CATALOG I DIMENSIONAL METROLOGY

- 0 +

Mahr

EXACTLY

1870

Vernier calipers from Carl Mahr made of steel and brass, produced in 1868

1900

Length measuring machine from 1908. Reading on the vernier .0001 mm

1930

Millimess precision probe, constructed in 1937. First indicating unit for reliably recording dimensional differences down to .0001 mm

1960

Millitron from 1964, compact length measuring instrument that was given the nickname "the miner's lamp"

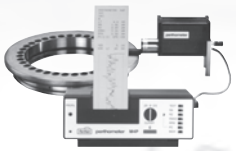
1980

MMQ 2, compact desktop formtester for evaluating roundness

MORE ABOUT MAHR: HOW IT ALL STARTED

►I **The measure of all things since 1861.** The industrialization of the 19th century not only saw rapid growth in productivity, but also a call for precision in manufacturing machine parts. Carl Mahr recognized the demand this would create for precision length measurement instruments 150 years ago. Founded in Esslingen on the Neckar River, his family business grew slowly but surely into a large-scale enterprise with over 1,500 employees. We have grown up in the world of metrology and have collected expertise along the way. We implement this knowledge in order to support you as well as possible in solving your tasks. Mahr products have been used in many branches for a long time. Our know-how creates customer benefits

1985



M4P, the first microprocessor-controlled roughness measuring instrument, with integrated printer for parameters and profiles

2006

UNI VIS 250 – high-precision optical measuring unit with picture processing for measurement of the smallest geometries in the common rail injection process close to the production site

2010

MarShaft SCOPE, optical measuring unit for turned parts with matrix camera for direct use in the production area

2012

MarSurf M 400 - the best of the "mobiles"! Easy. Fast. Innovative. With skidless tracing and automatic zeroing

2014

MarCal 16 EWRi, the world's first digital calipers with intergrated Wireless data transmission system

in the automotive industry and mechanical engineering, as well as in precision mechanics, plastics or medical technology. Metrology from Mahr solves various measuring tasks such as fuel injection systems of motors, the smallest workpieces of the clock and watch industry or artificial lenses for eyes. Our solutions speak the language of expert knowledge, quality and sustainability since 1861.

more than 150 YEARS Mahr EXACTLY

GÖTTINGEN

Germany
Headquarters of the Mahr Group
Production Site for Metrology Systems

Mahr GmbH
Carl-Mahr-Str. 1
37073 Göttingen

ESSLINGEN

Germany
Precision Gages Division
Sales Europe and Asia

Mahr GmbH
Reutlinger Straße 48
73728 Esslingen

JENA

Germany
Research, Development and Production
Optical Systems

Mahr GmbH
Carl-Zeiss-Promenade 10
07745 Jena

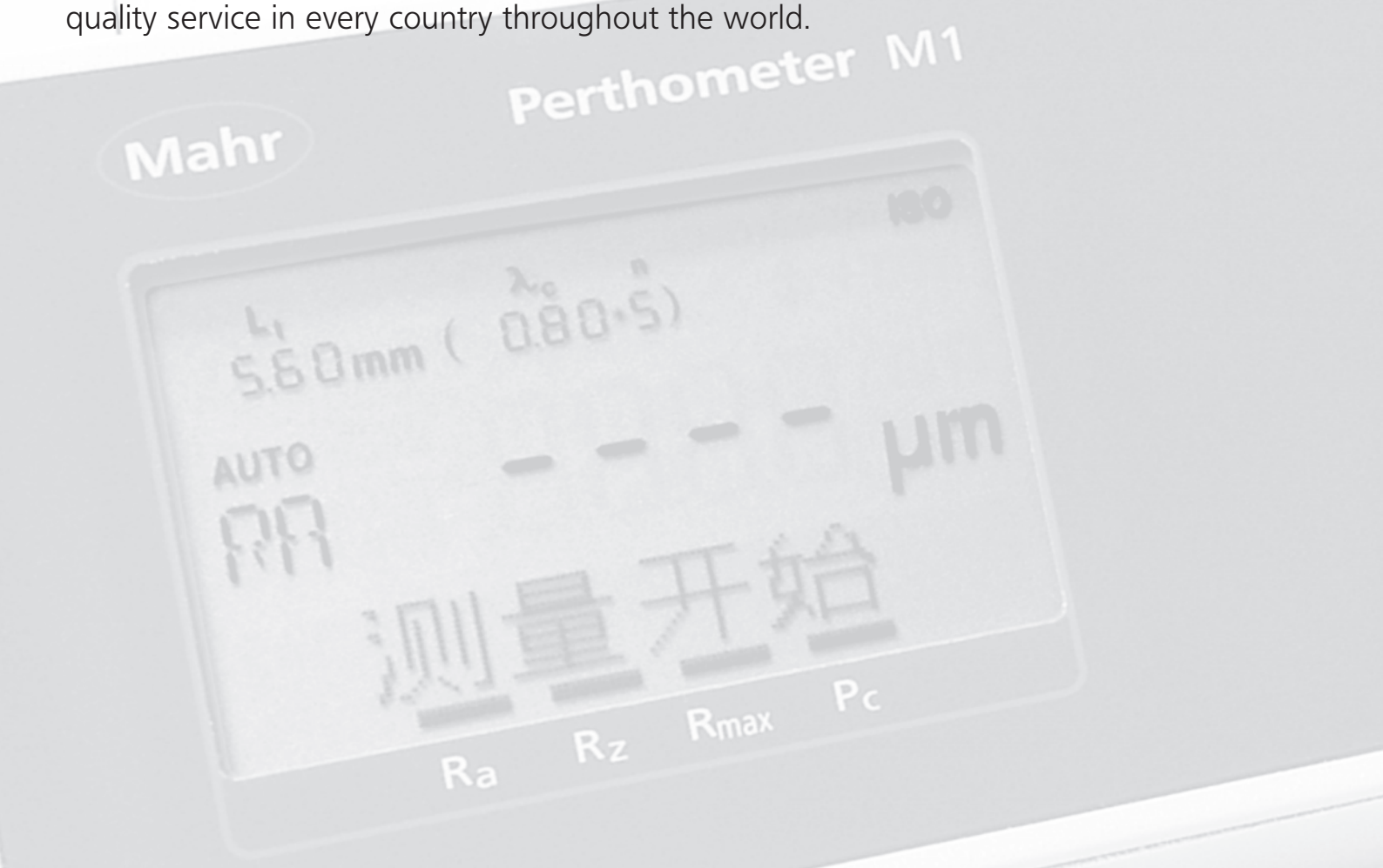
PROBOSTOV

Czech Republic
Production and Sales
Precision Gages and Metrology Systems

Mahr spol s.r.o.
Kpt. Jaroše 552
41712 Proboštov

MORE ABOUT MAHR: A GLOBAL PLAYER

►I **We're there wherever you need us.** As globalization advances, our customers expect that we at Mahr are represented worldwide. We have built a global network of production sites, branches and agencies with a goal to ensuring the optimum level of quality service in every country throughout the world.



PROVIDENCE

USA
Headquarters NAFTA
Production and Sales
Precision Gages and Metrology Systems

Mahr Federal Inc.
1144 Eddy Street
Providence, RI 02905

SUZHOU

China
Production and Sales
Precision Gages

Mahr Precision Metrology
#399 Su Hong Road
Suzhou Industrial Park
Suzhou 215122, P.R.

MAHR IS REPRESENTED IN

Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Chile, China, CIS, Croatia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkey, UAE, United Kingdom, USA, Vietnam

You can find Mahr metrology contacts in Europe, North America, Latin America and Asia.

We're there wherever and whenever you need us. Measure us by this pledge!

EXPERIENCE

Mahr has been producing measuring instruments for over 150 years

PROFESSIONALISM

The perfect solution for every need

PRECISION

Top quality for absolute precision

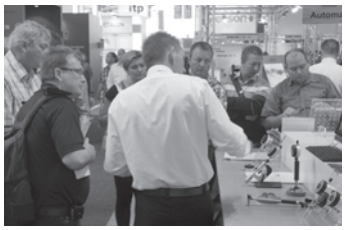
RELIABILITY

Results you can rely on

MORE ABOUT MAHR: THE BRAND

►I **We let precision speak!** Quality assurance is playing an ever greater role in the world of production. The more important repeatable precision becomes, the greater the importance of metrology to the final result. We make it our job to ensure that the results are accurate. As one of the world's largest manufacturers of measuring equipment, our leadership in the field of innovation is unrivalled. We have the precise technology required for all conceivable requirements. Our range of products extends from calipers to customized high-end measuring systems with direct connection to your production process. Supplemented with the right soft-

EXACTNESS

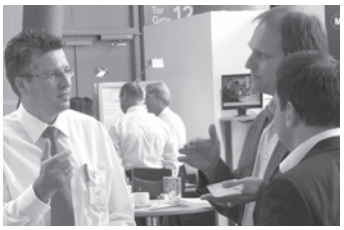


Going its own way to new standards

INNOVATION

Innovation leader in industrial metrology

DIMENSION



Continuous growth, a global player

VISION

Seeing things from a new perspective

ware, training and services such as calibration, we ensure smooth operations, quality and the continual reduction of costs. The concepts we devise for the future of metrology are the direct result of dialogue with your experts from the areas of production, research and development. As a process-oriented application specialist, we work out solutions with you, especially suited to your demands. Mahr offers more than just a product!

AUTOMOTIVE

AEROSPACE

MEDICINE

MORE ABOUT MAHR: THE EXPERTISE

►I **Industrial metrology for all applications. Production metrology with experience, innovation and dedication.** We are increasingly committed to developing solutions that provide our customers with a process-oriented spectrum of benefits for every conceivable application. Our solutions are used from initial research to final check. Many of them are derived from direct dialogue with our most loyal customers across a whole

ELECTRONICS

MACHINES&TOOLS

OPTICS

range of industries. Mahr offers you a broad spectrum for hand-held metrology, surface metrology and form metrology, as well as for shafts or gears. A comprehensive global service network provides services for everything from procurement of spare parts to gage measurement and also runs labs performing calibrations compliant with DIN EN ISO 17025.

MAHR. THE AUTOMOTIVE APPLICATION SPECIALIST

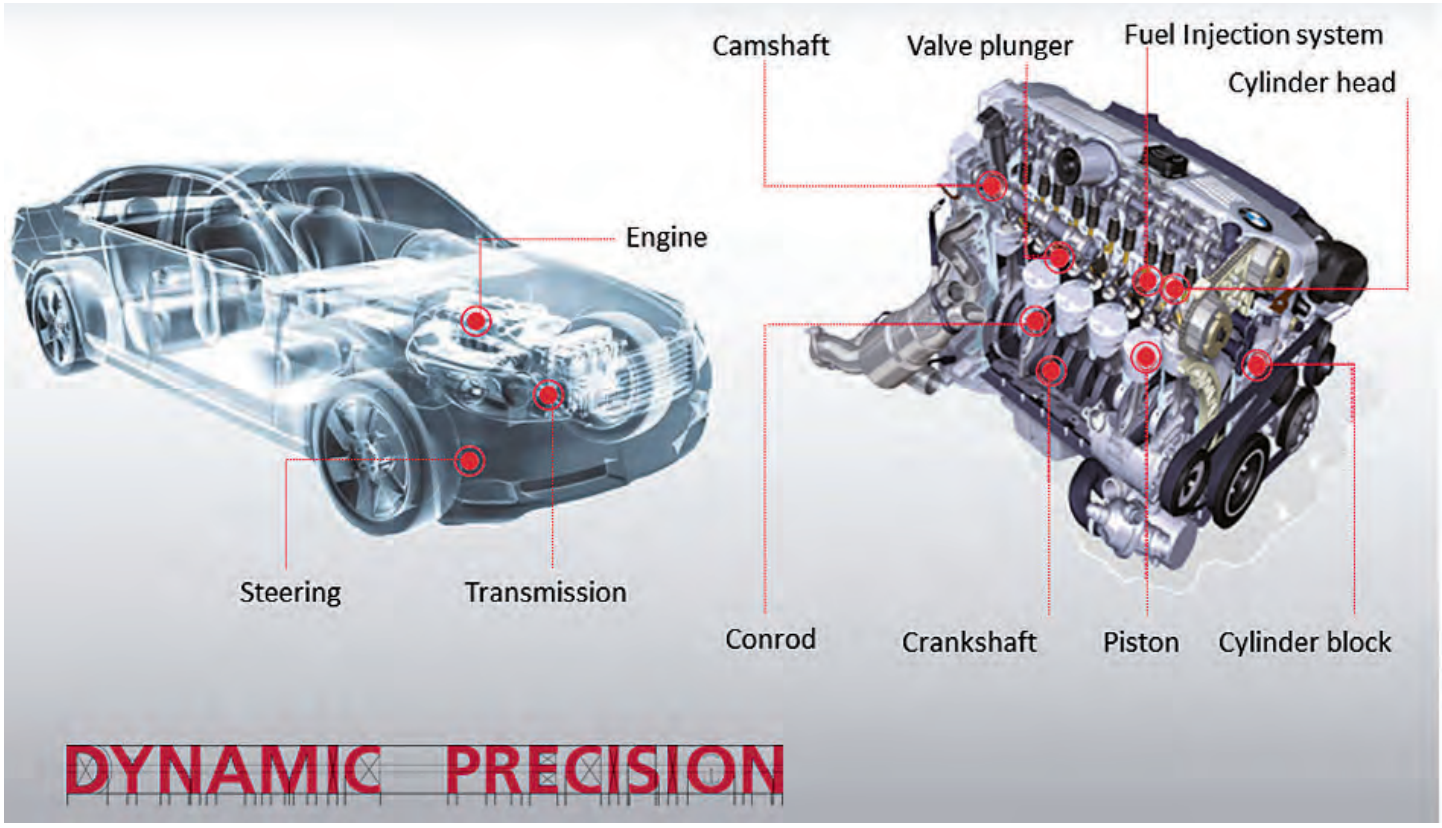
►I Precision and driving dynamics belong together in the automobile. Driving dynamics is only possible with precision-engineered and precision-measured components. In order to keep it this way, Mahr offers field-proven measurement technology that follows the major trends in the automotive industry.

In the foreseeable future, the internal combustion engine will remain the predominant type of drive. For this reason, many efforts are being made to significantly reduce the consumption of the engine and to meet stringent CO_2 emission regulations.

An important element in the reduction of fuel consumption is downsizing. For example, the number of cylinders can be reduced from 4 to 3 or from 6 to 4 cylinders. With turbocharging, a much higher performance per cylinder is possible. There are various concepts such as the conventional turbocharger, the twin-turbocharger or the sequential bi-turbocharger.

Another component in gasoline engines is direct fuel injection and active cylinder management. This is understood as the activation or deactivation of cylinders. The camshaft is used to control these processes.

In addition to the design of new engine concepts, work is primarily being done on the reduction of friction. Friction reduction affects the entire drive train from the engine, via the transmission, to the tires. The aim is to reduce the gear, transfer more power and reduce noise. In addition, there are particularly high demands, for example, on cylinder liners, bearings or gears.

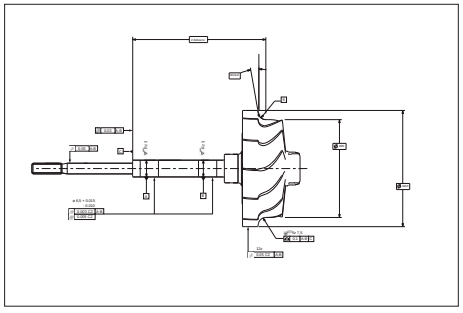


Alternative drives such as hybrid vehicles or electric vehicles with batteries or fuel cells expedite electrification of the drive train. Currently, the automotive industry is taking on the challenge of manufacturing components with high quality at a reasonable cost in medium to high volumes such as batteries, fuel cells and electric motors.

Mahr, the Application Specialist, offers metrology solutions for automotive parts. Whether it be axles, starter, brakes, seals, electric motors, gear parts, steering, pulleys, wipers, seat, turbochargers or engine, with Mahr you get a solution for your metrology challenges. Mahr has a wide variety of solutions for engine parts such as injectors, engine blocks, camshafts, pistons, crankshafts, connecting rods, valves and cylinder heads.

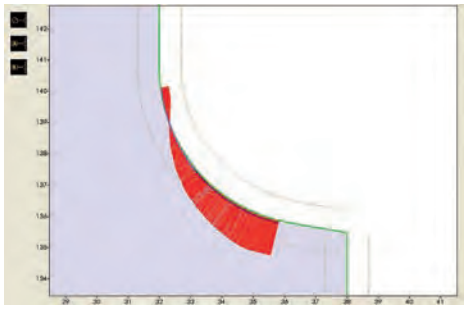
Mahr metrology solutions range from standard instruments for measuring in the precision measuring laboratory to fully automatic measurements in the production line. In addition, Mahr covers the complete parameter spectrum of parameters from length, shape, roughness, contour and even gear tooth geometry.

Measuring task



Measuring solution

Documented quality



MAHR. THE APPLICATION SPECIALIST FOR MECHANICAL ENGINEERING

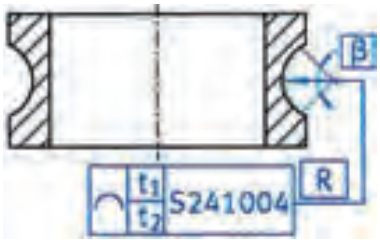
►I Precision and productivity form a unit in mechanical engineering. In order to optimize production processes of precision parts for low to high quantities, support comes from proven Mahr metrology. Mahr offers the mechanical engineering industry measurement solutions that are universal, comfortable and inexpensive.

With the innovation in the manufacturing processes of turning, grinding, milling, drilling, honing, laser cutting or eroding, the demands on production metrology grow. Precision metrology from Mahr supports these developments with customer- and application-oriented solutions. From automated measurement solutions with 100 percent inspection to the individual statistical test, Mahr offers the right solution - right at the production site. These solutions provide budget-oriented quality assurance, creating a valuable competitive advantage, as the costs of quality and production are reduced.

Individual customer solutions from Mahr comprise important factors such as life cycle cost (LCC), return on investment (ROI) and longer service intervals.

Mahr, the Application Specialist, offers metrological solutions for parts used in the field of mechanical engineering. Representative of this wide range of parts are bolts, seals, cans, gears, hydraulic components, bearings, pumps, compressors, pipes, shaving cutters, worm gears, cutters, hobs, shafts, gearing and gear wheels.

Measuring task



Measuring solution

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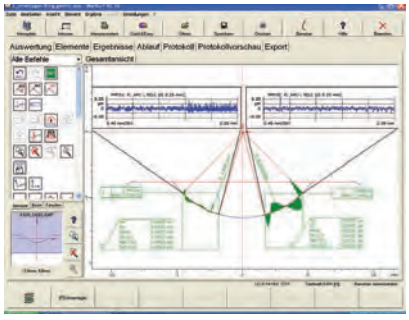


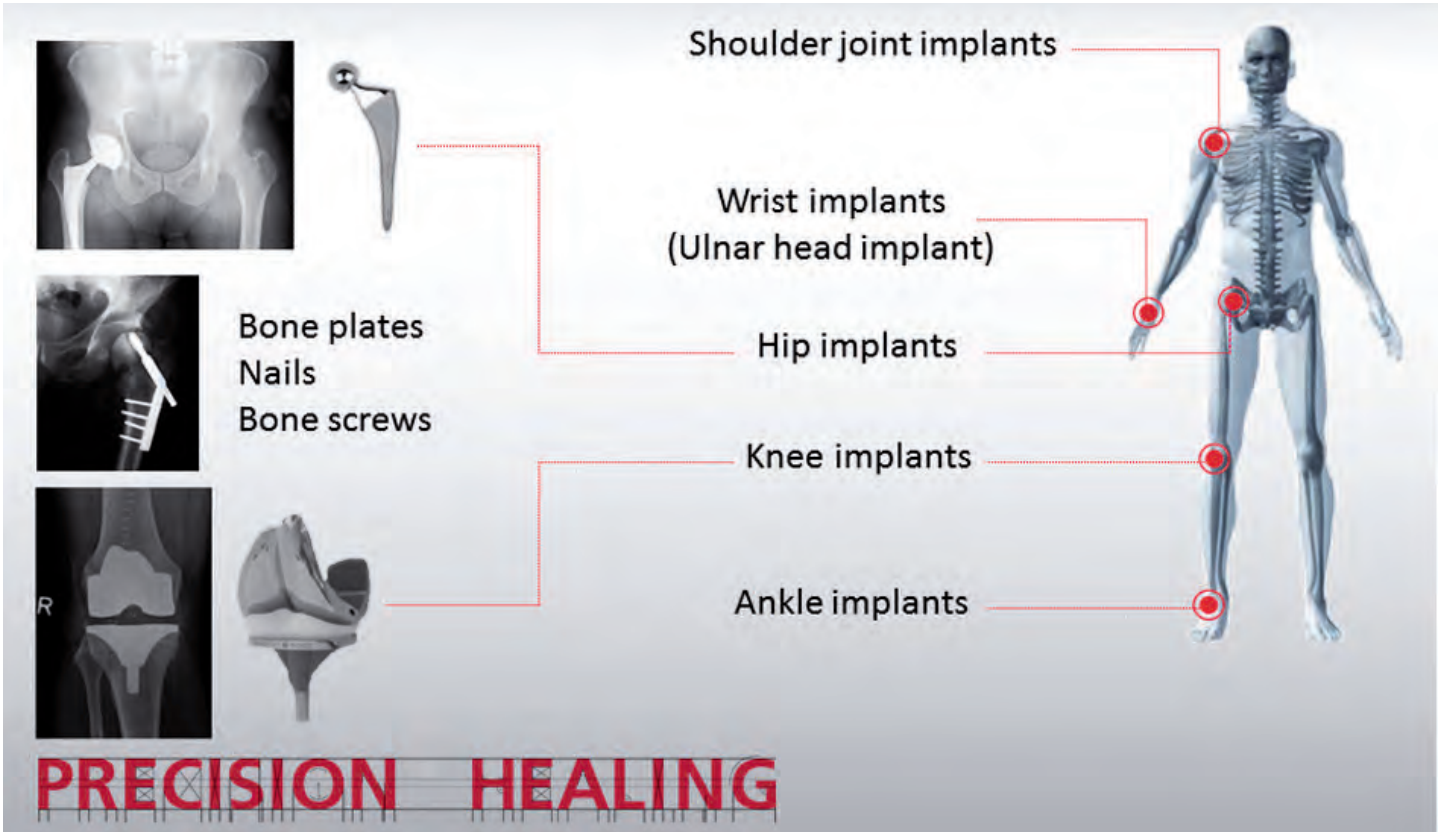
MAHR. THE APPLICATION SPECIALIST FOR THE MEDICAL INDUSTRY

►I Precision promotes health. Highly-precise manufactured implants can be more easily implanted, cause fewer painful side effects such as metallic abrasion, and have a longer service life. Mahr offers proven metrology to expand the quality assurance of medical parts.

Medical technology and metrology are two terms that are continually gaining importance. They are combining to improve healing success and the recovery process. Alloplastic implants are being used in operative fields more frequently. The essential objective is to give the patient freedom from pain and the most natural function possible. Directly associated with this is the demand for biocompatibility and long-term functionality (breaking resistance, low abrasion). New materials improve these implant qualities, allowing optimized design and increased production efficiency.

For the patient, this continual improvement in quality means that further operations, so-called revisions, are only needed after many years and the implant can be kept for as long as possible.

To ensure the characteristics important to the quality of a product, the use of modern, innovative but also proven metrology is absolutely necessary.

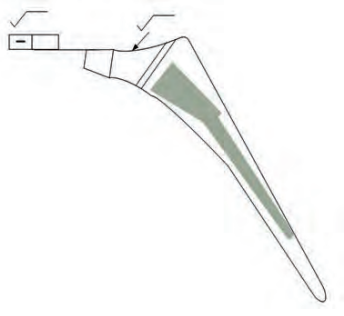


Use high-precision metrology from Mahr in your R&D department as well as in production monitoring to ensure the quality of your implants, just like other manufacturers of such implants do. Mahr metrology gives you detailed information on the product optimization and enables the documentation of your delivered quality.

Avoid expensive and unnecessary defects by using Mahr metrology.

Mahr, the Application Specialist, offers metrological solutions for parts used in medical technology such as medical screws, individual components of hip and knee joint implants, dental implants, pumps for precise metering and thin cannulas.

Measuring task



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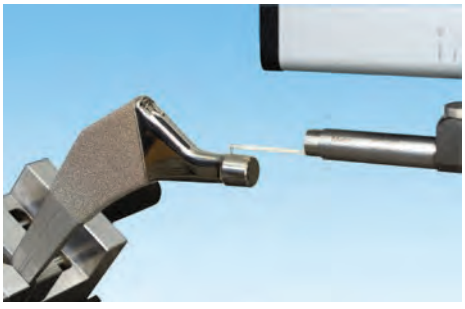

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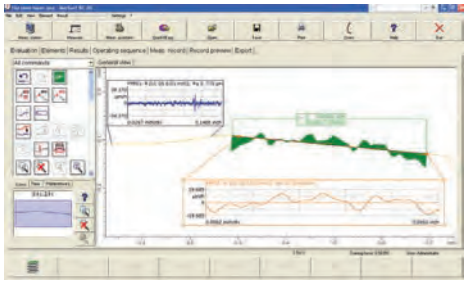


MAHR. THE APPLICATION SPECIALIST FOR OPTICS

►I Precision for the proper beam path through lenses and lens systems is essential in order to focus the light, and achieve the desired luminous intensity.

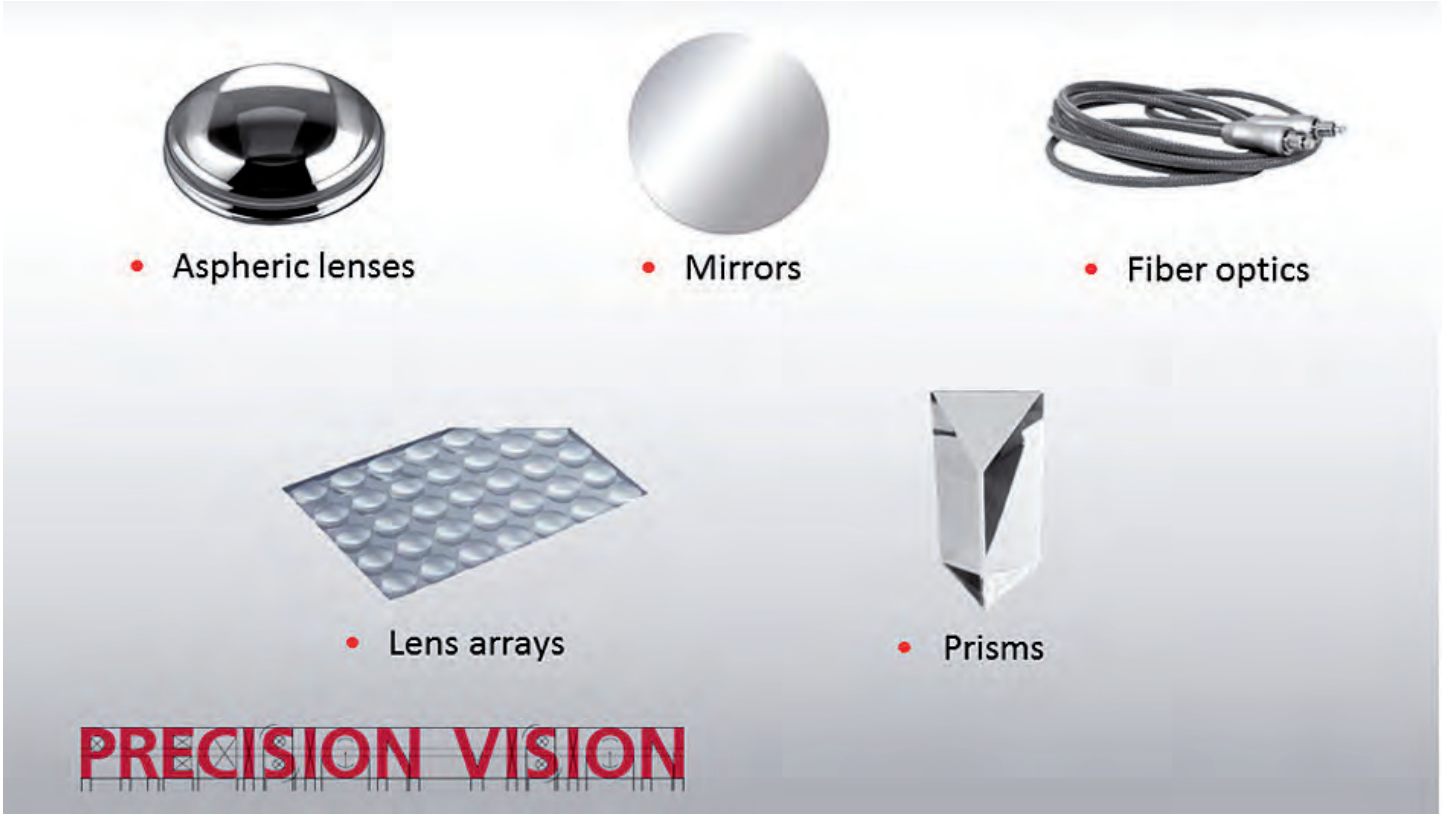
The constant development of optical components in conjunction with modern light sources such as lasers and LEDs, high-performance image processing software and the huge increase in storage in computer technology now allow cost-effective technical solutions that were unthinkable a few years ago.

Accompanying this development is the growing demand on metrology. Often the first quality testing of optical components such as the lenses, diaphragms, prisms, mirrors of the optical fibers or the light source occurs at an early stage of production.

For many years, Mahr has been working with the measurement of optical components. The lens measurement is a particular focus. Mahr, as a complete supplier of dimensional measurement technology, provides both the manufacturers of machining tools for lenses and the lens manufacturers themselves customized solutions from hand tools for use directly on the machine to the accompanying production measurement system MarSurf LD 130 Aspheric.

The requirements for optical systems such as zoom lenses, lenses for DVD drives and lenses in mobile phone cameras focus on a more compact and cost-effective system design. For this purpose, in addition to the classical, spherical (ball-shaped) lens forms, aspheric (non-spherical) lens forms are increasingly being manufactured. The most modern manufacturing procedures enable a variety of design possibilities and also support the trend towards free-forms and diffractive elements in optical components.

Lenses with high precision are made with glass abrasion processes such as grinding, polishing or finishing. The optimization of this manufacturing process, with measurements that accompany production, is an important starting point to reduce costs. Processes such as precision molding for producing high quality at relatively low cost or injection molding for manufacturing low-cost plastic lenses are used in the mass production of lenses. The quality

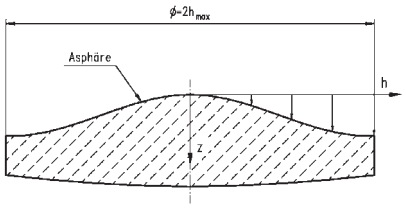


of the tools used to create the lenses is the foundation for the quality of the products produced. New geometries and increasing demands on the quality of the products also require new measurement techniques and measurement strategies.

Non-contact surface measuring systems that can detect arbitrary shapes with high accuracy and evaluate measurement technology solve the tasks of quality assurance. Intensive research and decades of experience in industrial metrology and cooperation with partners from science and industry provide the necessary foundation to support you with innovative products in the manufacture of optical components. The metrology of Mahr is prepared for the challenges of the future.

Mahr, the Application Specialist, offers measurement solutions for optical components such as spheres, mirrors, cylinder lenses, lens arrays and fiber optics.

Measuring task



Measuring solution

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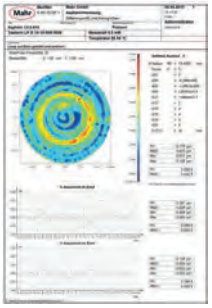


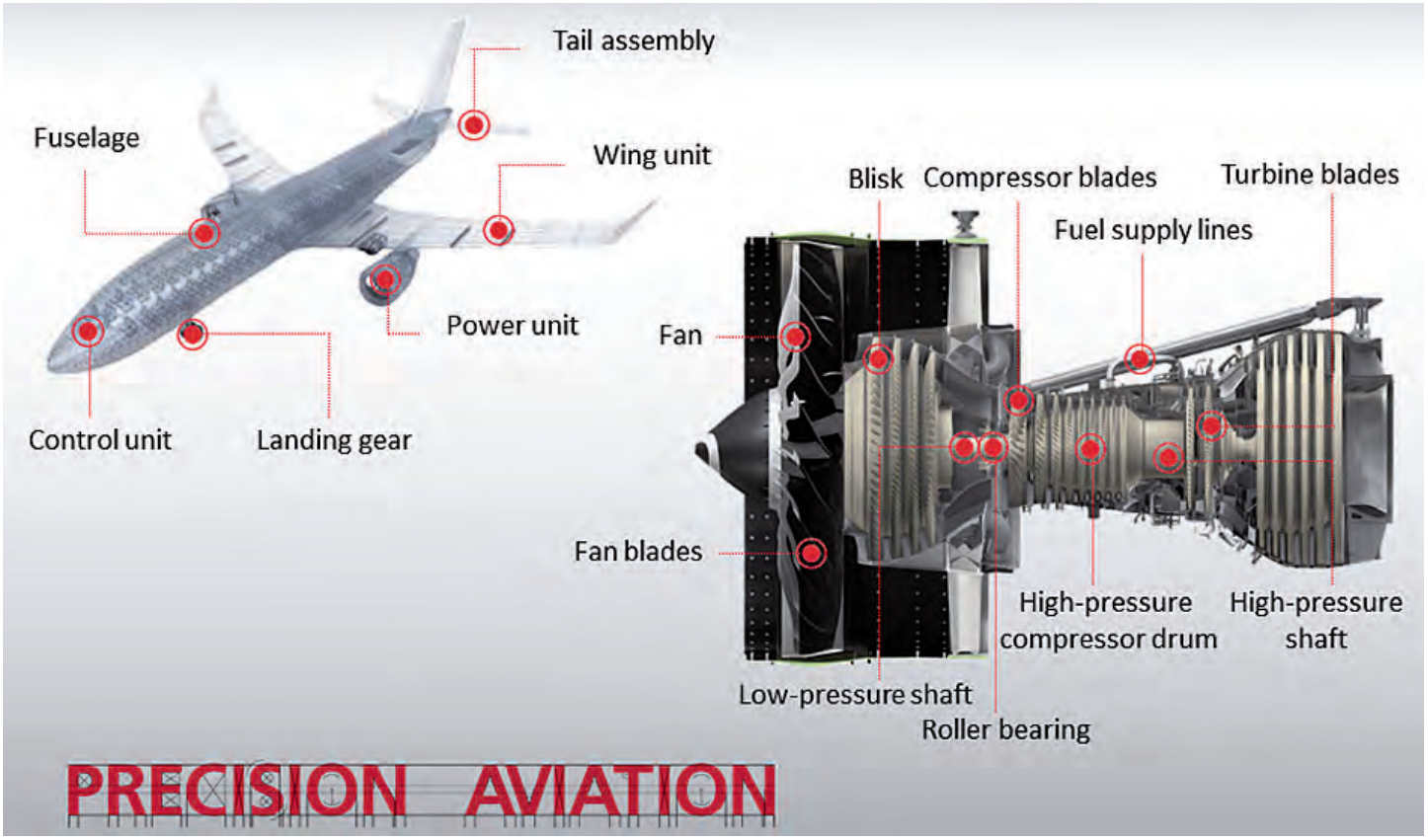
MAHR. THE APPLICATION SPECIALIST FOR THE AEROSPACE INDUSTRY

►I Precision makes flying safe. Engines, wings, rudders, flaps, control systems, chassis, etc., must function absolutely properly during the flight in order to guarantee the safe transport of passengers. Only precision-crafted components function reliably for hours and in almost any environment.

Global air traffic is rapidly increasing. This means that the requirements for lower exhaust emissions and thus lower fuel consumption are always increasing. In addition, the reduction of aircraft noise in urban areas is more vehemently demanded by the population, which in turn affects the noise emission of engines. In addition, suppliers are increasingly feeling the pressure on the costs of major aircraft manufacturers.

In this field of tension between innovation and cost pressure, as well as the high demands for reliability, metrology from Mahr provides solutions for R&D, measuring rooms and 100% control in manufacturing. During development, new lighter materials are increasingly being tested and implemented. Surface structures are carefully examined in order to minimize frictional resistance.

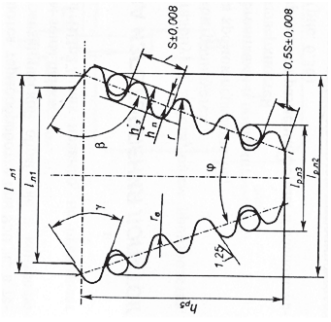
In manufacturing, the challenge is to deliver the high-quality components error-free to the subsequent processing or assembly step and avoid costly rework. In addition to the testing of dimensional parameters, inspection plays an important role in cracks and eruptions. Optical measurement methods and inspection methods can accelerate quality assurance and make it independent of subjective assessments.



When the aircraft components are in use, the question of timely and reliable service quickly arises. Even at this stage, Mahr offers corresponding measurement solutions to check parts for wear, damage or to determine their further use.

Mahr, the Application Specialist, offers metrology solutions for airplane components. Metrological solutions are available for blisks, seals, discs, gearing, hydraulic components, bearings, turbine blades, shafts and gear wheels.

Measuring task



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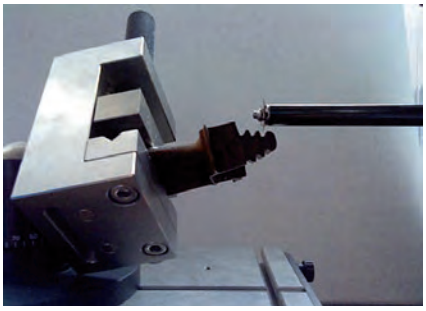

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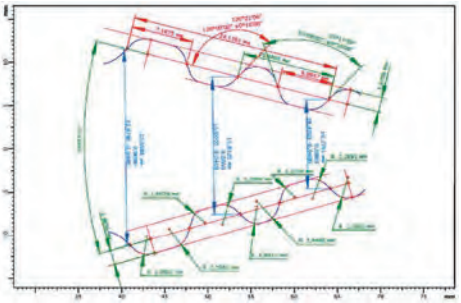
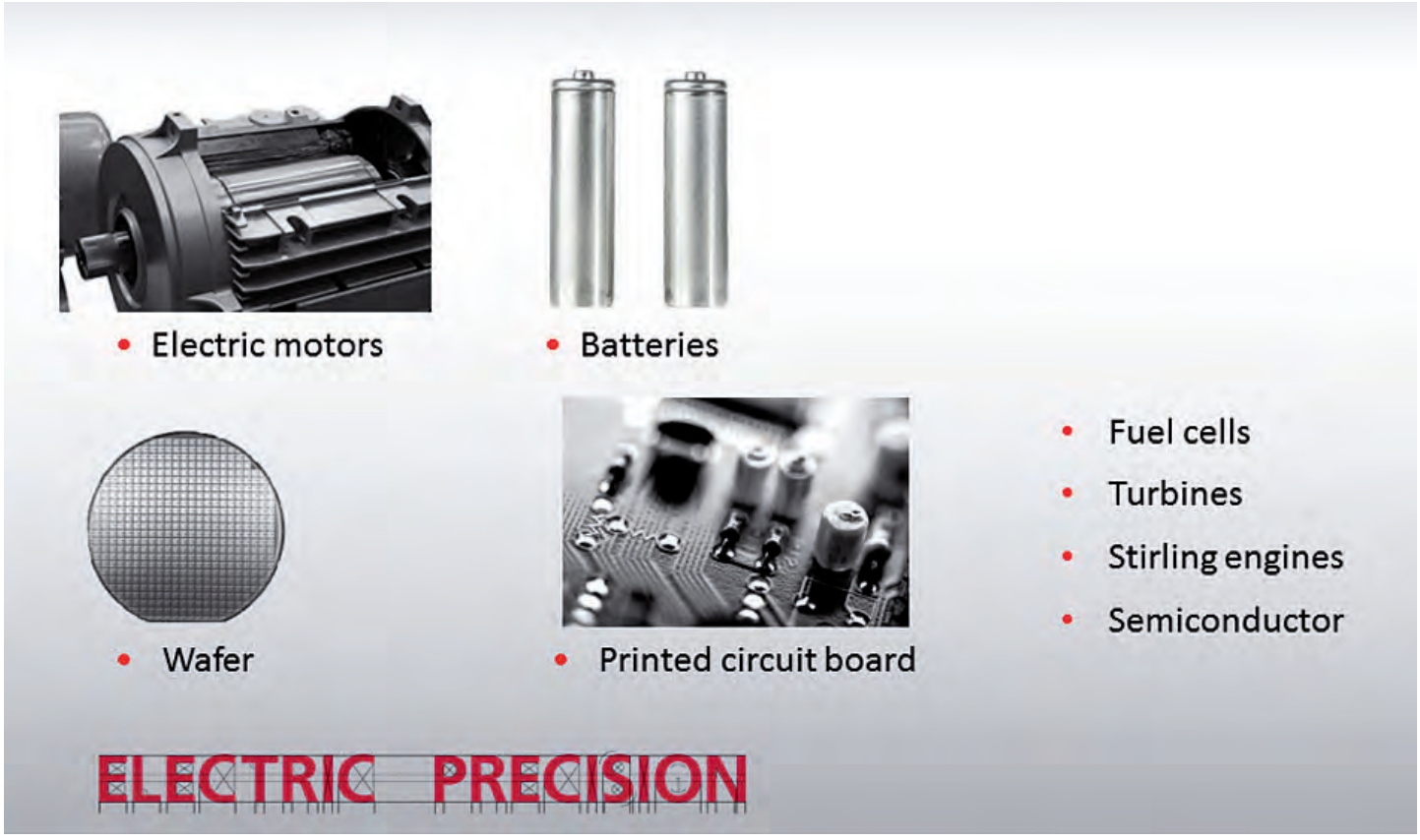


MAHR. THE APPLICATION SPECIALIST FOR ELECTRICAL ENGINEERING

►I Precision ensures that electricity can flow and power devices. Precision in the nanometer range and in the micrometer range, such as in semi-conductors and printed circuit boards, assures that there is electrical wiring and electric function can be performed.

The electrical engineering industry mainly follows the trend of energy efficiency. The reduction of energy consumption applies to all devices such as washing machines, dryers, refrigerators, dishwashers, consumer electronics and mobile phones. In order to reduce the consumption of energy, new materials are used, friction in mechanical components reduced and controls optimized. The optimization of energy efficiency, low noise and long life is the aim in electric motors. In addition to electronic commutation, this leads to the reduction of imbalance in electric motor parts.

Another trend is the miniaturization of devices and components. Examples are flatter laptops or mobile phones. This, in turn, implies a smaller size in electronic components and thinner multilayer printed circuit boards. Specifically, the reduction of conductor widths and thicknesses as well as the reliable production of the vias are becoming more demanding. In the field of electronic components, Moore's law in the meantime has led to 16 nm, and soon it will be 10 nm in manufacturing processes. These very small structural sizes are not only a challenge in terms of technical process but also a measuring challenge. Even the counter-movement "More than Moore" with process modules such as MEMS, high voltage, image sensors or integrated memory has already reached structures with a size of up to 55 nm.

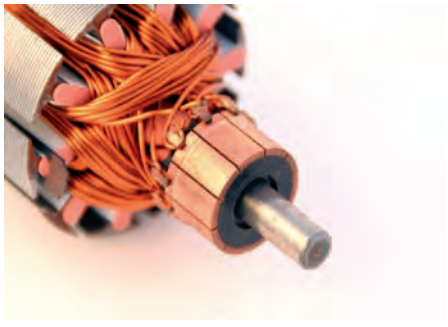


New energy storage devices such as fuel cells or lithium-ion batteries also put new demands on dimensional metrology.

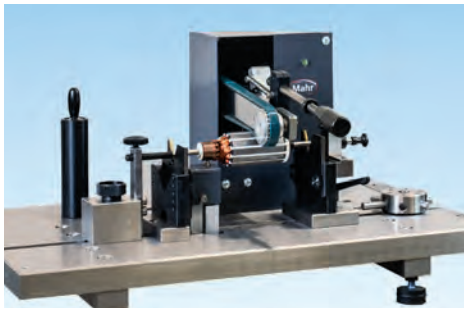
The manufacturing processes in electrical engineering are often high volume processes. For quality assurance in manufacturing, 100% of measurements or inspections are performed at many process steps. The process development or the development of components requires the use of dimensional metrology. Mahr offers proven measurement solutions for these requirements.

Mahr, the Application Specialist, provides measurement techniques for the electrical engineering industry. Proven measurement solutions are available for the measurement and inspection of semiconductor structures on wafers, printed circuit boards, electric motors, connectors, contacts, batteries and fuel cells.

Measuring task



Measuring solution



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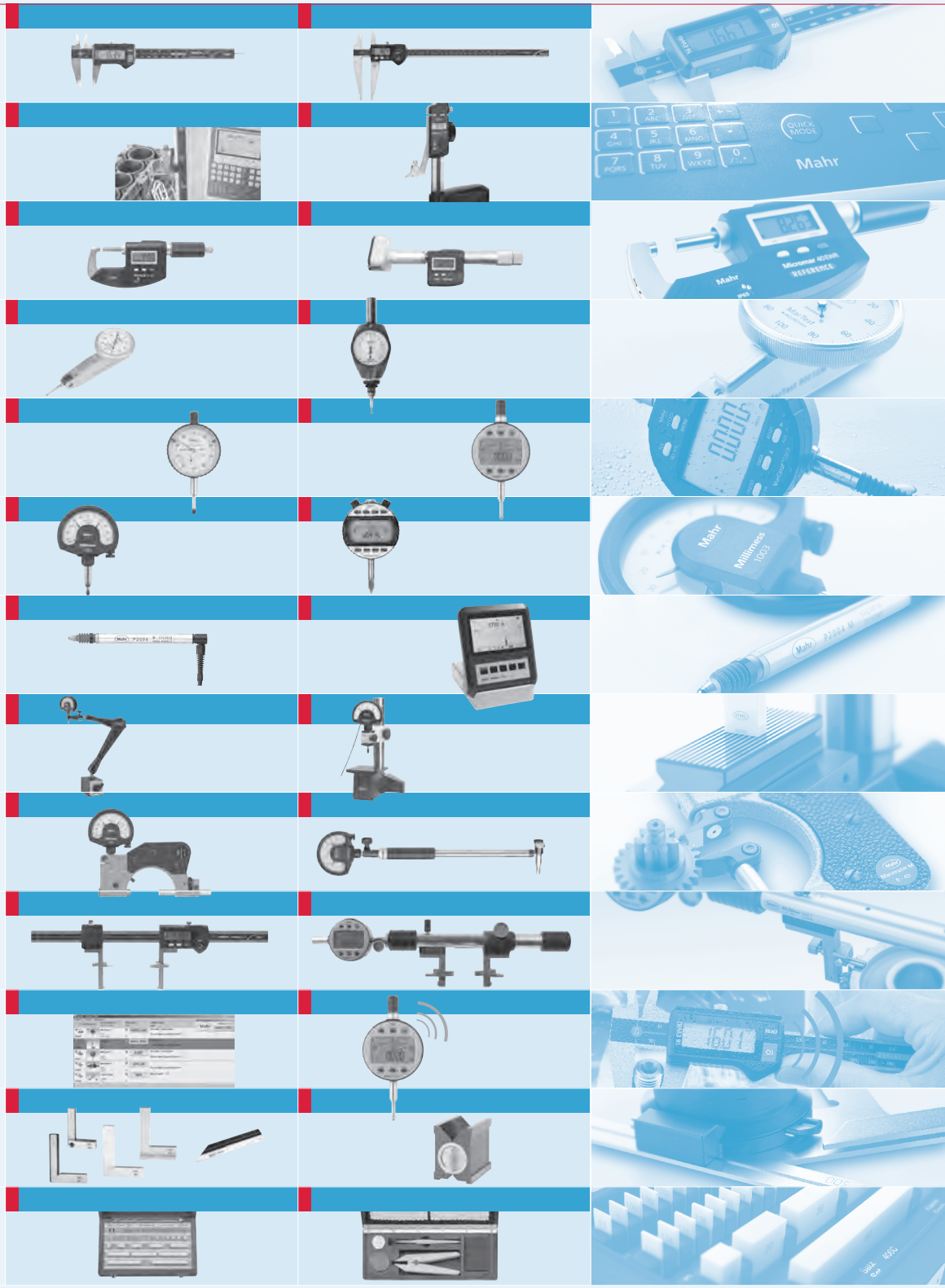
DIMENSIONAL METROLOGY



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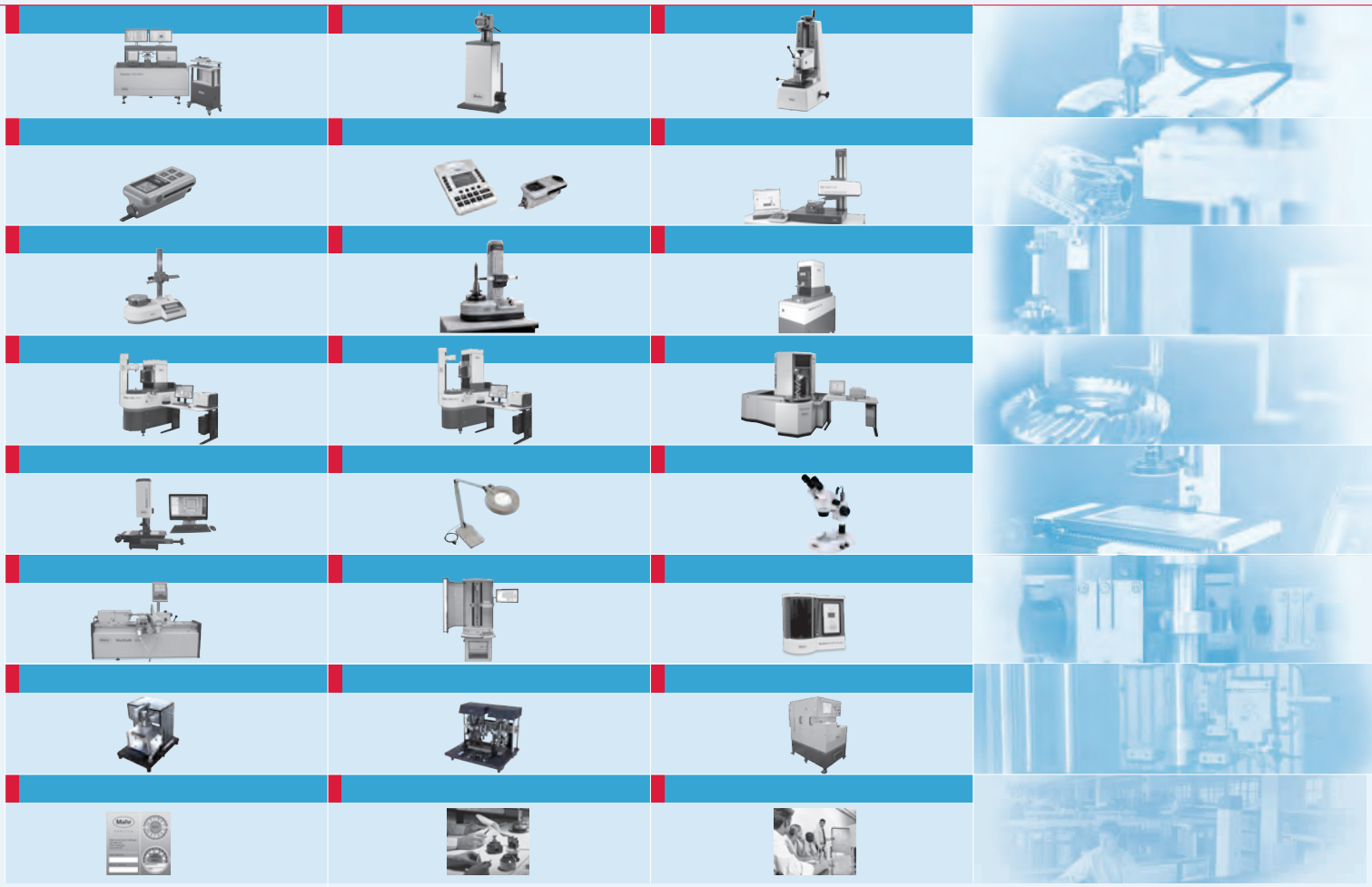
DIMENSIONAL METROLOGY



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MarShaft	Shaft Metrology	19- 2
MarSolution	Customer Specifical Metrology	20- 2
Service		21- 2

FOR SIMPLE MEASUREMENT THE RULE OF THUMB IS SUFFICIENT.
FOR THE REST THERE IS MARCAL.

The latest information on MARCAL products can be found on our website:
www.mahr.de/en/Home, WebCode 20065

► | High-quality calipers are amongst the most important measuring instruments in Dimensional Metrology because they are both versatile and easy to use, such as the MarCal series from Mahr. The ER digital caliper series is simple to operate, has a large, easy to read display and enables fast and uncomplicated data transmission thus meeting all requirements of modern metrology. The new generation of Mahr calipers is the MarCal 16 EWRi; an Integrated Wireless digital caliper with an economical integrated wireless data transmission. Besides the MarCal 16 EWRi being the optimal solution for data transmission, this caliper is also waterproof (IP 67), thus enabling measurement even in the most difficult workshop conditions. In addition all the Mahr calipers have a highly precise slide movement as well as both the slide and beam being made of hardened stainless steel thus completing the outstanding characteristics of Mahr calipers. | ◄

► | MarCal. Calipers

Overview
MarCal Calipers 1- 2

Standard Calipers

MarCal 16 EWRi 1- 6
Integrated Wireless Waterproof Caliper with a Digital Display
MarCal 16 EWR 1- 8
Waterproof Caliper with a Digital Display
MarCal 16 ER 1-12
With a Digital Display
MarCal 16 DN / 16 FN / 16 GN / 16 N 1-14
With a Line Scale (Vernier)
MarCal 16 U 1-15
With Dial

Universal Calipers

MarCal 16 EWV 1-16
With a Digital Display

Special Calipers

MarCal 16 EWR 1-18
Waterproof Caliper in special design

Workshop Calipers

MarCal 18 EWR / 18 ESA 1-24
With a Digital Display
MarCal 18 NA / 18 N / 18 DN 1-27
With a Line Scale (Vernier)
MarCal 18 EWR-V 1-30
Universal Caliper with a Digital Display

Depth Calipers

MarCal 30 EWRi / 30 EWR / 30 EWN 1-32
With a Digital Display
MarCal 30 N / 30 NH / 30 ND 1-36
With a Line Scale (Vernier)

Linear Machine Scales

MarCal 31 EW 1-37
With a Digital Display

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Universal Caliper with a Digital Display

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MarCal 30 EWRi / 30 EWR / 30 EWN 1-32
With a Digital Display
MarCal 30 N / 30 NH / 30 ND 1-36
With a Line Scale (Vernier)

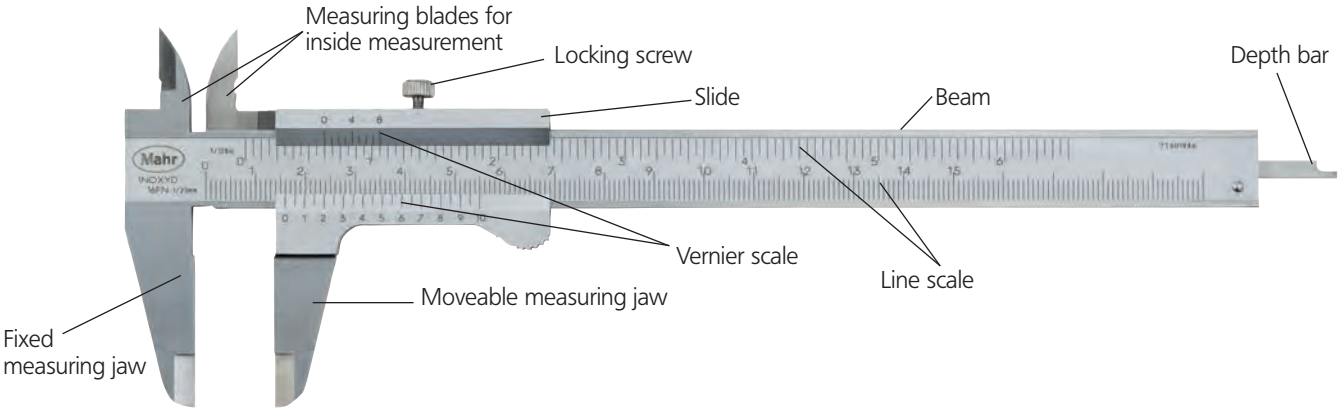
Linear Machine Scales

MarCal 31 EW 1-37
With a Digital Display

MarCal. Calipers

OVERVIEW

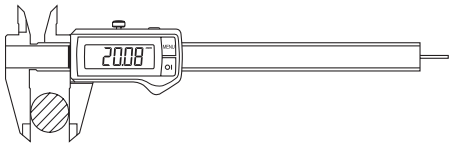
MarCal - Design Features



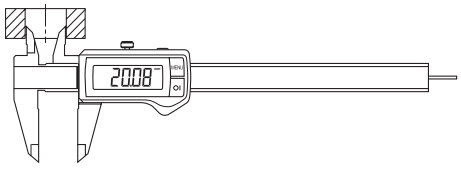
MarCal - Types on measurement

Calipers of the 16 series (e.g. 16 EWRi, 16 U, 16 FN) can be used to conduct 4 different types of measurements:

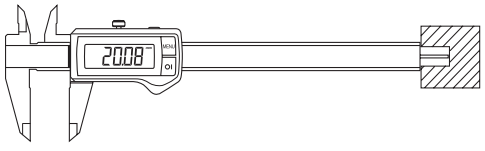
a) Outside measurement



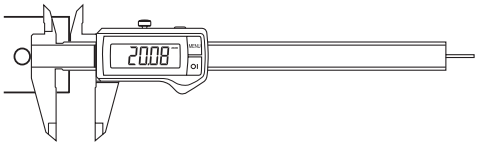
b) Inside measurement



c) Depth measurement



d) Step (Distance) measurement



Error limits *G* according to DIN 862

Measuring length	Error limits *G* in µm		
	Scale interval and/or vernier interval		Resolution
l	0.1 and 0.05	0.02	0.01
50	50	20	20
100			
200		30	30
300			
400	60		
500	70		
600	80		
700	90	40	40
800	100		
900	110		
1000	120		
1200	140	50	–
1400	160	60	
1600	180		
1800	200		
2000	220		

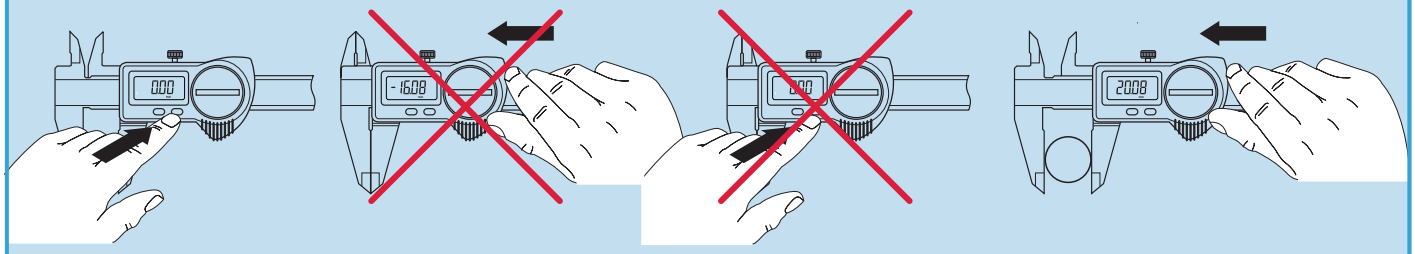
MarCal - The innovative Reference-System

Just set once to zero

All Mahr digital calipers with this logo REFERENCE are equipped with the innovative Reference-System. The zero position just has to be set once: after setting the zero position, the zero remains stored for all further measurements. Therefore, once the caliper is switched ON or the slide is moved the caliper is immediately ready for measurement. The need to reset to zero with a conventional caliper once the caliper is switched on has now become obsolete.

Conventional

① Switch ON ② Close the measuring jaws ③ Set to zero ④ Results of measurement



REFERENCE **- System**

① Switch ON ② Results of measurement

Press the ON key or move the slide

IP-Protection classes

First digit is the degree of protection according to IEC 60529		Second digit is the degree of protection according to IEC 60529 (approximate)	
Protection against particles, contaminants and dust		Protection against wet conditions (fluids)	
0	Not protected	**0**	Not protected
1	Particles > 50.0 mm	**1**	Falling water drops - vertical
2	Particles > 12.5 mm	**2**	Falling water drops - tilted < 15°
3	Particles > 2.5 mm	**3**	Spray water < 60°
4	Particles > 1.0 mm	**4**	Water splashing from all directions
5	Dust protected	**5**	Water jets from all directions
6	Dust tight	**6**	Powerful water jets
		7	Temporary immersion in water
		8	Continuous immersion in water

IP67

Example:
IP67 means that the product is "Dust tight" and is protected against "Temporary immersion in water".

MarCal. The new Generation

WATERPROOF DIGITAL CALIPERS WITH THE REFERENCE-SYSTEM AND INTEGRATED WIRELESS

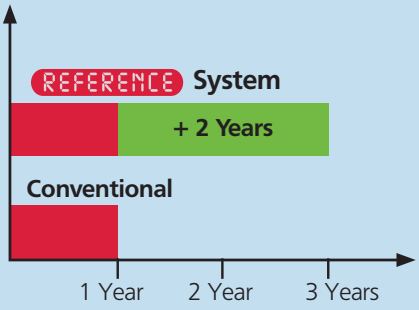
Security due to the Reference-Lock function

- Zero-position is secured
- Operating error is not possible

The digital caliper MarCal 16 EWRi Reference is equipped with a LOCK function. With this key lock the zero position is secured and operating error is avoided.

Battery service life is 3 years

The new Reference system is extremely energy efficient as when the caliper is in standby mode; almost no power is required, thus **extending the life of the battery up to 3 years*.**



** When Integrated Wireless is deactivated*

Superior quality of the guide ways

Only MarCal calipers have lapped guide way surfaces, these guarantee an even and sensitive run of the slide. Additionally, the service life of the caliper increases compared to a ground guide way due to the greater contact area on the guide way surface.

Surface of the guide way

Mahr
Lapped guide way

Competitor A
Ground guide way

Competitor B
Ground guide way

MarConnect Integrated Wireless

Wireless data transmission for the price of a data cable. With Integrated Wireless, you have a new Integrated Wireless data transmission system from Mahr for the price of a data cable. Data acquisition with digital calipers is now even simpler: Simply transmit your measured data without being caught up between cables directly into Microsoft Office Excel® or via a keyboard code into any Windows program.

Secure data transmission

With Integrated Wireless your data will be transferred to the digital indicator; this is confirmed with a message in the digital indicator's display to whether the sent data has been transferred correctly, and/or whether you are in the reception range of the i-stick.

Ergonomic Design

The handy non-slip thumb support of the MarCal 16 EWRi ensures even in contaminated working conditions trouble-free handling and therefore reliable measuring results.

The high-contrast display with 11 mm high digits enables accurate, fatigue-free reading of the measurement results.

Excellent resistance against dust, coolant and lubricants

Due to the outstanding protection against dust and water the digital caliper MarCal 16 EWRi Reference delivers precise and secure results even in the most difficult workshop conditions. The finished plastic components have an excellent outstanding chemical resistance.

Code Initials	**IP**	International Protection
First digit	**6**	Dust-tight
Second digit	**7**	Protected against temporary immersion in water

Digital Caliper MarCal 16 EWRi

Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Japan, China and Korea.

Features

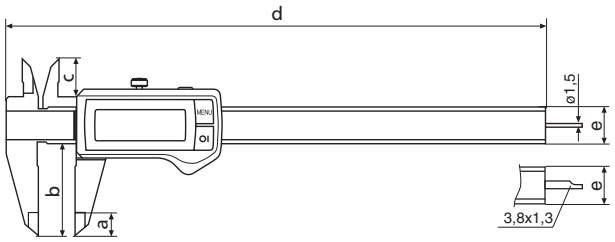
Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
PRESET (for entering a numerical value)
Reference-Lock/Unlock
Hold
DATA
Auto-ON/OFF

- Integrated Wireless data transmission
- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 11 mm high digits
- Lapped guide way
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw
- Supplied with: Case, battery, operating instructions

Technical Data

Measuring range mm	*(inch)*	Resolution mm/inch	Error limit *G* mm	/ *inch*	DIN 862	Depth rod		Friction wheel	Order no.
150	***(6")***	0.01/***.0005"***	0.03	/ ***.001"***	●	●			**4103400**
150	***(6")***	0.01/***.0005"***	0.03	/ ***.001"***	●	●		●	**4103401**
150	***(6")***	0.01/***.0005"***	0.03	/ ***.001"***	●		●		**4103402**
150	***(6")***	0.01/***.0005"***	0.03	/ ***.001"***	●		●	●	**4103403**
200	***(8")***	0.01/***.0005"***	0.03	/ ***.001"***	●		●		**4103404**
200	***(8")***	0.01/***.0005"***	0.03	/ ***.001"***	●		●	●	**4103405**
300	***(12")***	0.01/***.0005"***	0.04	/ ***.0015"***					**4103406**
300	***(12")***	0.01/***.0005"***	0.04	/ ***.0015"***				●	**4103407**

Technical Data



Dimensions

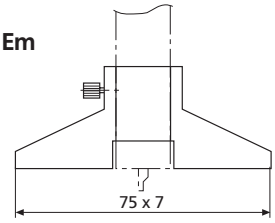
mm	a	b	c	d	e
150	10	40	16	235	16 x 3
200	10	50	19	285	16 x 3.5
300	14	64	19	388	16 x 4

Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**
i-Stick wireless receiver incl. MarCom Standard		**4102220**
Software MarCom Professional 5.0		**4102212**
Software MarCom Standard 5.0		**4102211**

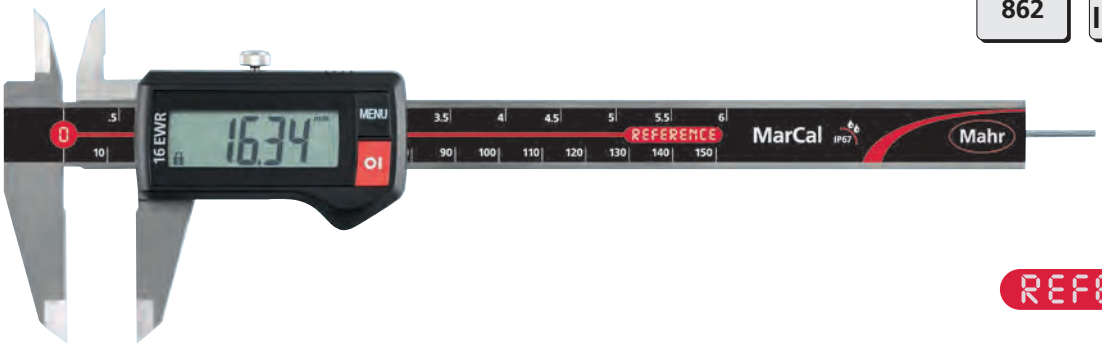
Accessories for Data Processing see Chapter 11

16 Em



i-Stick

Digital Caliper MarCal 16 EWR



DIN 862 IP67

REFERENCE

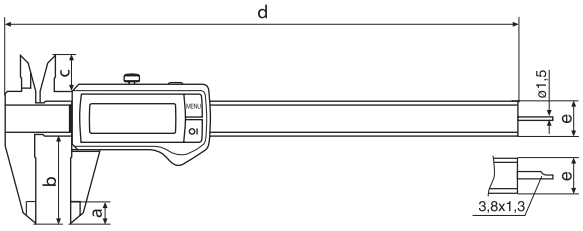
Features

Functions:
ON/OFF
AUTO-ON / OFF
RESET (set display to zero)
PRESET (for entering a numerical value)
Reversal of counting direction mm/inch
Reference-System
LOCK-Function (key lock)

- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast Liquid Crystal Display with 11 mm high digits
- Raised guide ways for the protection of the scale
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw above
- Supplied with: Case, battery, operating instructions

Technical Data

Measuring range mm	*(inch)*	Resolution mm / *inch*	Error limit *G* mm	Depth rod		Friction wheel	Order no.
150	***(6")***	0.01/ ***.0005"***	0.03	●			**4103300**
150	***(6")***	0.01/ ***.0005"***	0.03	●		●	**4103301**
150	***(6")***	0.01/ ***.0005"***	0.03		●		**4103302**
150	***(6")***	0.01/ ***.0005"***	0.03		●	●	**4103303**



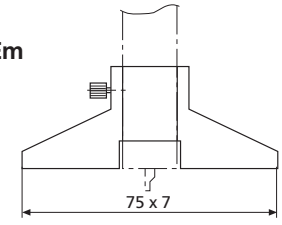
Dimensions

mm	a	b	c	d	e
150	10	40	16	235	16 x 3

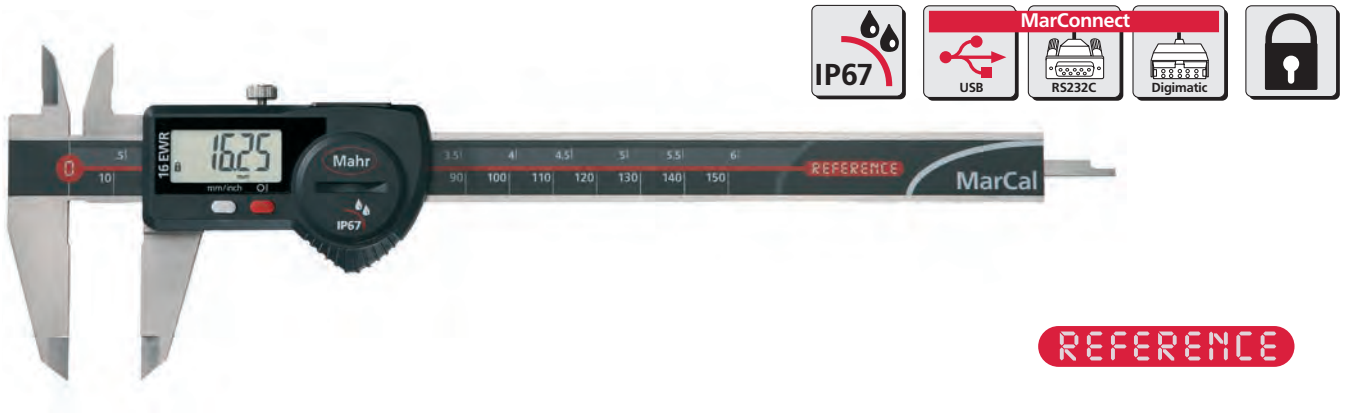
Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**

16 Em



Digital Caliper MarCal 16 EWR with data output



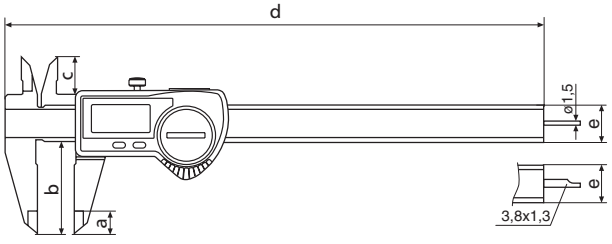
Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
DATA (Data transmission via connection cable)
Auto-ON/OFF

- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 8.5 mm high digits
- Lapped guide way
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw
- Supplied with: Case, battery, operating instructions

Technical Data

Measuring range		Resolution			Error limit *G*			Depth rod		Friction wheel	Order no.
mm	*(inch)*	mm	/	*inch*	mm	/	*inch*	DIN 862	⌀1,5		
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***	●	●		**4103064**
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***	●		●	**4103066**
200	***(8")***	0.01	/	***.0005"***	0.03	/	***.001"***	●		●	**4103068**
300	***(12")***	0.01	/	***.0005"***	0.04	/	***.0015"***				**4103070**
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***	●	●	●	**4103065**
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***	●		●	**4103067**
200	***(8")***	0.01	/	***.0005"***	0.03	/	***.001"***	●		●	**4103069**
300	***(12")***	0.01	/	***.0005"***	0.04	/	***.0015"***			●	**4103071**



Dimensions

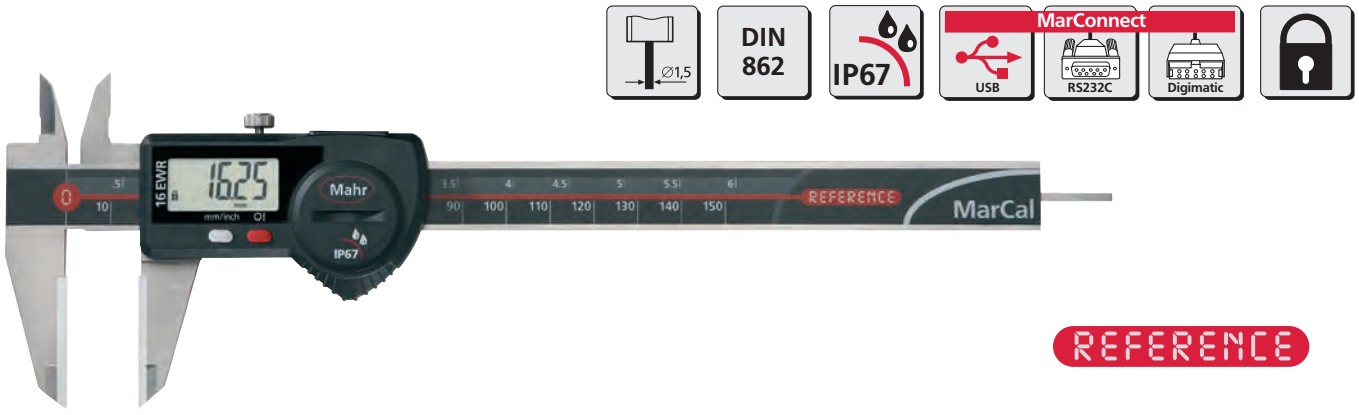
mm	a	b	c	d	e
150	10	40	16	235	16 x 3
200	10	50	19	285	16 x 3.5
300	14	64	19	388	16 x 4

Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 EWR-C with ceramic outside measuring faces



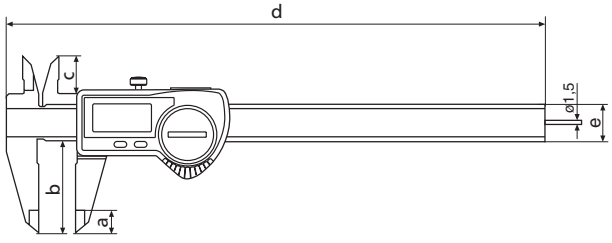
Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
DATA (Data transmission via connection cable)
Auto-ON/OFF

- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 8.5 mm high digits
- Lapped guide way
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw
- Supplied with: Case, battery, operating instructions

Technical Data

Measuring range		Resolution			Error limit *G*			Order no.
mm	*(inch)*	mm	/	*inch*	mm	/	*inch*	
150	*(6")*	0.01	/	*.0005"*	0.03	/	*.001"*	**4103072**



Dimensions

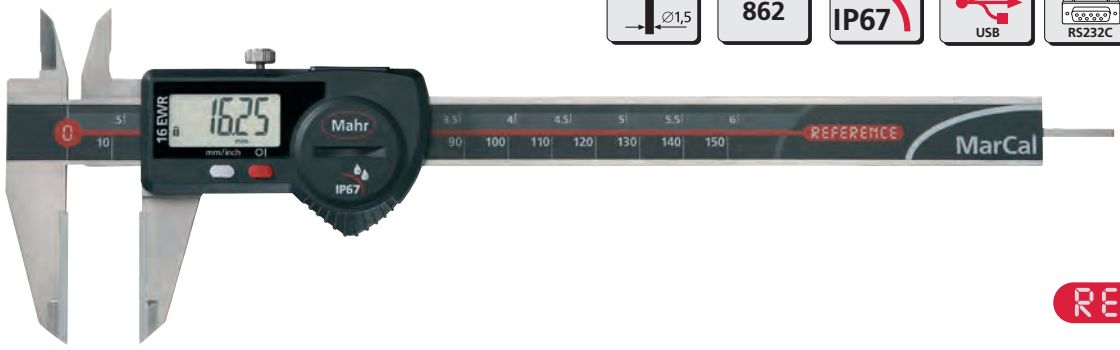
mm	a	b	c	d	e
150	10	40	16	235	16 x 3

Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 EWR-H with carbide outside measuring faces



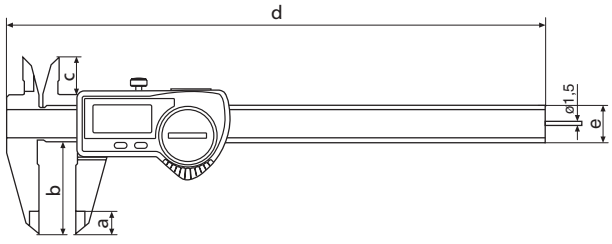
Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
DATA (Data transmission via connection cable)
Auto-ON/OFF

- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 8.5 mm high digits
- Lapped guide way
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw
- Supplied with: Case, battery, operating instructions

Technical Data

Measuring range		Resolution			Error limit *G*			Order no.
mm	*(inch)*	mm	/	*inch*	mm	/	*inch*	
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***	**4103073**



Dimensions

mm	a	b	c	d	e
150	10	40	16	235	16 x 3

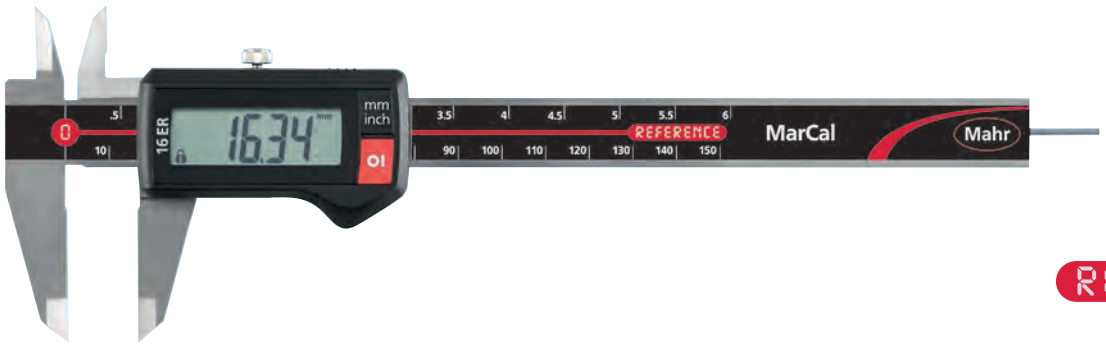
Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 ER

DIN 862



REFERENCE

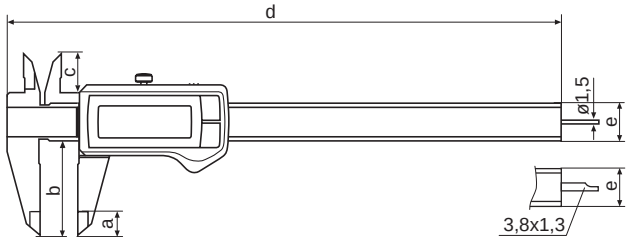
Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
Auto-ON/OFF

- Immediate measurement due to the Reference system
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast Liquid Crystal Display with 11 mm high digits
- Lapped guide way
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw
- Supplied with: Case, battery, operating instructions

Technical Data

Measuring range mm	*(inch)*	Resolution mm / *inch*	Error limit *G* mm	Depth rod		Friction wheel	Order no.
150	***(6")***	0.01/ ***.0005"***	0.03	●			**4103010**
150	***(6")***	0.01/ ***.0005"***	0.03	●		●	**4103011**
150	***(6")***	0.01/ ***.0005"***	0.03		●		**4103012**
150	***(6")***	0.01/ ***.0005"***	0.03		●	●	**4103013**



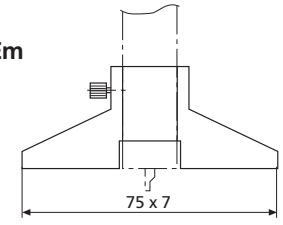
Dimensions

mm	a	b	c	d	e
150	10	40	16	235	16 x 3
200	10	50	19	285	16 x 3.5
300	14	64	19	388	16 x 4

Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**

16 Em



Digital Caliper MarCal 16 ER with data output

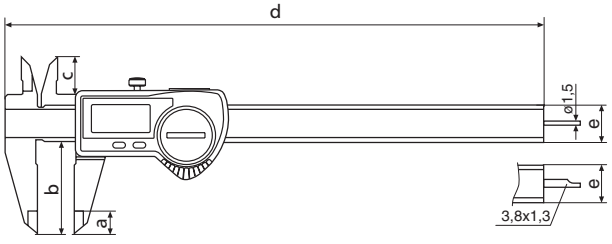
Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
DATA (Data transmission via connection cable)
Auto-ON/OFF

- Immediate measurement due to the Reference system
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 11 mm high digits
- Lapped guide way
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw
- Supplied with: Case, battery, operating instructions

Technical Data

Measuring range		Resolution			Error limit *G*			Depth rod			Friction wheel	Order no.
mm	*(inch)*	mm	/	*inch*	mm	/	*inch*	DIN 862	∅1,5			
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***		●			**4103014**
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***		●		●	**4103015**
200	***(8")***	0.01	/	***.0005"***	0.03	/	***.001"***			●		**4103018**
300	***(12")***	0.01	/	***.0005"***	0.04	/	***.0015"***					**4103020**
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***			●		**4103016**
150	***(6")***	0.01	/	***.0005"***	0.03	/	***.001"***			●	●	**4103017**
200	***(8")***	0.01	/	***.0005"***	0.03	/	***.001"***			●	●	**4103019**
300	***(12")***	0.01	/	***.0005"***	0.04	/	***.0015"***				●	**4103021**



Dimensions

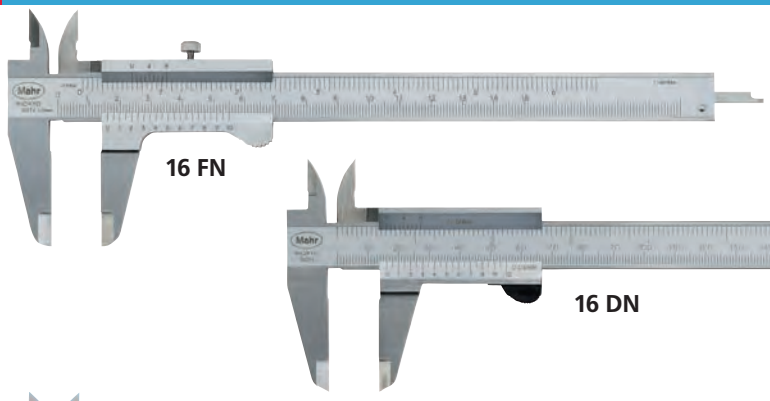
mm	a	b	c	d	e
150	10	40	16	235	16 x 3
200	10	50	19	285	16 x 3.5
300	14	64	19	388	16 x 4

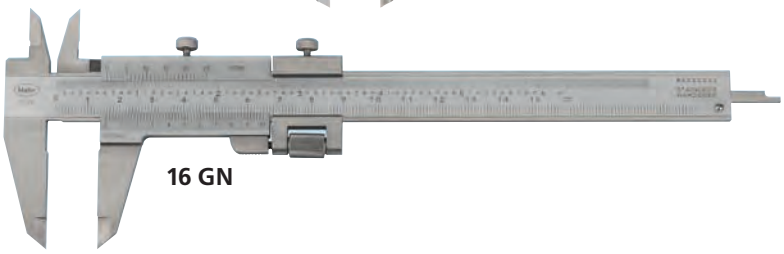
Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Vernier Calipers MarCal 16 N, 16 FN, 16 GN, 16 DN with scale reading





Features

- Vernier and main scale have a satin chrome finish for glare free reading
- Slide and beam made of hardened stainless steel
- Raised guide ways for the protection of the scale
- Measuring blades for inside measurement
- Step measuring function
- Depth bar
- Locking screw or thumb clamp

- Supplied with:
  Plastic case and thread table

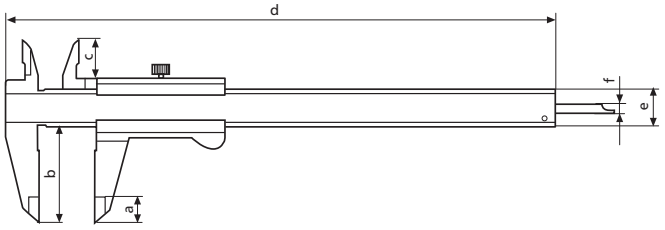
Technical Data

	Measuring range mm	*(inch)*	Readings upper *inch*	lower mm	Error limit *G* mm	DIN 862	Order no. without fine adjustment	Order no. with fine adjustment	Remarks
16 FN	150			0.05	0.05	●	**4100420**		Locking screw above
16 FN	150	***(6")***	***1/128"***	0.05	0.05	●	**4100400**		Locking screw above
16 DN	150	***(6")***	***1/128"***	0.05	0.05	●	**4100600**		Thumb clamp
16 N	150	***(6")***	***1/128"***	0.05	0.05	●	**4100500**		Locking screw below
16 GN	150			0.02	0.04		**4100650**	**4100660***	
16 GN	150	***(6")***	***.001"***	0.02	0.04		**4100670**	**4100680***	
16 FN	200			0.05	0.05	●	**4100421**		
16 FN	200	***(8")***	***1/128"***	0.05	0.05	●	**4100401**		
16 GN	200			0.02	0.05		**4100651**	**4100661***	
16 GN	200	***(8")***	***.001"***	0.02	0.05		**4100671**	**4100681***	Locking screw above
16 FN	300			0.05	0.05	●	**4100422**		
16 FN	300	***(12")***	***1/128"***	0.05	0.05	●	**4100402**		
16 GN	300			0.02	0.05		**4100652**	**4100662***	
16 GN	300	***(12")***	***.001"***	0.02	0.05		**4100672**	**4100682***	

* *Calipers with fine adjustment the measuring range is shortened by 20 mm / 1"*

Dimensions

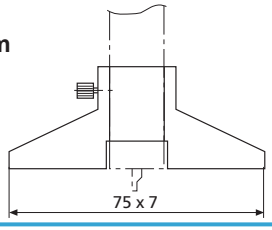
mm	a	b	c	d	e	f
150	10	40	16	228	16 x 3	3.8
200	14	50	19	290	17 x 3.5	3.8
300	16	64	23	404	20 x 4	4.8



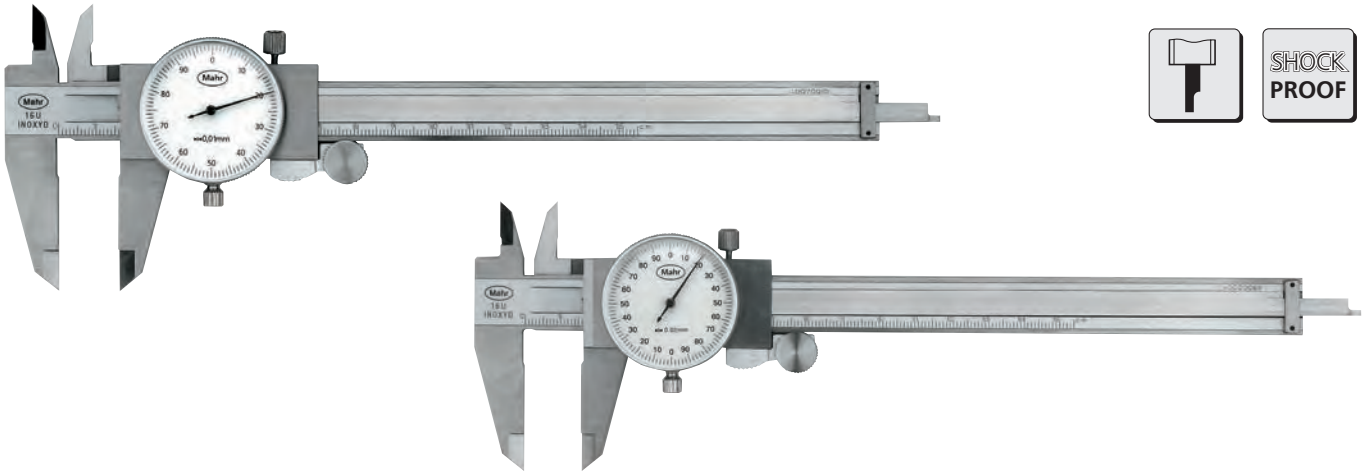
Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Leather case for measuring range 150 mm		**4100302**

16 Em



Vernier Caliper MarCal 16 U with circular scale



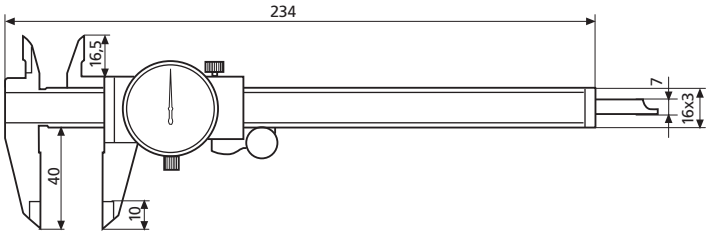
SHOCK PROOF

Features

- Large, high contrast dial face
- Satin chrome finished line scale
- Shockproof movement
- Zero setting through rotating the dial face and locking screw
- Covered rack
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw
- Depth bar
- Supplied with: Plastic case
- Inch model is supplied with a black dial face

Technical Data

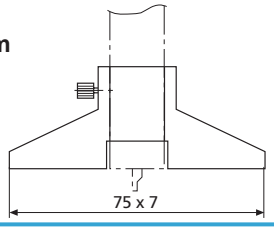
Measuring range	Readings	Diameter of circular scale	1 Pointer revolution	Dial face color	Error limit *G*	DIN 862	Order no.
150 mm	0.01 mm	34 mm	1 mm	white	0.03 mm	●	**4107005**
150 mm	0.02 mm	34 mm	2 mm	white	0.03 mm	●	**4107107**
6"	***.001"***	***1.3"***	***.100"***	black	***.0012"***		**4107900**



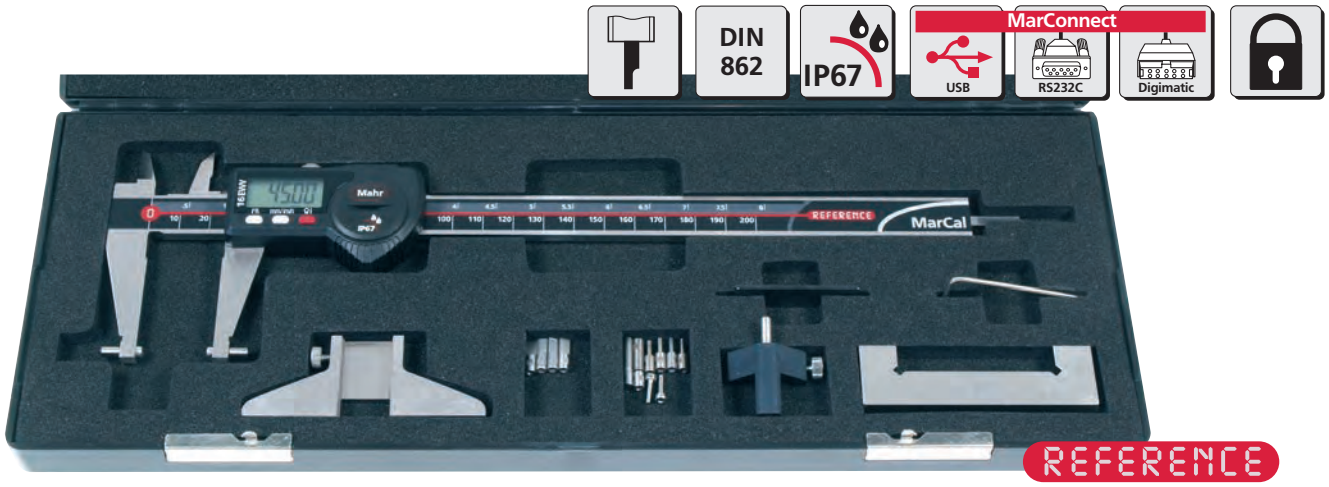
Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Leather case for meas. range 150 mm		**4100302**

16 Em



Universal Digital Caliper MarCal 16 EWV in set



Applications

- The 16 EWV can also be used as a standard caliper (4 types of measurement).

  When used in conjunction with the standard accessories; it is possible to measure recesses, grooves, etc.

  In conjunction with the additional accessories; threads, bores, serrations, etc. can be measured.

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
PRESET (for entering a numerical value)
DATA (Data transmission via connection cable)
Auto-ON/OFF

- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 8.5 mm high digits
- Lapped guide way
- Slide and beam made of hardened stainless steel
- Measuring blades for inside measurement
- Step measuring function
- Locking screw
- Supplied with: Case, battery, operating instructions

Technical Data

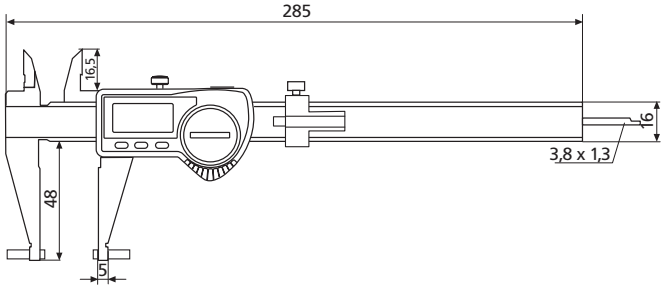
Measuring range* mm	*(inch)*	Resolution mm /	*inch*	Error limit *G* mm	Order no.
200	***(8")***	0.01 /	***.0005"***	0.03	**4118807****
200	***(8")***	0.01 /	***.0005"***	0.03	**4118808*****

** in conjunction with accessories the measuring range may change ** includes standard accessories *** excludes standard accessories*

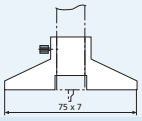
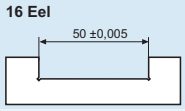
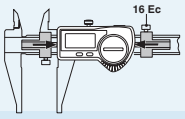
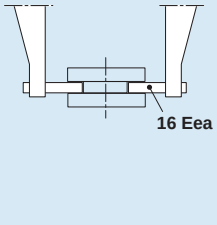
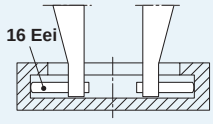
Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

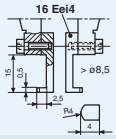
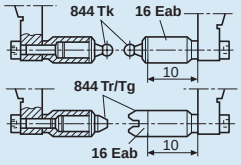
Accessories for Data Processing see Chapter 11



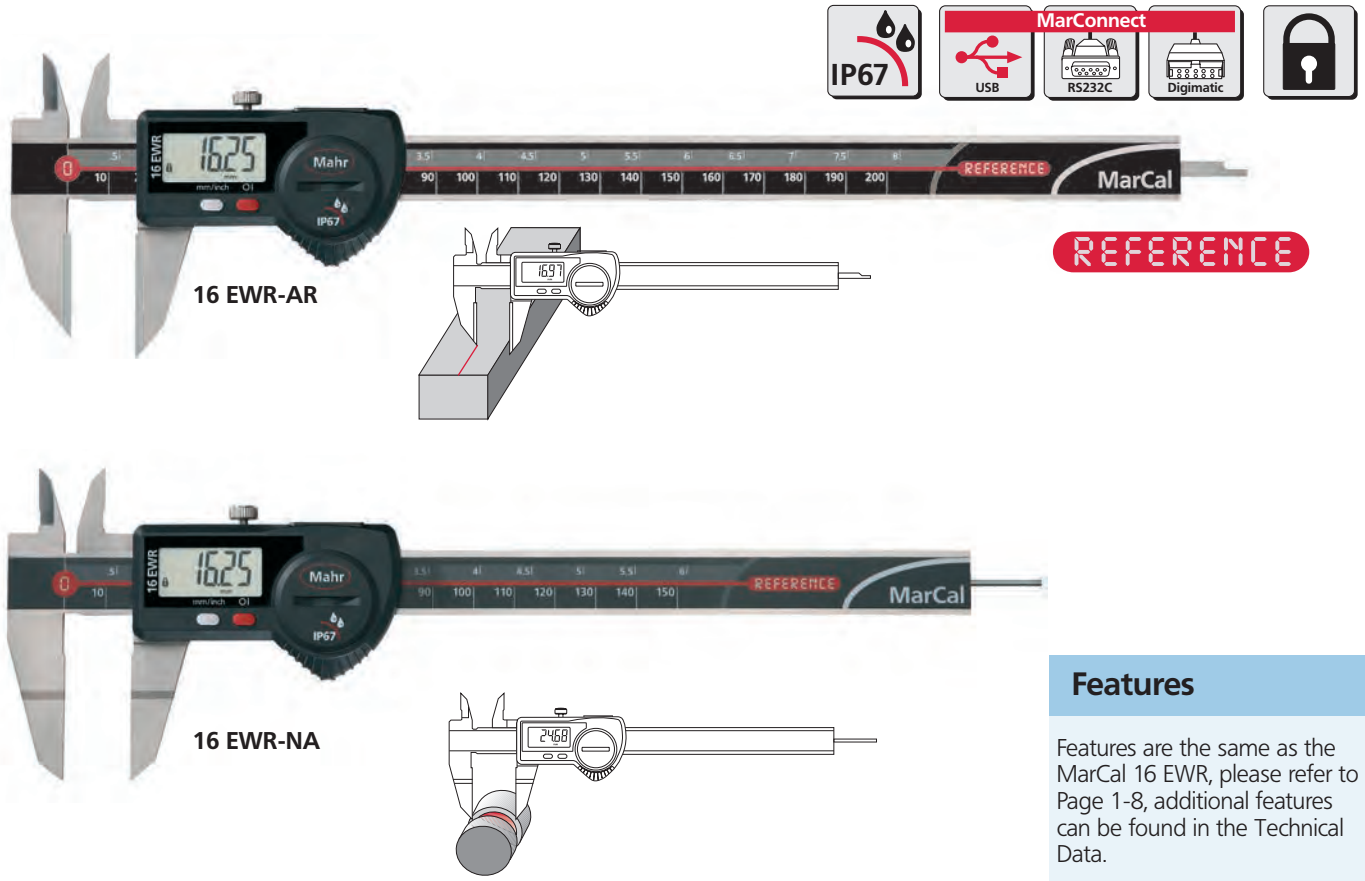
Standard Accessories are included in the set

Catalog no.	Description	Order no.	Required quantity		Remarks
16 Em	Depth Measuring Bridge	**4102020**	1		
16 Eel	Setting Gage for inside measurement	**4118817**	1		
16 Ec	Measuring Force Device	**4118818**	1		
16 Eea 1	Anvils for outside measurement	**4118810**	2		up to dia. 175 mm
16 Eea 2	Anvils for outside measurement	**4118811**	2		up to dia. 175 mm
16 Eea 3	Anvils for outside measurement	**4118812**	2		up to dia. 175 mm
16 Eei 1	Anvils for inside measurement	**4118813**	2		from dia. 27 mm
16 Eei 2	Anvils for inside measurement	**4118814**	2		from dia. 39 mm
16 Eei 3	Anvils for inside measurement	**4118815**	2		from dia. 39 mm
	Screws M2 x 8	**4879602**	2		

Additional Accessories

Catalog no.	Description	Order no.	Required quantity		Remarks
16 Eei 4	Anvils for inside measurement	**4118816**	2		from dia. 8.5 mm
16 Eab	Mounting Attachment for 844Tg/Tr and 844 Tk	**4118819**	2		
844 Tk	Ball Anvil		2		**see Page 10-19**
844 Tg/Tr	Thread Anvil		1 + 1		**see Pages 10-16/10-17**

Digital Caliper MarCal 16 EWR special design



Features

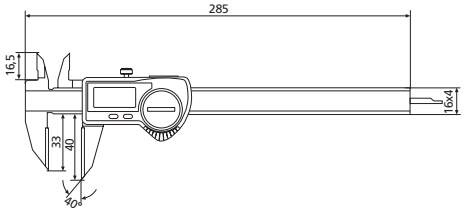
Features are the same as the MarCal 16 EWR, please refer to Page 1-8, additional features can be found in the Technical Data.

Technical Data

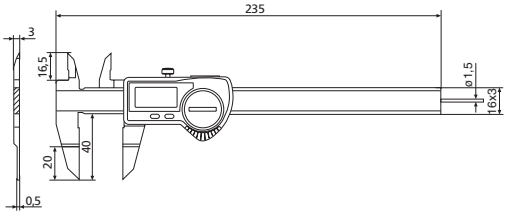
	Measuring range		Resolution			Error limit G	Depth rod		Order no.	Type
	mm	*(inch)*	mm	/	*inch*	mm				
16 EWR-AR	200	***(8")***	0.01	/	***.0005"***	0.03		●	**4103082**	Scribing/marking caliper*
16 EWR-NA	150	***(6")***	0.01	/	***.0005"***	0.03	●		**4103074**	Keyseat caliper

* *Carbide measuring faces*

16 EWR-AR



16 EWR-NA

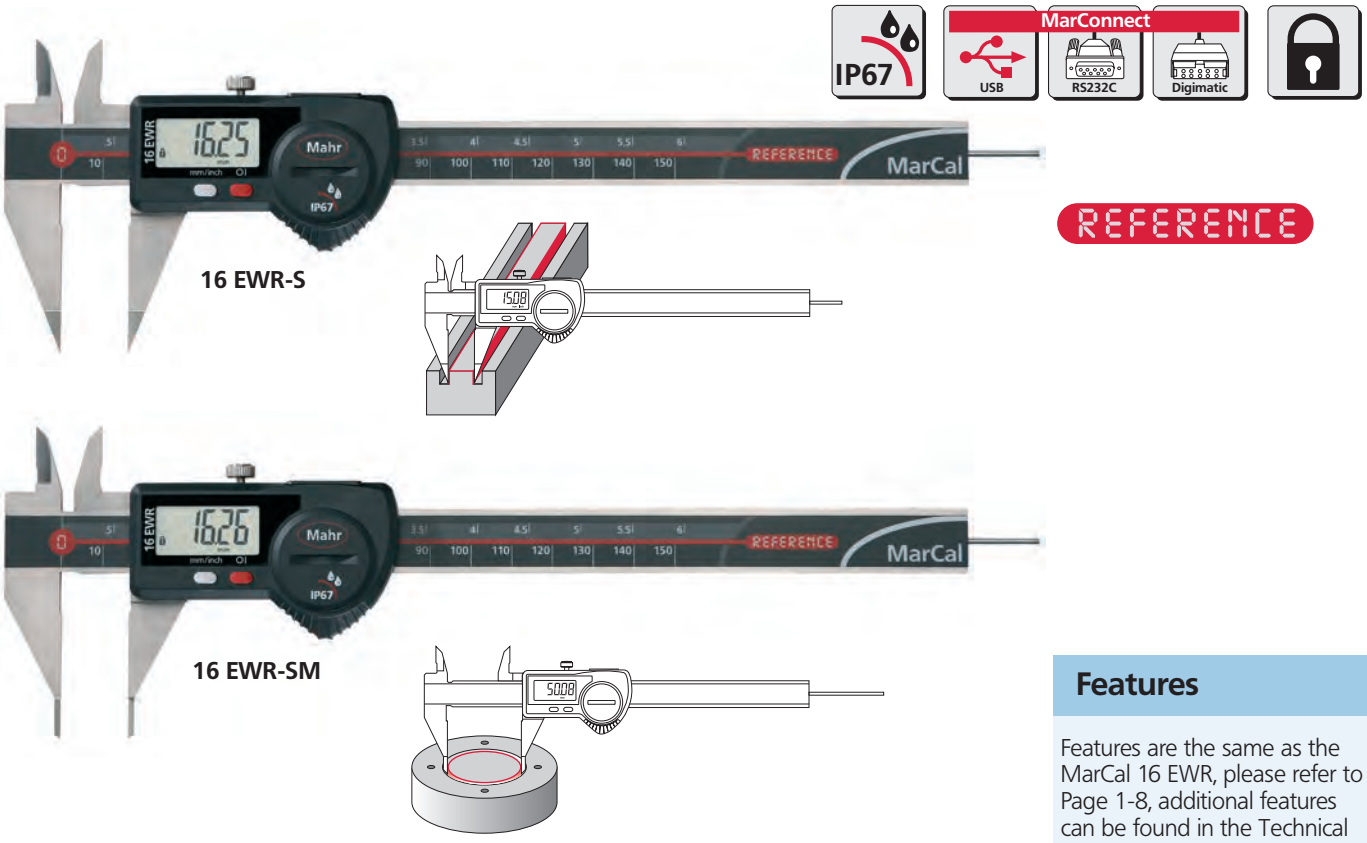


Accessories

Battery, Data Connection Cables see Page 1 - 9

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 EWR special design



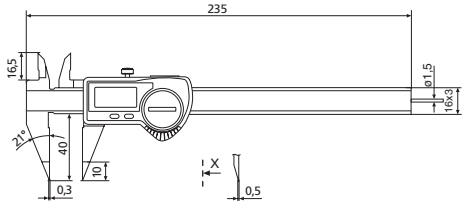
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-8, additional features can be found in the Technical Data.

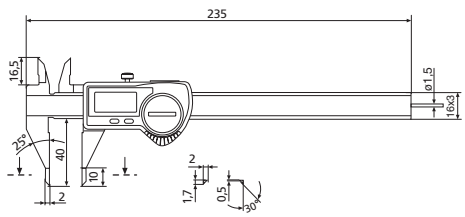
Technical Data

	Measuring range		Resolution			Error limit G	Depth rod	Order no.	Type
	mm	*(inch)*	mm	/	*inch*	mm			
16 EWR-S	150	***(6")***	0.01	/	***.0005"***	0.03	●	**4103075**	Pointed caliper
16 EWR-SM	150	***(6")***	0.01	/	***.0005"***	0.03	●	**4103076**	Caliper with pointed meas. jaws

16 EWR-S



16 EWR-SM

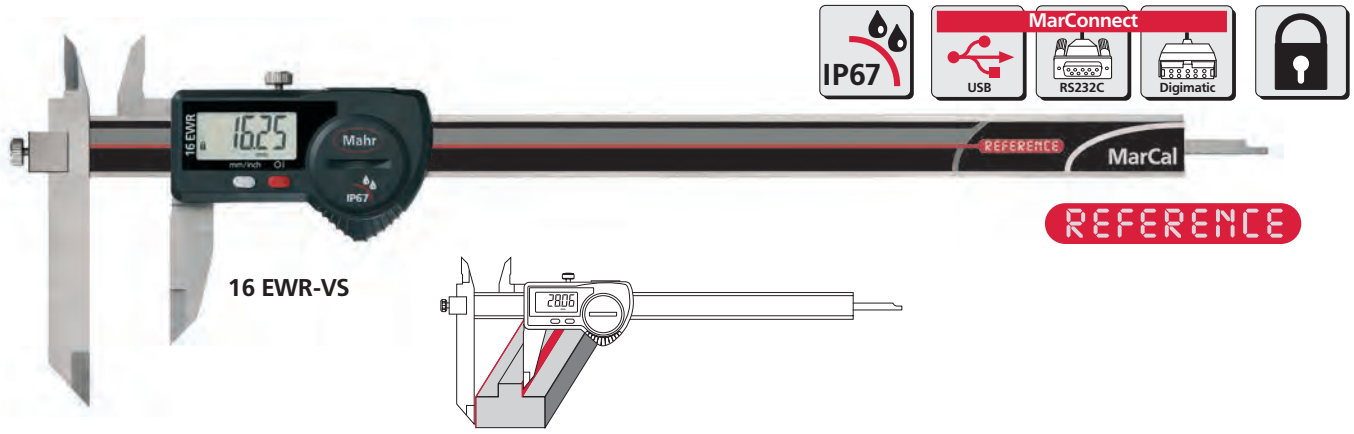


Accessories

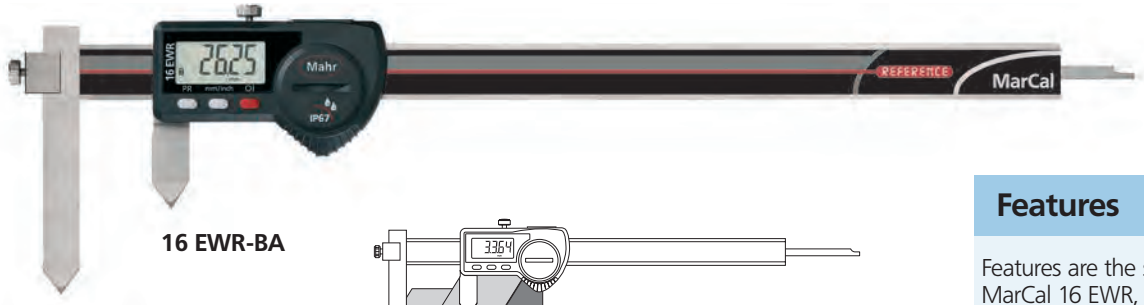
Battery, Data Connection Cables see Page 1 - 9

Accessories for Data Processing see Chapter 11

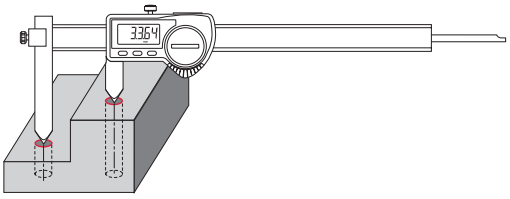
Digital Caliper MarCal 16 EWR special design



16 EWR-VS



16 EWR-BA



Features

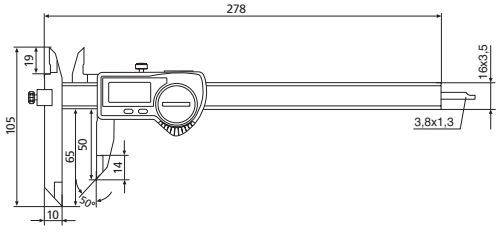
Features are the same as the MarCal 16 EWR, please refer to Page 1-8, additional features can be found in the Technical Data.

Technical Data

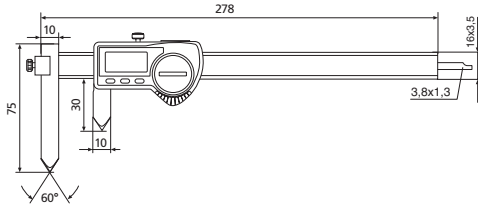
	Measuring range mm	*(inch)*	Resolution mm	/	*inch*	Error limit *G* mm	Depth rod	Order no.	Type
16 EWR-VS	0 - 200	***(0 - 8")***	0.01	/	***.0005"***	0.04	●	**4103083**	Adjustable measuring jaws
16 EWR-BA	10 - 210	***(.4 - 8.3")***	0.01	/	***.0005"***	0.04	●	**4103084**	Adjustable measuring jaws*

* *to measure the distance between bores*

16 EWR-VS



16 EWR-BA

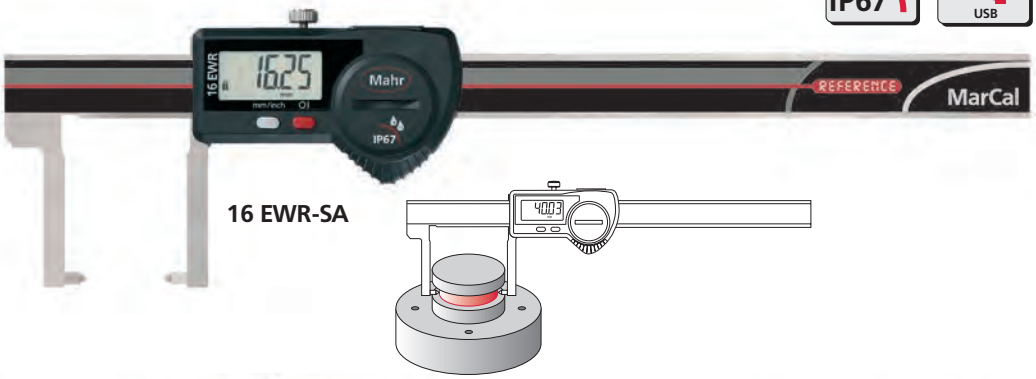


Accessories

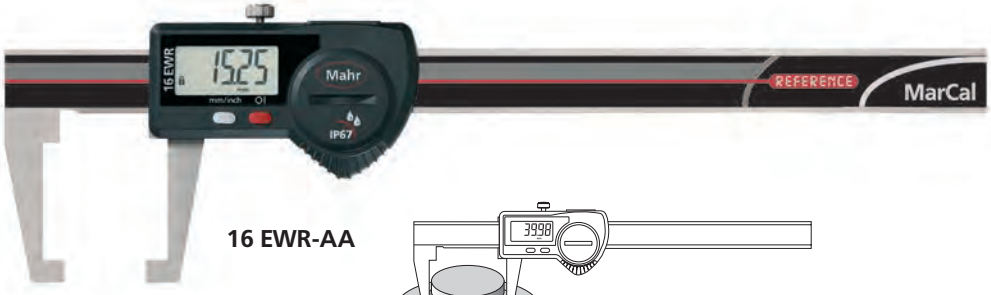
Battery, Data Connection Cables see Page 1 - 9

Accessories for Data Processing see Chapter 11

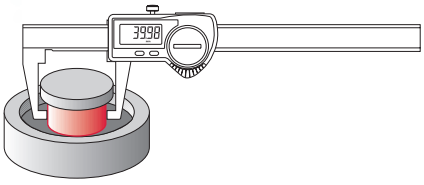
Digital Caliper MarCal 16 EWR special design



16 EWR-SA



16 EWR-AA



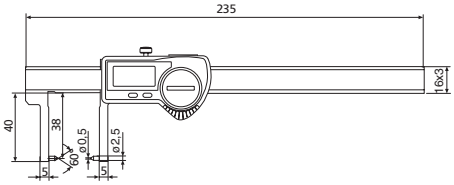
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-8, additional features can be found in the Technical Data.

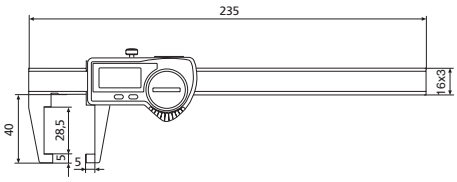
Technical Data

	Measuring range		Resolution			Error limit *G*	Order no.	Type
	mm	*(inch)*	mm	/	*inch*	mm		
16 EWR-SA	150	***(6")***	0.01	/	***.0005"***	0.03	**4103077**	Inwardly angled anvils
16 EWR-AA	150	***(6")***	0.01	/	***.0005"***	0.03	**4103079**	Inwardly angled measuring jaws

16 EWR-SA



16 EWR-AA

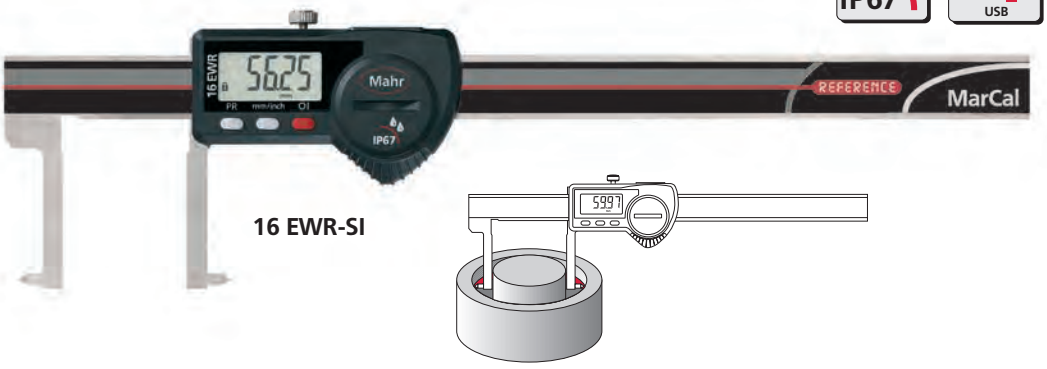


Accessories

Battery, Data Connection Cables see Page 1 - 9

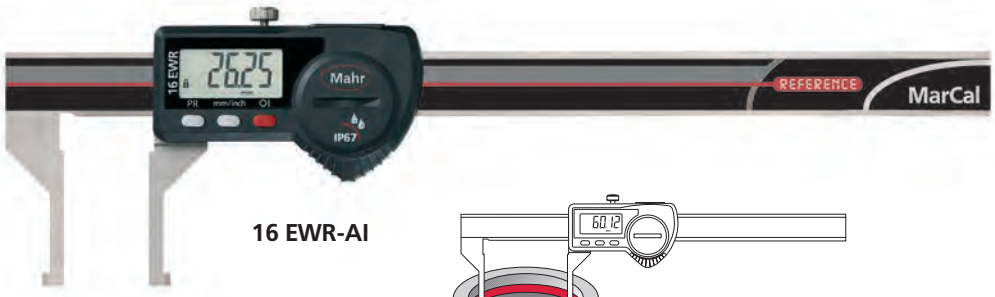
Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 EWR special design

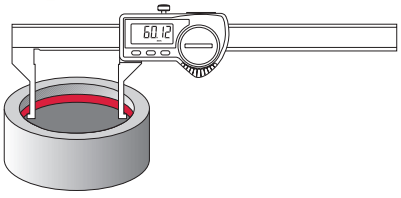


16 EWR-SI

REFERENCE



16 EWR-AI



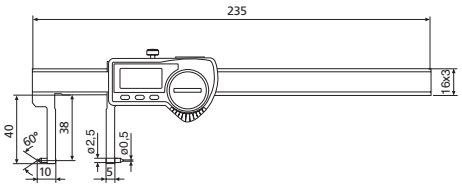
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-8, additional features can be found in the Technical Data.

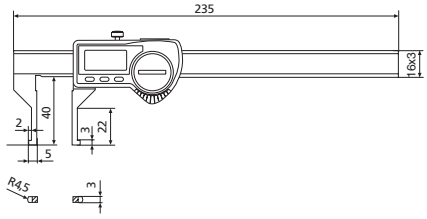
Technical Data

	Measuring range mm	(inch)	Resolution mm	/	inch	Error limit G mm	Order no.	Type
16 EWR-SI	20 - 170	***(.8 - 6.7")***	0.01	/	***.0005"***	0.03	**4103078**	Outwardly angled anvils
16 EWR-AI	10 - 160	***(.4 - 6.3")***	0.01	/	***.0005"***	0.03	**4103080**	Outwardly angled measuring jaws

16 EWR-SI



16 EWR-AI

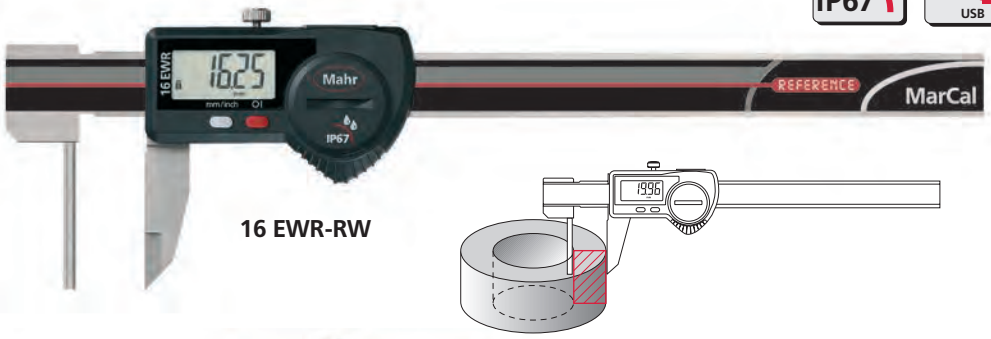


Accessories

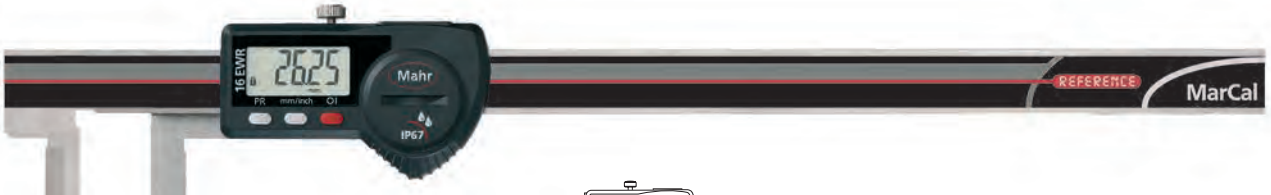
Battery, Data Connection Cables see Page 1 - 9

Accessories for Data Processing see Chapter 11

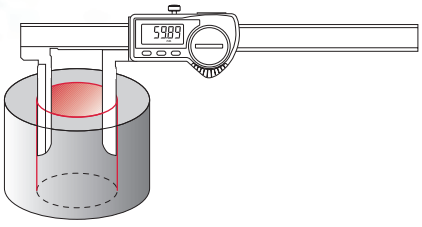
Digital Caliper MarCal 16 EWR special design



16 EWR-RW



16 EWR-LI



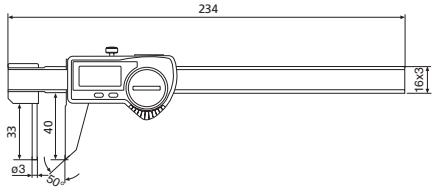
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-8, additional features can be found in the Technical Data.

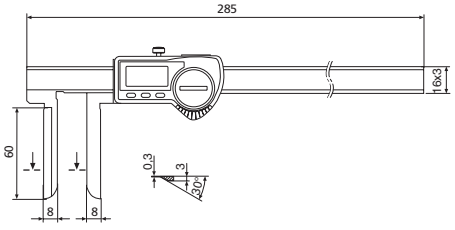
Technical Data

	Measuring range		Resolution			Error limit G	Order no.	Type
	mm	*(inch)*	mm	/	*inch*	mm		
16 EWR-RW	0 - 150	***(0 - 6")***	0.01	/	***.0005"***	0.05	**4103081**	Wall thickness measuring caliper
16 EWR-LI	10 -200	***(.4 - 8")***	0.01	/	***.0005"***	0.05	**4103085**	with long narrow measuring jaws

16 EWR-RW



16 EWR-LI



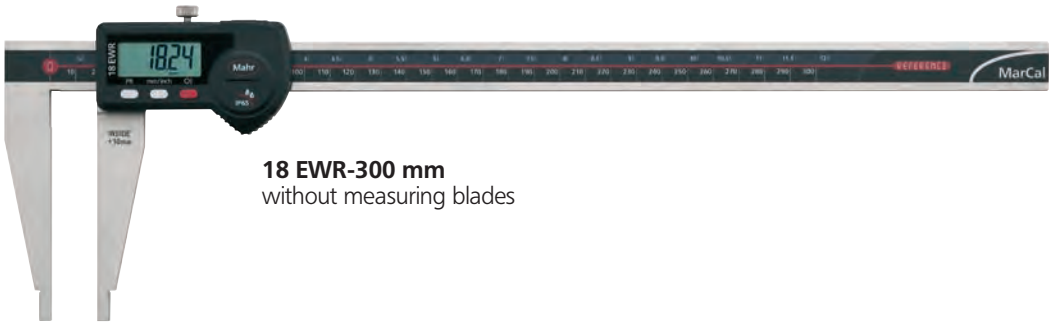
Accessories

Battery, Data Connection Cables see Page 1 - 9

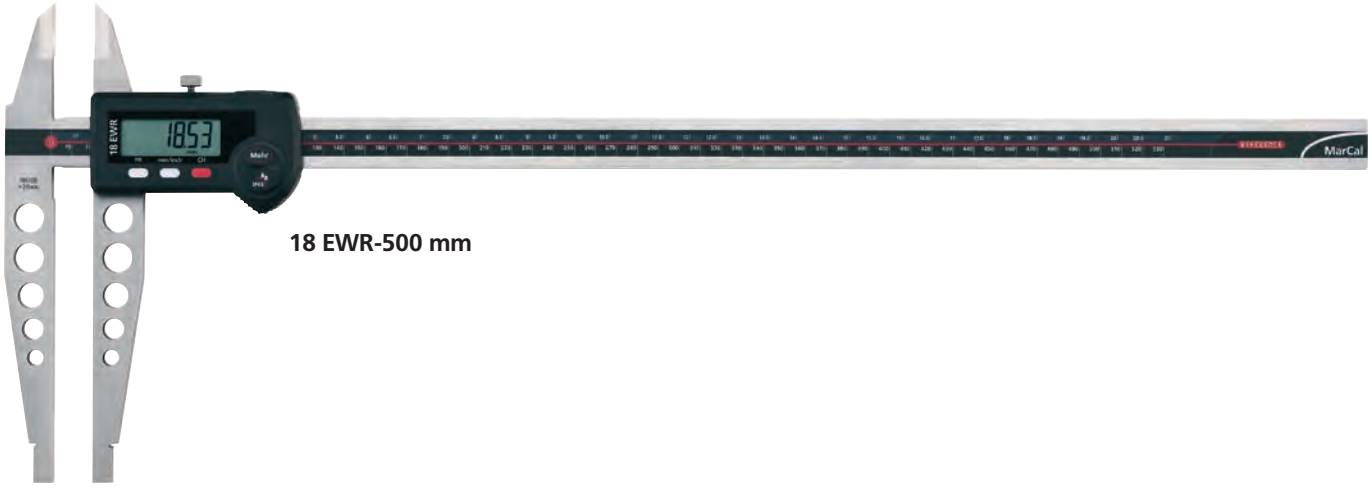
Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 18 EWR

18 EWR-300 mm



18 EWR-300 mm
without measuring blades

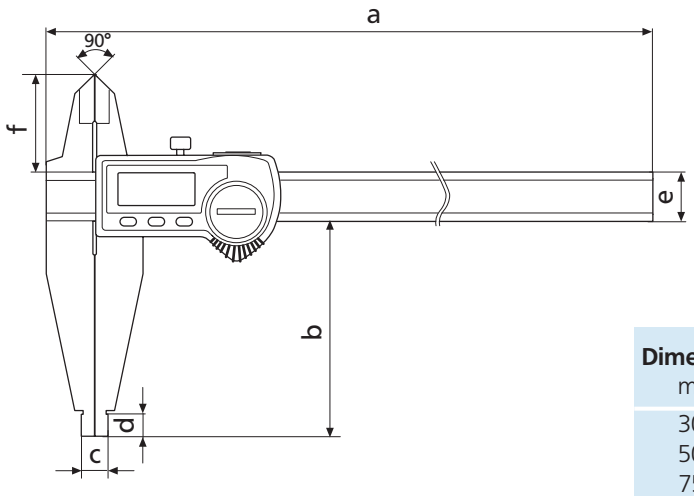


18 EWR-500 mm

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
PRESET (for entering a numerical value)
DATA (Data transmission via connection cable)
Auto-ON/OFF

- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP65
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 10 mm (only 300 mm) and 12.5 mm high digits
- Slide and beam made of hardened stainless steel
- Rounded measuring blades for inside measurement
- Locking screw
- Supplied with: Case, battery, operating instructions



Dimensions

mm	a	b	c	d		e		f
300	410	90	10	10	20	x	4.5	40
500	650	150	20	20	25	x	5.5	55
750	905	150	20	20	25	x	5.5	55
1000	1165	150	20	20	30	x	6.5	60

Technical Data

Measuring range		Resolution			Error limit *G*	Weight	Order no. with measuring blades	Weight	Order no. without measuring blades
mm	***(inch)***	mm	/	***inch***	mm	kg		kg	
300	***(12")***	0.01	/	***.0005"***	0.03	0.45	**4112704**	0.44	**4112705**
500	***(20")***	0.01	/	***.0005"***	0.04	1.10	**4112712**	1.00	**4112713**
750	***(30")***	0.01	/	***.0005"***	0.05	1.35	**4112714**	1.28	**4112715**
1000	***(40")***	0.01	/	***.0005"***	0.06	2.20	**4112716**	2.10	**4112717**

Accessories

		Order no.
Depth Measuring Bridge	**16 Em**	**4102020**
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 18 ESA lightweight construction

Features

Functions:
ON/OFF
RESET (Zero setting)
mm/inch
HOLD (storage of measured values)
DATA (Data transmission)

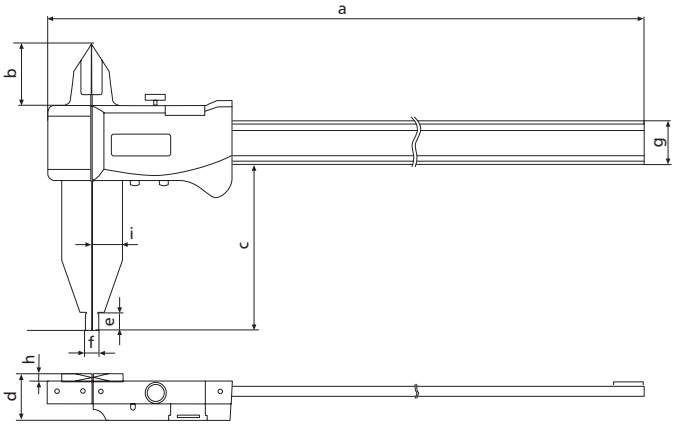
- Dirt wipers are integrated in the slide
- Max measuring speed 1.5 m/sec (60"/sec)
- Data output: Opto RS232C (only 300 mm version)
- High contrast Liquid Crystal Display with 6 mm or 10.5 mm high digits
- To reduce the overall weight the slide and beam are made from aluminum and are coated with a hard anodized surface coating (1100HV)
- Measuring faces are made of hardened stainless steel
- Prisma guide ways for a more smooth and even movement
- Measuring blades for outside measurement
- Rounded measuring faces for inside measurement
- Locking screw
- Supplied with: Case

Technical Data

Measuring range		Resolution			Error limit *G*			RS232C	Weight	Order no.
mm	***(inch)***	mm	/	***inch***	mm	/	***inch***		kg	
300	***(12")***	0.01	/	***.0005"***	0.03	/	***.001"***	●	0.50	**4112620**
500	***(20")***	0.01	/	***.0005"***	0.03	/	***.001"***	–	1.40	**4112621**
800	***(32")***	0.01	/	***.0005"***	0.07	/	***.0025"***	–	1.60	**4112622**
1000	***(40")***	0.01	/	***.0005"***	0.08	/	***.0032"***	–	1.80	**4112623**

Dimensions

mm	a	b	c	d	e	f	g	h	i
300	450	33	90	24.5	10	10	25	4.5	17
500	726	42	150	33.5	15	20	31.9	6	29
800	1026	42	150	33.5	15	20	31.9	6	29
1000	1226	42	150	33.5	15	20	31.9	6	29

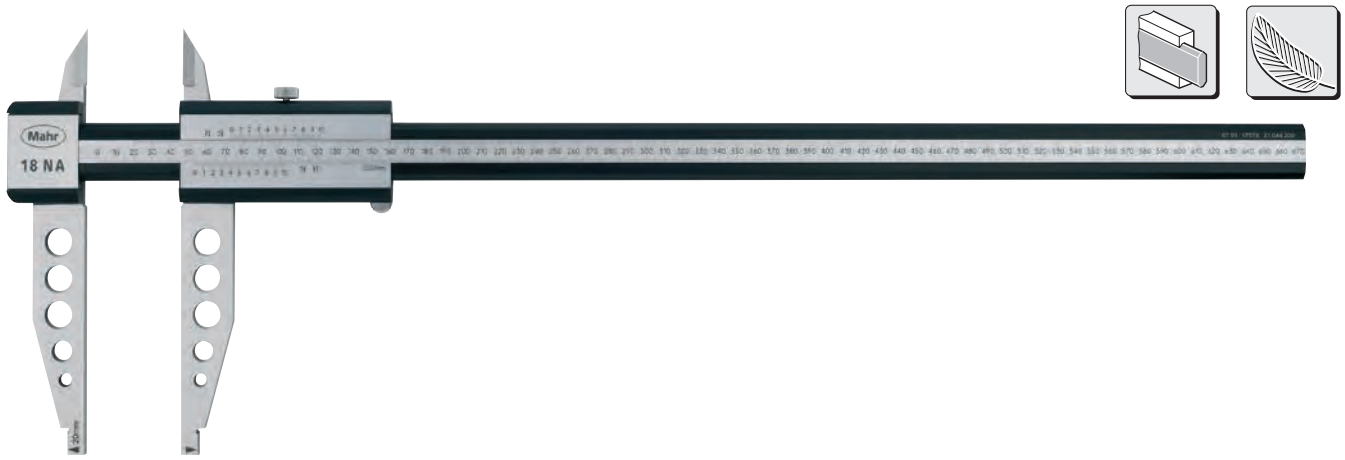


Accessories

		Order no.
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 ESv**	**4102510**

Accessories for Data Processing see Chapter 11

Caliper MarCal 18 NA lightweight construction

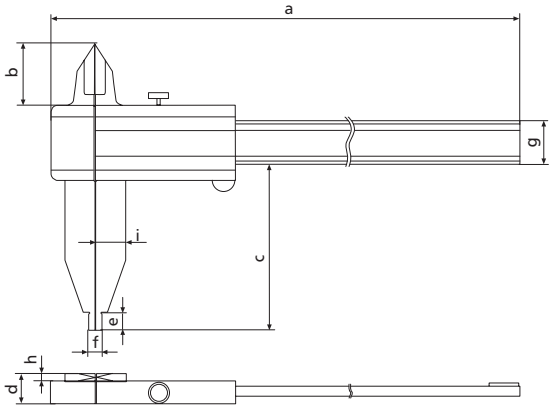


Features

- To reduce the overall weight the slide and beam are made from aluminum and are coated with a hard anodized surface coating (1100HV)
- Measuring faces are made of hardened stainless steel
- Prisma guide ways for a more smooth and even movement
- Measuring blades for outside measurement
- Rounded measuring faces for inside measurement
- Locking screw
- Supplied with: Case, over 1500 mm supplied in a cardboard box

Technical Data

Measuring range	Readings upper	Readings lower	Error limit *G*	Weight	Order no.
mm	mm	mm	mm	kg	
300	0.02	0.02	0.03	0.50	**4112300**
500	0.02	0.02	0.03	1.40	**4112301**
1000	0.02	0.02	0.08	1.75	**4112303**
800	0.02	0.02	0.07	1.60	**4112302**
1500	0.05	0.05	0.16	2.10	**4112304**
2000	0.05	0.05	0.16	2.50	**4112305**



Dimensions

mm	a	b	c	d	e	f	g	h	i
300	450	33	90	17.5	10	10	25	4.5	17
500	726	42	150	20.7	15	20	31.9	6	29
800	1026	42	150	20.7	15	20	31.9	6	29
1000	1226	42	150	20.7	15	20	31.9	6	29
1500	1760	85	200	25	15	30	48.1	6	40
2000	2260	85	200	25	15	30	48.1	6	40

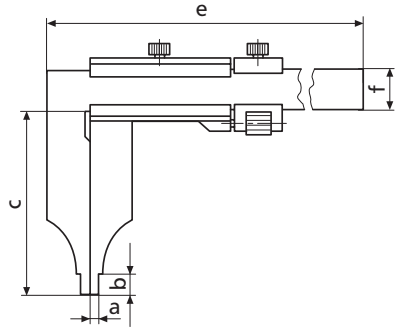
Vernier Caliper MarCal 18 N

Features

- Vernier and main scale have a satin chrome finish for glare free reading
- Slide and beam made of hardened stainless steel
- Raised guide ways for the protection of the scale
- Rounded measuring faces for inside measurement
- Locking screw
- Supplied with: up to 1000 mm delivered with a case, over 1000 mm individually packed

Technical Data

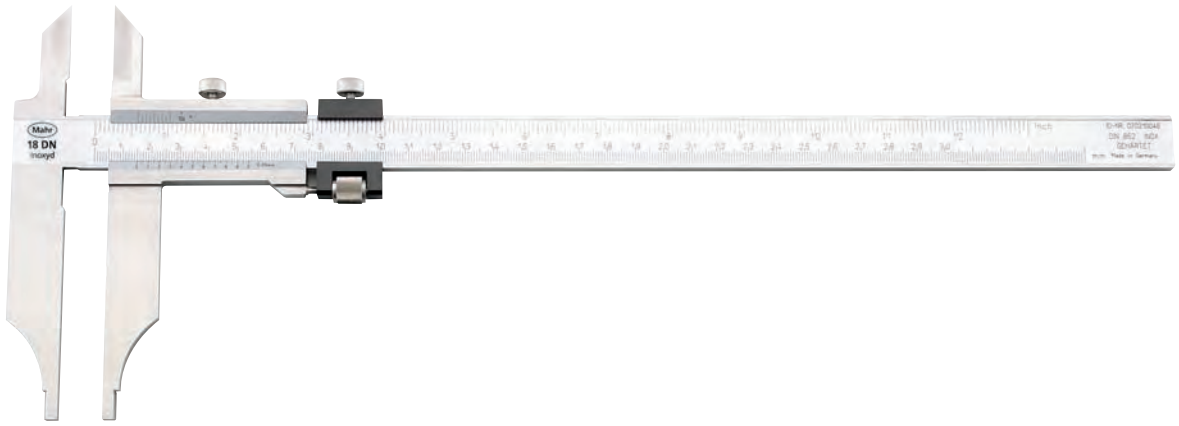
Measuring range mm	*(inch)*	Resolution upper	lower	Error limit *G* mm	DIN 862	Order no. without fine adjustment	Order no. with fine adjustment
200		0.02 mm	0.02 mm	0.05		**4112200**	
300		0.02 mm	0.02 mm	0.05		**4112201**	**4112220**
300	***(12")***	***.001"***	0.02 mm	0.05			**4112230**
500		0.02 mm	0.02 mm	0.06			**4112221**
500	***(20")***	***.001"***	0.02 mm	0.06			**4112231**
500		0.05 mm	0.05 mm	0.07	●	**4112210**	
800		0.02 mm	0.02 mm	0.08			**4112222**
800	***(32")***	***.001"***	0.02 mm	0.08			**4112232**
800		0.05 mm	0.05 mm	0.10	●	**4112211**	
1000		0.02 mm	0.02 mm	0.08			**4112223**
1000	***(40")***	***.001"***	0.02 mm	0.08			**4112233**
1000		0.05 mm	0.05 mm	0.12	●	**4112212**	
1500		0.02 mm	0.02 mm	0.10			**4112224**
1500	***(60")***	***.001"***	0.02 mm	0.10			**4112234**
1500		0.05 mm	0.05 mm	0.18	●	**4112213**	
2000		0.02 mm	0.02 mm	0.12			**4112225**
2000	***(80")***	***.001"***	0.02 mm	0.12			**4112235**
2000		0.05 mm	0.05 mm	0.22	●	**4112214**	



Dimensions

mm		a	b	c	e	f
18 N	200 mm	5	10	80	310	20 x 5
	300 mm	5	10	90	410	20 x 5
	500 mm	10	19	150	675	25 x 6
	800 mm	10	19	150	985	30 x 7
	1000 mm	10	19	150	1185	30 x 7
	1500 mm	15	19	200	1760	40 x 8
	2000 mm	15	19	200	2270	45 x 10

Vernier Caliper MarCal 18 DN with measuring blades for outside measurement

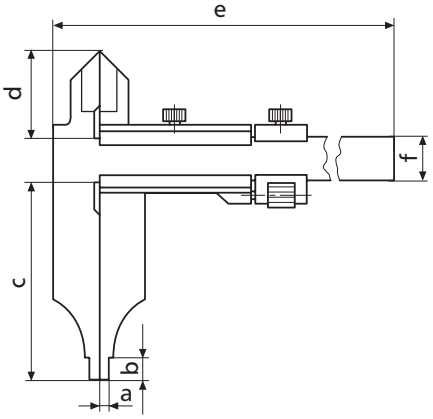


Features

- Vernier and main scale have a satin chrome finish for glare free reading
- Slide and beam made of hardened stainless steel
- Raised guide ways for the protection of the scale
- Rounded measuring faces for inside measurement
- Locking screw
- Supplied with: up to 1000 mm delivered with a case, over 1000 mm individually packed

Technical Data

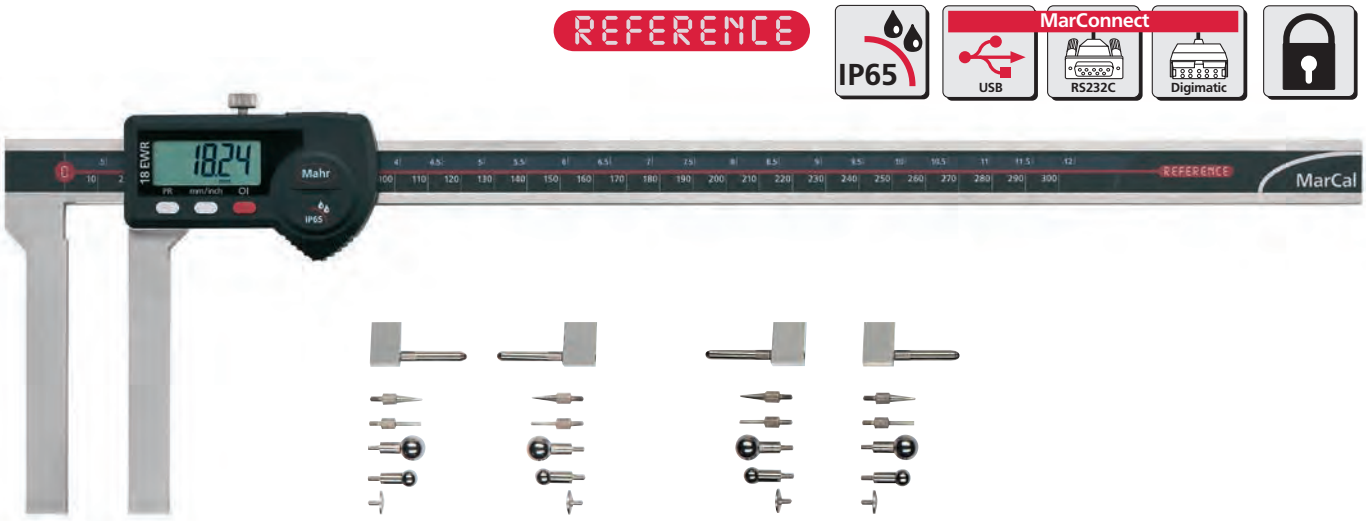
Measuring range mm	Resolution upper	Resolution lower	Error limit *G* mm	DIN 862	Order no. without fine adjustment	Order no. with fine adjustment
200	0.05	0.05	0.05	●	**4113200**	
200	0.02	0.02	0.05			**4113300**
300	0.05	0.05	0.05	●	**4113201**	
300	0.02	0.02	0.05			**4113301**
500	0.05	0.05	0.07	●	**4113202**	
500	0.02	0.02	0.06			**4113302**
800	0.05	0.05	0.10	●	**4113203**	
800	0.02	0.02	0.08			**4113303**
1000	0.05	0.05	0.12	●	**4113204**	
1000	0.02	0.02	0.08			**4113304**
1500	0.05	0.05	0.18	●	**4113205**	
2000	0.05	0.05	0.22	●	**4113206**	



Dimensions

mm		a	b	c	d	e	f
18 DN	200 mm	5	10	80	40	310	20 x 5
	300 mm	5	10	90	40	410	20 x 5
	500 mm	10	19	150	60	675	25 x 6
	800 mm	10	19	150	65	985	30 x 7
	1000 mm	10	19	150	67	1185	30 x 7
	1500 mm	15	19	200	86	1760	40 x 8
	2000 mm	15	19	200	96	2270	45 x 10

Universal Digital Caliper MarCal 18 EWR-V



Measuring anvils for external measurements

Measuring anvils for internal measurements

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
PRESET (for entering numerical values)
DATA (Data transmission via connection cable)
Auto-ON/OFF

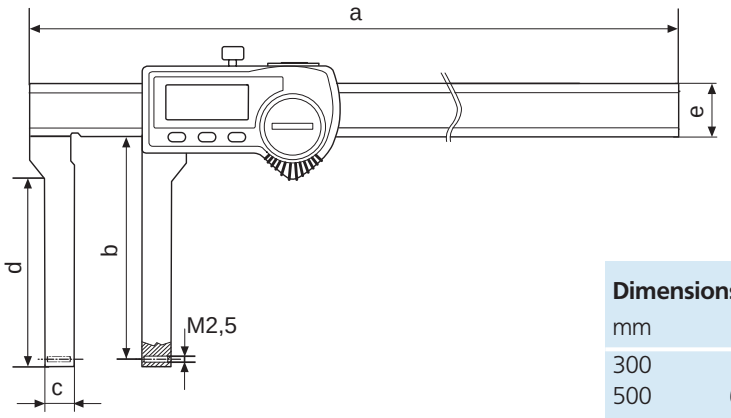
- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP65
- MarConnect data output, choose alternatively:
  USB
  OPTO RS232C
  Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High constrast LCD with 10 mm (model 300 mm) and 12.5 mm (model 500 mm) high digits
- Slide and beam made of hardened stainless steel
- Measuring faces for outside measurement
- Thread M2.5 measuring jaws to accommodate measuring anvils for internal and external measurements
- Locking screw
- Supplied with:
  Case, battery, measuring anvils, operating instructions

Technical Data

Measuring range*		Resolution			Error limit *G*	Order no.
mm	***(inch)***	mm	/	***inch***	mm	
300	***(12")***	0.01	/	***.0005"***	0.06	**4112722**
500	***(20")***	0.01	/	***.0005"***	0.08	**4112723**

* *When used in conjuction with measuring anvils the measuring range may change*

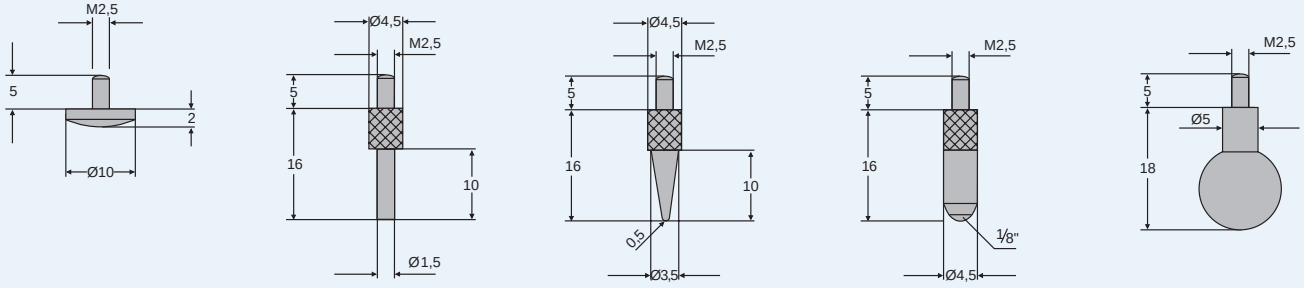
Technical Data



Dimensions

mm	a	b	c	d	e
300	410	90	12	75.5	20 x 4.5
500	680	100	16	81	25 x 5.5

Measuring Anvils (Standard Accessories)



For further measuring anvils see Dimensional Metrology, pages 5-58 and 5-59

Accessories

		Order no.
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m) incl. MarCom Standard	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 30 EWRi according to protection class IP67

Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Japan, China and Korea.

MarConnect integrated wireless

IP67

REFERENCE

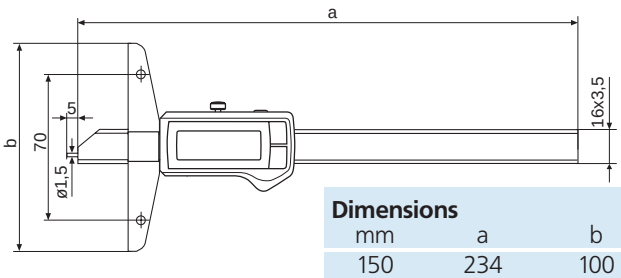
Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
PRESET (enter a numerical value)
Reference-Lock/Unlock
Hold
DATA
Auto-ON/OFF

- Integrated Wireless data transmission
- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 11 mm high digits
- Lapped guide way
- Beam and cross beam are made of hardened stainless steel
- Locking screw
- Supplied with: Case, battery, operating instructions

Technical Data

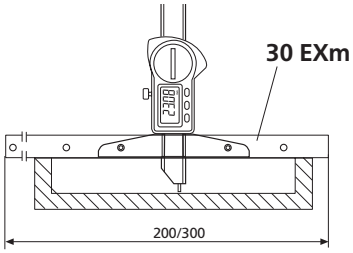
Measuring range mm	(inch)	Resolution mm / inch	Error limit G mm	Order no.
150	*(6")*	0.01 / *.0005"*	0.03	**4126755**
300	*(12")*	0.01 / *.0005"*	0.04	**4126756**
500	*(20")*	0.01 / *.0005"*	0.05	**4126757**



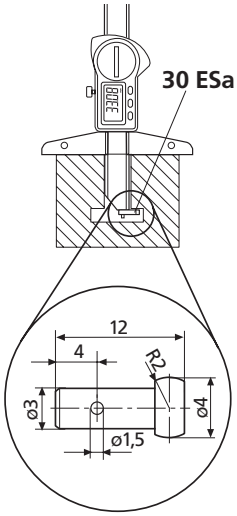
Dimensions

mm	a	b
150	234	100
300	384	150
500	584	150

Depth measurement



Distance measurement



Accessories

			Order no.
Battery 3V, Type CR 2032			**4102520**
i-Stick wireless receiver incl. MarCom Standard			**4102220**
Software MarCom Professional 5.0			**4102212**
Software MarCom Standard 5.0			**4102211**
Cross Beam Extension	200 mm	**30 EXm**	**4126511**
	300 mm	**30 EXm**	**4126510**
Anvil for distance measurement to be fixed to the measuring pin		**30 ESa**	**4125611**

Accessories for Data Processing see Chapter 11

Digital Depth Gage MarCal 30 EWR according to protection class IP67

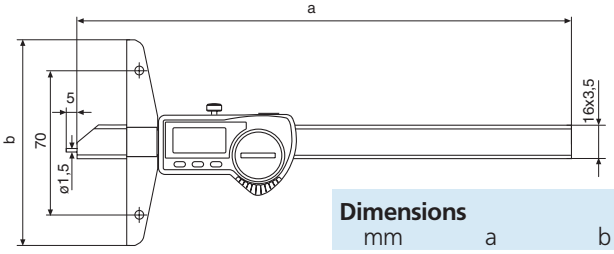
Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
PRESET (enter a numerical value)
Reference-Lock/Unlock
DATA (Data transmission via connection cable)
Auto-ON/OFF

- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 8.5 mm high digits
- Lapped guide way
- Beam and cross beam are made of hardened stainless steel
- Locking screw
- Supplied with: Case, battery, operating instructions

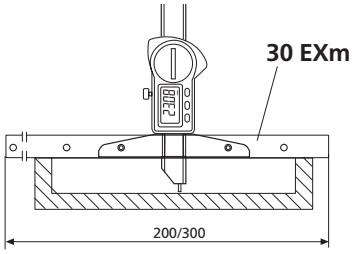
Technical Data

Measuring range mm	*(inch)*	Resolution mm	/ *inch*	Error limit G mm	Order no.
150	***(6")***	0.01	/ ***.0005"***	0.03	**4126700**
300	***(12")***	0.01	/ ***.0005"***	0.04	**4126701**
500	***(20")***	0.01	/ ***.0005"***	0.05	**4126702**

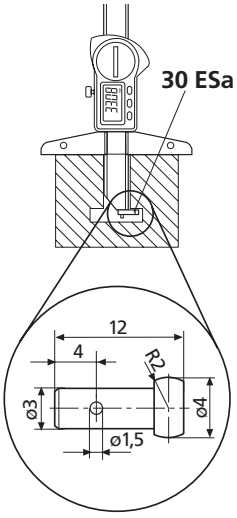


Dimensions mm	a	b
150	234	100
300	384	150
500	584	150

Depth measurement



Distance measurement



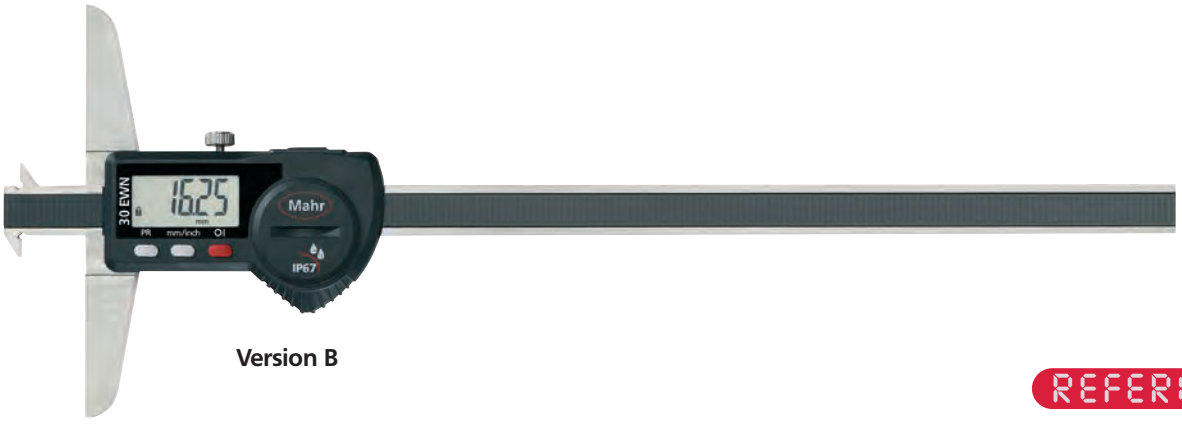
Accessories

			Order no.
Battery 3V, Type CR 2032			**4102520**
Data Connection Cable USB (2 m)		**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin		**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin		**16 EWd**	**4102915**
Cross Beam Extension	200 mm	**30 EXm**	**4126511**
	300 mm	**30 EXm**	**4126510**
Anvil for distance measurement to be fixed to the measuring pin		**30 ESa**	**4125611**

Accessories for Data Processing see Chapter 11

Digital Depth Gage MarCal 30 EWN

Version A



Version B

REFERENCE

Applications

- Ideal for measuring the width of grooves and distances between grooves

Features

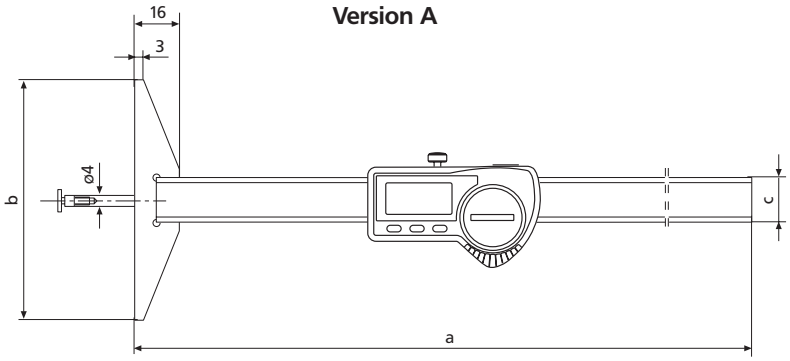
Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
PRESET (enter a numerical value)
Reference-Lock/Unlock
DATA (Data transmission via connection cable)
Auto-ON/OFF

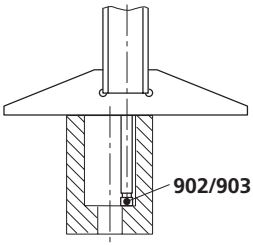
- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD with 8.5 mm high digits
- Beam and cross beam are made of hardened stainless steel
- Locking screw
- Supplied with: Case, battery, operating instructions. Version A: Anvils 30 ENt (1 mm), 902 and 903

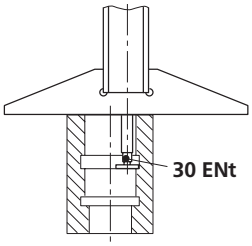
Technical Data

Measuring range		Length of cross beam	Resolution	Error limit *G*	Version	Order no.
mm	(inch)	mm	mm / inch	mm		
100	(4")	85	0.01 / .0005"	0.03	A	**4126512**
200	(8")	100	0.01 / .0005"	0.03	B	**4126517**
300	(12")	150	0.01 / .0005"	0.03	B	**4126518**

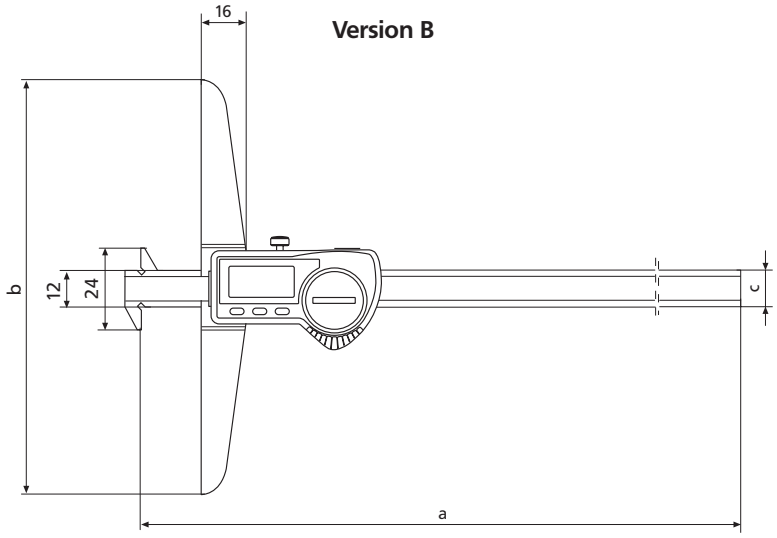
Version A

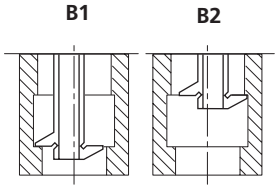






Version B





Dimensions

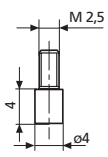
mm	a	b	c
100	268	85 x 8.5	16 x 3
200	281	100 x 8.7	11.5 x 3.6
300	381	150 x 8.7	11.5 x 3.6

Accessories

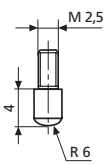
		Order no.
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**
Disc Type Anvil 0.5 mm thick, hardened	**30 ENt**	**4126310**
Disc Type Anvil 1 mm thick, hardened	**30 ENt**	**4882022**

Accessories for Data Processing see Chapter 11

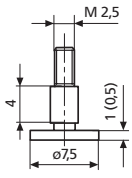
903



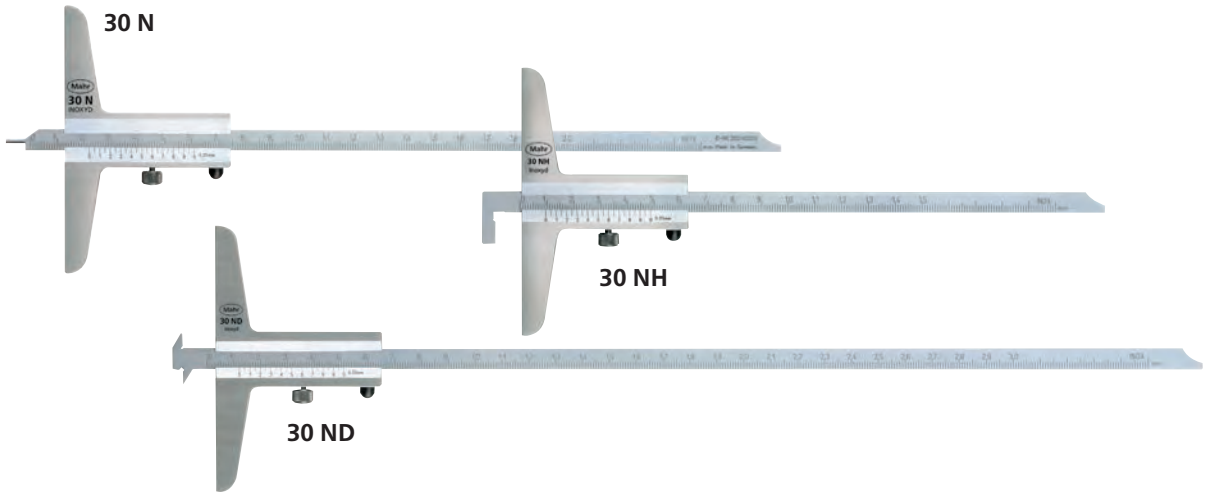
902



30 ENt



Depth Gages MarCal 30 N / 30 NH / 30 ND



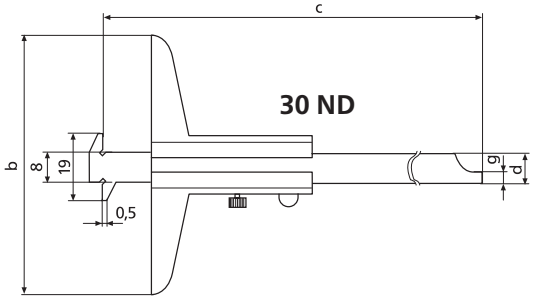
DIN 862

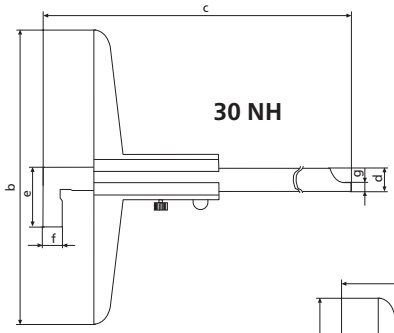
Features

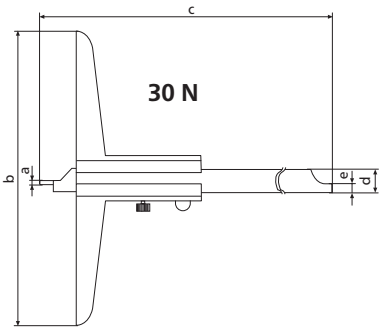
- Vernier and main scale have a satin chrome finish for glare free reading
- Slide, beam and cross beam are made of hardened stainless steel
- Raised guide ways for the protection of the scale
- Locking screw
- Supplied with: Case

Technical Data

Measuring range mm	Vernier scale mm	Error limit *G* mm	Order no. 30 N with hardened measuring pin	Order no. 30 NH with hook	Order no. 30 ND with double sided hook
80	0.05	0.05	**4127200**		
150	0.05	0.05	**4127300**	**4127350**	
200	0.05	0.05	**4127301**	**4127351**	**4127410**
300	0.05	0.05	**4127201**	**4127352**	**4127411**
500	0.05	0.07	**4127202**	**4127353**	







Dimensions

mm	dia. a	b	c	d	e	f	g
80 mm	1	50	140	8 x 3	–	–	–
150 mm	1.5	100	235	8 x 3	20	5	3.5
200 mm	1.5	100	285	8 x 3	20	5	3.5
300 mm	2.0	150	390	12 x 4	28	10	4
500 mm	2.0	150	590	12 x 4	28	10	4

Digital Linear Machine Gage MarCal 31 EW

REFERENCE

Application

- For measuring travel on a machine (e.g. on an upright drilling machine, milling machine)
- Ideal on either an horizontal or vertical fixture, the housing can be rotated through 270°

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reference-Lock/Unlock
PRESET (for entering a numerical value)
DATA (Data transmission via connection cable)
Auto-ON/OFF
Multiplier factor

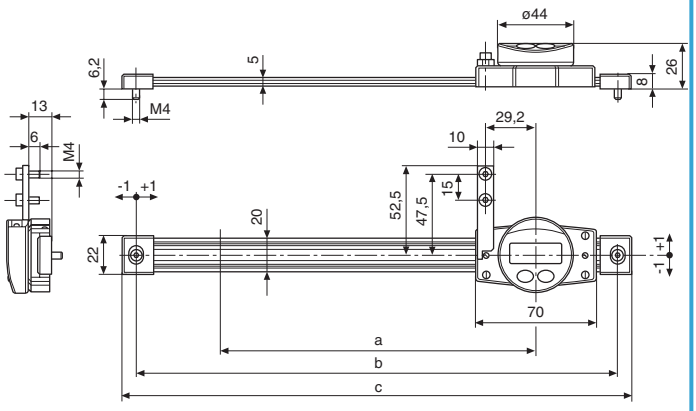
- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP54
- MarConnect data output, choose alternatively:
  USB
  OPTO RS232C
- Dirt wipers are integrated in the slide
- Max measuring speed 2.5 m/s (100"/s)
- High contrast LCD
- Supplied with:
  Battery,
  operating instructions

Technical Data

Measuring range mm	Measuring range *(inch)*	Resolution mm / *inch*	Error limit *G* µm	Order no.
150	***(6")***	0.01/ ***.0005"***	30	**4104100**
200	***(8")***	0.01/ ***.0005"***	30	**4104101**
300	***(12")***	0.01/ ***.0005"***	40	**4104102**
600	***(24")***	0.01/ ***.0005"***	50	**4104103**

Dimensions

mm	a	b	c
150	185	282	398
200	235	332	348
300	335	432	448
600	665	762	778



Accessories

		Order no.
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB	800 EWu	**4305121**
Data Connection Cable Opto RS232	800 EWr	**4305122**

Accessories for Data Processing see Chapter 11

DO YOU WANT TO AIM EVEN HIGHER?
FOR THIS THERE IS DIGIMAR.

The latest information on DIGIMAR products can be found on our website:
www.mahr.de/en/Home, WebCode 20536

► | Mahr offers you a complete range of products in order for you to obtain the most reliable solution for all your measuring tasks. Whether it's simply scribing a work piece or complex measurements in two dimensions - Digimar Height Measuring Instruments guarantee a maximum of both flexibility and quality. Our motorized Height Measuring Instruments Digimar 817 CLM and 816 CL exceed all customer requirements; they are simple to operate, all the basic functions can be executed with a single key as well as offering a maximum of ease and accuracy. | ◄

► | Digimar. Height Measuring Instruments

Overview
Digimar Height Measuring Instruments 2- 2

Motorized Height Measuring Instruments

Digimar 817 CLM Quick Height 2- 4
High-End Height Measuring Instruments with 2D measurement and a statistics function

Digimar 816 CL 2- 8
Height Measuring Instruments for use in the workshop and in production

Accessories for 817 CLM and 816 CL 2-10

Manual Height Measuring Instruments

Digimar M 814 N 2-16
With Cast Iron Base

Digimar M 814 G 2-17
With Granite Table Plate

Accessories for Digimar M 814 2-18

Height Measuring and Scribing Instrument

Digimar 814 SR 2-19

Digimar. Height Measuring Instruments

OVERVIEW

	Digimar 817 CLM „Quick Height“		
Catalog page	2-4	2-4	2-4
Measuring range mm / ***inch***	0-350 / ***0-14“***	0-600 / ***0-24“***	0-1000 / ***0-40“***
Application range up to mm / ***inch***	520 / ***20.47“***	770 / ***30.35“***	1170 / ***46.06“***
Measuring error* in µm	1.8+L/600 (L in mm)	1.8+L/600 (L in mm)	1.8+L/600 (L in mm)
Quick Mode	●	●	●
1-D	●	●	●
2-D	●	●	●
Motorized measuring carriage	●	●	●
Scribing/marking work pieces			
Bore diameter	●	●	●
Max-Min	●	●	●
Tolerance monitoring	●	●	●
Perpendicularity measurement	●	●	●
Straightness measurement	●	●	●
Angle calculation	●	●	●
Statistics	●	●	●
Measuring programs	40	40	40
Temperature compensation	●	●	●
Air bearings	●	●	●
Integrated USB memory	●	●	●
Data interface	RS232	RS232	RS232
USB printer interface	●	●	●
Order no.	**4429010**	**4429011**	**4429012**

** At 20°C in conjunction with a base plate in accordance to DIN 876/0 and a standard probe K6/51*

Digimar 816 CL		Digimar M 814 N		Digimar M 814 G		Digimar 814 SR	
2-8	2-8	2-16	2-16	2-17	2-17	2-19	2-19
0-350 / ***0-14"***	0-600 / ***0-24"***	0-320 / ***0-12"***	0-620 / ***0-24"***	0-320 / ***0-12"***	0-620 / ***0-24"***	0-350 / ***0-14"***	0-600 / ***0-24"***
520 / ***20.47"***	770 / ***30.31"***	320 / ***12.6"***	620 / ***24.4"***	320 / ***12.6"***	620 / ***24.4"***	350 / ***14"***	600 / ***24"***
2.8+L/300 (L in mm)		20	30	20	30	40	50
●	●	●	●	●	●	●	●
●	●						
		●	●	●	●	●	●
●	●	●	●	●	●		
●	●	●	●	●	●		
		●	●	●	●		
1	1						
●	●						
●	●						
USB / RS232		Opto RS232		Opto RS232		USB / RS232 / Digimatic	
4429030	**4429031**	**4426540**	**4426542**	**4426541**	**4426543**	**4426100**	**4426101**

Digimar 817 CLM Quick Height

►| The new Height Measuring Instrument **Digimar** 817 CLM with the innovative Quick Mode. Highly accurate rapid measurements, a wide range of measuring and evaluation options and excellent operator comfort. |◄

The best solution for all measuring tasks

QUICK MODE

Fast measurement per hand
Easy to operate due to the „Quick Mode"; an innovative solution from Mahr (patented).

Ill. 1. Move the measuring carriage by hand in the direction of the object to be measured.

Ill. 2. The motor starts, the measurement procedure will automatically be performed.

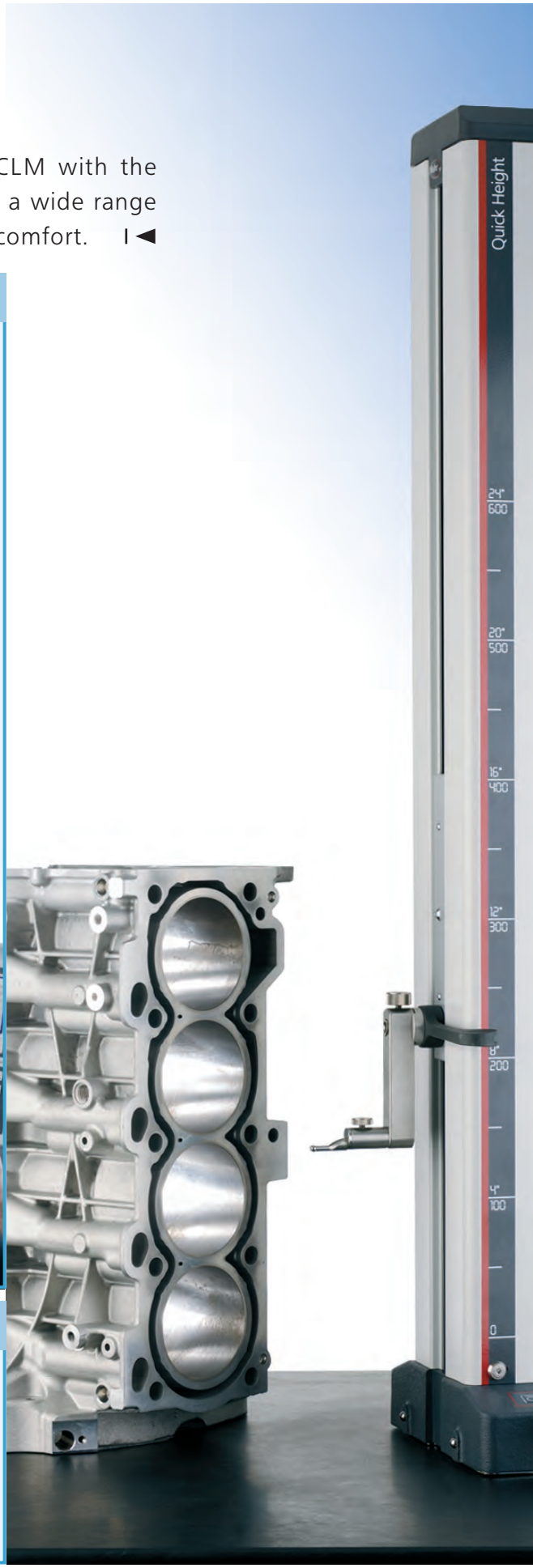
Measurement using the keypad (speed keys) on the base

Ideal in conjunction with the air bearings for large work pieces.

By using the keys that are integrated into the base; the operator can comfortably move the measuring carriage into the desired position and start a measurement. This eases measurement particularly when measuring large workpieces as these do not have to be moved into position. The operator can keep both hands on the measuring instrument (one hand on the key for the air bearing and other on the high-speed keys) and measure the workpiece in one run.

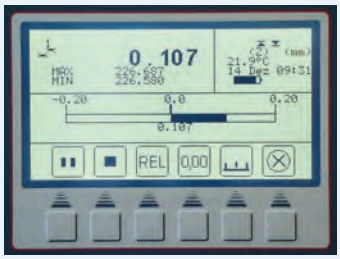
Highest accuracy and reliability

- Extremely accurate incremental measuring system with double reader head system, insensitive to the contamination of dirt
- Robust guide column, made from stainless steel
- Measuring head in precision ball bearings guide
- Temperature compensation with an integrated temperature sensor



Ergonomic operating and display unit

- The display unit can be positioned freely with the swivel arm



- Large, back-lit display
- Self-explanatory guided operation with icons

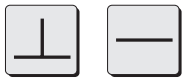
Easy to operate all measurement functions with the function keys due to the clearly defined symbols.

Universal measurement possibilities

- Wide range of measurement functions in 1D or 2D

- Dynamic measurement functions with the analog display

- Automatic perpendicularity and straightness measurements (in conjunction with accessories)

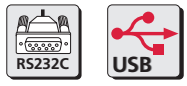


- Automated measuring procedures (measurement programs)

- Auto function for chain measurements and distance measurements

Extensive evaluation possibilities

- Transmit data to a PC via RS232 or USB (with an adapter) for example into MS Excel via the MarCom-Software



- Print measured values, statistics, etc. via a USB printer

- Save measued values in the integrated USB memory (will be recognized by a PC as an interchangeable disc drive) or on a USB dongle

- Broad range of statistical evaluations are available

Height Measuring Instrument Digimar 817 CLM

See our brochure at
WebCode 12369

Features

Measuring system

- Excellent accuracy and reliabilty due to the optical incremental measurement system with the double reader head
- Dynamic probing system enabling high repeatability
- Air bearings system for light and smooth movement
- Precise measuring head on stainless steel guideways
- Motorised measuring carriage simplifies measurement runs
- Probe constant remains after the instrument is switched off
- Integrated rechargeable battery with a long operating time span for mains independent measurement
- Temperature compensation with an integrated temperature sensor

Operating and display unit

- Large and clearly defined function keys
- Easy to read background lit graphic LCD display
- Operator guidance with self-explanatory icons / pictograms
- Operator prompts and menus are available in several languages
- Possible to set additional zero points on a work piece
- RS232 and / or USB data output for further data processing
- Save measured data on the integrated USB memory or on a USB stick
- USB interface to connect a compatible USB printer
- Additional measuring instruments with Opto RS232-interface can be connected
- Secure the future due to software update potential
- Automatic Stand-by switch mode
- Selectable Auto-off function, without loss of measured values

- Supplied with:
  Height Measuring Instrument incl. operating and display unit, Carrier 817h1, Probe K6/51, Setting block 817 eb, Operating instructions, Mains power adapter, USB cable and a Calibration certificate

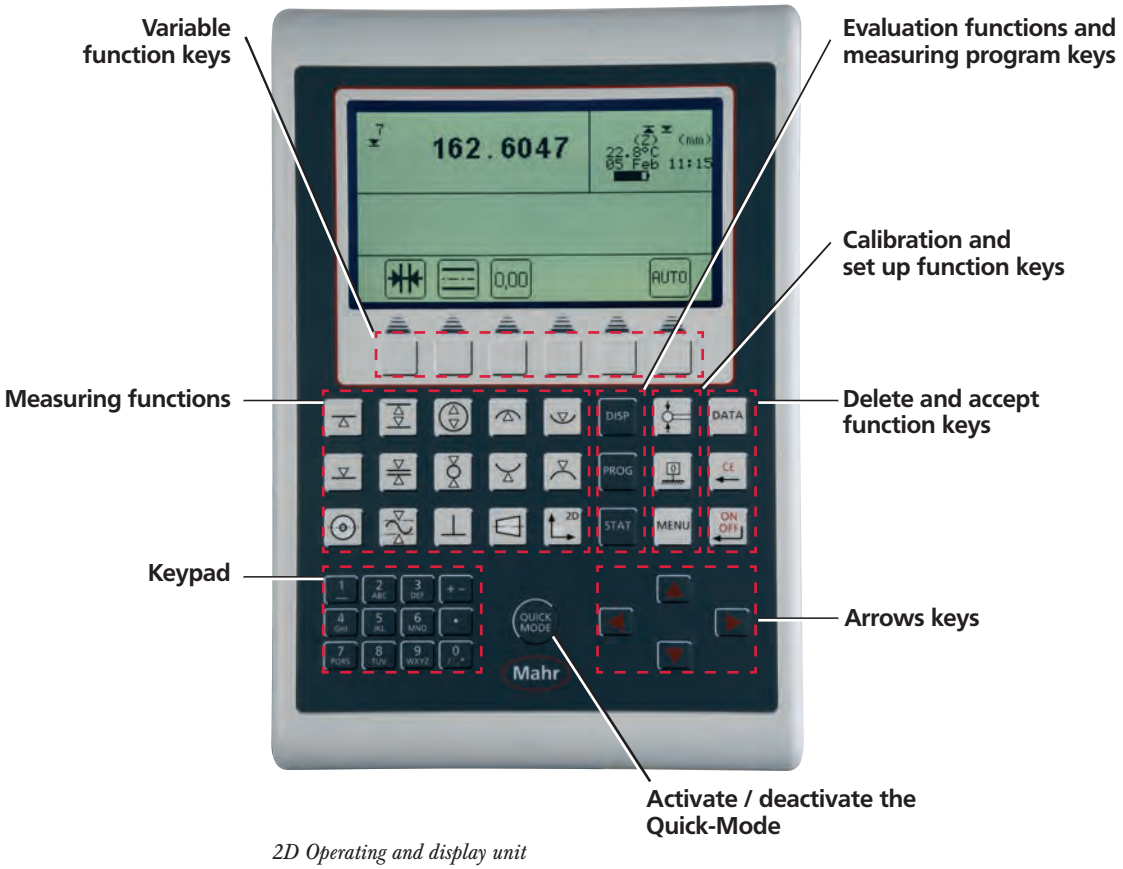
Technical Data

Measuring range	mm / ***inch***	350 / ***14"***	600 / ***24"***	1000 / ***40"***
Range of application	mm / ***inch***	520 / ***20.47"***	770 / ***30.31"***	1170 / ***46.06"***
Resolution	mm	0.01 / 0.005 / 0.001 / 0.0005 / 0.0001		
	inch	***.001" / .0005" / .0001" / .00005" / .00001"***		
Measuring error*	µm	(1.8 + L/600), L in mm		
Repeatability	µm	0.5 (plane) 1 (bore)		
Perpendicularity error (elect. adjusted)	µm	frontal ≤5	frontal ≤6	frontal ≤10
Operating time of rechargeable battery	h	up to 12		
Measuring force	N	1.0 ± 0.2		
Permissible relative air humidity	%	65 (non condensed)		
Working temperature	°C / °F	20 ± 1 / 68 ± 1.8		
Operating temperature	°C / °F	10 . . . 40 / 50 . . . 104		
3-point air cushion, height	µm	ca. 9		
Measuring system		incremental scale with optical reading		
Total height	mm / ***inch***	741 / ***29.17"***	985 / ***38.78"***	1392 / ***54.80"***
Base area (L x W)	mm / ***inch***	240 x 250 / ***9.45" x 9.84"***		
Weight	kg / lbs	25 / 55.15	30 / 66.14	35 / 77.16
Order no.		**4429010**	**4429011**	**4429012**

** At 20°C in conjunction with a base plate in accordance to DIN 876/0 and a standard probe K6/51*

Height Measuring Instrument Digimar 817 CLM

Operating and display unit



2D Operating and display unit

Operating and display unit		
Measurement		
One dimensional (1D)		●
Two dimensional (2D)		●
Measuring programs (automatic run)		40
Perpendicularity / straightness measurement		●
Flatness / parallel deviation (Max, Min)		●
Roundness / run-out deviation (Max-Min)		●
Measuring a taper		●
Evaluation		
- Statistics		●
- Transmit measured values to a PC via RS232		●
- Print measured values and diagrams on a USB printer		●
- Print out statistical evaluations		●
- Save measured values on the integrated USB memory or on a USB dongle		●

Digimar 816 CL

►I The new Height Measuring Instrument **Digimar** 816 CL.
You want to obtain highly accurate measurement results without any complicated procedures? With the Digimar 816 CL you have the perfect partner for simple and accurate measurements both in the workshop or on the production line, just as you expect from Mahr! I◄

User-friendly operation. . .

. . .due to the

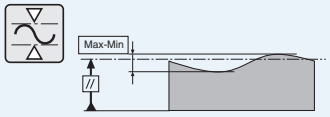
- Clearly displayed measured values
- Self-explanatory operator guidance

The operating and display unit has a background illuminated display.

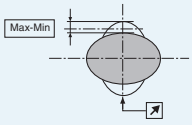
Versatile

The Height Measuring Instrument Digimar 816 CL offers numerous practical measuring and evaluation functions:

- Convenient standard measuring functions
- Dynamic measuring functions



Parallel deviation



Roundness deviation

- Wide range of options for data evaluation

RS232C USB

Precise measuring results. . .

. . . on the production line

- Robust design
- Measuring results independent of the user
- Reliable results even outside of the inspection room

Probe contact with the motorized measuring carriage.

20°C

- Temperature compensation with an integrated temperature sensor

The measuring program. . .

. . . is essential for repetitive component measurement

PROG

- Repetitive measuring procedures can easily be automated
- Simply create a measuring program with the Teach-In-mode
- Complex procedures can be started by just pressing one key

Height Measuring Instrument Digimar 816 CL

Features

Measuring system
- Excellent accuracy and reliabilty due to the optical incremental measurement system with the double reader head
- Dynamic probing system enabling high repeatability
- Air bearings system for light and smooth movement
- Precise measuring head on stainless steel guideways
- Motorized measuring carriage simplifies measurement runs
- Temperature compensation with an integrated temperature sensor
- Probe constant remains after the instrument is switched off
- Integrated rechargeable battery with a long operating time for mains independent measurement

Operating and display unit
- Easy to read background lit graphic LCD display
- Large and clearly defined function keys
- Operator guidance with self-explanatory icons / pictograms
- Possible to set additional zero points on a work piece
- Memory can store up to 99 measured values
- MarConnect data output, select either:
  - USB
  - OPTO RS232C

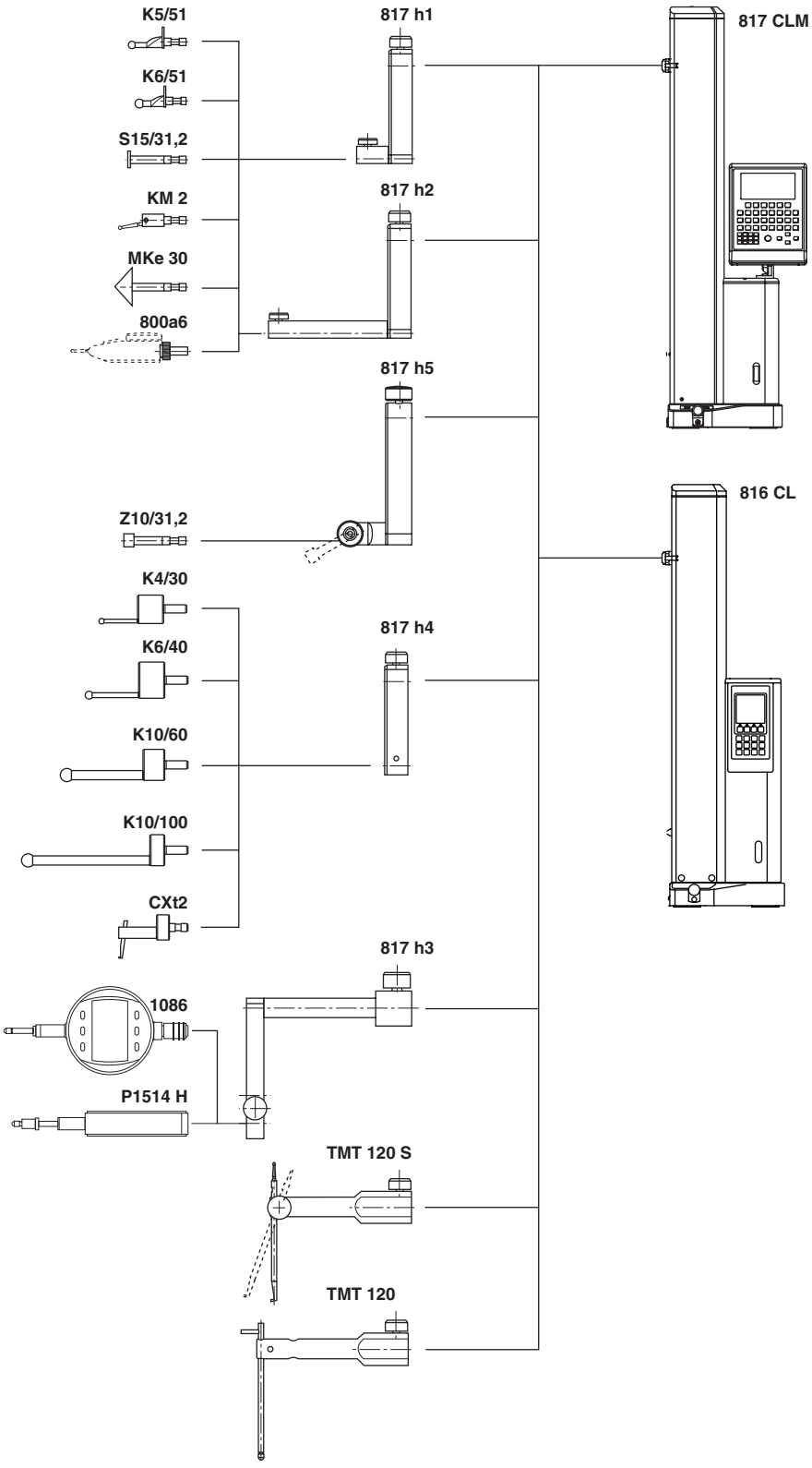
- Supplied with:
  Height Measuring Instrument incl. operating and display unit, Carrier 817h1, Probe K6/51, Setting block 817 eb, Operating instructions, Mains power adapter and a Calibration certificate

Technical Data

Measuring range	mm / ***inch***	350 / ***14"***	600 / ***24"***
Range of application	mm / ***inch***	540 / ***21.26"***	770 / ***30.31"***
Resolution	mm ***(inch)***	0.01 / 0.001 ***(.0001" / .00005")***	
Measuring error*	µm	(2.8+L/300), L in mm	
Repeatability	µm	2 (plane) 3 (bore)	
Perpendicularity error (mech.)	µm	frontal ≤15	frontal ≤20
Operating time of rechargeable battery	h	up to 14	
Measuring force	N	1.0 ± 0.2	
Permissible relative air humidity	%	65 (non condensed)	
Working temperature	°C / °F	20 ±1 / 68 ±1.8	
Operating temperature	°C / °F	10 . . . 40 / 50 . . . 104	
3-point air cushion, height	µm	ca. 9	
Measuring system		incremental scale with optical reading	
Total height	mm / ***inch***	741 / ***29.17"***	985 / ***38.78"***
Base area (L x W)	mm / ***inch***	240 x 250 / ***9.45" x 9.84"***	
Weight	kg / lbs	25 / 55.15	30 / 66.14
Order no.		**4429030**	**4429031**

** 20°C with surface base plate according to DIN 876/0 and standard probe K6/51*

Overview of carriers and probes for Digimar 817 CLM / 816 CL



Height Measuring Instruments Digimar 817 CLM / 816 CL

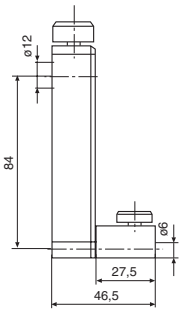
Accessories

Carrier for probes with mount dia. 6 mm

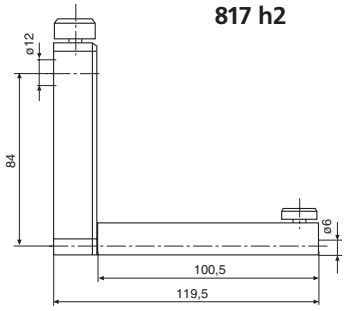
Catalog no.	Description	Shaft length mm	Order no.
817 h1	Carrier for a probe	27.5	**4429154***
817 h2	Carrier for a probe	100	**4429219**
817 h5	Carrier with a joint for a probe	35	**4429454**

* *Supplied with standard accessories*

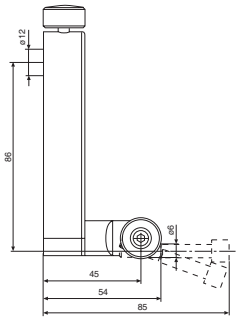
817 h1



817 h2



817 h5



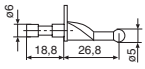
rotatable

Probes with mount dia. 6 mm

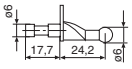
Catalog no.	Description	Order no.
K5/51	Spherical probe	**4429158**
K6/51	Spherical probe	**4429254***
S15/31,2	Disc probe	**4429226**
Z10/31,2	Cylindrical probe	**4429227**
MKe 30	Taper probe	**4429228**
KM 2	Probe M2 incl. styli 800 ts, dia. 2 mm	**4429256**
800 a6	Mounting shaft 800 a6 for MarTest	**4301865**

* *Supplied with standard accessories*

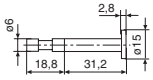
K 5/51



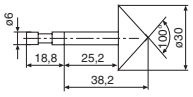
K 6/51



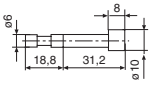
S 15/31,2



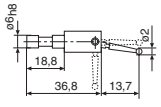
MKe 30



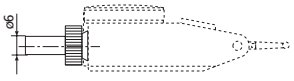
Z 10/31,2



KM 2



800 a6



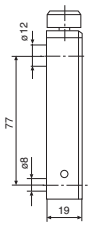
Height Measuring Instruments Digimar 817 CLM / 816 CL

Accessories

Carrier for probes with mount dia. 8 mm

Catalog no.	Description	Order no.
817 h4	Carrier for probes	**4429220**

817 h4

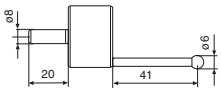


Probes with mount dia. 8 mm

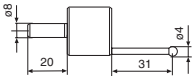
Catalog no.	**Ball** dia. D mm	Order no.
K4/30	4	**7023813**
K6/40	6	**7023816**
K10/60	10	**7023810**
K10/100	10	**7023615**

Universal probe CXt2 see page 2-14
The above Probes requires the Probe Carrier 4429220 in order to be used on either an 817 CLM or 816 CL

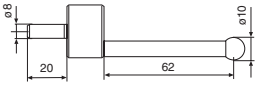
K 6/40



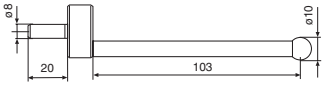
K 4/30



K 10/60



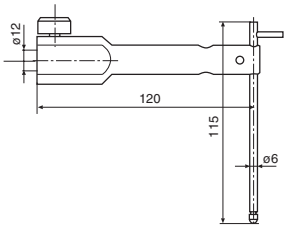
K 10/100



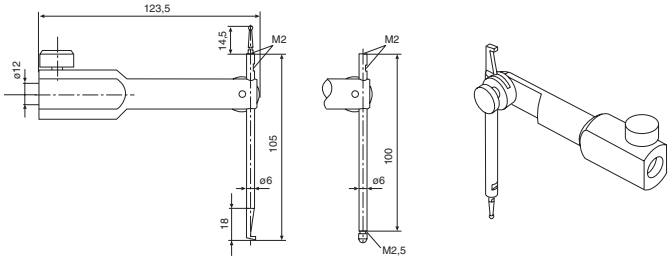
Depth probes

Catalog no.	Description	Order no.
TMT 120	Depth probe incl. carrier	**4429221**
TMT 120 S	2 depth probes incl. carrier (rotatable)	**4429421**

TMT 120



TMT 120 S



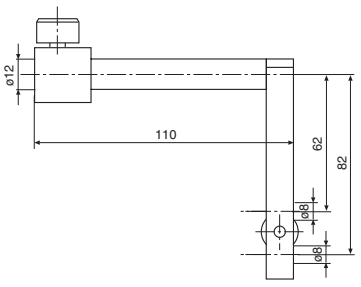
Height Measuring Instruments Digimar 817 CLM / 816 CL

Accessories for checking perpendicularity

Carrier for probes

Catalog no.	Description	Order no.
817 h3	Carrier for transducers	**4429206**

817 h3

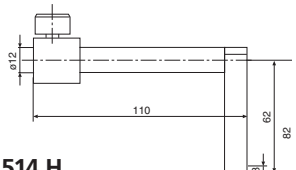


Transducers for checking perpendicularity

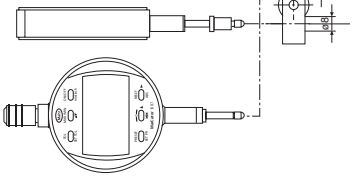
Catalog no.	Description	Order no.
P1514 H	Incremental Probe, 12 mm incl. cable	**4426810***
1086 R	Digital Indicator, 12.5 mm Resolution 0.001 mm** / ***.00005"***	**4337620**
16 EXr	Data cable for Digital Indicator 1086 R	**4102410***

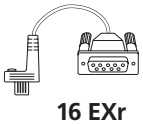
* *Only for Digimar 817 CLM*
** *Resolution switchable*

817 h3



P1514 H





16 EXr

1086 R

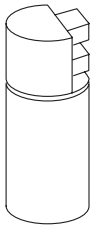
Accessories

Setting blocks

Catalog no.	Description	Order no.
817 eb	Setting block	**4429168***

* *Supplied with standard accessories*

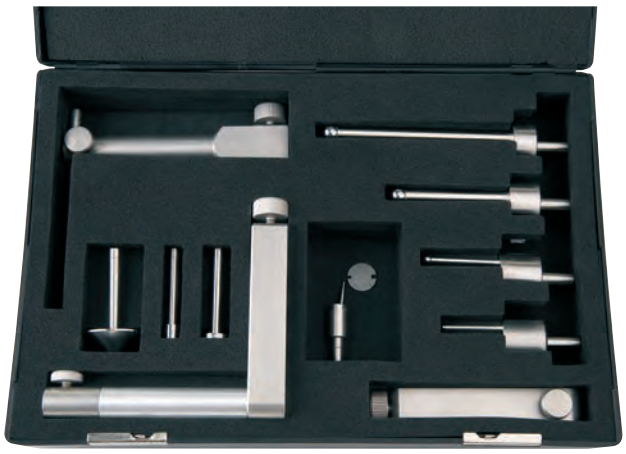
817 eb



Height Measuring Instruments Digimar 817 CLM / 816 CL

Accessory sets for probes

Probe set 817 ts1 consists of:		**4429019**
	Carrying case for accessories	**4429020**
817 h2	Carrier for probes	**4429219**
S15/31,2	Disc probe	**4429226**
Z10/31,2	Cylindrical probe	**4429227**
MKe 30	Taper probe	**4429228**
TMT 120	Depth probe incl. carrier	**4429221**
KM 2	Probe for MarTest styli M2	**4429256**
817 h4	Carrier for probes	**4429220**
K4/30	Spherical probe	**7023813**
K6/40	Spherical probe	**7023816**
K10/60	Spherical probe	**7023810**
K10/100	Spherical probe	**7023615**



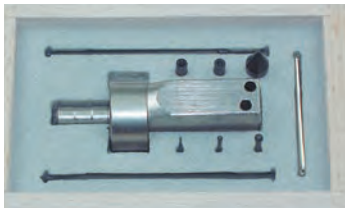
817 ts1

Probe set 817 ts2 consists of:		**4429018**
	Carrying case for accessories	**4429020**
817 h2	Carrier for probes	**4429219**
S15/31,2	Disc probe	**4429226**
Z10/31,2	Cylindrical probe	**4429227**
MKe 30	Taper probe	**4429228**
TMT 120	Depth probe incl. carrier	**4429221**
KM 2	Probe for MarTest styli M2	**4429256**

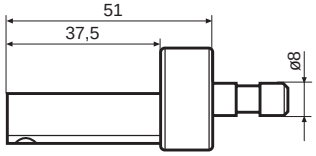
817 ts2

Universal probe set CXt2 consists of:			**7034000**
Case			**3015925**
Probe carrier			**3015917**
	Dimension	**Shaft length**	
Measuring crook	d = 0.5 mm	*l* = 78 mm	**3015918**
Probe pin /tip:	dia. d = 1.2 mm	*l* = 75 mm	**3015919**
		ls = 15.5 mm	
Taper probe	dia. d = 0–7.5 mm		**3015920**
Spherical probe	TC dia. dk = 3 mm	*l* = 24 mm	**3022000**
Spherical probe	TC dia. dk = 2 mm	*l* = 24 mm	**3022001**
Spherical probe	TC dia. dk = 1 mm	*l* = 24 mm	**3022002**
Extension M3 – M3	d = 4 mm	*l* = 20 mm	**3015921**
Extension M3 – M2.5	d = 4 mm	*l* = 20 mm	**3015888**

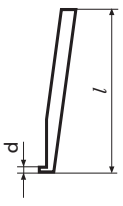
The above Probes requires the Probe Carrier 4429220 in order to be used on either an 817 CLM or 816 CL



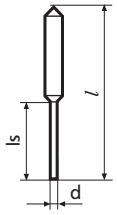
Probe carrier



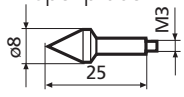
Measuring crook



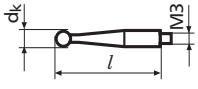
Pin probe



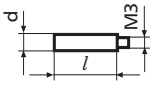
Taper probe



Spherical probe



Extension



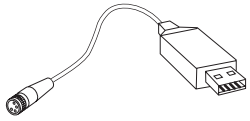
Height Measuring Instruments Digimar 817 CLM / 816 CL

Accessories for data transmission for 816 CL

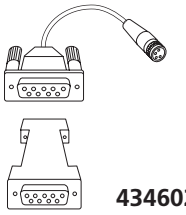
Data connection cable

		Order no.
Data connection cable incl. MarCom Standard, USB (2 m)	**2000 usb**	**4346023**
Data connection cable Opto RS232C (2 m), with SUB-D jack 9-pin	**2000 r**	**4346020**

Accessories for Data Processing see Chapter 11



4346023



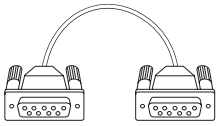
4346020

Accessories for data transmission for 817 CLM

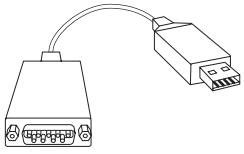
Data connection cable

	Order no.
Data cable 817 CLM to a PC	**7024634**
Adapter cable RS232-USB for Digimar 817 CLM incl. MarCom Standard	**4102333**

Accessories for Data Processing see Chapter 11



7024634



4102333

Printer for 817 CLM

HP Officejet printer

- Standard connectivity: USB - compatible with USB 2.0 specifications
- Compatible operating systems: Microsoft® Windows® 98 SE, Me, 2000, XP, 7, 8
- Standard printer languages HP PCL 3

Similar to illustration

	Order no.
HP Officejet printer	**4429015**

Height Measuring and Scribing Instrument Digimar 814 N Standard version

Applications

Ideal for measuring:
- Heights
- Center distances between bores and surfaces, widths of ledges, plus marking and scribing of workpieces

Features

With extra rugged, cast iron base with three-point support. To be used on base plates, machine beds and work piece surfaces. Conversion to a 814 G version is quick and easy at any time.

- High accuracy
- Incremental inductive measuring system
- Measuring head with an ball bush guide
- Resistance free measuring system
- Large, easy to read digital display
- Measuring and display unit are incorporated in the measuring head
- Easy to operate due to the hand crank on the side of the measuring head
- Constant measuring force; acting upwards or downwards as required
- Measuring head can be locked in position, ideal for scribing tasks
- With fine adjustment
- Data transmission via Opto RS232C interface
- Digital Preset
- Zero setting in any position
- MAX, MIN and MAX-MIN functions
- Enter tolerance limit for 1 characteristic
- Switch between mm/inch
- Mains independent due to being battery operated
- Universal application due to a broad range of accessories

Technical Data

Measuring range	mm / ***inch***	320 / ***12.6"***		620 / ***24.4"***
Resolution	mm ***(inch)***		0.01 / 0.001 ***(.0005" / .00005")***	
Measuring error	µm	20 / ***.0008"***		30 / ***.0012"***
Repeatability	µm		5 / ***.0002"***	
Perpendicularity error	µm	frontal 20 (300 mm)		frontal 30 (600 mm)
Operating time of the battery	h		2000	
Measuring force	N		ca. 3	
Working temperature	°C / °F		20 ±1 / 68 ±1.8	
Operating temperature	°C / °F		5. . . 40 / 41. . .104	
Measuring system			inductive	
Total height	mm / ***inch***	513 / ***20.20"***		813 / ***32.01"***
Cast iron base (L x W)	mm / ***inch***	205 x 175 / ***8.07" x 6.89"***		205 x 175 / ***8.07" x 6.89"***
Weight	kg / lbs	6.2 / 13.22		10.5 / 23.15
Order no.		**4426540**		**4426542**

Height Measuring and Scribing Instrument Digimar 814 G Base plate version

Applications

Ideal for measuring:
- Heights
- Center distances between bores and surfaces, widths of ledges, plus marking and scribing of workpieces

Features

Table plate is made of fine grained black granite (greenstone) which is extremely hard and stable.
Conversion to a 814 N version is quick and easy at any time.

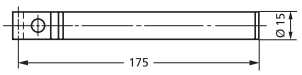
- High accuracy
- Incremental inductive measuring system
- Measuring head with an ball bush guide
- Resistance free measuring system
- Large, easy to read digital display
- Measuring and display unit are incorporated in the measuring head
- Easy to operate due to the hand crank on the side of the measuring head
- Constant measuring force; acting upwards or downwards as required
- Measuring head can be locked in position, ideal for scribing tasks
- With fine adjustment
- Data transmission via Opto RS232C interface
- Digital Preset
- Zero setting in any position
- MAX, MIN and MAX-MIN functions
- Enter tolerance limit for 1 characteristic
- Switch between mm/inch
- Mains independent due to being battery operated
- Universal application due to a broad range of accessories

Technical Data

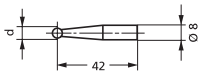
Measuring range	mm / ***inch***	320 / ***12.6"***		620 / ***24.4"***
Resolution	mm ***(inch)***		0.01 / 0.001 ***(.0005" / .00005")***	
Measuring error	µm	20 / ***.0008"***		30 / ***0.0012"***
Repeatability	µm		5 / ***.0002"***	
Perpendicularity error	µm	frontal 20 (300 mm)		frontal 30 (600 mm)
Operating time of the battery	h		2000	
Measuring force	N		ca. 3	
Working temperature	°C / °F		20 ±1 / 68 ±1.8	
Operating temperature	°C / °F		5. . . 40 / 41. . .104	
Measuring system			inductive	
Total height	mm / ***inch***	558 / ***21.97"***		858 / ***33.78"***
Granite plate (L x W)	mm / ***inch***		200 x 300 / ***7.87" x 11.81"***	
Grade of accuracy			1 DIN 876	
Weight	kg / lbs	14 / 30.86		18.3 / 35.27
Order no.		**4426541**		**4426543**

Accessories for Height Measuring and Scribing Instrument Digimar 814 N / 814 G

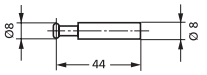
				Order no.
814 t	Probe arm with joint for mounting probes, dial indicators, dial comparators and test indicators.			**4426510***
	Length of mounting shank	150 mm	***(5.91")***	
	Mounting bore	8 mm	***(.315")***	
814 m	Spherical probe	2 mm ball	***(.0787")***	**4426525**
	To mount in probe arm 814 t	3 mm ball	***(.118")***	**4426526**
		4 mm ball	***(.157")***	**4426512**
		5 mm ball	***(.197")***	**4426527**
		6 mm ball	***(.236")***	**4426511**
		7 mm ball	***(.276")***	**4426528**
		8 mm ball	***(.315")***	**4426509***
814 s	Disc probe for measuring heights, distances, surfaces and edges. Especially recommended for narrow shoulders, e.g. on centering edges.			**4426513**
814 h	Probe holder	M 2.5		**4426514**
	to mount the styli of dial indicators and dial comparators. For special applications.			
814 a	Scriber for scribing and marking of work pieces. Carbide tipped. To be mounted on the Probe arm 814 t.			**4426515**
814 kh	Halter			**4426516**
817 ks1	Measuring taper	0 – 15	***(0 - .591")***	**4426071**
817 ks2	Measuring taper	14 – 20	***(.551" - .787")***	**4426072**
817 ks3	Measuring taper	18 – 24	***(.709" - .945")***	**4426073**
817 ks4	Measuring taper	23 – 30	***(.906" -1.181")***	**4426074**
814 u	Two direction probe for measuring outside and inside diameters, width of ledges, recesses and slots. Actual ball diameter does not influence the results.	4 mm ball	***(.157")***	**4426517**
814 ua	Interchangeable probe arm for use in conjunction with the two direction probe 814 u	2 mm ball	***(.0787")***	**4426518**
817 Cl-r	Spherical probe	4 mm ruby ball	***(.157")***	**4426498**
817 Cl-am	Holder with connection thread	M 2.5, M 1.6, M 1.4		**4426434**
817 Cl-sa	Stylus with exchangeable measuring pin			**4426433**
817 Cl-p	Stylus with parallel measuring faces			**4426435**
	Battery 3 V, type CR 2032			**4102520***
	Dust cover	0–320 mm	***(0 - 12.60")***	**4426616***
	Dust cover	0–620 mm	***(0 - 24.41")***	**4426619***
814 Nf	Cast iron base			**4426506****
814 Gf	Table plate			**4426507****
814 X	Column with measuring head	0–320 mm	***(0 - 12.60")***	**4426544**
814 X	Column with measuring head	0–620 mm	***(0 - 24.41")***	**4426545**
16 ESv	Data connection cable Opto RS232C	Length 2 m	***(6.56 ft)***	**4102510**



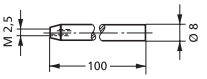
814 t



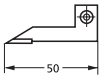
814 m



814 s

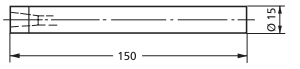


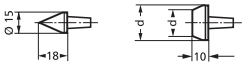
814 h



814 a

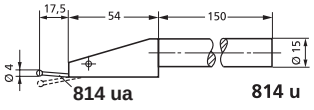
814 kh





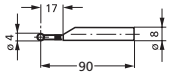
817 ks1

817 ks2
817 ks3
817 ks4

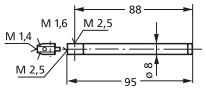


814 ua

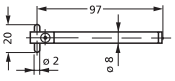
814 u



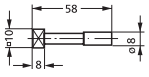
817 Cl-r



817 Cl-am



817 Cl-sa



817 Cl-p

* *Scope of supply*
** *for upgrade*

Height Measuring and Scribing Instrument Digimar 814 SR

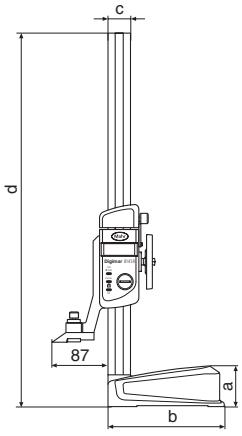
Application

- Scribing and marking of work pieces
- Measuring heights and distances

Features

Functions:
RESET (Set the display to zero for relative measurement)
ABS (Switch between relative and absolute measurement)
mm/inch
Reference-Lock/Unlock
PRESET (To enter a numerical value)
DATA (Data transmission via connection cable)
Auto-ON/OFF

- Life of the battery up to 3 years
- Max. measuring speed 1.5 m/s (60"/s)
- MarConnect Data output: choose either
  USB
  OPTO RS232C
  Digimatic
- High contrast Liquid Crystal Display with 12 mm high digits
- Sturdy heavy-duty base, easy to handle
- Hardened and lapped contact surface which produce both a smooth and even movement
- Slide and beam made of hardened stainless steel
- Hand crank for positioning and measuring
- Fine adjustment
- Locking screw
- Interchangable scriber point, carbide tipped
- Scope of supply:
  Scriber point, cardboard box, battery and operating instructions



Dimensions

mm	a	b	c	d
350	62	180 x 98	35 x 15	580
600	62	180 x 98	35 x 15	835

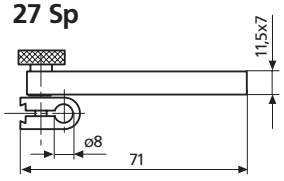
Technical Data

Measuring range mm	*(inch)*	Resolution mm / *inch*	Error limit mm / *inch*	Weight kg / lbs	Order no.
350	***(14")***	0.01 / ***.0005"***	0.04 / ***.0016"***	7 / 15.43	**4426100**
600	***(24")***	0.01 / ***.0005"***	0.05 / ***.0020"***	8 / 17.64	**4426101**

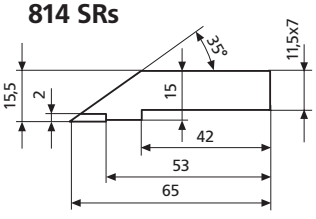
Accessories

		Order no.
Measuring / Scriber Point, carbide tipped	**814 SRs**	**4123867**
Holder for Test Indicators	**27 Sp**	**4123041**
Battery 3V, type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

27 Sp



814 SRs



DOES EVERYTHING ROTATE AROUND PRECISION?
NO PROBLEM WITH MICROMAR.

The latest information on MICROMAR products can be found on our website:
www.mahr.de/en/Home, WebCode 20127

► | Micrometers belong alongside calipers to the most frequently used hand measuring instruments. With their precision ground spindle, their carbide tipped measuring faces and their robust frame construction the modern micrometer from the Micromar series ensures maximum precision and a long working life. Our mechanical micrometers are extremely reliable and are easy to read due to the scales having a satin chrome finish, thus ensuring accuracy and user comfort. Our digital micrometers unite both the highly renowned mechanical precision from Mahr with most modern electronics. These digital micrometers offer simple operation with an error free reading as well as problem-free data transmission to an external evaluation instrument. Micromar 40 EWR, the newest generation of waterproof digital micrometers ensures that even in the most difficult workshop conditions precise and reliable results are obtained. A speciality of Mahr is the micrometer with a dial comparator, with its built-in dial comparator, stationary anvil and constant measuring force they are particularly well suited for rapid measurements and highly precise serial measurements. | ◄

► | Micromar. Micrometers

Overview
Micromar Micrometers 3- 2

Micrometers

Micromar 40 EWR / 40 ER / 40 EWS / 40 EWV 3- 4
With a Digital Display
Micromar 40 A / 40 W 3-12
With Scales
Micromar 40 F / 40 T / 40 TS 3-16
With a Dial Comparator
Micromar 40 AB / 40 AS / 40 AR / 40 AW / 40 SM 3-19
With Special Measuring Faces
Micromar 40 Z 3-22
For Gear and Thread Measurement
Accessories for Micrometers 3-24

Inside Micrometers

Micromar 44 F / 44 Cms / 44 CB / 44 CZ 3-25
Inside Micrometers with 2-Point Contact
Micromar 44 A / 44 EWR / 844 A
Self-Centering Inside Micrometers / Measuring Pistols 3-31

Depth Micrometers

Micromar 45 T
With a Line Scale (Vernier) 3-35

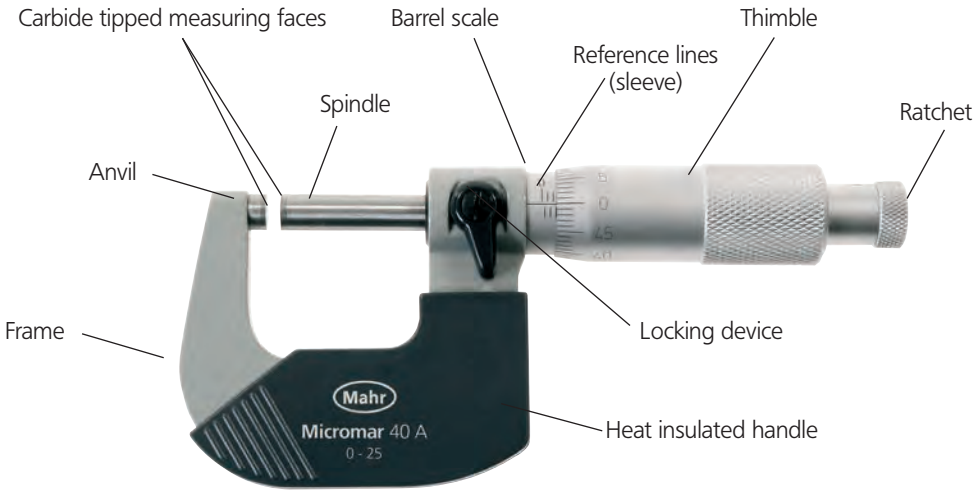
Micrometer Heads

Micromar 46 EWR / 46 / 46H
With Digital Display or Scales (Vernier) 3-36

Micromar. Micrometer

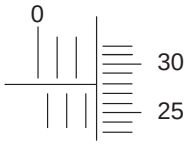
OVERVIEW

Micromar - Design Features



Reading example:

Micrometer with 0.01 mm-divisions



Sleeve	2.5
Thimble	0.28
Measuring result	2.78 mm

Micromar - Types of Micrometers

Mahr - Micrometers are available with the following means of indication:

a) Digital Micrometer with digital display

b) Mechanical Micrometer with scale and dial

c) Mechanical Micrometer with scale

Error limits *G* according to DIN 863-1

Measuring range mm			Error limit *G* µm	Measuring force N
0	-	25	4	5 - 10
25	-	50	4	5 - 10
50	-	75	5	5 - 10
75	-	100	5	5 - 10
100	-	125	6	5 - 10
125	-	150	6	5 - 10
150	-	175	7	5 - 10
175	-	200	7	5 - 10
200	-	225	8	5 - 10
225	-	250	8	5 - 10
250	-	275	9	5 - 10
275	-	300	9	5 - 10
300	-	325	10	5 - 10
325	-	350	10	5 - 10
350	-	375	11	5 - 10
375	-	400	11	5 - 10
400	-	425	12	5 - 10
425	-	450	12	5 - 10
450	-	475	13	5 - 10
475	-	500	13	5 - 10

Micromar - Variations

a) Micrometer

b) Micrometer for inside dimensions

c) Micrometer for depth measurement

d) Micrometer Head

Function keys of Digital Micrometers

Functions			Type
			40 EWR 40 EWS 40 EWV 40 ER 44 EWR 46 EWR
PR	Enter a numerical value (Reference Setting)		●
mm/in	Switch between mm/inch		●
0/ABS	Set display to either 0.000 mm or ***.0000"*** for relative measurement / set to a reference or preset value (PR)	ABS	●
DATA	Data transmission	USB	●*
		Digimatic	●*
		RS232C	●*

* For digital micrometers with a data output

Micromar. Digital Micrometer Micromar 40 EWR

WATERPROOF MICROMETERS

►| With the digital waterproof Micrometer **Micromar** 40 EWR, precise and reliable results are obtained even in the most difficult conditions. |◄

The high-contrast display with 8.5 mm high digits enables accurate, fatigue free reading of the measurement results.

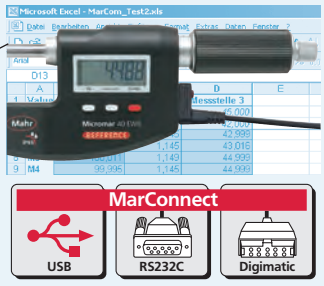
Absolute-Function: Micrometer can be set in any position to 0.000 mm / ***.0000"*** without the reference to the Preset value being lost

ABS

The **Reference-Lock-Function** prevents operating error caused by accidental usage of the operating buttons.

Stainless steel, hardened spindle

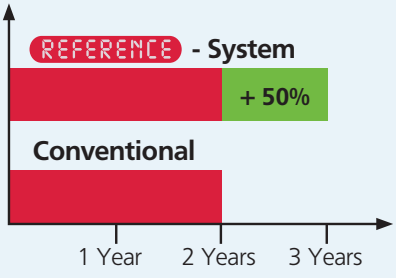
Sturdy hard lacquered steel frame



Universal SPC-interface (optional). You have a choice of **MarConnect** data outputs, select either **USB, Digimatic** or **Mahr Opto RS232**

The **ergonomically formed** and **thermally insulated handle** as well as the integrated ratchet in the thimble ensures both trouble free handling and accurate measurement results.

The new Reference system is extremely energy efficient as when the caliper is in standby mode; almost no power is required, thus **extending the life of the battery to up to 50%.**



IP65

Code Initial	**IP**	International Protection
First Numeral	**6**	Dust-tight
Second Numeral	**5**	Protected against powerful water jets

Protection class **IP65** in accordance to IEC 60529, the water proof measuring system **FPS** (Fluid Protected measuring System) with a sealed housing.

Digital Micrometer Micromar 40 EWR with data output

Features

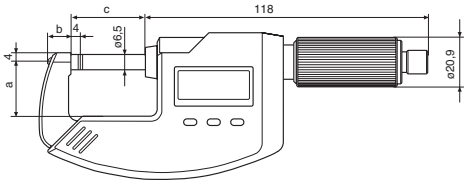
Functions:
RESET (Zero setting the display for Relative measurement)
ABS (Switch between Relative and Absolute measurement)
mm/inch
Reference-Lock/Unlock
PRESET (Reference setting)
DATA (Data transmission via connection cable)

- Immediate measurement due to the Reference system
- MarConnect data output, choose alternatively
  USB
  OPTO RS232C
  Digimatic
- High contrast Liquid Crystal Display with 8.5 mm high digits
- Hard lacquered steel frame, heat insulated
- Spindle and anvil are carbide tipped
- Spindle is made of stainless steel, hardened throughout and ground
- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with:
  Case, battery, operating instructions and setting standard (from measuring range 25-50 mm / 1-2")

Technical Data

	Measuring range mm	*(inch)*	Resolution mm / *inch*	Error limit G * µm	Spindle thread pitch mm	Data output MarConnect USB RS232C Digimatic	Order no.
40 EWR	0 - 25	***(0 - 1")***	0.001 /***.00005"***	2	0.635	●	**4151705**
40 EWR	25 - 50	***(1 - 2")***	0.001 /***.00005"***	2	0.635	●	**4151706**
40 EWR	50 - 75	***(2 - 3")***	0.001 /***.00005"***	3	0.635	●	**4151707**
40 EWR	75 - 100	***(3 - 4")***	0.001 /***.00005"***	3	0.635	●	**4151708**
40 EWR	100 - 125	***(4 - 5")***	0.001 /***.00005"***	5	0.635	●	**4151740**
40 EWR	125 - 150	***(5 - 6")***	0.001 /***.00005"***	5	0.635	●	**4151741**
40 EWR	150 - 175	***(6 - 7")***	0.001 /***.00005"***	6	0.635	●	**4151742**
40 EWR	175 - 200	***(7 - 8")***	0.001 /***.00005"***	6	0.635	●	**4151743**

* *at fixed zero point (better than DIN 863-1)*



Dimensions

mm			a	b	c
0	-	25 mm / 0-1"	23	9.5	31.5
25	-	50 mm / 1-2"	32	11.5	57
50	-	75 mm / 2-3"	44	13.5	82
75	-	100 mm / 3-4"	57	15.5	107
100	-	125 mm / 4-5"	73	17	132.5
125	-	150 mm / 5-6"	85	17	157.5
150	-	175 mm / 6-7"	97	17	182.5
175	-	200 mm / 7-8"	110	17	207.5

Accessories

		Order no.
Battery 3V, type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Digital Micrometer Micromar 40 EWR without data output

REFERENCE

Features

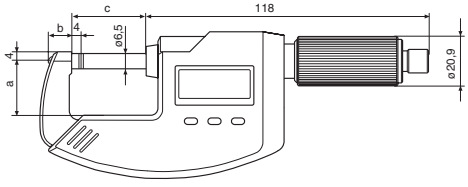
Functions:
RESET (Zero setting the display for Relative measurement)
ABS (Switch between Relative and Absolute measurement)
mm/inch
Reference-Lock/Unlock
PRESET (Reference setting)

- Immediate measurement due to the Reference system
- High contrast Liquid Crystal Display with 8.5 mm high digits
- Hard lacquered steel frame, heat insulated
- Spindle and anvil are carbide tipped
- Spindle is made of stainless steel, hardened throughout and ground
- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with: Case, battery, operating instructions

Technical Data

	Measuring range		Resolution	Error limit G *	Spindle thread pitch	Data output	Order no.
	mm	***(inch)***	mm / ***inch***	µm	mm		
40 EWR	0 - 25	***(0 - 1")***	0.001 ***/.00005"***	2	0.635	–	**4151721**

* *at fixed zero point (better than DIN 863-1)*



Dimensions

mm				a	b	c
0	-	25 mm	/ 0-1"	23	9.5	31.5

Accessories

	Order no.
Battery 3V, type CR 2032	**4102520**

Digital Micrometer Set Micromar 40 EWR

Features

Functions:
RESET (Zero setting the display for Relative measurement)
ABS (Switch between Relative and Absolute measurement)
mm/inch
Reference-Lock/Unlock
PRESET (Reference setting)

- DATA (Data transmission via connection cable)
- Immediate measurement due to the Reference system
- MarConnect data output, choose alternatively
  USB
  OPTO RS232C
  Digimatic
- High contrast Liquid Crystal Display with 8.5 mm high digits
- Hard lacquered steel frame, heat insulated
- Spindle and anvil are carbide tipped
- Spindle is made of stainless steel, hardened throughout and ground
- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with:
  Custom fitted plastic case, battery, operating instructions and standards
  25 mm, 50 mm and 75 mm

Technical Data

	Measuring range		Resolution	Spindle thread pitch	Number of Micrometers	Order no.
	mm	***(inch)***	mm / ***inch***	mm		
40 EWR	0 - 100	***(0 - 4")***	0.001 /***.00005"***	0.635	4	**4151709**

Accessories

		Order no.
Battery 3V, type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Digital Micrometer Micromar 40 ER without data output

Features

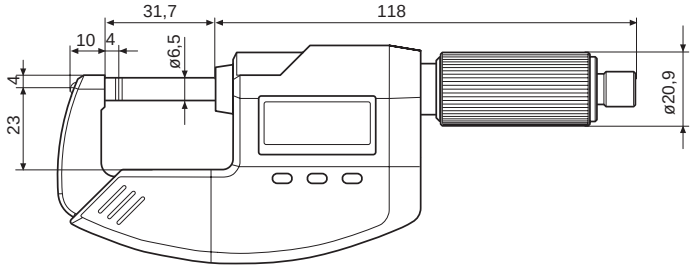
Functions:
RESET (Zero setting the display for Relative measurement)
ABS (Switch between Relative and Absolute measurement)
mm/inch
Reference-Lock/Unlock
PRESET (Reference setting)

- Immediate measurement due to the Reference system
- High contrast Liquid Crystal Display with 8.5 mm high digits
- Hard lacquered steel frame, heat insulated
- Spindle and anvil are carbide tipped
- Spindle is made of stainless steel, hardened throughout and ground
- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with: Case, battery and operating instructions

Technical Data

	Measuring range			Resolution	Error limit *G* *	Spindle thread pitch	Order no.
	mm		***(inch)***	mm / ***inch***	µm	mm	
40 ER	0	- 25	***(0-1")***	0.001 ***/.00005"***	2	0.635	**4151601**

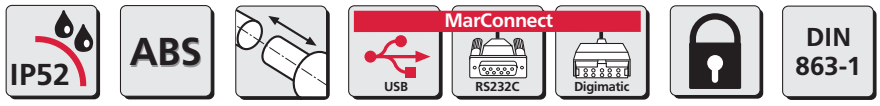
* *at fixed zero point (better than DIN 863-1)*



Accessories

	Order no.
Battery 3V, type CR 2032	**4102520**

Digital Micrometer Micromar 40 EWS with sliding spindle



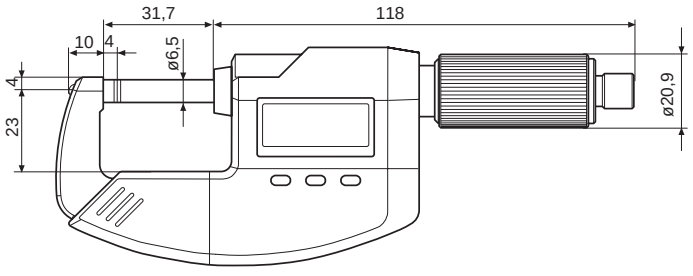
Features

Functions:
RESET (Zero setting the display for Relative measurement)
ABS (Switch between Relative and Absolute measurement)
mm/inch
Reference-Lock/Unlock
PRESET (Reference setting)

- Immediate measurement due to the Reference system
- MarConnect data output, choose alternatively
  USB
  OPTO RS232C
  Digimatic
- High contrast Liquid Crystal Display with 8.5 mm high digits
- Hard lacquered steel frame, heat insulated
- Spindle and anvil are carbide tipped
- Spindle is made of stainless steel, hardened throughout and ground
- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with:
  Case, battery and operating instructions

Technical Data

	Measuring range mm			*(inch)*	Resolution mm / *inch*	Error limit *G* µm	Spindle thread pitch mm	Order no.
40 EWS	0	-	25	***(0-1")***	0.001 /***.00005"***	4	0.635	**4151724**



Accessories

		Order no.
Battery 3V, type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Universal Digital Micrometer Micromar 40 EWV with sliding spindle

Features

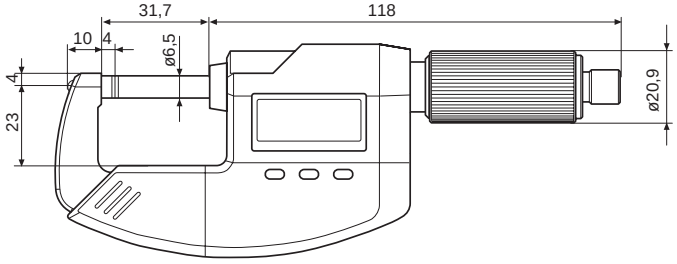
Functions:
RESET (Zero setting the display for Relative measurement)
ABS (Switch between Relative and Absolute measurement)
mm/inch
Reference-Lock/Unlock
PRESET (Reference setting)

- Immediate measurement due to the Reference system
- MarConnect data output, choose alternatively
  USB
  OPTO RS232C
  Digimatic
- High contrast Liquid Crystal Display with 8.5 mm high digits
- Hard lacquered steel frame, heat insulated
- Mounting bore for inter-changeable anvils
- Spindle is made of stainless steel, hardened throughout and ground
- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with:
  Case, battery and operating instructions

Technical Data

Measuring range* mm	Resolution mm / *inch*	Error limit** *G* µm	Spindle thread pitch mm	Spindle dia. mm	Order no. without standard accessories	Order no. with standard accessories
0 - 25	0.001 /***.00005"***	4	0.635	6.5	**4151722**	
0 - 25	0.001 /***.00005"***	4	0.635	6.5		**4151723**

** with thread anvils the measuring range is reduced*
*** with flat anvils over the full length of the anvils*



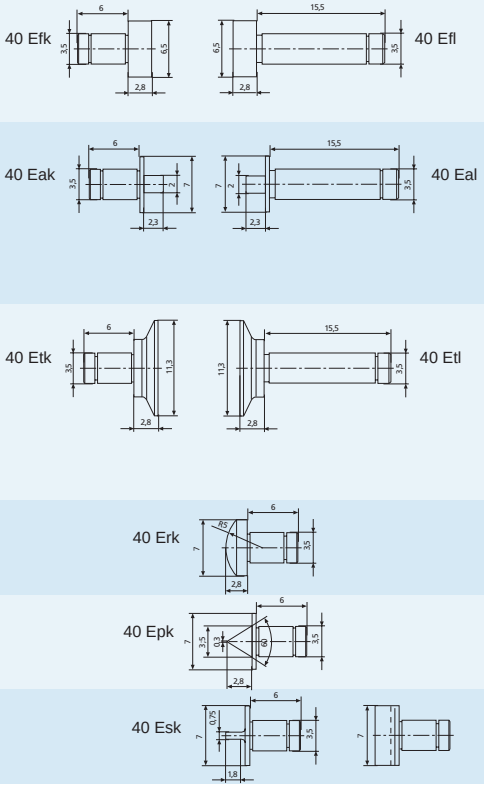
Special Accessories

		Order no.
Battery 3V, type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

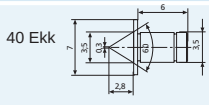
Standard Accessories are included in the set

Catalog no.	Description	Order no.	Quantity required
40 Efk	Flat anvils (reference)	**4151771**	**1**
40 Efl	Flat anvils (sensitive)	**4151761**	**1**
40 Eak	Anvils with reduced measuring faces (reference)	**4151777**	**1**
40 Eal	Anvils with reduced measuring faces (sensitive)	**4151767**	**1**
40 Etk	Disc type anvils (reference) d = 11.3 mm	**4151772**	**1**
40 Etl	Disc type anvils (sensitive) d = 11.3 mm	**4151762**	**1**
40 Erk	Anvils with spherical measuring faces	**4151774**	**2**
40 Epk	Conical shaped anvil	**4151773**	**2**
40 Esk	Wedge shaped anvil (blade)	**4151775**	**2**



Special Accessories

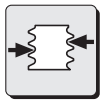
Catalog no.	Description	Order no.	Quantity required
40 Ekk	Wedge shaped anvil (blade) 60°	**4151776**	**2**

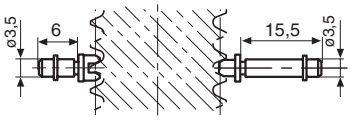


Thread anvils for pitch diameters*

- Pair consists of 1 V-anvil and 1 blade anvil

* *with thread anvils the measuring range is reduced to 20 mm*





Metric thread (60°) Pitch mm			V-anvil Order no.	Blade Order no.
0.5	-	0.7	**4501000**	**4173700**
0.7	-	1	**4501001**	**4173701**
1.25	-	2	**4501002**	**4173702**
2	-	3.5	**4501003**	**4173703**

Whitworth thread (55°) Pitch range TPI			V-anvil Order no.	Blade Order no.
40	-	32	**4501007**	**4173743**
32	-	24	**4501008**	**4173744**
24	-	18	**4501009**	**4173745**
18	-	14	**4501010**	**4173746**
14	-	10	**4501011**	**4173747**
10	-	7	**4501012**	**4173748**

American UST thread (60°) Pitch range TPI			V-anvil Order no.	Blade Order no.
40	-	32	**4501018**	**4173815**
32	-	24	**4501019**	**4173816**
24	-	18	**4501020**	**4173817**
18	-	14	**4501021**	**4173818**
14	-	10	**4501022**	**4173819**
10	-	7	**4501023**	**4173820**

Micrometer Micromar 40 A

DIN 863-1

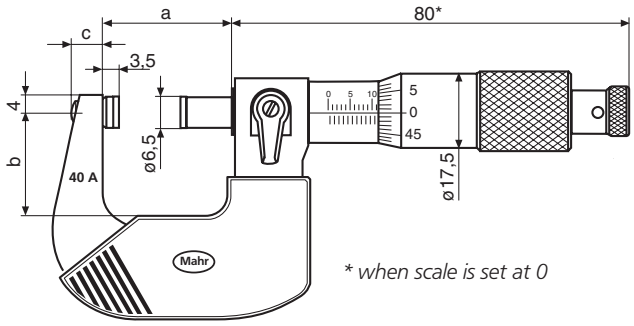
Features

- Hard lacquered steel frame
- Spindle and anvil made of hardened steel, carbide tipped
- Scales with satin-chrome finish
- Heat insulators
- Rapid drive with integrated ratchet
- Locking device
- Supplied with: Case, setting standard (from measuring range 25-50 mm / 1-2"), operating instructions

Technical Data

Measuring range	Readings	Error limit *G*	Spindle thread pitch	Order no.
Metric				
0 - 25 mm	0.01 mm	4 µm	0.5 mm	**4134000**
25 - 50 mm	0.01 mm	4 µm	0.5 mm	**4134001**
50 - 75 mm	0.01 mm	5 µm	0.5 mm	**4134002**
75 - 100 mm	0.01 mm	5 µm	0.5 mm	**4134003**
100 - 125 mm	0.01 mm	6 µm	0.5 mm	**4134004**
125 - 150 mm	0.01 mm	6 µm	0.5 mm	**4134005**
150 - 175 mm	0.01 mm	7 µm	0.5 mm	**4134006**
175 - 200 mm	0.01 mm	7 µm	0.5 mm	**4134007**
Inch				
0 - 1"	***.0001"***	***.00016"***	***.025"***	**4134900**
1 - 2"	***.0001"***	***.00016"***	***.025"***	**4134901**
2 - 3"	***.0001"***	***.00020"***	***.025"***	**4134902**
3 - 4"	***.0001"***	***.00020"***	***.025"***	**4134903**
4 - 5"	***.0001"***	***.00024"***	***.025"***	**4134904**
5 - 6"	***.0001"***	***.00024"***	***.025"***	**4134905**
6 - 7"	***.0001"***	***.00028"***	***.025"***	**4134906**
7 - 8"	***.0001"***	***.00028"***	***.025"***	**4134907**

Technical Data



** when scale is set at 0*

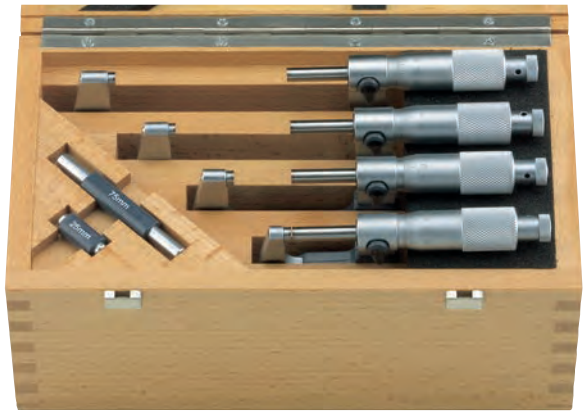
Dimensions

Measuring range mm	Measuring range inch	a mm	b mm	c mm
0 - 25	0 - 1″	31	25.5	7
25 - 50	1 - 2″	56	34.5	12
50 - 75	2 - 3″	81	47.5	12
75 - 100	3 - 4″	106	58.5	13
100 - 125	4 - 5″	131	71.5	13
125 - 150	5 - 6″	156	83.5	13
150 - 175	6 - 7″	182	95.5	13
175 - 200	7 - 8″	207	108.5	13

Accessories

Stand, setting standards, etc. please refer to page 3-24

Micrometer Sets Micromar 40 SA



Application range	Order no.	Remarks
0 - 100 mm (4 Micrometers)	**4134050**	Incl. wooden case, setting standards 25 mm and 75 mm
100 - 200 mm (4 Micrometers)	**4134051**	Incl. wooden case, setting standards 125 mm and 175 mm
0 - 4″ (4 Micrometers)	**4134960**	Incl. wooden case, setting standards 1″ and 3″
4 - 8″ (4 Micrometers)	**4134961**	Incl. wooden case, setting standards 5″ and 7″

Micrometer Micromar 40 AG

DIN 863-1

Features

- Hard lacquered steel frame
- Spindle and anvil made of hardened steel, carbide tipped
- Scales with satin-chrome finish
- Heat insulators
- Ratchet is integrated in the thimble
- Locking device

- Supplied with:
  Case, setting standard

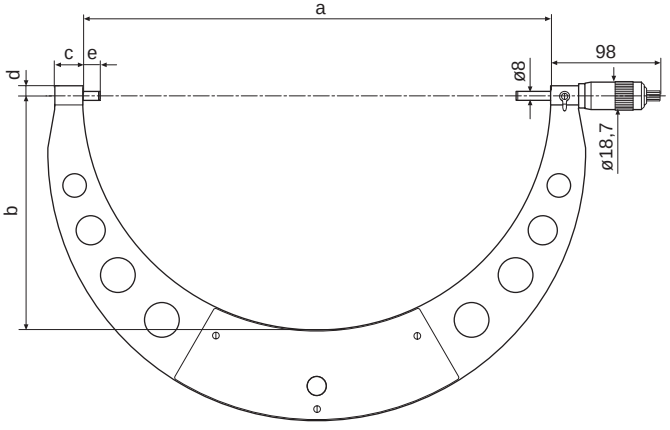
Note:
All Micrometers with measuring ranges between 400 mm to 500 mm, the frame is made from a steel tube

Technical Data

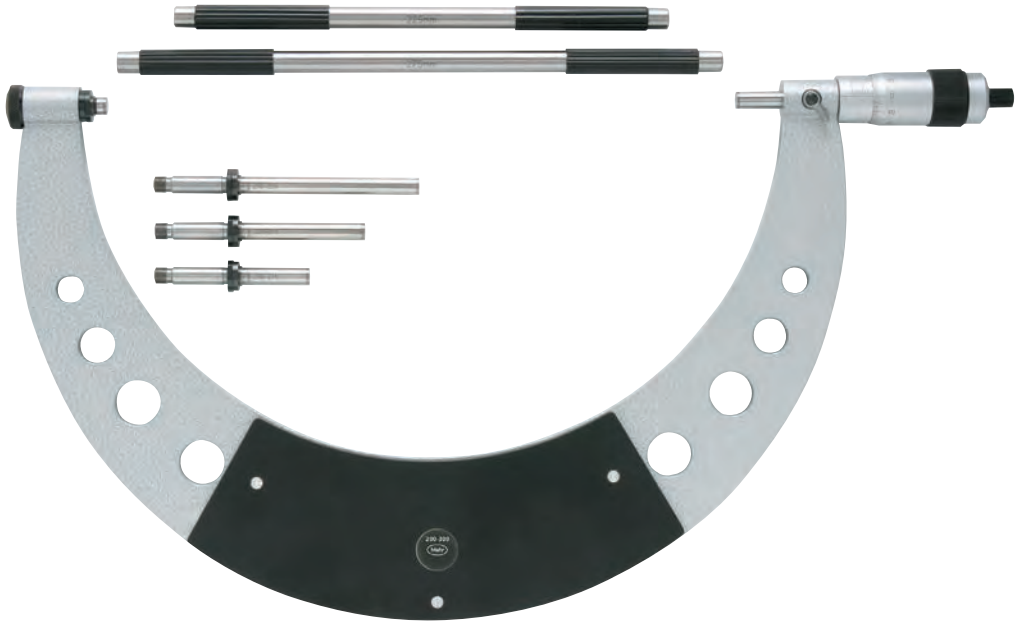
Measuring range mm	Readings mm	Error limit *G* µm	Spindle thread pitch mm	Weight kg	Order no.
200 - 225	0.01	8	0.5	2	**4134500**
225 - 250	0.01	8	0.5	2.2	**4134501**
250 - 275	0.01	9	0.5	2.3	**4134502**
275 - 300	0.01	9	0.5	2.7	**4134503**
300 - 325	0.01	10	0.5	3.2	**4134504**
325 - 350	0.01	10	0.5	3.4	**4134505**
350 - 375	0.01	11	0.5	3.6	**4134506**
375 - 400	0.01	11	0.5	4	**4134507**
400 - 425	0.01	12	0.5	4.2	**4134508**
425 - 450	0.01	12	0.5	4.5	**4134509**
450 - 475	0.01	13	0.5	4.9	**4134510**
475 - 500	0.01	13	0.5	5	**4134511**

Dimensions

Dimensions in mm	a	b	c	d	e
200 - 225	242.5	121.5	25	5	12
225 - 250	267.5	134	25	5	12
250 - 275	292.5	146.5	25	5	12
275 - 300	317.5	159	25	5	12
300 - 325	342.5	171.5	25	5	12
325 - 350	367.5	184	25	5	12
350 - 375	392.5	196.5	25	5	12
375 - 400	417.5	209	25	5	12
400 - 425	442	223	25	5	12
425 - 450	467	236	25	5	12
450 - 475	492	248	25	5	12
475 - 500	517	259	25	5	12



Micrometer Micromar 40 W



Features

- Hard lacquered steel frame
- Spindle and anvil made of hardened steel, carbide tipped
- Scales with satin-chrome finish
- Heat insulators
- Ratchet is integrated in the thimble
- Exchangeable anvils
- Locking device

- Supplied with:
  Case, setting standards

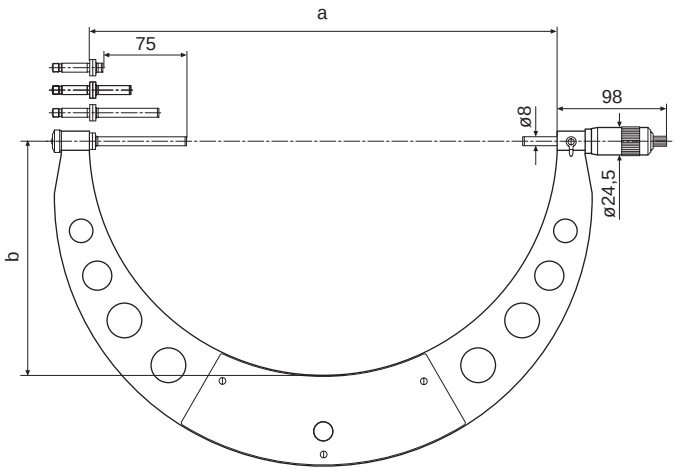
Note:
All Micrometers with measuring ranges from 400 mm up to 1000 mm, the frame is made from a steel tube

Technical Data

Measuring range mm	Readings mm	Error limit *G* µm	Spindle thread pitch mm	Weight kg	Order no.
0 - 100	0.01	5	1	1.1	**4137500**
100 - 200	0.01	7	1	2.1	**4137501**
200 - 300	0.01	9	1	3.4	**4137502**
300 - 400	0.01	11	1	5.7	**4137503**
400 - 500	0.01	13	1	2.6	**4137504**
500 - 600	0.01	21	1	3.3	**4137505**
600 - 700	0.01	23	1	4.0	**4137506**
700 - 800	0.01	26	1	4.4	**4137507**
800 - 900	0.01	28	1	5.3	**4137508**
900 - 1000	0.01	30	1	6.5	**4137509**

Dimensions

Dimensions in mm	a	b
0 - 100	117.5	59
100 - 200	217.5	109
200 - 300	317.5	159
300 - 400	417.5	209
400 - 500	517.5	259
500 - 600	617.5	309
600 - 700	717.5	360
700 - 800	817.5	410
800 - 900	917.5	460
900 - 1000	1017.5	510



Micrometer with integrated Dial Comparator Micromar 40 F / FC

DIN 863-3

Applications

- For rapid measurements of diameters of cylindrical parts (shafts, bolts and shanks)
- Measurements of thickness and length
- Recommended for standard precision parts

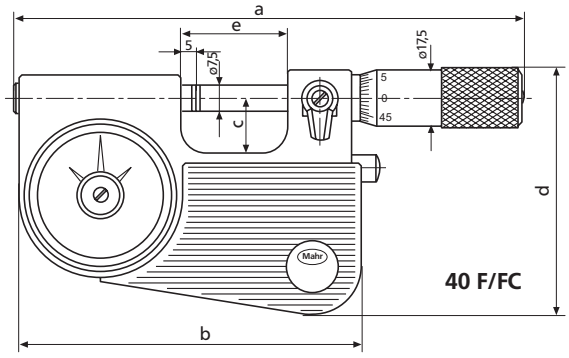
Features

- Chrome plated steel frame with heat insulators
- Maximum stability
- Retraction of the movable anvil and carbide-tipped measuring faces ensures maximum wear resistance
- Longer service life due to the ceramic measuring faces (40 FC)
- Measuring spindle made of stainless steel, hardened throughout and ground, lockable
- Scales with satin-chrome finish
- Constant measuring force
- Dial Comparator is integrated in frame
- Adjustable tolerance markers
- Supplied with: Case

Technical Data

	Measuring range	Retraction	Measuring faces Flatness	Measuring faces Parallelism	Measuring force	Order no.	Remarks
40 F	0 - 25 mm	1 mm	≤0.2 µm	≤1 µm	9 N	**4150000**	
	25 - 50 mm	1 mm	≤0.2 µm	≤1 µm	9 N	**4150001**	
	0 - 1"	***.04"***	***≤.00001"***	***≤.00005"***	9 N	**4150900**	
	1 - 2"	***.04"***	***≤.00001"***	***≤.00005"***	9 N	**4150901**	
40 FC	0 - 25 mm	1 mm	≤0.2 µm	≤1 µm	9 N	**4150200**	Ceramic measuring faces
	25 - 50 mm	1 mm	≤ 0.2 µm	≤1 µm	9 N	**4150201**	Ceramic measuring faces

Micrometer			Dial Comparator		
Readings	**Error limit G_{me}**	**Spindle thread pitch**	**Error limit G_e** (DIN 879)	**Meas. range**	**Readings**
0,01 mm	≤2 µm	0,5 mm	1 µm	±65 µm	1 µm
.0001"	***≤.00008"***	***.025"***	***.00005"***	***±.0025"***	***.00005"***



Dimensions

Dimensions in mm		a*	b	c	d	e
40 F/FC	0-25 mm ***(0-1")***	149	100	16	71	32
	25-50 mm ***(1-2")***	174	125	30	85	56

* *in zero position*

Accessories

Stand, setting standards, etc. please refer to page 3-24

Micrometer with Dial Comparator Micromar 40 T

DIN 863-3

Applications

- For rapid measurements of diameters of cylindrical parts (shafts, bolts and shanks)
- Measurements of thickness and length
- Recommended for standard precision parts

Features

- Rugged steel frame, heat insulated and chrome plated (up to measuring range 100 - 150 mm)
- Maximum stability
- Retraction of the movable anvil and carbide-tipped measuring faces ensures maximum wear resistance
- Measuring spindle made of stainless steel, hardened throughout and ground, lockable
- Scales with satin-chrome finish
- Constant measuring force
- Heat insulators
- Supplied with: Dial Comparator 1003, wooden case

Technical Data

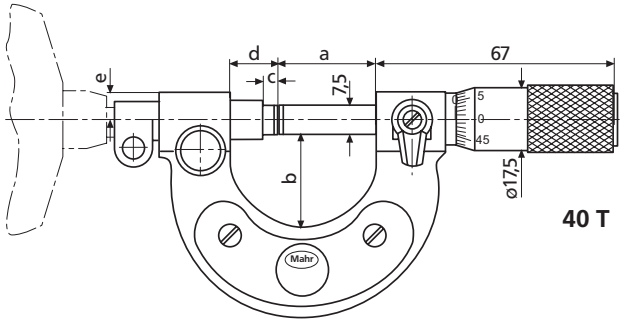
Measuring range	Retraction	Measuring faces		Measuring force	Order no.*
		Flatness	Parallelism		
0 - 25 mm	1.2 mm	≤0.2 µm	≤2 µm	6.5 N	**4154000**
25 - 50 mm	1.2 mm	≤0.2 µm	≤2 µm	6.5 N	**4154001**
50 - 100 mm	1.2 mm	≤0.2 µm	≤2 µm	6.5 N	**4154002**
100 - 150 mm	1.2 mm	≤0.2 µm	≤2 µm	7.5 N	**4154003**
150 - 200 mm	1.2 mm	≤0.2 µm	≤2 µm	7.5 N	**4154004**

Micrometer			Dial Comparator*		
Readings	Error limit G_{me}	Spindle thread pitch	Error limit G_e (DIN 879)	Meas. range	Readings
0.01 mm	≤2 µm	0.5 mm	1 µm	±50 µm	1 µm

Dimensions

Dimensions in mm	a**	b	c	d**	e
0 - 25	27	28	4	11	8
25 - 50	52	40	4	11	8
50 - 100	76	65	5.5	30	8
100 - 150	127	87	5.5	30	8
150 - 200	177	112	5.5	30	8

* *Alternative indicating instruments are available on request*
** *in zero position*



40 T

Indicating Snap Gage 840 F
see page 9-8

Accessories

Stand, setting standards, etc. please refer to page 3-24

Precision Bench Micrometer Micromar 40 TS

DIN 863-3

Applications

- For rapid measurements of diameters of cylindrical parts (shafts, bolts and shanks)
- Measurements of thickness and length
- Recommended for standard precision parts

Features

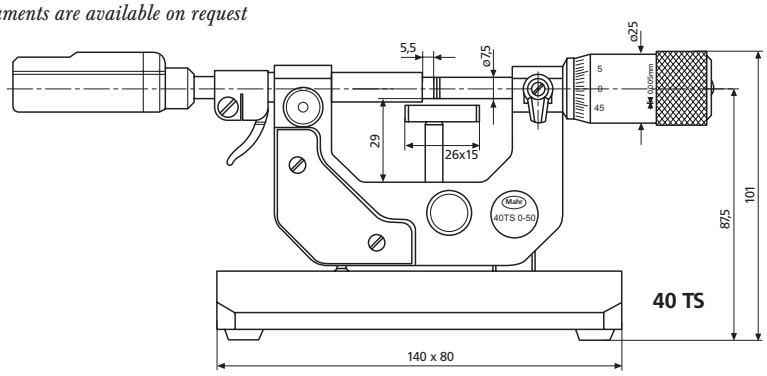
- Rugged steel frame, can be tilted up to 45° in relation to the sturdy base
- Retraction of the movable anvil and carbide-tipped measuring faces ensures maximum wear resistance
- Height-adjustable stop
- Constant measuring force
- Measuring spindle made of stainless steel, hardened throughout and ground, lockable
- Scales with satin-chrome finish

- Supplied with:
  Dial Comparator 1003

Technical Data

Measuring range			Retraction	Measuring faces Flatness	Measuring faces Parallelism	Measuring force	Order no.*	Order no. wooden case
0	-	50 mm	1.2 mm	≤0.2 µm	≤2 µm	6.5 N	**4154030**	**4154035**
0	***-***	***2"***	***.045"***	***≤.00001"***	***≤.00008"***	6.5 N	**4154930**	**4154035**

* *Alternative indicating instruments are available on request*



Micrometer			Dial Comparator 1003/1003Z		
Readings	Error limit G_{me}	Spindle thread pitch	Error limit G_e (DIN 879)	Meas. range	Readings
0.01 mm .0001"	≤2 µm ≤.00008"	0.5 mm .025"	1 µm .00005"	±50 µm ±.002"	1 µm .00005"

Accessories

Stand, setting standards, etc. please refer to page 3-24

Indicating Thread Snap Gage 852 TS see page 9-19

Micrometer Micromar 40 AB with reduced measuring faces

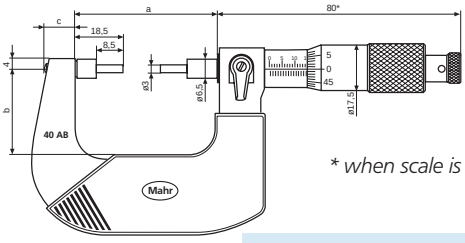
DIN 863-3

Features

- For measuring recesses, grooves, etc.
- Hard lacquered steel frame
- Spindle and anvil made of hardened steel, carbide tipped
- Scales with satin-chrome finish
- Heat insulators
- Rapid drive with integrated ratchet
- Locking device
- Supplied with: Case, setting standard (from measuring range 25 - 50 mm / 1 - 2"), operating instruction

Technical Data

Measuring range	Readings	Error limit *G*	Spindle thread pitch	Order no.
0 - 25 mm	0.01 mm	4 µm	0.5 mm	**4134100**
25 - 50 mm	0.01 mm	4 µm	0.5 mm	**4134101**
50 - 75 mm	0.01 mm	5 µm	0.5 mm	**4134102**
75 - 100 mm	0.01 mm	5 µm	0.5 mm	**4134103**
0 - 1"	***.0001"***	***.00016"***	***.025"***	**4134920**
1 - 2"	***.0001"***	***.00016"***	***.025"***	**4134921**
2 - 3"	***.0001"***	***.00020"***	***.025"***	**4134922**
3 - 4"	***.0001"***	***.00020"***	***.025"***	**4134923**



** when scale is set at 0*

Dimensions in mm	a	b	c
0 - 25 mm / ***0-1"***	56	34.5	12
25 - 50 mm / ***1-2"***	81	47.5	12
50 - 75 mm / ***2-3"***	106	58.5	13
75 - 100 mm / ***3-4"***	131	71.5	13

Micrometer Micromar 40 AS with sliding spindle and measuring spades

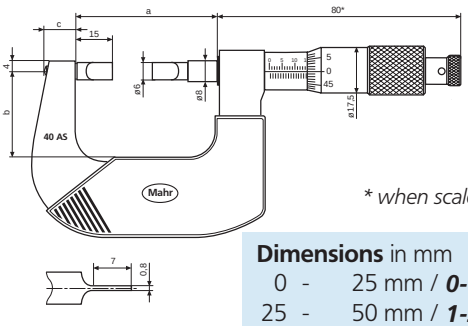
DIN 863-3

Features

- For measuring narrow recesses, grooves, etc.
- Hard lacquered steel frame
- Spindle and anvil made of hardened steel
- Scales with satin-chrome finish
- Heat insulators
- Rapid drive with integrated ratchet
- Supplied with: Case, setting standard (from measuring range 25 - 50 mm / 1 - 2"), operating instructions

Technical Data

Measuring range	Readings	Error limit *G*	Spindle thread pitch	Order no.
0 - 25 mm	0.01 mm	4 µm	0.5 mm	**4134200**
25 - 50 mm	0.01 mm	4 µm	0.5 mm	**4134201**
50 - 75 mm	0.01 mm	5 µm	0.5 mm	**4134202**
75 - 100 mm	0.01 mm	5 µm	0.5 mm	**4134203**
0 - 1"	***.0001"***	***.00016"***	***.025"***	**4134930**
1 - 2"	***.0001"***	***.00016"***	***.025"***	**4134931**
2 - 3"	***.0001"***	***.00020"***	***.025"***	**4134932**
3 - 4"	***.0001"***	***.00020"***	***.025"***	**4134933**



** when scale is set at 0*

Dimensions in mm	a	b	c
0 - 25 mm / ***0-1"***	56	34.5	12
25 - 50 mm / ***1-2"***	81	47.5	12
50 - 75 mm / ***2-3"***	106	58.5	13
75 - 100 mm / ***3-4"***	131	71.5	13

Micrometer Micromar 40 AR with spherical anvil

DIN 863-3

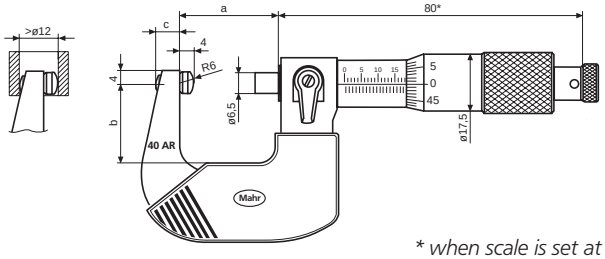
Features

- For measuring the wall thickness of a pipe, etc.
- Hard lacquered steel frame
- Spindle and anvil made of hardened steel, carbide tipped
- Scales with satin-chrome finish
- Heat insulators
- Rapid drive with integrated ratchet
- Locking device
- Supplied with: Case, setting standard (measuring range for 25 - 50 mm / 1 - 2"), operating instructions

Technical Data

Measuring range	Readings	Error limit *G*	Spindle thread pitch	Order no.
0 - 25 mm	0.01 mm	4 µm	0.5 mm	**4134250**
25 - 50 mm	0.01 mm	4 µm	0.5 mm	**4134251**
0 - 1"	***.0001"***	***.00016"***	***.025"***	**4134940**
1 - 2"	***.0001"***	***.00016"***	***.025"***	**4134941**

Dimensions in mm	a	b	c
0 - 25 mm / ***0-1"***	31	25.5	7
25 - 50 mm / ***1-2"***	56	34.5	12



** when scale is set at 0*

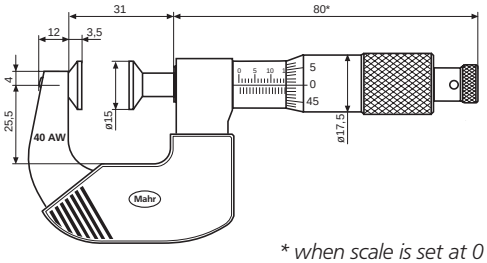
Micrometer Micromar 40 AW with sliding spindle and disc-type anvils

Features

- For measuring soft materials such as felt, rubber, cardboard, etc.
- Hard lacquered steel frame
- Spindle and anvil made of hardened steel
- Scales with satin-chrome finish
- Heat insulators
- Rapid drive with integrated ratchet
- Supplied with: Case, operating instructions

Technical Data

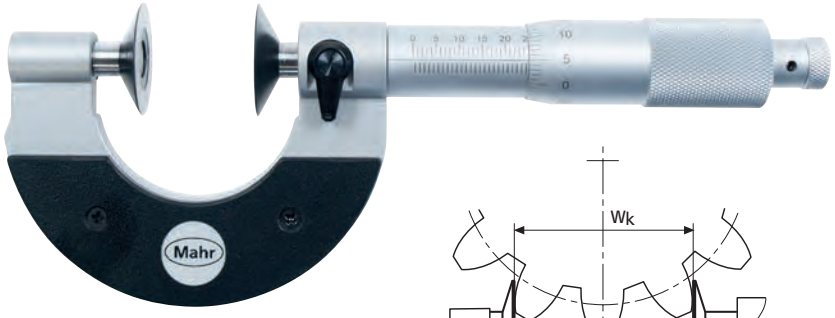
Measuring range	Readings	Error limit *G*	Parallelism	Flatness	Spindle thread pitch	Order no.
0 - 25 mm	0.01 mm	8 µm	5 µm	2 µm	0.5 mm	**4134300**
0 - 1"	***.0001"***	***.0003"***	***.0002"***	***.001"***	***.025"***	**4134950**

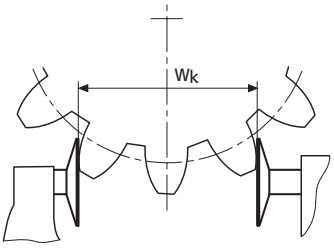


** when scale is set at 0*

Precision Micrometer Micromar 40 SM with disc-type anvils

DIN 863-3





Applications

For measurements of
- Tooth spans W_k as of module 0.8 as indirect determination of tooth thickness on spur gears with straight and helical teeth
- Shoulders on shafts
- Undercut dimensions
- Registers
- Soft materials such as rubber, cardboard, felt, etc.

Features

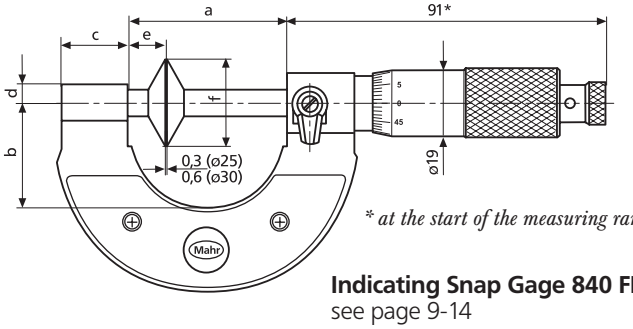
- Hard lacquered steel frame
- Maximum stability
- Spindle is hardened throughout and ground
- Disc-type anvils are hardened and lapped
- Scale have a satin chrome finish
- Heat insulators
- Rapid drive with integrated ratchet
- Locking device
- Supplied with: Case

Technical Data

Measuring range mm	Readings mm	Error limit G µm	Spindle thread pitch mm	Measuring faces Flatness µm	Measuring faces Parallelism µm	Order no.
0 - 25	0.01	4	0.5	≤ 0.6	≤ 4	**4134600**
25 - 50	0.01	4	0.5	≤ 0.6	≤ 4	**4134601**
50 - 75	0.01	5	0.5	≤ 0.6	≤ 4	**4134602**
75 - 100	0.01	5	0.5	≤ 0.6	≤ 4	**4134603**
100 - 125	0.01	6	0.5	≤ 0.6	≤ 5	**4134604**
125 - 150	0.01	6	0.5	≤ 0.6	≤ 5	**4134605**
150 - 175	0.01	7	0.5	≤ 0.6	≤ 5	**4134606**
175 - 200	0.01	7	0.5	≤ 0.6	≤ 5	**4134607**

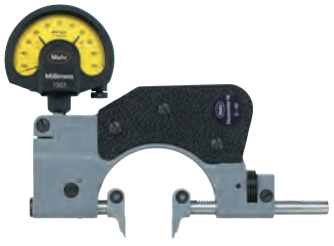
Dimensions

Dimensions in mm	a	b	c	d	e	f
0 - 25	45	30.5	18.1	6	11	25
25 - 50	70	35	18.1	6	11	25
50 - 75	95	48	18.1	6	11	25
75 - 100	120	59.5	18.1	6	11	25
100 - 125	145	71	18.1	6	11	30
125 - 150	170	83	18.1	6	11	30
150 - 175	195	96	18.1	6	11	30
175 - 200	220	108	18.1	6	11	30



** at the start of the measuring range*

Indicating Snap Gage 840 FM
see page 9-14



Accessories

Stand, setting standards, etc. please refer to page 3-24

Thread Micrometer Micromar 40 Z

DIN 863-3

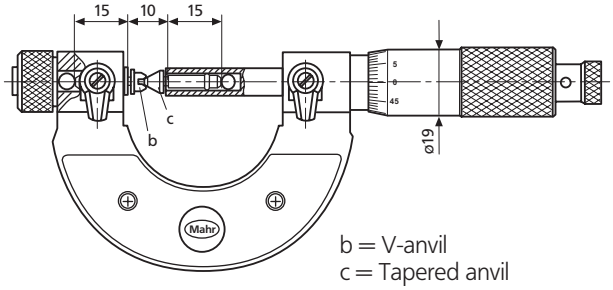
Features

- For measuring pitch, root and outside diameters
- Hard lacquered steel frame, heat insulated
- Spindle is hardened throughout, ground and is also provided which a locking device
- Adjustable anvil
- Spindle and anvil both have a mounting bore to accommodate inter-changeable anvils
- Flat end surface of the anvil shank rests on a hardened steel ball which is at the bottom of the mounting bore
- Scales have a satin-chrome finish
- Supplied with: Case

Technical Data

Measuring range mm	Readings mm	Error limit G_{me} µm	Spindle thread pitch mm	Mounting bores for anvils mm	Order no.
0 - 25*	0.01	4	0.5	3.5	**4170030**
25 - 50	0.01	4	0.5	3.5	**4170031**
50 - 75	0.01	5	0.5	3.5	**4170032**
75 - 100	0.01	5	0.5	3.5	**4170033**
100 - 125	0.01	6	0.5	3.5	**4170034**
125 - 150	0.01	6	0.5	3.5	**4170035**
150 - 175	0.01	7	0.5	3.5	**4170036**
175 - 200	0.01	7	0.5	3.5	**4170037**

* *Setting only with Thread Setting Plug Gages 715 E, when the interchangeable anvils span over several leads.*



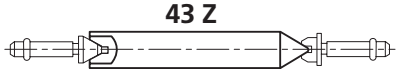
b = V-anvil
c = Tapered anvil

Indicating Thread Snap Gage 852 see page 9-20

Accessories

Setting Standards 43 Z
For setting Thread Micrometers 40 Z.
With point on one side and a V-groove on the other, both match the pitch angle of thread to be inspected.
One setting standard is sufficient for two adjacent frame sizes.

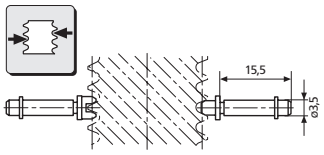
43 Z



Length mm	Accuracy ± µm	Thread angle 60° Order no.	Thread angle 55° Order no.
25	4	**4175000**	**4175100**
50	4.5	**4175001**	**4175101**
75	4.5	**4175002**	**4175102**
100	4.5	**4175003**	**4175103**
125	5	**4175004**	**4175104**
150	5	**4175005**	**4175105**
175	5	**4175006**	**4175106**
200	5.5	**4175630**	**4175636**

Interchangeable Anvils for Thread Micrometer Micromar 40 Z

For pitch and outside diameters. Hardened, wear-resistant special steel. With cylindrical mounting shank and retainer ring which ensures locking while permitting rotation in bore of spindle and anvil.



For pitch diameters

Pair consists of V-anvil and tapered anvil. For pitch range 0.2 - 0.45 mm V-anvil covers 3 thread leads, set with a Thread Setting Plug Gage 715 E, as opposed to Setting Standards 43 Z for other applications.

Metric thread (60°)		
Pitch mm	V-anvil Order no.	Tapered anvil Order no.
0.2	**4173007**	**4173407**
0.25	**4173008**	**4173408**
0.3	**4173009**	**4173409**
0.35	**4173010**	**4173410**
0.4	**4173011**	**4173411**
0.45	**4173012**	**4173412**
0.5 - 0.7	**4173000**	**4173400**
0.7 - 1	**4173001**	**4173401**
1.25 - 2	**4173002**	**4173402**
2 - 3.5	**4173003**	**4173403**
3.5 - 5	**4173004**	**4173404**
5 - 7	**4173005**	**4173405**
7 - 9	**4173006**	**4173406**

Whitworth thread (55°)		
Pitch range TPI	V-anvil Order no.	Tapered anvil Order no.
40 - 32	**4173043**	**4173443**
32 - 24	**4173044**	**4173444**
24 - 18	**4173045**	**4173445**
18 - 14	**4173046**	**4173446**
14 - 10	**4173047**	**4173447**
10 - 7	**4173048**	**4173448**
7 - 4.5	**4173049**	**4173449**
4.5 - 3	**4173050**	**4173450**
3 - 2.5	**4179408**	**4179409**

American UST thread (60°)		
Pitch range TPI	V-anvil Order no.	Tapered anvil Order no.
60 - 48	**4173113**	**4173513**
48 - 40	**4173114**	**4173514**
40 - 32	**4173115**	**4173515**
32 - 24	**4173116**	**4173516**
24 - 18	**4173117**	**4173517**
18 - 14	**4173118**	**4173518**
14 - 10	**4173119**	**4173519**
10 - 7	**4173120**	**4173520**
7 - 4.5	**4173121**	**4173521**
4.5 - 3	**4173122**	**4173522**

For pitch diameters

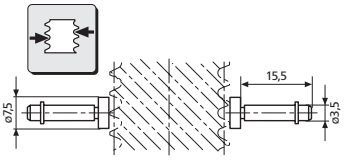
Pair consists of V-anvil and tapered anvil.
Shank length 15.5 mm

Trapezoid threads according to DIN 103		
Pitch mm	V-anvil Order no.	Tapered anvil Order no.
1	**4173250**	**4173650**
1.5	**4173251**	**4173651**
2	**4173252**	**4173652**
3	**4173253**	**4173653**
4	**4173254**	**4173654**
5	**4173255**	**4173655**
6	**4173256**	**4173656**
7	**4173257**	**4173657**
8	**4173258**	**4173658**
9	**4173259**	**4173659**
10	**4173260**	**4173660**
12	**4173261**	**4173661**
14	**4173262**	**4173662**
16	**4173263**	**4173663**
18	**4173264**	**4173664**
20	**4173265**	**4173665**

For outside diameter

Anvils 40 Za
with flat measuring faces

Made of hardened steel
Order no. **4173210**
Carbide tipped
Order no. **4511190**



Accessories for Micromar Micrometers

41 H

Stand 41 H

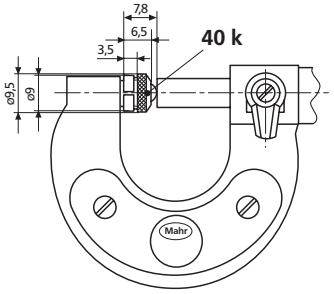
- For mounting a micrometer
- Enables the user to use both hands to operate the micrometer and / or to insert a work piece
- Sturdy, heavy-duty base, hammer-dimple enamel finish
- Jaw width 3.5 - 15 mm
- Clamping jaws are rubber lined to protect micrometer, the clamping jaws can be tilted
- Both the clamping jaws and hinge are fixed in place with one screw

Dimensions (D x W x H)	**Order no.**
130 x 100 x 90 mm	**4158000**

Ball shaped Anvil Attachment 40 k

- For measuring the thickness, for example: of pipe walls
- Slips over every anvil or the spindle with a dia. 7.5 mm
- Carbide ball, Ball dia. 5 ± 0.002 mm

Order no. **4130099**



Setting Standards 43 A

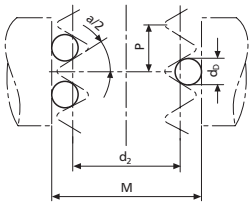
- For testing the basic setting of a micrometer
- Heat insulated handle
- Manufacturing tolerance js 2

Length mm	**Order no.**	**Length** *inch*	**Order no.**
25	**4159400**	***1"***	**4159940**
50	**4159401**	***2"***	**4159941**
75	**4159402**	***3"***	**4159942**
100	**4159403**	***4"***	**4159943**
125	**4159404**	***5"***	**4159944**
150	**4159405**	***6"***	**4159945**
175	**4159406**	***7"***	**4159946**

Thread Pin Gage 426 M in holder

- For determining the pitch diameter of external threads according to the three wire method
- Slips over every anvil or the spindle
- Pin gages are hardened and lapped

426 M



Pin gage dia.	**Manufacturing tol.**	**Mounting hole**
0.17 - 5.05 mm	± 0.5 µm	dia. 6.5 mm / 7.5 mm

Order no. and further details see page 13-17

Wooden Cases for Micrometer

For measuring ranges over 100 mm the following wooden cases are available:

	40 SH	**40 SM**	**Order no.**
Meas. range mm	100-125	95-120	**4130064**
	125-150	120-145	**4130065**
	150-175	145-170	**4130066**
	175-200	170-195	**4130067**

Inside Micrometer Micromar 44 F

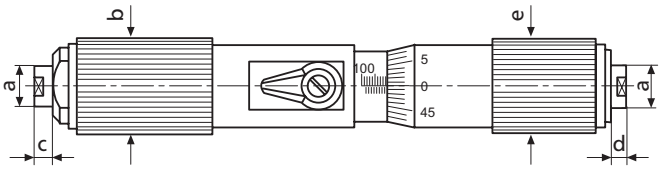
DIN 863-4

Features

- Rigid, lightweight tubular construction
- Spindle is hardened throughout and ground
- Measuring faces spherically lapped, one measuring face adjustable
- Scales with satin-chrome finish
- From measuring range 100-125 mm with heat insulators and a locking device
- Supplied with:
  Case

Technical Data

Measuring range mm	Readings mm	Error limit *G* µm	Spindle thread pitch mm	Order no.
30 - 40	0.01	4	0.5	**4163000**
40 - 50	0.01	4	0.5	**4163001**
50 - 70	0.01	5	0.5	**4163002**
70 - 100	0.01	5	0.5	**4163003**
100 - 125	0.01	6	0.5	**4163004**
125 - 150	0.01	6	0.5	**4163005**
150 - 175	0.01	7	0.5	**4163006**
175 - 200	0.01	7	0.5	**4163007**



Dimensions

Meas. range in mm	a	b	c	d	e
30 - 40	ø7	ø12.5	2	4	ø12.6
40 - 50	ø7	ø12.5	2.5	4.5	ø12.6
50 - 70	ø7	ø13.5	2.5	4.5	ø13.6
70 - 100	ø7	ø13.5	4.5	4.5	ø14.0
100 - 125	ø8	ø20	4.5	4.5	ø20
125 - 150	ø8	ø20	8	8	ø20
150 - 175	ø8	ø20	8	8	ø20
175 - 200	ø8	ø20	8	8	ø20

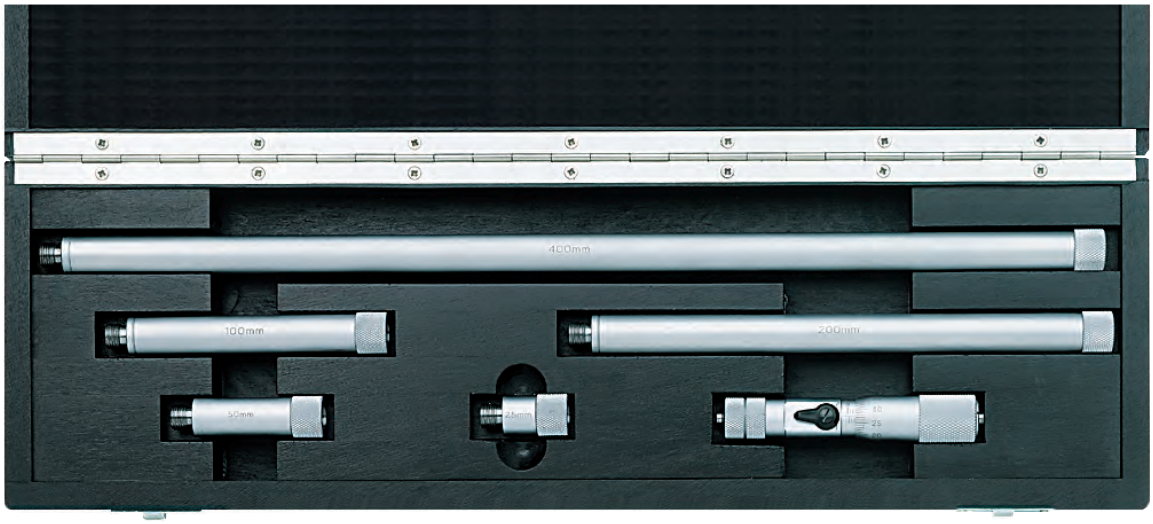
Accessories

	Page
Ring Gage 355 E for testing the basic setting	13-19

Special wear resistant steel,
hardened and lapped
Dimensions according to DIN 2250 C
Manufacturing tolerance in accordance to DIN 2250
Uncertainty of the engraved actual dimension 1/2 IT1

355 E

Inside Micrometer Micromar 44 Cms Set



Features

- Rigid, lightweight tubular construction
- Spindle is hardened throughout and ground
- Locking lever
- Scales with satin-chrome finish
- Carbide tipped spherical measuring faces
- Interchangeable extensions 44 Cv with cylindrical gage rods that are spring-mounted in protective sleeves; for the extension of the measuring range
- Protection sleeves have a satin chrome finish

Span of error
Basic unit 5 µm

Basic unit in combination with any of the extensions

$4\ \mu m + 10 \times 10^{-6} \times l$

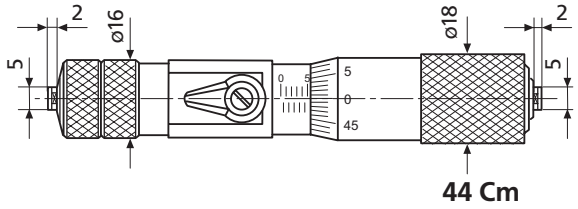
(l = length of the combination in mm)

- Supplied with:
  Case

Technical Data

Catalog no.	Measuring range mm			Measuring head 44 Cm Readings mm	Measuring head 44 Cm Spindle thread pitch mm	Extensions 44 Cv length in mm	Order no.
44 Cms1	100	-	150	0.01	0.5	25	**4168020**
44 Cms2	100	-	300			25 / 50 / 100	**4168021**
44 Cms3	100	-	500			25 / 50 / 100 / 200	**4168022**
44 Cms4	100	-	900*			25 / 50 / 100 / 200 / 400	**4168023**

* *up to 2500 mm can be achieved with 2 extensions: 44 Cv 800 mm*



Accessories

Inside Micrometers, ring gages, etc. please refer to page 3-30

Inside Micrometer Micromar 44 CB with reduced measuring faces

DIN 863-4

Features

- Basic Instrument consists of: Measuring head 44 CBm and End piece CBv
- Measuring faces have a smaller diameter for measuring grooves
- Rigid, lightweight tubular construction
- Spindle is hardened throughout and ground
- Locking lever
- Carbide tipped spherical measuring faces
- Interchangeable extensions 44 Cv with cylindrical gage rods that are spring-mounted in protective sleeves; for the extension of the measuring range (Accessories)
- Protection sleeves have a satin chrome finish

Span of error
Basic unit 6 µm

Basic unit in combination with any of the extensions

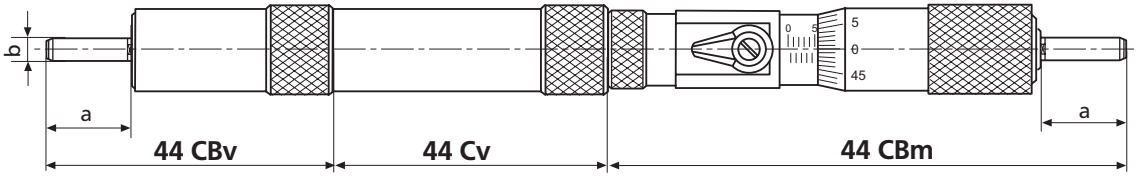
$4\ \mu m + 10 \times 10^{-6} \times l$

(l = length of the combination in mm)

- Supplied with: Case

Technical Data

Measuring range (Measuring head 44 CBm and End piece CBv) mm			Measuring head 44 CBm Readings mm	Measuring head 44 CBm Spindle thread pitch mm	Order no.
150	-	175	0.01	0.5	**4167922**
175	-	200			**4167906**
250	-	275			**4167912**
275	-	300			**4167921**



Accessories

Individual Extensions 44 Cv

Length mm	Order no.	Length mm	Order no.
25	**4167030**	200	**4167033**
50	**4167031**	400	**4167034**
100	**4167032**	800	**4167035**

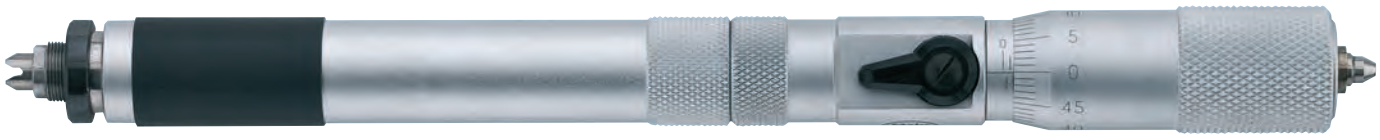
Case, wooden boxes, etc. please refer to page 3-30

Dimensions

Meas. range in mm	a	b
150 - 175	10	dia. 5
175 - 200	20	dia. 5
200 - 275	40	dia. 5
275 - 300	50	dia. 5

Inside Thread Micrometer Micromar 44 CZ

DIN 863-4



Features

- Basic Instrument consists of: Measuring head and End piece
- Measuring head and End piece with mounting bore for interchangeable anvils
- Rigid, lightweight tubular construction
- Spindle is hardened throughout and ground
- Locking lever
- Scales with satin-chrome finish
- Carbide tipped spherical measuring faces
- Interchangeable extensions 44 Cv with cylindrical gage rods that are spring-mounted in protective sleeves; for the extension of the measuring range (Accessories)
- Protection sleeves have a satin chrome finish

Span of error
Basic unit 6 µm

Basic unit in combination with any of the extensions

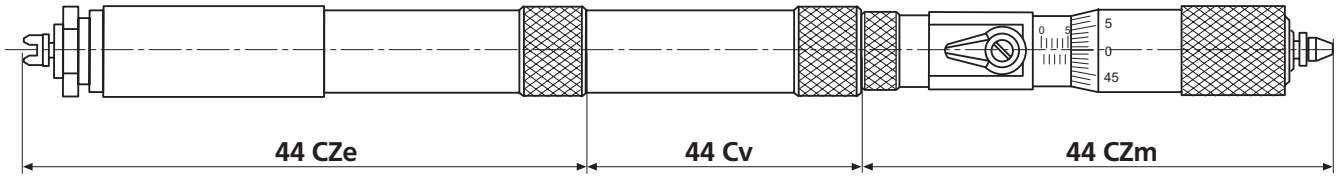
$4\ \mu m + 10 \times 10^{-6} \times l$

(l = length of the combination in mm)

- Supplied with: Case

Technical Data

Measuring range (Measuring head 44 CZm and End piece CZe) mm			Measuring head 44 CZm Readings mm	Measuring head 44 CZm Spindle thread pitch mm	Order no.
200	-	225	0.01	0.5	**4168030**



Accessories

Individual Extensions 44 Cv

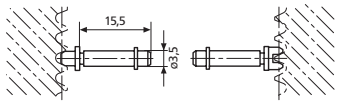
Length mm	Order no.	Length mm	Order no.
25	**4167030**	200	**4167033**
50	**4167031**	400	**4167034**
100	**4167032**	800	**4167035**

Case, wooden boxes, etc. please refer to page 3-30

Inchangeable Anvils for Inside Thread Micrometer Micromar 44 CZ

For pitch diameters. Hardened, wear-resistant special steel. With cylindrical mounting shank and retainer ring which ensures locking while permitting rotation in bore of spindle and anvil.

For pitch diameters



Metric thread (60°)				Whitworth thread (55°)				American UST thread (60°)			
Pitch mm			V-anvil Order no.	Tapered anvil Order no.	Pitch range TPI			V-anvil Order no.	Tapered anvil Order no.	Pitch range TPI			V-anvil Order no.	Tapered anvil Order no.
0.5	-	0.7	**4179400**	**4173400**	40	-	32	**4179043**	**4173443**	40	-	32	**4179115**	**4173515**
0.7	-	1	**4179401**	**4173401**	32	-	24	**4179044**	**4173444**	32	-	24	**4179116**	**4173516**
1.25	-	2	**4179402**	**4173402**	24	-	18	**4179045**	**4173445**	24	-	18	**4179117**	**4173517**
2	-	3.5	**4179403**	**4173403**	18	-	14	**4179046**	**4173446**	18	-	14	**4179118**	**4173518**
3.5	-	5	**4179404**	**4173404**	14	-	10	**4179047**	**4173447**	14	-	10	**4179119**	**4173519**
5	-	7	**4179405**	**4173405**	10	-	7	**4179048**	**4173448**	10	-	7	**4179120**	**4173520**
7	-	9	**4179406**	**4173406**	7	-	4.5	**4179049**	**4173449**	7	-	4.5	**4179121**	**4173521**
					4.5	-	3	**4179050**	**4173450**	4.5	-	3	**4179122**	**4173522**
					3	-	2.5	**4179407**	**4179409**					

For pitch diameters

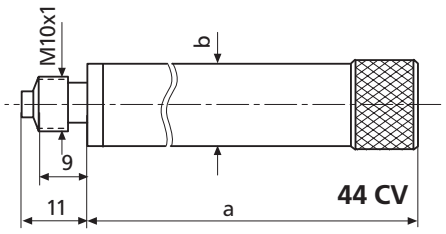
Pair consists of V-anvil and tapered anvil.
Shank length 15.5 mm

Trapezoid threads according to DIN 103		
Pitch mm	V-anvil Order no.	Pointed anvil Order no.
1	**4179950**	**4173650**
1.5	**4179951**	**4173651**
2	**4179952**	**4173652**
3	**4179953**	**4173653**
4	**4179954**	**4173654**
5	**4179955**	**4173655**
6	**4179956**	**4173656**
7	**4179957**	**4173657**
8	**4179958**	**4173658**
9	**4179959**	**4173659**
10	**4179960**	**4173660**
12	**4179961**	**4173661**
14	**4179962**	**4173662**
16	**4179963**	**4173663**
18	**4179964**	**4173664**
20	**4179965**	**4173665**

Accessories for Micromar 44 Cms / 44 CB / 44 CZ

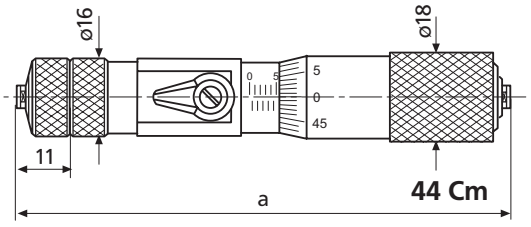
Individual Extensions 44 Cv

Length a mm	dia. b mm	**Order no.**
25	15	**4167030**
50	15	**4167031**
100	15	**4167032**
200	15	**4167033**
400	15	**4167034**
800	22	**4167035**



Inside Micrometer 44 Cm

Measuring range mm	**Reading** mm	**Spindle thread pitch** mm	**Order no.**
100 - 125	0.01	0.5	**4168001**



Ring Gage 355 E

Ring Gage 355 E for testing the basic setting see page 13-19.
Special wear resistant steel, hardened and lapped
Dimensions according to DIN 2250 C
Manufacturing tolerance in accordance to DIN 2250
Uncertainty of the engraved actual dimension 1/2 IT1

355 E

	Order no.
Case for Inside Micrometer 44 Cm and extension sets Cvs1 or Cvs2	**4168015**
Wooden case for 2 extensions 44Cv 800 mm	**4168016**

Self-Centering Inside Micrometer Micromar 44 A

DIN 863-4

Applications

For measuring:
- through holes
- blind holes
- centering shoulders

Technical Data

Measuring range mm	Measuring depth mm	Readings mm	Error limit *G** µm	Order no.
6 - 8	58 / (133**)	0.001	4	**4190310**
8 - 10	58 / (133**)	0.001	4	**4190311**
10 - 12	58 / (133**)	0.001	4	**4190312**
12 - 16	64 / (139**)	0.001	4	**4190313**
16 - 20	64 / (139**)	0.001	4	**4190314**
20 - 25	68 / (218**)	0.005	4	**4190315**
25 - 30	68 / (218**)	0.005	4	**4190316**
30 - 40	76 / (226**)	0.005	4	**4190317**
40 - 50	76 / (226**)	0.005	4	**4190319**
50 - 60	79 / (229**)	0.005	5	**4190320**
60 - 70	79 / (229**)	0.005	5	**4190321**
70 - 85	97 / (247**)	0.005	5	**4190012**
85 - 100	97 / (247**)	0.005	5	**4190013**
100 - 125	132 / (282**)	0.005	6	**4190014**
125 - 150	132 / (282**)	0.005	6	**4190015**
150 - 175	132 / (282**)	0.005	7	**4190016**
175 - 200	132 / (282**)	0.005	7	**4190017**

* *Over the full length of the anvils* ** *With the extension 44 Av*

Features

- Scales with satin-chrome finish
- Spindle is hardened throughout and ground
- Rapid drive with integrated ratchet
- Self-centering measuring head consists of 3 laterally positioned anvils, each are offset at intervals of 120°
- Anvils from 12 mm are carbide tipped
- From 12 mm the anvils can be used to measure to the bottom of a bore
- From 40 mm all measuring heads are made from aluminum to reduce weight
- Supplied with: Case and operating instructions

Accessories

Measuring heads, ring gages, etc. please refer to page 3-34

Self-Centering Inside Micrometer Sets 44 AS

Measuring range mm	Number of Micrometers	Ring gages dia. mm	Order no.
6 - 12	3	8 / 10	**4190350**
12 - 20	2	16	**4190351**
20 - 50	4	25 / 40	**4190352**
50 - 100	4	60 / 85	**4190353**

- Supplied with: Case and ring gage

Digital Self-Centering Inside Micrometer Micromar 44 EWR

IP52 · ABS · MarConnect (USB, RS232C, Digimatic) · DIN 863-4 · REFERENCE

Applications

For measuring:
- through holes
- blind holes
- centering shoulders

Technical Data

Measuring range mm			Measuring range *(inch)*	Measuring depth mm	Readings mm / *inch*	Error limit *G** µm	Order no.
6	-	8	***(.25 - .3125")***	58 / (133**)	0.001 / ***.00005"***	4	**4191120**
8	-	10	***(.3125 - .4")***	58 / (133**)	0.001 / ***.00005"***	4	**4191121**
10	-	12	***(.4 - .4725")***	58 / (133**)	0.001 / ***.00005"***	4	**4191122**
12	-	16	***(.4725 - .625")***	64 / (139**)	0.001 / ***.00005"***	4	**4191123**
16	-	20	***(.625 - .775")***	64 / (139**)	0.001 / ***.00005"***	4	**4191124**
20	-	25	***(.775 - 1")***	68 / (218**)	0.001 / ***.00005"***	4	**4191125**
25	-	30	***(1 - 1.2")***	68 / (218**)	0.001 / ***.00005"***	4	**4191126**
30	-	40	***(1.2 - 1.6")***	76 / (226**)	0.001 / ***.00005"***	4	**4191127**
40	-	50	***(1.6 - 2")***	76 / (226**)	0.001 / ***.00005"***	4	**4191129**
50	-	60	***(2 - 2.35")***	79 / (229**)	0.001 / ***.00005"***	5	**4191130**
60	-	70	***(2.35 - 2.75")***	79 / (229**)	0.001 / ***.00005"***	5	**4191131**
70	-	85	***(2.75 - 3.35")***	97 / (247**)	0.001 / ***.00005"***	5	**4191032**
85	-	100	***(3.35 - 4")***	97 / (247**)	0.001 / ***.00005"***	5	**4191033**
100	-	125	***(4 - 4.9")***	132 / (282**)	0.001 / ***.00005"***	6	**4191034**
125	-	150	***(4.9 - 5.9")***	132 / (282**)	0.001 / ***.00005"***	6	**4191035**
150	-	175	***(5.9 - 6.9")***	132 / (282**)	0.001 / ***.00005"***	7	**4191036**
175	-	200	***(6.9 - 7.9")***	132 / (282**)	0.001 / ***.00005"***	7	**4191037**

* *Over the full length of the anvils* ** *With the extension 44 Av*

Features

Functions:
0 (Setting the display to zero for Relative measurement)
ABS (Switching between Relative and Absolute measurement)
mm/inch
PR (Reference setting)

- Immediate measurement due to the Reference system
- Basic Instrument consists of: Basic Unit 44 EXg and Measuring Head 44 Ak
- Threaded connection for changing the measuring heads
- Self-Centering measuring head consists of 3 laterally positioned anvils, each are offset at intervals of 120°
- Anvils from 12 mm are carbide tipped
- From 12 mm the anvils can be used to measure to the bottom of a bore
- From 40 mm all measuring heads are made from aluminum to reduce weight
- Supplied with: Case, battery and operating instructions

Accessories

Measuring heads, ring gages, etc. please refer to page 3-34

Digital Self-Centering Inside Micrometer Sets Micromar 44 EWR

Measuring range mm			Measuring range *(inch)*	Number of measuring heads 44 Ak	Ring gages dia. mm	Order no.
6	-	12	***(.25 - .4725")***	3	8 / 10	**4191160**
12	-	20	***(.4725 - 775")***	2	16	**4191161**
20	-	50	***(.775" - 2")***	4	25 / 40	**4191162**
50	-	100	***(2 - 4")***	4	60 / 85	**4191163**

- Supplied with:
  1 Basic Unit 44 EWg, Measuring Heads 44 Ak, case and ring gages

Self-Centering Measuring Pistol Micromar 844 A

MarConnect: USB, RS232C, Digimatic

Applications

For measuring:
- through holes
- blind holes
- centering shoulders

Technical Data

Measuring range mm	Measuring range (inch)	Measuring depth mm	Error limit G* µm / inch	Order no. excludes Indicator
6 - 8	(.25 - .3125")	58 / (133**)	3 / .00015	4487700
8 - 10	(.3125 - .4")	58 / (133**)	3 / .00015	4487701
10 - 12	(.4 - .4725")	58 / (133**)	3 / .00015	4487702
12 - 16	(.4725 - .625")	64 / (139**)	3 / .00015	4487703
16 - 20	(.625 - .775")	64 / (139**)	3 / .00015	4487704
20 - 25	(.775 - 1")	68 / (218**)	3 / .00015	4487705
25 - 30	(1 - 1.2")	68 / (218**)	3 / .00015	4487706
30 - 40	(1.2 - 1.6")	76 / (226**)	3 / .00015	4487707
40 - 50	(1.6 - 2")	76 / (226**)	3 / .00015	4487709
50 - 60	(2 - 2.35")	79 / (229**)	4 / .00016	4487710
60 - 70	(2.35 - 2.75")	79 / (229**)	4 / .00016	4487711
70 - 85	(2.75 - 3.35")	97 / (247**)	4 / .00016	4487612
85 - 100	(3.35 - 4")	97 / (247**)	4 / .00016	4487613
100 - 125	(4 - 4.9")	132 / (282**)	5 / .0002	4487614
125 - 150	(4.9 - 5.9")	132 / (282**)	5 / .0002	4487615
150 - 175	(5.9 - 6.9")	132 / (282**)	6 / .00025	4487616
175 - 200	(6.9 - 7.9")	132 / (282**)	6 / .00025	4487617

* *Indicator is not taken into consideration, over the full length of the anvils* ** *With the extension 44 Av*

Features

- Basic Instrument consists of: 844 Ag and Measuring Head 44 Ak
- Threaded connection for changing the measuring heads
- Self-Centering measuring head consists of 3 laterally positioned anvils, each are offset at intervals of 120°
- Anvils from 12 mm are carbide tipped
- From 12 mm the anvils can be used to measure to the bottom of a bore
- From 40 mm all measuring heads are made from aluminum to reduce weight

- Supplied with: Case and operating instructions

The following indicating instruments are recommended:

Indicating instr.	Order no.
MarCator 1086 Ri	4337625
MarCator 1086 R	4337621
MarCator 1087 Ri	4337665
MarCator 1087 R	4337661

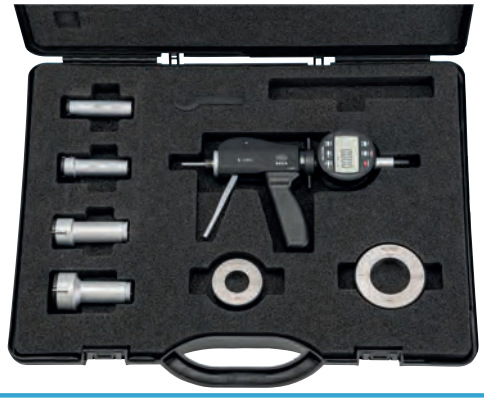
Accessories

Measuring heads, ring gages, etc. please refer to page 3-34

Self-Centering Measuring Pistol Set Micromar 844 AS

Measuring range mm	Measuring range (inch)	Number of measuring heads	Ring gages dia. mm	Order no. with Digital Indicator 1086 R	Order no. excludes Indicator
6 - 12	(.25 - .4725")	3	8 / 10	4487760	4487750
12 - 20	(.4725 - .775")	2	16	4487761	4487751
20 - 50	(.775" - 2")	4	25 / 40	4487762	4487752
50 - 100	(2 - 4")	4	60 / 85	4487763	4487753

- Supplied with:
  1 Basic Instrument 844 Ag, Measuring Heads 44 Ak, case and ring gages



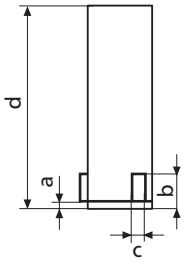
Accessories for Micromar 44 A, 44 EWR, 844 A

Measuring Heads 44 Ak for 44 EWR

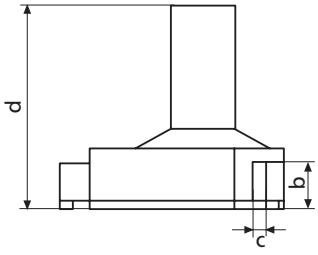
- Self-centering measuring head consists of 3 laterally positioned anvils, each are offset at intervals of 120°
- Anvils from 12 mm are carbide tipped
- From 12 mm, anvils can be used to measure to the base of a bore
- From 40 mm all measuring heads are made from aluminum to reduce weight

Measuring range mm			Measuring range *(inch)*	Order no.
6	-	8	*(.25 - .3125")*	**4190330**
8	-	10	*(.3125 - .4725")*	**4190331**
10	-	12	*(.4725 - .5")*	**4190332**
12	-	16	*(.5 - .625")*	**4190333**
16	-	20	*(.625 - .775")*	**4190334**
20	-	25	*(.775 - 1")*	**4190335**
25	-	30	*(1 - 1.2")*	**4190336**
30	-	40	*(1.2 - 1.6")*	**4190337**
40	-	50	*(1.6 - 2")*	**4190339**
50	-	60	*(2 - 2.35")*	**4190340**
60	-	70	*(2.35 - 2.75")*	**4190341**
70	-	85	*(2.75 - 3.35")*	**4190042**
85	-	100	*(3.35 - 4")*	**4190043**
100	-	125	*(4 - 4.9")*	**4190044**
125	-	150	*(4.9 - 5.9")*	**4190045**
150	-	175	*(5.9 - 6.9")*	**4190046**
175	-	200	*(6.9 - 7.9")*	**4190047**

Meas. range 6 - 12 mm



Meas. range 12 - 200 mm



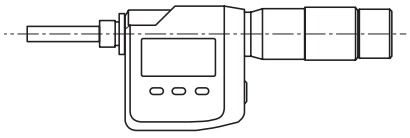
Measuring range mm			a	b	c	d
6	-	8	1.5	4	1.5	58
8	-	10	1.8	4.3	1.5	58
10	-	12	1.8	4.3	1.5	58
12	-	16	–	6.5	4	64
16	-	20	–	6.5	4	64
20	-	25	–	9	4	68
25	-	30	–	9	4	68
30	-	40	–	15	5	76
40	-	50	–	15	5	76
50	-	60	–	18	5	79
60	-	70	–	18	5	79
70	-	85	–	23	7	97
85	-	100	–	23	7	97
100	-	125	–	27	7	132
125	-	150	–	27	7	132
150	-	175	–	27	7	132
175	-	200	–	27	7	132

Ring Gages 355 E

- Can be used for 2 consecutive measuring ranges
- Manufacturing tolerance in accordance to DIN 2250C

dia. mm	Order no.	dia. mm	Order no.
8	**4710026**	60	**4710080**
10	**4710030**	85	**4710105**
16	**4710036**	125	**4710121**
25	**4710045**	175	**4710122**
40	**4710060**		

Basic Unit 44 EWg

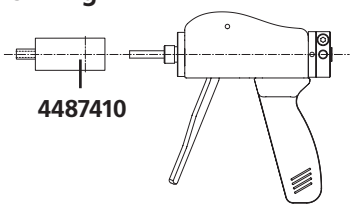


Threaded connection for changing the measuring heads

Measuring range mm			Order no.
6	-	20	**4190106**
20	-	100	**4190107**
100	-	200	**4190108**

Basic Unit Measuring Pistol 844 Ag

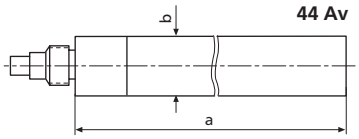
Threaded connection for changing the measuring heads. Any indicating instrument with an 8 mm mounting shank can be used.



Measuring range mm			*(inch)*	Order no.
6	-	100*	*(.25 - 4.0")*	**4487630**
20	-	100	*(.775 - 4.0")*	**4487631**
100	-	200	*(4.0 - 7.9")*	**4487632**

* *Includes adapter 4487410*

Depth Extension Rod 44 Av



Measuring range mm			*(inch)*	Length a mm	dia. b mm	Order no.
6	-	12	*(.25 - .5")*	75	5.8	**4190090**
12	-	20	*(.5 - .775")*	75	8.5	**4190091**
20	-	30	*(.775 - 1.2")*	150	19.0	**4190092**
30	-	200	*(1.2 - 7.9")*	150	22.0	**4190093**

Depth Micrometer Micromar 45 T

Applications

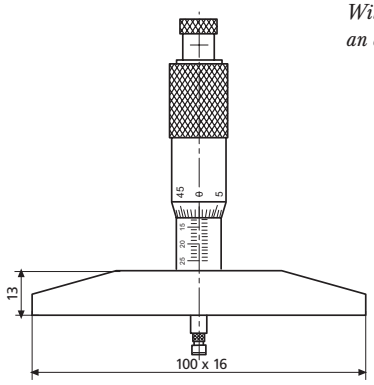
- Depth measurement
- Measuring the space between grooves and groove widths (in conjunction with a Disc anvil 45 Tm)

Features

- Measuring spindle is hardened throughout and ground
- Hardened chrome plated cross beam, the contact surface is lapped
- Hardened anvil
- When using interchangeable extensions recalibrating the depth micrometer is not necessary
- Scales with satin-chrome finish
- Supplied with: Extensions 25 mm and 50 mm, case

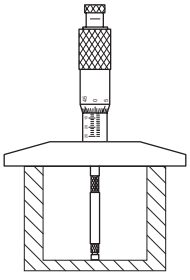
Technical Data

Total measuring range mm	Range of micrometer mm	Readings mm	Spindle thread pitch mm	Error limit with a standard anvil µm	Measuring force N	Length tolerance of extensions µm	Order no.
0-100	25	0.01	0.5	≤5	5 - 10	± 1.5	**4180000**



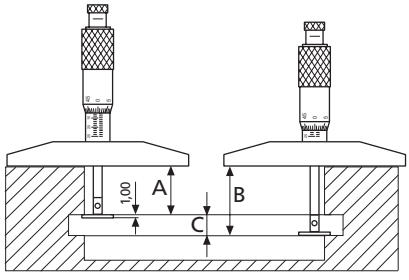
Standard depth measurements

With a standard anvil, if necessary with an extension



Measuring the space between grooves and the widths of a groove

With disc anvil 45 Tm, if necessary with an extension



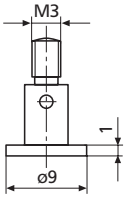
Dimension A: Can be direct read of the thimble

Dimension B: The reading plus 1.00 mm (thickness of the disc anvil)

Dimension C: Dimension B minus Dimension A

Accessories

	Order no.
Disc anvil 45 Tm for groove spacing and groove widths	**4180011**
Extensions 45 Tv	
Length L 25 mm, Length tolerance ± 1.5 µm	**4180001**
Length L 50 mm, Length tolerance ± 1.5 µm	**4180002**
Length L 100 mm, Length tolerance ± 1.5 µm	**4180003**



45 Tm

Digital Micrometer Head Micromar 46 EWR

IP52 ABS MarConnect USB RS232C Digimatic

REFERENCE

Features

Functions:
0 (Zero setting)
ABS (Switch between Relative and Absolute measurement)
mm/inch
PRESET (enter a numerical value)
DATA (Data transmission via connection cable)

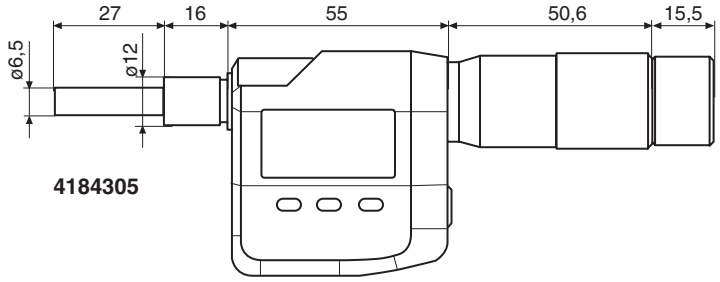
- Patented capacitive measuring system with an energy saving function, life of the battery approx. 2 years
- Ratchet with integrated coupler

- Supplied with:
Case, end cap (in case the rapid drive is not required) and operating instructions

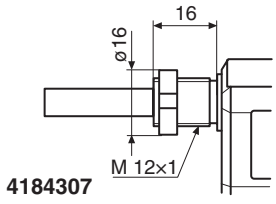
Technical Data

Measuring range mm	*(inch)*	Readings mm / *inch*	Error limit G_{me} µm	Measuring face	Mounting shaft mm	Order no.
0-25	***(0-1")***	0.001 / ***.00005"***	4	flat	12	**4184305**
0-25	***(0-1")***	0.001 / ***.00005"***	4	flat	M12x1*	**4184307**
0-25	***(0-1")***	0.001 / ***.00005"***	4	spherical	12	**4184306**
0-25	***(0-1")***	0.001 / ***.00005"***	4	spherical	M12x1*	**4184308**

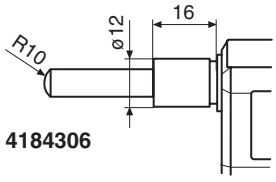
* *with locking nut*



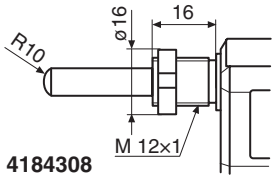
4184305



4184307



4184306



4184308

Accessories

		Order no.
Battery 3V, type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**

Accessories for Data Processing see Chapter 11

Micrometer Head Micromar 46

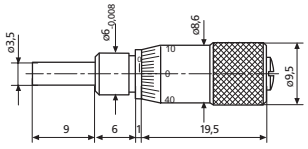
Features

- Spindle is made of stainless steel, hardened throughout and ground
- Scales with satin-chrome finish

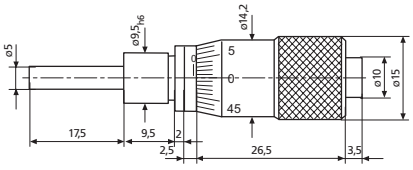
Technical Data

	Measuring range mm	Readings mm	Error limit G_{me} µm	DIN 863	Spindle thread pitch mm	Spindle dia. mm	Order no.
46	0 - 6.5	0.01	3	●	0.5	3.5	**4183021**
	0 - 13	0.01	3	●	0.5	5	**4183025**
	0 - 25	0.01	3	●	0.5	6.35	**4183030**
	0 - 25*	0.01	3	●	0.5	6.35	**4183024**
	0 - 50	0.01	5		0.5	7.5	**4183023**
46 H	0 - 25**	0.01	3	●	0.5	7.5	**4184000**

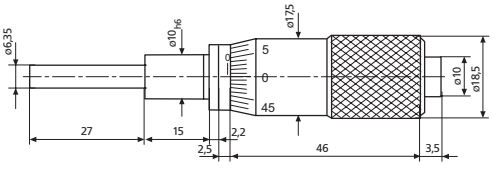
* *with locking nut*
** *with ratchet, carbide tipped*



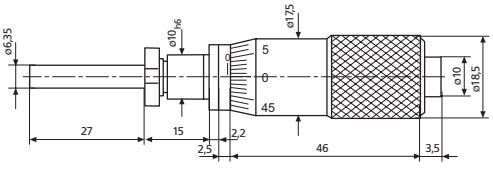
4183021
Measuring range 0-6.5 mm



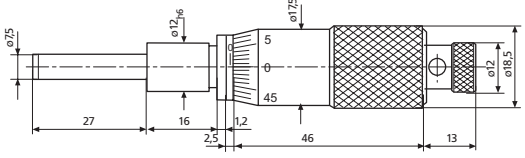
4183025
Measuring range 0-13 mm



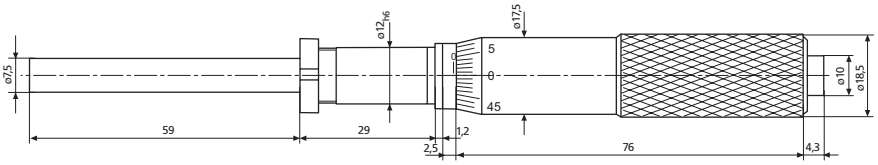
4183030
Measuring range 0-25 mm



4183024
Measuring range 0-25 mm
with locking nut



4184000
Measuring range 0-25 mm
carbide tipped



4183023
Measuring range 0-50 mm

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► | MarTest. Test Indicators and Touch Probes

Mechanical Dial Test Indicators
Overview 4- 2

Standard version
MarTest 800 S / 800 SG / 800 SA / 800 SGA metric 4- 4
MarTest 801 S1 / 801 S / 801 SG / 801 SGI inch 4- 4

With a higher resolution
MarTest 800 SM / 800 SGM / 800 SGE metric 4- 5
MarTest 801 SM / 801 SGM / 801 SGE inch 4- 5

With a longer styli
MarTest 800 SL / 800 SGL / 800 SGB metric 4- 6
MarTest 801 SL / 801 SGL inch 4- 6

Horizontal version
MarTest 800 H metric 4- 7
MarTest 801 H inch 4- 7

Vertical version
MarTest 800 V / 800 VGM metric 4- 7
MarTest 801 V / 801 VGM inch 4- 7

With a larger measuring range
MarTest 800 SR / 800 SRM metric 4- 8
MarTest 801 SR / 801 SRM inch 4- 8

Digital Test Indicators

Standard version
MarTest 800 EW 4- 9

With a longer styli
MarTest 800 EWL 4-10

Accessories 4 - 8 / 4-11

3D-Touch Probes
Water proof, with a Digital display
MarTest 802 NW 4-14

Water proof, with an Analog display
MarTest 802 EW 4-15

MarTest. Test Indicators

OVERVIEW

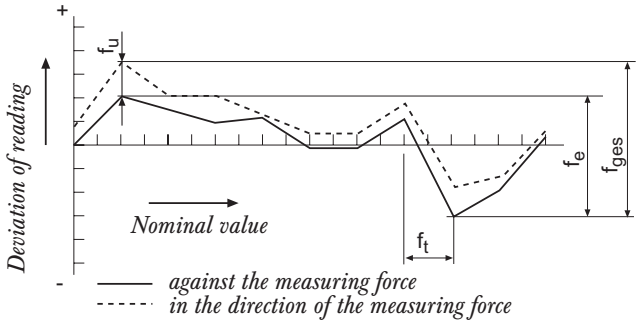
MarTest - Versions

		Measuring range	Dial style	Readings	DIN 2270	Accuracy f_{ges}	f_e	f_u	f_t	f_w
Standard	**metric**									
	800 S	± 0.4 mm	0-40-0	0.01 mm	●	13 µm	10 µm	3 µm	5 µm	3 µm
	800 SG	± 0.4 mm	0-40-0	0.01 mm	●	13 µm	10 µm	3 µm	5 µm	3 µm
	800 SA	± 0.25 mm	0-25-0	0.01 mm		8 µm	5 µm	3 µm	5 µm	3 µm
	800 SGA	± 0.25 mm	0-25-0	0.01 mm		8 µm	5 µm	3 µm	5 µm	3 µm
	800 EW	± 0.4 mm ± .015"	digital	0.001/ ***.00005"*** 0.01/ ***.0005"***	●		10 µm	3 µm		
	inch									
	801 S1	***±.015"***	***0-15-0***	***.001"***		***.0005"***	***.0004"***	***.00012"***	***.0002"***	***.0002"***
	801 S	***±.015"***	***0-15-0***	***.0005"***		***.0005"***	***.0004"***	***.00012"***	***.0002"***	***.0002"***
	801 SG	***±.015"***	***0-15-0***	***.0005"***		***.0005"***	***.0004"***	***.00012"***	***.0002"***	***.0002"***
	801 SGI	***±.015"*** (± 0.30 mm)	***0-15-0*** (0-30-0)	***.001"*** (0.01 mm)		***.0005"***	***.0004"***	***.00012"***	***.0002"***	***.0002"***
Extra Long Styli	**metric**									
	800 SL	± 0.25 mm	0-25-0	0.01 mm		13 µm	10 µm	5 µm	5 µm	3 µm
	800 SGL	± 0.25 mm	0-25-0	0.01 mm		13 µm	10 µm	5 µm	5 µm	3 µm
	800 SGB	± 0.5 mm	0-50-0	0.01 mm		13 µm	10 µm	4 µm	5 µm	3 µm
	800 EWL	± 0.25 mm ± .010"	digital	0.001/ ***.00005"*** 0.01/ ***.0005"***			10 µm	3 µm		
	inch									
	801 SL	***±.010"***	***0-10-0***	***.0005"***		***.0005"***	***.0004"***	***.0002"***	***.0002"***	***.00012"***
	801 SGL	***±.010"***	***0-10-0***	***.0005"***		***.0005"***	***.0004"***	***.0002"***	***.0002"***	***.00012"***
Higher Resolution	**metric**									
	800 SM	± 0.1 mm	0-100-0	0.002 mm	●	4 µm	3 µm	2 µm	2 µm	1.5 µm
	800 SGM	± 0.1 mm	0-100-0	0.002 mm	●	4 µm	3 µm	2 µm	2 µm	1.5 µm
	800 SGE	± 0.07 mm	0-70-0	0.001 mm		4 µm	3 µm	2 µm	2 µm	1.5 µm
	inch									
	801 SM	***±.004"***	***0-4-0***	***.0001"***		***.00016".00012".00008".00008".00006"***				
	801 SGM	***±.004"***	***0-4-0***	***.0001"***		***.00016".00012".00008".00008".00006"***				
	801 SGE	***±.004"***	***0-4-0***	***.00005"***		***.00016".00012".00008".00008".00006"***				
Larger Measuring Range	**metric**									
	800 SR	± 0.8 mm	0-40-0	0.01 mm		14 µm	10 µm	4 µm	5 µm	3 µm
	800 SRM	± 0.2 mm	0-100-0	0.002 mm		5 µm	3 µm	3 µm	2 µm	1.5 µm
	inch									
	801 SR	***±.030"***	***0-15-0***	***.0005"***		***.0005"***	***.0004"***	***.00016"***	***.0002"***	***.00012"***
	801 SRM	***±.008"***	***0-4-0***	***.0001"***		***.0002"***	***.00012".00012".00008".00006"***			
Horizontal Models	**metric**									
	800 H	± 0.4 mm	0-40-0	0.01mm	●	13 µm	10 µm	3 µm	5 µm	3 µm
	inch									
	801 H	***±.015"***	***0-15-0***	***.0005"***		***.0005"***	***.0004"***	***.00012"***	***.0002"***	***.00012"***
Vertical Models	**metric**									
	800 V	± 0.4 mm	0-40-0	0.01 mm	●	13 µm	10 µm	3 µm	5 µm	3 µm
	800 VGM	± 0.1 mm	0-100-0	0.002 mm	●	4 µm	3 µm	2 µm	2 µm	1.5 µm
	inch									
	801 V	***±.015"***	***0-15-0***	***.0005"***		***.0005"***	***.0004"***	***.00012"***	***.0002"***	***.00012"***
	801 VGM	***±.004"***	***0-4-0***	***.0001"***		***.00016".00012".00008".00008".00006"***				

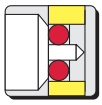
* *Only available in North America, Canada and Mexico; includes holding bar and clamp*

Length of styli	Order no.	Order no. with kit*
14.5 mm	**4305200**	**2015309**
14.5 mm	**4307200**	**2015310**
14.5 mm	**4301200**	**2015343**
14.5 mm	**4301250**	**2015344**
14.5 mm	**4305120**	
14.5 mm	**4305960**	**2015317**
14.5 mm	**4305950**	**2015316**
14.5 mm	**4307950**	**2015318**
14.5 mm	**4307970**	**2015311**
41.24 mm	**4306200**	**2015312**
41.24 mm	**4306250**	**2015313**
32.3 mm	**4301300**	**2015346**
41.24 mm	**4306120**	
41.24 mm	**4306950**	**2015319**
41.24 mm	**4306960**	**2015320**
14.5 mm	**4308150**	**2015315**
14.5 mm	**4308200**	**2015314**
9.1 mm	**4308220**	**2015345**
14.5 mm	**4308960**	**2015321**
14.5 mm	**4308970**	**2015322**
14.5 mm	**4308985**	**2015323**
14.5 mm	**4307250**	**2015348**
14.5 mm	**4308250**	**2015349**
14.5 mm	**4307960**	**2015350**
14.5 mm	**4308980**	**2015351**
14.5 mm	**4303200**	**2015328**
14.5 mm	**4303950**	**2015324**
14.5 mm	**4302200**	**2015327**
14.5 mm	**4302250**	**2015347**
14.5 mm	**4302950**	**2015325**
14.5 mm	**4302960**	**2015326**

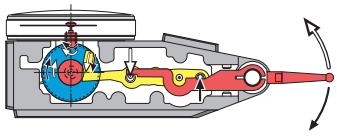
Metrological characteristics

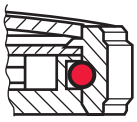


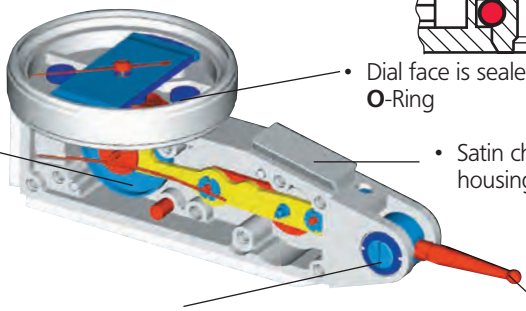
MarTest - Design features



Mechanism
- Shockproof
- Anti magnetic
- Movement bearings are jeweled with 8 precious stones
- Automatic matching to sensing direction, thus ensuring error-free reading







- Dial face is sealed with an **O**-Ring
- Satin chrome finished housing
- Double lever supported in ball bearings, overload protection provided by slip clutch
- Contact point with carbide ball

MarTest - Applications

Concentricity of a shaft

Concentricity of a sleeve

Centering of a bore

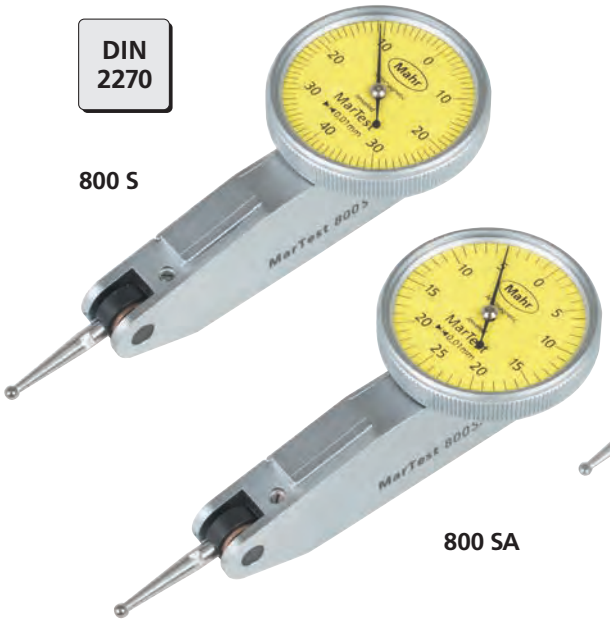
Aligning a surface

Testing parallelism

MarTest standard versions

DIN 2270

800 S



800 SA

800 SGA

SHOCK PROOF

800 SG

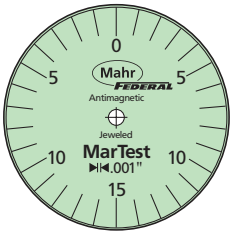
DIN 2270

Technical Data

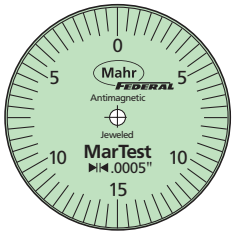
	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.	Order no. with kit
800 S	± 0.4 mm	0.01 mm	27.5 mm	0.15 N	14.5 mm	**4305200**	**2015309**
800 SG	± 0.4 mm	0.01 mm	38 mm	0.15 N	14.5 mm	**4307200**	**2015310**
800 SA	± 0.25 mm	0.01 mm	27.5 mm	0.1 N	14.5 mm	**4301200**	**2015343**
800 SGA	± 0.25 mm	0.01 mm	38 mm	0.1 N	14.5 mm	**4301250**	**2015344**
801 S1	***± .015"***	***.001"***	***1.1"***	0.15 N	14.5 mm	**4305960**	**2015317**
801 S	***± .015"***	***.0005"***	***1.1"***	0.15 N	14.5 mm	**4305950**	**2015316**
801 SG	***± .015"***	***.0005"***	***1.5"***	0.15 N	14.5 mm	**4307950**	**2015318**
801 SGI	***± .015" (± 0.3 mm)***	***.0005" (0.01 mm)***	***1.5"***	0.15 N	14.5 mm	**4307970**	**2015311**

Supplied with:
Plastic storage case, spanner for changing the styli, styli dia. 2 mm, mounting shaft 800 a8 (for metric versions), mounting shaft 800 a6 (800 SA, 800 SGA), mounting shaft 800 a3/8 (for inch versions)

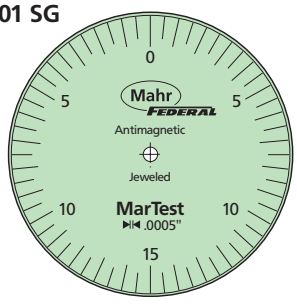
801 S1



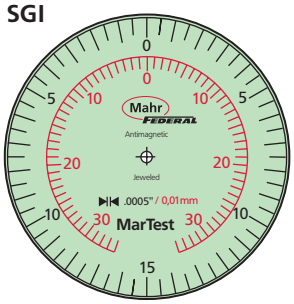
801 S

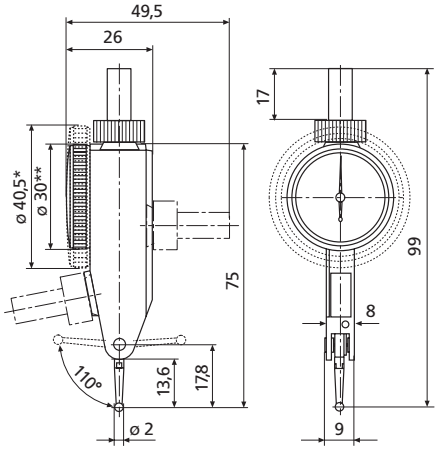


801 SG



801 SGI





* *800 SG, 800 SGA, 801 SG, 801 SGI*
** *800 S, 800 SA, 801 S1, 801 S*

MarTest with resolution 0.002 mm/0.001 mm for higher accuracy

DIN 2270

800 SM

DIN 2270

800 SGM

SHOCK PROOF

800 SGE

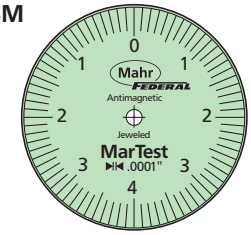
Inductive Probe Millimar 1318
see page 7-14

Technical Data

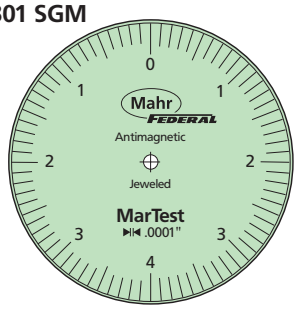
	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.	Order no. with kit
800 SM	± 0.1 mm	0.002 mm	27.5 mm	0.15 N	14.5 mm	**4308150**	**2015315**
800 SGM	± 0.1 mm	0.002 mm	38 mm	0.15 N	14.5 mm	**4308200**	**2015314**
800 SGE	± 0.07 mm	0.001 mm	38 mm	0.2 N	9.1 mm	**4308220**	**2015345**
801 SM	***± .004"***	***.0001"***	***1.1"***	0.15 N	14.5 mm	**4308960**	**2015321**
801 SGM	***± .004"***	***.0001"***	***1.5"***	0.15 N	14.5 mm	**4308970**	**2015322**
801 SGE	***± .004"***	***.00005"***	***1.5"***	0.15 N	14.5 mm	**4308985**	**2015323**

Supplied with:
Plastic storage case, spanner for changing the styli, styli dia. 2 mm, mounting shaft 800 a8 (for metric versions)

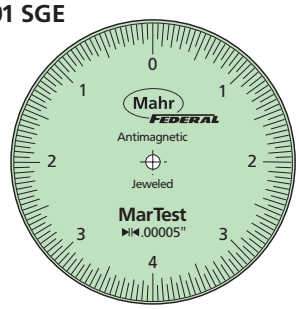
801 SM

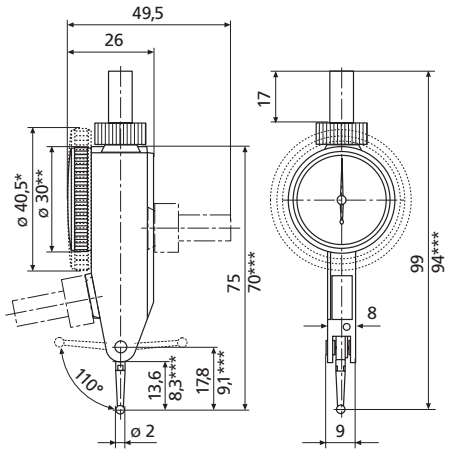


801 SGM



801 SGE





* *800 SGM, 800 SGE, 801 SGM, 801 SGE*
** *800 SM, 801 SM*
*** *800 SGE*

MarTest with extra long styli for measuring in even difficult to access positions

800 SL

800 SGL

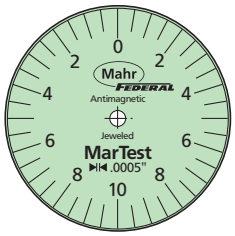
800 SGB

Technical Data

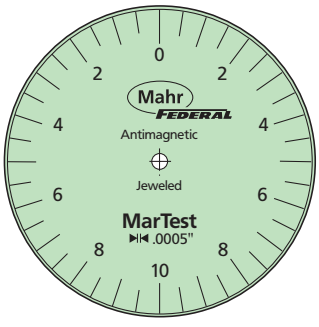
	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.	Order no. with kit
800 SL	± 0.25 mm	0.01 mm	27.5 mm	0.07 N	41.24 mm	**4306200**	**2015312**
800 SGL	± 0.25 mm	0.01 mm	38 mm	0.07 N	41.24 mm	**4306250**	**2015313**
800 SGB	± 0.5 mm	0.01 mm	38 mm	0.1 N	32.3 mm	**4301300**	**2015346**
801 SL	***± .010"***	***.0005"***	***1.1"***	0.07 N	41.24 mm	**4306950**	**2015319**
801 SGL	***± .010"***	***.0005"***	***1.5"***	0.07 N	41.24 mm	**4306960**	**2015320**

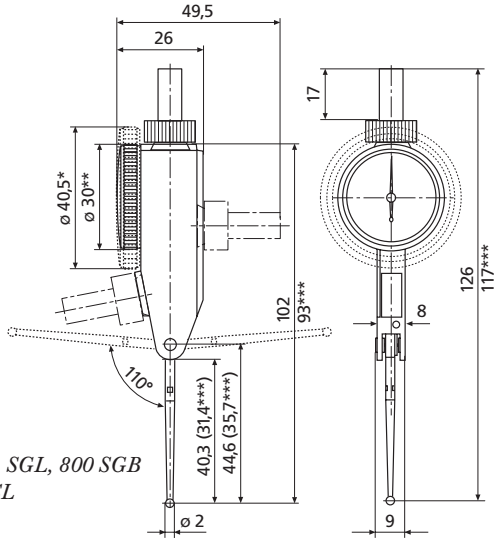
Supplied with:
Plastic storage case, spanner for changing the styli, styli dia. 2 mm, mounting shaft 800 a8 (for metric versions), mounting shaft 800 a3/8 (for inch versions), mounting shaft 800 a6 (800 SGB)

801 SL



801 SGL



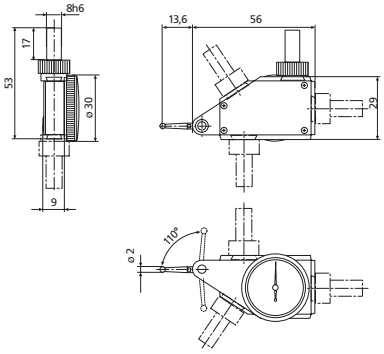


* *800 SGL, 801 SGL, 800 SGB*
** *800 SL, 801 SL*
*** *800 SGB*

MarTest styli can positioned horizontally to the dial face

DIN 2270

800 H



SHOCK PROOF

Technical Data

	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.	Order no. with kit
800 H	± 0.4 mm	0.01 mm	27.5 mm	0.25 N	14.5 mm	**4303200**	**2015328**
801 H	***± .015"***	***.0005"***	***1.1"***	0.25 N	14.5 mm	**4303950**	**2015324**

Supplied with:
Plastic storage case, spanner for changing the styli, styli dia. 2 mm, mounting shaft 800 a8 (for metric versions), mounting shaft 800 a3/8 (for inch versions)

MarTest vertical model

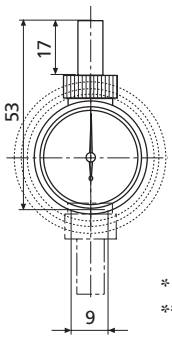
800 V

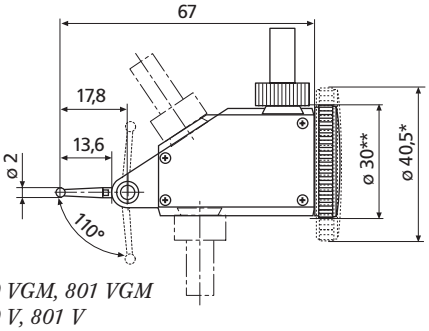
DIN 2270

800 VGM

DIN 2270

SHOCK PROOF





* 800 VGM, 801 VGM
**800 V, 801 V

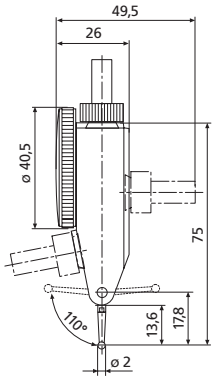
Technical Data

	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.	Order no. with kit
800 V	± 0.4 mm	0.01 mm	27.5 mm	0.2 N	14.5 mm	**4302200**	**2015327**
800 VGM	± 0.1 mm	0.002 mm	38 mm	0.25 N	14.5 mm	**4302250**	**2015347**
801 V	***± .015"***	***.0005"***	***1.1"***	0.2 N	14.5 mm	**4302950**	**2015325**
801 VGM	***± .004"***	***.0001"***	***1.5"***	0.25 N	14.5 mm	**4302960**	**2015326**

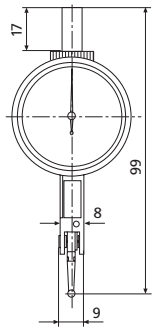
Supplied with:
Plastic storage case, spanner for changing the styli, styli dia. 2 mm, mounting shaft 800 a8 (for metric versions), mounting shaft 800 a3/8 (for inch versions)

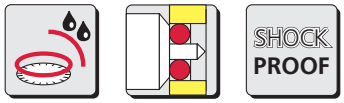
MarTest with larger measuring range

800 SRM



800 SR/SRM





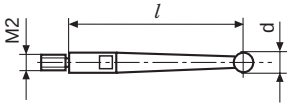
Technical Data

	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.	Order no. with kit
800 SR	± 0.8 mm	0.01 mm	38 mm	0.15 N	14.5 mm	**4307250**	**2015348**
800 SRM	± 0.2 mm	0.002 mm	38 mm	0.15 N	14.5 mm	**4308250**	**2015349**
801 SR	***±.030"***	***.0005"***	***1.5"***	0.15 N	14.5 mm	**4307960**	**2015350**
801 SRM	***±.008"***	***.0001"***	***1.5"***	0.15 N	14.5 mm	**4308980**	**2015351**

Supplied with:
Plastic storage case, spanner for changing the styli, styli dia. 2 mm, mounting shaft 800 a8 (for metric versions), mounting shaft 800 a3/8 (for inch versions)

MarTest - Accessories

Styluses with ruby contact points



Styluses with carbide contact points

Spanner for changing the styluses **4305868**

Model	Stylus length *l*	Styluses					
		Carbide contact point				Ruby contact point	
			d				d
		Cat. no.	dia. 1 mm	dia. 2 mm	dia. 3 mm	Cat. no.	dia. 2 mm
800 S/801 S1/801 S **800 SG/801 SG** **800 SA** **800 SGA** **800 SM/801 SM** **800 SGM/801 SGM** **801 SGE** **800 SR/801 SR** **800 SRM/801 SRM** **800 H/801 H** **800 V/801 V** **800 VGM/801 VGM**	14.5 mm	**800 ts**	**4305870**	**4305850**	**4305871**	**800 tsr**	**4309051**
800 SGE	9.1 mm	**800 te**	**4308851**	**4308850**	**4308852**	**800 ter**	**4309050**
800 SL/801 SL **800 SGL/801 SGL**	41.24 mm	**800 tl**	**4306851**	**4306850**	**4306853**	**800 tlr**	**4309053**
800 SGB	32.3 mm	**800 tb**	**4301851**	**4301850**	**4301852**	**800 tbr**	**4309052**

Digital Test Indicator MarTest 800 EW

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
MAX/MIN memory
MAX-MIN ideal for testing concentricity an flatness
Auto-OFF

- Inductive measuring system, battery life span ca. 2 years
- MarConnect data output, choose alternatively:
  USB
  OPTO RS232C
- Operating unit is protected against coolants and lubricants, protection class IP65
- Combined analog and digital display
- Operating and display unit (bezel) can be rotated through 360°
- Satin chrome finished housing with 3 dovetail guideways
- Shockproof, movement bearings are jewelled
- Automatic matching to sensing direction
- Anti-magnetic
- Double lever supported in ball bearings, overload protection provided by slip clutch
- Supplied with:
  Plastic case, spanner to change the styluses, contact point dia. 2 mm, mounting shaft 800a8

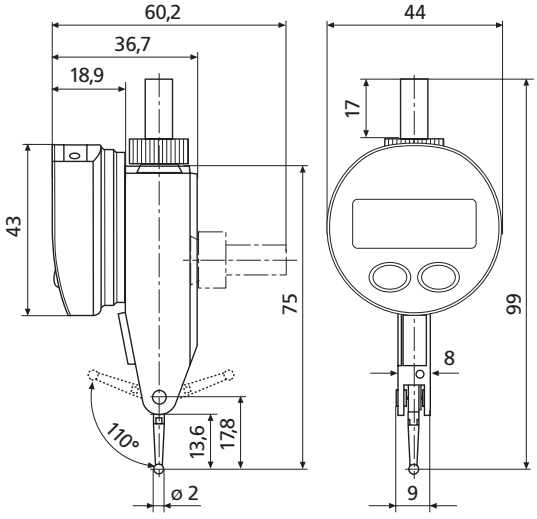
Technical Data

	Measuring range		Resolution switchable	Measuring force	Length of styli	Order no.
	mm	***(inch)***	mm / ***inch***	N	mm	
800 EW	± 0.4	***(± .015")***	0.001 / ***.00005"*** 0.01 / ***.0005"***	0.13	14.5	**4305120**

Accessories

		Order no.
Styli, with carbide contact point dia. 1 mm		**4305870**
Styli, with carbide contact point dia. 2 mm		**4305850**
Styli, with carbide contact point dia. 3 mm		**4305871**
Styli, with ruby contact point dia. 2 mm		**4309051**
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB	**800 EWu**	**4305121**
Data Connection Cable Opto RS232	**800 EWr**	**4305122**

Accessories for Data Processing Chapter 11



Digital Test Indicator MarTest 800 EWL

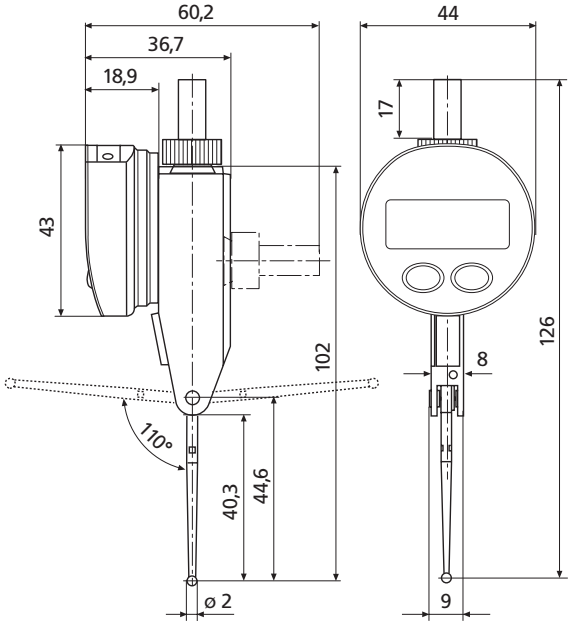
Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
MAX/MIN memory
MAX-MIN ideal for testing concentricity an flatness
Auto-OFF

- Inductive measuring system, battery life span ca. 2 years
- MarConnect data output, choose alternatively:
  USB
  OPTO RS232C
- Operating unit is protected against coolants and lubricants, protection class IP65
- Combined analog and digital display
- Operating and display unit (bezel) can be rotated through 360°
- Satin chrome finished housing with 3 dovetail guideways
- Shockproof, movement bearings are jewelled
- Automatic matching to sensing direction
- Anti-magnetic
- Double lever supported in ball bearings, overload protection provided by slip clutch
- Supplied with:
  Plastic case, spanner to change the styluses, contact point dia. 2 mm, mounting shaft 800a8

Technical Data

	Measuring range mm	Measuring range *(inch)*	Resolution switchable mm / *inch*	Measuring force N	Length of styli mm	Order no.
800 EWL	± 0.25	***(± .010")***	0.001 / ***.00005"*** 0.01 / ***.0005"***	0.07	41.24	**4306120**



Accessories

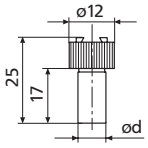
		Order no.
Styli, with carbide contact point dia. 1 mm		**4306851**
Styli, with carbide contact point dia. 2 mm		**4306850**
Styli, with carbide contact point dia. 3 mm		**4306853**
Styli, with ruby contact point dia. 2 mm		**4309053**
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB	**800 EWu**	**4305121**
Data Connection Cable Opto RS232	**800 EWr**	**4305122**

Accessories for Data Processing Chapter 11

Martest - Accessories

Mounting shaft for dovetail

800 a



Mounting shaft	dia. d mm	Order no.
800 a8	8	**4305865**
800 a6	6	**4301865**
800 a4	4	**4305885**
800 a1/4	***1/4"***	**4305895**
800 a3/8	**3/8"**	**4305875**

Stand 801 p

- With swivel holder
- Base with V-groove 140°

Total height 150 mm
Mounting bore dia. 4 and 8 mm
Column dia. 8 mm
Base surface 65 x 40 mm

Order no. **4309090**

Indicator not included.

Centering support rods 801 v

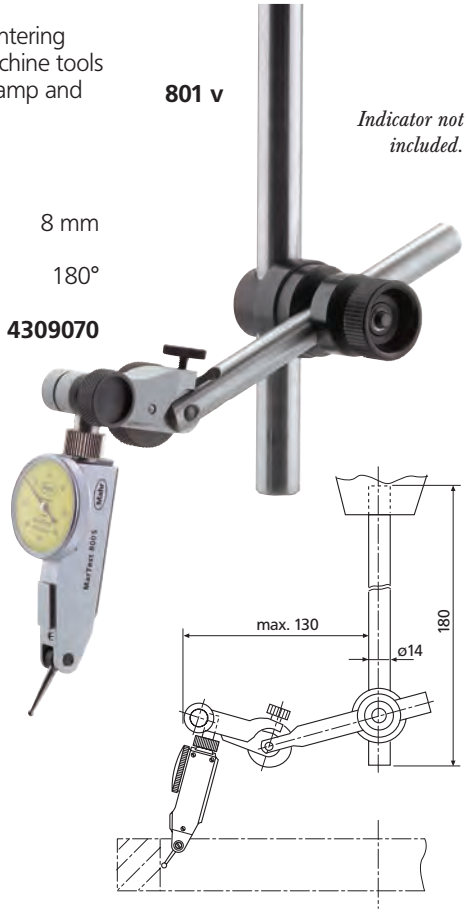
- For aligning and centering work pieces on machine tools
- Swivel mounting clamp and fine adjustment
- Stainless steel rods

801 v

Indicator not included.

Mounting bore dia. 8 mm
Swivel range of mounting clamp 180°

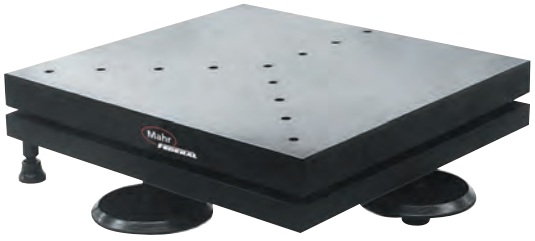
Order no. **4309070**



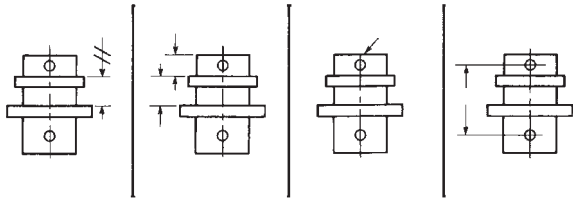
Leveling Table TE-20

Cuts set-up time 60% or more for many height gage measurements.

- The leveling table, TE-20, permits you to quickly bring the surface of a part into alignment with a surface plate in both planes. Completely eliminates shimming. Saves so much time that, used only occasionally, it will pay for itself in two weeks.
- The top plate is stress-relieved steel providing about 67 square inches of work area. It is drilled and tapped for fixtures. Fine pitch screws and large knobs assure precisely controlled adjustments. Works with any type of height gage.
- Operation is simple. Height gage readings are taken at edges of the surface to be aligned. Each plate, independently adjustable at right angles to the other, is angled as required for precise alignment.
  Flatness = .025 mm / ***.001"***



Typical checks which require careful positioning of work because rest surface is not sufficiently parallel to other work surfaces. Leveling Table compensates for error quickly, drastically reduces set-up time.

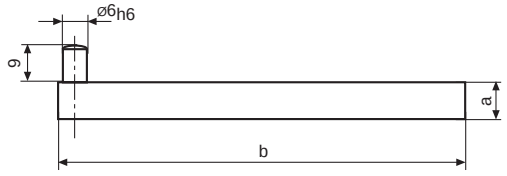


Parallelism | Step Height | Flatness | Center distance

Adjustment	Top Plate	Bottom Plate
Total	± 1° 30′	± 1° 30′

Martest - Accessories

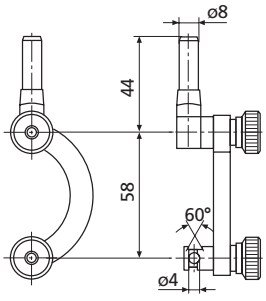
Holder 800 h



	Dimensions a	b	Order no.
800 h1	9x9	100	**4305888**
800 h2	***1/4" x 1/2"***	***4"***	**4305889**

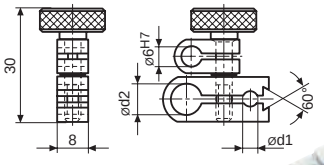
Universal centering support frame 800 b

Order no. 4305893



Indicator not included.

Universal clamp 800 k



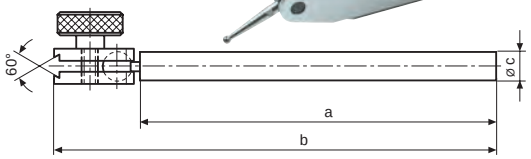
800 h1 with 800 k8

	Dimensions dia. d1	dia. d2	Order no.
800 k8	4	8	**4305891**
800 k3/8	***5/32"***	***3/8"***	**4305892**

Indicator not included.

Universal holder with dovetail clamp

800 hs8



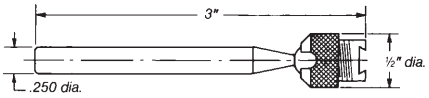
	Dimensions a	b	dia. c	Order no.
800 hs8	100	124	8	**4305886**
800 hs3/8	***4"***	***5"***	***3/8"***	**4305887**

Indicator not included.

Ball Clamp

- Dovetail and ball for indicator mounting and omni-directional orientation

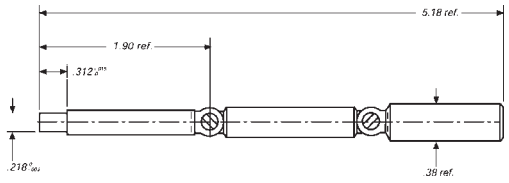
Order no. **AT-50**



Double-jointed Clamp

- Reaches up to 127 mm / ***5"*** with easy positioning for many applications including milling machine and Jig Borers

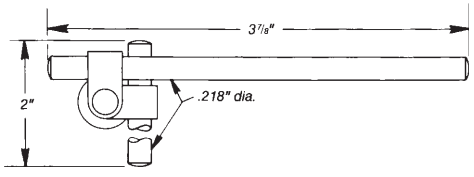
Order no. **AT-100**



Jig Borer Attachment

- Furnished with two rods and clamp for fast machine mounting

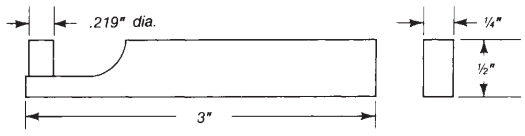
Order no. **RD-21**



Holding Bar

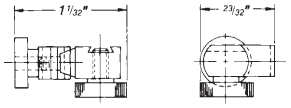
- Normally furnished with MarTest models. Three-inch length provides ample reach for most applications

Order no. **HB-2157**



Swivel Clamp

- Normally furnished with MarTest models. Allows indicator to be mounted on most indicator stands and fixtures



Order no. **CP-2199**

Martest - Accessories

Test Stand 1492B

- Use with any MarTest Indicator - Support arms stepped at one end (.218" dia.) for Swivel Clamp (CP-2199) included.
- Accommodates Vertical and Horizontal lug back mounts for AGD type Indicators.
- Bases have powerful "ON/OFF" permanent magnets which hold from any of four faces - three sides or bottom.

Indicator not included.

Base Dimensions W x L x H		Main Post Length		Main Post Diameter		Support Arm Length		Support Arm Diameter		Order no.
mm	*(inch)*	mm /	*inch*	mm /	*inch*	mm /	*inch*	mm /	*inch*	
60 x 48 x 59	***(2.4" x 1.9" x 2.2")***	178 /	***7"***	10 /	***.47"***	165 /	***6.5"***	9.9 /	***.39"***	**1492B-5**
60 x 48 x 59	***(2.4" x 1.9" x 2.2")***	178 /	***7"***	10 /	***.47"***	149 /	***5.9"***	9.9 /	***.39"***	**1492B-10**
114 x 48 x 59	***(4.5" x 1.9" x 2.2")***	401 /	***15.8"***	20 /	***.79"***	20 /	***7.9"***	14 /	***.55"***	**1492B-15**

Measurements are mm/inch. All models furnished with post clamp and indicator mounting clamp. Style 1492B-10 has fine adjustment on post clamp.

Transfer Stand 2300

- Fine adjustment conveniently located in base
- Three-point base pads improve accuracy
- Contoured shape facilitates movement
- Use with any Testmaster Indicator - stud accommodates Swivel Clamp (CP-2199)
- EHE-2048 Gage head requires a CP-116 Clamp

Indicator not included.

Base Dimensions W x L x H		Column (dia. x H)		Maximum vertical capacity		Reach (base to contact point)		Mounting stud dia.		Order no.
mm	*(inch)*	mm /	*inch*	mm /	*inch*	mm /	*inch*	mm /	*inch*	
76 x 110 x 45	***(3 x 4.375 x 1.75")***	25 x 430 /	***.995 x 17"***	457 /	***18"***	approx. 86 /	***3.375"***	5.55 /	***.218"***	**2300**

Mechanical 3D-Touch Probe MarTest 802 NW

Applications

Can be used on milling and CNC machines to

- determine the zero position on a work piece
- determine the center of a bore
- determine and correct the position of a work piece

and for measurement of

- lengths
- depths

Features

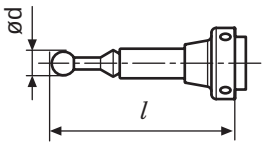
- High accuracy and linearity
  - suitable for measuring work pieces
  - measurement over the entire working range is possible
- Can be controlled independently of a machine tool
- Easy to read display
- Large working range in all axis (X, Y, Z) prevents damage to the stylus by contacting errors
- Shock and Water proof, ideal for the use on a machine with a tool changer
- Compact metal housing and long probe arm
- Supplied with: Styli 802 EWt and operating instructions

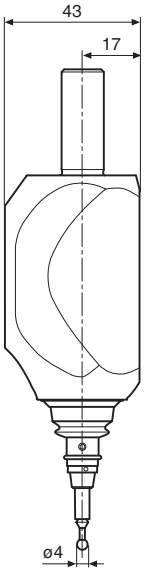
Technical Data

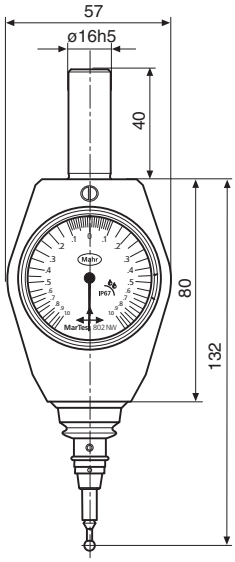
	Repeatability in zero position unidirectional	Readings	Dial dia.	Mounting shaft dia.	Order no.
802 NW	± 0.01 mm	0.01 mm	50 mm	16 mm	**4304311**

Accessories

Styli	dia. d mm	*l* mm	Order no.
802 EWt	4	31	**4304320**
802 NWt	6	56.6	**4304321**







Digital 3D-Touch Probe MarTest 802 EW

Applications

Can be used on milling and CNC machines to

- determine the zero position on a work piece
- determine the center of a bore
- determine and correct the position of a work piece

and for measurement of

- lengths
- depths

Features

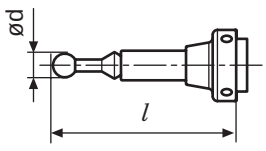
- High accuracy and linearity
  - suitable for measuring work pieces
  - measurement over the entire working range is possible
- Can be controlled independently of a machine tool
- Easy to read display due to the combination of:
  - a progressive analog display (bar graph) for dynamic path information
  - a digital display for accurate reading
- Large working range (6 mm) in all axis (X, Y, Z) prevents damage to the stylus by contacting errors
- Shock and water proof; ideal for the use on a machine with a tool changer
- Compact metal housing and long probe arm
- Supplied with: Styli 802 EWt, battery and operating instructions

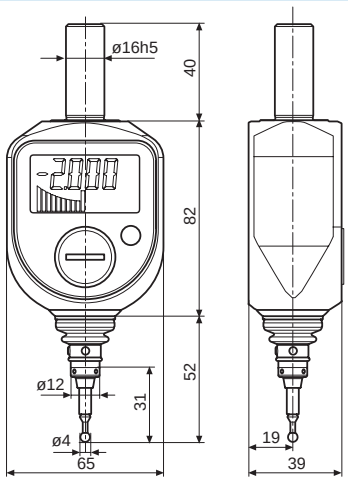
Technical Data

	Working range X, Y, Z-Axis	Repeatability in zero position unidirectional	Resolution of digital display	Display range	Mounting shaft dia.	Order no.
802 EW	-2 to 4 mm	± 0.005 mm	0.005 mm	± 2 mm	16 mm	**4304300**
802 EWZ	***-.0787"*** to ***.157"***	***± .0001"***	***.0001"***	***± .0787"***	***3/4"***	**4304305**

Accessories

Styli	dia. d mm	*l* mm	Order no.
802 EWt	4	31	**4304320**





THEY POINT YOU IN THE RIGHT DIRECTION.
MARCATOR DIAL INDICATORS.

The latest information on MARCATOR products can be found on our website:
www.mahr.de/en/Home, WebCode 20234

► | Dial indicators due to their versatility rank as the most frequently applied transducer, just like our MarCator series. Our mechanical dial indicators have precision gears and pinions for a maximum accuracy. They are also available in shock and waterproof versions. Our digital indicator range contains highly precise electronic measuring systems, which make measuring functions possible yet without the loss of an analog display. With the simple operation, the large display that can be read error free and the possibility of a rapid and simple transmission of all your measurement results thus meeting all requirements of a modern measuring instrument. | ◄

► | MarCator. Dial and Digital Indicators

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MarCator ANSI/AGD Dial Indicators

OVERVIEW

Dial Indicators Selection Guide

Grad	Range per Rev.	Total Range	Dial Style w/o Rev	Dial Style with Rev	Order number w/o Rev Counter	Order number with Rev Counter
			Group 0			
.0001"	***.004"***	***.010"***	0-2-0	–	**A1/2Q**	
.0005"	***.020"***	***.050"***	0-10-0	–	**A3Q**	
.001"	***.040"***	***.100"***	0-20-0	–	**A6Q**	
.002 mm	.100	.250	0-5-0	–	**N1/2O**	
.005 mm	.500	1.25	0-25-0	–	**N3I**	
.010 mm	1.00	2.50	0-50-0	–	**N6I**	
			Group 1			
.0001"	***.010"***	***.025"***	0-5-0	0-10	**12I**	**12I-RC**
.00025"	***.010"***	***.025"***	0-5-0	0-10	**12Q**	**12Q-RC**
.00025"	***.020"***	***.050"***	0-10-0	0-20	**B3K**	**B3K-RC**
.0005"	***.020"***	***.050"***	0-10-0	0-20	**B3Q**	**B3Q-RC**
.0005"	***.030"***	***.075"***	0-15-0	0-30	**B5M**	**B5M-RC**
.0005"	***.040"***	***.100"***	0-20-0	0-40	**B6K**	**B6K-RC**
.0005"	***.050"***	***.125"***	0-25-0	0-50	**B7I**	**B7I-RC**
.001"	***.020"***	***.050"***	0-10-0	0-20	**B3W**	**B3W-RC**
.001"	***.040"***	***.100"***	0-20-0	0-40	**B6Q**	**B6Q-RC**
.001"	***.050"***	***.125"***	0-25-0	0-50	**B7O**	**B7O-RC**
.001"	***.100"***	***.250"***	0-50-0	0-100	**B8I**	**B8I-RC**
.002 mm	.200	.500	0-10-0	0-20	**O1I**	**O1I-RC**
.005 mm	.500	1.25	0-25-0	0-50	**O3I**	**O3I-RC**
.010 mm	1.00	2.50	0-50-0	0-100	**O6I**	**O6I-RC**
.025 mm	2.50	6.25	0-125-0	0-250	**O8I**	**O8I-RC**
			Group 2			
.00005"	***.004"***	***.010"***	0-2-0	0-4	**C1/2K**	**C1/2K-RC**
.0001"	***.008"***	***.020"***	0-4-0	0-8	**C1K**	**C1K-RC**
.0001"	***.010"***	***.025"***	0-5-0	0-10	**2015781**	**2014761**
.00025"	***.010"***	***.025"***	0-5-0	0-10	**2015782**	**2014791**
.00025"	***.020"***	***.050"***	0-10-0	0-20	**2015783**	**2014808**
.0005"	***.020"***	***.050"***	0-10-0	0-20	**2015784**	**2014810**
.0005"	***.030"***	***.075"***	0-15-0	0-30	**2015786**	**2014811**
.0005"	***.040"***	***.100"***	0-20-0	0-40	**2015787**	**2014812**
.0005"	***.050"***	***.125"***	0-25-0	0-50	**2015790**	**2014814**
.001"	***.020"***	***.050"***	0-10-0	0-20	**2015785**	**2014809**
.001"	***.040"***	***.100"***	0-20-0	0-40	**2015789**	**2014813**
.001"	***.050"***	***.125"***	0-25-0	0-50	**2015791**	**2014815**
.001"	***.100"***	***.250"***	0-50-0	0-100	**2015792**	**2011049**
.001 mm	.100	.250	0-5-0	0-10	**P1/2I**	**P1/2I-RC**
.002 mm	.200	.500	0-10-0	0-20	**P1I**	**P1I-RC**
.005 mm	.500	1.25	0-25-0	0-50	**2015793**	**2014817**
.010 mm	1.00	2.50	0-50-0	0-100	**2015794**	**2014818**
.020 mm	2.00	5.00	0-100-0	0-200	**2015795**	**2014819**
			1 Rev			
.0005"	**–**	***.040"***	–	–	**2014793**	
.001"	**–**	***.080"***	–	–	**2014792**	
.010 mm	–	1.00	–	–	**2014795**	
.020 mm	–	2.00	–	–	**2014794**	
.010 mm	–	1.00	–	–	**2014797**	
.020 mm	–	2.00	–	–	**2014796**	

Grad	Range per Rev.	Total Range	Dial Style w/o Rev	Dial Style with Rev	Order number w/o Rev Counter	Order number with Rev Counter
			Group 3			
.0001"	***.008"***	***.020"***	0-4-0	0-8	**D1K**	**D1K-RC**
.0001"	***.010"***	***.025"***	0-5-0	0-10	**32I**	**32I-RC**
.00025"	***.010"***	***.025"***	0-5-0	0-10	**32Q**	**32Q-RC**
.00025"	***.020"***	***.050"***	0-10-0	0-20	**D3K**	**D3K-RC**
.00025"	***.030"***	***.075"***	0-15-0	0-30	**D5G**	**D5G-RC**
.0005"	***.020"***	***.050"***	0-10-0	0-20	**D3Q**	**D3Q-RC**
.0005"	***.030"***	***.075"***	0-15-0	0-30	**D5M**	**D5M-RC**
.0005"	***.040"***	***.100"***	0-20-0	0-40	**D6K**	**D6K-RC**
.0005"	***.050"***	***.125"***	0-25-0	0-50	**D7I**	**D7I-RC**
.001"	***.020"***	***.050"***	0-10-0	0-20	**D3W**	**D3W-RC**
.001"	***.040"***	***.100"***	0-20-0	0-40	**D6Q**	**D6Q-RC**
.001"	***.050"***	***.125"***	0-25-0	0-50	**D7O**	**D7O-RC**
.001"	***.100"***	***.250"***	0-50-0	0-100	**D8I**	**D8I-RC**
.002 mm	.200	.500	0-10-0	0-20	**Q1I**	**Q1I-RC**
.005 mm	.500	1.25	0-25-0	0-50	**Q3I**	**Q3I-RC**
.010 mm	1.00	2.50	0-50-0	0-100	**Q6I**	**Q6I-RC**
.020 mm	2.00	5.00	0-100-0	0-200	**Q8I**	**Q8I-RC**
			Group 4			
.0001"	***.008"***	***.020"***	0-4-0	0-8	**E1K**	**E1K-RC**
.0001"	***.010"***	***.025"***	0-5-0	0-10	**42I**	**42I-RC**
.00025"	***.020"***	***.050"***	0-10-0	0-20	**E3K**	**E3K-RC**
.00025"	***.030"***	***.075"***	0-15-0	0-30	**E5G**	**E5G-RC**
.0005"	***.020"***	***.050"***	0-10-0	0-20	**E3Q**	**E3Q-RC**
.0005"	***.030"***	***.075"***	0-15-0	0-30	**E5M**	**E5M-RC**
.0005"	***.050"***	***.125"***	0-25-0	0-50	**E7I**	**E7I-RC**
.001"	***.020"***	***.050"***	0-10-0	0-20	**E3W**	**E3W-RC**
.001"	***.050"***	***.125"***	0-25-0	0-50	**E7O**	**E7O-RC**
.001"	***.100"***	***.250"***	0-50-0	0-100	**E8I**	**E8I-RC**
.002 mm	.200	.500	0-10-0	0-20	**R1I**	**R1I-RC**
.005 mm	.500	1.25	0-25-0	0-50	**R3I**	**R3I-RC**
.010 mm	1.00	2.50	0-50-0	0-100	**R6I**	**R6I-RC**
.020 mm	2.00	5.00	0-100-0	0-200	**R8I**	**R8I-RC**
			Long Range			
.0001"	***.010"***	***.500"***	–	0-10		**42IQ**
.001"	***.100"***	***.500"***	–	0-100		**2014699**
.001"	***.100"***	***1.00"***	–	0-100		**2014698**
.001"	***.100"***	***1.00"***	–	0-100		**D8IS**
.001"	***.100"***	***2.00"***	–	0-100		**D8IT**
.001"	***.100"***	***3.00"***	–	0-100		**E8IU**
.010"	***1.00"***	***1.00"***	–	0-1000		**2014816**
.010 mm	1.00	25.00	–	0-100		**SP6IS**
.010 mm	1.00	25.00	–	0-100		**SQ6IS**
.025 mm	2.50	50.00	–	0-25		**Q8IT**
.025 mm	2.50	75.00	–	0-25		**R8IU**

Dial Indicators per ANSI/AGD

Features

You get more with Mahr Federal Dial Indicators

- Proven for the most demanding applications
- Superior design and serviceability
- Unmatched customer and technical support
- Catalog and customized styles
- Full range of accessories to suit virtually every need
- Unit construction, removable movement . . . saves repair/cleaning time and maintenance costs
- Hardened gears and stainless steel racks provide lasting protection against indicator failure due to shock or wear
- Jeweled bearings resist friction, add to longer indicator life
- Skeletonized, hobbed gears for more sensitive response, superior indicator accuracy with minimal hysteresis error
- Soft-tinted dials (green, inch.,or yellow, metric) minimize eye strain
- Special steel alloy, balanced dial hand affords no-shift, precise reading
- Controlled rack and pinion mesh eliminates slope for precise response and reading
- Smooth-adjusting bezels for easy setup
- Positive pressure pull-back spring . . . less maintenance
- Compliance with ANSI/AGD dimensional and accuracy specifications
- Many models employ stainless steel stem for added durability

How to Order

How to Order Your Dial Indicator and Accessories

1. Select the type of Indicator you require. Check the specialize types as well as regular ANSI/AGD models.
2. Choose the Model best suited to the magnification, range and viewing needs of your job.
3. Accessories. These are important because they greatly increase the speed, efficiency and convenience of obtaining desired results. A wide selection of Mahr Federal dial indicator accessories are shown in this catalog.
4. Options. You are not restricted to the normally furnished equipment mentioned above. A wide choice of optionally available points, backs or dial arrangements can be specified at little or no extra cost. We maintain the most extensive stock of indicators and gages for dimensional measurement available anywhere. Items which are in stock are normally shipped within five working days. If you need them sooner, inquire when ordering. We can often make next-day deliveries.
   Understandably, some of the items in this catalog are not always in stock or are special order items, which take a little longer to ship.

If you need help in determining what Indicators right for your application, just ask us. Contact Mahr Federal:

1-800-333-4243

One of our experienced professionals will give you courteous, professional advice that can save you time and money.

Replacement indicators

Although Mahr Federal dial indicators are known for their lifetime service, it is not uncommon to change an indicator back, contact point, dial or to even add an accessory to suit your latest application.

When ordering a replacement dial indicator for a specific application, always verify the configuration of the indicator. Ordering a replacement using the standard model number shown on your indicator may not provide you with the configuration or accessories you desire.

Dial Indicators per ANSI/AGD

Selecting a Dial Indicator

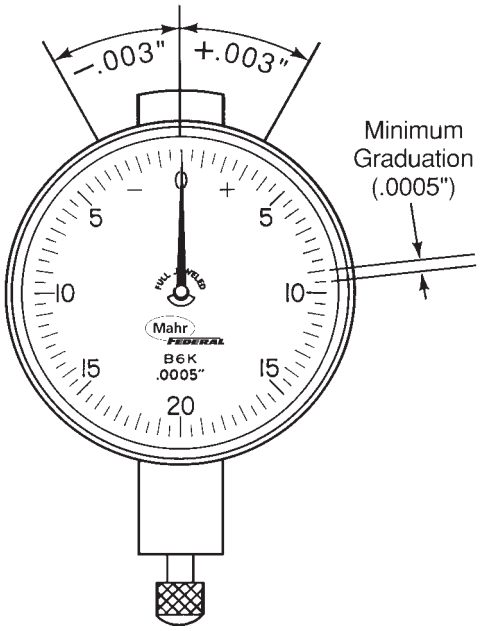
Since modern manufacturing involves a wide range of tolerances. choosing a dial indicator might be difficult, especially since the number of indicators available is so vast. The following guidelines were prepared to assist you in selecting the right model for your application.

Consider four characteristics when selecting a dial indicator:

- **Minimum Graduation Value** — value of the smallest graduations marked on the dial. From several different values available from Mahr Federal, select the one which is closest to 10% of the tolerance spread of the work you are measuring. This assures that the tolerance will span about ten divisions of the dial
- **Size** — represents the bezel diameter. Make your selection on the basis of space available for the indicator and the distance from which it will be viewed. The Indicator photograph shown on the first page of each ANSI/AGD Group is full scale. Simply place the page which illustrates the Indicator at the expected viewing distance, and choose the size that offers you the best readability and is the proper size for your fixture. Mahr Federal's "C" size bezels (ANSI/AGD Group 2), which have a diameter of 2-1/4", are the most popular.
- **Range per Revolution** — represents the distance the spindle travels with one complete revolution of the dial hand. From the dials available in the size and minimum graduation value you chose, select the range per revolution which allows the tolerance spread to occupy 1/10 to 1/4 of the dial.
- **Total Range** — the maximum distance over which the indicator spindle can travel. Usually, this represents 2-1/2 revolutions of the hand, which is adequate for most needs. Sometimes, however, this may not be adequate for your application and a special total range may be necessary.

If your tolerance spread is .006" (±.003"), then, the most suitable minimum graduation value is .0005".

TOLERANCE IS .006"



Your tolerance spread is .006". You have chosen an ANSI/AGD Group 2 (Mahr Federal "C" Size) dial with a minimum graduation value of .0005". Mahr Federal offers four indicator types in this size and minimum graduation value. Of these, type C5M has a range per revolution of .030" which is about midway between your tolerance extremes.

You selected a C5M indicator. Your total range, however, needs to be at least .200" so the spindle can clear the lip of your part. But, the longest range available in the C5M indicator you need is only .075". Special ranges up to .400" are available for this indicator type. Select the closest range for your application (for Model C5M, you would select .250").

If the range you need is not listed under the "Special Ranges" category, contact Mahr Federal. Chances are we can supply the range you need.

Copies of the current ANSI Standard for Dial Indicators (ANSI B89.1.1 0-1987) are available from:

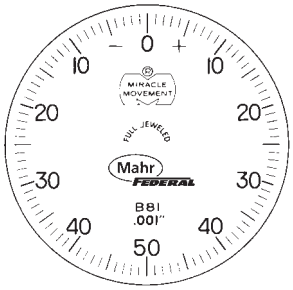
The American Society of Mechanical Engineers
ASME Order Desk
22 Law Drive
Fairfield, NJ 07007
(973)882-1167

Dial Indicators per ANSI/AGD

Dial Types

1. Balanced (+) on right.
Normally furnished on all Group 0, 1, 3 and 4 ANSI/AGD indicators only, unless otherwise specified. Indicates an increasing value when contact is depressed as in comparison type O.D. snap and bench thickness gages.

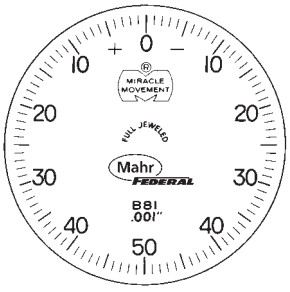
Note: If Revolution Counter models are ordered, counter dial numbered counterclockwise.



2. Balanced (+) on left.
Indicates decreasing values when contact is depressed as in comparison bore* and depth gages.

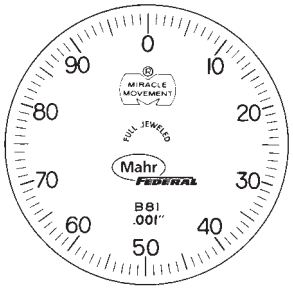
Note: With Revolution Counter models, counter dial numbered clockwise.

** Will vary as dictated by motion transfer design.*



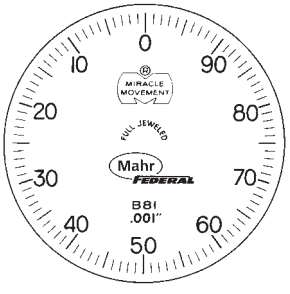
3. Continuous clockwise.
Normally furnished on Long and Extra Long Range Indicators, unless otherwise specified. Indicates an increasing value when contact is depressed as in direct-reading thickness gages.

Note: With Revolution Counter models, counter dial numbered counterclockwise.



4. Continuous counterclockwise.
Indicates a decreasing value when contact is depressed as in direct reading slot, recess or hole depth measurements.

Note: If Revolution Counter models are ordered, counter dial numbered clockwise



Dial Indicators per ANSI/AGD Group 0 - Mahr Federal Series A and N

Where available space prohibits the use of a larger dial indicator.

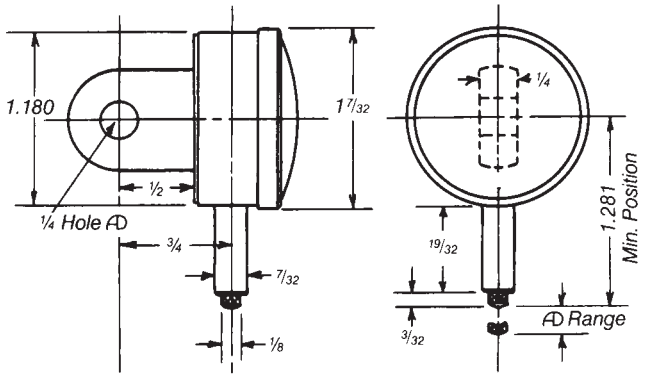
Technical Data

Mahr Federal Series A (inch)
Dial: approx. 1.250" dia. with soft-green tint

Measuring range	Graduation value	Dial style	Range per revolution	Accuracy	Order no.
.010"	***.0001"***	0-2-0	***.004"***	***±.0001"***	**A1/2Q**
.050"	***.0005"***	0-10-0	***.020"***	***±.0005"***	**A3Q**
.100"	***.001"***	0-20-0	***.040"***	***±.001"***	**A6Q**

Mahr Federal Series N (Metric – mm)
Dial: approx. 32 mm dia. with soft-yellow tint

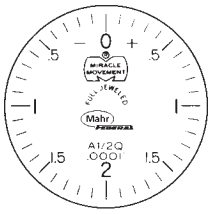
Measuring range	Graduation value	Dial style	Range per revolution	Accuracy	Order no.
0.250	0.002	0-5-0	0.100	± 0.002 mm	**N1/2O**
1.250	0.005	0-25-0	0.500	± 0.005 mm	**N3I**
2.500	0.010	0-50-0	1.00	± 0.010 mm	**N6I**



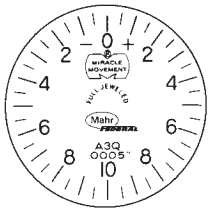
Backs can be rotated 90° and 180°

Dial Indicators per ANSI/AGD Group 0 - Mahr Federal Series A and N

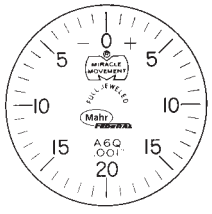
Mahr Federal Series A



A1/2Q



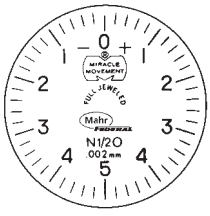
A3Q



A6Q

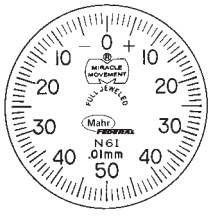
- Normally furnished: balanced dial with + on right; centered vertical lug back; regular contact point, .09" radiused, .093" long.
- Optional dials: balanced with + on left; continuous clockwise; continuous counter-clockwise. Order by part number and specify dial style desired.
- For other dial styles or special requirements, call Mahr Federal.

Mahr Federal Series N



N1/2O

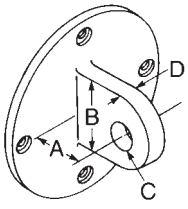
N3I



N6I

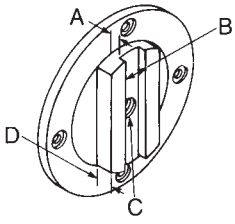
Backs for ANSI Group 0 - Series A and N

Vertical (Centered) Lug Back is normally furnished and included in price of Indicator. Back can be rotated 90° for horizontal lug mounting.



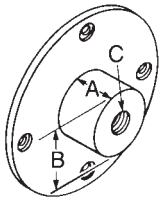
Vertical Lug (Centered)
BK-37

A	B	C	D
1/2	11/16	1/4	1/4



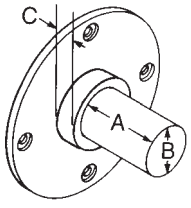
Adjustable
BK-45

A	B	C	D
1/8	3/8	8-32	1/4



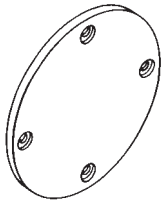
Screw Type
BK-88

A	B	C
1/2	11/16	1/4-28



Post
BK-38

A	B	C
5/16	7/32	1/16

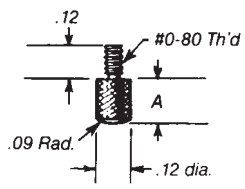


Flat
BK-32

Split Bushing, BU-112 Fits Stem (.218" I.D. x .375" O.D.). .500" long.

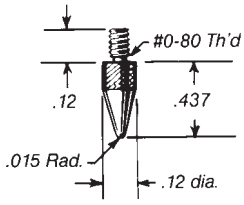
Points for ANSI Group 0 - Series A and N

Regular PT-43
normally furnished

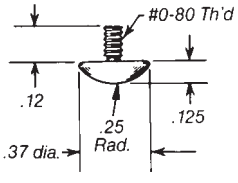


Dim. A	Style
3/32"	PT-43
1/4"	PT-204
3/8"	PT-205
1/2"	PT-207
5/8"	PT-208
3/4"	PT-209
7/8"	PT-210
1"	PT-211

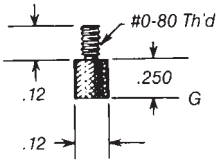
Taper
PT-119



Button
PT-118



Flat
AL-61



Dial Indicators per ANSI/AGD Group 1 - Mahr Federal Series B and O

Technical Data

Mahr Federal Series B (inch)
Dial: approx. 1.750" dia. with soft-green tint

Measuring range	Graduation value	Dial style w/o Rev Counter	Dial style with Rev Counter	Range per revolution	Accuracy	Order no. w/o Rev Counter	Order no. with Rev Counter
.025"	***.0001"***	0-5-0	0-10	***.010"***	***± .0001"***	**12I**	**12I-RC**
.025"	***.00025"***	0-5-0	0-10	***.010"***	***± .00025"***	**12Q**	**12Q-RC**
.050"	***.00025"***	0-10-0	0-20	***.020"***	***± .00025"***	**B3K**	**B3K-RC**
.050"	***.0005"***	0-10-0	0-20	***.020"***	***± .0005"***	**B3Q**	**B3Q-RC**
.075"	***.0005"***	0-15-0	0-30	***.030"***	***± .0005"***	**B5M**	**B5M-RC**
.100"	***.0005"***	0-20-0	0-40	***.040"***	***± .0005"***	**B6K**	**B6K-RC**
.125"	***.0005"***	0-25-0	0-50	***.050"***	***± .0005"***	**B7I**	**B7I-RC**
.050"	***.001"***	0-10-0	0-20	***.020"***	***± .001"***	**B3W**	**B3W-RC**
.100"	***.001"***	0-20-0	0-40	***.040"***	***± .001"***	**B6Q**	**B6Q-RC**
.125"	***.001"***	0-25-0	0-50	***.050"***	***± .001"***	**B7O**	**B7O-RC**
.250"	***.001"***	0-50-0	0-100	***.100"***	***± .001"***	**B8I**	**B8I-RC**

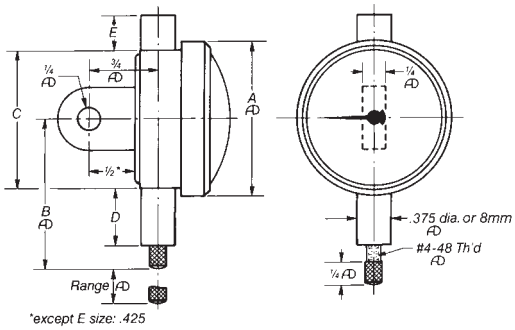
Mahr Federal Series O (Metric, mm)
Dial: approx. 45 mm dia. with yellow tint

Measuring range	Graduation value	Dial style w/o Rev Counter	Dial style with Rev Counter	Range per revolution	Accuracy	Order no. w/o Rev Counter	Order no. with Rev Counter
0.500	0.002	0-10-0	0-20	0.200	± 0.004	**O1I**	**O1I-RC**
1.250	0.005	0-25-0	0-50	0.500	± 0.005	**O3I**	**O3I-RC**
2.500	0.010	0-50-0	0-100	1.000	± 0.010	**O6I**	**O6I-RC**
6.250	0.025	0-125-0	0-250	2.500	± 0.025	**O8I**	**O8I-RC**

Dimensions

ANSI / AGD Group	Mahr Federal Styles	A mm/inch	B mm/inch	C mm/inch	D mm/inch	E mm/inch
1	B/O	42.86/ 1.688"	41.28/ 1.625"	38.10/ 1.5"	15.88/ .625"	8.73/ .344"
2	C/P	57.15/ 2.25"	50.80/ 2"	52.39/ 2.063"	18.26/ .719"	8.73/ .344"

These indicators are normally furnished with continuous dial (with R.C.) or + on right balance dial (w/o R.C.), lug back and .18" by .250" long contact.



Dial Indicators per ANSI/AGD Group 2 - Mahr Federal Series C and P

Ordering Information

In addition to the information provided below, see pages 5-4 & 5-5 for complete instructions on ordering your dial indicators and accessories.

www.mahr.com

Technical Data

Mahr Federal Series C (inch)
Dial: approx. 2.250" dia. with soft-green tint

Measuring range	Graduation value	Dial style w/o Rev Counter	Dial style with Rev Counter	Range per revolution	Accuracy	Order no. w/o Rev Counter	Order no. with Rev Counter	OLD Order no.
.020"	*.0001"*	0-4-0	0-8	*.008"*	*±.0001"*	**C1K**	**C1K-RC**	**C1K**
.025"	*.0001"*	0-5-0	0-10	*.010"*	*±.0001"*	**2015781**	**2014761**	**C2I/22I**
.025"	*.00025"*	0-5-0	0-10	*.010"*	*±.00025"*	**2015782**	**2014791**	**C2Q/22Q**
.050"	*.00025"*	0-10-0	0-20	*.020"*	*±.00025"*	**2015783**	**2014808**	**C3K/23K**
.050"	*.0005"*	0-10-0	0-20	*.020"*	*±.0005"*	**2015784**	**2014810**	**C3Q/23Q**
.075"	*.0005"*	0-15-0	0-30	*.030"*	*±.0005"*	**2015786**	**2014811**	**C5M/25M**
.100"	*.0005"*	0-20-0	0-40	*.040"*	*±.0005"*	**2015787**	**2014812**	**C6K/26K**
.125"	*.0005"*	0-25-0	0-50	*.050"*	*±.0005"*	**2015790**	**2014814**	**C7I/27I**
.050"	*.001"*	0-10-0	0-20	*.020"*	*±.001"*	**2015785**	**2014809**	**C3W/23W**
.100"	*.001"*	0-20-0	0-40	*.040"*	*±.001"*	**2015789**	**2014813**	**C6Q/26Q**
.125"	*.001"*	0-25-0	0-50	*.050"*	*±.001"*	**2015791**	**2014815**	**C7O/27O**
.250"	*.001"*	0-50-0	0-100	*.100"*	*±.001"*	**2015792**	**2011049**	**C8I/28IN**
Super Sensitive Type (Inch)								
.010"	*.00005"*	0-2-0	0-4	*.004"*	*±.0001"*	**C1/2K**	**C1/2K-RC**	**C1/2K**

Mahr Federal Series P (Metric, mm)
Dial: approx. 57 mm dia. with soft-yellow tint

Measuring range	Graduation value	Dial style w/o Rev Counter	Dial style with Rev Counter	Range per revolution	Accuracy	Order no. w/o Rev Counter	Order no. with Rev Counter	OLD Order no.
0.500	0.002	0-10-0	0-20	0.200	± 0.004	**P1I**	**P1I-RC**	**P1I/21IN**
1.250	0.005	0-25-0	0-50	0.500	± 0.005	**2015793**	**2014817**	**P3I/23I**
2.500	0.010	0-50-0	0-100	1.000	± 0.010	**2015794**	**2014818**	**P6I/26I**
5.000	0.020	0-100-0	0-200	2.000	± 0.020	**2015795**	**2014819**	**P8I/28IM**
Super Sensitive Type (Metric – mm)								
0.250	0.001	0-5-0	0-10	0.100	± 0.002	**P1/2I**	**P1/2I-RC**	**P1/2I**

These indicators are normally furnished with continuous dial (with R.C.) or + on right balance dial (w/o R.C.), lug back, .18" by .250" long contact and tolerance hands.*

** tolerance hands not supplied on C1K, C1/2K , P1I & P1/2I.*

Accessories

- Contact Points - see page 5-27 and 5-22
- Backs and Mounting Brackets - see pages 5-21 and 5-22
- Accessories - see pages 5-23 and 5-24

Dial Indicators per ANSI/AGD Group 3 - Mahr Federal Series D and Q

Recommended for larger gages and greater visibility.

Ordering Information

In addition to the information provided below, see pages 5-4 & 5-5 for complete instructions on ordering your dial indicators and accessories.

www.mahr.com

Technical Data

Mahr Federal Series D (inch)
Dial: approx. 2.750" dia. with soft-green tint

Measuring range	Graduation value	Dial style w/o Rev Counter	Dial style with Rev Counter	Range per revolution	Accuracy	Order no. w/o Rev Counter	Order no. with Rev Counter
.020"	***.0001"***	0-4-0	0-8	***.008"***	***±.0001"***	**D1K**	**D1K-RC**
.025"	***.0001"***	0-5-0	0-10	***.010"***	***±.0001"***	**32I**	**32I-RC**
.025"	***.00025"***	0-5-0	0-10	***.010"***	***±.00025"***	**32Q**	**32Q-RC**
.050"	***.00025"***	0-10-0	0-20	***.020"***	***±.00025"***	**D3K**	**D3K-RC**
.075"	***.00025"***	0-15-0	0-30	***.030"***	***±.00025"***	**D5G**	**D5G-RC**
.050"	***.0005"***	0-10-0	0-20	***.020"***	***±.0005"***	**D3Q**	**D3Q-RC**
.075"	***.0005"***	0-15-0	0-30	***.030"***	***±.0005"***	**D5M**	**D5M-RC**
.100"	***.0005"***	0-20-0	0-40	***.040"***	***±.0005"***	**D6K**	**D6K-RC**
.125"	***.0005"***	0-25-0	0-50	***.050"***	***±.0005"***	**D7I**	**D7I-RC**
.050"	***.001"***	0-10-0	0-20	***.020"***	***±.001"***	**D3W**	**D3W-RC**
.100"	***.001"***	0-20-0	0-40	***.040"***	***±.001"***	**D6Q**	**D6Q-RC**
.125"	***.001"***	0-25-0	0-50	***.050"***	***±.001"***	**D7O**	**D7O-RC**
.250"	***.001"***	0-50-0	0-100	***.100"***	***±.001"***	**D8I**	**D8I-RC**

Mahr Federal Series Q (Metric – mm)
Dial: approx. 70 mm dia. with soft-yellow tint

Measuring range	Graduation value	Dial style w/o Rev Counter	Dial style with Rev Counter	Range per revolution	Accuracy	Order no. w/o Rev Counter	Order no. with Rev Counter
0.500	0.002	0-10-0	0-20	0.200	± 0.004	**Q1I**	**Q1I-RC**
1.250	0.005	0-25-0	0-50	0.500	± 0.005	**Q3I**	**Q3I-RC**
2.500	0.010	0-50-0	0-100	1.000	± 0.020	**Q6I**	**Q6I-RC**
5.000	0.020	0-100-0	0-200	2.000	± 0.020	**Q8I**	**Q8I-RC**

These indicators are normally furnished with continuous dial (with R.C.) or + on right balance dial (w/o R.C.), lug back, and .18" by .250" long contact.

Accessories

- Contact Points - see pages 5-27 and 5-22
- Backs and Mounting Brackets - see pages 5-21 and 5-22
- Accessories - see pages 5-23 and 5-24

Dial Indicators per ANSI/AGD Group 4 - Mahr Federal Series E and R

Technical Data

Mahr Federal Series E (inch)
Dial: approx. 3.625" dia. with soft-green tint

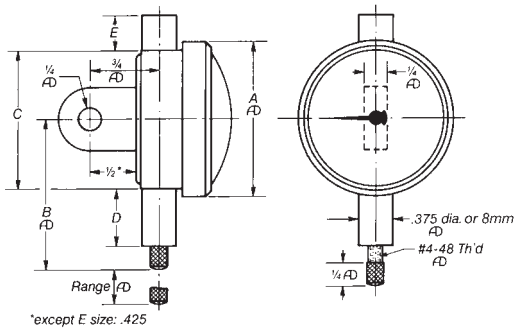
Measuring range	Graduation value	Dial style w/o Rev Counter	Dial style with Rev Counter	Range per revolution	Accuracy	Order no. w/o Rev Counter	Order no. with Rev Counter
.020"	***.0001"***	0-4-0	0-8	***.008"***	***± .0001"***	**E1K**	**E1K-RC**
.025"	***.0001"***	0-5-0	0-10	***.010"***	***± .0001"***	**42I**	**42I-RC**
.050"	***.00025"***	0-10-0	0-20	***.020"***	***± .00025"***	**E3K**	**E3K-RC**
.075"	***.00025"***	0-15-0	0-30	**.030"**	**± .00025"**	**E5G**	**E5G-RC**
.050"	***.0005"***	0-10-0	0-20	***.020"***	***± .0005"***	**E3Q**	**E3Q-RC**
.075"	***.0005"***	0-15-0	0-30	***.030"***	***± .0005"***	**E5M**	**E5M-RC**
.125"	***.0005"***	0-25-0	0-50	***.050"***	***± .0005"***	**E7I**	**E7I-RC**
.050"	***.001"***	0-10-0	0-20	***.020"***	***± .001"***	**E3W**	**E3W-RC**
.125"	***.001"***	0-25-0	0-50	***.050"***	***± .001"***	**E7O**	**E7O-RC**
.250"	***.001"***	0-50-0	0-100	***.100"***	***± .001"***	**E8I**	**E8I-RC**

Mahr Federal Series R (Metric, mm)
Dial: approx. 92 mm dia. with yellow tint

Measuring range	Graduation value	Dial style w/o Rev Counter	Dial style with Rev Counter	Range per revolution	Accuracy	Order no. w/o Rev Counter	Order no. with Rev Counter
0.500	0.002	0-10-0	0-20	0.200	± 0.004	**R1I**	**R1I-RC**
1.250	0.005	0-25-0	0-50	0.500	± 0.005	**R3I**	**R3I-RC**
2.500	0.010	0-50-0	0-100	1.000	± 0.010	**R6I**	**R6I-RC**
5.000	0.020	0-100-0	0-200	2.000	± 0.020	**R8I**	**R8I-RC**

Dimensions

ANSI / AGD Group	Mahr Federal Styles	A mm/inch	B mm/inch	C mm/inch	D mm/inch	E mm/inch
3	D/Q	69.85 / 2.75"	53.98 / 2.125"	65.09 / 2.563"	15.88 / .625"	8.73 / .344"
4	E/R	92.08 / 3.625"	65.09 / 2.563"	87.31 / 3.438"	15.88 / .625"	8.73 / .344"



*except E size: .425

These indicators are normally furnished with continuous dial (with R.C.) or + on right balance dial (w/o R.C.), lug back and .18" by .250" long contact.

Easy Reading, Single Revolution Dial Indicator

Easy reading

A practical solution for inspectors and machine operators who need to eliminate the potential for indicator misreadings. No matter how far out of tolerance a part may be, the needle of a one revolution indicator will always stay in the red, non-read zone – no passing zero again – no reading errors.

- No limited contact travel
- Shockproof "Following Movement" always keeps the hand within a single revolution
- Alternate contact points, backs and other accessories are optionally available
- Metric dials are yellow
- One-piece case design
- Inserted precision bearings
- Available in ANSI/AGD Group 2 size
- Flat back

Technical Data

Measuring range	Graduation value	Stem diameter	Model no.	Order no.
2 mm	0.02 mm	***.375"***	**P1RN-200**	**2014794**
1 mm	0.01 mm	***.375"***	**P1RN-100**	**2014795**
2 mm	0.02 mm	8 mm	**M1RN-200**	**2014796**
1 mm	0.01 mm	8 mm	**M1RN-100**	**2014797**
.080"	***.001"***	***.375"***	**C1RN-80**	**2014792**
.040"	***.0005"***	***.375"***	**C1RN-40**	**2014793**

High Performance, Dial Indicators per ANSI/AGD Group 2

Features

- A well thought-out design, the use of high-quality components and materials as well as the precision engineered mechanism guarantee the outstanding quality of these indicators.
- The concentric "Speed Read" pointer (on 1.0" and .500" models) allows easy and safe reading of this Dial Indicator
- Spindle and stem are made of resistant stainless steel. Supplied with: Lug Back and Tolerance Hands

2016005

2016002

Technical Data

Measuring Range	Graduation value	Stem diameter	Dial style	Range per Rev.	Rev. Counter	Order no.
.250"	***.001"***	***.375"***	0-100	***.100"***	Standard	**2016005**
.500"	***.001"***	***.375"***	0-100	***.100"***	Speed read	**2016004**
1.00"	***.001"***	***.375"***	0-100	***.100"***	Speed read	**2016002**

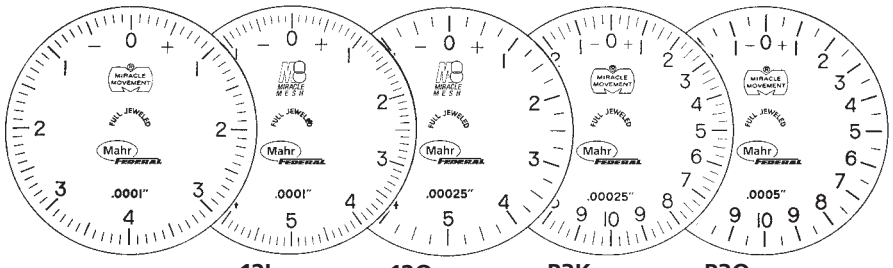
Accessories

Flat Back	**2247145**
Lug Back	**2016007**
Screw back	**2016008**
Post back	**2016009**
Adj. Back	**2016010**

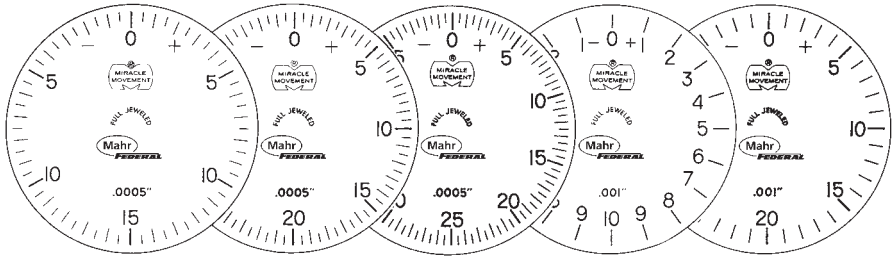
- Contact Points - see pg 5-27

Dial Styles for ANSI/AGD Groups 1 thru 4 Balanced Dials

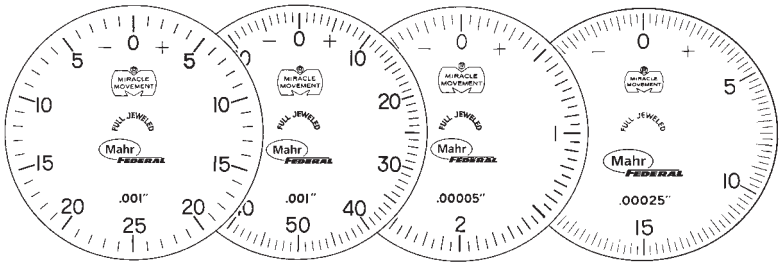
Mahr Federal Series B thru E



	12I	12Q	B3K	B3Q
C1K	2015781	2015782	2015783	2015784
D1K	32I	32Q	D3K	D3Q
E1K	42I		E3K	E3Q

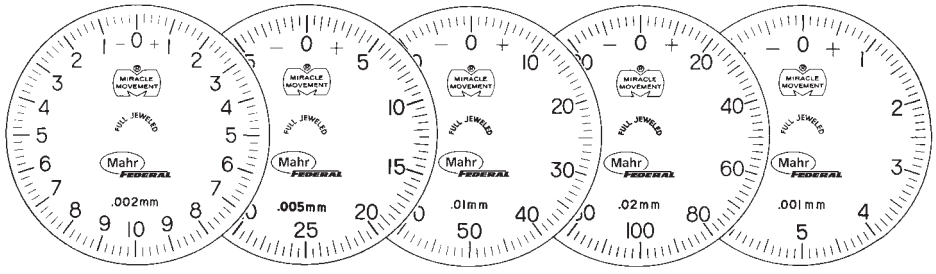


B5M	B6K	B7I	B3W	B6Q
2015786	2015787	2015790	2015785	2015789
D5M	D6K	D7I	D3W	D6Q
E5M		E7I	E3W	



B7O	B8I		
2015791	2015792	C1/2K	
D7O	D8I		D5G
E7O	E8I		E5G

Mahr Federal Series O thru R



O1I	O3I	O6I	Q8I	P1/2I
P1I	2015793	2015794	2015795	
Q1I	Q3I	Q6I	R8I	
R1I	R3I	R6I		

Indicator O8I is not illustrated: Dial style is 0-125-0, minimum graduation is .025 mm

Features

- Normally furnished: dial as illustrated; centered vertical lug back; regular contact point, .18" radiused, 1/4" long.
- Optional Dials: balanced dial with + on left; continuous clockwise; continuous counter-clockwise. (Order by part number and specify dial style desired.)
- Revolution Counters available, please specify when ordering, Includes continuous dial unless otherwise specified.
- For other dial styles or special requirements - call Mahr Federal.
- Indicator dimensions are located on pages containing individual ANSI/AGD descriptions.

Accessories

- Contact Points - see page 5-27 and 5-22
- Backs and Mounting Brackets - see pages 5-21 and 5-22
- Accessories - see pages 5-23 and 5-24

Ordering Information

In addition to the information provided above, see pages 5-4 & 5-5 for complete instructions on ordering your dial indicators and accessories.

www.mahr.com

Long Range and Extra Long Range Indicators

Technical Data

Long Range/Extra Long Range (Inch)
Dial: soft-green tint

Measuring range	Graduation value	Dial style	Range per revolution	Accuracy	ANSI/AGD	Model no.	Order no.
.500″	***.0001″***	0-10	***.010″***	***.0001″****	4	**42IQ**	**42IQ ****
.500″	***.001″***	0-100	***.100″***	***.001″***	2	**28IQN**	**2014699**
1.000″	***.001″***	0-100	***.100″***	***.001″***	2	**28ISN**	**2014698**
1.000″	***.001″***	0-100	***.100″***	***.001″***	3	**D8IS**	**D8IS**
1.000″	***.010″***	0-1000	***1.000″***	***.010″***	2	**29I**	**2014816**
Extra Long Range							
2.000″	***.001″***	0-100	***.100″***	***.001″****	3	**D8IT**	
3.000″	***.001″***	0-100	***.100″***	***.001″****	4	**E8IU**	

* *for first 2-1/2 revolutions only.*
** *hysteresis = .0003" for full range*
*** *for first 1 inch of travel.*

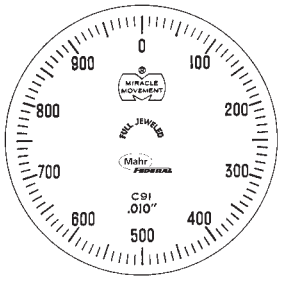
Long Range/Extra Long Range (Metric)
Dial: yellow tint

Measuring range	Graduation value	Dial style	Range per revolution	Accuracy	ANSI/AGD	Model no.	Order no.
25.000	0.010	0-100	1.000	0.020	2	**SP6IS**	
25.000	0.010	0-100	1.000	0.020	3	**SQ6IS**	
Extra Long Range							
50.000	0.025	0-25	2.500	0.025****	3	**Q8IT**	
75.000	0.025	0-25	2.500	0.025****	4	**R8IU**	

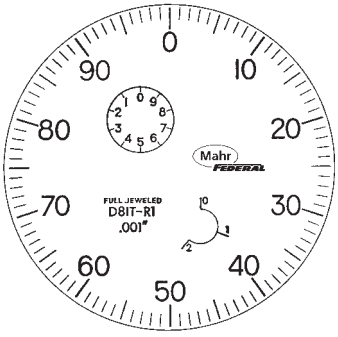
**** *for first 25 mm of travel.*

Dial Styles for Long Range and Extra Long Range Indicators

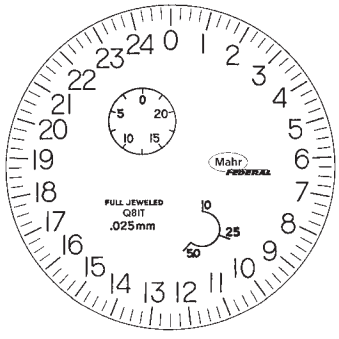
28IQN, 28ISN & D8IS



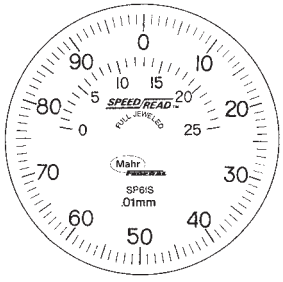
29I



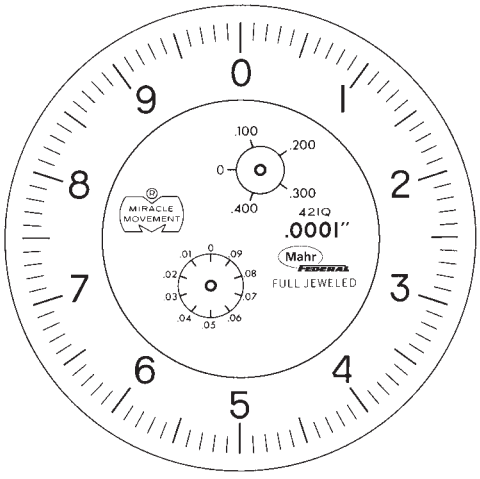
D8IT & E8IU



Q8IT & R8IU



SP6IS & SQ6IS



42IQ

Features

- Normally furnished: continuous clockwise dial; centered vertical lug back; regular contact point, .18" radiused, .250" long.
- Long Range Models: include (1) revolution counter (except C9I without revolution counter). Extra Long Range Models: include (2) revolution counters.
- For other dial styles or special requirements - call Mahr Federal.
- Indicator dimensions are located on pages containing individual ANSI/AGD descriptions.

Accessories

- Contact Points - see page 5-27 and 5-22
- Backs and Mounting Brackets - see pages 5-21 and 5-22
- Accessories - see pages 5-23 and 5-24

Dial Indicator Modifications & Specials

Available to meet specific requirements.

- Special Ranges
- Restricted Hand Travel
- Special Dials
- High Temperature
- Special Contact Points
- 8 mm Stem Diameters Special Lengths
- Specified Contact Load
- Counter-clockwise Movement
- Special Stem Lengths
- Push-Down Action
- Special Ratio Movement
- Threaded Stems

Ordering Information

In addition to the information provided above, see pages 5-4 & 5-5 for complete instructions on ordering your dial indicators and accessories.

www.mahr.com

Series WC and WP Wetproof Dial Indicators

Splashproof protection from coolant, oil, or other contaminant's.

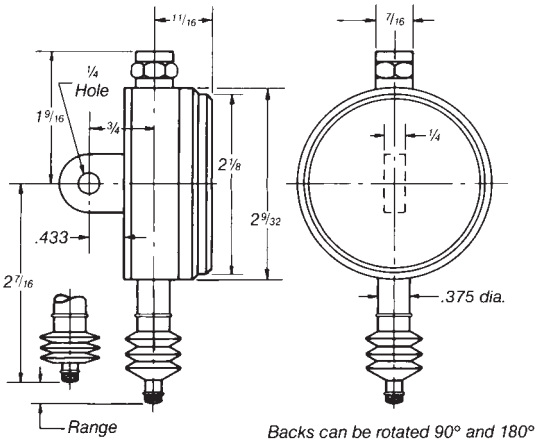
Technical Data

Series WC and WP Wetproof Dial Indicators (Inch)
Dial: approx. 2-1/4" dia. with soft-green tint

Measuring range	Graduation value	Dial style	Range per revolution	Accuracy	Order no.
.025"	***.0001"***	0-10	***.010"***	***.0001"***	**W22I**
.050"	***.00025"***	0-20	***.020"***	***.00025"***	**WC3K**
.050"	***.0005"***	0-20	***.020"***	***.0005"***	**WC3Q**
.075"	***.0005"***	0-30	***.030"***	***.0005"***	**WC5M**
.100"	***.0005"***	0-40	***.040"***	***.0005"***	**WC6K**
.125"	***.0005"***	0-50	***.050"***	***.0005"***	**WC7I**
.250"	***.001"***	0-100	***.100"***	***.001"***	**WC8I**
1.000"	***.001"***	0-100	***.100"***	***.001"***	**WC8IS**

Series WC and WP Wetproof Dial Indicators (Metric)
Dial: approx. 57 mm dia. with soft-yellow tint

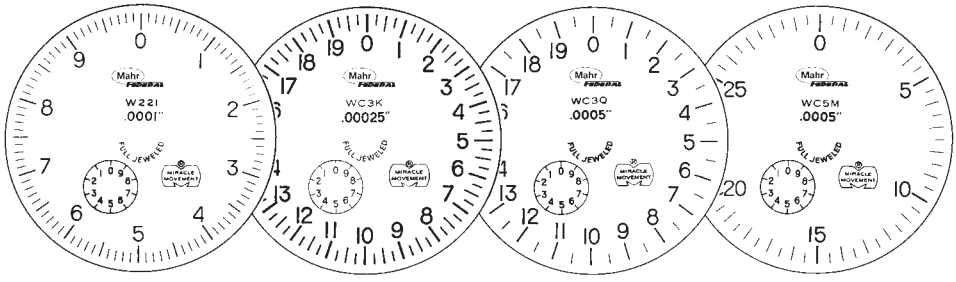
Measuring range	Graduation value	Dial style	Range per revolution	Accuracy	Order no.
0.500	0.002	0-20	0.200	0.004	**WP1I**
1.250	0.005	0-50	0.500	0.005	**WP3I**
2.500	0.010	0-100	1.000	0.010	**WP6I**



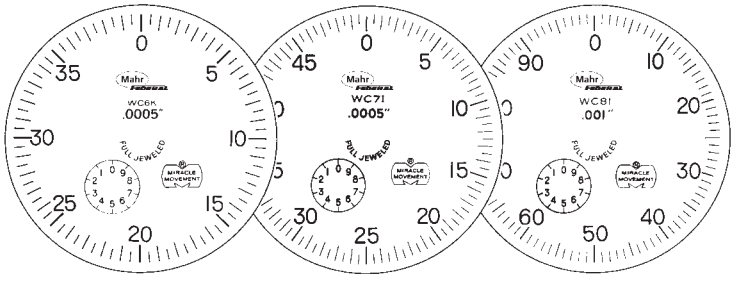
Backs can be rotated 90° and 180°

Dial Styles for WC and WP Wetproof Dial Indicators

Series WC indicators

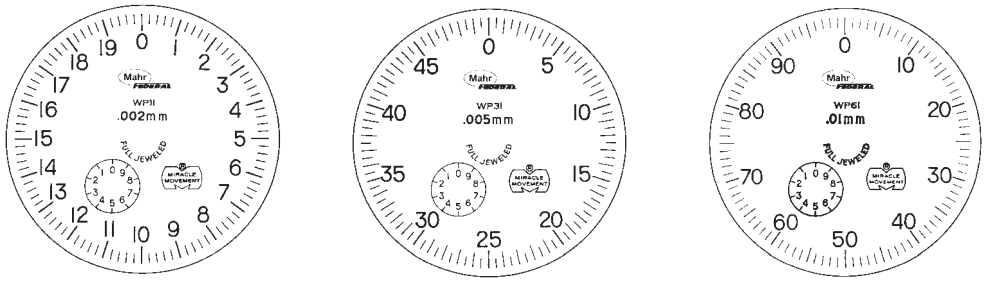


W22I WC3K WC3Q WC5M



WC6K WC7I WC8I/WC8IS

Series WP indicators



WP1I WP3I WP6I

Features

- Normally furnished: continuous clockwise dial with revolution counter; BK-63 centered vertical lug back; regular contact point, .18" radiused, .625" long
- Optional Dials: continuous counter-clockwise with revolution counter; balanced outer dial with + on right or left. Order by dial type and specify dial style desired.
- For other dial styles or special requirements - call Mahr Federal.

Accessories

- Contact Points - see page 5-27 and 5-22
- Accessories - see pages 5-23 and 5-24

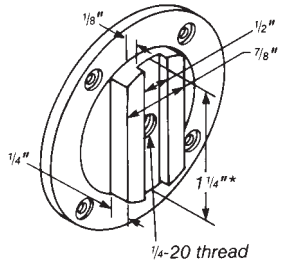
Ordering Information

In addition to the information provided above, see pages 5-4 & 5-5 for complete instructions on ordering your dial indicators and accessories.

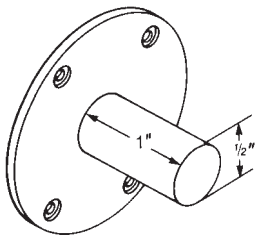
www.mahr.com

Backs for Wetproof Dial Indicators

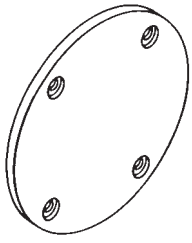
Vertical (centered) lug back is normally furnished and included in price of indicator. Back can be rotated 90° for horizontal lug mounting.



BK-68
Adjustable Back



BK-90
Post Back



BK-97
Flat Back

Perpendicular Dial Indicators

Provides improved readability where other style indicators cannot be used.

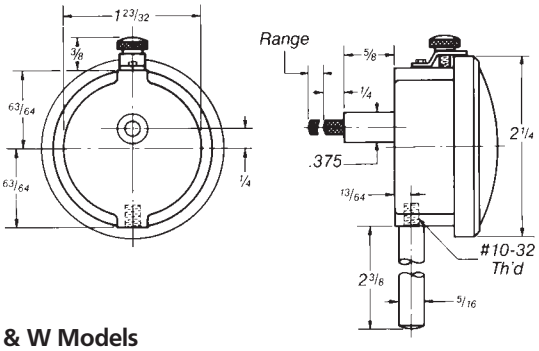
Technical Data

Series F, G, J, V (Inch)
Dial: soft-green tint

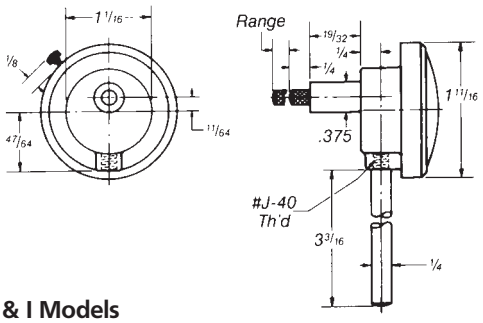
Measuring range	Graduation value	Dial style	Range per revolution	Accuracy	Gear type	Dial Dia. (approx.)	Order no.
.008"	***.0001"***	0-4-0	***.008"***	***.0001"***	crown	***2-1/4"***	**J1K**
.040"	***.0005"***	0-20-0	***.040"***	***.0005"***	crown	***2-1/4"***	**J6K**
.100"	***.0005"***	0-12-0	***.025"***	***.0005"***	spiral	***2-1/4"***	**G4O**
.100"	***.001"***	0-50-0	***.100"***	***.001"***	crown	***2-1/4"***	**J8I**
.100"	***.001"***	0-50-0	***.100"***	***.001"***	crown	***1-11/16"***	**V8I**
.200"	***.001"***	0-50-0	***.100"***	***.001"***	spiral	***1-23/32"***	**F8I**
.200"	***.001"***	0-50-0	***.100"***	***.001"***	spiral	***2-1/4"***	**G8I**

Series I, W (Metric)
Dial: yellow tint

Measuring range	Graduation value	Dial style	Range per revolution	Accuracy	Gear type	Dial Dia. (approx.)	Order no.
0.200	0.002	0-10-0	0.200	0.002	crown	57	**W1I**
1.000	0.010	0-50-0	1.000	0.010	crown	57	**W6I**
2.500	0.025	0-125-0	2.500	0.025	crown	57	**W8I**
2.500	0.025	0-125-0	2.500	0.025	crown	43	**I8I**



J & W Models



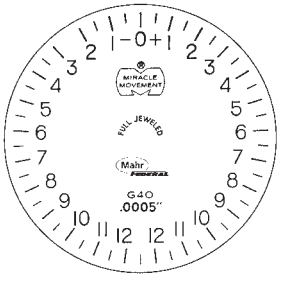
V & I Models

Dial Styles for Perpendicular Indicators

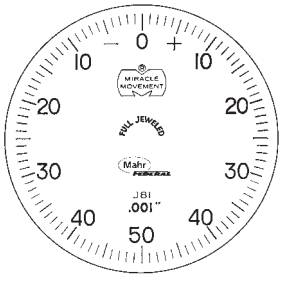
Series J, G, V, F

J1K

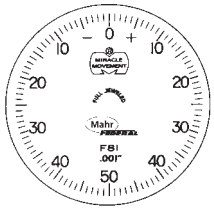
J6K



G4O

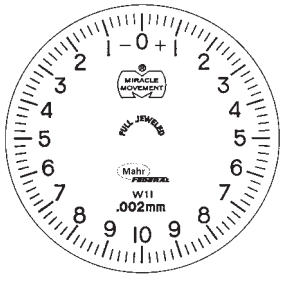


J8I & G8I

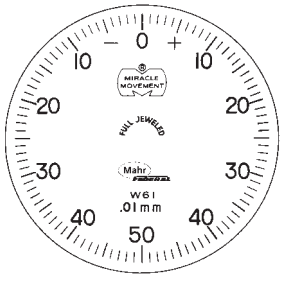


V8I & F8I

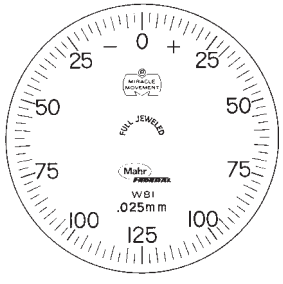
Series W, I



W1I



W6I



W8I & I8I

Features

- Normally furnished: balanced dial with + on right; mounting rod (see dimension drawings); regular contact point, .18" radiused, .250" long.
- Threaded stem versions available as an option; AD-59 (.5622 long x .500" O.D. for "J & W" styles), 3/8-32 internally threaded bushings and AD-60 (.687" long x .500" O.D. for "G & F" Models) purchased separately. Bushings also available separately.
- For other dial styles or special requirements - call Mahr Federal.

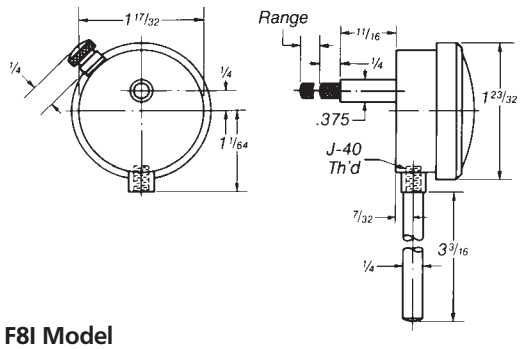
Accessories

- Contact Points - see page 5-27 and 5-22
- Accessories - see pages 5-23 and 5-24

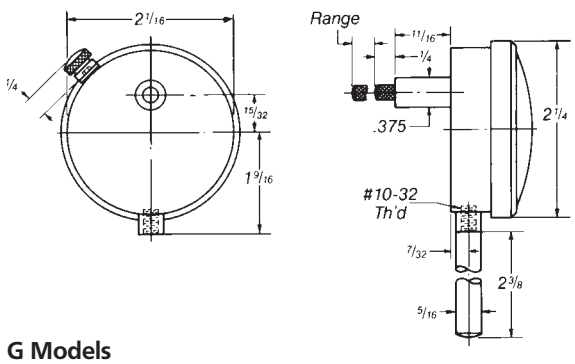
Ordering Information

In addition to the information provided above, see pages 5-4 & 5-5 for complete instructions on ordering your dial indicators and accessories.

www.mahr.com



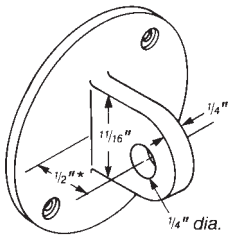
F8I Model



G Models

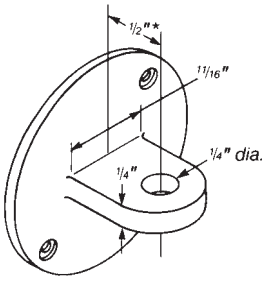
Backs for ANSI/AGD Group 1, 2, 3, and 4 Dial Indicators

Vertical Lug
(centered) normally furnished

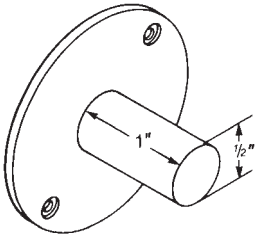


*27/64" for E/R size

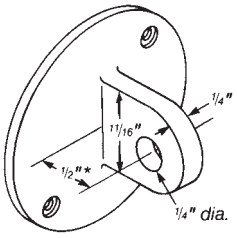
Horizontal Lug
(centered)



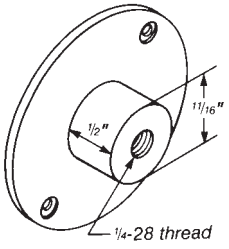
Post



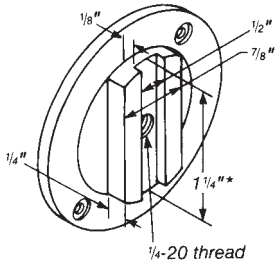
Vertical Lug
(offset) Left face of lug is on centerline of back



Screw Type

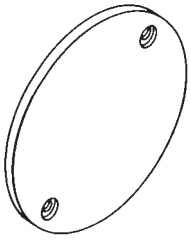


Adjustable



*7/8" for B/O size; no flats

Flat



Features

- Backs shown are for ANSI/AGD Groups 1,2,3,4, Long Range and Extra Long Range Indicators. Backs for ANSI/AGD Group 0 Indicators - see page 5-8. Backs for Wetproof Indicators - see page 5-18.
- To order - specify Back Order Number (from table below).
- Backs for ANSI/AGD Group 1 (Series B/O) Indicators can be repositioned 180°. Backs for ANSI/AGD Group 4 (Series E/R) Indicators can be repositioned 90° and 180°.
- For Special Backs - call Mahr Federal.

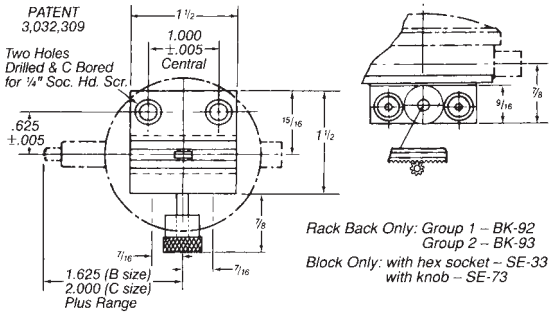
Ordering Numbers

	ANSI/AGD			
	Group 1 Series B/O	**Group 2 Series C/P**	**Group 3 Series D/Q**	**Group 4 Series E/R**
Vertical Lug, Centered	**BK-1600**	**BK-383**	**BK-431**	**BK-3**
Vertical Lug, Offset	**BK-1601**	**BK-2168**	**BK-545**	**BK-4**
Horizontal Lug, Centered	**BK-19**	**BK-400**	**BK-109**	**BK-3**
Flat	**BK-1660**	**BK-470**	**BK-473**	**BK-5**
Post	**BK-1634**	**BK-2093**	**BK-664**	**BK-17**
Screw	**BK-1661**	**BK-692**	**BK-177**	**BK-16**
Adjustable	**BK-1633**	**BK-531**	**BK-10**	**BK-18**

Adjustable Mounting Brackets

Features

- Allows fast, positive indicator adjustments
- Ideal for permanent indicator mounting to fixtures
- Rack Back included with all Brackets
- Sizes for ANSI/AGD Groups 1 and 2



Order Numbers

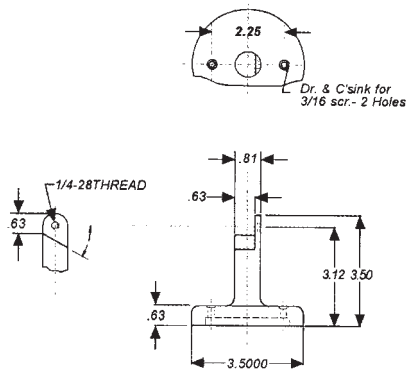
Mahr Federal Indicator	Used with	Order no.
Group 1	hex socket adjust	**AT-27**
Group 1	adjusting knob	**AT-115**
Group 2	hex socket adjust	**AT-28**
Group 2	adjusting knob	**AT-116**

Universal Mounting Base

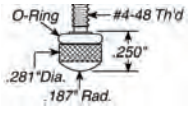
Features

- Allows mounting indicator to custom fixtures
- Uses lug back to mount indicator
- Accommodates all size indicators

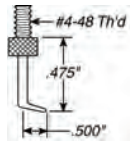
Order no. **BA-1051**



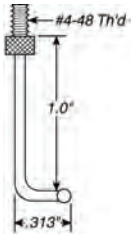
Added flexibility for your Mahr Federal Dial Indicators



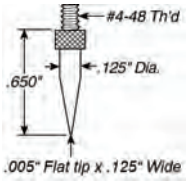
PT-2263



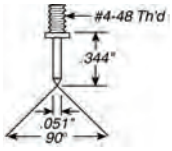
PT-2267



PT-2268



PT-2266



PT-2265

Features

Innovative Contact Points make your indicators more versatile.

- Minimize point damage with a shock absorbing contact. without the need for a cushion gear.
- Needle point perfect for checking small areas – etchings, pits and more.
- Chisel point easily adapts to small slots or screw heads.
- Small offset point for narrow recesses – grooves, holes and under ledges.
- Right angle point makes hard to reach grooves easily accessible.

Description	Order no.
Shock Absorbing Contact. "O" ring over threads provides a barrier between metal surface and stem, minimizing damage if point is pushed in with excessive force.	**PT-2263**
Chisel Point Contact for checking small slots. Furnished with a small lock nut for positioning on the indicator.	**PT-2266**
Small Offset Point Contact. Small tip, .010" radius, permits checking narrow recesses. Furnished with a lock nut for indicator positioning.	**PT-2267**
Needle Contact for checking into small areas. Correct length for use as a replacement on Mahr Federal 65P-40 Depth Gage.	**PT-2265**
Right Angle Contact with a .093" diameter ball for checking hard-to-reach grooves. Right angle allows checking to bottom or to top of a groove when used with a push down action Indicator. Its 1" length makes it long enough to be used with Mahr Federal 75P-50 Series Depth Gages.	**PT-2268**
Contact Thread Adapter, Male M2.5 thread to 4-48 Female thread (.375" length)	**AD-185**
4-48 Male to M2.5 FemaleThreaded Adapter	**2236519**

Indicator Accessories

Weights

Used with ANSI/AGD type and long range indicators. Applies constant pressure throughout indicator range.
To order specify requirement.

Protective Housing

For ANSI/AGD Group 2 indicators. Opens at rear so indicator can be mounted by its back. Mounts to indicator stem using a .687" O.D. bushing (not included). Order **HG-100** for Indicator models with ranges up to 6.35 mm /.250", **HG-101** for ranges of 6.35 mm /.250" to 25 mm /1".
Recommended bushings: **BU-111** split bushing, or **AD-87** split collet. See next page.

Magnetic Maximum Hand

For ANSI/AGD Groups 2 and 3 indicators having plain dials. Accurately indicates maximum reading. Easy to reset. Order **2014804** (Group 2, snap-on bezel), **2011341** (Group 3, screw-on bezel).

Styles for Groups 1 and 4 indicators available on special order; consult Mahr Federal Customer Resource Center.

Range Limiting Caps

Used with ANSI/AGD type indicators. Adjustable thru 9.52 mm /.375" to limit range to any desired amount. Order **CS-123**.

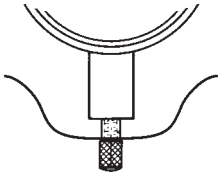
Lifting Levers - CAM Type.

Used with ANSI/AGD type and long range indicators.

Use with Indicator Type	Order no. Left Hand	Order no. Right Hand
ANSI/AGD Group 1*	**LR-46**	**LR-47****
ANSI/AGD Group 2*	**LR-48**	**LR-49****
ANSI/AGD Group 3*	**LR-50**	**LR-51****
ANSI/AGD Group 4*	**LR-68**	**LR-69**
Federal Models D8IT & Q8IT	**LR-115**	
Ox-Bow Lifting Lever	**LR-40**	

* *Up to 25 mm /1" range*
** *Requires case to have Bezel Clamp on Left*

Ox-Bow Lifting Lever - Type LR-40



Tolerance Hands

Used with ANSI/AGD, long range and some Perpendicular indicators. Furnished integrally with split bezel. Easily replaces regular bezel.

Use with Indicator Type	Order no. Snap-on Bezel	Order no. Screw-type Bezel
ANSI/AGD Group 1	**HD-128**	**HD-59**
ANSI/AGD Group 2	**BZ-2503**	**HD-57**
ANSI/AGD Group 4		**HD-53**

Electronic Probe Adapter

Permits using electronic probes with many Mahr Federal dial indicators. Order **AD-138.**

Indicator Accessories

Hole Attachments

For ANSI/AGD type and perpendicular indicators with .375" diameter stems. For measuring internal surfaces. Order **AT-7293**, 47.50 mm/ 1.87" long, **AT-7294**, 25 mm /1" long.

Split Collet

For .375" diameter stem indicators. Six-finger grip permits easy, secure indicator adjustment. Requires 1/2-32 threaded hole. O.D. is 17.45 mm/ .687". Can be used with protective housings, page 5-23, Order **AD-87**. For 1/2-32 tap, Order **V-892**. 8 mm stem, Order **AD-190**.

Brake Attachment

For ANSI/AGD indicators with .001" graduations. Requires indicator modification for assembly. Range limited to 6.35 mm/ .250" for Group 1 indicators; and to 12 mm/ .500" for Group 2 indicators. Order **AT-A-7** stem mount, **AT-81** dust cap mount.

Threaded Bushing

For ANSI/AGD indicators with 5/16-32 threaded stems (an available option from Mahr Federal). Permits conventional stem mounting of indicator in gages and fixtures. Order **AD-62**, .625" long, .500" O.D., 5/16-32 internal thread. Threaded bushings for perpendicular indicators, see page 5-19.

Auxiliary Plungers

For extending reach of all ANSI/ AGD type and perpendicular indicators with .375" diameter stems and ranges up to 6.35 mm/ .250" range. Attaches to indicator stem by integral split collet. Body is 12 mm/ .500" O.D. Order **AT-25**, 57 mm/ 2.25" long, **AT-26**, 104 mm/ 4" long. Special lengths available. Replacement contact. **PT-184**, 8-32 thread.

Dust Guard

For ANSI/AGD perpendicular indicators with .375" diameter stems. Recommended for ranges of 7.62 mm/ .300" or less. Oil resistant to protect spindle and bushing from dust, mist and contaminant's. Order **GU-2**. For sealed indicators, see Wetproof models, page 5-17.

Split Bushings

Fits all ANSI/AGD type and perpendicular indicators, Permits safe, non-cramping stem mounting. Order **BU-94** without counter-bore, **BU-80** with counterbore, .375" stem hole x .500" O.D., **BU-111** for use with protective housings (.375" stem hole x .687" O.D.), **BU-112** (.218" stem hole x .375" O.D.), **BU-197** with shoulder, **4310103** without shoulder. (8 mm stem hole x .375" O.D.)

Right Angle Attachments

For ANSI/AGD type and perpendicular indicators (.375" diameter stems), For making measurements at right angle to spindle movement, Order **A-9**, regular type with flat spring hinge; for ranges up to 3.05 mm/ .120". Replacement spring: **SP-56**. Order **AT-24**, long range type with pivot-type bearing; for ranges up to 9.50 mm/.375".

Long Range Indicator Calibrator

Features

Model OPTIMAR 25

- A precision, benchtop instrument, providing a wide variety of precision measuring intruments including dial and Digital Indicators, dial and digital comparators, dial and digital test indicators, electronic probes and gageheads, Air Probes® and jet probes, or any other devices that magnifies the linear displacemet of a contact point or measuring spindle
- MarCheck, large clearly readable LCD monochrome digital display (240x160 pixels) with background illumination with 13 mm / 0.512" high digits
- User selectable for either inch or metric
- Output:
  - USB interface maxed at 3GB USB thumb drive
  - USB interface for PC
  - Selectable RS232 interface
  - Includes certification of calibration

Order no. **2062722**

Technical Data

	Range	Resolution	Accuracy
Inch	***1.00"***	***0.000005, 0.00001, 0.00005, 0.0001, 0.0005, 0.001***	***±10 µ"***
Metric	25 mm	0.0001, 0.0005, 0.001, 0.005, 0.01, 0.1	±0.2 µm

Description	Values
Display Power	110V - 60 Hz, 240V - 50 Hz
Dimensions Calibrator	***18" x 6" x 8"***
H x W x D (approx)	460 x 153 x 204 mm
Readout	**10" x 7" x 2.0"**
H x W x D	260 x 180 x 50 mm
Weight - Calibrator	37 lbs. / 17 kg
Weight - MarCheck	3 lbs. / 1.4 kg

Normally furnished:	**Order no.**
MarTest Mounting Shaft 3/8" diameter	**4305875**
Adapter Bushing (8 mm to .375") diameter	**BU-197**
MarCheck Angle Display Stand	**5350403**

Also available:

Universal Centering Support 800b	**4305893**
MarTest Dovetail Mounting Shaft 4 mm diameter	**4305885**
Foot Switch for data transfer	**5360322**
RS232 Null Modem Cable 10 feet long	**7024634**
Dial Indicator Inspection Software QMSOFT®	**5350196**

Test Indicators

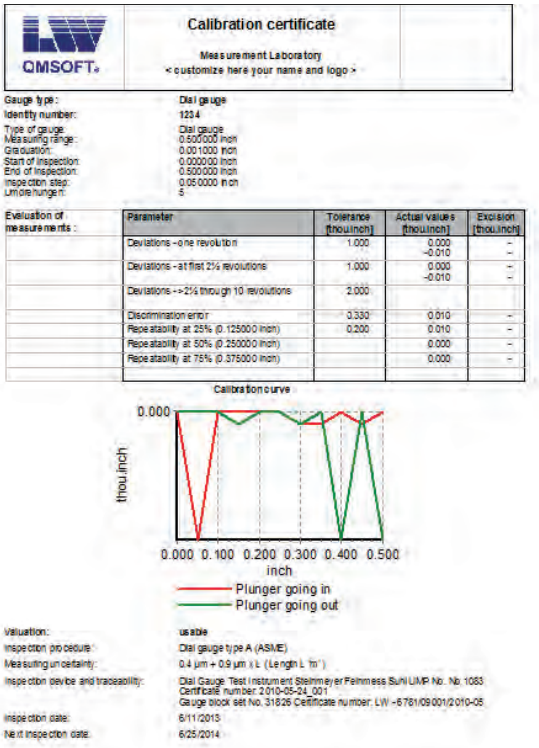
Dial Comparator

QMSOFT Software QM-DIAL

Features

The inspection program QMSOFT®/QM-DIAL is used for computer aided inspection of dial gages, dial indicators and dial test indicators. It was designed to support the inspection of these dial gages according to the worldwide mostly used standards. The QM-DIAL program includes a module to carry out the inspection according to the German standards **(DIN 878, DIN 879, DIN 2270)** inclusive the rules according to the **VDI/VDE/DGQ-standard**, the American standard **ANSI/ASME B89.1.10M-1987**, the British standards **BS 907 / BS 2795** and the Australian standard **AS 2103-1978**, the Korean and Japanese standards **KS B 5206, KS B 5207, KS B 5238, JIS B 7503, JIS B 7533** and the standard **JMAS 2001** and also the French standard **NF E 11-050**.

Order no. **5350196**


Calibration certificate

Measurement Laboratory
< customize here your name and logo >

Gauge type: Dial gauge
Identity number: 1234
Type of gauge: Dial gauge
Measuring range: 0.500000 inch
Graduation: 0.001000 inch
Start of inspection: 0.000000 inch
End of inspection: 0.500000 inch
Inspection step: 0.050000 inch
Limit deviation: 5

Evaluation of measurements :	Parameter	Tolerance [thou.inch]	Actual values [thou.inch]	Excision [thou.inch]
	Deviations - one revolution	1.000	0.000 -0.010	- -
	Deviations - at first 2½ revolutions	1.000	0.000 -0.010	- -
	Deviations - > 2½ through 10 revolutions	2.000		
	Discrimination error	0.330	0.010	-
	Repeatability at 25% (0.125000 inch)	0.200	0.010	-
	Repeatability at 50% (0.250000 inch)		0.000	-
	Repeatability at 75% (0.375000 inch)		0.000	-

Calibration curve

Valuation: usable
Inspection procedure: Dial gauge type A (ASME)
Measuring uncertainty: 0.4 µm + 0.9 µm x L (Length L in m)
Inspection device and traceability: Dial Gauge Test Instrument Steinmeyer Feinmess Suhl UMP No. No. 1083 Certificate number: 2010-05-24_001 Gauge block set No. 31826 Certificate number: LW -6781/09001/2010-05
Inspection date: 6/11/2013
Next inspection date: 6/25/2014

Accessories

	Order no.
RS232 Null Modem cable 10 feet long	**7024634**
Foot Switch for data transfer	**5360322**

Dial Indicator Calibrator

Features

400B-3 and 400B-4 Shop-floor Calibrators

All too often we have blinders on and don't look at the whole picture on how a precision gage can do more than what's its intended to do. Take for example our Dial Indicator Calibrators 400B-3 & 400B-4. We look at it and know that its purpose is to calibrate AGD dial indicators right? But let's take it a step further! If we add the Universal centering support frame 800b (part number 4305893) from the test indicator section of our catalog and an 8mm to .375" bushing (part number 4310103) we now have the ability to calibrate test indicators having a .0001" / .002mm resolution giving the once only dial indicator calibrator a DUAL PURPOSE!

- For checking dial indicators (both ANSI/ AGD and perpendicular styles) and other transducers.
- Large micrometer wheel has widely spaced graduations for easy setting and reading.
- Adjustable crosshair provides on-the-mark setting.
- Tungsten carbide anvil for maximum wear resistance.
- Indicator clamped in-line with micrometer spindle.

400B-3
Dial Indicator Calibrator

Technical Data

	Range	Minimum Graduation	Accuracy	Order no.
Metric (mm)	0-25	0.002	within 0.001*	**400B-4**
Inch	***0-1.000"***	***.0001"***	***within .000050"****	**400B-3**

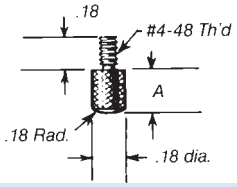
- Normally furnished:
  BU-112 Bushing (.218" I.D. to .375" O.D.)
  AD-58 Bushing (.275" I.D. to .375" O.D.)
  BU-197 Bushing (8 mm I.D. to .375" O.D.)

** Accuracy calibration as specified in Federal Specification GGG-105B.*

Contact Points

Used with ANSI/AGD Groups 1.2.3.4 Long Range Wetproof Perpendicular and *Maxμmill*® Indicators, Points for ANSI Group 0 Indicators - see page 5-8. For Special Points - call Mahr Federal. See pages 5-58 & 5-59 for additional Metric Contact Points.

Regular



Hardened Steel (inch)

Dimension A	Order no.	Dimension A	Order no.
1/8"	PT-225	*1-5/8"*	PT-235
1/4"	PT-223*	*1-3/4"*	PT-241
3/8"	PT-563	*1-7/8"*	PT-100
1/2"	PT-14	*2"*	PT-51
5/8"	PT-564**	*2-1/8"*	PT-243
3/4"	PT-31	*2-1/4"*	PT-696
7/8"	PT-201	*2-3/8"*	PT-101
1"	PT-232	*2-1/2"*	PT-245
1-1/8"	PT-305	*2-5/8"*	PT-102
1-1/4"	PT-565	*2-3/4"*	PT-566
1-3/8"	PT-239	*2-7/8"*	PT-247
1-1/2"	PT-50	*3"*	PT-155

Hardened Steel (Metric***)

Dimension A	Order no.	Dimension A	Order no.
6 mm	EPT-1037-W1	15 mm	EPT-1037-W3
10 mm	EPT-1037-W2	20 mm	EPT-1037-W4
12 mm	EPT-1037-W6	25 mm	EPT-1037-W5

Tungsten Carbide

1/4"	PT-35

Diamond

1/4"	PT-317

Set of 8 Steel

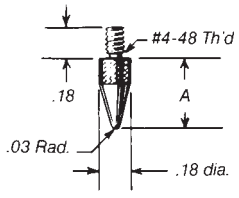
1/8" to *1"*	PT-116

Set of 24 Steel

1/8" to *3"*	PT-115

* *PT-223 normally furnished with all Indicators*
** *PT-564 normally furnished with all Wetproof Indicators*
*** *All Metric Points have M2.5 thread*

Tapered

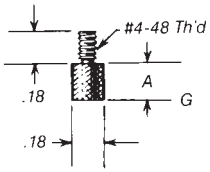


Hardened Steel (inch)

Dimension A	Order no.	Dimension A	Order no.
3/16"	PT-233	*7/16"*	PT-181
7/16"	PT-229	*3/4"*	PT-182
1"	PT-253	*1"*	PT-183
1-7/16"	PT-230		
2"	PT-231		

Tungsten Carbide (inch)

Flat End



Hardened Steel (inch)

Dimension A	Order no.
1/8"	AL-19
1/4"	AL-673
3/8"	AL-20
1/2"	AL-21
5/8"	AL-22
3/4"	AL-23
7/8"	AL-24
1"	AL-25

Hardened Steel (Metric***)

Dimension A	Order no.
6 mm	EAL-1016-W1
10 mm	EAL-1016-W2
15 mm	EAL-1016-W3
20 mm	EAL-1016-W4
25 mm	EAL-1016-W5

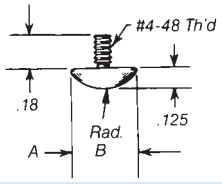
Tungsten Carbide

1/4"	AL-51

Set of 8 Steel

1/8" to *1"*	AL-55

Button



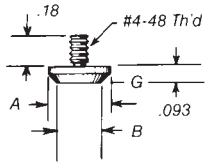
Hardened Steel (inch)

Dim. A	Dim. B	Order no.
.375"	*.250"*	PT-227
.500"	*.375"*	PT-619

Tungsten Carbide

Dim. A	Dim. B	Order no.
.375"	*.250"*	PT-120

Wide Face



Hardened Steel (inch)

Dim. A	Dim. B	Order no.
.356"	*.250"*	AL-502
.500"	*.375"*	AL-1510
.615"	*.500"*	AL-520
.731"	*.625"*	AL-44

Hardened Steel (Metric***)

Dim. A	Dim. B	Order no.
9.04	6.35	EAL-1020-W1
12.7	9.5	EAL-1020-W2
15.6	12.7	EAL-1020-W3
18.6	15.9	EAL-1020-W4

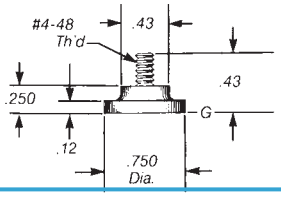
Tungsten Carbide (inch)

.356"	*.250"*	AL-1730

Tungsten Carbide (Metric***)

9.04	6.35	EAL-1021

Extra Wide Face



Hardened Steel

	Order no.
(inch)	AL-291
(metric)	2252940

MarCator Dial Indicators (DIN Style)

OVERVIEW

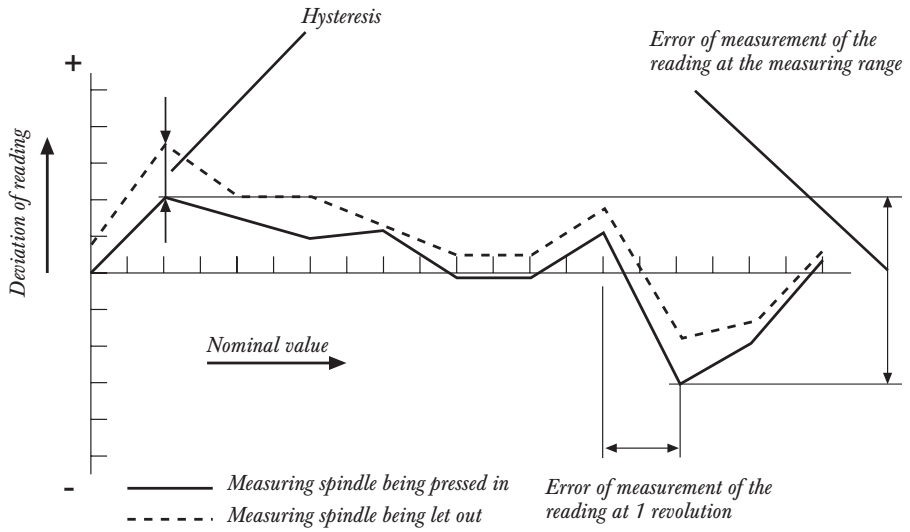
Precision Small Dial Indicators

Model			**803 A**	**805 A**	**803 S**	**803 SW**
Range			3 mm	5 mm	3 mm	3 mm
Readings			0.01 mm	0.01 mm	0.01 mm	0.01 mm
Dial style			0-50	0-100	0-50	0-50
Standard for metrological characteristics			DIN 878	DIN 878	DIN 878	DIN 878
DIN EN ISO 463						
Limit value for measurement error at the reading		Meas. range	10 µm	12 µm	10 µm	10 µm
		1 revolution	9 µm	9 µm	9 µm	9 µm
		1/2 revolution	8 µm	8 µm	8 µm	8 µm
		1/10 revolution	5 µm	5 µm	5 µm	5 µm
Limit value for		Repeatability	3 µm	3 µm	3 µm	3 µm
Limit value for		Hysteresis	3 µm	3 µm	3 µm	3 µm
Shockproof	SHOCK PROOF				●	●
Measuring force			0.7 - 1.1 N	0.7 - 1.1 N	0.7 - 1.1 N	0.7 - 1.7 N
Order no.			**4324050**	**4324060**	**4324000**	**4326000**

Precision Dial Indicators

Model			**810 A**	**810 AT**	**810 S**	**810 SW**
Range			10 mm	10 mm	10 mm	10 mm
Readings			0.01	0.01	0.01	0.01
Dial style			0-100	0-100	0-100	0-100
Standard for metrological characteristics			DIN 878	DIN 878	DIN 878	DIN 878
DIN EN ISO 463						
Limit value for measurement error at the reading		Meas. range	15 µm	15 µm	15 µm	15 µm
		1 revolution	10 µm	10 µm	10 µm	10 µm
		1/2 revolution	9 µm	9 µm	9 µm	9 µm
		1/10 revolution	5 µm	5 µm	5 µm	5 µm
Limit value for		Repeatability	3 µm	3 µm	3 µm	3 µm
Limit value for		Hysteresis	3 µm	3 µm	3 µm	3 µm
Shockproof	SHOCK PROOF				●	●
Measuring force			0.7 - 1.3 N	0.7 - 1.3 N	0.7 - 1.3 N	0.7 - 1.6 N
Order no.			**4311050**	**4311060**	**4311000**	**4315000**

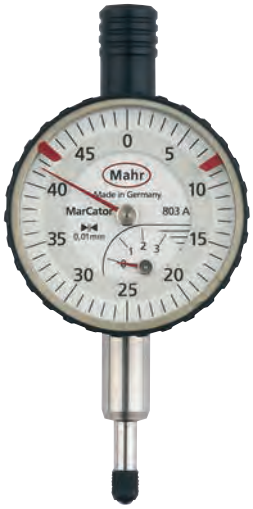
Metrological characteristics



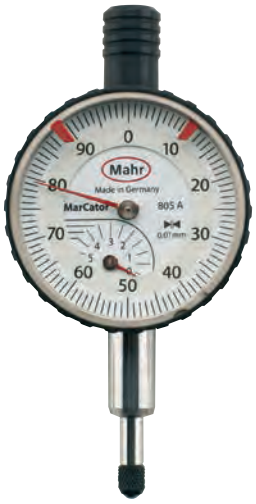
803 SB	803 AZ
0.4 mm (±0.2)	***.120"***
0.01 mm	***.0005"***
0-20-0	0-20
DIN 878	Factory standard
9 µm	***.0004"***
8 µm	
5 µm	***.0002"***
3 µm	***.00012"***
3 µm	***.00012"***
●	
0.9 - 1.1 N	0.7 - 1.1 N
4324250	**4324900**

810 SB	810 SM	810 SRM	810 AZ	810 AU	810 AX	810 AG	810 SV
0.8 mm (±0.4)	1 mm	5 mm	***.400"***	10 mm	10 mm	10 mm	40 mm
0.01	0.001	0.001	***.0005"***	0.01	0.1	0.01	0.01
0-40-0	0-100	0-100	***0-45***	100-0	0-10	0-100	0-100
DIN 878	Factory standard	Factory standard	Factory standard	Factory standard	Factory standard	Factory standard	Factory standard
7 µm	4 µm	10 µm	***.0005"***	15 µm	50 µm	17 µm	25 µm
	3 µm	5 µm		10 µm	50 µm	15 µm	15 µm
6 µm	2 µm	3 µm		9 µm	30 µm	10 µm	10 µm
5 µm	1 µm	2 µm	***.0002"***	5 µm	15 µm	5 µm	5 µm
3 µm	1.5 µm	3 µm	***.00012"***	5 µm	15 µm	3 µm	3 µm
3 µm	1.5 µm	3 µm	***.00012"***	5 µm	15 µm	5 µm	6 µm
●	●	●					●
0.7 - 1.1 N	1.3 - 1.8 N	1.2 - 1.7 N	0.9 - 1.5 N	1.0 - 1.8 N	0.7 - 1.3 N	1.3 - 2.2 N	0.8 - 1.8 N
4317000	**4311070**	**4311080**	**4311900**	**4329050**	**4331000**	**4322000**	**4321000**

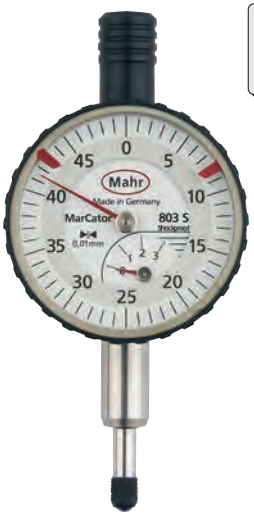
Precision Small Dial Indicators 803 / 805 DIN style



803 A



805 A



803 S

SHOCK PROOF

Features

Small Dial Indicator 803 A
Standard version

- High precision gears and pinions
- Lifter protection cap on the upper end of the measuring spindle
- Adjustable tolerance markers
- Chrome-plated housing

Small Dial Indicator 805 A
Standard version

- High precision gears and pinions
- Lifter protection cap on the upper end of the measuring spindle
- Adjustable tolerance markers
- Chrome-plated housing

Small Dial Indicator 803 S
Shockproof version

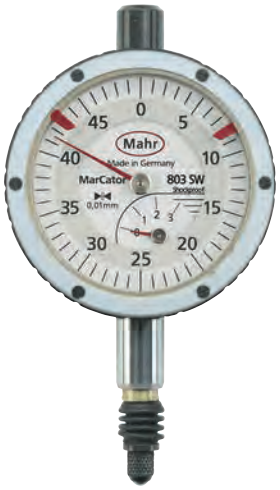
- High precision gears and pinions
- Lifter protection cap on the upper end of the measuring spindle
- Adjustable tolerance markers
- Chrome-plated housing

All indicators are delivered in plastic case

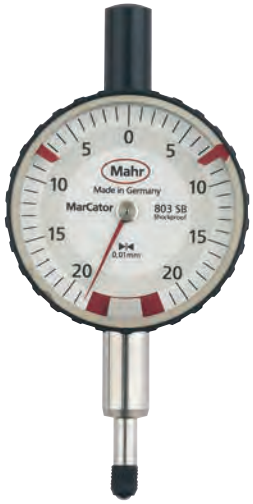
Technical Data

	Range mm	Readings mm	Dial face dia. mm	Overtravel mm	Mounting shank dia. mm	Measuring force N	Accuracy DIN 878	Order no.
803 A	3	0.01	34	0.1	8h6	0.7 - 1.1	●	**4324050**
805 A	5	0.01	34	0.1	8h6	0.7 - 1.1	●	**4324060**
803 S	3	0.01	34	0.1	8h6	0.7 - 1.1	●	**4324000**
803 SW	3	0.01	34	0.1	8h6	0.7 - 1.7	●	**4326000**
803 SB	0.4 (±0.2)	0.01	34	4.5	8h6	0.9 - 1.1	●	**4324250**
803 AZ	***.120"***	***.0005"***	***1.4"***	***.008"***	8h6	0.7 - 1.1		**4324900**

Precision Small Dial Indicators 803 / 805 DIN style



803 SW



803 SB

803 AZ

Features

Small Dial Indicator 803 SW
Waterproof and oil proof

Design features identical to 803 S, with the following exceptions:
- Hermetically sealed upper protective measuring spindle cap as well as bezel and transparent dial cover; sealed with O-rings
- Measuring spindle sealed with rubber sleeve, thus preventing contamination by liquids and impurities

Small Dial Indicator 803 SB
with limited measuring range

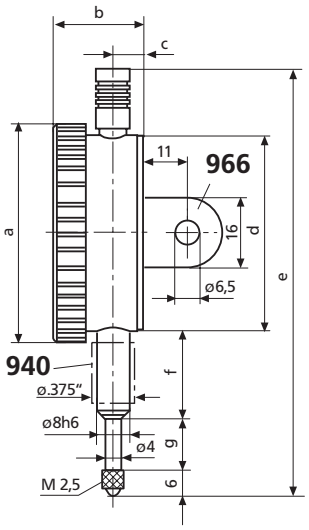
Design features identical to 803 S, with the following exceptions:
- Limited measuring range (0.4 mm) for error-free readings
- Large overtravel (ca. 4.5 mm), for easier insertion of test items in measuring devices
- Hermetically sealed upper protective measuring spindle cap

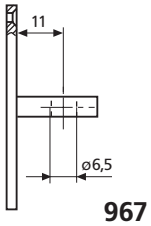
Small Dial Indicator 803 AZ
Inch version

Design features identical to 803 A, with the following exception:
- The scope of supply includes an Adapter Bush 940 for adapting mounting shank 8h6 mm to inch bore .375"

Dimensions according to DIN EN ISO 463

mm	a	b	c	d	e	f	g
803 A	ø 40	20.6	6.8	ø 37	83	15.5	8
805 A	ø 40	20.6	6.8	ø 37	83	15.5	8
803 S	ø 40	20.6	6.8	ø 37	80	15	5.5
803 SW	ø 44	21.6	7.1	ø 37	86	15	11
803 SB	ø 40	20.6	6.8	ø 37	83	15.5	8
803 AZ	ø 40	20.6	6.8	ø 37	83	15.5	8

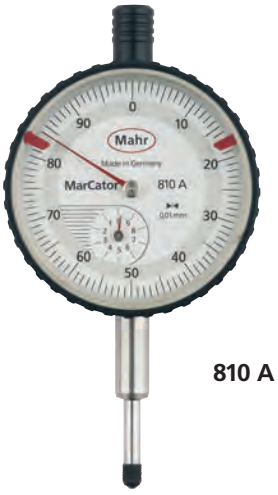




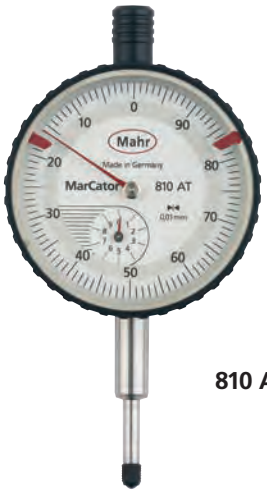
Accessories

		Order no.
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	**940**	**4310103**
Splash Guard Cover for bezel dia. 40 mm	**956**	**4373021**
Mounting Lugs		
Bore perpendicular to mounting shank	**966**	**4375020**
Bore parallel to mounting shank	**967**	**4375021**

Precision Dial Indicators 810 DIN style

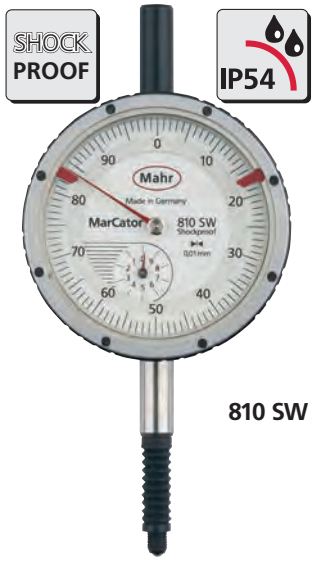


810 A



810 AT

810 S



810 SW

Features

Dial Indicator 810 A
Standard version

- High precision gears and pinions
- Lifter protection cap on the upper end of the measuring spindle
- Adjustable tolerance markers
- Chrome-plated housing

Dial Indicator 810 AT
for depth measurement

Design features identical to 810 A, with the following exception:

- Scale of the dial face is counter-clockwise

Dial Indicator 810 S
Shockproof

- High precision gears and pinions
- Lifter protection cap on the upper end of the measuring spindle
- Adjustable tolerance markers
- Chrome-plated housing

Dial Indicator 810 SW
Waterproof and oil proof

Design features identical to 810 S, with the following exceptions:

- Measuring spindle sealed with rubber sleeve, thus preventing contamination by liquids and impurities
- Hermetically sealed protective measuring spindle cap

All indicators are delivered in plastic case

Technical Data

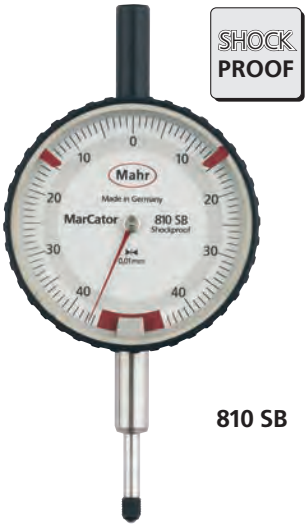
	Range mm	Readings mm	Dial face dia. mm	Overtravel mm	Mounting shank dia. mm	Measuring force N	Accuracy DIN 878	Order no.
810 A	10	0.01	50	0.1	8h6	0.7 - 1.3	●	**4311050**
810 AT	10	0.01	50	0.1	8h6	0.7 - 1.3	●	**4311060**
810 S	10	0.01	50	0.1	8h6	0.7 - 1.3	●	**4311000**
810 SW	10	0.01	50	0.1	8h6	0.7 - 1.6	●	**4315000**
810 SB	0.8 (±0.4)	0.01	50	9	8h6	0.7 - 1.1	●	**4317000**
810 SM	1	0.001	50	4	8h6	1.3 - 1.8		**4311070**
810 SRM	5	0.001	50	0.1	8h6	1.2 - 1.7		**4311080**
810 AZ	***.400"***	***.0005"***	***2"***	***.004"***	8h6	0.9 - 1.5		**4311900**

Accessories

		Order no.
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	**940**	**4310103**
Splash Guard Cover for bezel dia. 58 mm	**955**	**4373020**

		Order no.
Mounting Lug		
Bore perpendicular to mounting shank	**961**	**4375010**
Bore parallel to mounting shank	**962**	**4375011**

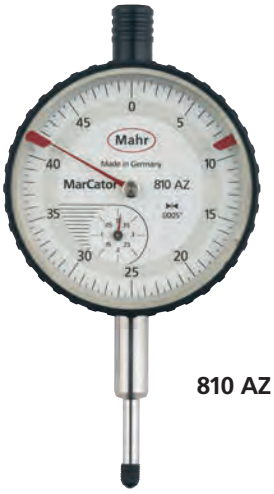
Precision Dial Indicators 810 DIN style



810 SB

810 SM

810 SRM



810 AZ

Features

Dial Indicator 810 SB
with limited measuring range

Design features identical to 810 S, with the following exceptions:
- Limited measuring range (0.8 mm) for error-free readings
- Large overtravel (ca. 9 mm) for easier insertion of test items in measuring devices
- Hermetically sealed protective measuring spindle cap

Dial Indicator 810 SM
Shockproof
with reading 0.001 mm
- Precise mechanism with a combined gear lever transmission
- High accuracy with a minimum span of error
- Lifter protection cap on the upper end of the measuring spindle
- Adjustable tolerance markers
- Chrome-plated housing

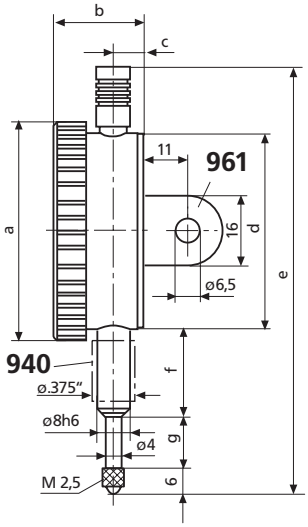
Dial Indicator 810 SRM
Shockproof
with reading 0.001 mm
- High precision gears and pinions
- Lifter protection cap on the upper end of the measuring spindle
- Adjustable tolerance markers
- Chrome-plated housing

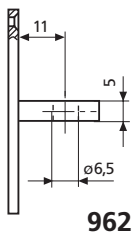
Dial Indicator 810 AZ
Inch version

Design features are identical to 810 A, with the following exception:
- The scope of supply includes an Adapter Bush 940 for adapting mounting shank 8h6 mm to inch bore .375"

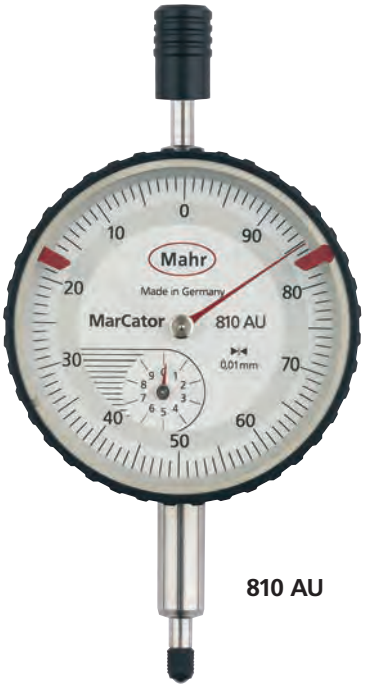
Dimensions according to DIN EN ISO 463

mm	a	b	c	d	e	f	g
810 A/AT	ø 58	23	7.5	52	112	21	16
810 S	ø 58	23	7.5	52	111.5	22	15
810 SW	ø 61	24.15	7.9	52	127.6	22	22.1
810 SB	ø 58	23	7.5	52	120	22	15
810 SM	ø 58	25	8.5	52	111.5	22	15
810 SRM	ø 58	23	7.5	52	111.5	22	15
810 AZ	ø 58	23	7.5	52	111.5	22	15

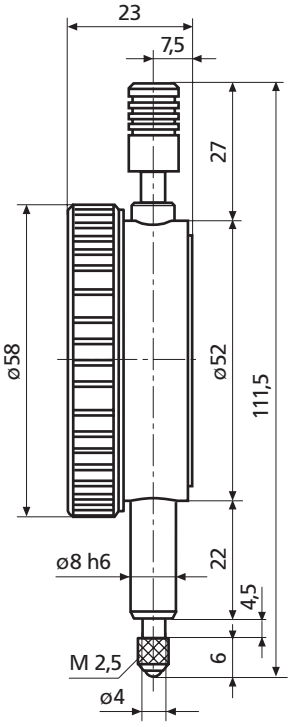


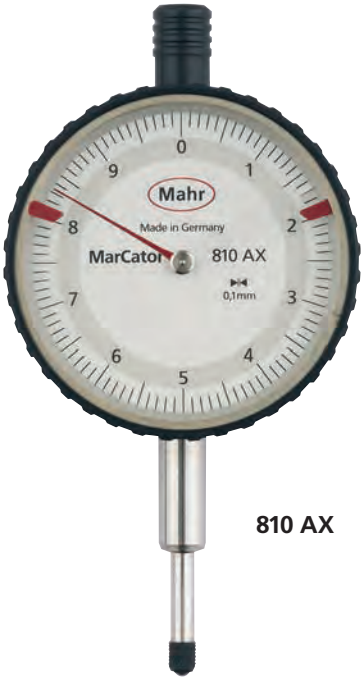


Precision Dial Indicators 810

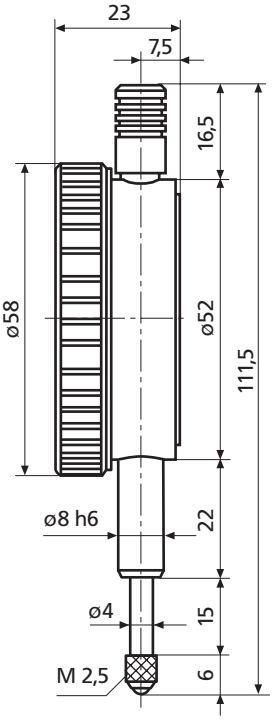


810 AU





810 AX



Features

Dial Indicator 810 AU
with a reversed measuring force direction

- Chrome-plated housing
- Adjustable tolerance markers
- Scale on the dial increases counter clockwise (+ on left)
- Measuring force acting towards the top
- Delivered in plastic case

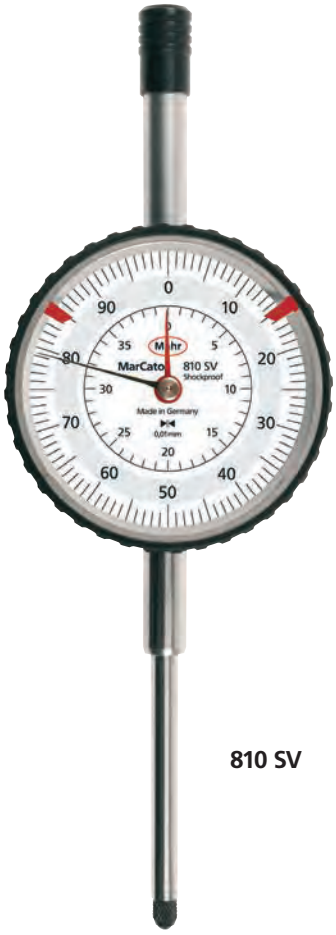
Dial Indicator 810 AX
with reading 0.1 mm

- Constant measuring force
- Chrome-plated housing
- Adjustable tolerance markers
- 1 pointer movement on 10 mm
- Delivered in plastic case

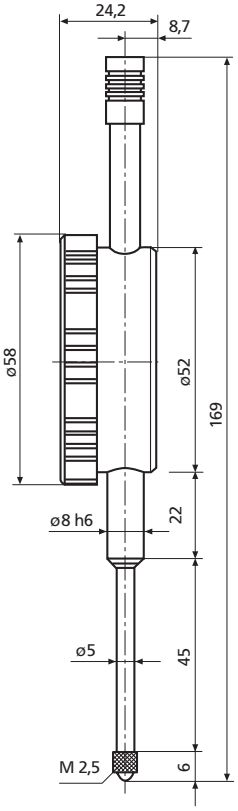
Technical Data

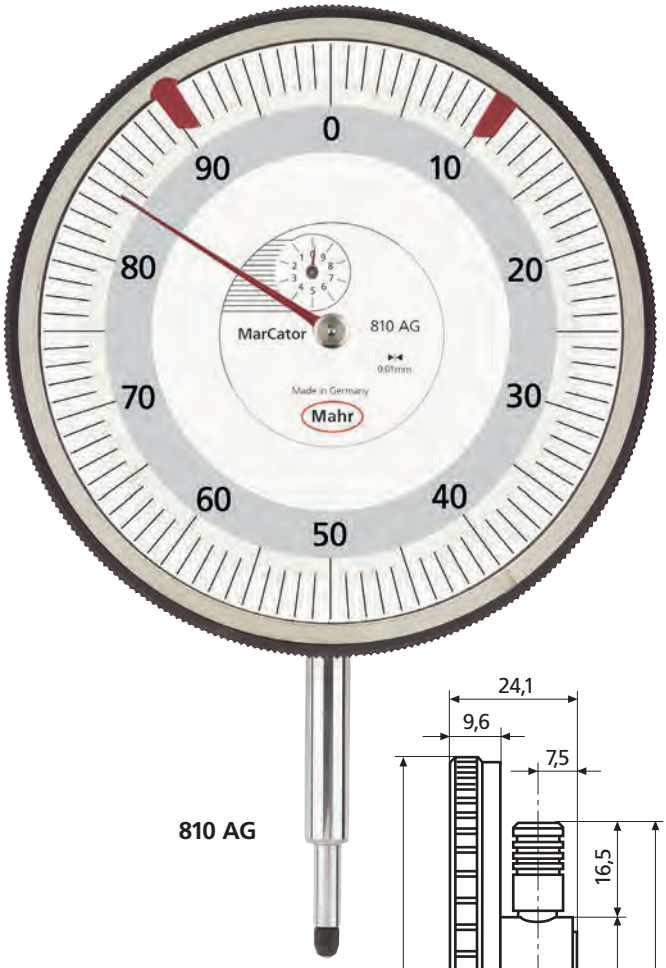
	Range mm	Readings mm	Dial face dia. mm	Overtravel mm	Mounting shank dia. mm	Measuring force N	Order no.
810 AU	10	0.01	50	0.1	8h6	1 - 1.8	**4329050**
810 AX	10	0.1	50	0.5	8h6	0.7 - 1.3	**4331000**
810 SV	40	0.01	50	0.1	8h6	0.8 - 1.8	**4321000**
810 AG	10	0.01	108	0.1	8h6	1.3 - 2.2	**4322000**

Precision Dial Indicators 810

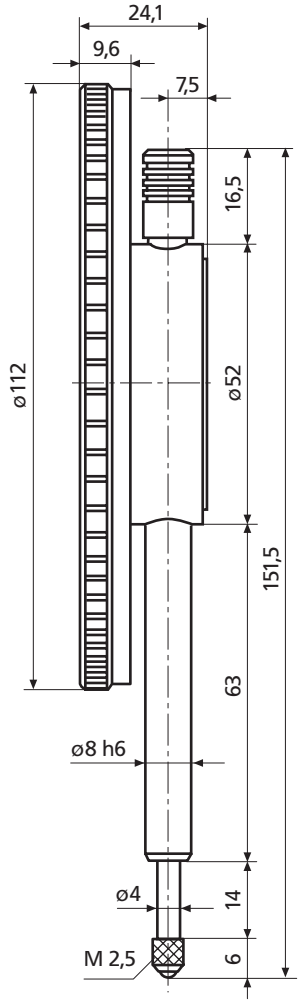


810 SV





810 AG



Features

Long Range Dial Indicator 810 SV
with larger measuring range

- Range 40 mm
- Strengthened measuring spindle (5 mm)
- Raising of measuring spindle via lifting cap
- Adjustable tolerance markers
- Shockproof movement
- Delivered in folded box

Extra large Dial Indicator 810 AG
with dial face dia. 108 mm

- Ideal for long reading distance and in bad light conditions
- Plastic outer ring
- Delivered in folded box

Accessories

		Order no.
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	**940**	**4310103**
Splash Guard Cover for dia. 58 mm	**955**	**4373020**
Mounting Lug to mount on mounting shank of all versions	**963**	**4375002**

MarCator. Digital Indicators (Long range)

OVERVIEW

Functions of Digital Indicators

			1075 R	1075 R	1075 R	1086 R(i)	1086 ZR
Catalog page			5 - 38	5 - 38	5 - 38	5 - 44	5 - 46
Measuring ranges	mm / inch		12.5 / .5"	12.5 / .5"	12.5 / .5"	12.5 / .5" 25 / 1 50 / 2" 100 / 4"	12.5 / .5" 25 / 1
Resolution	metric inch metric inch metric inch metric inch metric inch		0.01 mm ***.0005"***	0.005 mm ***.0001"***	0.001 mm ***.00005"***	0.01 mm ***.0005"***	0.01 mm ***.0005"***
Mounting shank			8h6	8h6	8h6	8h6	3/8"
Protection class	IP class acc. to IEC 60529		IP52	IP52	IP52	IP42	IP42
Functions:							
ON/OFF			●	●	●	●	●
Set display to zero			●	●	●	●	●
Switch between mm/inch			●	●	●	●	●
Reversal of counting direction			●	●	●	●	●
Enter numerical value	PRESET		●	●	●	●	●
Data			●	●	●	●	●
ABS/REL-switchable		ABS				●	●
Tolerance display		TOL				●	●
Dynamic measuring functions	MIN. MAX MAX-MIN (TIR)	MAX MIN					
Search for reversal point	START/STOP						
Factor set / adjust						●	●
Analog display							
Switch the analog value							
Key lock function LOC			●	●	●	●	●
Data output:	USB	USB	●	●	●	●	●
	Digimatic	Digimatic	●	●	●	●	●
	Opto RS232C	RS232C	●	●	●	●	●
	Integrated wireless	MarConnect				●*	●
Control output:							

* Ri version

	1086 R(i)	1086 ZR	1086 WR(i)	1086 WR(i)	1087 R(i)	1087 ZR	1087 BR(i)	1088	1088 W
	5 - 43	5 - 45	5 - 48	5 - 47	5 - 49	5 - 51	5 - 54	5 - 53	5 - 53
	12.5 / .5" 25 / 1	12.5 / .5" 25 / 1	12.5 / .5" 25 / 1	12.5 / .5" 25 / 1	12.5 / .5" 25 / 1	12.5 / .5" 25 / 1	12.5 / .5" 25	12.5 / .5" 25 / 1	50 / 2"
	0.0005 mm ***.00002"*** 0.001 mm ***.00005"*** 0.002 mm ***.0001"*** 0.005 mm ***.0002"*** 0.01mm ***.0005"***	0.0005 mm ***.00002"*** 0.001 mm ***.00005"*** 0.002 mm ***.0001"*** 0.005 mm ***.0002"*** 0.01mm ***.0005"***	0.01 mm ***.0005"***	0.0005 mm ***.00002"*** 0.001 mm ***.00005"*** 0.002 mm ***.0001"*** 0.005 mm ***.0002"*** 0.01mm ***.0005"***	0.0005 mm ***.00002"*** 0.001 mm ***.00005"*** 0.002 mm ***.0001"*** 0.005 mm ***.0002"*** 0.01mm ***.0005"***	0.0005 mm ***.00002"*** 0.001 mm ***.00005"*** 0.002 mm ***.0001"*** 0.005 mm ***.0002"*** 0.01mm ***.0005"***	0.0005 mm ***.00002"*** 0.001 mm ***.00005"*** 0.002 mm ***.0001"*** 0.005 mm ***.0002"*** 0.01mm ***.0005"***	0.001 mm ***.00005"***	0.001 mm ***.00005"***
	8h6	3/8"	8h6	8h6	8h6	3/8"	8h6	8h6	8h6
	IP42	IP42	IP54	IP54	IP42	IP42	IP42	IP42	IP54
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
					●	●	●	●	●
					●	●		●	●
							●		
	●	●	●	●	●	●	●	●	●
					●	●	●	●	●
					●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●		●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●*		●*	●*	●*		●*		
								●	●

Digital Indicators 1075 R

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of counting direction
PRESET (for entering a numerical value)
DATA (data transmission with a data connection cable)
LOCK-Function: Individual buttons can be locked
Auto-OFF (selectable)

- Immediate measurement due to the Reference system
- Max measuring speed 1.5 m/sec (60"/sec)
- MarConnect Data output: choose either
  USB
  OPTO RS232C
  Digimatic
- High contrast Liquid Crystal Display with12 mm high digits
- Operating temperature 10-40°C
- Class of protection IP52 according to IEC 60529

Scope of supply:
Battery,
Operating instructions

Reference System - Just set once to zero

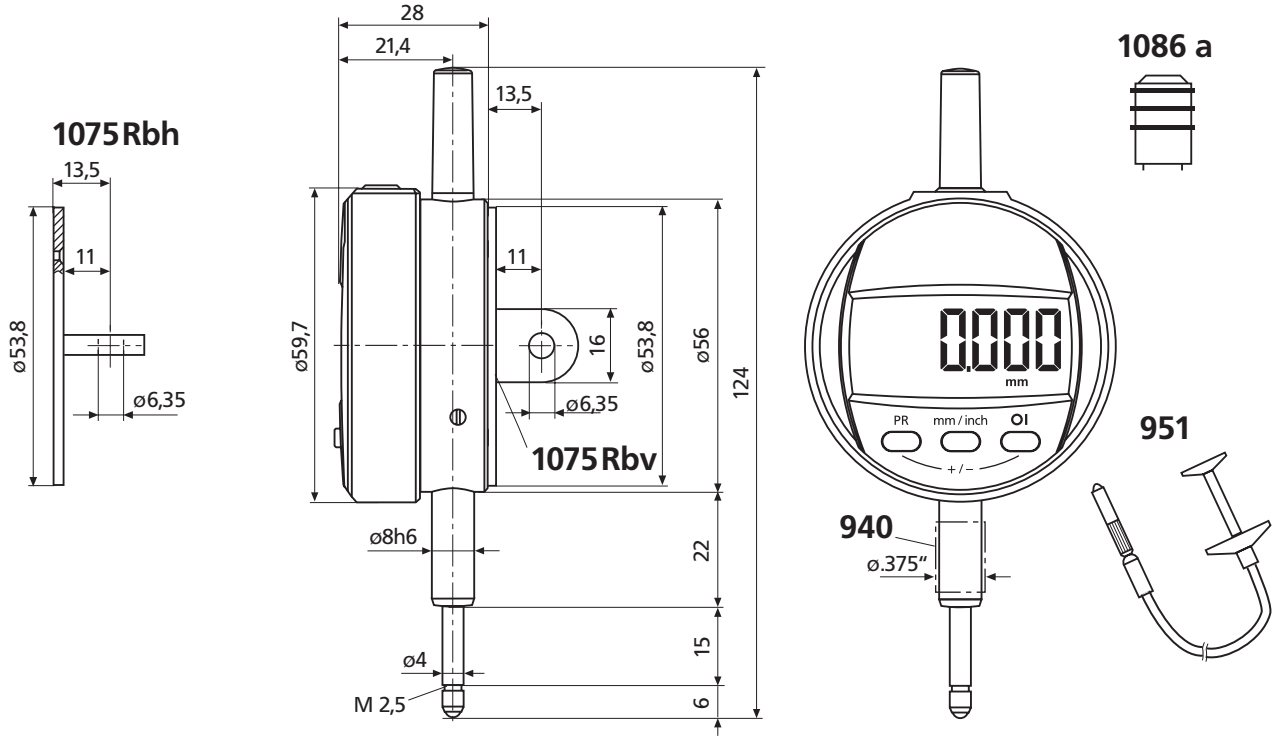
REFERENCE The new Digital Indicators 1075 R are equipped with the innovative Reference-System. The zero position only has to be set one time: once it is set, the zero remains stored for all further measurements. Therefore, when the indicator is switched ON or the measuring spindle is moved the indicator is immediately ready for measurement; thus the need to reset as with a conventional indicator is now obsolete.

Technical Data

Measuring range		Resolution			Span of error *G* *	Measuring force	Weight	Order no.
mm	***(inch)***	mm	/	***inch***	mm	N	g	
12.5	***(.5")***	0.01	/	***.0005"***	0.020	0.5 - 1	180	**4336010**
12.5	***(.5")***	0.005	/	***.0001"***	0.015	0.5 - 1	180	**4336020**
12.5	***(.5")***	0.001	/	***.00005"***	0.005	0.5 - 1	180	**4336030**

** in any zero point*

Technical Data



Shown with Mounting Lug, not included.

Accessories

		Order no.
Battery 3V, Type CR 2032		**4102520**
Data Connection Cable USB (2 m)	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m). Flat plug 10-pin	**16 EWd**	**4102915**
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	**940**	**4310103**
Cable Release to raise the measuring spindle	**951**	**4372000**
Lifter Protection Cap	**1086 a**	**4337320**
Lug Back, horizontal	**1075 Rbh**	**4336041**
Lug Back, vertical	**1075 Rbv**	**4336042**

Additional Accessories		Page
Contact Points	**901-913**	5-58
Special Holder	**941**	5-59
Sensor Lever	**943**	5-59

Accessories for Data Processing see Chapter 11

MarConnect Integrated Wireless

►| With integrated wireless, you have a new integrated wireless data transmission system from Mahr for the price of a cable. Data acquisition with Digital Indicators is now even simpler: Simply transmit your measuring data without being tangled up between cables directly into Microsoft Office Excel® or via a keyboard code into any other Windows program. |◄

Inexpensive

MarConnect integrated wireless

With the integrated wireless receiver up to 8 Digital Indicators can be connected per i-stick, therefore expensive interface boxes are no longer required. When just attaching a Digital Indicator you have already a wireless data transmission for the price of a data cable.

Secure data transmission

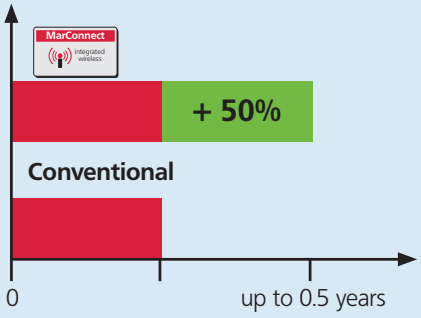
MarConnect integrated wireless

With the integrated wireless your data will be transferred to the Digital Indicator; this is confirmed with a message in the Digital Indicator's display to whether the sent data has been transferred correctly, and/or whether you are in the reception range of the i-stick.

Long battery life span

MarConnect integrated wireless

As the wireless interface is integrated in the Digital Indicator, the Digital Indicator is extremely energy efficient. In addition contrary to conventional wireless data transmission systems no additional battery is needed.



Simple data transmission

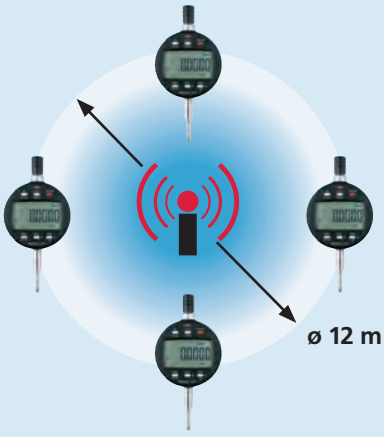
MarConnect integrated wireless

With the i-stick you can simply **transfer your measured values via integrated wireless to the PC**. The measured values are sent directly (as with a data cable) via the MarCom software to Microsoft Office Excel® or by a keyboard code into any other Windows program.

Large freedom of movement

MarConnect integrated wireless

The integrated wireless clearly gives you more **freedom of movement.** When used with a Digital Indicator in conjunction with a indicating measuring instruments, for example when measuring on or at the machine or with large workpieces you are not obstructed by any cables.



Excellent ergonomics

MarConnect integrated wireless

Compared to a bulky conventional radio transmission which requires a large external transmitter with a separate battery. The integrated wireless transmitter is integrated in the Digital Indicator.

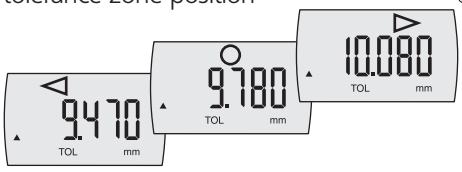
MarCator. Digital Indicators

DIGITAL INDICATORS WITH THE REFERENCE SYSTEM AND INTEGRATED WIRELESS

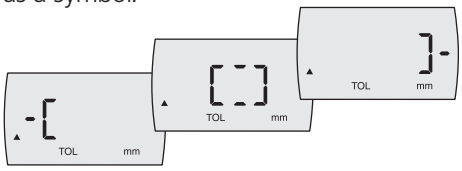
►| Once again Mahr sets a new standard in the Digital Indicator product segment with the new generation of Digital Indicators **MarCator** 1086 Ri / 1087 Ri Reference. With the new Reference system the MarCator Digital Indicators can be applied immediately as the zero-position only has to be set once for all further measurements. Also, if you need to document your data, we have our integrated wireless indicators; an integrated energy efficient wireless data transmission system, the optimal solution for transmitting your measured values to a PC. |◄

Clear display

Tolerance is displayed. Displayed is the actual measured value and the tolerance zone position



Tolerance indication without the value in the display. In and Out of tolerance will be indicated in the display as a symbol.



Universal Data-Interface

- **Integrated Wireless** The wireless interface for the price of a data
- **USB:** No interface box is required! Simple and inexpensive way to set up a multiple measuring instruments via a USB hub
- **Digimatic:** To connect a Digimatic compatible evaluation instrument
- **Mahr Opto RS232C:** For direct connection to a COM port on a PC

Absolute function:

ABS Digital Indicator can be set in any position to 0.000 without losing the reference to the preset value.

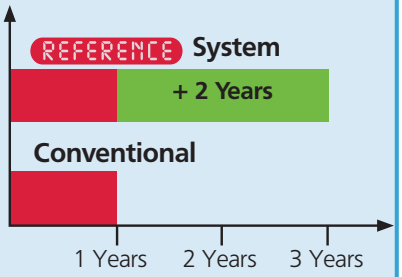
REFERENCE All our **MarCator** Digital Indicators from the 1086 R(i) and 1087 R(i) series are equipped with the **innovative Reference System.** For further information regarding our Reference System please refer to page 5-40.

Error free operation

Lock function: This prevents unintentional activation of an operating button. Either all the operating buttons or only certain individual buttons can be locked. If a locked operating button is pressed the "LOC" symbol will appear in the display.

Battery service life is 3 years

The new Reference system is extremely energy efficient as when the caliper is in standby mode; almost no power is required, thus **extending the life of the battery up to 3 years*.**

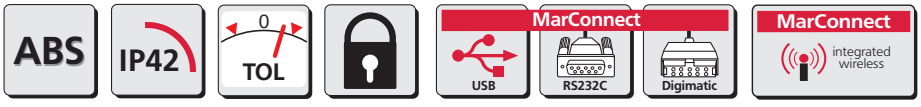


** When Integrated Wireless is deactivated*

IP-Protection class IP54 (optional)
- Protection cap is sealed
- Rubber bellows for the measuring spindle
- Sealed battery compartment

Code Initial	IP	International Protection
First Numeral	5	Dust protected
Second Numeral	4	Protection against splash water in all directions

Digital Indicators MarCator 1086 Ri

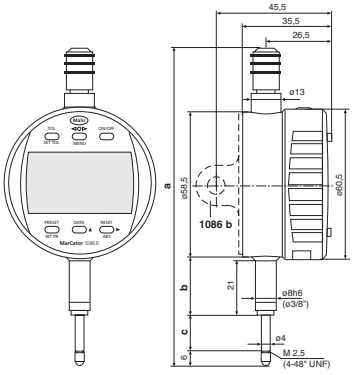


REFERENCE

Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Brazil, Japan, China and Korea.

12,5 mm

25 mm



Dimensions

Meas. range mm	(inch)	a mm	b mm	c mm
12.5	(.5")	126.3	23	13.5
25	(1")	153.4	26.8	26.5
50	(2")	267.3	40	52
100	(4")	420.3	91	103

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
ABS (Display can be set to zero, without losing the reference to the Preset value)
<0> (Tolerance GO / NO GO display mode)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Integrated Wireless data transmission
- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 11 mm high digits
- Operating time approx. 3 years (2000 work. hrs/year)
- Maximum measuring speed 1.5 m/s (60"/s)
- Lifter protection cap on the measuring spindle
- MarConnect data output: choose either: USB, OPTO RS232C, Digimatic or Integrated Wireless
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range mm	(inch)	Resolution switchable	Span of error* mm	MarConnect **	Measuring force N	Weight g	Mounting shank	Order no.
12.5	(.5")	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm .00002" / .00005" / .0001" / .0002" / .0005"	0.004	●	0.65 - 0.90	130	8h6	**4337624**
25	(1")		0.004	●	0.65 - 1.15	140	8h6	**4337625**
50	(2")		0.008	●	1.25 - 2.70	190	8h6	**4337626**
100	(4")		0.009	●	1.60 - 3.50	235	8h6	**4337627**
25	(1")		0.004	●	— —	140	8h6	**4337628**

* *in any zero point*

** *To use the integrated wireless function an i-Stick Wireless Receiver is required, see page 5-58*

Digital Indicators MarCator 1086 Ri, Resolution 0.01 mm / .0005"

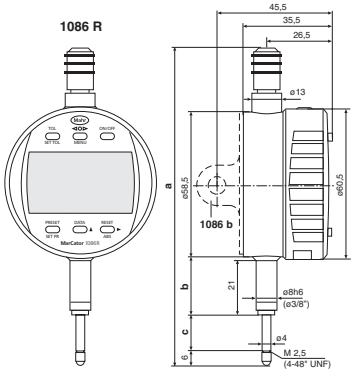
ABS · IP42 · TOL · USB · RS232C · Digimatic · MarConnect integrated wireless

REFERENCE

Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Brazil, Japan, China and Korea.

12,5 mm

25 mm



Dimensions

Meas. range mm	(inch)	a mm	b mm	c mm
12.5	(.5")	126.3	23	13.5
25	(1")	153.4	26.8	26.5
50	(2")	267.3	40	52
100	(4")	420.3	91	103

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
ABS (Display can be set to zero, without losing the reference to the Preset value)
<0> (Tolerance GO / NO GO display mode)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Integrated Wireless data transmission
- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 11 mm high digits
- Operating time approx. 3 years (2000 work. hrs/year)
- Maximum measuring speed 1.5 m/s (60"/s)
- Lifter protection cap on the measuring spindle
- MarConnect data output: choose either: USB, OPTO RS232C, Digimatic or Integrated Wireless
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range mm	(inch)	Resolution mm	/ inch	Span of error* mm	MarConnect**	Measuring force N	Weight g	Mounting shank	Order no.
12.5	(.5")	0.01	/ .0005"	0.02	●	0.65 - 0.90	130	8h6	**4337134**
25	(1")	0.01	/ .0005"	0.02	●	0.65 - 1.15	140	8h6	**4337135**
50	(2")	0.01	/ .0005"	0.02	●	1.25 - 2.70	190	8h6	**4337136**
100	(4")	0.01	/ .0005"	0.02	●	1.60 - 3.50	235	8h6	**4337137**

* *in any zero point*

** *To use the integrated wireless function an i-Stick Wireless Receiver is required, see page 5-56.*

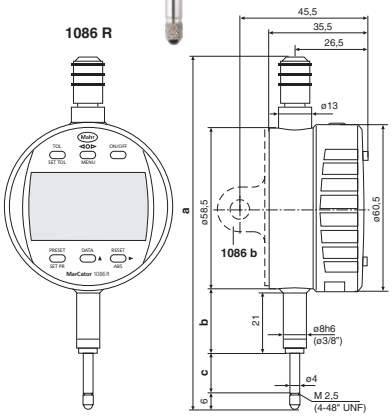
Digital Indicators MarCator 1086 R / 1086 ZR

12,5 mm

25 mm

50 mm

1086 R



Dimensions

Meas. range mm	(inch)	a mm	b mm	c mm
12.5	(.5")	126.3	23	13.5
25	(1")	153.4	26.8	26.5
50	(2")	267.3	40	52
100	(4")	420.3	91	103

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
ABS (Display can be set to zero, without losing the reference to the Preset value)
<0> (Tolerance GO / NO GO display mode)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 11 mm high digits
- Inductive measuring system, battery life ca. 2000 hrs.
- Maximum measuring speed 1.5 m/s (60"/s)
- Lifter protection cap on the measuring spindle
- MarConnect data output: choose either
  USB
  OPTO RS232C
  Digimatic
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range mm	(inch)	Resolution switchable	Span of error* mm	Repeatability mm	Measuring force N	Weight g	Mounting shank dia.	Order no.
12.5	*(.5")*	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm *.00002" / .00005" / .0001" / .0002" / .0005"*	0.004	0.002	0.65 - 0.90	130	8h6	**4337620**
25	*(1")*		0.004	0.002	0.65 - 1.15	140	8h6	**4337621**
50	*(2")*		0.008	0.002	1.25 - 2.70	190	8h6	**4337622**
100	*(4")*		0.009	0.002	1.60 - 3.50	235	8h6	**4337623**
12.5	*(.5")*		0.004	0.002	0.65 - 0.90	150	3/8"	**4337650**
25	*(1")*		0.004	0.002	0.65 - 1.15	160	3/8"	**4337651**

* *in any zero point*

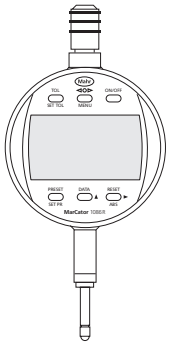
Digital Indicators MarCator 1086 R / 1086 ZR, Resolution 0.01 mm / .0005"

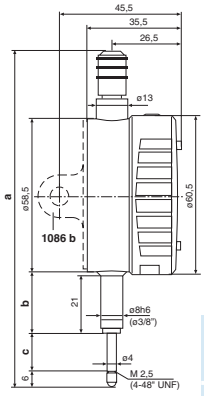
12,5 mm

25 mm

50 mm

1086 R





Dimensions

Meas. range mm	(inch)	a mm	b mm	c mm
12.5	(.5")	126.3	23	13.5
25	(1")	153.4	26.8	26.5
50	(2")	267.3	40	52
100	(4")	420.3	91	103

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
ABS (Display can be set to zero, without losing the reference to the Preset value)
<0> (Tolerance GO / NO GO display mode)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 11 mm high digits
- Inductive measuring system, battery life ca. 2000 hrs.
- Maximum measuring speed 1.5 m/s (60"/s)
- Lifter protection cap on the measuring spindle
- MarConnect data output: choose either
  USB
  OPTO RS232C
  Digimatic
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

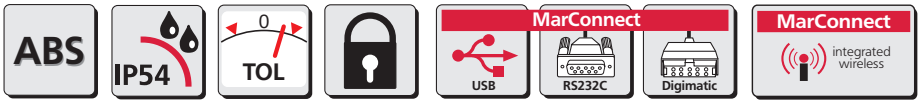
Supplied with:
Battery, operating instructions

Technical Data

Measuring range mm	(inch)	Resolution mm / inch	Span of error* mm	Repeatability mm	Measuring force N	Weight g	Mounting shank dia.	Order no.
12.5	(.5")	0.01 / .0005"	0.02	0.01	0.65 - 0.90	130	8h6	**4337130**
25	(1")	0.01 / .0005"	0.02	0.01	0.65 - 1.15	140	8h6	**4337131**
50	(2")	0.01 / .0005"	0.02	0.01	1.25 - 2.70	190	8h6	**4337132**
100	(4")	0.01 / .0005"	0.02	0.01	1.60 - 3.50	235	8h6	**4337133**
12.5	(.5")	0.01 / .0005"	0.02	0.01	0.65 - 0.90	150	3/8"	**4337155**
25	(1")	0.01 / .0005"	0.02	0.01	0.65 - 1.15	160	3/8"	**4337156**

** in any zero point*

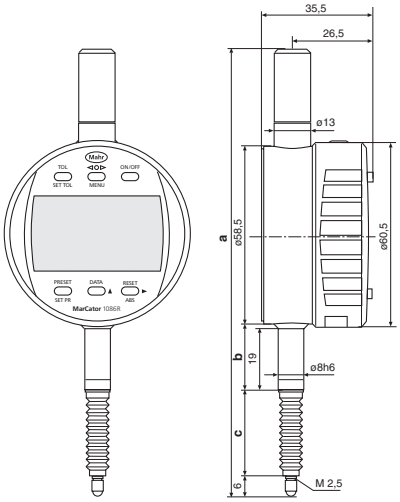
Digital Indicators MarCator 1086 WRi / 1086 WR, Waterproof version



Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Brazil, Japan, China and Korea.

12,5 mm

25 mm



MarConnect integrated wireless

* *Only available in conjunction with 1086 WRi indicators*

Dimensions

Meas. range mm	(inch)	a mm	b mm	c mm
12.5	(.5")	144.3	23	28.6
25	(1")	193.2	26.8	50

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
ABS (Display can be set to zero, without losing the reference to the Preset value)
<0> (Tolerance GO / NO GO display mode)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Integrated Wireless data transmission*
- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 11 mm high digits
- Inductive measuring system, battery life ca. 2000 hrs.
- Maximum measuring speed 1.5 m/s (60"/s)
- Sealed protection cap
- Measuring spindle is sealed with a rubber bellows, thus preventing contamination by liquids and impurities
- MarConnect data output: choose either: USB, OPTO RS232C, Digimatic or Integrated Wireless*
- Operating temperature 10 - 40°C
- Class of protection IP54 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range mm	(inch)	Resolution switchable	Span of error* mm	Repeatability mm	Measuring force N	Weight g	Order no. WRi**	Order no. WR
12.5	***(.5")***	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm ***.00002" / .00005" / .0001" / .0002" / .0005"***	0.004	0.001	0.65 - 1.40	135	**4337142**	**4337640**
25	***(1")***		0.004	0.001	1.00 - 2.25	145	**4337143**	**4337641**

* *in any zero point*

** *To use the integrated wireless function an i-Stick Wireless Receiver is required, see page 5-56*

Digital Indicators MarCator 1086 WRi / 1086 WR, Waterproof version, resolution 0.01 mm / .0005"

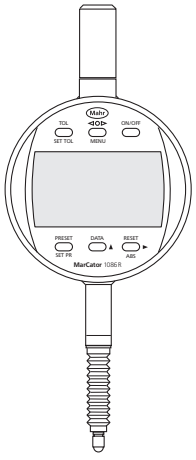
ABS | IP54 | 0 TOL | USB | MarConnect RS232C | MarConnect Digimatic | MarConnect integrated wireless

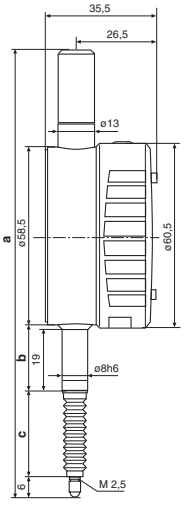
REFERENCE

Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Brazil, Japan, China and Korea.

12,5 mm

25 mm





MarConnect integrated wireless

* *Only available in conjunction with 1086 WRi indicators*

Dimensions

Meas. range mm	(inch)	a mm	b mm	c mm
12.5	(.5")	144.3	23	28.6
25	(1")	193.2	26.8	50

Features

Functions:
ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
ABS (Display can be set to zero, without losing the reference to the Preset value)
<0> (Tolerance GO / NO GO display mode)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Integrated Wireless data transmission*
- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 11 mm high digits
- Inductive measuring system, battery life ca. 2000 hrs.
- Maximum measuring speed 1.5 m/s (60"/s)
- Sealed protection cap
- Measuring spindle is sealed with a rubber bellows, thus preventing contamination by liquids and impurities
- MarConnect data output: choose either: USB, OPTO RS232C, Digimatic or Integrated Wireless*
- Operating temperature 10 - 40°C
- Class of protection IP54 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range mm	(inch)	Resolution mm	/	inch	Span of error* mm	Repeatability mm	Measuring force N	Weight g	Order no. WRi**	Order no. WR
12.5	(.5")	0.01	/	.0005"	0.02	0.01	0.65 - 1.40	135	4337147	4337145
25	(1")	0.01	/	.0005"	0.02	0.01	1.00 - 2.25	145	4337148	4337146

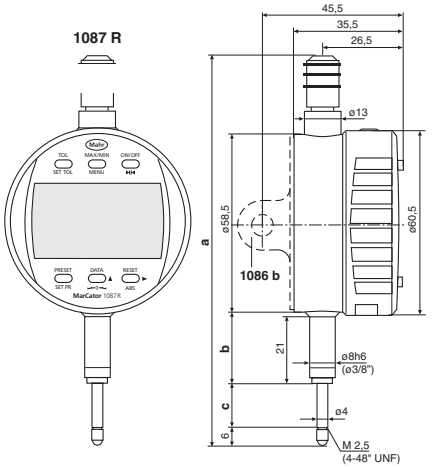
* *in any zero point*
** *To use the integrated wireless function an i-Stick Wireless Receiver is required, see page 5-56*

Digital Indicators MarCator 1087 Ri with analog display for dynamic measurements

ABS | MAX MIN | IP42 | TOL | MarConnect USB | MarConnect RS232C | MarConnect Digimatic | MarConnect integrated wireless

REFERENCE

Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Japan, China and Korea.



Features

Functions:

ON/OFF
RESET (Set display to zero)
mm/inch
Reverse the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
Tolerance band max. 1.6 mm
MAX/MIN memory, ideal for searching the reversal point
TIR (MAX-MIN) ideal for testing concentricity and flatness
ABS (Display can be set to zero, without losing the reference to the Preset value)
0 (Set analog display to zero)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Integrated Wireless data transmission
- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 8.5 mm high digits
- Operating time approx. 3 years (2000 work. hrs/year)
- Maximum measuring speed 1.5 m/s (60"/s)
- MarConnect data output: choose either: USB, OPTO RS232C, Digimatic or Integrated Wireless
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Dimensions

Meas. range mm	Meas. range (inch)	a mm	b mm	c mm
12.5	(.5")	126.3	23	13.5

Analog display

Readings mm	/	*inch*	Display range mm	/	*inch*
0.001	/	***.00005***	± 0.02	/	***± .001***
0.002	/	***.0001***	± 0.04	/	***± .002***
0.004	/	***.0005***	± 0.08	/	***± .01***
0.01	/	***.001***	± 0.2	/	***± .02***

Technical Data

Measuring range mm	*(inch)*	Resolution switchable	Span of error* mm	MarConnect **	Measuring force N	Weight g	Mounting shank	Order no.
12.5	***(.5")***	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm ***.00002" / .00005" / .0001" / .0002" / .0005"***	0,004	●	0.65 - 0.90	140	8h6	**4337663**
25	***(1")***		0,004	●	0.65 - 1.15	150	8h6	**4337665**

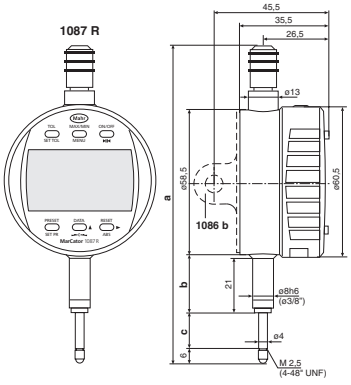
* *in any zero point*

** *To use the integrated wireless function an i-Stick Wireless Receiver is required, see page 5-56*

Digital Indicators MarCator 1087 R, with analog display for dynamic measurements

12,5 mm

25 mm



Dimensions

Meas. range		a	b	c
mm	(inch)	mm	mm	mm
12.5	(.5")	126.3	23	13.5
25	(1")	153.4	26.8	26.5

Analog display

Readings			Display range		
mm	/	inch	mm	/	inch
0.001	/	.00005	± 0.02	/	± .001
0.002	/	.0001	± 0.04	/	± .002
0.004	/	.0005	± 0.08	/	± .01
0.01	/	.001	± 0.2	/	± .02

Features

Functions:

ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
Tolerance band max, 1.6 mm
MAX/MIN memory, ideal for searching the reversal point
TIR (MAX-MIN) ideal for testing concentricity and flatness
ABS (Display can be set to zero, without losing the reference to the Preset value)
0 (Set analog display to zero)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 8.5 mm high digits
- Inductive measuring system, battery life ca. 2000 hrs.
- Maximum measuring speed 1.5 m/s (60"/s)
- MarConnect data output:choose either
  USB
  OPTO RS232C
  Digimatic
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

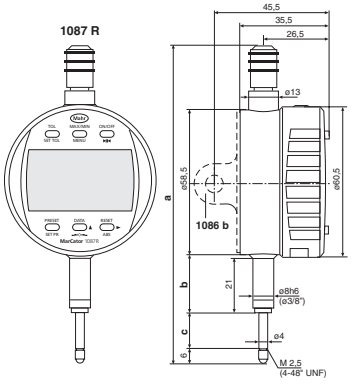
Measuring range		Resolution switchable	Span of error*	Repeatability	Measuring force			Weight	Mounting shank	Order no.
mm	*(inch)*		mm	mm	N			g		
12.5	***(.5")***	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm ***.00002" / .00005" / .0001" / .0002" / .0005"***	0.004	0.001	0.65	-	0.90	140	8h6	**4337660**
25	***(1")***		0.004	0.001	0.65	-	1.15	150	8h6	**4337661**

* *in any zero point*

Digital Indicators MarCator 1087 ZR, with analog display for dynamic measurements

12,5 mm

25 mm



Dimensions

Meas. range mm	(inch)	a mm	b mm	c mm
12.5	(.5")	126.3	23	13.5
25	(1")	153.4	26.8	26.5

Analog display

Readings mm	/	*inch*	Display range mm	/	*inch*
0.001	/	***.00005***	± 0.02	/	***± .001***
0.002	/	***.0001***	± 0.04	/	***± .002***
0.004	/	***.0005***	± 0.08	/	***± .01***
0.01	/	***.001***	± 0.2	/	***± .02***

Features

Functions:

ON/OFF
RESET (Set display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
Tolerance band max, 1.6 mm
MAX/MIN memory, ideal for searching the reversal point
TIR (MAX-MIN) ideal for testing concentricity and flatness
ABS (Display can be set to zero, without losing the reference to the Preset value)
0 (Set analog display to zero)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 8.5 mm high digits
- Inductive measuring system, battery life ca. 2000 hrs.
- Maximum measuring speed 1.5 m/s (60"/s)
- MarConnect data output:choose either
  USB
  OPTO RS232C
  Digimatic
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range mm	*(inch)*	Resolution switchable	Span of error* mm	Repeatability mm	Measuring force N	Weight g	Mounting shank	Order no.
12.5	***(.5")***	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm ***.00002" / .00005" / .0001" / .0002" / .0005"***	0.004	0.001	0.65 - 0.90	150	3/8"	**4337670**
25	***(1")***		0.004	0.001	0.65 - 1.15	160	3/8"	**4337671**

* *in any zero point*

MarCator 1088

►| The Digital Indicator **MarCator** 1088. Tolerance monitoring is simplified with the changing of the color in the background lit display. |◄

Dynamic measuring functions

- **MAX-MIN**-Function ideal for testing flatness and concentricity
- **MAX** and / or **MIN** for searching the reversal point

Universal Data-Interface

- **USB**
  No interface box is required! Simple and inexpensive way to set up a multiple measuring instruments via a USB hub
- **Digimatic**
  To connect a Digimatic compatible evaluation instrument
- **Mahr Opto RS232C**
  For direct connection to a COM port on a PC

Control output can be connected to a SPS

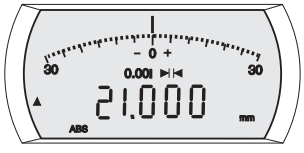
Tolerance function:
clearly visual tolerance excess due to the change of color in the background lit display.

Absolute function:
Digital Indicator can be set in any position to 0.000 without losing the reference to the preset value.

Protection class IP54 according to IEC 60529. Especially suited for use in a manufacturing environment (excludes measuring range 50 mm)

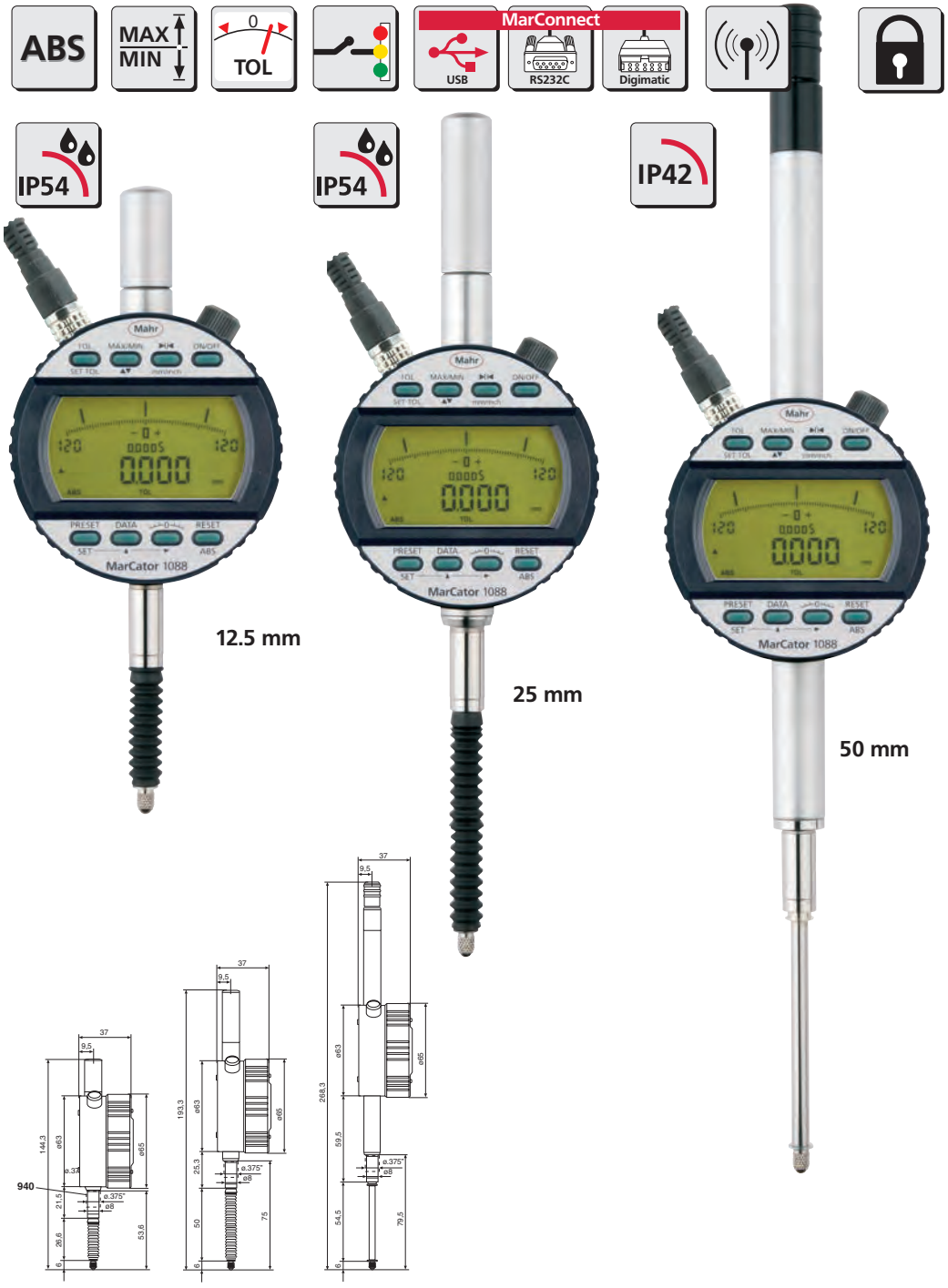
Code Initial	**IP**	International Protection
First Numeral	**5**	Dust protected
Second Numeral	**4**	Protection against splash water in all directions

Analog display



Readings (switchable)			Display range		
mm	/	***inch***	mm	/	***inch***
0.001	/	***.00005"***	± 0.030	/	***±.0015"***
0.002	/	***.0001"***	± 0.060	/	***±.0030"***
0.005	/	***.0005"***	± 0.150	/	***±.0150"***
0.01	/	***.001"***	± 0.30	/	***±.030"***

Digital Indicators MarCator 1088 / 1088 W, with analog display for dynamic measurements



Features

Functions:
ON/OFF
RESET (set digital and analog displays to zero)
- 0 - (set analog display to zero)
PRESET (enter any numerical values)
DATA (data transmission)
mm/inch-switchable
Factor (adjustable)
Reversal of counting direction (switch value in digital display)
MAX/MIN memory, ideal for searching the reversal point
MAX-MIN memory, e.g. for testing flatness and concentricity
TOL (Enter tolerance limit values)
Tolerance band max, 1.6 mm
LOCK: operating functions can be blocked via PC-Software

- Power supply via the main power adapter
- MarConnect data output: USB, OPTO RS232C, or Digimatic
- Can be remotely operated via the interface (Opto RS232C)
- Control output compatible to Dial Comparators with limit contacts
- Operating and display unit (bezel) can be rotated 280°
- Class of protection IP54 in accordance to IEC 60529
- Operating temperature 5 - 40°C
- High contrast backlit LCD with 6.5 mm high digits
- Analog display with 4 mm pointer ensures better visual recognition, ideal when checking concentricity or flatness as well as searching for the reversal point when measuring bores
- Supplied with: Mains adapter, rubber bellows, operating instructions

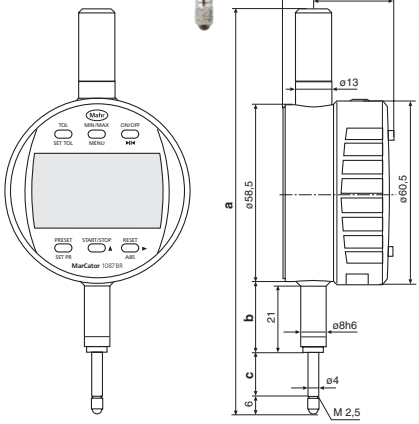
Technical Data

Measuring range mm	*(inch)*	Resolution mm	/	*inch*	Measuring force N	Span of error* mm	Protection class	Order no. 230 V	Order no. 115 V
12.5	***(.5")***	0.001	/	***.00005"***	0.65 - 1.40	0.005	IP54	**4337000**	**4337010**
25	***(1")***	0.001	/	***.00005"***	1.00 - 2.25	0.005	IP54	**4337001**	**4337011**
50	***(2")***	0.001	/	***.00005"***	1.25 - 2.7	0.008	IP42	**4337002**	**4337012**

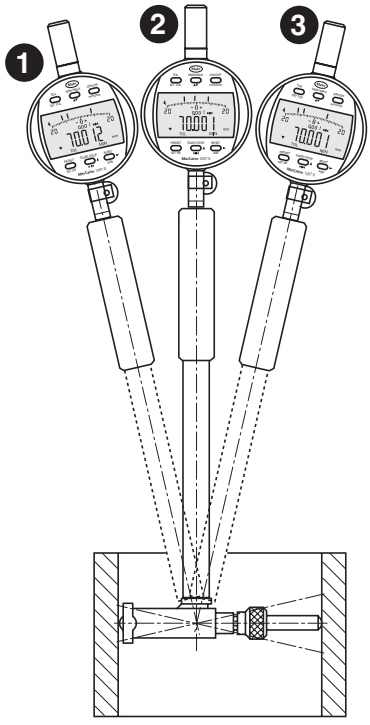
** in any zero point*

Digital Indicator MarCator 1087 BRi for 2 point inside and outside measurement

Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Japan, China and Korea.



Example of application



With a 2 point inside measuring instrument the point of reversal is automatically determined through rocking back and forth. The actual value is detected and stored by the MIN function and indicated in the display (3).

Dimensions

Meas. range mm	Meas. range (inch)	a mm	b mm	c mm
12.5	(.5")	126.3	23	13.5

Analog display

Readings mm	/	*inch*	Display range mm	/	*inch*
0.001	/	***.00005***	± 0.02	/	***±.001***
0.002	/	***.0001***	± 0.04	/	***±.002***
0.004	/	***.0005***	± 0.08	/	***±.01***
0.01	/	***.001***	± 0.2	/	***±.02***

Features

Functions:
ON/OFF
RESET (Set the display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
Tolerance band max. 1.6 mm
START/STOP for searching the reversal point
MAX/MIN memory, ideal for searching the reversal point
ABS (Display can be set to zero, without losing the reference to the Preset value)
0 (Set analog display to zero)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Integrated Wireless data transmission
- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 8.5 mm high digits
- Operating time approx. 3 years (2000 work. hrs/year)
- Max. meas. speed 1.5 m/s (60"/s)
- Sealed protection cap
- MarConnect data output: choose either: USB, OPTO RS232C, Digimatic or Integrated Wireless
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529
- Supplied with: Battery, Operating instructions

Technical Data

Measuring range mm	Measuring range *(inch)*	Resolution switchable	Span of error* mm	MarConnect **	Measuring force N	Weight g	Mounting shank	Order no.
12.5	***(.5")***	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm ***.00002" / .00005" / .0001" / .0002" / .0005"***	0.004	●	0.65 - 0.90	140	8h6	**4337664**

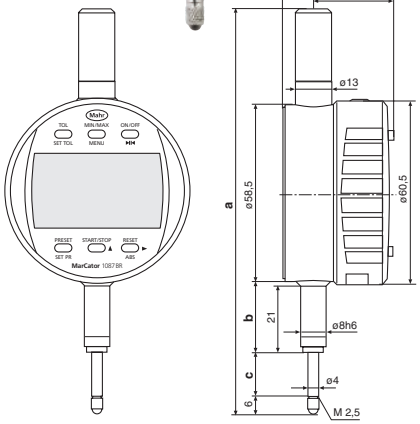
* *in any zero point*

** *To use the integrated wireless function an i-Stick Wireless Receiver is required, see page 5-56*

Digital Indicator MarCator 1087 BR for 2 point inside and outside measurement

ABS | MAX MIN | IP42 | 0 TOL | MarConnect: USB, RS232C, Digimatic

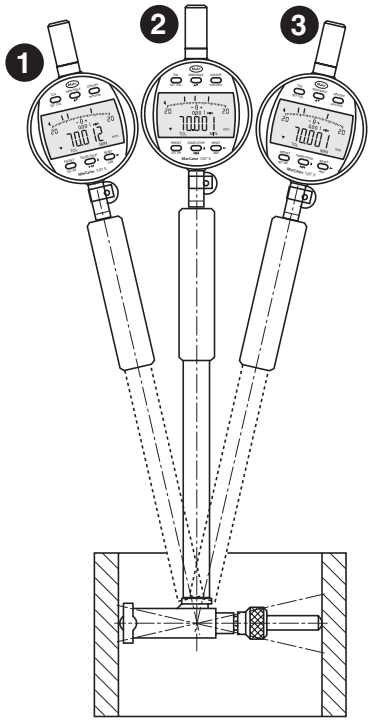
REFERENCE



Dimensions

Meas. range mm	Meas. range (inch)	a mm	b mm	c mm
12.5	(.5")	126.3	23	13.5

Example of application



With a 2 point inside measuring instrument the point of reversal is automatically determined through rocking back and forth. The actual value is detected and stored by the MIN function and indicated in the display (3).

Analog display

Readings mm	/	*inch*	Display range mm	/	*inch*
0.001	/	***.00005***	± 0.02	/	***± .001***
0.002	/	***.0001***	± 0.04	/	***± .002***
0.004	/	***.0005***	± 0.08	/	***± .01***
0.01	/	***.001***	± 0.2	/	***± .02***

Features

Functions:

ON/OFF
RESET (Set the display to zero)
mm/inch
Reversal of the counting direction
PRESET (Allows the entry of any value using set buttons)
TOL (Enter tolerance limit values)
Tolerance band max. 1.6 mm
START/STOP for searching the reversal point
MAX/MIN memory, ideal for searching the reversal point
ABS (Display can be set to zero, without losing the reference to the Preset value)
0 (Set analog display to zero)
DATA (when connected with a data connection cable)
Factor (adjustable)

- Immediate measurement due to the Reference system
- Individual buttons can be locked - Lock Function
- Operating and display unit (bezel) can be rotated 280°
- High contrast LCD with 8.5 mm high digits
- Operating time approx. 3 years (2000 work. hrs/year)
- Max. meas. speed 1.5 m/s (60"/s)
- Sealed protection cap
- MarConnect data output: choose
  USB
  OPTO RS232C
  Digimatic
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529
- Supplied with: Battery, Operating instructions

Technical Data

Measuring range mm	Measuring range *(inch)*	Resolution switchable	Span of error* mm	Repeatability mm	Measuring force N	Weight g	Mounting shank	Order no.
12.5	***(.5")***	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm ***.00002" / .00005" / .0001" / .0002" / .0005"***	0.004	0.001	0.65 - 0.90	140	8h6	**4337662**

* *in any zero point*

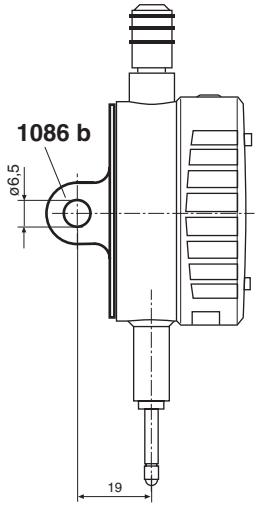
Accessories for MarCator 1086 R / Ri, 1087 R / Ri and 1088

Accessories for MarCator 1086 R / Ri and 1087 R / Ri

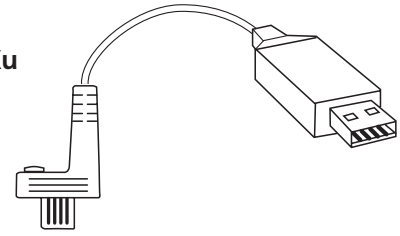
		Order no.
Battery 3V, Type CR 2450		**4884464**
Data Connection Cable USB (2 m) incl. MarCom Standard	**16 EXu**	**4102357**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4102410**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**16 EWd**	**4102915**
Mounting Lug	**1086 b**	**4337421**
Adjustable Mounting Back		**2246308**
Rubber bellows for 1086 W - 12.5 mm		**4337472**
Rubber bellows for 1086 W - 25 mm		**4337474**

Accessories for Data Processing see Chapter 11

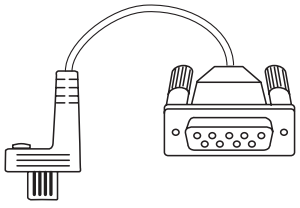
1086 b



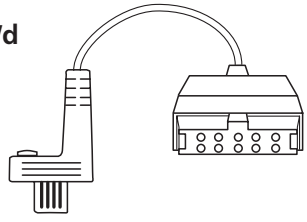
16 EXu



16 EXr



16 EWd



Accessories for MarCator 1086 Ri and 1087 Ri

	Order no.
i-Stick Wireless Receiver incl. MarCom Standard Software	**4102220**
Software MarCom Professional 5.0	**4102212**
Software MarCom Standard 5.0	**4102211**

Accessories for Data Processing see Chapter 11

i-Stick

Accessories for MarCator 1088

		Order no.
Data Connection Cable USB (2 m)	**2000 usb**	**4346023**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**2000 r**	**4346020**
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	**2000 d**	**4346021**
Cable to connect control output to an SPS	**2000 sps**	**4346031**
Mounting Lug	**1085 b**	**4336310**
Rubber bellows for 1088 W - 12.5 mm		**4337472**
Rubber bellows for 1088 W - 25 mm		**4337474**
Control Instrument for remote control operation	**2000 sg**	**4346035**

Accessories for Data Processing see Chapter 11

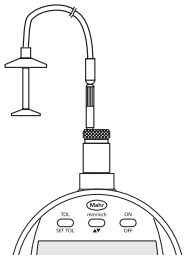
Accessories for MarCator 1086 R, 1087 R and 1088

		Order no.
Cable Release for measuring ranges 12.5 and 25 mm	**1085 a**	**4336311**
Pneumatic Lifter for measuring ranges 12.5 and 25 mm	**1082 p**	**4336237**
Pneumatic Lifter for measuring ranges 50 and 100 mm	**1082 p**	**4336230**

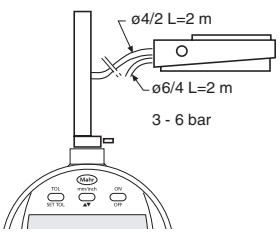
Additional Accessories		**Page**
Contact Points	**901-913**	5-58
Special Holder	**941**	5-59
Sensor Lever	**943**	5-59

Accessories for Data Processing see Chapter 11

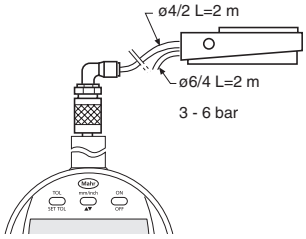
1085 a



1082 p (12.5/25)



1082 p (50/100)



Contact Points and Accessories for Dial Indicators, Dial Comparators and Probes

Standard Contact Points 901
Ball dia. 3 mm

Catalog no.		Order no.
901	with steel ball	**4360001**
901 H	with carbide ball	**4360002**
901 R	with ruby ball	**4360003**

Spherical Contact Points 902 — Flat Contact Points 903

Length mm	902 Steel Order no.	902 H Carbide contact face Order no.	903 Steel Order no.	903 H Carbide tipped Order no.
4	**4360007**	**–**	**4360070**	**–**
6	**4360009**	**–**	**4360071**	**4360101**
8	**4360010**	**4360040**	**4360072**	**4360102**
10	**4360011**	**4360041**	**4360073**	**4360103**
12	**4360012**	**4360042**	**4360074**	**4360104**
15	**4360013**	**4360043**	**4360075**	**4360105**
20	**4360014**	**4360044**	**4360076**	**4360106**
25	**4360015**	**4360045**	**4360077**	**4360107**
30	**4360016**	**4360046**	**4360300**	**4360110**
35	**4360017**	**4360047**	**4360078**	**4360108**
40	**4360019**	**4360049**	**4360310**	**4360111**
45	**4360026**	**4360050**	**4360303**	**–**
50	**4360018**	**4360048**	**4360079**	**4360109**
55	**4360031**			
65	**4360035**			
75	**4360020**			
85	**4360036**			
95	**4360029**			

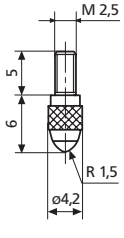
Ball Contact Point 906 H
with carbide ball, accuracy ball dia. 0/-6µm

Ball dia. d mm	*l* mm	Order no.	Ball dia. d mm	*l* mm	Order no.
1	8.5	**4360150**	5.5	9	**4360161**
1.25	8.5	**4360151**	6	9	**4360162**
1.5	8.5	**4360152**	6.35 ***(1/4")***	9	**4360163**
1.75	8.5	**4360153**	6.5	10	**4360164**
2	8.5	**4360154**	7	10	**4360165**
2.5	8.5	**4360155**	7.5	11	**4360166**
3	8.5	**4360156**	8	11	**4360167**
3.5	8.5	**4360157**	8.5	12	**4360168**
4	8.5	**4360158**	9	12	**4360169**
4.5	8.5	**4360159**	10	13	**4360170**
5	9	**4360160**			

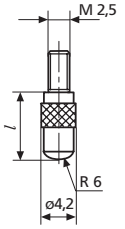
Contact Rollers 909
Concentricity error 3 µm

		Order no.
Cylindrical Roller	**909 A**	**4360220**
Radiused Roller, R = 5 mm	**909 B**	**4360221**

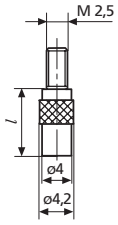
901



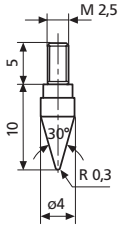
902



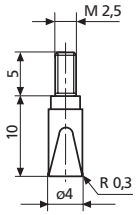
903



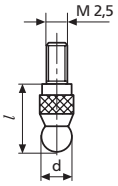
904



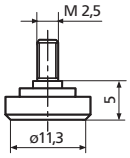
905



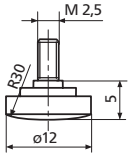
906 H



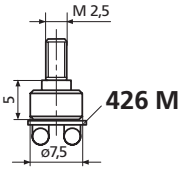
907



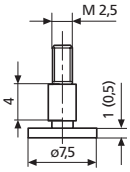
908 H



913



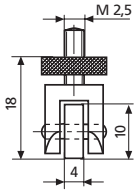
30 ENt



Special Contact Points

		Order no.
Conical Contact Points, Steel	**904**	**4360130**
Carbide tipped	**904 H**	**4360131**
Wedge Shaped Contact Points, Steel	**905**	**4360140**
Carbide tipped	**905 H**	**4360141**
Flat Contact Points, Steel, A = 1 cm²	**907**	**4360200**
Carbide tipped, dia. 7 mm	**907 H**	**4360201**
Spherical Contact Points, Steel	**908**	**4360210**
Carbide tipped	**908 H**	**4360211**
Flat Contact Point, for mounting Pin Gage Holder 426 M for measuring threads using three-wire method	**913**	**4360400**
Disc Type anvil thickness 0.5 mm, hardened	**30 ENt**	**4126310**
Disc Type anvil thickness 1 mm, hardened	**30 ENt**	**4882022**

909 A

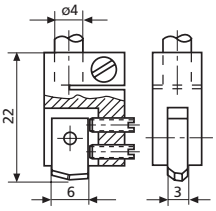


Contact Points and Accessories for Dial Indicators, Dial Comparators and Probes

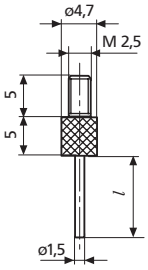
Measuring Attachment 910 H

		Order no.
with parallel adjustable carbide blades	**910 H**	**4360230**

910 H



911

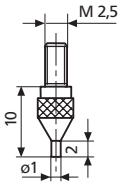


Pin Contact Point 911

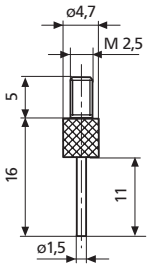
dia. 1.5 mm, flat

Length l mm	Order no.	Length l mm	Order no.
15	**4360280**	35	**4360284**
20	**4360281**	40	**4360285**
25	**4360282**	50	**4360286**
30	**4360283**		

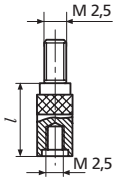
911 H1



911 H2



912



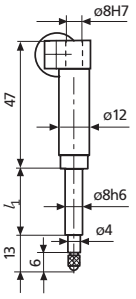
Pin Contact Point 911 H

		Order no.
Carbide tipped, dia 1 mm, flat	**911 H1**	**4360240**
Carbide tipped, dia 1.5 mm, flat	**911 H2**	**4360241**

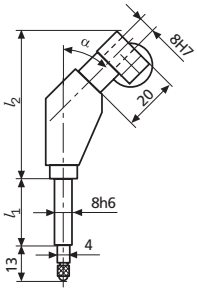
Measuring Spindle Extensions 912

Length l mm	Order no.	Length l mm	Order no.
10	**4360250**	35	**4360254**
15	**4360251**	50	**4360255**
20	**4360252**	75	**4360256**
25	**4360253**	100	**4360257**

941 G



941 W



Special Holder 941

For all types of measuring equipment
For placing a dial indicator at a certain distance or angle
Travel of the measuring spindle 3 mm
Contact Point 901 (interchangeable)

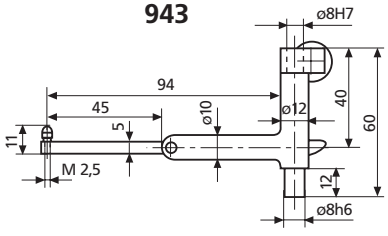
Transmission error with the 941 W max. 1%; for travel 3 mm = 0.03 mm

Straight Holder 941 G Mounting shank length l_1 mm	**Order no.**	**Angular Holder 941 W** Order no. Angle α=45°	l_2 mm	Order no. Angle α=60°	l_2 mm	Order no. Angle α=90°	l_2 mm
25	**4365000**	**4365010**	53.7	**4365020**	49.3	**4365030**	34.5
50	**4365001**	**4365011**		**4365021**		**4365031**	
75	**4365002**	**4365012**		**4365022**		**4365032**	

Sensor Level 943

	Order no.
For testing concentricity in bore holes as well as difficult to reach outside diameters To be inserted in a measuring stand with a lifting device Contact Point 901 interchangeable Travel ±1 mm	**4367000**

943



SIMPLE, ACCURATE AND INEXPENSIVE MEASUREMENT.
MILLIMESS DIAL COMPARATORS.

The latest information on MILLIMESS products can be found on our website:
www.mahr.de/en/Home, WebCode 20297

► | Millimess is the "classic" amongst all measuring instrument. For over 60 years the Millimess series of dial comparators has been synonymous with both high precision and extreme robustness. Both maximum accuracy and a minimal reversal span error are obtained through the levers, gears and pinions being supported with jeweled bearings and that the measuring spindle running in a ball bush guide. Millimess is therefore particularly suitable for measuring tasks where the accuracy and the reversal span of a conventional dial indicator are not sufficient. Further advantages of Millimess are the simple handling, the easy reading as well as the movement being absolute shockproof. With a digital comparator with an inductive measuring system combined with most modern state of the art digital technology readings as small as 0.2 µm / 10 µinch are realized. The practical control functions (for example tolerance monitoring or the storage of measuring values for dynamic measurements), the combined analog and digital display as well as the easy to use data transmission rounds off the complete Millimess spectrum. | ◄

► | Millimess. Digital and Dial Comparators

Inductive Digital Comparators

Overview 6- 2

Millimess 2100 6- 4
With background lit digital and analog display

Millimess 2000 / 2001 6- 6
With digital and analog display

µMaxµm® *II* 6- 8
With digital display

Maxµm® *III* 6-10
With digital and analog display, probe

Mechanical Dial Comparators

Overview 6-14

Millimess 1000 A / 1000 B 6-17
With large dial

Millimess 1002 / 1003 / 1003 XL / 1004 / 1010 / 1050 6-18
Standard versions

Millimess 1110 N / 1150 N 6-20
With limit contacts

Millimess. Digital Comparators (Short range)

OVERVIEW

Inductive Digital Comparators

		2100	2000
Catalog page		6 - 3	6 - 5
Measuring range		2.8 mm	1.8 mm
Resolution		mm / ***inch*** 0.0005 / ***.00002"*** 0.001 / ***.00005"*** 0.005 / ***.0002"*** 0.01 / ***.0005"***	mm / ***inch*** 0.0002 / ***.00001"*** 0.0005 / ***.00002"*** 0.001 / ***.00005"***
Mounting shank		8h6	8h6
Protection class	IP class acc. IEC 60529	IP54	IP54
Functions:			
ON/OFF		●	●
Zero set the display		●	●
Zero set the analog display		●	●
Switch between mm/inch		●	●
Reversal of counting direction		●	●
Enter a numerical value Preset		●	●
Data key		●	
Data via control instrument 2000sg		●	●
ABS/REL-switchable		●	●
Tolerance display		●	
Dynamic measuring functions	Min, Max. Max-Min (Tir)	● ●	
Resolution switchable		●	●
Analog display		●	●
Analog value switchable		●	●
Lock key function		●	
Data output	USB	●	●
	Digimatic	●	●
	Opto RS232C	●	●
Control output		●	

2001	***µMaxµm® II***	***Maxµm® III***
6 - 5	6 - 7	6 - 8
1.8 mm	2 mm	2 mm / 3.98 mm
mm / ***inch***	mm / ***inch***	mm / ***inch***
0.0002 / ***.00001“***	0.0002 / ***.00001“***	0.0005 / ***.00002“***
0.0005 / ***.00002“***	0.0005 / ***.00002“***	0.001 / ***.00005“***
0.001 / ***.00005“***	0.001 / ***.00005“***	0.001 / ***.0001“***
	0.001 / ***.0001“***	0.005 / ***.0005“***
	0.005 / ***.0002“***	
	0.010 / ***.0005“***	
	0.020 / ***.001“***	
8h6	8h6 / ***3/8“***	8h6 / ***3/8“***
IP54	IP54	IP54
●	●	Auto
●	●	●
●	●	●
●	●	●
●	●	●
●	●	
	●	
●		
●	●	●
●	●	●
●	●	●
●	●	●
●	●	●
●	●	●
●	●	●
●	Optional	Optional
●	●	●
●	●	●
●	●	●
●		

Millimess 2100

►| The Inductive Digital Comparator **Millimess** 2100. Tolerance monitoring is simplified with the color change in the background lit display. |◄

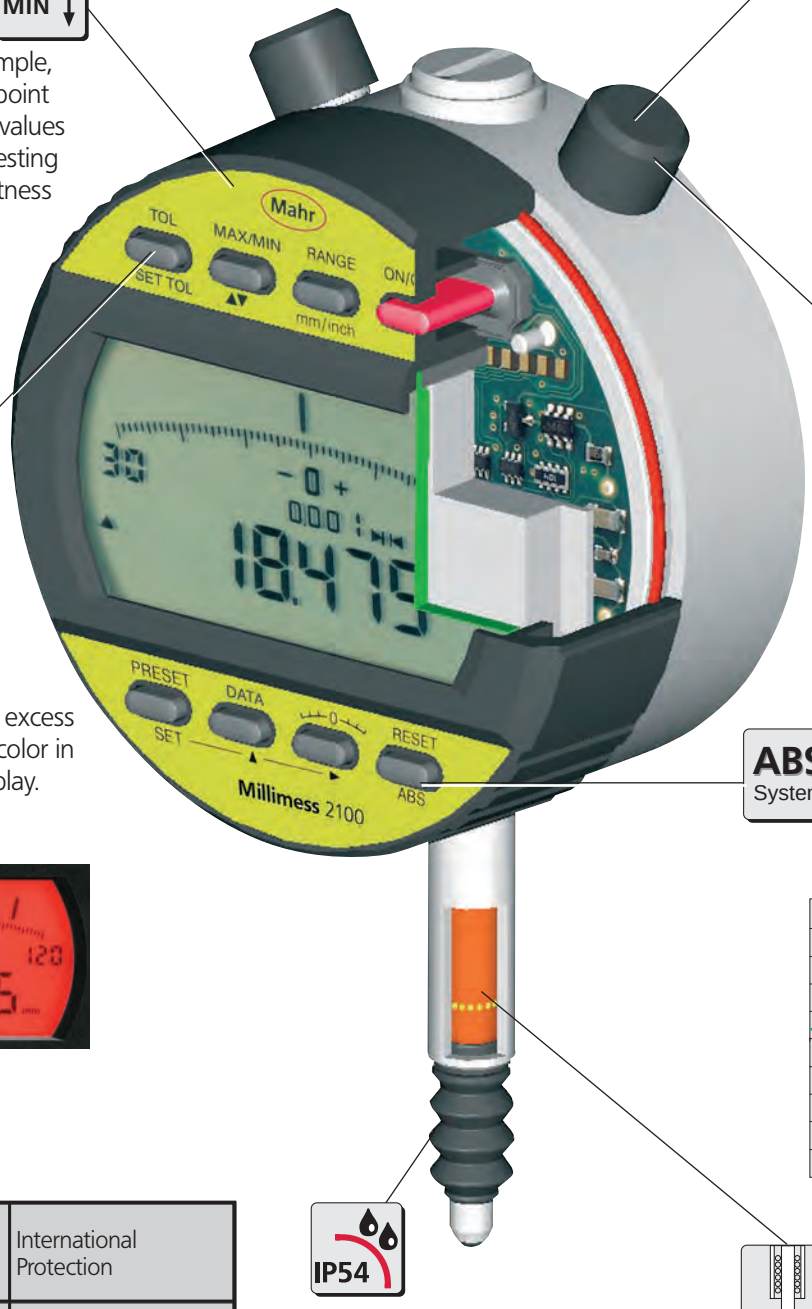
Dynamic measuring functions:
- MAX / MIN for example, finding the reversal point
- MAX - MIN storing values for example when testing concentricity and flatness

MAX / MIN

Universal SPS Interface
The choice is yours: **MarConnect** Data output, choose between USB, Digimatic or RS232C

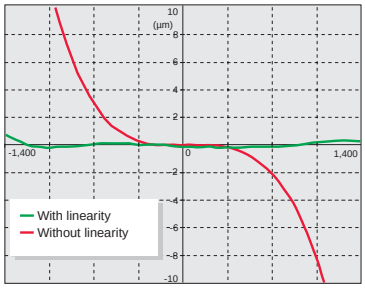
Control output can be connected to a SPS

Tolerance function:
clearly visual tolerance excess due to the change of color in the background lit display.



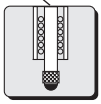
ABS System

Linearized, inductive **absolute measuring system.** Reference point is not lost when the instrument is switched off



IP54

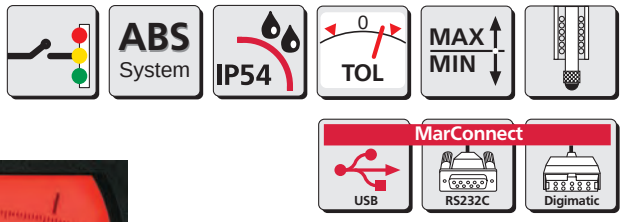
Especially suited for use in a manufacturing environment. Waterproof: **protection class IP54** in accordance to IEC 60529



High precision rotary stroke bearings for a longer service life and higher capacity

Code Initial	**IP**	International Protection
First Numeral	**5**	Dust protected
Second Numeral	**4**	Protection against splash water in all directions

Inductive Digital Comparator Millimess 2100 with background lit display



Features

Functions:
ON/OFF
RESET (zero setting the digital and analog displays)
- 0 - (set the analog display to zero)
PRESET (enter any numerical values)
DATA (data transmission)
mm/inch-switchable
Reversal of counting direction
RANGE (switch the measuring range and resolution)
ABS (reference to electrical zero point)
MAX / MIN memory, e.g. ideal to search for the reversal point
MAX-MIN e.g. testing concentricity and flatness
TOL (entering tolerance)
Tolerance band max. 2.8 mm
LOCK: operating functions can be blocked via PC-Software

- Factor can be set / adjusted
- Linearized inductive absolute measuring system
- Measurement electronic is compensated for temperature
- Power supply via the mains power adapter
- MarConnect data output: choose either
  USB
  OPTO RS232C
  Digimatic
- Dial Comparator can be remotely operated via the interface (Opto RS232C)
- Control output compatible to Dial Comparators with limit contacts
- Operating and display unit (bezel) can be rotated through 280°
- Measuring force spring is interchangeable
- Lower stop is adjustable
- Protection class IP54 according to IEC 60529
- Operating temperature 5 - 40°C
- High contrast background lit LCD with 6.5 mm high digits
- Analog display has a 4 mm long pointer which ensures better visual perception, ideal when checking concentricity and flatness and also to search for the reversal point when measuring bores
- Supplied with:
  Mains adapter, rubber bellows and spanner for preliminary stroke setting

Technical Data

Measuring ranges switchable		Resolution switchable		Display range of the analog display		Span of error* G within		Over-travel	Meas. force	Order no.	Order no.
mm	*(inch)*	mm	/ *inch*	mm	*(inch)*	±0.8mm	±1.4mm	mm	N	230 V	115 V
±1.0	*(.04")*	0.0005	/ *.00002"*	±0.015	*(.0006")*	1µm	2µm	1.8	0.7 - 0.9	**4346200**	**4346201****
±1.4	*(.055")*	0.001	/ *.00005"*	±0.030	*(.0015")*						
		0.005	/ *.0002"*	±0.150	*(.0060")*						
		0.01	/ *.0005"*	±0.300	*(.0150")*						

* *1 digit in any zero position*
** *Includes Adapter Bush 940*

Inductive Digital Comparator 2000 / 2001

2000

2001

Features

Extramess 2000

Functions:
ON/OFF
RESET (Set the digital and analog display to zero)
- 0 - (Set analog display to zero)
PRESET (enter any numerical values)
mm/inch switchable
Reversal of counting direction
RANGE (Switch the measuring range and resolution)
ABS (reference to electrical zero point)

- Battery charge level indicator
- Linearized inductive absolute measuring system
- Power supply via either the integrated rechargeable batteries (40 hrs.) or via the mains power adapter
- Rate measuring values are actualized 20 values/second
- MarConnect data output: choose either
  USB
  OPTO RS232C
  Digimatic
- Comparator can be remotely operated via the interface
- High contrast LCD with 6.5 mm high digits. Analog display has a 4 mm long pointer for better visual perception, ideal when checking concentricity and flatness as well as search for the reversal point when measuring bores
- Operating and display unit (bezel) can be rotated 280°
- Measuring force spring is interchangeable
- Lower stop is adjustable
- Protection class IP54
- Operating temperature 5 - 40°C

- Supplied with:
  Mains adapter, rubber bellows and spanner for preliminary stroke setting

Extramess 2001

Features are identical to Extramess 2000, in addition:
MAX / MIN memory, e.g. ideal to search for the reversal point
MAX-MIN e.g. testing concentricity and flatness
TOL (entering tolerance)
Tolerance band max. 180 µm

- Block individual operating functions via Software (see accessories)
- Factor can be set / adjusted
- Control output compatible to Dial Comparators with limit contacts

- Supplied with:
  Mains adapter, rubber bellows and spanner for preliminary stroke setting

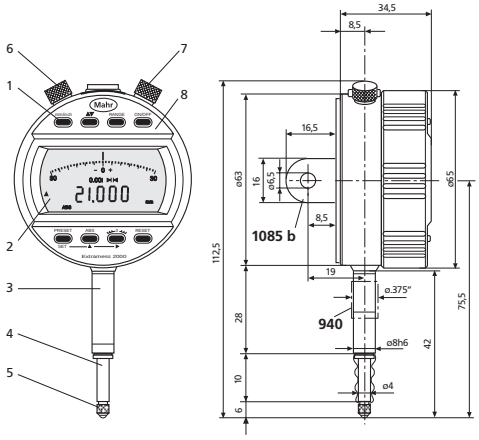
Technical Data

	Measuring ranges switchable		Resolution and readings		Display range of analog display		Span of error* *G*	Over-travel	Meas. force	Order no. 230 V	Order no. 115 V
	mm	*(inch)*	mm	/ *inch*	mm	*(inch)*	µm	mm	N		
2000	1.8	*(.07")*	0.001	/ *.00005"*	± 0.030	*(.0015")*	0.6	2.4	0.7 - 0.9	**4346000**	**4346900****
	1.8	*(.07")*	0.0005	/ *.00002"*	± 0.015	*(.0006")*	0.6	2.4			
	0.8	*(.031")*	0.0002	/ *.00001"*	± 0.006	*(.0003")*	0.3	2.9			
2001	1.8	*(.07")*	0.001	/ *.00005"*	± 0.030	*(.0015")*	0.6	2.4	0.7 - 0.9	**4346100**	**4346910****
	1.8	*(.07")*	0.0005	/ *.00002"*	± 0.015	*(.0006")*	0.6	2.4			
	0.8	*(.031")*	0.0002	/ *.00001"*	± 0.006	*(.0003")*	0.3	2.9			

* *1 digit in any zero position*
** *Includes Adapter Bush 940*

Inductive Digital Comparators 2100 / 2000 / 2001

1 Operating buttons
2 Display
3 Mounting shank
4 Measuring spindle
5 Contact point 901H
6 Connection or mains power supply
7 Data output
8 Rotatable operating and display unit (bezel)



Control Instrument 2000sg

Features

- Remote control buttons:
  RESET
  PRESET
  RANGE*
- DATA-button for data transmission, option via foot switch
- Power is supplied by the Extramess
- Connect to the Extramess with the built-in control cable
- Data can be transferred to a PC with an optional data cable
- Splash waterproof according to IP54

Order no. **4346035**

** Function is limited when used in conjunction with the 2100*

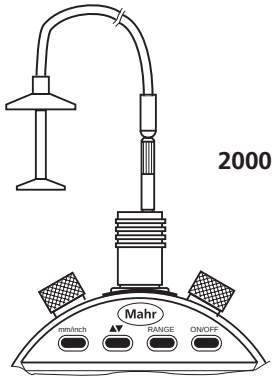
Accessories

		Order no.
Data Connection Cable USB (2 m)	**2000 usb**	**4346023**
Data Connection Cable Opto RS232C (2 m), SUB-D jack 9-pin	**2000 r**	**4346020**
Data Connection Cable Digimatic (2 m), flat plug 10-pin	**2000 d**	**4346021**
Cable to connect control output to an SPS	**2000 sps**	**4346031**
Manual Lifter with cable release	**2000 h**	**4346010**
Pneumatic Lifter	**2000 p**	**4346011**
Measuring Force Adjuster	**2000 m**	**4346012**
Mounting Lug Horizontal/Vertical	**1085 b**	**4336310**
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	**940**	**4310103**

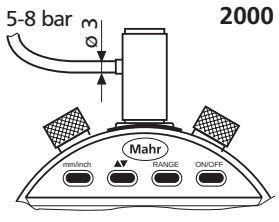
Additional Accessories		**Page**
Contact Points	901-913	5-58
Special Holder	941	5-59

Accessories for Data Processing see Chapter 11

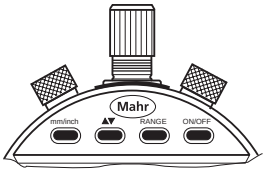
Measuring Force Springs	**Order no.**
0.25 N	**4346050**
0.5 N	**4346051**
0.75 N	**4882284**
1.0 N	**4346052**
1.5 N	**4346053**
2 N	**4346054**
2.5 N	**4346055**



2000 h

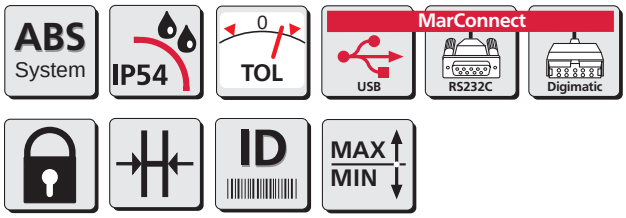


2000 p



2000 m

Inductive Digital Comparator *µMaxµm® II*



Advanced Functions:
- Dynamic mode operation: Max, Min, TIR
- Two point difference measurement – provides comparison of two readings or measuring locations.
  - Calculate the distance between 2 measured values
- Multiplier factor for ratio measurements
- Hold function – holds reading on display until ready to resume measuring
- ID Data output with serial number identification capability
- Data output with selectable continuous output or single request of reading(s)

Features

Functions:
- Inch/Metric – operator selectable with switchable resolution.
- Normal / Reverse Sensing
- Preset capabilities to view actual size
- "Absolute" Transducer – no overspeed errors or constant re-zeroing. Transducer always remembers its location, even if power is off
- High resolution digital readout and analog bar graph – digital display shows deviation from zero or actual dimension size (Preset)
- Lightweight, contamination resistant – ruggedly built to withstand hard use – gasketed case, crystal and stem assemblies resist fluid contamination
- Calibratable – if ever needed – values remembered even after battery change.
- MarConnect data output: USB, OPTO RS232C, Digimatic
- Auto-power down – provides extremely low battery consumption, assuring long life from readily available commercial batteries.
- Increased resolution (0.0002 mm / 10 µinch) for today's demanding tolerances
- Unilateral Tolerances
- Go/NoGo Display Feature

Mode A:
Actual value + bargraph
Display of tolerance

Mode B:
GO/NOGO display

Optional Factory Configured Features:
- Locked Multiplier factor for ratio measurements
- Disabled sleep mode (manual ON/OFF)
- Locked inch or mm display unit
- Power up in inch or mm unit on battery change
- Calibration mode lockout (with password entry)
- Setup mode lockout with password entry

Technical Data

Model	Range mm / *inch*	Resolution mm / *inch*	Accuracy % of digital range	Stem diameter	Stem Length mm / *inch*	Order no.
Standard				***.375"***	11.7 / ***.46"***	**2034101**
Standard				***.375"***	38.0 / ***1.50"***	**2034103**
Standard		0.0002 / ***.00001"***	±0.25% over	8 mm	11.7 / ***.46"***	**2034105**
Standard		0.0005 / ***.00002"***	±0.50 mm / ***±.020"***	8 mm	38.0 / ***1.50"***	**2034107**
Advanced	±1.00 / ***±0.040"***	0.001 / ***.00005"*** 0.002 / ***.0001"***	±0.50% from ±0.50 mm / ***±.020"***	***.375"***	11.7 / ***.46"***	**2034201**
Advanced		0.005 / ***.0002"***	to	***.375"***	38.0 / ***1.50"***	**2034203**
Advanced		0.01 / ***.0005"***	±1.00 mm / ***±.040"***	8 mm	11.7 / ***.46"***	**2034205**
Advanced		0.02 / ***.001"***		8 mm	38.0 / ***1.50"***	**2034207**
Advanced Perpendicular				***.375"***	11.7 / ***.46"***	**2034401**

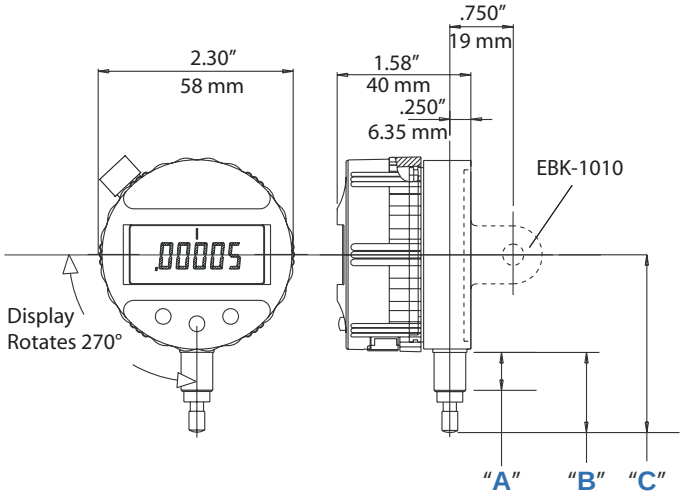
Technical Data

Display Range:	±1.067 mm / ***± .042"***
Spindle Range:	-1.25 to 1.50 mm / ***- .050 to + .060"***
Resolution:	0.0002 mm / ***.00001"***
Accuracy:	±0.5 mm range: 1.25µm (0.25%)
(% of range)	±1.0 mm range: 5.0µm (0.50%)
	± .020" range: 50µinch (0.25%)
	± .040" range: 200µinch (0.50%)
Thermal Stability	0.1% of full scale/F
Gaging Force:	85 to 122 g (grams) - at center of travel
	3 to 4 oz (ounce) - at center of travel
Weight:	170 g / ***6 oz***
Spindle Velocity:	Unrestricted
Temperature	
Operating:	5° to 54°C / ***40° to 130°F***
Storage:	-17° to 60°C / ***0° to 140°F***
Repeatability:	± 1 LSD (Least Significant Digit)
Battery Life:	6000 hours
	~12 months normal usage*

** normal usage = 12 hr/day x 7 day/wk*

Contact Point:	(**PT-223** radiused tip, 4-48 thread, furnished on 0.375" dia. Stem model) **EPT-1037-W1** radiused tip, M2.5 thread furnished on 8 mm dia. stem model
Power:	3 volt lithium coin cell (2 per unit), type CR 2450. Order no. **EBY-1018**
Display:	Rotates through 270°

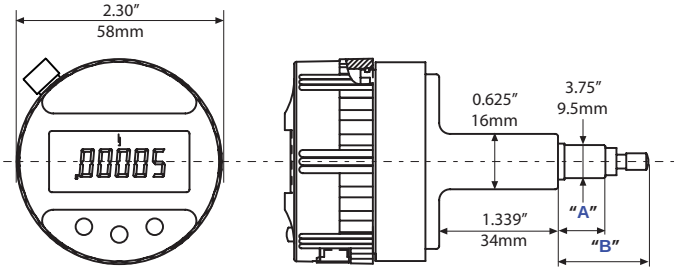
Standard Model



For contact points please refer to pages 5-25, 5-27, 5-60 & 5-61

Dimensions mm / ***inch***	**A**	**B**	**C**
	11.7 / ***.46"***	24.1 / ***.95"***	53.6 / ***2.11"***
	38.0 / ***1.50"***	57.2 / ***2.25"***	86.6 / ***3.41"***

Perpendicular Model



Accessories

	Order no.
Backs:	
Flat Black (Standard on all models)	**EBK-1018**
Post Back (.5" dia. x 1" long)	**EBK-1012**
Lug Back (Horizontal / Vertical)	**EBK-1010**
Screw Back (11/16" dia x .5", 1/4-28 thread)	**EBK-1013**
Adj. Slide Back (0.5" slot, 1/4-20 thread)	**EBK-1016**
Adj. Rack Back*	**EBK-1014**
** used on AT-28 or AT-116 - SE-33 or SE-73 Sold seperately.*	
Data Interface:	
USB Cable (for MarCom or PC, 2 m length)	**4346023**
RS232 Cable (SUB-D jack 9-pin, 2m length)	**4346020**
Digimatic Cable (10 pin plug, 2 m length)	**4346021**
Transmitter (Mahr t, used w/ FM1 Receiver)	**2121369**

	Order no.
Other Hardware:	
Splash Cover	**ECV-1307-W2**
Adaptor Bushing (8 mm to 3/8")	**BU-197**
Thread Adaptor (M2.5 to 4-48 thread)	**AD-185**
Spring (for lighter gaging force: 35g)	**SP-351**

For further mounting accessories refer to page 6-13

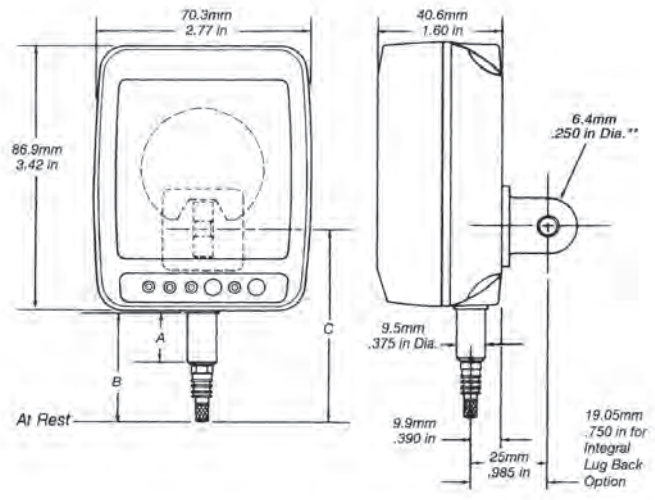
Maxμm® /// Digital Comparator

Features

- Features both digital display for accuracy and readability and unique fan analog display for trend and change
- User configurable in inch / metric units, normal / reverse sensing, resolution, analog scale, and tolerance setup & display
- Dynamic Capabilities: Min, Max, TIR, Hold, Reset
- Absolute Transducers - no overspeed errors. . . . no missed counts. . . . no missed readings
- Auto power down - provides extremely low battery consumption, assuring long life from readily available commercial batteries
- Data output - 3 formats - Maxum, serial, or digimatic
- Both integral and remote readout versions available
- Easily used on Snap Gages, Bore Gages, Comparator Stands, and Fixture Gages
- Special options available: setup mode or calibration lockout, remote external power, 4:5 ratio, 12 o'clock mounted integral transducer, integral vertical or horizontal lug back, 1.5, 2.0 or 3.0 inch stem length, and more. . . .
- IP54 protection
- Easy to select, order and operate!

ABS System
TOL
MAX MIN
RS232C
Digimatic
USB
IP54

Technical Data



Easily designed into your applications . . . full-size MaxumIII® Indicator and accessories, tracing templates or CAD files available on request.

For short range indicators – Standard Stem Length (± 1.0 mm / ± .040" range indicators)

A	B	C
17 mm / ***.670"***	36 mm / ***1.42"***	63.5 mm / ***2.50"***

For long range indicators – Standard Stem Length (± 1.99 mm / ± .100" range indicators)

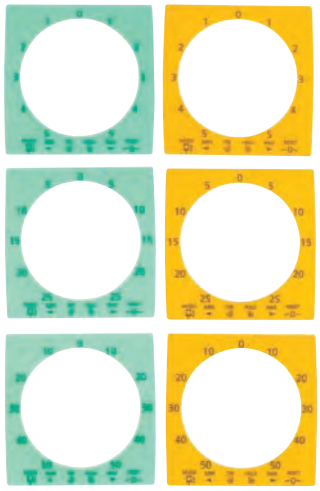
22 mm / ***.87"***	47 mm / ***1.84"***	73 mm / ***2.87"***

For both short and long range indicators – Long Stem Lengths

38 mm / ***1.5"***	57 mm / ***2.25"**** ***	84.6 mm / ***3.33"**** ***
51 mm / ***2"****	70 mm / ***2.75"**** ***	97.3 mm / ***3.83"**** ***
76 mm / ***3"****	95 mm / ***3.75"**** ***	123 mm / ***4.83"**** ***

* *Special Order Lengths*
** *Back supplied with remote indicating unit only*
*** *For long stem lengths add .220" to above lengths*

Technical Data



Description	Short Range	Long Range
Digital range		
Standard	±1.00 mm / ***±.040"***	±1.99 mm / ***±.100"***
Reduced	±0.199 mm / ***±.0199"***	None
Digital resolution	0.005 mm / ***.0005"***	0.005 mm / ***.0005"***
Switchable	0.001 mm / ***.0001"***	0.001 mm / ***.0001"***
	0.001 mm / ***.00005"***	
	0.0005 mm / ***.00002"***	
Analog range	5 or 25 or 50	25 or 50
Analog resolution	0.01 mm / ***.001"***	0.01 mm / ***.001"***
Switchable	0.005 mm / ***.0005"***	0.005 mm / ***.0005"***
	0.001 mm / ***.0001"***	
Total spindle travel	3.04 mm / ***.120"***	6.35 mm / ***.250"***
Pre-Travel*	0.3 mm / ***.010"***	1.06 mm / ***.020"***
Over-Travel*	0.8 mm / ***.030"***	1.31 mm / ***.030"***
Accuracy		
Standard range	0.5% of Total Range	0.35% of Total Range
Reduced range	0.25% of Total Range	N/A
Repeatability	±One Least Digit	±One Least Digit
Gaging force	3 - 4 oz / 85 - 112 grams, preloaded	
Operation temperature	10° to 55°C / 50° to 130°F	
Storage temperature	-20° to 65°C / -4° to 149°F	
IP Rating	54	
Weight	approx. 385 g / 13.6 oz.	
Battery life	approx. 4000 hours	
Power	3.0 volt Lithium battery (type CR123A or equivalent) Mahr Federal Order Number: **2239138**	
Contact point	(Normally furnished – PT-223) for ***.375"*** dia. Stem, ***.250"*** long, radiused tip, 4-48 thread; (EPT-1037-W1) for 8 mm dia. stem, 6 mm long, radiused tip, M2.5 thread.	

Stem length mm	/	*inch*	Stem diameter	Data output	Order no. Short range	Order no. long range
17 mm		***.670"***	***.375"***		**2033101**	**2033102****
38 mm	/	***1.50"***	***.375"***	No output	**2033103**	**2033104**
17 mm	/	***.670"***	8 mm		**2033105**	**2033106****
38 mm	/	***1.50"***	8 mm		**2033107****	**2033108****
17 mm	/	***.670"***	***.375"***		**2033111**	**2033112****
38 mm	/	***1.50"***	***.375"***	Digital Output 6 pin (D, E1)	**2033113**	**2033114**
17 mm	/	***.670"***	8 mm		**2033115**	**2033116****
38 mm	/	***1.50"***	8 mm		**2033117**	**2033118**
17 mm	/	***.670"***	***.375"***		**2033121**	**2033122****
38 mm	/	***1.50"***	***.375"***	Digital Output with Hold / Reset 10 pin (E2)	**2033123**	**2033124**
17 mm	/	***.670"***	8 mm		**2033125**	**2033126****
38 mm	/	***1.50"***	8 mm		**2033127**	**2033128**

* *dependent on standard or reduced range selected. Standard range shown.*

** *Long Range Indicator Stem Length is .870" / 22 mm*

Maxμm® *III* Digital Comparator

Technical Data

Maxμm® *III* Remote Indicating Unit*

	Order no.
No Digital Output Port	**2033001**
Digital Output -6 pin (D, E1)	**2033011**
Digital Output with Hold & Reset -10 pin (E2)	**2033021**

* *Maxμm® III Remote Indicating Units are NOT compaitible with traditional Remote Transducer models EAS-XXXX.*

Supplied with Lug back

Maxμm® *III* Digital Transducer①

Digital Transducers	Short Range	Long Range
Range	±1.00 mm / ***±.040"***	±1.99 mm / ***±.100"***
Total Spindle Travel	3.04 mm / ***.120"***	6.35 mm / ***.250"***
Pre-Travel**	0.3 mm / ***.010"***	0.5 mm / ***.020"***
Over-Travel**	0.8 mm / ***.030"***	
Gaging Force	3-4 oz / 85-112 grams, preloaded	
Operation Temperature	10° to 55°C/50° to 130°F	
Storage Temperature	-20° to 65°C/-4° to 149°F	
Contact Point	(Normally furnished — PT-223) for ***.375"*** dia. Stem, ***.250"*** long, radiused tip, 4-48 thread; (EPT-1037-W1) for 8 mm dia. Stem, 6 mm long, radiused tip, M2.5 thread 2033099 has PT-225 - .125" long.	

** dependent on standard or reduced range selected. Standard range shown.*

Transducer Type	Stem Length	Stem Diameter	Order no. Short Range	Order no. Long Range
Canister	17 mm / ***.670"***	***.375"***	**2033091**	**2033092**②
Canister	38 mm / ***1.50"***	***.375"***	**2033093**	**2033094**
Canister	17 mm / ***.670"***	8.0 mm	**2033095**	**2033096**②
Canister	38 mm / ***1.50"***	8.0 mm	**2033097**	**2033098**
Pencil	Body Diameter = ***.375"***		**2033099**	—

Note: Cable length 4ft

① *Digital Transducer models 203309X require an adaptor cable for use with traditional DEI-XXXXX Maxμm and Maxμm Plus Indicating Units.*

② *Long Range Indicator Stem Length is .870" / 22 mm.*
See Adaptor Cable selections as follows:

Adaptor Cables	Order no.
For DEI with 6 pin split connector (Short Range)	**2239080**
For DEI with 8 pin round connector (Long Range)	**2239081**

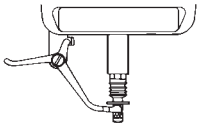
- Maxμm® and Maxμm Plus Transducers are available as Replacement Parts. Refer to Part Price List for Part Numbers and Pricing.
- Maxμm *III* Remote Indicating units sold separately from Digital Transducer.
- Any Digital Transducer may be used with a Maxμm *III* Remote Indicating unit.
- For English or Metric Contact Points visit pages 5-22, 5-27 and 5-52 thru 5-53.
- For alternate cable lengths or extension cables - call Mahr Federal's Technical Assistance Group.
- For special indicator options - call Mahr Federal's Technical Assistance Group.

Pencil

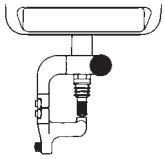
Canister

Accessories

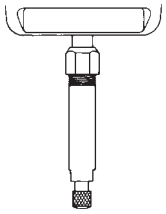
For Integral Maxμm® Indicators



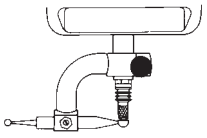
Lifting Levers[1)]
Furnished with washer and longer contact point. Left Hand (shown)
Order no. **EAS-1903***
Right Hand (not shown)
Order no. **EAS-1904***



Right Angle Attachments
Lever Type (not shown)
(± .187" maximum range)
Order Model **EAT-1034-W1**
Spring Type (shown)
(± .060" maximum range)
Order Model **EAT-1035-W1**



Auxiliary Plunger
3" long, .500" O.D.
Order no. **EAS-1912**



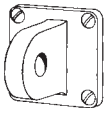
Hole Attachments
Short Lever (shown)
(1.0" pivot to contact)
Order Model **EAT-1032-W1**
Long Lever (not shown)
(1.87" pivot to contact)
Order Model **EAT-1033-W1**

[1)] *(For use on .670" stem length only, DEI-XX1X1)*
** Not for (±.100" / 1.99 mm*

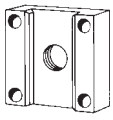
Ox-Bow Lifting Lever
Order no. **LR-40**

** Other Accessories shown are for .375" stem models. Equivalent types are available for most Maxμm models having 8 mm stems. Adaptor Bushing (BU-197) may also allow 8mm stem indicators to be used with the above accessories. Full size Maxμm Indicator and accessories tracing templates are available on request.*

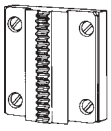
Backs for Maxμm® Indicators and Remote Indicating Units (Supplied with mounting screws)



Lug Back (.250" hole)
Mounts horizontally or vertically.
Order no. **EBK-1006**

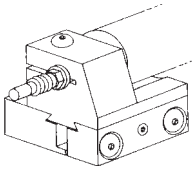


Adjustable Slide Back
(.500" slot, 1/4-20 thread)
Order no. **EBK-1007**



Rack Back
Fits SE-33 (shown) and SE-73. Adjustable Mounting Block (not shown).
Order no. **EBK-1005**

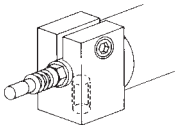
Replacement Screws
2-56 x .218"
Order no. **ESW-1252**



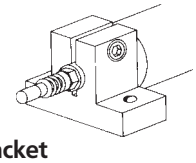
Rack Bracket (Shown mounted to SE-33 Adjustable Mounting Block.)

SE-33 and SE-73 Adjustable Mounting Blocks are available separately. SE-33 is supplied with hex-screw adjust. SE-73 is supplied with knob adjust.

Order Model EAD-1007-W1 (.375" I.D.)
Order Model EAD-1007-W2 (8 mm I.D.)



Square Bracket
(1/4-20 mounting thread)
Order Model **AAD-67**



T Bracket
Flange mounted.
Order Model **AAD-91**

** Mounting Brackets shown are for .375" stem models. Equivalent types are available for most Maxμm models having 8 mm stems. Adaptor Bushing (BU-197) may also allow 8 mm stem indicators to be used with the above accessories. Full size Maxμm Indicator and accessories tracing templates are available on request.*

Other Maxμm Accesssories	**Order no.**
Data Output Cables for Maxμm ///	
USB Cable (for MarCom / PC, length 2 m)	**2121428**
Serial Cable (6 pin to db9 pinF PC)	**2239036**
Serial Cable (10 pin to db9 pinF PC)	**2239038**
Digimatic Cable (6 pin to std 10 pin)	**2239035**
Digimatic Cable (10 pin to std 10 pin)	**2239037**
Send Data Footswitch used with Serial Cables above.	**300-50**
Transmitter (Maxμm /// t, used w / FM 1 Receiver)	**2121368**
Mating Connectors – Maxμm /// Models	
For 6 pin data output type (D, E1)	**ECN-1521**
For 10 pin data output type (E2)	**ECN-1689**
Remote Switch Assembly (for Hold/Reset)	
Handswitch (10 pin data output model only)	**EAS-2867**
Footswitch (10 pin data output model only)	**EAS-2868**
Splashcover for Maxμm ///	**ECV-1307-W1**
Battery for Maxμm ///	**2239138**
Overlay Kit for Maxμm ///	**2239040**
Access Key (6 pin)	**2240545**
Access Key (10 pin)	**2240547**

Millimess. Dial Comparators

OVERVIEW

Models

Metric	1000 A	1000 B	1002	1003
Measuring range	± 100 µm	± 50 µm	± 25 µm	± 50 µm
Readings	1 µm	1 µm	0.5 µm	1 µm
Dial style	100-0-100	50-0-50	25-0-25	50-0-50
Accuracy*	Factory standard	Factory standard	Factory standard	DIN 879-1
G_{ges}	2 µm	2 µm	0.6 µm	1.2 µm
G^e	1.5 µm	1.5 µm	0.5 µm	1 µm
f_u	1 µm	1 µm	0.3 µm	0.5 µm
G^t	0.7 µm	0.7 µm	0.4 µm	0.7 µm
r	0.5 µm	0.5 µm	0.3 µm	0.5 µm
Order no. Standard	**4338100**	**4339100**	**4335000**	**4334000**
Order no. Waterproof IP54			**4335005**	**4334005**

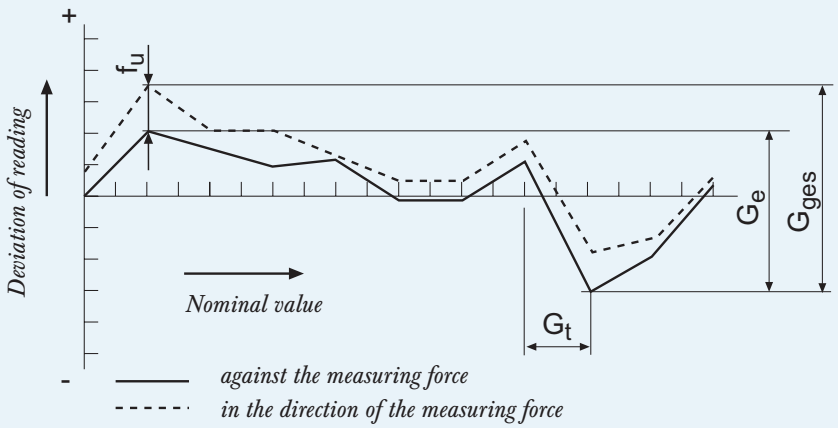
Inch			1002 Z	1003 Z
Measuring range			***±.0010"***	***±.0020"***
Readings			***.00002"***	***.00005"***
Dial style			***.001-0-.001***	***.002-0-.002***
Accuracy*			Factory standard	Factory standard
G_{ges}			***.000025"***	***.00006"***
G^e			***.00002"***	***.00005"***
f_u			***.00001"***	***.000025"***
G^t			***.000014"***	***.000035"***
r			***.00001"***	***.000025"***
Order no. Standard			**4335900**	**4334900**
Order no. Waterproof IP54			**4335905**	**4334905**

* *Accuracy of 1004, 1010, 1010 Z, 1050 exceeds DIN 879-1*
** *Accuracy of 1110 N and 1150 N exceeds DIN 879-3*

1003 XL	1004*	1010*	1050*	1110 N**	1150 N**
± 130 µm	± 0.13 mm	± 0.25 mm	± 1.5 mm	± 0.25 mm	± 1.5 mm
2 µm	5 µm	0.01 mm	0.05 mm	0.01 mm	0.05 mm
130-0-130	130-0-130	25-0-25	15-0-15		
DIN 879-1	Factory standard	Factory standard	Factory standard	Factory standard	Factory standard
2.4 µm	4 µm	8 µm	40 µm	12 µm	60 µm
2 µm	3.5 µm	7 µm	35 µm	6.5 µm	35 µm
1 µm	1 µm	2 µm	10 µm	3.5 µm	17 µm
1.4 µm	3 µm	4 µm	24 µm	5 µm	25 µm
1 µm	1 µm	2 µm	10 µm	0.5 µm	17 µm
4334001	**4333000**	**4332000**	**4330000**	**4343100**	**4342100**
4334006	**4333005**	**4332005**	**4330005**	**4343105**	**4342105**

1004 Z	1010 Z
±.0050"	***±.0100"***
.0001"	***.0005"***
.005-0-.005	***.01-0-.01***
Factory standard	Factory standard
.00012"	***.0004"***
.0001"	***.00035"***
.00003"	***.0001"***
.00005"	***.00025"***
.00003"	***.0001"***
4333900	**4332900**
4333905	**4332905**

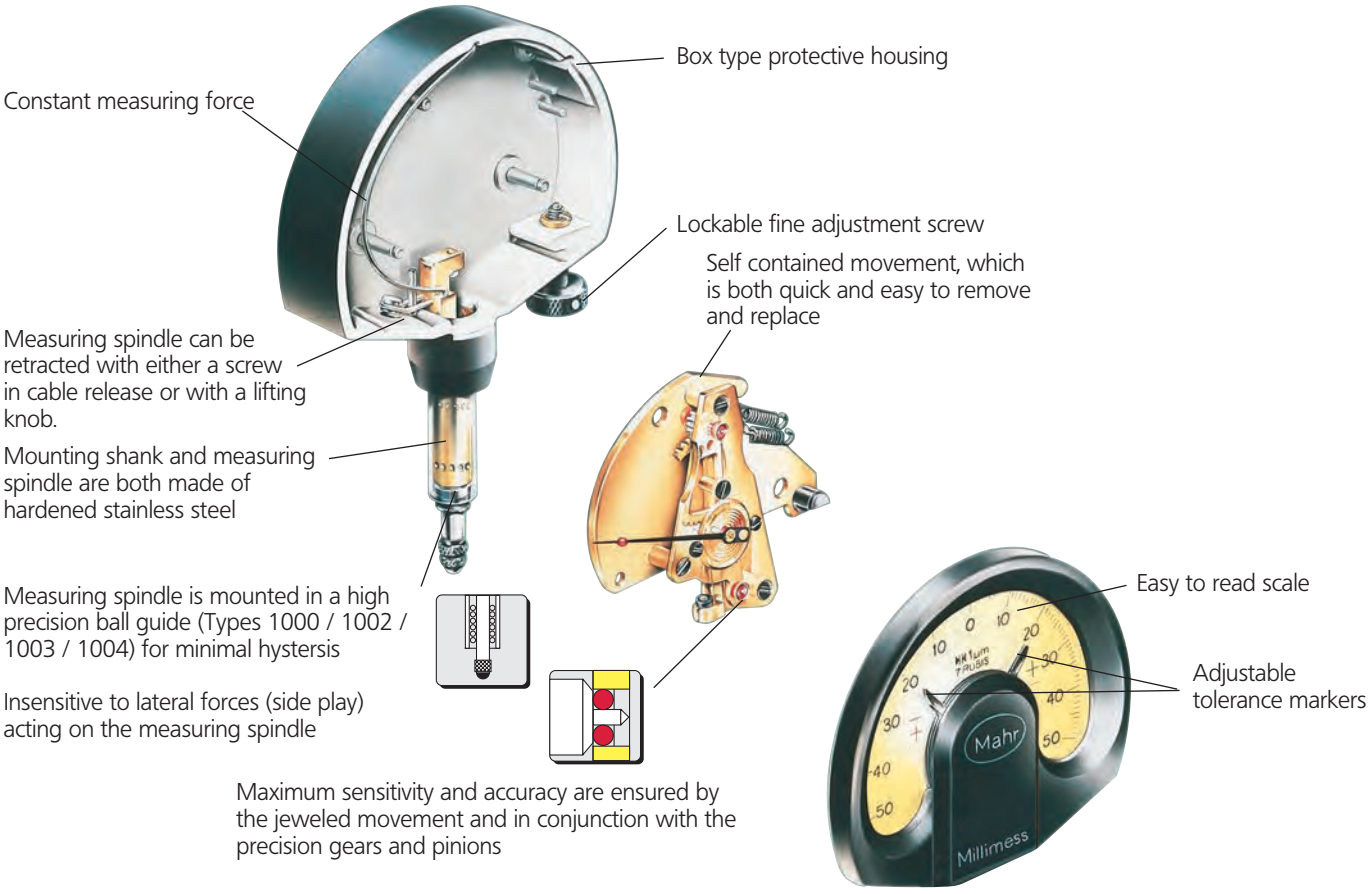
Metrological characteristics



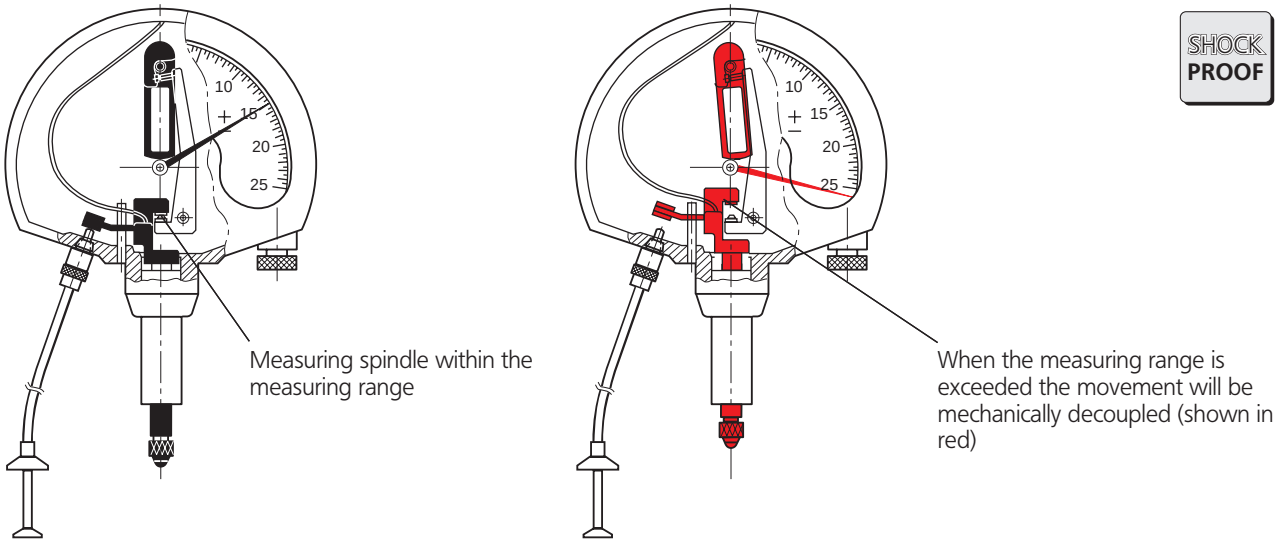
Millimess. Dial Comparators

OVERVIEW

Design Features

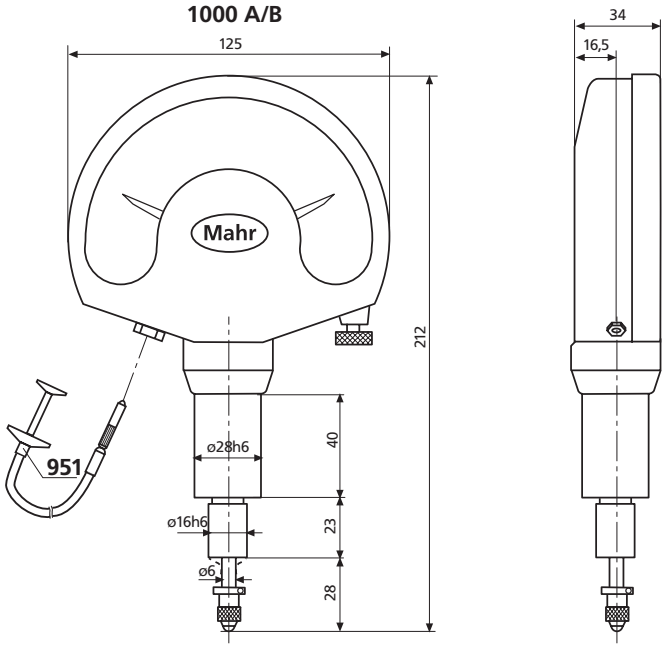


Shockproof Mechanism

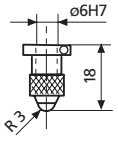


Mechanical Dial Comparator Large Type Millimess

1000 A



921



Features

- Large design
- Easy to read dial
- Shockproof movement
- Jeweled movement bearings
- Measuring spindle is mounted in a high-precision ball guide which precludes play
- Supplied with: Cable Release 951, case

Accessories

		Order no.
Contact Points		
with Steel ball	**921**	**4362001**
with Ruby ball	**921 R**	**4362002**
Cable Release to raise the measuring spindle	**951**	**4372000**
Rubber Bellows to seal the open end of the measuring spindle		**4338008**
Additional Accessories		**Page**
Precision Stand	**824 GT**	8-15

Technical Data

	Measuring range	Reading	Overtravel	Measuring* force	Order no.
Metric					
1000 A	± 120 µm	1 µm	4 mm	1.9 ± 0.3 N	**4338100**
1000 B	± 50 µm	1 µm	4 mm	1.9 ± 0.3 N	**4339100**

* *In the vertically mounted position*

Mechanical Dial Comparators

1002

1003

DIN 879-1

1004

1003 XL

DIN 879-1

1003T**

DIN 879-1

IP54

Technical Data

Metric	Measuring range	Readings	Overtravel	Measuring force	DIN 879-1	Order no. Standard*	Order no. Waterproof**
1002	± 25 µm	0.5 µm	2.8 mm	1 N		**4335000**	**4335005**
1003	± 50 µm	1 µm	2.8 mm	1 N	●	**4334000**	**4334005**
1003	± 50 µm	1 µm	2.8 mm	0.3 N	●	**4334075**	
1003	± 50 µm	1 µm	2.8 mm	0.5 N	●	**4334050**	
1003	± 50 µm	1 µm	2.8 mm	0.7 N	●	**4334071**	
1003	± 50 µm	1 µm	2.8 mm	2 N	●	**4334010**	
1003	± 50 µm	1 µm	2.8 mm	3 N	●	**4334011**	
1003 XL	± 130 µm	2 µm	2.5 mm	1 N	●	**4334001**	
1004	± 0.13 mm	5 µm	2.5 mm	1 N		**4333000**	**4333005**
1010	± 0.25 mm	0.01 mm	2.5 mm	1 N		**4332000**	**4332005**
1050	± 1.5 mm	0.05 mm	0.3 mm	1 N		**4330000**	**4330005**
Inch							
1002 Z	± 0.0010″	0.00002″	0.11″	1 N	●	**4335900**	**4335905**
1003 Z	± 0.0020″	0.00005″	0.11″	1 N	●	**4334900**	**4334905**
1004 Z	± 0.0050″	0.0001″	0.10″	1 N		**4333900**	**4333905**
1010 Z	± 0.0100″	0.0005″	0.10″	1 N		**4332900**	**4332905**

* *Incl. Plastic Case; Adapter 940 (for inch instruments only)*

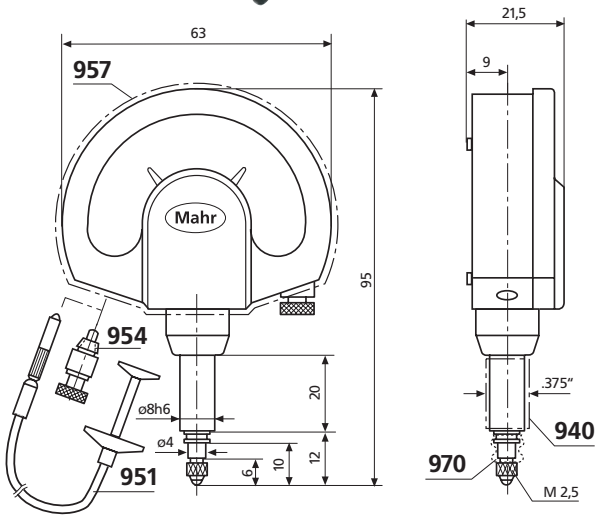
** *IP54, Incl. Plastic Case, Splash Guard Cover 957, Rubber Bellows (only for 1002/1003/1004); Adapter 940 (for inch instruments only)*

Mechanical Dial Comparators

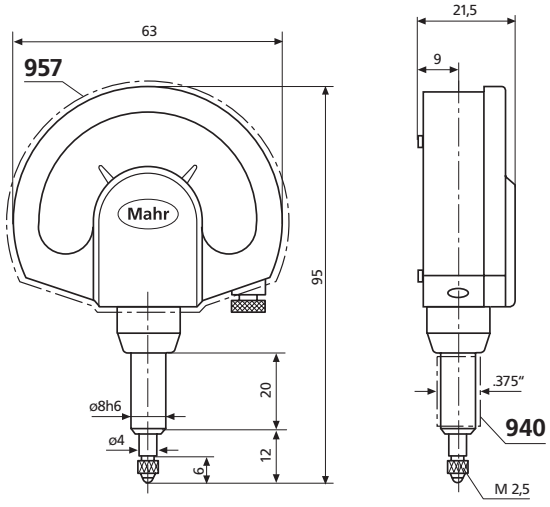
1010

SHOCK PROOF

1050



1002/1003/1004

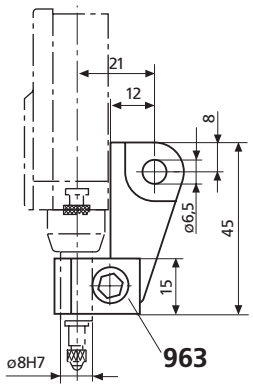


1010/1050

Accessories

		Order no.
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	**940**	**4310103**
Cable Release to raise the measuring spindle	**951**	**4372000**
Lifting Knob for lifting the measuring spindle	**954**	**4372030**
Splash Guard Cover	**957**	**4373030**
Rubber Bellows for 1002/1003/1004 to seal the open end of the measuring spindle	**970**	**4334786**
Mounting Lug to mount on mounting shank 8h6 mm	**963**	**4375002**

Additional Accessories		**Page**
Contact Points	**901-913**	5-58
Special Holder	**941**	5-59
Sensor Lever	**943**	5-59



Mechanical Dial Comparators with limit contacts

1110 N

1150 N

Features

- Can be applied for example as tolerance control or as a precision contactor in automatic control systems
- Design features are identical with Mechanical Dial Comparators, but with the addition of adjustable limit contacts; made from high-grade precious metal
- Limit contacts are particularly well protected against vibration and mechanical overload

Technical Data

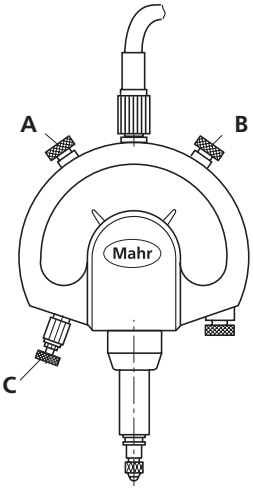
		Measuring range	Readings	Overtravel	Measuring force	Order no. Standard*	Order no. Waterproof**
Metric							
1110 N	Elzentimess	± 0.25 mm	0.01 mm	2.3 mm	2 N	**4343100**	**4343105**
1150 N	Eldezimess	± 1.5 mm	0.05 mm	0.3 mm	1.5 N	**4342100**	**4342105**

* *Incl. Plastic Case, Setting Knob 953, Cable (1.2m)*
** *IP54, Incl. Plastic Case, Splash Guard Cover 957, Rubber Bellows (only for 1110)*

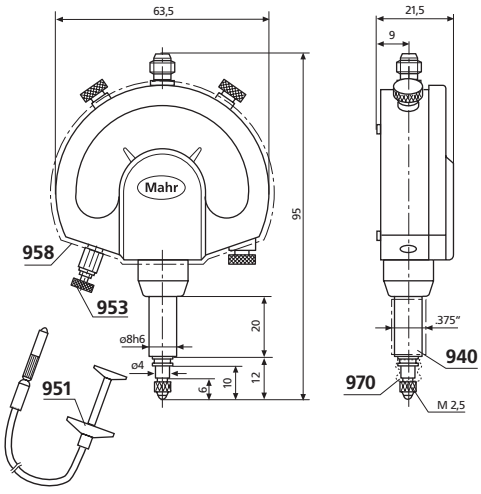
Mechanical Dial Comparators with limit contacts

Electrical Specifications

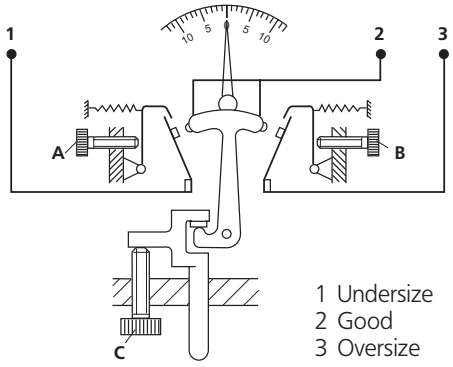
	Contact uncertainty with non-inductive load of 10 mA/24V	max. contact rating	max. contact voltage	max. contact current
1110 N	± 1.5 µm	240 mW	24 V	100 mA
1150 N	± 7 µm			



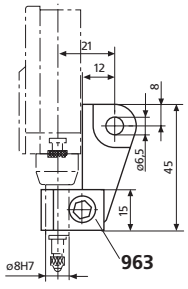
1110/1150



Wiring diagram



1 Undersize
2 Good
3 Oversize



Accessories

		Order no.
Connection Cable (1.2 m), axial		**4345695**
Connection Cable (5 m), axial		**4345694**
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	**940**	**4310103**
Cable Release to raise the measuring spindle	**951**	**4372000**
Setting Knob for setting the limit contacts without an additional setting standard	**953**	**4372020**
Lifting Knob for lifting the measuring spindle	**954**	**4372030**

		Order no.
Splash Guard Cover	**958**	**4373031**
Rubber Bellows to seal the open end of the measuring spindle	**970**	**4334786**
Mounting Lug to mount on mounting shank 8h6 mm	**963**	**4375002**

Additional Accessories		Page
Contact Points	**901-913**	5-58
Special Holder	**941**	5-59
Sensor Lever	**943**	5-59

COMPLEX MEASURING TASKS BROUGHT STRAIGHT TO THE POINT.
MILLIMAR

The latest information on MILLIMAR products can be found on our website:
www.mahr.de/en/Home, WebCode 20515

► | The requirements for electrical length measuring instruments are almost as broad as their scope of application. Reliability, precision as well as simple operation are the major demands, Millimar compact and column measuring instruments fulfill all these demands and requirements.

Millimar probes are the most influential components of a measurement chain. Their characteristics determine the quality of the entire measurement; depending upon the type of application we have the corresponding probe for your requirements. For example; a Millimar Inductive Probe: robust, versatile and has an attractive price, or a Millimar Incremental Probe which is ideal over a large measuring range and has a small linearity error over the entire measuring range. | ◄

► | Millimar. Electrical Length Measuring Instruments, Air Gaging and Engineered Solutions

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Air Gages 7-55

Engineered Solutions 7-66

Millimar. Electrical Length Measuring Instruments

OVERVIEW

Evaluation Instruments

C 1200

- Compact, handy and simple to operate
- Extremely precise and easy to read due to the large clearly defined analog or digital display
- Single, sum and differential measurement; limit switches and extreme value memories

C 1245

- Highly accurate, long term stability and insensitive to environmental influences
- Good zero stability even when changing the measuring range
- Short response time ideal for assessment of fast processes
- Analog or digital display
- Connect to a controller or a computer via the digital output
- Analog output (optional)

S 1840

Inductive Probes

- Large linearity range, strong output signal and insensitive to interference
- Precise measuring spindle and lever, frictionless ball or spring bearing for the highest resolution with the lowest hystersis
- Cable is plugged into the probe allowing quick and simple maintenance (P1300)
- Robust construction for use on the shop floor; further models for all applications are available.

P1300 M

P2004 M

Millimar. Electrical Length Measuring Instruments

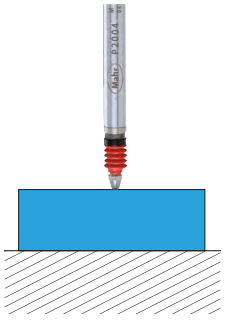
APPLICATIONS WITH INDUCTIVE PROBES

Single measurement with one probe

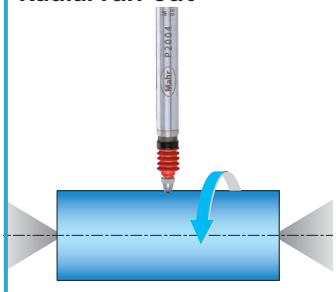
Indicating instrument instantly displays the measured value.

- Used for all kinds of direct measurements on cylindrical and flat work pieces
- Applied in the same way as with digital / dial indicators, digital / dial comparators or test indicators

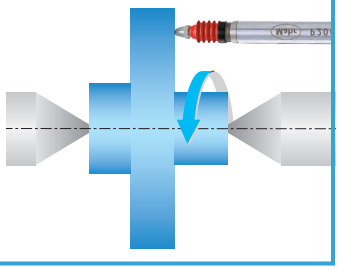
Thickness measurement



Radial run-out



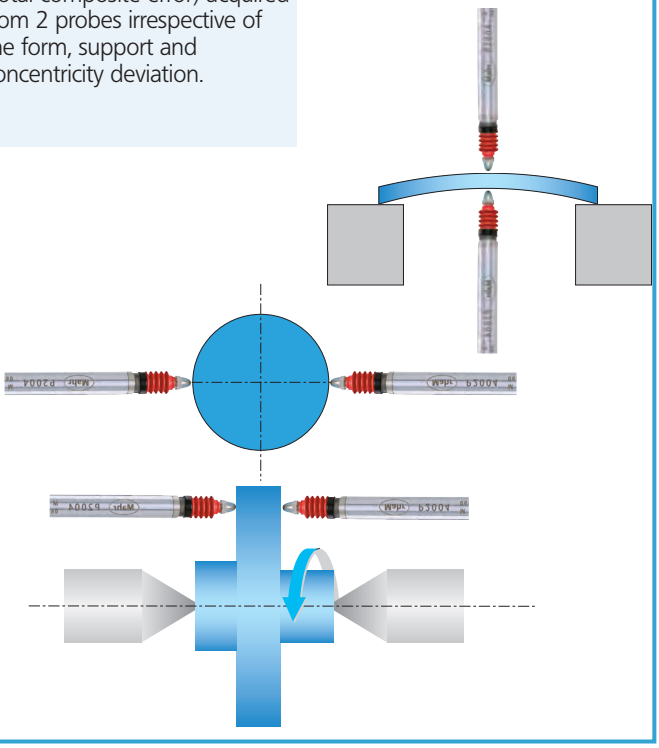
Axial run-out



Sum measurement with 2 probes

Indicates the sum of deviation (total composite error) acquired from 2 probes irrespective of the form, support and concentricity deviation.

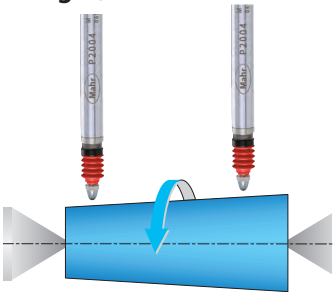
Thickness measurement



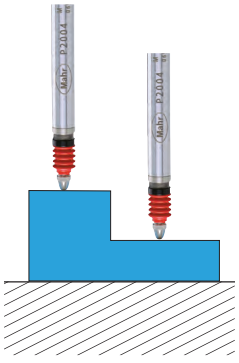
Difference measurement with 2 probes

Shows the difference between the measured values acquired by 2 probes irrespective of the absolute dimension of the test piece. This is particularly suitable for dimensional comparison of two test points.

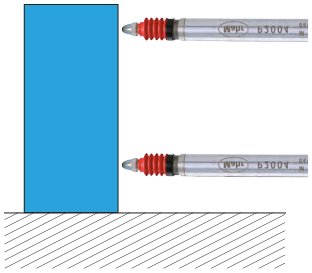
Form measurement of wedges, cones



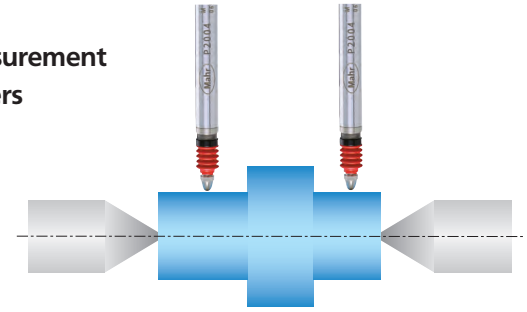
Height difference between 2 steps



Perpendicularity measurement



Concentricity measurement on 2 shaft diameters



Millimar. Electrical Length Measuring Instruments

INDUCTIVE PROBE PROGRAM

P1300-Series (Mahr-Half bridge)

P1300 A

P1300 B

- Available in Mahr and Tesa compatibilities
- Well-proven and established Mahr-Half Bridge technology
- Easy to service: cable and probe can be seperated via the plug-in connector
- Simple to change to pneumatic lifting
- Measuring spindle runs in rotary stroke bearings

Page 7-6

P2000-Series

P2001

P2004

P2010 A

P2104 A

- Available in all prominent compatibilities (Mahr, Mahr-Federal, Tesa, Marposs)
- Wide product spectrum; measuring ranges from 1 to 10 mm plus models with a compressed air (pneumatic) lifter or with vacuum retraction
- With rotary stroke bearings (except P2001)
- High linearity over the total measuring range
- Excellent electromagnetic shielding (EMC)
- All probes (except P2001) can be easily converted from axial to radial by mounting a slip on cap, included in the scope of supply

Page 7-10

1301 / 1303 / 1304 K / 1318 (Mahr-LVDT) / EHE-Series (Federal-LVDT)

1301

1303

1304 K

1318

EHE-2056

- Extremely robust in all operating conditions; measuring system is offset to guide and mounting shank
- Excellent clamping characteristics
- Measuring spindle runs in rotary stroke bearings (except 1318)
- Measuring spindle can be lifted with a cable release (1301/1303)
- Gaging pressure is less than 4g / .14 oz in either direction, with a change of less than 0.1 g per 25 µm / .0001" of contact travel and linearity of 0.1% over the full range ±0.250 mm ± .010", also clutch-mounted contact swivels through 280° arc for easy positioning (EHE-Series)

Page 7-14 / 7-16

1340 Mahr High Precision Probe

1340

- To obtain the best results use in conjunction with Millitron 1240
- Unprecedented measuring accuracy and minimum linearity error < 0.01 %, i.e. 0.4 µm over the total measuring range

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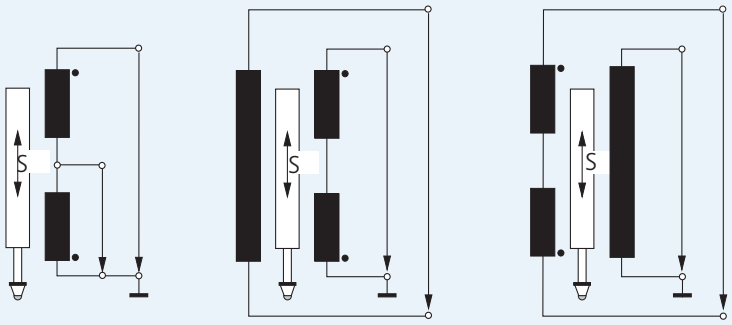
General Technical Data of Inductive Probes

The measuring principle of inductive probes is based on the change of position of the magnets conductive core moving within a coil system, generally this is distinguished between a half bridge and LVDT's.

The Mahr P2000 series of probes applies a high linear, patented VLDT transducer which is similar to an LVDT transducer. This also operates according to a differential transformer principle.



Half Bridge HB (Differential Choke Coil)

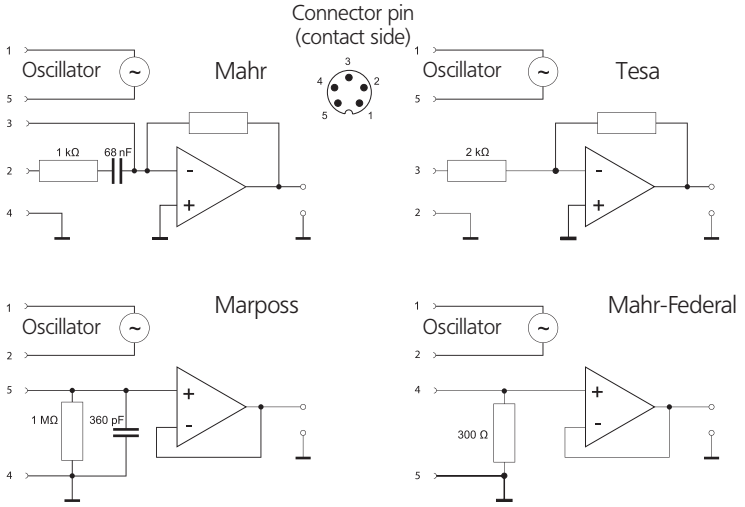
LVDT (Linear Variable Differential Transducer)

VLDT (Very Linear Differential Transducer)

Electrical specification of various compatibilities

		Type	Mahr	Tesa	Marposs	Mahr-Federal
Carrier frequency	KHz		19.4	13	7.5	5
Sensitivity	mV/V/mm	P2001 P2004 P2104	192	73.75	115	78.74
		P1300	192	73.75	–	–
		1301 1303 1304 K 1318	192	–	–	–
		P2010	19.2	29.5	11.5	7.874
Amplitude	Veff		5	3	3.5	2

Schematic drawings of Mahr input amplifiers according to the various compatibilities



Millimar. The Plug and Play Probe

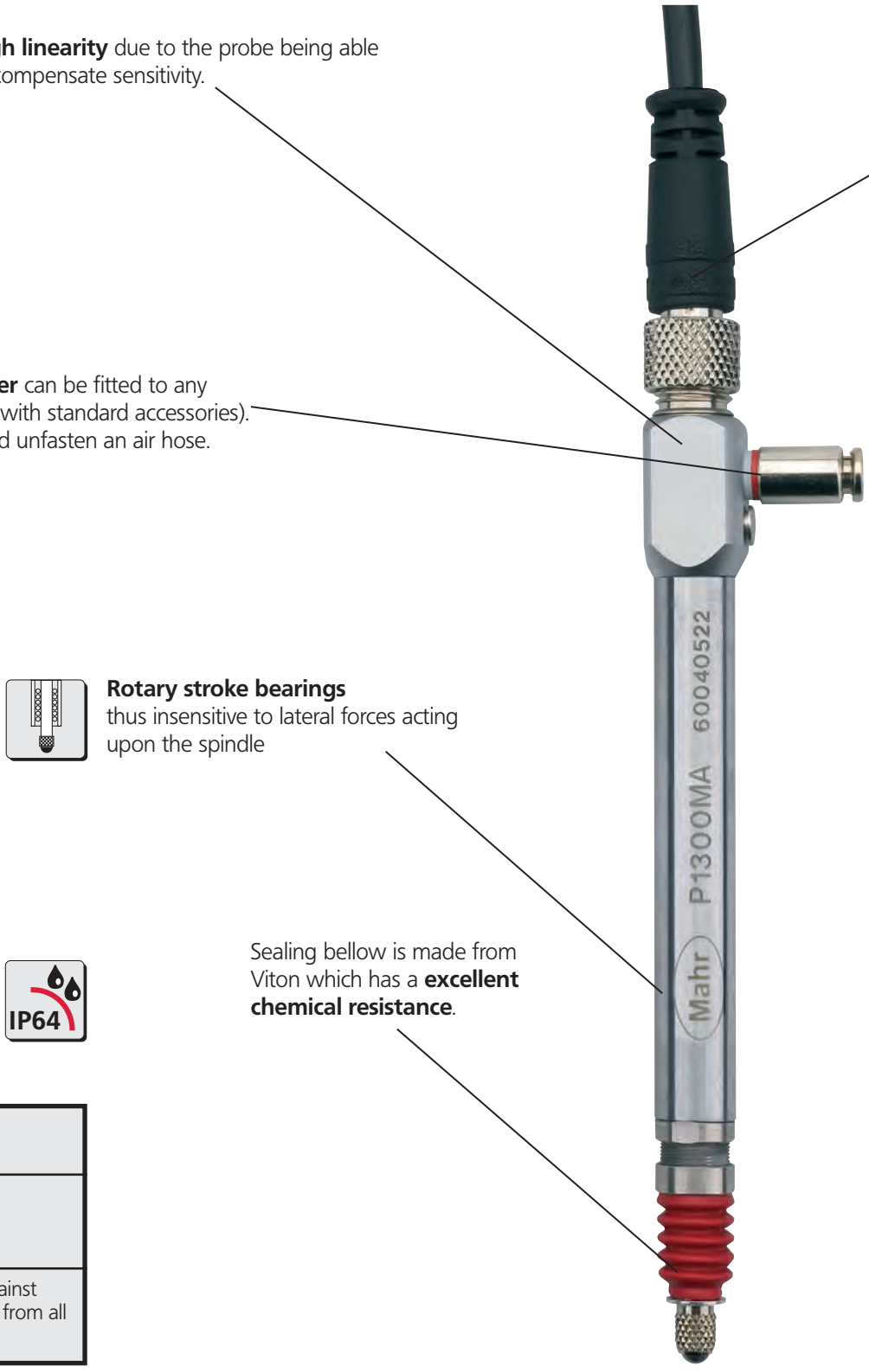
THE INDUCTIVE PROBE MILLIMAR P1300

►| The Plug and Play Probe: Cable and probe can be separated with the plug-in connector. High linearity due to sensitivity compensation in the probe. |◄

High linearity due to the probe being able to compensate sensitivity.

Pneumatic Lifter can be fitted to any standard probe (with standard accessories). Simply fasten and unfasten an air hose.

Rotary stroke bearings thus insensitive to lateral forces acting upon the spindle



Sealing bellow is made from Viton which has a **excellent chemical resistance**.

Especially suited for use in critical manufacturing environments. Probe and cable connector are water proof **IP64** according to IEC 60529

Code Initial	**IP**	International Protection
First Numeral	**6**	Dust-tight
Second Numeral	**4**	Protected against splash water from all directions

Extremely easy to service
Cable and probe can be separated via the plug-in connector.

Advantages of a probe with a plug-in connector:

Service incident	P1300	Standard Probe
Cable break 	Only the cable has to be replaced. **Advantage:** a) Shorter downtime of manufacturing equipment as the probe does not need to be newly installed and adjusted. b) Inexpenisve, as only the cable has to be replaced and not the complete probe.	The complete probe must be removed from the fixture and replaced. **Disadvantage:** a) Longer downtime as the probe must be newly installed, set-up and adjusted. b) Expensive as the complete probe must be replaced.
Defective probe e.g. collision with workpiece 	Only the probe has to be replaced. **Advantage:** The cable does not need to be removed from the cable guide or the cable harness	The complete probe including the cable must be replaced. **Disadvantage:** The cable must be dismounted from the cable guide or the cable harness.

Inductive Probe Millimar P1300 M / T Half Bridge

Features

- Supplied with:
  Inductive Probe P1300
  Connection cable 2.5 m
  Screwed sealing plug
  Hose connector for compressed air
  Open-ended spanner
  Operating instructions

Cable and probe can be seperated with the plug-in connector.

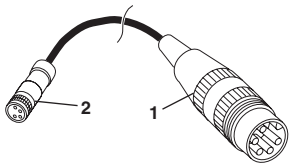
Technical Data

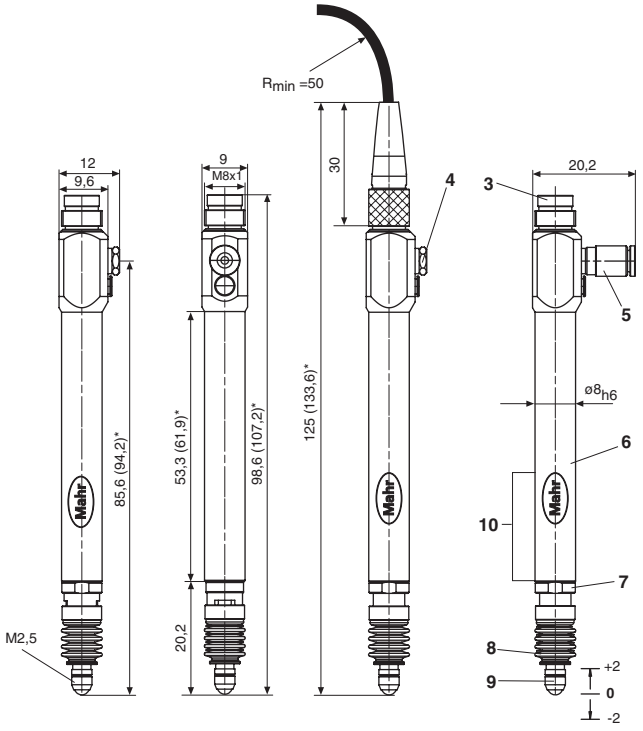
Probe type	**P1300 MA**	**P1300 TA**	**P1300 MB**	**P1300 TB**
Measuring range	± 2.0 mm / ***± 0.079"***			
Distance of lower stop[1)]	- 2.2 . . . 0 mm / ***- 0.09 . . . 0"***			
Distance of upper stop[1)]	+ 2.2 . . . 4.4 mm / ***+ 0.09 . . . 0.173"***			
Lifter/Retraction	Vacuum Lifter (Standard option)		Compressed Air Retraction (max. 1 bar)	
Measuring force at electrical zero point	0.75 N / ± 0.15 N[2)]		depending upon air pressure	
Increase in measuring force	0.3 N / mm		–	
Sensitivity deviation	0.3 %			
Repeatability f_w	0.1 µm / ***4 µin***			
Hysteresis f_u	0.5 µm / ***20 µin***			
Linearity deviation with revised sensitivity				
within range ± 0.5 mm	0.4 µm / ***16 µin***	1.0 µm / ***40 µin***	0.4 µm / ***16 µin***	1.0 µm / ***40 µin***
within range ± 1.0 mm	1.5 µm / ***60 µin***	3.0 µm / ***120 µin***	1.5 µm / ***60 µin***	3.0 µm / ***120 µin***
within range ± 2.0 mm	3.0 µm / ***120 µin***	not specified	3.0 µm / ***120 µin***	not specified
Protection class according to IEC 60529	IP64			
Length of cable	2.5 m / 8 ft (detachable)			
Compatibility - Half Bridge	Mahr	Tesa	Mahr	Tesa
Order no.	**4400180**	**4400190**	**4400181**	**4400191**

[1)] *Relative to the electrical zero point. Adjustable; lower and upper stops are simultaneously adjusted*
[2)] *Measuring force springs are interchangeable, following measuring force springs are available (0.25; 0.5; 1; 1.25; 1.5 N)*

Inductive Probe Millimar P1300 M / T Half Bridge

1 Connection jack for an evaluation instrument
2 Connecting plug for the probe
3 Socket
4 Screw sealing plug SW 4.6
5 Hose connector for compressed air (external diameter 3 mm)
6 Mounting shank
7 Locking nut
8 Sealing bellows
9 Contact point 901 H
10 Preferred clamping area





* *Values shown in brackets apply to Tesa-compatibility*

Individual Components and Accessories P1300

P1300 . . A

P1300 . . B

Connector for the air hose (90°)

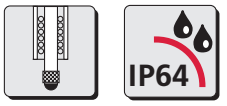
Connection cable 2.5 m / 8 ft

		Order no.
P1300 MA without cable		**4400182**
P1300 MB without cable		**4400183**
P1300 TA without cable		**4400192**
P1300 TB without cable		**4400193**
Hose connector for compressed air 90°		**4400238**
Cable for P1300 - 90°	2.5 m / 8 ft	**4885334**
Cable for P1300 - 90°	5 m / 16 ft	**4885335**
Cable for P1300 - 90°	10 m / 32 ft	**4885336**
Cable for P1300	2.5 m / 8 ft	**4885220**
Cable for P1300	5 m / 16 ft	**4885259**
Cable for P1300	10 m / 32 ft	**4885260**

	Order no.
Sealing bellows for	
P1300 . . A	**7021546**
P1300 . . B	**7028220**
Measuring force springs[1] for P1300 . . A	
0.25 N	**7026827**
0.50 N	**7026827**
0.75 N	**7026828**
1.00 N	**7026849**
1.25 N	**7025579**
1.50 N	**7025505**

[1] *All measuring forces (except 0.25 N) including the sealing bellows have a measuring spring force of ca 0.25 N at zero point.*

Inductive Probe Millimar P2000-Series



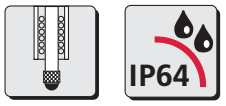
Technical Data

Probe type	**P2001**	**P2004**	**P2004 A**	**P2004 B**
Measuring range	± 0.5 mm / ***± 0.020"***	± 2.0 mm / ***± 0.079"***		
Distance of lower stop[1)]	–	- 2.2 . . . 0 mm / ***-0.09 . . . 0"***		
Distance of upper stop[1)]	–	+2.2 . . . 4.4 mm / ***0.09 . . . 0.173"***		
Lifter/Retraction	–	–	Vacuum lifter	Compressed air (max. 1 bar)
Measuring force at the electrical zero point	0.75 N ± 0.15 N	0.75 N ± 0.15 N [2)]	0.75 N ± 0.15 N [2)]	depending on air pressure
Increase in measuring force	0.1 N / mm	0.2 N / mm	0.2 N / mm	–
Sensitivity deviation	0.3 %	0.3 %		
Repeatability f_w	0.15 µm / ***6 µin***	0.1 µm / ***4 µin***		
Hysteresis f_u	0.2 µm / ***8 µin***	0.5 µm / ***20 µin***		
Linearity deviation with corrected sensitivity				
within range ± 0.1 mm	0.6 µm / ***24 µin***	–		
within range ± 0.5 mm	1.5 µm / ***60 µin***	0.4 µm / ***16 µin***		
within range ± 1.0 mm	–	1.5 µm / ***60 µin***		
within range ± 2.0 mm	–	3.0 µm / ***120 µin***		
Protection class acc. to DIN VDE 0470 Part 1 / IEC 60529	IP40	IP64		
Cable length	2.5 m / 8 ft [3)]	2.5 m / 8 ft [3)]		

Order no.	**P2001**	**P2004**	**P2004 A**	**P2004 B**
Compatibility - Mahr	**5323040**	**5323010**	**5323020**	**5323030**
Compatibility - Tesa	**5323041**	**5323011**	**5323021**	**5323031**
Compatibility - Marposs	**5323043**	**5323013**	**5323023**	**5323033**
Compatibility - Federal	**5323044**	**5323014**	**5323024**	**5323034**

[1)] Relative to the electrical zero point. Adjustable; lower and upper stops are simultaneously adjusted
[2)] Measuring force springs are interhangeable, additional measuring force springs are available (0.25; 0.5; 1; 1.25; 1.5 N)
[3)] Extension cables are available, see accessories

Inductive Probe Millimar P2000-Series



Technical Data

Probe type	**P2010***	**P2010 A***	**P2010 B***	**P2104 A**	**P2104 B**
Measuring range	± 5.0 mm / ***± 0.197"***			± 2.0 mm / ***± 0.079"***	
Distance of lower stop	- 5.3 mm / ***- .20"***			- 2.2 . . .0 mm / ***-0.09 . . . 0"*** [1]	
Distance of upper stop	+ 5.3 / ***+ .20"***			8.4 . . . 10.4 mm / ***-0.33 . . . 0.41"*** [1]	
Lifter/Retraction	–	Vacuum lifter	Compressed air (max. 1 bar)	Vacuum lifter	Compressed air (max. 1 bar)
Measuring force at the electrical zero point	0.75 N ± 0.15 N [2]	0.75 N ± 0.15 N [2]	depending on air pressure	0.75 N ± 0.15 N [2]	depending on air pressure
Increase in measuring force	0.1 N / mm	0.1 N / mm	–	0.1 N / mm	–
Sensitivity deviation	0.3 %				
Repeatability f_w	0.2 µm / ***8 µin***				
Hysteresis f_u	1 µm / ***40 µin***			0.5 µm / ***20 µin***	
Linearity deviation with corrected sensitivity					
within range ± 0.5 mm	–			0.5 µm / ***20 µin***	
within range ± 1.0 mm	–			2.0 µm / ***80 µin***	
within range ± 2.0 mm	4.0 µm / ***160 µin***			4.0 µm / ***160 µin***	
within range ± 5.0 mm	20.0 µm / ***800 µin***			–	
Protection class acc. to DIN VDE 0470 Part 1 / IEC 60529	IP64			IP64	
Cable length	2.5 m / 8 ft [3]			2.5 m / 8 ft [3]	

Order no.	**P2010**	**P2010 A**	**P2010 B**	**P2104 A**	**P2104 B**
Compatibility - Mahr	**5324010**	**5324020**	**5324030**	**5324070**	**5324080**
Compatibility - Tesa	–	**5324021**	**5324031**	**5324071**	**5324081**
Compatibility - Marposs	–	**5324023**	**5324033**	**5324073**	**5324083**
Compatibility - Federal	–	**5324024**	**5324034**	**5324074**	**5324084**

* *Output $^1/_{10}$ sensitivity*

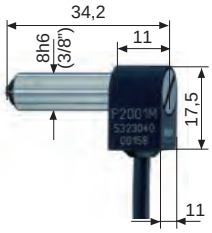
[1] *Relative to the electrical zero point. Adjustable; lower and upper stops are simultaneously adjusted*

[2] *Measuring force springs are interhangeable, additional measuring force springs are available (0.25; 0.5; 1; 1.25; 1.5 N)*

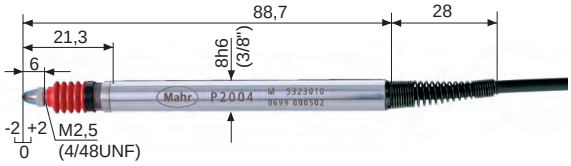
[3] *Extension cables are available, see accessories*

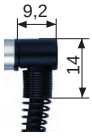
Inductive Probe Millimar P2000-Series

P2001



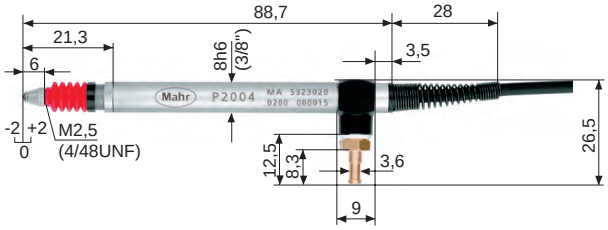
P2004

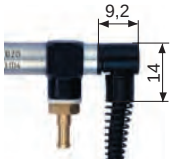




With the supplied slip-on cap, the cable can be flexed to 90° (vertical to horizontal)

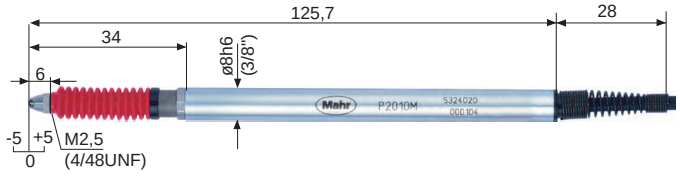
P2004 A / P2004 B





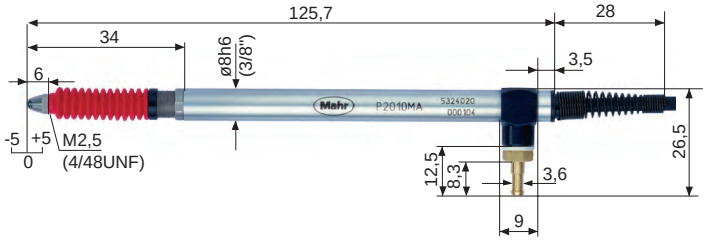
With the supplied slip-on cap, the cable can be flexed to 90° (vertical to horizontal)

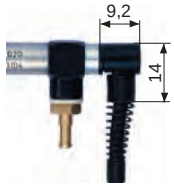
P2010



With the supplied slip-on cap, the cable can be flexed to 90° (vertical to horizontal)

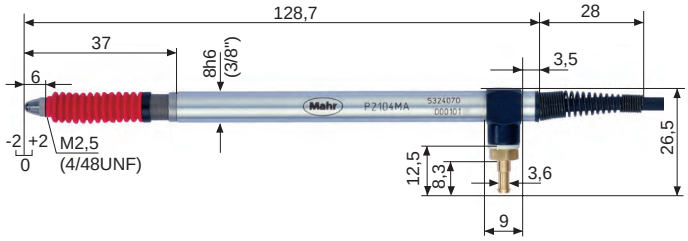
P2010 A / P2010 B

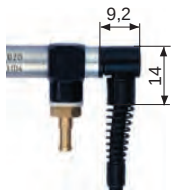




With the supplied slip-on cap, the cable can be flexed to 90° (vertical to horizontal)

P2104 A / P2104 B





With the supplied slip-on cap, the cable can be flexed to 90° (vertical to horizontal)

Values shown in brackets apply to Federal-compatibility

Accessories

Extension cables Length	Description	Mahr M Order no.	Tesa T Order no.	Marposs U Order no.	Mahr Federal F Order no.
2.5 m / 8 ft	C 2025	**5323130**	**5323131**	**5323133**	**5323134**
5 m / 16 ft	C 2050	**5323140**	**5323141**	**5323143**	**5323144**
7.5 m / 24 ft	C 2075	**5323150**	**5323151**	**5323153**	**5323154**
10 m / 32 ft	C 2100	**5323160**	**5323161**	**5323163**	**5323164**

	Order no.
Measuring force springs[1] for P2004 and 2004 A	
0.25 N	**7026827***
0.50 N	**7026827**
0.75 N	**7026828**
1.00 N	**7026849**
1.25 N	**7025579**
1.50 N	**7025505**

1) All measuring forces (except 0.25 N) include the rubber sealing bellows have a measuring spring force of ca. 0.25 N in zero position.
** Remove rubber sealing bellows*

	Order no.
Measuring force springs[1] for P2010 and P2010 A	
0.25 N	**7028212***
0.50 N	**7028212**
0.75 N	**7027764**
1.00 N	**7028213**
1.25 N	**7028214**
1.50 N	**7028215**

1) All measuring forces (except 0.25 N) include the rubber sealing bellows have a measuring spring force of ca. 0.25 N in zero position.
** Remove rubber sealing bellows*

	Order no.
Measuring force springs[1] for P2104 A	
0.25 N	**7028212**
0.50 N	**7027764**
0.75 N	**7028213**
1.00 N	**7028214**
1.25 N	**7028215**

1) All measuring forces include the rubber sealing bellows

	Order no.
Rubber sealing bellows for	
2004, 2004 A	**7021546**
2004 B	**7028220**
2010, 2010 A, 2104 A	**7027758**
2010 B, 2104 B	**7028221**

Pneumatic Lifter 1340/1	for connection with 1 Probe	**5313420**
Pneumatic Foot Switch 1340/1F	for connecting max. 4 Probes, types 1340, P2004xA, P2010xA, P2104xA, 1300 A, 1310 A	**5313419**

Temperature specifications

Temperature coefficient ftT	0.15 µm / °C
Working temperature range	+ 10 . . . + 55° C (+ 50 . . . + 131° F)
Operating temperature range	- 10 . . . + 80° C (+14 . . . + 176° F)
Information regarding chemical resistance	Resistant against oil, gasoline (petrol), water, alipate. Moderate against acids, alkaline solutions, solvents, ozone

Inductive Probe Millimar 1301 / 1303 / 1304 K / 1318 / 1340 M

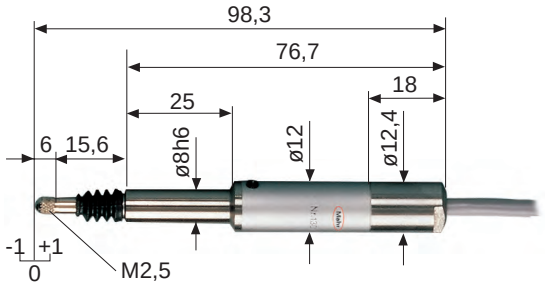
Technical Data

Probe type	**1301**	**1303**	**1304 K**	**1318**	**1340**
Measuring range	± 1.0 mm / ***± .039"***		± 1.0 mm / ***± .039"***	-0.3 . . . +1.0 mm / ***- .012 . . . + .039"***	± 2 mm / ***± .079"***
Distance of lower stop [1]	-1.1 . . . 0 mm / ***- .043 . . . 0"***		1.1 mm / ***- .043"***	-0.37 mm / ***- .0146"***	-2.2 mm / ***- .09"*** (adjustable)
Distance of upper stop [1]	+2.7 mm / ***+ .106"***		+1.1 mm / ***+ .043"***	+1.6 mm / ***+ .063"***	+3.0 mm / ***+ .118"***
Lifter/Retraction	Cable release		–	–	pneumatic
Measuring force at the electrical zero point	0.75 N ± 0.15 N		0.75 N ± 0.15 N	0.25 N ± 0.05 N	0.75 N ± 0.15 N
Increase in measuring force	0.4 N / mm		0.15 N / mm	0.04 N / mm	0.08 N / mm
Sensitivity deviation	0.3 %		1.0 %	0.5 %	0.3 %
Repeatability f_w	0.1 µm / ***4 µin***		0.15 µm / ***6 µin***	0.03 µm / ***1.2 µin***	≤ 0.08 µm / ***3.15 µin***
Hysteresis f_u	0.2 µm / ***8 µin***		0.2 µm / ***8 µin***	0.5 µm / ***20 µin***	0.08 µm / ***3.15 µin***
Linearity deviation with corrected sensitivity					
within range ± 0.3 mm	–		–	0.9 µm / ***36 µin***	–
within range ± 0.5 mm	0.5 µm / ***20 µin***		1.0 µm / ***40 µin***	–	–
within range ± 1.0 mm	2.0 µm / ***80 µin***		4.0 µm / ***160 µin***	–.	0.15 µm / ***6 µin***
within range ± 2.0 mm	–		–	–	0.4 µm / ***16 µin***
Protect. class acc. to IEC 60529	IP64		IP62	IP50	IP64
Cable length	1.5 m [2]				
Compatibility - Mahr	LVDT				only with Millimar C 1240 M*
Order no.	**5313010**	**5313030**	**5313049**	**5313180**	**5313400**

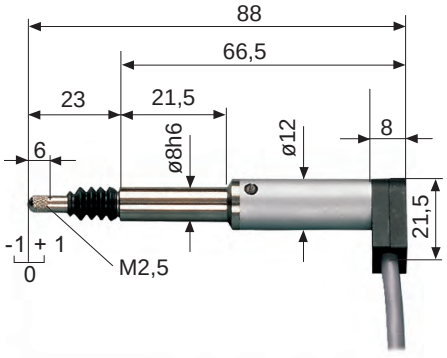
* *See page 7-29*
[1] *Relative to the electrical zero point*
[2] *Extension cables are available, see accessories*

Inductive Probe Millimar 1301 / 1303 / 1304 K / 1318 / 1340 M

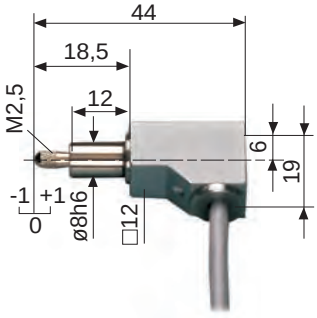
1301



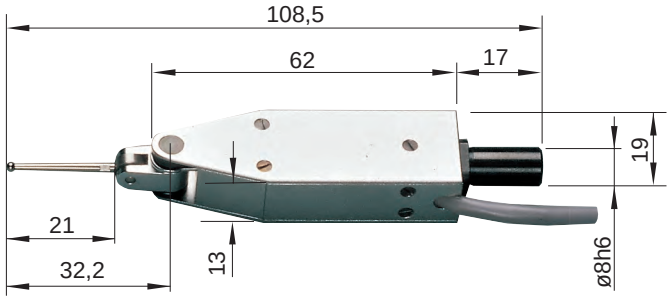
1303



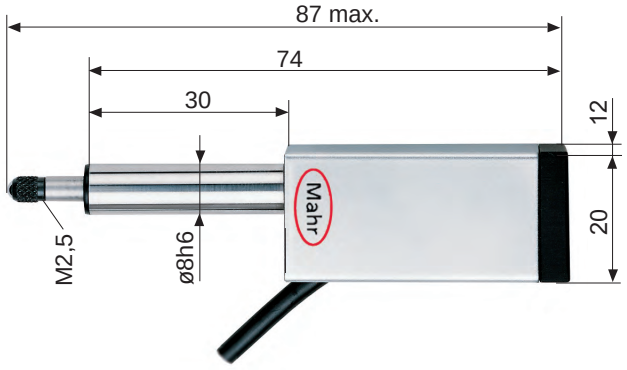
1304 K



1318



1340



Accessories

	Description		Order no.
Extension Cables for 1301 / 1303 / 1304 K / 1318			
	1288/1	1 m / 3 ft	**5312881**
	1288/2,5	2.5 m / 8 ft	**5312882**
	1288/5	5 m / 16 ft	**5312885**
	1288/7,5	7.5 m / 24 ft	**5312887**
	1288/10	10 m / 30 ft	**5312889**
Cable Release for 1301 / 1303	**1399**		**5313990**
Styluses for 1318 with carbide ball		d = 2 mm; L = 21 mm*	**3005223**
		d = 0.5 mm; L = 21 mm	**7003901**
		d = 1 mm; L = 21 mm	**7003902**
		d = 3 mm; L = 21 mm	**7003903**
Styluses for 1318 with ruby ball		d = 2 mm; L = 21 mm	**8004231**
Pneumatic Lifter for 1340 Pneumatic hand pump with an plug-in hose ca. 1 m / 3 ft	**1340/1**		**5313420**
Pneumatic Foot Switch for 1340 for connecting up to 4 P1300 Probes	**1340/1F**		**5313419**

** Supplied with 1318*

Lever Type Gage Heads F

EHE-2056

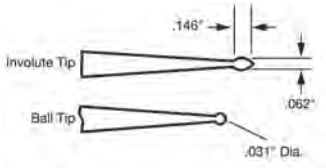
For use on test stands, surface plate work, or where light pressure is needed.

Features

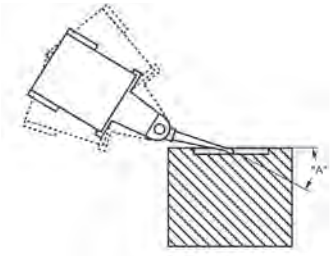
- Clutch-mounted contact swivels through 280° arc for easy positioning
- Linearity – 0.1% over full range of ±0.250 mm / ±.010"
- Gaging pressure less than 4 g / .14 oz. in either direction, with a change of less than 0.1 gram per 25 µm / .001" of contact travel.
- Repeatability better than 0.1 µm / 4 µin
- Cable length – 1.2 m / 4 ft

Automatic Cosine Error Compensation

Angle "A"	Correction Factor
10	.985
20	.940
30	.866
40	.766
50	.643
60	.500



Involute tip (normally furnished) automatically corrects for cosine error when finger is at an angle up to 20°. Simplifies "reach over" jobs.



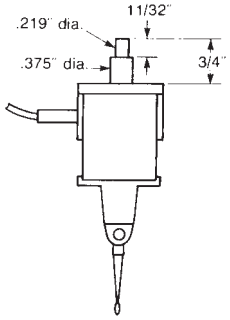
When exceeding 20°, use ball tip contact and table above. With multiplier function, 832F & 1840F Amplifiers can correct for cosine error.

Accessories

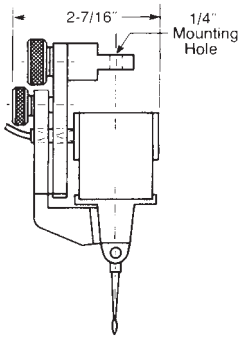
	Order no.
Adaptor to mount EHE-2048 on Model 2400 Stand	**EAM-1071**
Clamp for mounting EHE-2048 on model 2300 Stand	**CP-116**
Accessories kit for EHE-2048. Includes EAM-1071, CP-116, EPT-1013, two rectangular holding bars and a holding rod	**EAS-1333**
Replacement tip, 1.6 mm/ ***.062"*** dia. steel ball	**EPT-1004**
Replacement tip, 0.787 mm/ ***.031"*** dia. tungsten carbide ball	**EPT-1007**
Replacement tip, steel involute (normally furnished)	**EPT-1008**
Replacement tip, 0.787 mm/ ***.031"*** steel ball	**EPT-1013**
Replacement tip, 1.6 mm/ ***.062"*** dia., sapphire ball, 1:1 ratio	**EPT-1059-W1**
Replacement tip, 1.6 mm/ ***.062"*** dia., sapphire ball, 2:1 ratio	**EPT-1059-W2**
Replacement tip, 1.6 mm/ ***.062"*** dia., sapphire ball, 3:1 ratio	**EPT-1059-W3**
Replacement tip, 1.6 mm/ ***.062"*** dia., sapphire ball, 4:1 ratio	**EPT-1059-W4**
Replacement tip, 1.6 mm/ ***.062"*** dia., sapphire ball, 5:1 ratio	**EPT-1059-W5**
Replacement adjustable nose mounting bracket	**EAT-1010**
Replacement fixed back plate mounting bracket	**EPL-1140**

Lever Type Gage Heads F

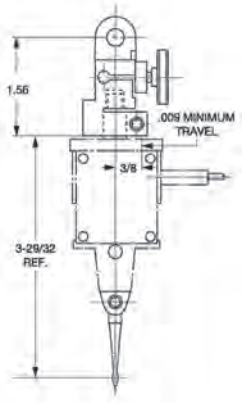
Models and Accessories



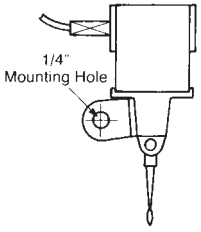
Model EHE-2048 – Post Bracket Back, (BK-108) tamper-proof mounted. Option: Conversion Bracket, EAM-1071 (sold separately), attaches quickly and securely in any rotational direction to suit a wide variety of mounting needs.



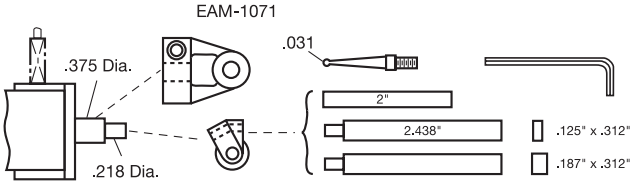
Model EHE-2056 – Adjustable Nose Mount (EAT-1010), tamper-proof mounted. Permits wide choice of positions and approximately 3.8 mm /.150" fine adjustment for quick setup with support close to gaging contact.



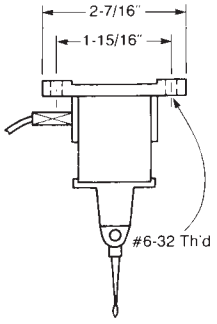
Model EAT-1026 – Fine Adjust Attachment for Lever Type Gage Heads with post mounting option, permits mounting on a wide variety of fixtures.



Model EHE-2050 – Fixed Nose Mount (EAM-1045), tamper-proof mounted. Provides support close to gaging contact for the most critical applications.



Model EAS-1333 – Mounting Kit for use with EHE-2048. Permits Gage Head to be mounted on a wide variety of stands and holding fixtures. Includes Conversion Bracket, EAM-1071 and 0.787 mm /.031" diameter ball tip contact.



Model EHE-2052 – Fixed Back Plate, (EPL-1140) tamper-proof mounted. For mounting on adjustable plates or slides in fixtures for continuous duty application.

Spring (Pantograph) Type Gage Heads F

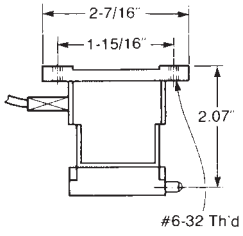
Rugged and reliable, ideal for fixtures or automatic gages

Features

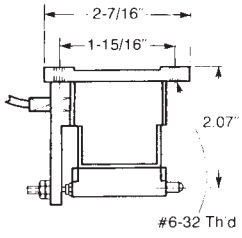
- Friction-free, straight line motion.
- Repeatability better than 0.01 µm /.5 µin
- Linearity – 0.05% over full range of ±0.250 mm / ±.010", with repeat accuracy within 0.01 µm / .5 µin.
- Adjustable pretravel.
- Gaging pressure provided by external spring, from 85 g / 3oz. to 400 g / 14 oz.
- Uses regular 4-48 threaded Contact Points (PT-223 normally furnished).
- Cable length – 2.4 m / 8 ft.

Technical Data

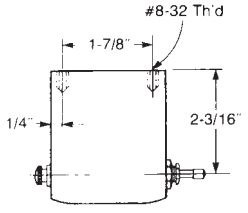
Model EHE-2053
Fixed Back Plate EPL-1140 (15.8 mm / 0.625" wide), tamper-proof mounted. Provides means of attachment for mounting on adjustable plates or slides in fixtures for continuous duty application.



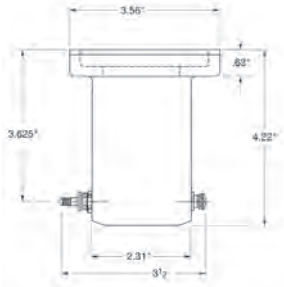
Model EHE-2049
Pressure Spring mount, tamper-proof mounted. Permits setting pre-travel and provides ample gaging pressure regardless of Gage Head position.



Model EGH-2011
Protective Housing encloses head in tamper-proof mounting. Permits adjustment of both gaging pressure (from 3 to 14 oz.) and pre-travel.

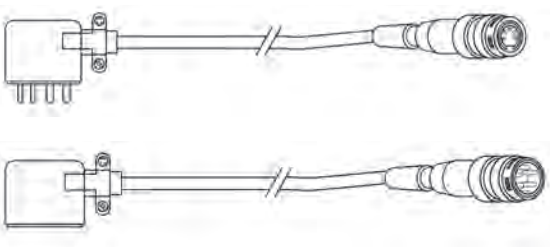


Model EGH-2006
Housing is extended and equipped with heavy duty back plate forming suitable support for use with Model 700 Comparator Stand.

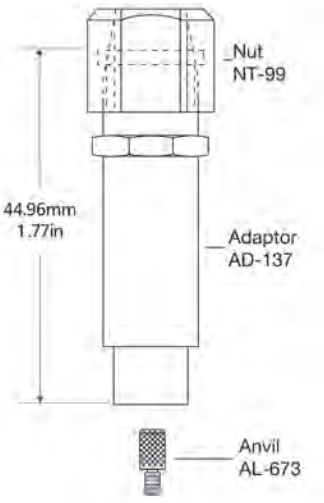


Gage Head Adaptor Cables

	Order no.
Gage Head Adaptor Cables connects Mahr Federal EHE-2XXX and P2XXXF gage heads to Mahr Federal series 432 and 230 amplifiers; 152 mm / ***6"*** long	**ECB-1852**
Gage Head Adaptor Cables connects Mahr Federal EHE 1XXX gage heads to Mahr Federal series 832 and 830 amplifiers; 152 mm / ***6"***	**ECB-1853**

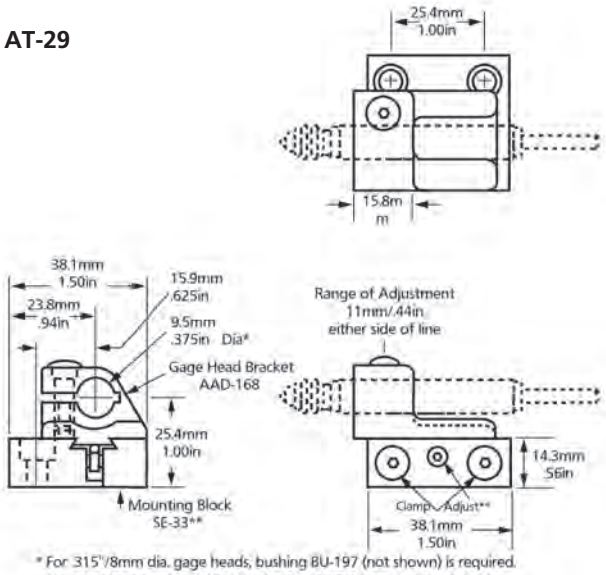


Adaptors for Cartridge Type Gage Heads F

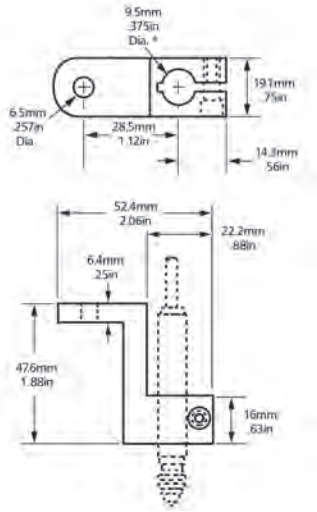


AD-138
Electronic probe adaptor permits using cartridge type gage heads with any regular Mahr Federal indicator.

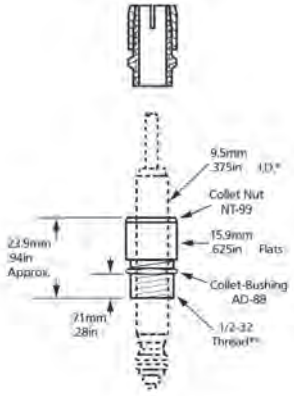
AT-29



* For .315"/8mm dia. gage heads, bushing BU-197 (not shown) is required.
** Gage Head Bracket AAD-168 also fits SE-73 Mounting BLock (with adjustment knob in place of socket head adjustment screw)

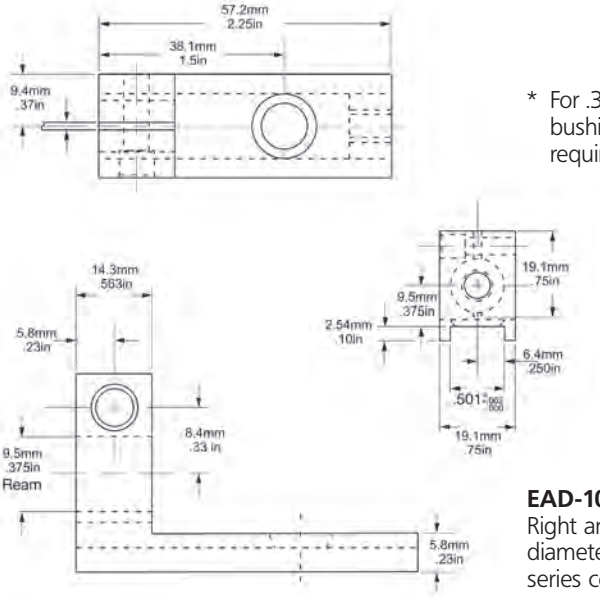


AAD-66
"L" bracket used for mounting .375" diameter gage heads on comparator stands.



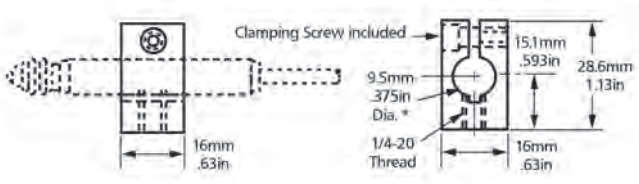
* For .315"/8 mm dia. gage heads, bushing BU-197 (no shown) is required.

AD-87
Split collar adaptor for mounting .375" dia. gage heads.
For 1/2-32 taps use **V-892**



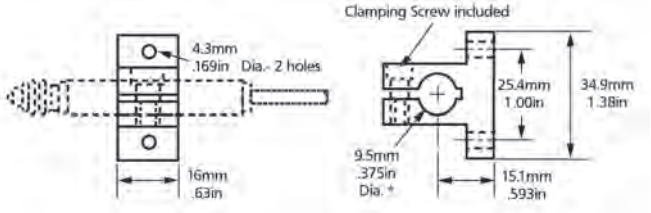
* For .375"/8mm dia. gage heads, bushing BU-197 (not shown) is required.

EAD-1029
Right angle adaptor for mounting .375" diameter cartridge gage heads on 36B series comparators.



* For .315"/8 mm dia. gage heads, bushing BU-197 (no shown) is required.

AAD-67
For .375" diameter stem, square bracket. 1/4-20 mounting thread.



* For .315"/8 mm dia. gage heads, bushing BU-197 (no shown) is required.

AAD-91
"T" bracket flange mounted, two 4.3 mm / .169" through holes. For .375" dia. gage heads.

Millimar. Evaluation Instruments

OVERVIEW

	C 1200	830	832	C 1208 / C 1216	C 1245
Catalog page	7 - 22	7 - 23	7 - 24	7 - 26	7 - 28
Display	TFT color display 11 cm (4.3"), 480 x 272 Pixel	Needle analog scale	Analog display with 1 digital line display	Background lit LCD with an analog display and a two line digital display	Analog scale with a two line digital display
Measuring channels	1 Inductive Probe (A)	According to type, up to: • 2 Inductive Probes (A, B)	According to type, up to: • 2 Inductive Probes (A, B) • 1 Pneumatic device (A, B)	According to type, up to: • 2 Inductive Probes (A, B) • 1 Pneumatic device	According to type, up to: • 8 Inductive Probes • 4 Incremental • Probes • 2 Pneumatic • devices 8 Analog Signals or a combination of the above
Compatible Inductive Probe (carrier frequency)	Mahr	Mahr Federal	Mahr / Mahr Federal	Mahr / Mahr Federal	Mahr / TESA / Mahr Federal
Max. Resolution	0.1 µm / ***.000005"***	0.1 µm / ***.000005"***	0.01 µm / ***.000001"***	0.1 µm / 0.01 µm * ***.000005"/.000001" ****	0.1 µm / ***.000005"***
Input Combinations	+A, - A	+A, - A, +B , -B , A + B , A - B , B - A , -A - B	+A, - A, +B , -B , A + B , A - B , B - A , -A - B	+A, - A, +B , -B , A + B , A - B , B - A , -A - B	Formula editor for 80 characters Functions: + / - / * / ÷/ () / Factor
Features / Programs	1	2 / 2	2 / 2	2 / 2	16 / 6
Test steps	1	1	1	1	6
Dynamic measurements	–	–	MAX, MIN, MAX-MIN, (MAX+MIN)/2	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean
Statistics functions	–	–	–	–	N, x-bar, S, Xmax, Xmin, Range
Classification	–	–	5 class LED and I/O	3 class LED and I/O	max. 998, max. 62 on I/O
Control inputs and outputs / SPS connections	–	–	3 inputs, 5 TTL Opto-coupler outputs	3 Opto-coupler inputs, 3 Opto-coupler outputs	3 Opto-coupler inputs, 6 Opto-coupler outputs
Analog output	–	1	1	1*	1
Data interfaces / ports	RS232C, USB, Digimatic, Wireless	–	RS232, 9 pin, plug	RS232, 9 pin, plug	RS232, 9 pin, plug
Configuration	PC, Keypad	Turn switch	Keypad	PC, Keypad	PC, Keypad
Battery operated	Yes or AC powered	Yes	Yes or AC powered	No, AC powered	No, AC powered
Dimensions in mm (H x W x D)	170 x 130 x 150	165 x 190 x 148	254 x 168 x 143	205 x 160 x 165	210 x 160 x 155

**Only C1216*

C 1240 M	S 1840	X 1715	X 1741	1901 TA	G 1275 incl. D1200 X
7 - 29	7 - 30	7 - 31	7 - 32	7 - 33	7 - 34
Background lit LCD with an analog display and a two line digital display	1 illuminated bar and a two line digital display	None Only via PC, supplied with Software D1000X	None Only via PC, supplied with Software D1000X	None Measuring amplifier with analog output	15"-TFT-Bildschirm 1024 x 768 Pixel Touchscreen
2 Inductive Probes (A, B) • Compatible with Probe 1340, (6-pin jack)	According to type, up to: • 2 Inductive Probes (A, B) • 1 Pneumatic device	According to type, up to: • 8 Inductive Probes • 4 Incremental • Probes • 8 Analog Signals 2 Temperature Sensors or a combination of the above	According to type, up to: • 16 Inductive Probes • 8 Incremental • Probes • 8 Analog Signals 4 Temperature Sensors or a combination of the above	1 Inductive Probe	According to interface 4 - 128 for: Inductive Probes, Incremental Probes, Pneumatic Probes, Analog Signals
Mahr / Mahr Federal	Mahr / Mahr Federal	Mahr / TESA / Mahr Federal	Mahr / TESA / Mahr Federal	Mahr	Mahr / TESA / Mahr Federal
0.1 µm / 0.01 µm ***.000005"/.000001"***	0.1 µm / 0.01 µm ***.000005"/.000001"***	0.1 µm / ***.000005"***	0.1 µm / ***.000005"***	–	0.1 µm or 0.01 µm ***.000005" /.000001"***
+A, - A, +B , -B , A + B , A - B , B - A , -A - B	A, -A, B, -B, A+B, A-B, -A+B, -A-B	Formula editor for 80 characters Functions: + / - / * / ÷/ () / Factor	Formula editor for 80 characters Functions: + / - / * / ÷/ () / Factor	–	Freely programmable
2 / 2	2 / 2	16 / 6	16 / 6	1	99 / 1000
1	1	6	6	–	99
MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean	–	MAX, MIN, MAX-MIN, Freely programmable
–	–	N, x-bar, S, Xmax, Xmin, Range	N, x-bar, S, Xmax, Xmin, Range	–	Freely programmable
3 class LED and I/O	5 class display, 3 class I/O	max. 998, max. 5 on I/O	max. 998, max. 79 on I/O	–	Yes
3 Opto-coupler inputs, 3 Opto-coupler outputs	3 Opto-coupler inputs, 3 Opto-coupler outputs	3 Opto-coupler inputs, 6 Opto-coupler outputs	6 Opto-coupler inputs, 12 Opto-coupler outputs	–	16 Digital inputs (Optional) 16 Digital outputs (Optional)
1	1	1	2	1 Output voltage 1 Current output	–
RS232, 9 pin, plug	RS232, 9 pin, plug	RS232, 9 pin, plug	RS232, 9 pin, plug	–	1 x RS232, 3 x USB, 2 x Ethernet (RJ45)
PC, Keypad	PC, Keypad	PC	PC	–	PC, Touchscreen
No, AC powered	No, AC powered	No, AC powered	No, AC powered	No, AC powered	No, AC powered
205 x 160 x 165	487 x 47 x 144	160 x 205 x 165	235 x 180 x 160	170 x 43 x 100	305 x 400 x 65

Millimar C1200 Compact amplifier M

Features

Functions:
ON/OFF
mm/inch
Reversal of counting direction
Measuring range switching
TOL (enter tolerance limit values)
PRESET (for entering a numerical value)
Factor (adjustable)
DATA (Data transmission)

- High resolution and high contrast color display
- The display can be continuously inclined for the ideal field of vision
- Simple to operate
- Can be operated with batteries or from the main power supply
- The C 1200 is fully portable when battery powered
- Compact housing
- Wall mounting is also possible

- Supplied with:
  Mains adaptor and operating instructions

Technical Data

		C1200
Display		TFT color display 110 mm (4.3“), 480 x 272 Pixel
Range of digital display		± 5000 µm / ***± .19“***
Range of analog display		± 5000 µm, ± 2000 µm, ± 1000 µm, ± 300 µm, ± 100 µm, ± 30 µm, ± 10 µm, ± 3 µm ***± .19“ / ± .07“ / ± .03“ / ± .01“ / ± .003“ / ± .001“ / ± .0003“ / ± .0001“***
Resolution		0,1 µm ***/ ± .000005“***
Readings		500 µm, 200 µm, 100 µm, 20 µm, 10 µm, 2 µm, 1µm, 0,2 µm ***.019“ / .007“ / .002“ / .001“ / .0002“ / .0001“ / .00002“ / .00001“ /***
Both probe inputs		1
Compatibility		Mahr
Measuring combination		+A, -A
Features		1
Limit frequency	Hz	30
Error limit digital display		0.3 % (min. 0.2 µm / ***.000007“***)
Error limit analog display		0.25 % of the full scale / 0.3% of the indicated value
Data interface:		Opto RS232C, USB, Digimatic, Wireless
Energy supply:		Mains adaptor, 230 V/115 V; 50/60 Hz, Battery operation
IP protection category:		IP 42
Dimensions H x W x D		ca. 170 x 130 x 150 mm / ***6.69“ x 5.12“ x 5.91“***
Weight without batteries		ca. 496 g / 1.1 lbs
Weight with batteries		ca. 620 g / 1.4 lbs
Order no.		**5312010**

Accessories

		Order no.
Data Connection Cable USB (2 m) incl. Software MarCom Std.	**2000 usb**	**4346023**
Data Connection Cable Digimatic (2 m)	**2000 d**	**4346021**
Data Connection Cable RS232C (2 m)	**2000 r**	**4346020**

		Order no.
Transmitter for e-Stick	**2000 e**	**4102232**
Receiver incl. Software MarCom Std.	**e-Stick**	**4102230**

Accessories for Data Processing see Chapter 11

Millitron 830 Gaging amplifier

F

Features

- Battery operates more than 8 hours under full load
- Choice of Power Modules for 120 or 240 VAC operation
- ±2 volt analog output
- Conforms to CE Standards
- Dual input - for single or differential modes
- Normal/Reverse transducer setting
- Selectable ranges in either Inch or Metric units.
- Calibration adjustments for each input.
- Convenient, front-mounted controls.
- Tilt base provides stable support and easy adjustment for best viewing angle.
- The essential performer for today's slim budgets
- For appropriate inductive probes please refer to pages 7-6 to 7-18

Technical Data

Repeatability	to within 0.00005 mm / ***.000002"*** or 1/10 of a graduation, whichever is greater
Linearity	less than 4/5 of a scale division
Calibration	less than 4/5 of a scale division
Response Speed-Display	less than .5 seconds for 10% to 90% step follow
Response Time - Output	< 15 ms
Dimensions	approx. 165 mm / 6.5" h x 190 mm / 7.5" w x 148 mm / 5.8" d
Temperature at specified accuracy	20°C / 68°F ±.2°C
Operating temperature	5° to 45°C / 40° to 110°F, with a temperature coefficient of .02% change/°C x full scale range
Storage temperature	0° to 60°C / 32° to 140°F

Model	**Order no.**			**Ranges**		**Resolution**	
Linear:	**120V**	**220V EU**	**240V UK**				
Standard Unit				±100 µm	/ ***±.004"***	5 µm	/ 200 µ"
830 F	**2121421**	**2121431**	**2121441**	±20 µm	/ ***±.001"***	1 µm	/ 50 µ"
830 M	**2121404**	**2121405**	**2121425**	±10 µm	/ ***±.0002"***	0.5 µm	/ 10 µ"
High Resolution – Inch				±200 µm	/ ***±.004"***	10 µm	/ 200 µ"
830 F	**2121424**	**2121434**	**2121444**	±50 µm	/ ***±.001"***	2.5 µm	/ 50 µ"
				±10 µm	/ ***±.0001"***	0.5 µm	/ 5 µ"
Angular:	**120V**	**220V EU**	**240V UK**				
Angular unit - ARCSEC (used with Mahr Federal Level Heads)				±1000 Sec	/ ***±.010"***	50 Sec	/ 500 µ"
830 F	**2121422**	**2121432**	**2121442**	±200 Sec	/ ***±.002"***	10 Sec	/ 100 µ"
				±20 Sec	/ ***±.0004"***	1 Sec	/ 20 µ"

Accessories

	Order no.	**Compatible Probes** Used on 830 F	Used on 830 M
Analog Output Connector	**PRT-2380**	P2001 F	P2001 M
120V Battery Charger	**EBY-1016**	P2004 F	P2004 M
220V Battery Charger (EU)	**EBY-1019**	P2010 F	P2010 M
240V Battery Charger (UK)	**EBY-1020**	P2104 F	P2104 M
Battery	**EBY-1021**	EHE-2XXX	1301, 1303,
Battery Eliminator Kit for 110V Models	**EKT-1237-W1**	EGH-Levels	1304, 1318
Battery Eliminator Kit for 220 Models	**EKT-1237-W2**		

Millitron 832 Digital Electronic Amplifier

Features

- Dynamics – simultaneously computes the minimum, maximum, T.I.R., nominal and actual gage head signal for dynamic measurement capability.
- Multi-Range – three selectable ranges in inch or metric units.
- Message Center – display provides a simple "menu-driven" setup procedure in English, French or Spanish.
- RS-232 Output – for communicating with Data Collection Devices.
- Two Gage Head Input – Independent reading or for providing the capability of "summing" for diameter reading, matching clearances, runout and parallelism.
- Angular units — selectable arc seconds or millirads for angular measurement applications (see Electronic Levels).
- User selectable password for full lockout capability or individual key lockout in both setup and gaging modes.

Technical Data

	Measuring Range	Digital Resolution	Analog Minimum Grad.
Linear	±2 mm / ***±0.100"*** ±.200 mm / ***±.010"*** ±.020 mm / ***±.001"***	.001 mm / ***.0001"*** .0001 mm / ***.00001"*** .00002 mm / ***.000001"***	0.1 mm / ***.005"*** 0.01 mm / ***.0005"*** .001 mm / ***.00005"***
Angular	5 mrad / ±1000 arc sec. 1 mrad / ±200 arc sec.	.005 mrad / 1 arc sec. .0005 mrad / 0.1 arc sec.	.25 mrad / 50 arc sec. .05 mrad /10 arc sec.
Auto Range	Automatically selects the smallest range for the best resolution, in both linear and angular units		
Repeatability	±1 digit		
Calibration Accuracy	±1 digit		
Linear Error	Less than .025% of full scale		
Response Time	42 msec.		
Thermal Stability	.01% /C x full scale		
Temperature Range:			
At Specified Accuracy	20°C / 68°F ±.2°C		
Operating	5° to 45°C / 40° to 110°F, with a temperature coefficient of .02% change/°C x full scale range.		
Storage	0° to 60°C / 0° to 140°F		
Digital I/O	Five TTL opto-isolated outputs		
Data Output	RS-232, transmits Channels A, B, or both, units, and tolerances		
Analog Output	±5 VDC full scale for displayed value signal		
Measuring Modes	Actual, Minimum, Maximum, T.I.R., Nominal		
Tolerance Indicators	Five LEDs		
Weight	3.5 lbs. / 1.58 kg		
Dimensions	168 mm w x 254 mm d x 143 mm h / ***6.63"*** w x ***10"*** d x ***5.63"*** h		
Gage Head Display	A, B or both at any time		
Auto Power Off	User selectable, up to 99 minutes of non-use		
Power Requirements	Rechargeable battery, 10 hour operation under full load: or 120 VAC/240 VAC 50-60Hz with power module (furnished with Amplifier)		
Replacement Battery	**EBY-1015** Ni-Cad rechargeable, 4.8v, 2.5 amp hours		

Technical Data

Power	832 F Mahr Federal probe type Order no.	832 M Mahr probe type Order no.
120VAC adaptor	**2004005**	**2004000**
US battery/120VAC charger	**2004007**	**2004002**
EU/UK 220/240VAC adaptor	**2004006**	**2004001**
EU battery/220VAC charger	**2004008**	**2004003**
UK battery/240VAC charger	**2004009**	**2004004**

Accessories

	Order no.
Storage Cover (opaque) – protection for the 832 Amplifier when used in harsh environments	**ECV-1276**
Oil/Splash Cover (clear) – protection for the 832 Amplifier when used in harsh environments	**ECV-1285**
Footswitch for HOLD/RESUME, 3 m / 10 ft cable (15 pin)	**ECB-1857**
Footswitch for DYNAMIC RESET, or remote zeroing 3 m /10 ft cable (15 pin)	**ECB-1858**
Footswitch for SEND DATA, 3 m / 10 ft cable (15 pin)	**ECB-1859**
Footswitch for DYNAMIC RESET, or Remote Zeroing, 1.5m / 5 ft cable (Phone Plug)	**300-50**
Remote pushbutton for DYNAMIC RESET, or remote zeroing 1.5 m / 5 ft cable (Phone Plug)	**ECB-1855**
Remote pushbutton for SEND DATA, 1.5 m / 5 ft cable (15 pin)	**ECB-1860**
Remote pushbutton for HOLD/RESUME and SEND DATA, 3 m / 10 ft cable (15 pin)	**ECB-1868**
Relay Box – Five relays each with Normally Open/Normally Closed contacts; Contact Rating – 30 Vdc/120 Vac, 3 amps Power Supply – 120 Vac Dimensions – 39 mm x 129 mm x 134.6 mm d/1.53" x 5.082 x 5.3" with ECB-1886W-2, 6.1 mm/24" interconnect cable for amplifier to relay box	**EKT-1236-W3**
Mating connector, Digital I/O connector (15 pin MALE)	**ECN-1695-W2**
Mating connector, Reset Data connector (3/32 microphone plug)	**ECN-1693**
Mating connector, RS-232 Digital Output connector (9 pin FEMALE)	**ECN-1695-W1**
Mating connector, Gage Head to amplifier connector (5 pin MALE)	**ECN-1690**
Battery Charger Modules (For 832 Units using 3 pin connector)	
Plug-in 120 VAC, 50-60Hz charger for use with 120 Vac battery operated units	**EBY-1028**
220 VAC, 50-60Hz charger for use with 220 Vac battery operated units	**EBY-1029**
240 VAC, 50-60Hz (UK) charger for use with 240 Vac battery operated units	**EBY-1030**
Power Supply Module (Bypass battery operated units to direct AC source operation)	
For 120 Vac models (For 832 Units using 3 pin connector)	**2010000**
For 220/240 Vac models (For 832 Units using 3 pin connector)	**2010001**

For appropriate inductive probes please refer to pages 7-6 to 7-18

Millimar C 1208 Compact amplifier with background lit display

Features

- Favorites, frequently required functions can be assigned to the SELECT key
- Static measurements ± A, ± B and all combinations
- Dynamic measurements: Max, Min, Max-Min, Max+Min, mean
- Auto-Detect-Mode, two measuring instruments can be connected (Probe, Plug Gage . . .)
- Programmable via the integrated key pad or by RS232 interface in conjunction with the MS-Windows configuration Software

Display
- Background lit LCD-Display with an analog and a two line digital display
- 5 three color status lamps for warning and tolerances limits
- Up to 2 features can be simultaneously displayed

Connections
- 2 inputs for inductive probes (also compatible with probes from Mahr, Mahr-Federal)
- RS232 interface
- 3 digital inputs for measurement start, master measurement, send measured values, . . .
- 3 digital outputs for GO, NO GO, rework, measuring time, . . .

- Supplied with:
  Operating instructions and a mains power supply plug

Technical Data

Display	Background LCD, 115 mm x 70 mm
Analog scale	Pointer, 61 graduations
Range and text display	7 digit LCD, 5 x 7 dot matrix, alpha-numeric
Measured value display	7 digit LCD, 7 segments
Tolerance display	5 LEDs, 3 colors
Displayed ranges	± 3, 10, 30, 100, 300, 1000, 3000, 10000 µm ***± .0001; .0003; .001; .003; .01; .03; .1; .3 inch;*** or tolerance related
Meas. range inductive probe	4000 (±2000) µm, resolution 0.1µm ***± .08", resolution .000005"***
Response time	
- Meas. value memory	0.010s
- Digital display	0.100s
- Analog display	0.100s
- Outputs	0.020s

Error limit	
- 10 x analog display	2.5%
- Digital display	0.3% (min. 0.2 µm)
Temperature coefficient	0.005%/°C
Operating temperature	0°C . . . 45°C / 32°F . . . 113°F
Interfaces	
Computer, printer	RS232, 9 pin interface (PC-compatible assignment)
- Control outputs	3 Opto-coupler-outputs, 2 24V, 100mA
- Control inputs	3 Opto-coupler-inputs, 24V, 10mA
Power supply via	
Mains power pack	100V . . . 240V, 47Hz . . . 63Hz
Power consumption	10 VA
Protection class	IP54, with conductive dust IP43
Housing dimensions (H x W x D)	ca. 205 mm x 160 mm x 165 mm ***ca. 8.07" x 6.29" x 6.49"***
Weight	ca. 2.1 kg / 4.6 lbs

Order no.

		Order no.
C 1208 M	Mahr compatible	**5312080**
C 1208 F	Mahr-Federal compatible	**5312082**

For appropriate Inductive probes please refer to pages 7-6 to 7-15

Accessories

	Order no.
Extension cable (9 pin D-Sub-jack to a D-Sub-socket), length 3 m / 10 ft	**7024634**
Control Unit with 3 push buttons	**5318430**
Foot switch for for Input 1	**5330955**
for Input 2	**5330956**
for Input 3	**5330957**
Adaptor non wired for I/O port	**7032401**
Keypad dust cover	**3025712**

Millimar C 1216 Compact amplifier with background lit display

Features

- Favorites, frequently required functions can be assigned to the SELECT key
- Static measurements ± A, ± B and all combinations
- Dynamic measurements: Max, Min, Max-Min, Max+Min, mean
- Auto-Detect-Mode, two measuring instruments can be connected (Probe, Plug Gage . . .)
- Programmable via the integrated key pad or by RS232 interface in conjunction with the MS-Windows configuration Software

Display
- Background lit LCD-Display with an analog and a two line digital display
- 5 three color status lamps for warning and tolerances limits
- Up to 2 features can be simultaneously displayed
- Additional resolution 0.01 µm / 1µin at measuring ranges ± .008"

Connections
- 2 inputs for inductive probes (also compatible with probes from Mahr, Mahr-Federal)
- RS232 interface
- 3 digital inputs for measurement start, master measurement, send measured values, . . .
- 3 digital outputs for GO, NO GO, rework, measuring time, . . .
- Analog ouput
- Programable analog output voltage (max. ±5V)

- Supplied with:
  Operating instructions and a mains power supply plug

Technical Data

Display	Background LCD, 115 mm x 70 mm
Analog scale	Pointer, 61 graduations
Range and text display alpha-numeric	7 digit LCD, 5 x 7 dot matrix,
Measured value display	7 digit LCD, 7 segments
Tolerance display	5 LEDs, 3 colors
Displayed ranges	± 3, 10, 30, 100, 300, 1000, 3000, 10000 µm ***± .0001; .0003; .001; .003; .01; .03; .1; .3 inch;*** or tolerance related
Meas. range inductive probe	4000 (±2000) µm, resolution 0.1µm ***± .08", resolution .000005"*** 400 (±200) µm, resolution 0.01µm ***± .008", resolution .000001"***
Response time	
- Meas. value memory	0.010s
- Digital display	0.100s
- Analog display	0.100s
- Outputs	0.020s

Error limit	
- 10 x analog display	2.5%
- Digital display	0.3% (min. 0.2 µm)
Temperature coefficient	0.005%/°C
Operating temperature	0°C . . . 45°C / 32°F . . . 113°F
Interfaces	
Computer, printer	RS232, 9 pin interface (PC-compatible assignment)
- Control outputs	3 Opto-coupler-outputs, 2 24V, 100mA
- Control inputs	3 Opto-coupler-inputs, 24V, 10mA
Power supply via	
Mains power pack	100V . . . 240V, 47Hz . . . 63Hz
Power consumption	10 VA
Protection class	IP54, with conductive dust IP43
Housing dimensions (H x W x D)	ca. 205 mm x 160 mm x 165 mm ***ca. 8.07" x 6.29" x 6.49"***
Weight	ca. 2.1 kg / 4.6 lbs

Order no.

		Order no.
C 1216 M	Mahr compatible	**5312160**
C 1216 F	Mahr-Federal compatible	**5312162**

For appropriate Inductive probes please refer to pages 7-6 to 7-15

Accessories

		Order no.
Extension cable (9 pin D-Sub-jack to a D-Sub-socket), length 3 m / 10 ft		**7024634**
Control Unit with 3 push buttons		**5318430**
Foot switch for	for Input 1	**5330955**
	for Input 2	**5330956**
	for Input 3	**5330957**
Adaptor non wired for I/O port		**7032401**
Keypad dust cover		**3025712**

Millimar C 1245 Compact amplifier

Features

Functions
- 16 characteristics can be defined
- With the formula editor (80 characters) the input channels C1 to C8 are mathematically linked with 4 basic arithmetical functions with factors and brackets
- Static measurements: current value, square root, arc tangent
- Dynamic measurements: Max, Min, Max-Min, Max+Min, mean,
- Statistical functions: n, x-bar, S, Xmax, Xmin, R
- Programmable via the integrated keypad or with MS-Windows configuration software via the RS232 interface
- Memory can store up to 500 measurements
- Measurement Start / Stop

Display
- Analog indicator instrument for display of measurement values
- Two-line LCD for measuring values and help texts
- 5 three color status lamps for warning and tolerance limits
- Up to 3 features can be simultaneously displayed

Connections
- 2 input modules can be inserted into base unit
- Following modules are available:
  - 4 inputs for Inductive Probes (Mahr, Mahr-Federal, Tesa compatiblity)
- RS232 interface
- 1 Analog output
- 3 digital inputs for measurement start, master measurement / zeroize, send data
- 6 digital outputs for GO, NO GO, rework, ALL GO, measuring time, 4 classes
- Supplied with:
  Operating instructions and a mains power supply plug

Technical Data

Display	analog indicator instrument. LCD 53 mm x 40 mm (2.087" x 1.585")
Analog scale	145 mm x 80 mm (5.709" x 3.149")
Range and Text display	7-point LCD, 5 x 7 dot matrix. alphanumeric
Measured value display	7-point LCD. 7 Segment
Tolerance display	5 LEDs, 3-colors
Display ranges	± 10, 30, 100, 300, 1000, 3000, 10000 µm ***± .0003; .001; .003; .01; .03; .1; .3 inch***
Measuring range inductive probe	4000 (±2000) µm, resolution 0.1 µm (measured value display ***± .08", resolution .000005"***
Response time	
- Meas. value memory	0.005s
- Digital display	0.300s
- Analog display	0.050s - 0.300s
- Outputs	0.020s

Error limits	
- 10 x Analog display	2 %
- Digital display	0.3 % (min. 0.2 µm)
Temperature coefficient	± 0.005%/°C
Oper. temperature range	0°. . . 50°C / 32°F . . . 122°F
Interfaces	
Computer, printer	RS232, 9 pin interface (PC-compatible layout)
- Control outputs	6 Optocoupler-outputs, 24V, 100mA
- Control inputs	3 Optocoupler-inputs, 24V, 10mA
Analog output. voltage	programmable
Power supply	90 V . . . 264 V, 47Hz . . . 63Hz
Power consumption	11 VA
Protection class	IP53 with conductive dust IP43
Housing dimensions (H x B x D)	ca. 210 mm x 160 mm x 155 mm ***ca. 8.268" x 6.299" x 6.103"***
Weight	ca. 2 kg / 4.40 lbs

Order no.

		Order no.
C 1245 M	Mahr compatible for 4 inductive probes	**5331250**
C 1245 M	Mahr compatible for 8 inductive probes	**5331291**
C 1245 F	Mahr-Federal compatible for 4 inductive probes	**5331253**

For appropriate Inductive probes please refer to pages 7-6 to 7-15

Accessories

	Order no.
Extension cable (9 pin D-Sub-jack to a D-Sub-socket), length 3 m / 10 ft	**7024634**
Control Unit with 3 push buttons	**5318430**
Foot switch for Millimar for Input 1	**5330955**
for Input 2	**5330956**
for Input 3	**5330957**
Adaptor non wired for I/O port	**7032401**
Keypad dust cover	**3025712**

Millimar C 1240 M Compact amplifier with background lit display — M

Features

- Favorites, frequently required functions can be assigned to the SELECT key
- Static measurements ± A, ± B and all combinations
- Dynamic measurements: Max, Min, Max-Min, Max+Min, mean
- Auto-Detect-Mode, two measuring probes can be connected
- Programmable via the integrated key pad or by RS232 interface in conjunction with the MS-Windows configuration Software

Display
- Background lit LCD-Display with an analog and a two line digital display
- 5 three color status lamps for warning and tolerances limits
- Up to 2 features can be simultaneously displayed
- Additional resolution 0.01 µm / 1µin at measuring ranges ± .008"

Connections
- 2 inputs for inductive probes (only compatible with Mahr inductive probes)
- RS232 interface
- 3 digital inputs for measurement start, master measurement, send measured values, . . .
- 3 digital outputs for GO, NO GO, rework, measuring time, . . .
- Analog ouput
- Programable analog output voltage (max. ±5V)
- Also compatible with Probe 1340, see page 7-14
- Supplied with: Operating instructions and a mains power supply plug

Technical Data

Display	Background LCD, 115 mm x 70 mm
Analog scale	Pointer, 61 graduations
Range and text display	7 digit LCD, 5 x 7 dot matrix, alpha-numeric
Measured value display	7 digit LCD, 7 segments
Tolerance display	5 LEDs, 3 colors
Displayed ranges	± 3, 10, 30, 100, 300, 1000, 3000, 10000 µm ***± .0001; .0003; .001; .003; .01; .03; .1; .3 inch;*** or tolerance related
Meas. range inductive probe	4000 (±2000) µm, resolution 0.1µm ***± .08", resolution .000005"*** 400 (±200) µm, resolution 0.01µm ***± .008", resolution .0000005"***
Response time	
- Meas. value memory	0.010s
- Digital display	0.100s
- Analog display	0.100s
- Outputs	0.020s

Error limit	
- 10 x analog display	2.5%
- Digital display	0.3% (min. 0.2 µm)
Temperature coefficient	0.005%/°C
Operating temperature	0°C . . . 45°C / 32°F . . . 113°F
Interfaces	
Computer, printer	RS232, 9 pin interface (PC-compatible assignment)
- Control outputs	3 Opto-coupler-outputs, 2 24V, 100mA
- Control inputs	3 Opto-coupler-inputs, 24V, 10mA
Power supply via	
Mains power pack	100V . . . 240V, 47Hz . . . 63Hz
Power consumption	10 VA
Protection class	IP42
Housing dimensions (H x W x D)	ca. 205 mm x 160 mm x 165 mm ***ca. 8.07" x 6.29" x 6.49"***
Weight	ca. 2.1 kg / 4.6 lbs

Order no.

	Order no.
C 1240 M Mahr compatible	**5312163**

For appropriate Inductive probes please refer to pages 7-6 to 7-15
Recommended **Probe 1340** see page 7-14

Accessories

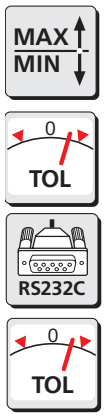
	Order no.
Extension cable (9 pin D-Sub-jack to a D-Sub-socket), length 3 m / 10 ft	**7024634**
Control Unit with 3 push buttons	**5318430**

Accessories

		Order no.
Foot switch for	for Input 1	**5330955**
	for Input 2	**5330956**
	for Input 3	**5330957**
Adaptor non wired for I/O port		**7032401**
Keypad dust cover		**3025712**
Adaptor Cable RS232-USB (1 m) incl. Software MarCom Std.		**4102331**
Transmitter for e-Stick	**RS232e**	**4102233**
Receiver incl. Software MarCom Std.	**e-Stick**	**4102230**

Accessories for Data Processing see Chapter 11

Millimar S 1840 Compact column amplifier



Features

- Easy to read 3 color analog display
- Measurement in conjunction with inductive probes (e.g. Mahr P2004) or electronic plug gages etc
- Two inputs for inductive probes (compatible with probes from Mahr, Mahr-Federal)
- Extensive calculation of input signals: ±A, ±B and all combinations
- Dynamic measurements: Max, Min, Max-Min, Max+Min, Mean
- Programmable either via the integrated keypad or the RS232 interface by means of MS-Windows configuration software
- Programmable warning and tolerance limits, exceeding the limit causes the color to change from green to yellow to red
- Background lit 2 lined LCD to display measured values, help text and measuring units
- Analog output
- 3 digital inputs (e.g. start of measurement, master measurement)
- 3 digital outputs for GO – NO GO – rework, measuring time
- Programable analog output voltage ± 5 V
- Supplied with: Operating instructions and a mains power supply plug

Technical Data

Analog display	101 LED elements, 3 colors
Range and Text display	7 point LCD, 14 Segment, alphanumeric
Measured value display	7 point LCD, 7 Segments
Tolerance display	via color changes in the analog display
Display ranges	± 10; 30; 100; 300; 1000; 3000; 10000 µm ***± .0003; .001; .003; .01; .03; .1; .3 inch*** or tolerance related
Meas. range inductive probe	4000 (±2000) µm, resolution 0.1 µm ***± .08", resolution .000005"*** 400 (±200) µm, resolution 0.01 µm ***± .008", resolution .000001"***
Response time	
- Meas. value memory	0.008 s
- Analog display	0.020 s
- Outputs	0.020 s

Error limits	
- 10 x Analog display	1% (101 LEDs)
- Digital display	0.3% (min. 0.2 µm)
Temperature coefficient	± 0.005% / °C
Operating temp. range	0 . . . 45 °C / 32°F . . . 113°F
Interfaces	
Computer, printer	RS232, 9 pin. male (PC-compatible layout)
- Control outputs	3 Optocoupler Outputs, 24 V, 100 mA
- Control inputs	3 Optocoupler Inputs, 24 V, 10 mA
Analog output	Voltage ±5 V programable
Power supply	90 . . . 264 V, 47 . . . 63 Hz
Power consumption	12 VA
Protection class	IP53 IP43 with conductive dust
Dimensions (H x W x D)	ca. 487 x 47 x 144 mm ***ca. 19.173" x 1.850" x 5.669"***
Weight	ca. 1.6 kg / 3.53 lbs

Order no.

		Order no.
S 1840 M	Mahr compatible	**5318400**
S 1840 F	Mahr-Federal compatible	**5318402**

For appropriate Inductive probes please refer to pages 7-6 to 7-15

Accessories

		Order no.
Base Plate, for up to 3 columns		**5330901**
Wall Mounting		**5330902**
Connection Cable (9 pin D-Sub-jack to D-Sub-jack), length 3 m / 10 ft		**7024634**
Control Unit with 3 push buttons		**5318430**
Foot Switch for Millimar	Input 1	**5330955**
	Input 2	**5330956**
	Input 3	**5330957**
Adaptor non wired for I/O port		**7032401**

Millimar X 1715 Intelligent measurement interface system

Features

Millimar X 1715 is a smart and universal measurement interface system for complex measuring tasks on the production floor. It is ideal as a signal transformer between sensors and the electronic measured data processsing.

Functions
- Static and dynamic measurements
- Equation editor
- Definition of 16 features are possible
- One or two point master measurement

Connections
- 1 to 8 measuring device inputs
- RS-232 interface
- Analog output
- 3 digital inputs and 6 digital outputs

- Supplied with: Operating instructions, connection cable and a mains power supply plug

Technical Data

Measuring range inductive probe	4000 (± 2000) µm, ***± .08"*** Resolution 0.1 µm, ***.000005"***
Response time	
- Meas. value memory	0.005s
- Outputs	0.020s
Error limits	
- 0.3% (min. 0.2 µm)	
Temperature coefficient	± 0.005%/°C
Oper. temperature range	0°. . . 50°C / 32° F . . . 122° F
Interfaces	
Computer, printer	RS232, 9 pin interface (PC-compatible layout)
- Control outputs	6 Optocoupler-outputs, 24V, 100mA
- Control inputs	3 Optocoupler-inputs, 24V, 10mA

Analog output voltage	programmable
Power supply	90 V . . . 264 V, 47Hz . . . 63Hz
Power consumption	11 VA
Protection class	IP53 IP43 with conductive dust
Dimensions (H x B x D)	ca. 160 x 205 x 165 mm ***ca. 6.30" x 8.07" x 6.49"***
Weight	ca. 2 kg / 4.40 lbs

Order no.

		Order no.
X 1715	Mahr compatible for 2 Inductive probes	**5331064**
X 1715	Mahr compatible for 4 Inductive probes	**5331063**
X 1715	Mahr compatible for 8 Inductive probes	**5331061**

For appropriate Inductive probes please refer to pages 7-6 to 7-15

Accessories

		Order no.
Connection Cable (9 pin D-Sub-jack to D-Sub-jack), length 3 m / 10 ft		**7024634***
Control Unit with 3 push buttons		**5318430**
Foot Switch for Millimar	Input 1	**5330955**
	Input 2	**5330956**
	Input 3	**5330957**
Adaptor non wired for I/O port		**7032401**

** Included in the scope of supply*

Millimar X 1741 Intelligent measurement interface system

Features

Millimar X 1741. is a smart and universal measurement interface system for complex measuring tasks on the production floor. It is ideal as a signal transformer between sensors and the electronic measured data processsing.

Functions
- Static and dynamic measurements
- Equation editor
- Definition of 16 features are possible
- One or two point master measurement

Connections
- 1 to 16 measuring device inputs
- RS-232 interface
- 2 analog outputs
- 6 digital inputs and 12 digital outputs

- Supplied with: Operating instructions, connection cable and a mains power supply plug

Technical Data

Measuring range inductive probe	4000 (± 2000) µm, ***± .08"*** Resolution 0.1 µm, ***.000005"***
Response time	
- Meas. value memory	0.005s
- Outputs	0.020s
Error limits	
- 0.3% (min. 0.2 µm)	
Temperature coefficient	± 0.005%/°C
Oper. temperature range	0°. . . 50°C / 32° F . . . 122° F
Interfaces	
Computer, printer	RS232, 9 pin interface (PC-compatible layout)
- Control outputs	12 Optocoupler-outputs, 24V, 100mA
- Control inputs	6 Optocoupler-inputs, 24V, 10mA

Analog output voltage	programmable (2 outputs)
Power supply	90 V . . . 264 V, 47Hz . . . 63Hz
Power consumption	11 VA
Protection class	IP53 IP43 with conductive dust
Dimensions (H x W x D)	ca. 235 x 180 x 160 mm ***(9.25" x 7.08" x 6.29")***
Weight	ca. 2 kg / 4.40 lbs

Order no.

		Order no.
X 1741	Mahr compatible for 4 Inductive probes	**9037840**
X 1741	Mahr compatible for 8 Inductive probes	**9038383**
X 1741	Mahr compatible for 12 Inductive probes	**5331057**
X 1741	Mahr compatible for 16 Inductive probes	**5331096**

For appropriate Inductive probes please refer to pages 7-6 to 7-15

Accessories

		Order no.
Connection Cable (9 pin D-Sub-jack to D-Sub-jack), length 3 m / 10 ft		**7024634***
Control Unit with 3 push buttons		**5318430**
Foot Switch for Millimar	Input 1	**5330955**
	Input 2	**5330956**
	Input 3	**5330957**
Adaptor non wired for I/O port		**7032401**

** Included in the scope of supply*

Millimar Measuring Amplifier 1901 TA with analog output M

IP54

Features

- The measuring amplifier 1901 TA is to be used in connection with an inductive probe for measurement control processes
- Provides the inductive probe with an AC voltage and converts the carrier fequency signal into output voltage
- Output voltage: ± 10 V (Option: ± 5 V / 0 V to 10 V) at the end of the measuring range
- Simultaneously the output signal current of ± 5 mA at the end of the measuring range is available
- Supply voltage 24 V=
- The housing of the 1901 TA is designed for use in the machine room
- Connections : 1 output for one Mahr compatible inductive probe
- Supplied with: 3 pin socket plug for analog output, 3 pin coupling bushing for power supply and operating instructions

Technical Data

Measuring ranges (adjustable through bridges)	± 125 µm ***(± .00492")*** ± 250 µm ***(± .00984")*** ± 500 µm ***(± .01968")*** ± 1000 µm ***(± .03937")*** ± 2000 µm ***(± .07874")***
Output voltage at end of measuring range	± 10 V
Option:	± 5 V / 0–5 V / 0–10 V
Current output at end of measuring range	± 5 mA
Linearity	± 0.3%
Supply voltage	24 V =

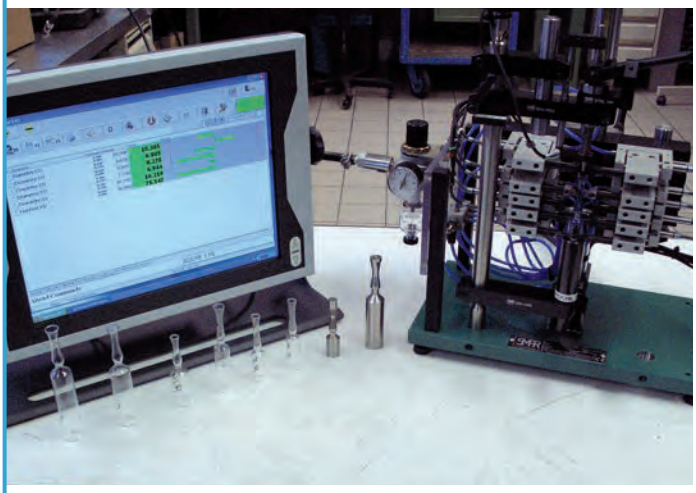
Connections	
Input	5 pin socket
Output	3 pin socket
Supply	3 pin plug
Response time	5-10 ms
Cut-off frequency	90 Hz
Protection class	IP 54
Dimensions: (L x D x H)	43 x 100 x 170 mm ***(1.69" x 3.93" x 6.69")***

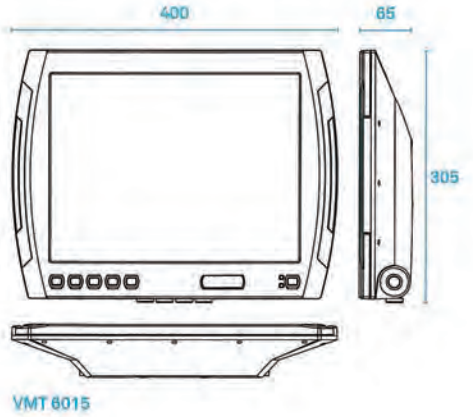
Order no.

		Order no.
1901 TA	Mahr compatible for 1 Inductive probe	**5319011**
1901 TA/So	Mahr compatible for 1 Inductive probe 0- 10 V	**9023856**

For appropriate Inductive probes please refer to pages 7-6 to 7-15

Millimar G1275





Description

With the measuring computer **Millimar G1275**, measuring results from multi-gaging units can easily be recorded and statistically evaluated.

The industrial housing makes the measuring computer suitable for use in the rough production area.

The compact dimensions of the housing allow for use of the computer in areas with little space.

The measuring results are clearly shown on the 15" TFT monitor, which avoids reading errors and misinterpretations.

Using the touchscreen, the measuring computer can be realiably operated in the production environment.

To record the measuring signals from the most different sensors, a broad spectrum of measuring interfaces can be connected to the measuring computer Milimar G1275.

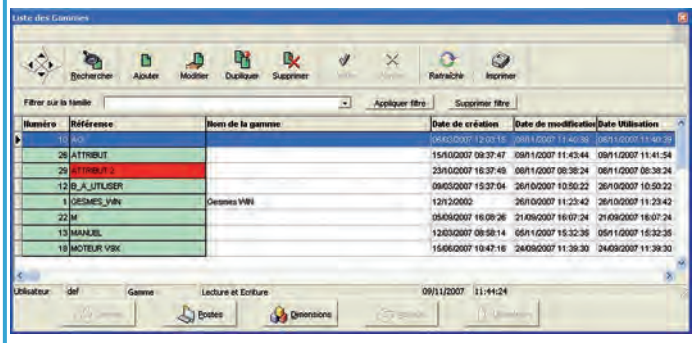
Technical Data

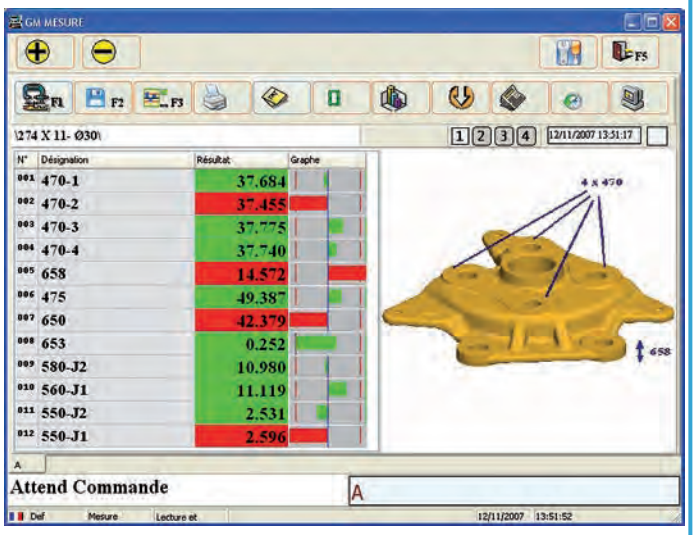
Dimensions (L x D x H)	305 x 400 x 65 mm
Weight	4,3 kg
Material	Aluminum pressure die-cast powder-coated
Operating temperature	0 °C . . . 55 °C / 32° F . . . 131 F
Relative humidity	10 % to 85 % non-condensing
Protection class	IP65
TFT color monitor	15" 1024 x 768 pixel
Touch	Resistive industry touchscreen
Power supply	230 V ± 10 % AC / 24V DC (via external mains unit)

Interfaces

Inputs/Outputs	1 RS232 (COM1) 1 input for keyboard/mouse 2 Ethernet connection (RJ45) 2 USB on the back side 1 USB in the front panel

Software Millimar D1200X

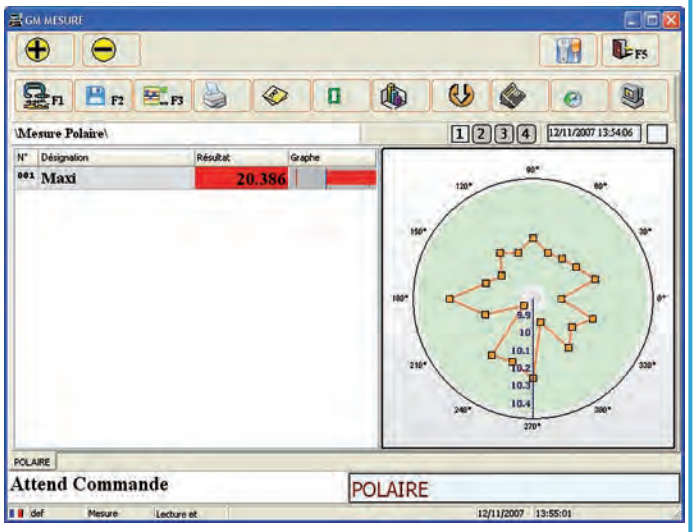




Description

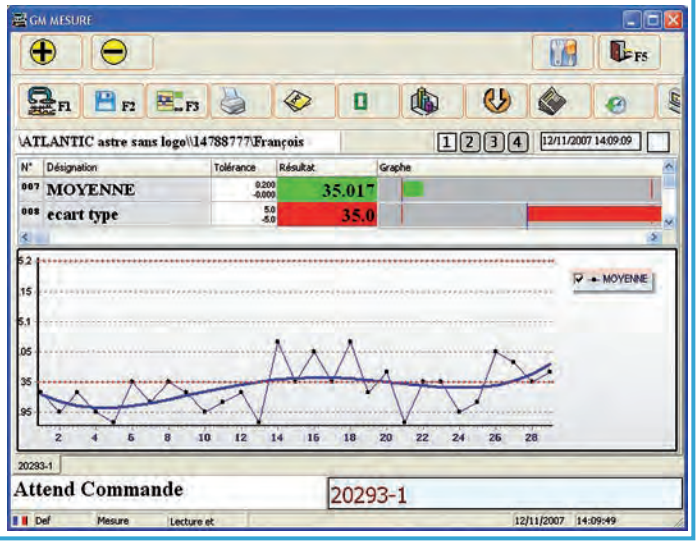
- Windows-based software
- ACCESS data bank
- Password protected menus and access authorization
- Free form editor
- Easy programming of the inspection plan by filling out masks
- Freely programmable calculation format

- Fast selection to display the measurements conducted
- Aid monitor for easy adjustment of sensors
- Calibration history is saved
- Measuring value display (numerical and as a bar graph)
- Measurement is saved (manually or automatically)
- Monitoring of the working range of the sensors and alarm
- Statistical evaluation of a measuring result
- Depiction as a histogramm and SPC control card.
- Automatic calibration demand after hours and n measurements
- Inaccurate measuring values can be commented on with the reasons
- Statistiscal analysis
- Test of normal distribution
- Measurement systems analysis (R&R) and gage capability integrated
- Module to export in numerous data formats
- Interfaces to e.g. QDAS, SUMEQ, SESAME, QUASAR
- I/O interface for automatic control (option)
- Operation in automatic production lines with dialog control



Minimum Requirements

- Pentium IV or similar processor with at least 1.5 GHz
- Windows 2000 or Windows XP
- 20 GB free memory on the hard drive
- 512 MB RAM
- Monitor 1024 x 768
- Free USB interface
- CD drive
- 1 to 4 RS232 interfaces, depending upon the number of peripheral units



Millimar. Electronic Levels

OVERVIEW

Electronic Levels Applications F

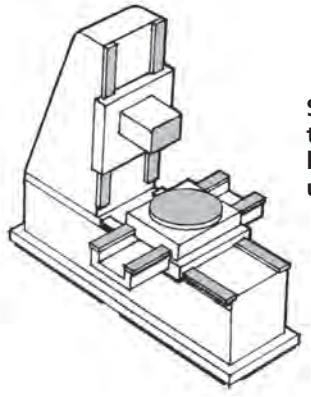
Measuring with a Mahr Federal Electronic Level is a relatively simple procedure. In a typical profile application, for example, measurements are made by moving the sensing heads in convenient increments along a straight path on the surface being checked. Comparative readings are taken at each increment.

Computer assisted models allow economical, fast, and error-free calculations to be made automatically. As prompted by the computer, the operator simply enters the value at each measurement point by pressing a hand-held switch. Depressing a computer key activates automatic analysis. Within moments, the results are displayed and printed, if desired, for permanent record.

Surface Deviation (Machine Tools)

The accuracy of machine tools begins with proper levelness plus the relationship between the ways and the table. These relationships are critical during the manufacturing process.

Once the level is zeroed, the instrument functions as a spirit level, and will check the overall levelness of the machine components to a very high degree of accuracy.



Shown here are just a few of the many surfaces that can be checked on a machine tool using the Electronic Level.

Differential Sensing

To aid in differential profiling applications, two level sensing heads, operating simultaneously with a single amplifier, are used. When the sensing heads are arranged for opposite response to a common motion (such as vibration or a shift in attitude of the object whose surfaces are being compared), they will ignore the common motion and respond only to changes which affect the two heads differentially. A deviation of flatness, squareness, parallelism or alignment, therefore, can be accurately determined even though the object (such as a surface plate or a machine way) does not maintain constant orientation.

Surface Plate Flatness

The next progression in data collection is to combine and print a number of surface straightness checks onto a single chart. This is useful for checking the surface flatness of machine beds and surface plates.

Although the Moody Method for checking surface plates has been traditionally used to check flatness, the computer assisted digital Electronic Level System is ideally suited for highly precise profiling of surface plates and large machined surfaces while eliminating tedious and time-consuming data recording and calculations required by manual systems.

Determining surface flatness is accomplished by using a straight edge as a guide and moving the level along the edge.

Readings are recorded at convenient locations, and entered into the computer via handswitch to produce the surface profile.

Machine Tool Evaluation

ANSI Standard B5.54, for machining center evaluation, refers to levels as an important part of machine evaluation, calling out angular deviation as a major contributor to machine tool errors.

Electronic Levels are ideal for monitoring such deviations as pitch, yaw and roll.

When used with the Spindle Mount Attachment (EAT-1062), levels become an essential tool towards total Machine Tool Evaluation.

Electronic Levels F

Offer fast response, fine resolution and excellent repeatability

Features

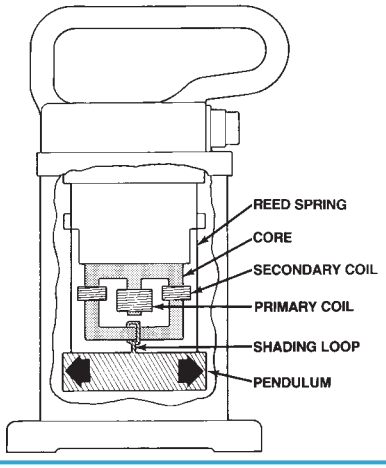
- Used to determine any deviation in the right angle relationship between a horizontal surface and the earth's gravitational force (usually expressed as an angular or linear deviation from absolute level).
- Show any change in this relationship over time.
- Compare the orientation attitude of separate or adjacent horizontal surfaces.
- Show any change in this comparison over time.
- Level systems are angular-linear compatible.
- Sensing heads are interchangeable with Mahr Federal's gage heads to accommodate linear measurements.
- Fast Response: quick response to slight angular changes permit taking fast and accurate measurements at various sensing head positions or taking dynamic position readings.
- Resolution/Repeatability: Mahr Federal's Electronic Levels far exceed the sensitivity and accuracy of precision spirit levels with a resolution to 6 µin per foot (.1 arc second), compared to the spirit level's resolution of .0001" per foot. With repeatability at ±.1 arc second, Electronic Levels are ideal for ultra-high resolution profiling.
- Direct Dimensional Readout: multiplier feature permits operator to view displacement caused by the angular measurement of the level head; this is displayed as an inches per foot readout rather than arc seconds: eliminates readout confusion when switching from spirit levels to electronic levels.
- Angular-Linear Compatible: sensing heads are easily interchangeable with Federal gage heads to accommodate linear measurements.
- Operator Friendly: Level systems are often compared to the autocollimator or laser calibration systems. In each case, the measurement technique is basically the same. Electronic Levels, however, are much easier to set up and operate. Results are obtained cost-effectively without requiring time consuming sight path alignments. There are no optical surfaces to keep clean, and the Level does not need a turbulence-free environment to achieve accurate readings.

How they work

As shown in the figure, our Sensing Head operates on the pendulum principle, with a pendulum supported by two reed springs attached to an extension block at the top of the Sensing Head housing.

Tilting the head causes a change in the position of the pendulum's shading loop in relation to the center leg of the core. This produces an electrical imbalance in the amount of flux passing through the two secondary coils, delivering a signal proportional to the displacement of the pendulum.

This is displayed on a Mahr Federal amplifier meter which is graduated in seconds of arc.



Electronic Levels Ordering Information

Differential Level System

The Differential Level System operates simultaneously with a single amplifier, permitting an immediate comparison between two surfaces.

Adjustable bases permit setup on surfaces that are out-of-level or square by as much as ±1.5°.

Each system includes:
- 832 F Amplifier with power module and storage case
- 2 EGH-2013-W2 Electronic Level Heads with 6m / 20ft cables
- 2 EAT-1029 Adjustable Bases
- ECB-1871 Remote data enter handswitch with 6m / 20ft cable

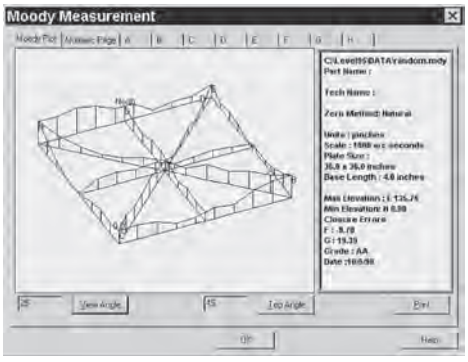
Ordering no.

Type	Order no.
Differential Level System described above with 120 VAC 50/60 Hz power module	**EMD-832P-48-W1**
Differential Level System described above with 220 VAC 50/60 Hz power module (EU)	**EMD-832P-48-W2**

Automatic Profiling System

Ideally suited for highly precise profiles of surface plate and large machine surfaces, eliminating tedious and time-consuming data recording and calculating required by manual systems.

Each system includes:
- 832 F Amplifier with power module and storage case
- 2 EGH-2013-W2 Electronic Level Heads with 6m/20ft cables
- 2 EAT-1029 Adjustable Bases
- ECB-1871 Remote data enter handswitch with 6m/20ft cable
- 7024634 RS-232 0.6 m/4 ft interconnect cable, 9 pin-9 pin
- Notebook computer (EAS-2836) with notebook printer (ERO-1063) and cable (ECB-1775)
- Mahr Federal Profiling Software (EDD-1035) for single line profile measurements and Moody Method surface plate profiling. Includes 3 data outputs (printout of data point readings, numeric and isometric plots of surface plate readings)
- Serial - USB Adaptor



Surface Plate Certification Software

- Moody and Profile Analysis
- Isometric or numeric plots
- Automatic grading according to industry standards
- On-line help
- Flexible path sequence and orientation
- Multiple run averaging
- Difference of Data Files

Ordering no.

Type	Order no.
Automatic Profiling System described above with 120 VAC 50/60 Hz power module	**EMD-832P-50-W1**
Automatic Profiling System described above with 220 VAC 50/60 Hz power module (EU)	**EMD-832P-50-W2**
Surface Plate Certification Software	**EDD-1035**

Electronic Levels Ordering Information

Accessories

Type	Order no.
Electronic Level Gage Head, with 2.5m / 8 ft cable, 210 mm / 8.2" x 114 mm / 4.5" x 50.8 mm / 2" 3.5 kg / 7.75 lbs.	**EGH-2013-W1**
Electronic Level Gage Head, same as above except with 6 m / 20 ft cable	**EGH-2013-W2**
Adaptor Cable, to connect EGH-13 Electronic Level Gage Heads or EHE-1xxx Gage Heads to a Series 832 & 830 Gaging Amplifier, 1.8 m / 6 ft long	**ECB-1853**

EAT-1029
(Adjustable Leveling Foot)

The adjustable level foot mounts to the base of the level head. Typically used to assist in leveling the head to its true zero position.

EAT-1054
(Magnetic Base)

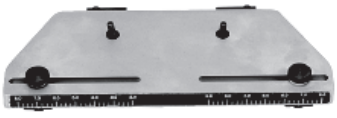
Incorporates a magnet to fix it in position, providing stability when mounted on a moving carriage.

EAT-1055
(Vee Base)

Has a 120° Vee precision ground into the 102 mm / 4" base for measuring the straightness or alignment of cylindrical surfaces.

EAT-1056
(Right Angle Attachment)

Has two 152 mm/ 6" surfaces, accurately ground to 90°, to simplify measuring flatness on horizontal or vertical and cylindrical surfaces. Each adjacent pair of faces is square to within 0.5 µm / 25 µin. Attachment includes 120° Vee face, which is parallel to its base to the same limit.

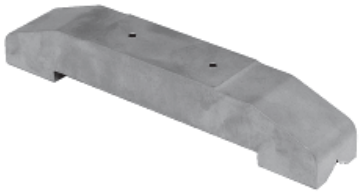


EAT-1057
(Adjustable Base)

A three-pad base lets you adjust the distance between the pads from 50 mm/2" to 203 mm/8" when using the "Grid" or "Union Jack" measuring methods. Can also be used for straightness movement checks.

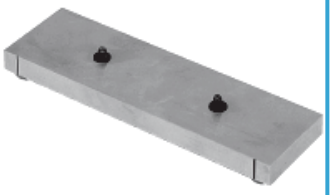
EAT-1062
(Spindle Block)

A special spindle mounting block to hold the level head in a horizontal or vertical spindle. Utilizes a 19 mm/.750" bar for mounting and allowing checking angular motion on a machine tool per B5.54 Calibration Standard.



EAT-1061
(29.5mm/11.625in Base)

Has a 29.5 mm/12.625" ground, flat surface for leveling machine beds and ways. It also has a 120° Vee ground into the base, permitting the base to be positioned on a cylindrical surface. When coupled with an 832 or 830 Electronic Amplifier while in the inch mode, it can display inches/feet as a direct reading.



EAT-1058 (50 mm / 2")
EAT-1059 (102 mm / 4")
EAT-1060 (152 mm / 6")

A three-pad base which provides the flexibility to maximize data accumulation for surface plate calibration. Available in three pad spacing sizes.

Millimar. Air Gage Metrology

PRECISION BEGINS AT THE START OF THE MEASURING PROCESS

►| High pressure air gages measure dimension deviations quickly and precisely. For years, they have proven themselves as high quality pneumatic length measuring units in industrial production and measuring rooms. Air measuring value recorders such as jet air probes, jet air plug gages, jet air ring gages, air caliper gages, angularity plug gages, angularity measuring rings and measuring units for mating parts determine the measuring value without contact. The measuring values of one or several air measuring value recorders are displayed by the Millimar evaluation units according to the principle of determination of changes in air pressure. |◄

Millimar. Air Gage Metrology

Metrological features

Millimar evaluation units work according to the principle of determination of changes in air pressure; the pressure differential between two chambers is measured. While one of the two chambers provides a constant reference pressure, the pressure of the other chamber (measuring chamber) is determined by the distance of the measuring jet of an air measuring value recorder to the test specimen.
Millimar evaluation units have two connection points that are each directly connected to one of the two pressure chambers. Thus the measuring value is measured directly without any conversion via a Piezo pressure sensor and is then digitalized.

Magnifications from 2500:1 to 10000:1 are realized with exchangeable instrument jets.

Millimar measuring units must be supplied with constant air pressure through a pressure reducing valve. Measuring units with pressure reducing valves can be connected to all compressed air lines from 3.5 bar to 10 bar overpressure, whereby an air filter should be interconnected.

The air must be dry and oil-free.

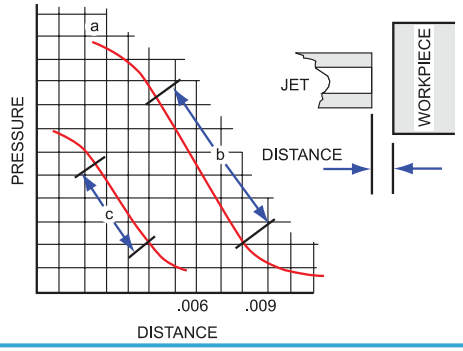
Metrological features

- Universal, relilable, proven, especially high-performing
- All measuring methods, individual, total and differential measurements
- High accuracy, long-term stability, insensitive to environmental influences
- Up to 10000x magnification of the measuring values, large measuring ranges
- High measuring accuracy and reproducibility for the measuring results: depnding upon the magnification 0.5 µm to 20 µm
- Contact-free measurements with measuring jets, no damage to the workpieces
- Reliable measurements of even uncleaned, oiled, lubricated workpieces, or workpieces with lapping paste. Measuring points are cleaned by the measuring air
- Linear display of the measuring values on a clear, large or long scale, easy and error-free reading of measuring results
- Measurement of diameters, distance between holes, tapers, excentricities, alignment of bores, mating measurements etc.
- Various measuring possibilities due to the corresponding adaption to existing measuring problems
- Airgage display unit for all applications
- Requires little room, handy, easy to use, all measuring methods
- Fully automatically working electrical units for measuring, control and sorting processes
- Measurement control unit for production machines
- **Millimar** single and multi-column units to set-up complete testing control units
- Multi-column units according to the modular construction system due to close arrangement of the measuring colums and long scales
- Versatile measuring elements: jet air probes, jet air plugs gage, jet air ring gages, air caliper gages, angularity plug gages, angularity measuring rings, taper jet plug gages, taper jet ring gages and measuring units for mating parts for contact-free measurement
- Unusually long life-time of the air measuring elements
- Robust model for the shop floor. Models for all applications.
- Special models for special tasks

General Technical Data of Air Gages

Air gaging is a measuring system that uses air pressure to determine the size of measured part. The relationship between air pressure and distance of a restriction (workpiece) to the air escape (jets) can be plotted on a graph (line a).

As the distance between jets and work surface increases, the pressure decreases and the ratio becomes linear as represented by the straight section "B". This straight portion of the curve can be accurately calibrated, and represents the scale of the Dimensionair. Compare its length with "C" on the other curve, which is the usable portion of other air gage scales. This longer linear scale gives the Dimensionair its longer usable measuring range.



Millimar. Air Evaluation Units

OVERVIEW

	Analog DA	Universal DA	µDimensionAir	832 DDA	C1208 PE
Catalog page	7 - 45	7 - 46	7 - 47	7 - 49	7 - 51
Display	Large analog scale with 2 tolerance markers	Large analog scale with 2 tolerance markers	Analog display with 1 digital line display	LCD with an analog display	Analog scale with a two line backlighted digital display
Measuring channels	Single channel	Single Channel	Single Channel	Single or Dual Channel	Single Channel
Compatible air tooling	Mahr Federal	Mahr Federal Universal	Mahr Federal Universal	Mahr Federal	Mahr Federal Universal
Max. Resolution	0.1 µm / ***.000005"***	0.1 µm / ***.000005"***	0.01 µm / ***.00002"***	0.1 µm / 0.01 µm* ***.000005"/.00001"***	0.1 µm / ***.000005"***
Input Combinations				+A, - A, +B , -B , A + B , A - B , A +B , -A - B	Formula editor for 80 characters Functions: + / - / * / ÷/ () / Factor
Features / Programs	1	1	1	1	16 / 6
Test steps	1	1	1	1	6
Dynamic measurements	–	–	MAX, MIN, MAX-MIN	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean
Mastering Mode:	Nominal Master	Max/Min Master/ Nominal	Nominal or Max/Min	Nominal or Max/Min	Nominal or Max/Min
Classification	–	–	3 class	5 class LED and I/O	max. 998, max. 62 on I/O, 5 LED
Control inputs and outputs / SPS connections	–	–	–	5 Opto-coupler outputs	3 Opto-coupler inputs, 6 Opto-coupler outputs
Analog output	–	–	–	1	1
Data interfaces / ports	–	–	USB, ASCII/Digimatic	RS232, 9 pin, plug	RS232, 9 pin, plug
Configuration	Turn switch	Turn switch	Keypad	Keypad	Keypad
Battery operated	–	–	Yes	No, AC powered	No, AC powered
Dimensions in mm (H x W x D)	137 x 157 x 80	165 x 190 x 148	254 x 168 x 143	205 x 160 x 165	210 x 160 x 155

	C 1245	1840PE
	7 - 52	7 - 53
	Analog scale with a two line digital display	Column analog scale, 2 line digital display
	Single/Dual	Single
	Mahr Federal Universal	Mahr Federal Universal
	0.1 µm / ***.000005"***	0.1 µm / ***.000005"***
	Formula editor for 80 characters Functions: + / - / * / ÷/ () / Factor	+A, - A, +B , -B , A + B , A - B , B - A , -A - B
	16 / 6	2 / 2
	6	1
	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean
	Nominal or Max/Min	Nominal or Max/Min
	max. 998, max. 62 on I/O	Nominal or Max/Min
	3 Opto-coupler inputs, 6 Opto-coupler outputs	3 Opto-coupler inputs, 6 Opto-coupler outputs
	1	1
	RS232, 9 pin, plug	RS232, 9 pin, plug
	Keypad	Keypad
	No, AC powered	No, AC powered
	137 x 157 x 80	165 x 190 x 148

Other display options available upon request

832 Differential

832 performs match gage operation

1841

1841 configured for multiple diameters:
- Taper angle
- Taper difference

Mar-Chek

Gaging computer for signal combination, statistics, operator sequence, etc.

Millimar. Air Evaluation Units

MEASURING COMPLEX TASKS TO THE POINT

►| Evaluation instruments have many different applications and therefore need to meet a broad range of requirements. They can perform anything from simple measurements on the shop floor to complex applications with a whole host of test features in fully automated production lines. These applications require high levels of reliability and precision combined with straightforward operation. Millimar evaluation instruments meet these requirements perfectly. Robust, compact, bright light-strip instruments, measurement interfaces for a wide range of applications and easy-to-use measuring computers can all be adapted for different probes and tailored to suit your particular application. |◄

Dimensionair® Air Gages (single master system) F

Features

- Uses regular shop air (40 - 150 psig).
- Internal pressure regulator keeps measuring pressures within calibrated range.
- Adjust meter to zero using a single setting master and the zero setting screw.
- High visibility meter has fine line graduations and a needle-thin hand for clear, precise readings. An air filter is included to remove dust and dirt contaminants from air line.
- Tooling mounts to the front of the unit. Connections are tight with finger pressure.
- No recalibration necessary when changing tooling. Just set zero and measure!
- Models available in 5 magnifications, 2 dial styles, and either Metric or Inch.

Technical Data

Magnification	Tooling ID no.	Range	Minimum Graduation	Dial Style	Surface Finish (recommended) µin Ra / µm Ra	Maximum Part Tolerance (recommended)	Order no.
1250:1	100	***.006"***	***.0001"***	Regular 82.6 mm / ***3.25"*** diameter	***100*** / 2.54	***±.002"***	**2095183**
2500:1	50	***.003"***	***.00005"***		***50*** / 1.27	***±.001"***	**2095184***
5000:1	20	***.0015"***	***.00002"***		***20*** / 0.50	***±.0005"***	**2095185***
10000:1	10	***.0006"***	***.00001"***		***10*** / 0.25	***±.0002"***	**2095186**
20000:1	5	***.0003"***	***.000005"***		***5*** / 0.12	***±.0001"***	**2095189**
1250:1M	100	152 µm	2 µm		***100*** / 2.54	± 50 µm	**2095190**
2500:1M	50	76 µm	1 µm		***50*** / 1.27	± 25 µm	**2095191***
5000:1M	20	38 µm	0.5 µm		***20*** / 0.50	± 13.5 µm	**2095192***
10000:1M	10	15.2 µm	0.2 µm		***10*** / 0.25	± 5 µm	**2095193**
20000:1M	5	7.6 µm	0.1 µm		***5*** / 0.12	± 2.5 µm	**2095194**
4000:1	50	***.003"***	***.000025"***	Large 152.4 mm / ***6"*** diameter	***50*** / 1.27	***±.001"***	**2095195***
8000:1	20	***.0015"***	***.000010"***		***20*** / 0.50	***±.0005"***	**2095196***
16000:1	10	***.0006"***	***.000010"***		***10*** / 0.25	***±.0002"***	**2095197**
32000:1	5	***.0003"***	***.000005"***		***5*** / 0.12	***±.0001"***	**2095198**
4000:1M	50	76 µm	0.5 µm		***50*** / 1.27	± 25 µm	**2095199***
8000:1M	20	38 µm	0.2 µm		***20*** / 0.50	± 13.5 µm	**2095200***
16000:1M	10	15.2 µm	0.2 µm		***10*** / 0.25	± 5 µm	**2095201**
32000:1M	5	7.6 µm	0.1 µm		***5*** / 0.12	± 2.5 µm	**2095202**

* *Contingent upon Plug having equivalent range, see chart on pages 7-57, 7-58 and 7-59*

Dimensionair® Air Gages (single or dual master system) F

Interchangeable Dials

Each Universal Dimensionair is furnished with an adaptor (for connecting standard Mahr Federal air tooling) Optional adaptors are available for virtually any air tooling application.

Features

- Uses regular shop air (40 -150 psig).
- Internal pressure regulators and differential meter assure ultimate stability over full operating range.
- Adjust span and zero setting to tune the gaging range to the interchangeable dial ranges.
- Interchangeable dials provide an easy, inexpensive means to accommodate various ranges
- High visibility meter has fine line graduations and a needle thin hand for clear, precise readings.
- An air filter is included to remove dust and dirt contaminants from airline.
- Tooling mounts to the front of the unit. Adaptors are available for virtually any tooling configuration.

Technical Data

Dial Size diameter mm / ***inch***	82.6 / ***3.25"***
Housing Dimensions mm	127 x 187 x 197 (high)
inch	***5" x 7.125" x 7.75"***
Weight (including filter) approx.	6.7 kg / 14.25 lbs.
Operating Pressure	414-1034 kPa / 60-150 psig

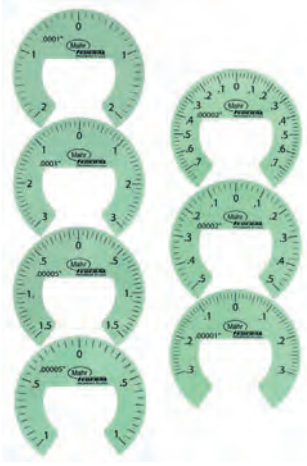
A plastic protective cover for Universal Dimensionair is available **Order no. ACV-1**

Ordering Information

Universal Dimensionair, complete with air filter and standard tooling adaptor for Mahr Federal air tooling. Supplied with one **2242662** Dial. **Order no. 2098125**

Optional Dials

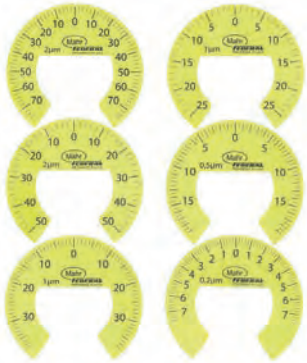
	Total Range	Range	Dial Graduations	Magnification	Order no.
(inch)	***.006"***	***± .003"***	***.0001"***	1260:1	**2242760**
	.004"	***± .002"***	***.0001"***	1875:1	**2242761**
	.003"	***± .0015"***	***.00005"***	2500:1	**2242662**
	.002"	***± .001"***	***.00005"***	3750:1	**2242763**
	.0015"	***± .00076"***	***.00002"***	5000:1	**2242764**
	.001"	***± .0005"***	***.00002"***	7500:1	**2242765**
	.0006"	***± .0003***	***.00001"***	10000:1	**2242766***
(metric)	152 µm	± 76 µm	2 µm	1260:1	**2242770**
	100 µm	± 50 µm	2 µm	1875:1	**2242771**
	76 µm	± 38 µm	1 µm	2500:1	**2242772**
	50 µm	± 25 µm	1 µm	3750:1	**2242773**
	38 µm	± 19 µm	0.5 µm	5000:1	**2242774**
	15.2 µm	± 7.6 µm	0.2 µm	10000:1	**2242776***



Tooling Adaptors

Adaptors are available for many standard-tooling configurations:

Thread/Adaptor style	Plug Type / Measured size	Order no.	
10-32	2.7686 mm / ***.109"*** to 12.547 mm /***.494"***	**AAD-194****	**AAD-313**
1/4-28	12.547 mm / ***.494"*** to 23.876 mm / ***.940"***	**AAD-193****	**AAD-312**
1/2-20	23.876 mm / ***.940"*** to 139.7 mm / ***5.500"***	**AAD-195****	**AAD-314**
1/8 Barb	3/8-32 Female	**2242767**	
Setlock	Moore	**2242777**	
8mm	Mahr Row	**2240621**	
12mm	Mahr Row	**2240623**	
9/32-40	Mahr Federal High Mag	**AAD-165**	



** Requires AAD-165 adaptor, ** Includes bleed to simulate MFI jetting.*

µ*Dimensionair*® *II* Air Gages (single or dual master system) F

The µDimensionair is the ultimate of portability and versatility — in your hand or at the workbench or machine tool. Shown with optional 2239307 Bench Kit

All parts of the µ*Dimensionair* are completely interchangeable and included with the gaging system — versatility is built-in.

All µ*Dimensionair* gages are supplied with output capability.

Features

- **Affordable**
- **Versatile**
- **Innovative**
- **Rugged**

- No other air gaging system offers so much — in the palm of your hand — mounted to the workbench or even right to the machine tool. µ*Dimensionair* is rated IP54, so, it can be used on the shop floor — and, the air tooling cleans dirt from the part for high performance measurements — fast and easy!
- Air gage readout is right in front of you — simple and clear.
- Fixed resolution and balanced air system makes the gage stable and reliable for your manufacturing environment.

µ*Dimensionair II* offers:

- Single and Min/Max mastering selectable
- All other features of the µ*Max*µ*m II* Digital Indicator:
  - Dynamic Mode operation: Min, Max, TIR
  - Multiplier factor and hold function
  - Data output with selectable serial number
  - MarConnect data output: USB OPTO RS232C Digimatic

Versatility

The ultimate in configuration — interchangeable handle allows for pistol grip or normal end-mount for easy application of the plug to the part. For large, heavy plugs, mount the handle between the tooling and the display — assures a well-balanced, ergonomic measuring system. Can also be mounted to a bench stand when parts are brought to the gage.

Accessories

Bench stand provides safe and secure µ*Dimensionair* storage between measurements.

Order no. 2241109

Slide valve controls air to tooling — saves cost of wasted air, reduces air noise.

Order no. 2240993

Swivel coupling allows for rotating tooling to fully explore bore.

Order no. 2240594

For applications where the local elevation is greater than 305m / 1000 feet, special calibration is required.

µ*Dimensionair® II* Air Gages (single or dual master system) F

Technical Data

		µ*Dimensionair II*	
		Resolution	**Tooling I.D. Numbers**
Measuring range	± 0.080mm **± .003"**	0.002mm, 0.001mm ***.0001", .00005"***	60
	± 0.040mm **± .0015"**	0.001mm, 0.0005mm ***.00005", .00002"***	50
	± 0.020mm **± .00075"**	0.001mm, 0.0005mm ***.00005", .00002"***	20
Data Output		USB / ASCII / Digimatic	
Battery Life		6,000 hours	

Operating Temperature	5 - 35° C / ***41 - 95° F***
Storage Temperature	0 - 60° C / ***32 - 140° F***
Repeatability	± 1 Last Significant Digit (LSD)
Calibration Accuracy	± 1 Last Significant Digit (LSD)
Linear Error	± 1% full scale (LSD)
Response Time	Approximately 1 second
Thermal Stability	0.1% of full scale/F
Tolerance Indicators	Two – over / under (3 Class)
Weight	25 kg / ***5.5 lbs***
Dimensions - Main body	approx. 100 x 60 x 70 mm / ***approx. (4" x 2.5" x 3")***
Auto Power Off	15 minutes of non-use
Power Requirements	3 volt lithium battery coin cell, 2 per unit – CR-2450
Air Supply	2.10 ± .01 bar / 30.4 ± .15 psi
Display	Rotates through 270 degrees
Order no.	**2103200***

** Complete with handle, adaptor and hose*

Accessories

	µ*Dimensionair II* **Order no.**
Pressure Regulator with filter	**2238020***
Pressure Meter	**2095924**
Bench Kit with adaptor	**2239307**
Battery 3V type CR-2450	**EBY-1018**
Insulated Handle	**2237666**
Shut off slide valve	**2240993**
Rest Stand	**2241109**
Swivel coupling adaptor	**2240594**
Air Regulator Trap	**AFL-24**
20' Long Hose	**2237713**
Supply Hose to Regulator/Filter	**AHO-2**
Data interface:	
USB Cable (MarCom or PC, 2m)	**4346023**
RS232 Cable (OPTO- 2m)	**4346020**
Digimatic Cable (10 pin plug 2m)	**4346021**

** For applications where the local elevation is greater than 305 m / 1000 ft, special calibration is required.*

Optional Factory Configured Features for µ*Dimensionair II*:

- Locked multiplier factor
- Disabled sleep mode
- Locked inch/mm button
- Locked setup mode with password
- Power up in inch/mm unit on battery change
- Calibration lockout with password

832 Dimensionair® Air Gaging (Zero master system) F

Features

- Digital and analog displays in a single unit. Large, high contrast digital readout shows exact deviation from zero; analog display shows measurement conditions at a glance
- Fixed resolution and balanced air system makes the Digital Dimensionair a stable and reliable system for manufacturing environments.
- Only a single master required to set zero; system is precalibrated for correct magnification
- Ranges and resolutions for virtually any air gage application, including 2-, 3, 4- and 6-jet tooling plus AirProbes and JetProbes.
- Dynamics measurement capability
- RS-232 Output – for communicating with a data collector, computer or printer, permitting statistical process control
- Master Deviation – enhances measurement by making Auto Zero even more accurate.

Technical Data

Model	Measuring Range	Digital Resolution	Analog Resolution	Tooling I.D. Number
Low Magnification Single or Dual Input	±0.080 mm /***±.003"***	0.0002 mm /***10µ"***	0.004 mm /***150µ"***	60
	±0.040 mm /***±.0015"***		0.002 mm /***75µ"***	50
	±0.020 mm /***±.00075"***		0.001 mm /***38µ"***	20
High Magnification Single or Dual Input	±0.008 mm /***±.0003"***	0.0001 mm /***5µ"***	0.0004 mm /***15µ"***	10
	±0.004 mm /***±.00015"***		0.0002 mm /***8µ"***	5

Operating Temperature	5~35° C / ***41~95° F***
Storage Temperature	0~60° C / ***32~140° F***
Repeatability	±1 digit or ±1% of range, whichever is greater
Calibration Accuracy	±1 digit*
Linear Error	±1 digit
Response Time (Electronics)	43 msec.
Response Time (Air)	Approx. 1 sec. (dependent on hose length of air tooling)
Thermal Stability	0.1% of full scale/°F
Digital I/O	Five TTL opto-isolated outputs
Data Output	RS-232, transmits Channels A, B, (or both – dual input models only)
Analog Output	±5 VDC full scale for displayed value signal ±A, ±B
Measuring Modes	Actual, Minimum, Maximum, T.I.R., Nominal
Tolerance Indicators	Five LEDs
Weight (approx.)	5 kg / ***11 lbs.***
Dimensions H x W x D	254 x 197 x 216 mm / ***10" x 7.75" x 10.25"***
Display Modes	A, (or B or both – dual input models only)
Auto Power Off	After 30 minutes of non-use (selectable)
Power Requirements	100 Vac to 240 Vac, 50-60Hz with power module (Furnished)

Note: All models listed may be ordered for: 1-Jet, 2-Jet, 3-Jet, 4-Jet, or 6-Jet applications. At time of ordering, PLEASE designate the number of jets to be used on the system.

** For applications where the local elevation is greater than 305M/1000 feet, special calibration is required.*

832 Dimensionair® Air Gaging (Zero master system) F

Technical Data

Number of Jets	Voltage/Adaptor	Low Magnification Single Input Order no.	High Magnification Single Input Order no.	Low Magnification Dual Input Order no.	High Magnification Dual Input Order no.
1, 2, 3	110/U.S.	**2004100**	**2004103**	**2004106**	**2004109**
4	110/U.S.	**2004101**	**2004104**	**2004107**	**2004110**
6	110/U.S.	**2004102**	**2004105**	**2004108**	**2004111**
1, 2, 3	240/International	**2004112**	**2004115**	**2004118**	**2004121**
4	240/International	**2004113**	**2004116**	**2004119**	**2004122**
6	240/International	**2004114**	**2004117**	**2004120**	**2004123**

Accessories

Order no.	Description
7024634	RS-232 Cable, Amplifier to MSP-2 Printer or computer, 2m / 6ft cable
ECV-1276	Oil/Splash Cover (opaque)–provides protection for the 832 Digital Dimensionair® when used in harsh environments
ECV-1285	Oil/Splash Cover (clear)–provides protection for the 832 Digital Dimensionair when used in harsh environments
ECB-1857	Footswitch for HOLD/RESUME, 3m / 10ft cable
ECB-1858	Footswitch for DYNAMIC RESET, 3 m / 10ft cable
ECB-1859	Footswitch for SEND DATA, 3m / 10ft cable
ECB-1855	Pushbutton for DYNAMIC RESET, 1.5m / 5ft cable
ECB-1860	Pushbutton for SEND DATA, 1.5m / 5ft cable
ECB-1868	Pushbutton for HOLD/RESUME and SEND DATA, 3m / 10ft cable
EKT-1236-W3	Relay Box – five relays each with Normally Open/Normally Closed contacts: Contact Rating – 30 Vdc/120 Vac, 3 amps Power Supply – 120 Vac Dimensions – 39 mm x 129 mm x 134.6 mm d/ 1.53" x 5.08" x 5.32" with ECB-1886-W2*, 6.1 mm / 24" interconnect cable amplifier/relay box
EKT-1236-W4	Same as W3, except with 220 Vac Power Supply
EKT-1236-W5	Same as W3, except with 240 Vac Power Supply
2010000	Power Supply, U.S. Adaptors (120V)
2010001	Power Supply, International Adaptor (120/240V)
Mating Connectors	
ECN-1695-W2	Digital I/O (15 pin male)
ECN-1693	Reset Data (3/32 microphone plug)
ECN-1695-W1	RS-232 Digital Output (9 pin female)

** Order ECB-1886-W1 for 305 mm / 12" interconnect cable, or, ECB-1886-W3 for 914 mm / 36" cable.*

Millimar C 1208 PE Compact, user-friendly length measuring unit

Model types and Accessories

			Order no.
C1208 PE	10000 F	Mahr Federal compatible	**5312093**
C1208 PE	2500 F/ 5000 F	Mahr Federal compatible	**5312095**

Accessories

Connection cable (9 pin D-Sub jack to D-Sub jack), length 3 m	**7024634**
Control unit with 3 push buttons	**5318430**
Footswitch for Millimar for	
Input 1	**5330955**
Input 2	**5330956**
Input 3	**5330957**
Air Supply Adaptor Kit	**2121236**

Features

Functions
- Favorites, using the SELECT button, frequently required settings can be directly called up
- Static measurements ± A, ± B and all combinations
- Dynamic measurements: Max, Min, Max-Min, Max+Min, mean value
- Auto-detect mode. Two measuring devices can be connected (probe, plug gage. . .) - the measuring device used is automatically shown on the display
- 1 point or 2 point master measurements
- Programmable via built-in keypad or RS232 interface via MS-Windows configuration software D1000S

Display
- Backlit LCD display with scale display and two-line digital display
- 5 three-colored status lamps for warning and tolerance limits
- Up to 2 features can be displayed at the same time

Connections
- One input for pneumatic measuring devices (optionally compatible to PE systems from Mahr or Mahr Federal)
- RS232 interface
- Three digital inputs for measuring start, master measurements, sending measuring value, . . .
- Three digital outputs for GO, NO-GO, rework, measuring time, . . .

Technical Data

Display	Backlit LCD display 115 mm x 70 mm
Analog scale	Indicator, 61 graduation
Range and text display	Characters LCD, 5 x 7, Dot matrix, alpha numerical
Measured value display	7 digit LCD, 7 segments
Tolerance display	5 LEDs, 3 colors
Display ranges	± 3, 10, 30, 100, 300, 1000, 3000, 10000 µm ***± 0.0001. 0.0003; 0.001; 0.003; 0.01; 0.03; 0.1; 0.3 inch*** or tolerance related

Measuring range / resolution (tooling dependant)

2500:1	100 (±50) µm / 0.1 µm
5000:1	50 (±25) µm / 0.1 µm
10000:1	25 (±12.5) µm / 0.1 µm

Error limits

10 x analog display	2 % (51 pixel)
Digital display	0.05 %
Temperature coefficient	± 0.005 %/°C
Operating temp. range	0 °C to 45 °C

Interfaces

Computer, printer	RS232, 9 pin, male (PC compatible configuration)
Control inputs	3 opto-coupler outputs, 24 V, 10 mA 24 V, 100 mA
Control outputs	3 opto-coupler inputs, 24 V, 100 mA 24V, 10 mA
Current supply	100 V to 240 V,
Mains unit	47 Hz to 63 Hz
Power consumption	10 VA
Protection class	IP53 with conductive dust IP43
Housing dimensions (H x W x D)	ca. 205 x 160 x 165 mm
Weight	ca. 2.1 kg

Millimar C 1245 PE Flexible length measuring unit for versatile tasks (single or dual master system)

Features

Display
- Analog indicator instrument for measuring value display
- Two-line LCD display to display the measuring value and help texts
- 5-color status lamps for warning and tolerance limits
- Up to 3 features can be shown simultaneously

Functions
- 16 characters can be defined
- With an equation editor (80 characters) input channels C1 to C8 are mathematically linked with factors and brackets using the 4 basic mathematical functions
- Static measurements: current value, square root, arc tangent
- Dynamic measurements: Max, Min, Max-Min, Max+Min, mean values
- Statistical functions: n, x-bar S, Xmax, Xmin, R
- Measuring value memory for 5000 measuring values
- Measuring Start / Stop via keyboard, digital input, RS232

Connections
- 2 input modules can be used in the basis unit
- RS232 interface
- 1 analog output
- 3 digital inputs for measuring start, master measurement / zeroing, sending data
- 6 digital outputs for GO, NO-GO, rework, collective goods, measuring time, 4 classes, BCD interface

Model types

			Order no.
C1245 PE/F	2500	with regulator	**5331271**
C1245 PE/F	5000	with regulator	**5331271**
C1245 PE/F	10000	with regulator	**5331273**
For 2 pneumatic probes			
C1245 PE/F 2	2500	without regulator	**5331275***
C1245 PE/F 2	5000	without regulator	**5331275***
C1245 PE/F 2	10000	without regulator	**5331277***
Accessories			
Air Supply Adaptor Kit			**2121236**
Baseplate* with 2 regulators (req'd for PE/F 2 Units			**5330909**

Technical Data

Display	analog indicator instrument, LCD 53 mm x 40 mm
Analog scale	145 mm x 80 mm
Range and text display	7 characters LCD, 5x7 dot matrix, alphanumerical
Measured value display	7 characters LCD, 7 segment
Tolerance display	5 LEDs, 3-colored
Display ranges	± 10, 30, 100, 300, 1000, 3000, 10000 µm ***± 0.0003; 0.001; 0.003; 0.01; 0.03; 0.1; 0.3 inch***

Measuring range / resolution (tooling dependant)

2500:1	100 (±50) µm / 0.1 µm
5000:1	50 (±25) µm / 0.1 µm
10000:1	25 (±12.5) µm / 0.1 µm

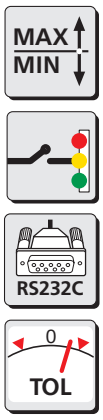
Error limits

10 x analog display	2 % (51 pixel)
Digital display	0.05 %
Temperature coefficient	± 0.005 %/°C
Operating temp. range	0 °C to 45 °C

Interfaces

Computer, printer	RS232, 9 pin, male (PC compatible configuration)
Control inputs	6 opto-coupler outputs, 24 V, 10 mA, 10 mA 24 V, 100 mA
Control outputs	3 opto-coupler inputs, 24 V, 100 mA
Current supply	90 V to 264 V,
Mains unit	47 Hz to 63 Hz
Power consumption	11 VA
Protection class	IP53 with conductive dust IP43
Housing dimensions (H x W x D)	ca. 205 x 160 x 165 mm
Weight	ca. 2.2 kg

Millimar S 1840 PE Length measuring instrument with three-color illuminated bar graph (single or dual master system)



Features

Assess and judge measuring results at a glance – nothing is easier than that with the Millimar S 1840 column amplifier. For measurements with air measuring devices

The Millimar S 1840 column amplifier offers a broad range of functions for combining the signals from both static and dynamic measurements.

Measuring results are indicated by way of 101 three-color LEDs. When the programmable warning and tolerance limits are exceeded, the LEDs change their color from green to yellow or red, accordingly – high visibility from any distance.

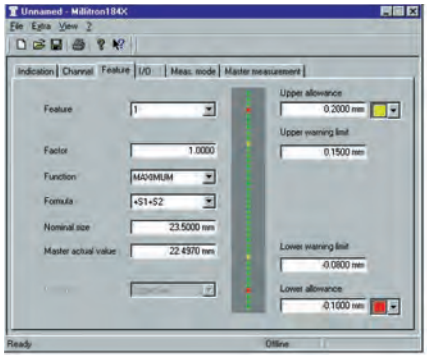
Display
- Easy to read 3-color illuminated bar graph with analog warning and tolerance limit display
- Backlit, two-line LCD for the display of measuring values, help tests and units of measurement
- Up to two characteristics can be displayed simultaneously.

Connections
- Single input.
- RS 232 interface.
- Analog output.
- Three digital inputs for measuring start, master measurement, etc.
- Three digital outputs for Accept – Reject – Rework classification, measuring time, etc.

Functions
- Dynamic measurements: Max, Min, Max-Min, Max+Min, mean.
- Windows® software for configuring the LED display The Millimar S 1840 column amplifier can be programmed either menu-guided via the integrated membrane keypad or with the provided Microsoft Windows® configuration software.
- Single Master or Dual Master setup.
- Password lockout in Setup Mode.

- Supplied with:
  Mains power supply plug

Configuration Software



The Millimar S 1840 column amplifier can be programmed either menu-guided via the integrated membrane keypad or with the provided Microsoft Windows® configuration software.

Shown with 2239307 stand

Millimar S 1840 PE Length measuring instrument with three-color illuminated bar graph (single or dual master system)

Technical Data

Analog display	101 LED elements, 3-color
Range and text display	7 character LCD, 14 segment, alphanumerical
Measured value display	7-stellig LCD, 7 Segment
Tolerance display	via color range of the anlog display
Display ranges	± 1, 10, 30, 100, 300, 1000, 3000, 10000 µm ***± .0001; .0003; .001; .003; .01; .03; .1; .3 inch*** or tolerance related
Error limits	
10 x analog display	1 % (101 LEDs)
Digital display	± 1 digit
Temperature coefficient	± 0.005 %/°C
Operating temp. range	0 °C to 45 °C

Interfaces	
Computer, printer	RS232, 9 pin, male (PC compatible configuration)
Control inputs	3 opto-coupler outputs, 24 V, 10 mA
Control outputs	3 opto-coupler inputs, 24 V, 100 mA
Analog output voltage	1 V/mm
Power supply	90 V bis 264 V, 47 Hz to 63 Hz
Power consumption	20 VA
Protection class	IP53 with conductive dust IP43
Housing dimensions (H x W x D)	ca. 487 x 47 x 144 mm ***ca. 19.17" x 1.85" x 5.67"***
Weight	ca. 1.6 kg

Air/electronic converter for Millimar S 1840 PE

Measuring principle	differential pressure		
Measuring value acquisition	piezo		
Magnification	2500:1	5000:1	10000:1
Air measuring range in µm ***(inch)***	± 50 ***(±.00196")***	± 25 ***(±.00098")***	± 12.5 ***(±.00049")***
Resolution	0.1 µm / ***.000005"***		
Measuring error in µm ***(inch)***	< 1 % of measuring range, better 0.5 %		
Signal noise in µm ***(µinch)***	<= 0.4 ***(15.748)***	<= 0.2 ***(7.874)***	<= 0.1 ***(3.937)***
Setting time in sec. (1 m / 3.3 ft hose)	<= 0.3	<= 0.3	<= 0.5
Setting time in sec. (2 m / 6.6 ft hose)	<= 0.5	<= 0.5	<= 0.7
Operating temperature	0 . . . 40 °C (32 . . . 104 °F)		
Supply pressure (> 4 bar before regulator)	2 bar ± 5 %		
Air supply connection	PU hose, dia 8 x 1 ***(.315 x .0394")***		
Measuring air connection	PU hose, dia. 6 x 1 ***(.236 x .0394")***		
Zero setter (OFFSET)	electrical		
Amplification (GAIN)	electrical		
Air consumption	approx. 1-2 m^3 ***(1.308-2.616 cu.yd.)***		

Order no.

Millimar S 1840 PE to connect air measuring devices

		Tooling I.D.	Order no.
S 1840 PE/F	Low magnification for 1 air gage 2500:1 / 5000:1 without regulator	50/20	**5318455***
S 1840 PE/F	High magnification for 1 air gage10000:1 without regulator	10,5	**5318457***

** Base with Regulator required and sold separately, Air Supply Kit recommended*

Accessories

	Order no.
Base Foot With 1 Regulator for 1 1840 PE Column Unit	**5330914**
Base Foot With 2 Regulators for 2 1840 PE Column Units	**5330915**
Base Foot With 3 Regulators for 3 1840 PE Column Units	**5330916**
Connection Cable (9 pin D-Sub jack to D-Sub jack), length 3 m	**7024634**
Control Unit with 3 push buttons	**5318430**
Foot Switch for Millimar	**5330955**
Configuration Software D1000 S	**7090375**
Air Supply Adaptor Kit Includes AFL-24 Filter and AHO-2 Hose	**2121236**
Splash cover	**2247956**

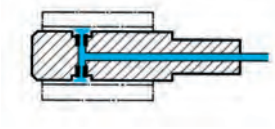
Millimar. Air Gages

PRECISION BEGINS AT THE START OF THE MEASURING PROCESS

►I Air gages use the measuring effect of the change in pressure when a workpiece approaches a measuring jet. As the distance between jets and work surface decreases, the pressure increases while the velocity of flow and the respective volume flow decrease. The air measuring procedure has a realtively short but very linear measuring range. I◄

1.

2.



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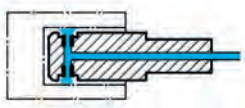

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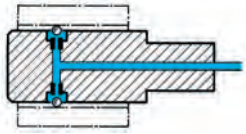

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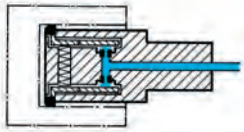

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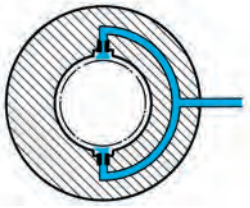

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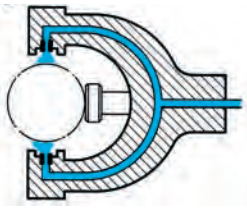

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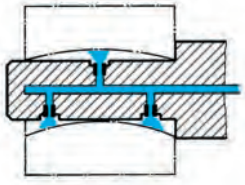

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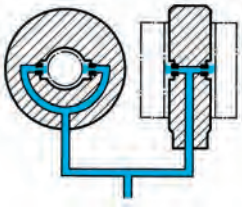

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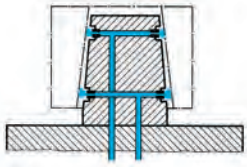

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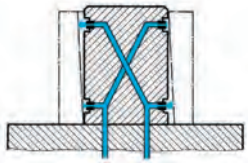

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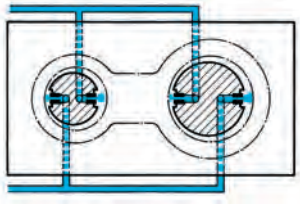

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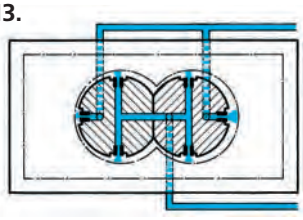

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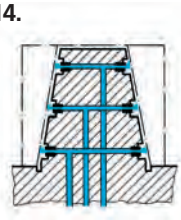

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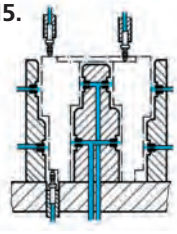


1. Thickness or wall thickness measurements with jet air gage **2.** Diameter measurement of cylindrical through bores with jet air plug gage. **3.** Diameter measurement of cylindrical blind bores with jet air plug gage. **4**. Diameter measurement of cylindrical through bores with ball contact plug gage **5.** Diameter measurement of cylindrical blind bores with lever contact plug gage **6.** Diameter of thickness measurement with adjustable jet air caliper gage **8**. Straightness measurement of a cylindrical bore with special jet air plug gage **9.** Mating measurement between bore and shaft with jet air plug gage and jet air ring gage. **10.** Taper-pitch measurement of an inside taper with taper jet air plug gage measurement as per the differential measuring method **11.** Measurement of a perpendicular position of a cylindrical bore to the front face with a special jet air plug gage measurement as per the differential measuring method **12.** Measurement of hole distances of separated cylindrical bores with jet air plug gage measurement as per the differential measuring method **13**. Measurement of hole distances of truncated cylindrical bores with jet air plug gages measurement as per the differential measuring method **14**. Taper-pitch measurement as well as form and diameter measurement of an inside taper with taper jet air plug gage. **15.** Multiple inside and outisde measurements with measuring jet air gages and contact probes in connection with a seven-column unit.

Dimensionair® Air Gages – Air Plugs

Features

- **Calibrated I.D. tooling for the Dimensionair® Air Gaging Systems**
- Tooling is interchangeable without adjusting system magnification.
- Federal Air Plugs have large clearance (see table below), allowing easy entrance into the hole being measured and greater measuring range.
- Long life - wide clearance and hard chrome (optional) body extends useful life of the Air Plug.
- Deep, recessed jets - Air jets are recessed into the plug body which protects them from damage.
- Large jet size eliminates clogging from dirt and oils..

Plug identification

Air Plugs are marked with an identification number which identifies its size, number of jets, plug style, and the Dimensionair® Model the plug should be used with.

For example: **DP50-T2-1.000** is the identification number of an Air Plug for a **2095184** or a standard magnification 832 Dimensionair (DP50), through-hole style with two jets (-T2), and 25mm/1.000" nominal size (-1.000).

The number (50) which identifies the Dimensionair intended is marked on the plug and also appears on the dial of the Dimensionair to help in matching the tooling to its corresponding Dimensionair Model.

Identification	Nominal Size from		To & include		Clearance from Nominal Size	
	mm	*inch*	mm	*inch*	mm	*inch*
DP100*, DP60	3	***.123"***	3.5	***.140"***	0.030	***.0012"***
	3.5	***.140"***	4.7	***.185"***	0.045	***.0018"***
	4.7	***.185"***	6.3	***.248"***	0.061	***.0024"***
	6.3	***.248"***	76.3	***3.004"***	0.081	***.0032"***
	76.3	***3.004"***	127	***5.000"***	0.089	***.0035"***
	above 127	***5.000"***			0.107	***.0042"***
DP50	3	***.123"***	3.5	***.140"***	0.015	***.0006"***
	3.5	***.140"***	4.7	***.185"***	0.027	***.0011"***
	4.7	***.185"***	6.3	***.248"***	0.030	***.0012"***
	6.3	***.248"***	76.3	***3.004"***	0.045	***.0018"***
	76.3	***3.004"***	127	***5.000"***	0.071	***.0028"***
	Above 127	***5.000"***			0.081	***.0032"***
DP20	3	***.123"***	3.5	***.140"***	0.009	***.00035"***
	3.5	***.140"***	4.7	***.185"***	0.013	***.0005"***
	4.7	***.185"***	6.3	***.248"***	0.015	***.0006"***
	6.3	***.248"***	76.3	***3.004"***	0.023	***.0009"***
	76.3	***3.004"***	127	***5.000"***	0.071	***.0028"***
	Above 127	***5.000"***			0.081	***.0032"***
DP10	1.57	***.062"***	44.5	***1.750"***	0.009	***.00035"***
	44.5	***1.750" up***			0.014	***.00055"***
DP5	1.57	***.062"***	25.40	***1.000"***	0.004	***.000175"***
	25.40	***1.000"***	44.45	***1.750"***	0.005	***.0002"***
	44.45	***1.750" up***			0.007	***.0003"***

** DP-100 not available below 9.525 mm / .375"*

Ordering Information

When ordering Air Plugs please specify:

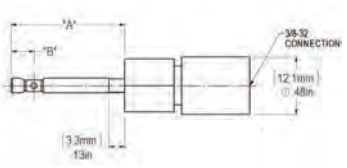
1. Nominal I.D. Size and Tolerance.
2. Dimensionair Model to be used.
3. Air Plug style (Through Hole, Blind Hole, or Counterbore).
4. Air Plug finish (Chrome-plated or Hardened Steel).
5. Order Master Setting Ring at same time.

Unless otherwise specified, Mahr Federal will furnish a 2-jet, Through Hole, High Chrome Air Plug for a 2500:1 Dimensionair.

Through Hole and Blind Hole Air Plugs

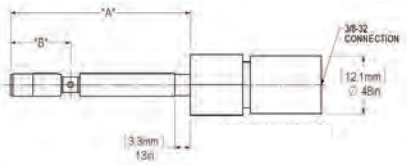
Through Hole Plugs (DP50 - DP20 & 60)

3.12-4.70 mm/ .123-.185"



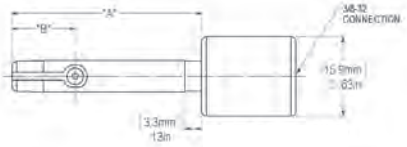
Minimum recommended hole length: 4.75 mm / ***.187***"

4.70-6.30 mm/ .185-.248"



Minimum recommended hole length: 4.75 mm / ***.187***"

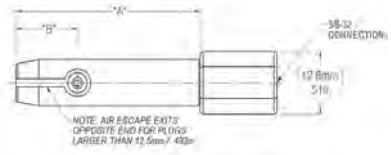
6.30-9.49 mm/ .248-.3735"



Minimum recommended hole length: 6.35 mm / ***.250***"

With guide sleeve or stop collar: 1.8 mm / ***.070***"

9.49-14.94 mm/ .3735-.588"

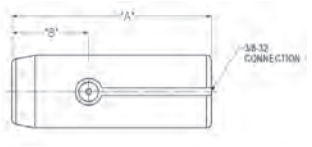


Minimum recommended hole length: 6.35 mm / ***.250***"

With guide sleeve or stop collar: 1.8 mm / ***.070***"

May be used with AEX-1 or -2 Extensions for deep holes.

14.94-19.05 mm/ .588-.750"

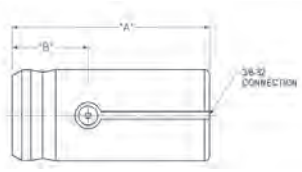


Minimum recommended hole length: 6.35 mm / ***.250***"

With guide sleeve or stop collar: 1.8 mm / ***.070***"

May be used with AHA-4 or -5 Extensions for deep holes.

19.05-37.69 mm/ .750-1.484"

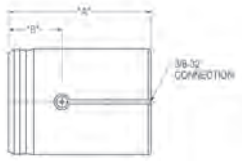


Minimum recommended hole length: 6.35 mm / ***.250***"

With guide sleeve or stop collar: 1.8 mm / ***.070***"

May be used with AHA-4 or -5 Extensions for deep holes.

37.69-76.30 mm/ 1.484-3.004"

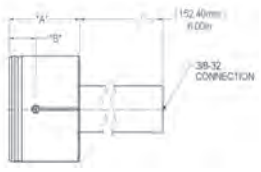


Minimum recommended hole length: 6.35 mm / ***.250***"

With guide sleeve or stop collar: 1.8 mm / ***.070***"

May be used with AHA-4 or -5 Extensions for deep holes.

76.30-114.30 mm/ 3.004-4.500"



Minimum recommended hole length: 6.35 mm / ***.250***"

With guide sleeve or stop collar: 1.8 mm / ***.070***"

Technical Data

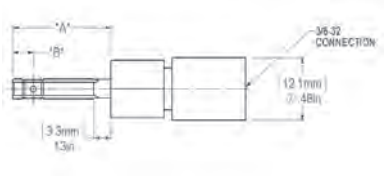
Through Hole Plugs
Measured Size mm ***inch***

Above	To & include	"A"	"B"	Minimum Hole Length*	Measuring Range DP50	DP20	DP60
3.12 ***.123"***	3.56 ***.140"***	23.81 ***.938"***	4.76 ***.188"***	4.75 ***.187"***	0.025 ***.0010"***	0.013 ***.0005"***	0.051 ***.0020"***
3.56 ***.140"***	4.70 ***.185"***	23.81 ***.938"***	4.76 ***.188"***	4.75 ***.187"***	0.038 ***.0015"***	0.0200 ***.00075"***	0.076 ***.0030"***
4.70 ***.185"***	6.30 ***.248"***	38.10 ***1.500"***	12.70 ***.500"***	4.75 ***.187"***	0.051 ***.0020"***	0.025 ***.001"***	0.102 ***.0040"***
6.30 ***.248"***	9.49 ***.3735"***	38.10 ***1.500"***	12.70 ***.500"***	6.35 ***.250"***	0.076 ***.0030"***	0.038 ***.0015"***	0.152 ***.0060"***
9.49 ***.3735"***	14.94 ***.588"***	38.10 ***1.500"***	12.70 ***.500"***	6.35 ***.250"***	0.076 ***.0030"***	0.038 ***.0015"***	0.152 ***.0060"***
14.94 ***.588"***	19.05 ***.750"***	41.28 ***1.625"***	15.88 ***.625"***	6.35 ***.250"***	0.076 ***.0030"***	0.038 ***.0015"***	0.152 ***.0060"***
19.05 ***.750"***	37.69 ***1.484"***	41.28 ***1.625"***	15.88 ***.625"***	6.35 ***.250"***	0.076 ***.0030"***	0.038 ***.0015"***	0.152 ***.0060"***
37.69 ***1.484"***	76.30 ***3.004"***	50.80 ***2.000"***	19.10 ***.750"***	6.35 ***.250"***	0.076 ***.0030"***	0.038 ***.0015"***	0.152 ***.0060"***
76.30 ***3.004"***	114.30 ***4.5"***	50.80 ***2.000"****	19.10 ***.750"***	6.35 ***.250"***	0.076 ***.0030"***	0.038 ***.0015"***	0.152 ***.0060"***

** If a guide sleeve or stop collar is used, minimum hole length can be as small as 1.78 mm /. 070" for holes larger than 6.30 mm / .248".*
*** A handle 152 mm / 6" long and 33.3 mm / 1.31" diameter is supplied with plugs over 76.5 mm / 3.004".*

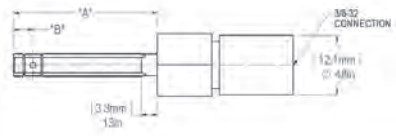
Blind Hole/Counterbore Plugs (DP50 - DP20 & 60)

3.94-4.7 mm / .155-.185"



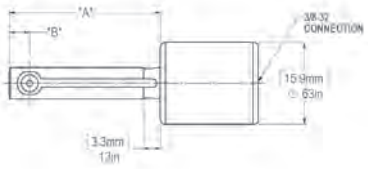
Minimum recommended hole length: 6.35 mm / ***.250"***.
Note: Masters must simulate workpiece for holes of this size.

4.7-6.30 mm / .185-.248"



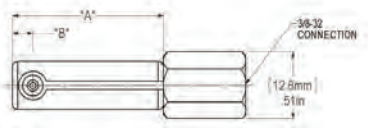
Minimum recommended hole length: 6.35 mm / ***.250"***

6.30-9.49 mm / .248-.3735"



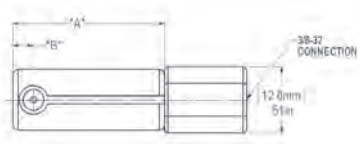
Minimum recommended hole length: 6.35 mm / ***.250"*** Shorter bores can be checked. Consult Mahr Federal Customer Resource Center.

9.49-11.86 mm / .3735-.467"



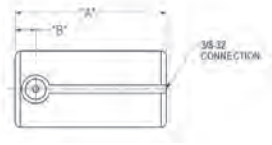
Minimum recommended hole length: 6.35 mm / ***.250"***. Shorter bores can be checked. Consult Mahr Federal Customer Resource Center. May be used with Extension AHA-28 for deep holes.

11.86-14.94 mm / .467-.588"



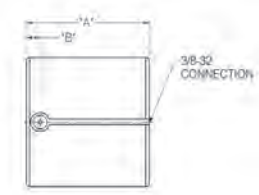
Minimum recommended hole length: 6.35 mm / ***.250"*** Shorter bores can be checked. Consult Mahr Federal Customer Resource Center. May be used with Extensions AEX-1 or -2 for deep holes.

14.94-37.69 mm / .588-1.484"



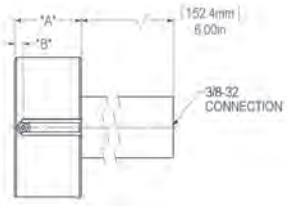
Minimum recommended hole length: 6.35 mm / ***.250"***. Shorter bores can be checked. Consult Mahr Federal Customer Resource Center. May be used with AHA-4 or -5 Extensions for deep holes.

37.69-76.30 mm / 1.484-3.004"



Minimum recommended hole length: 6.35 mm / ***.250"***. Shorter bores can be checked. Consult Mahr Federal Customer Resource Center. May be used with AHA-4 or -5 Extensions for deep holes.

76.30-114.30 mm / 3.004-4.50"



Minimum recommended hole length: 6.35 mm / ***.250"***.

Super Blind Plugs
Blind Hole Air Plugs can be furnished to check shorter holes than listed above, and can be furnished to check closer to the bottom of a hole. Holes must be at least 2.79mm/***.110"*** long, and the distance from the end of the plug to the center-line of the jets can be as short as 2.16mm/***.085"*** for plugs below 6.3mm/***.248"*** or 1.90mm/***.075"*** for plugs above 6.3mm/***.248"***

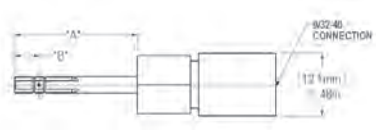
Blind Hole/Counterbore Plugs

mm ***inch*** Above		To & Include		"A"		"B"		Minimum Hole Length*		Measuring Range DP50		DP20		DP60	
3.94	***.155"***	4.70	***.185"***	19.10	***.750"***	3.96	***.156"***	6.35	***.250"***	0.038	***.0015"***	0.200	***.00075"***	.076	***.0030"***
4.70	***.185"***	6.30	***.248"***	29.36	***1.156"***	3.96	***.156"***	6.35	***.250"***	0.051	***.0020"***	0.025	***.0010"***	.102	***.0040"***
6.30	***.248"***	9.49	***.3735"***	29.36	***1.156"***	3.96	***.156"***	6.35	***.250"***	0.076	***.0030"***	0.038	***.0015"***	.152	***.0060"***
9.49	***.3735"***	11.86	***.467"***	29.36	***1.156"***	3.96	***.156"***	6.35	***.250"***	0.076	***.0030"***	0.038	***.0015"***	.152	***.0060"***
11.86	***.467"***	14.94	***.588"***	29.36	***1.156"***	3.96	***.156"***	6.35	***.250"***	0.076	***.0030"***	0.038	***.0015"***	.152	***.0060"***
14.94	***.588"***	37.69	***1.484"***	29.36	***1.156"***	3.96	***.156"***	6.35	***.250"***	0.076	***.0030"***	0.038	***.0015"***	.152	***.0060"***
37.69	***1.484"***	76.30	***3.004"***	35.71	***1.406"***	3.96	***.156"***	6.35	***.250"***	0.076	***.0030"***	0.038	***.0015"***	.152	***.0060"***
76.30	***3.004"***	114.3	***4.5"***	38.10	***1.5"*/****	3.96	***.156"***	6.35	***.250"***	0.076	***.0030"***	0.038	***.0015"***	.152	***.0060"***

** If a guide sleeve or stop collar is used, minimum hole length can be as small as 1.78 mm / .070" for holes larger than 6.30 mm / .248".*
*** A handle 152 mm/6" long and 33.3 mm/1.31" diameter is supplied with plugs over 76.30 mm / 3.004".*

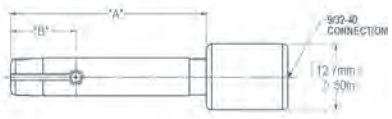
Through Hole Plug (DP10 – DP5)

1.57-6.35 mm/ .062-.250"



Minimum recommended hole length: 3.18 mm / ***.125"***.

6.35-9.49 mm/ .250-.3735"

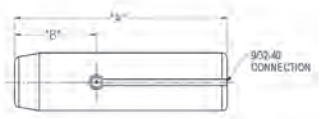


Minimum recommended hole length: 3.18 mm / ***.125"***.
With guide sleeve or stop collar: 1.14 mm/ .045".

9.49-11.10 mm/ .3735-.437"

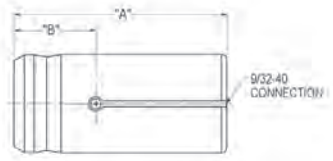
Minimum recommended hole length: 3.18 mm / ***.125"***.
With guide sleeve or stop collar: 1.14 mm / ***.045"***. May be used with AHA-23 or -24 Extensions for deep holes.

11.10-19.05 mm/ .437-750"



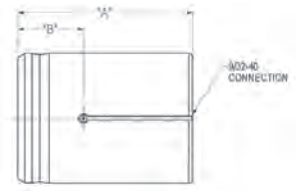
Minimum recommended hole length: 3.18 mm / ***.125"*** with proper support min. is 1.14 mm/ ***.045"***. May be used with AHA-23 or -24 Extensions for deep holes.

19.05-44.45 mm/ .750-1.750"



Minimum recommended hole length: 3.18 mm / ***.125"***.
With guide sleeve or stop collar: 1.14 mm / ***.04"***. May be used with AHA-23 or -24 Extensions for deep holes.

44.45-76.45 mm/1.750-3.010"



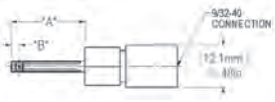
Minimum recommended hole length: 3.18 mm / ***.125"***.
With guide sleeve or stop collar: 1.14 mm / ***.04"***. May be used with AHA-23 or -24 Extensions for deep holes.

Through Hole Plugs mm / *inch*

Above		To & include		"A"		"B"		Minimum Hole Length*		Measuring Range DP10		DP5	
1.57	***.062"***	6.35	***.250"***	23.81	***.938"***	4.76	***.188"***	3.18	***.125"***	0.015	***.0006"***	0.008	***.0003"***
6.35	***.250"***	9.49	***.3735"***	38.10	***1.500"***	12.70	***.500"***	3.18	***.125"***	0.015	***.0006"***	0.008	***.0003"***
9.49	***.3735"***	11.10	***.437"***	41.28	***1.625"***	15.88	***.625"***	3.18	***.125"***	0.015	***.0006"***	0.008	***.0003"***
11.10	***.437"***	19.05	***.750"***	41.28	***1.625"***	15.88	***.625"***	3.18	***.125"***	0.015	***.0006"***	0.008	***.0003"***
19.05	***.750"***	44.45	***1.750"***	41.28	***1.625"***	15.88	***.625"***	3.18	***.125"***	0.015	***.0006"***	0.008	***.0003"***
44.45	***1.750"***	76.45	***3.010"***	50.80	***2.000"***	2.000	***.625"***	3.18	***.125"***	0.015	***.0006"***	0.008	***.0003"***

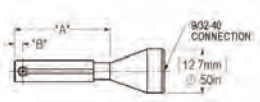
Blind Hole Plug (DP10 – DP5)

3.18-6.35 mm/ .125-.250"



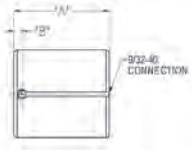
Minimum recommended hole length: 3.96 mm / ***.156"***.

6.35-11.10 mm/ .250-.437"



Minimum recommended hole length: 3.18 mm / ***.125"***.

11.10-76.45 mm/ .437-3.010"



Minimum recommended hole length: 3.18 mm / ***.125"***.
Use AHA-23 or -24 Extensions for deep hole applications.

Blind Hole/Counterbore Plugs

Above		To & include		"A"		"B"		Minimum Hole Length*		Measuring Range DP10		DP5	
mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*
3.18	***.125"***	6.35	***.250"***	21.44	***.844"***	2.39	***.094"***	3.96	***.156"***	.015	***.0006"***	.008	***.0003"***
6.35	***.250"***	11.10	***.437"***	27.79	***1.094"***	2.39	***.094"***	3.05	***.120"***	.015	***.0006"***	.008	***.0003"***
11.10	***.437"***	76.45	***3.010"***	27.79	***1.094"***	2.39	***.094"***	3.05	***.120"***	.015	***.0006"***	.008	***.0003"***

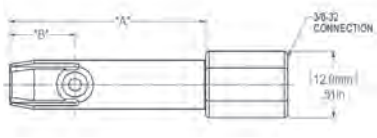
** If a guide sleeve or stop collar is used, minimum hole length can be as small as 1.1 mm/ .045" for holes larger than 6.4 mm/.250".*

Super Blind Plugs

Blind Hole Air Plugs can be furnished to check shorter holes than listed above, and can be furnished to check closer to the bottom of a hole. Holes must be at least 1.9 mm/.075" long, and the distance from the end of the plug to the center-line of the jets can be as short as 1.4mm/.055" for plugs below 6.4 mm/.250" or 1.1 mm/.045" for plugs above 6.4 mm/.250".

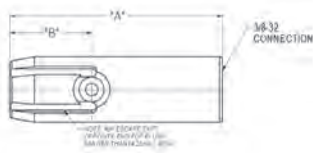
Through Hole Plug (DP100)

9.53-12.70 mm/ .375-.500"



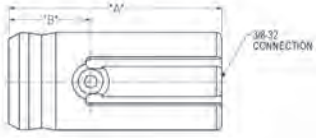
Minimum recommended hole length: 6.35 mm / ***.250"***, with proper support min. is 3.18 mm / ***.125"***. May be used with AEX-1 or -2 Extensions for deep holes.

12.70-19.05 mm/ .500-.750"



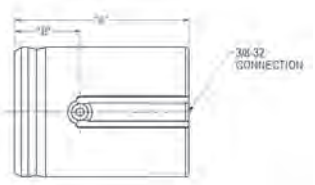
Minimum recommended hole length: 6.35 mm / ***.250"***, with proper support min. is 1.14 mm/ ***.125"***. May be used with AHA-4 or -5 Extensions for deep holes.

19.05-37.85 mm/ .750-1.490"



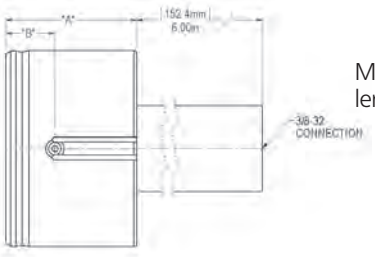
Minimum recommended hole length: 6.35 mm / ***.250"***, with proper support min. is 1.14 mm/ ***.125"***. May be used with AHA-4 or -5 Extensions for deep holes.

37.85-76.30 mm/ 1.490-3.004"



Minimum recommended hole length: 6.35 mm / ***.250"***. May be used with AHA-4 or -5 Extensions for deep holes.

76.30-114.30 mm/ 3.004-4.500"



Minimum recommended hole length: 6.35 mm / ***.250"***.

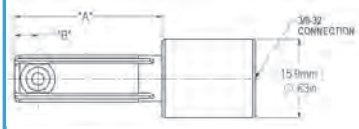
Through Hole Plugs

Measured Size mm/*inch*

Above		To & include		"A"		"B"		Minimum Hole Length*		Measuring Range	
9.53	***.375"***	12.70	***.500"***	38.10	***1.500"***	12.70	***.500"***	6.35	***.250"***	.152	***.006"***
12.70	***.500"***	19.05	***.750"***	41.28	***1.625"***	15.88	***.625"***	6.35	***.250"***	.152	***.006"***
12.70	***.500"***	37.85	***1.490"***	41.28	***1.625"***	15.88	***.625"***	6.35	***.250"***	.152	***.006"***
37.85	***1.490"***	76.30	***3.004"***	50.80	***2.000"***	19.05	***.750"***	6.35	***.250"***	.152	***.006"***
76.30	***3.004"***	114.30	***4.500"***	50.80	***2.000"***	19.05	***.750"***	6.35	***.250"***	.152	***.006"***

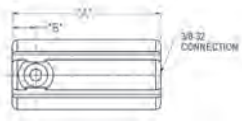
Blind Hole/Counterbore Plugs

9.53-14.25 mm/ .375-.561"



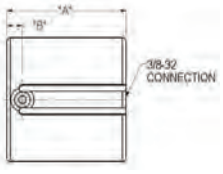
Minimum recommended hole length: 7.92 mm / ***.312"***.

14.25-37.85 mm/ .561-1.490"



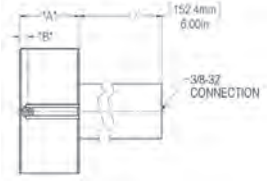
Minimum recommended hole length: 7.92 mm / ***.312"***. Use with AHA-4 or -5 handles for deep hole applications.

37.85-76.30 mm/ 1.490-3.004"



Minimum recommended hole length: 7.92 mm / ***.312"***. Use with AHA-4 or -5 handles for deep hole applications.

76.30-114.30 mm/ 3.004-4.500"



Minimum recommended hole length: 7.92 mm / ***.312"***.

Super Blind Plugs

Blind Hole Air Plugs can be furnished to check shorter holes than listed above, and can be furnished to check closer to the bottom of a hole. Holes must be at least 4.45 mm / ***.175"*** long, and the distance from the end of the plug to the center-line of the jets can be as short as 2.5 mm / ***.100"***.

Blind Hole Plugs

Measured Size mm/*inch*

Above		To & include		"A"		"B"		Minimum Hole Length*		Measuring Range	
9.53	***.375"***	14.25	***.561"***	30.15	***1.187"***	4.75	***.187"***	7.92	***.312"***	.152	***.0060"***
14.25	***.561"***	37.85	***1.490"***	30.15	***1.187"***	4.75	***.187"***	7.92	***.312"***	.152	***.0060"***
37.85	***1.490"***	76.30	***3.004"***	36.53	***1.438"***	4.75	***.187"***	7.92	***.312"***	.152	***.0060"***
76.30	***3.004"***	114.30	***4.500"****	36.53	***1.438"***	4.75	***.187"***	7.92	***.312"***	.152	***.0060"***

Notes:

* *If a guide sleeve or stop collar is used, minimum hole length can be as small as 3.18 mm/.125"*

** *A handle 152 mm/6" long and 33.3 mm/1.31" diameter is supplied with plugs over 76.3 mm /3.004". For smaller or larger plugs than those shown above, or for any modification to the specifications shown, contact Mahr Federal Customer Resource Center.*

Air Gaging Instruments

Accessories

Handles and Extensions

When an Air Plug is used with a hose, it should be equipped with a Handle to avoid excessive strain on the air connection and corrosion on the polished plug body. Handles may be combined for gaging deep holes.

Selection of a handle or extension is determined by the bore itself and whether or not it is preceded by a larger C-bored diameter. Corresponding thread sizes of the handle or extension must also be considered.

If no portion of the handle or extension enters the part, only thread sizes must be considered. If the plug does enter the part, then both O.D. and thread size must be considered.

2202010 and **2202011 Extensions** – accept 2202074 Hose on one end and the following plug sizes on the opposite end: all 1250:1 thru 8000:1 plugs up to 76.3 mm / ***3.004"***.

2202012 Handle – accepts 2202074 Hose on one end and the following plug sizes on the opposite end: all 1250:1 thru 8000:1 plugs up to 76.3 mm / ***3.004"***.
Has Bakelite insulating cover. Recommended for 37.7 mm / ***1.484"*** up to 76.3 mm / ***3.004"*** diameters.

2237666 – High impact and coolant resistant, light weight composite handle – normally furnished with µDimensionair and air snaps.

2202012 and **2236070** – light weight aluminum handles without or with air shutoff valve.

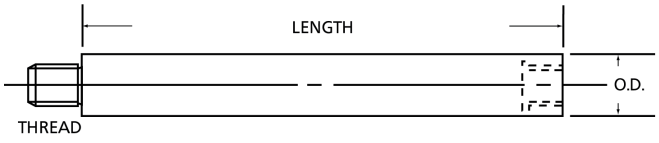
2202003 Handle – Used and furnished with 1250:1 thru 8000:1 through or blind hole plugs over 76.3 mm / ***3.004"***.

2202007 and **2202008 Handles** – Used with 10000:1 thru 32000:1 plugs.

2202009 Handle – Used with 2500:1 thru 8000:1 blind hole plugs in the 9.47 mm / ***.3735"*** to 11.8 mm / ***.467"*** range, using an 2201588 Adaptor.

2201954 and **2201963 Extensions** – Used with 2500:1 thru 8000:1 through hole air plugs in the 9.47 mm / ***.3735"*** to 14.93 mm / ***.588"*** range and with 11.8 mm / ***.467"*** to 14.93 mm / ***.588"*** range blind hole plugs, using an 2201601 Adaptor.

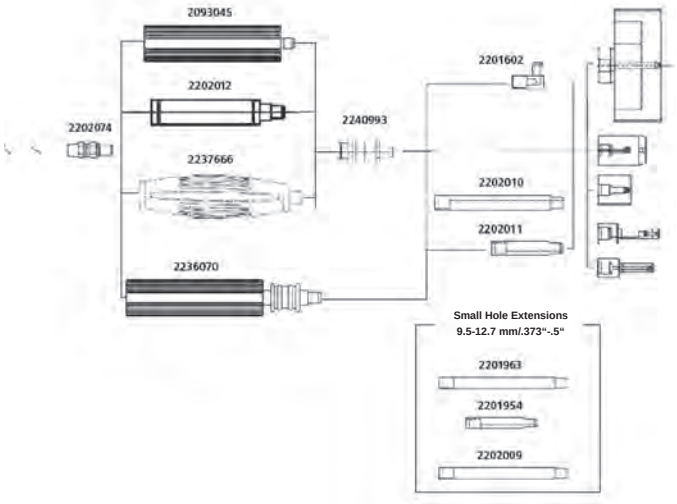
2201975 – extension used with 2204599 adjustable base. Provides easily configured base for bench-mounted air tooling fixturing. See Dimentron Plugs (Chapter 9. MaraMeter).



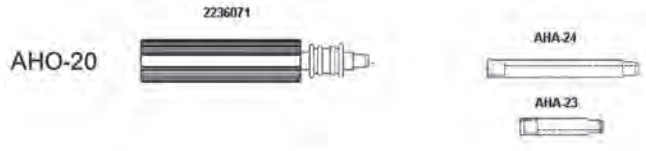
Order no.	Thread	O.D. mm / inch	Length mm / inch
2202010	3/8-32	12.07 / ***.475"***	102 / ***4"***
2202011	3/8-32	12.07 / ***.475"***	51 / ***2"***
2202012	3/8-32	25.4 / ***1.00"***	102 / ***4"***
2202003	1-1/8-18	33.4 / ***1.315"***	152 / ***6"***
2202006	3/8-32	12.7 / ***.500"***	133.3 / ***5.25"***
2202007	9/32-40	9.14 / ***.360"***	51 / ***2"***
2202008	9/32-40	9.14 / ***.360"***	102 / ***4"***
2202009	10-32	9.14 / ***.360"***	102 / ***4"***
2201954	5/16-32	9.02 / ***.355"***	51 / ***2"***
2201963	5/16-32	9.02 / ***.355"***	102 / ***4"***
2201975*	3/8-32	9.5 / ***.374"***	61.7 / ***2.43"***

** Use on 2204599*

Accessory Configuration for DP60/DP50/DP20 Systems – Low Magnification

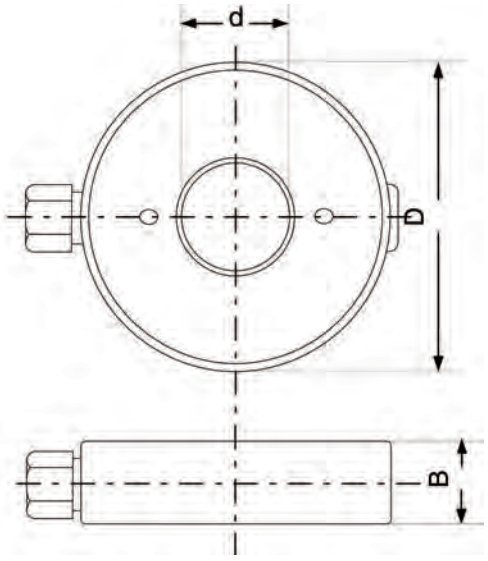


Accessories for High Magnification Systems – DP10/DP5

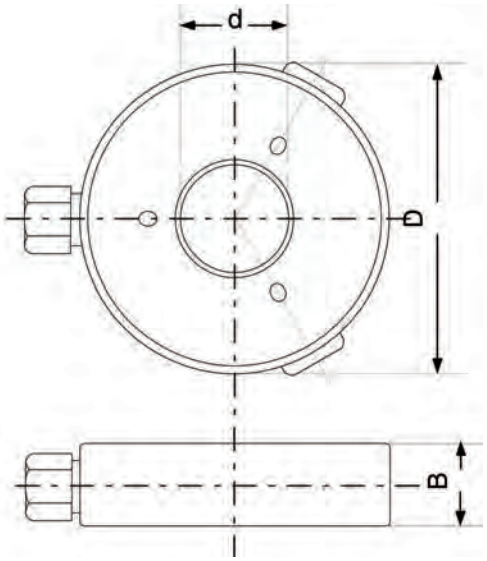


Dimensionair® Air Rings

Air rings are supplied in several styles for external measuring. Two and three jet rings are most common, used for checking outside diameters for sizes out of round conditions from 6.3 mm / ***.248"*** to 63.5 mm / ***2.500"***. Four and six jet rings are also available for special applications. All Air Rings have chrome-plated wear surfaces unless otherwise specified.

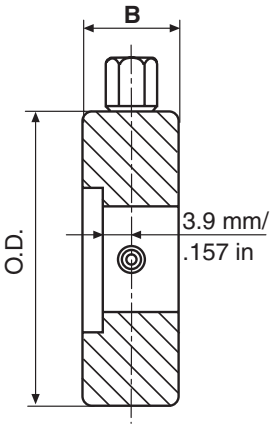


Jet air ring gage with 2 measuring jets

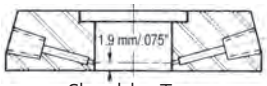


Jet air ring gage with 3 measuring jets

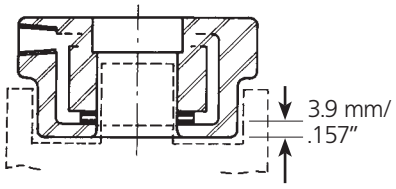
For applications where O.D.'s need to be checked near a shoulder, or where part length is restricted, contact Mahr Federal for technical assistance about shoulder and Snout Type Air Rings.



Counterbore Type



Shoulder Type
(for 2500:1 & 4000:1
5000:1 & 8000:1 only)



Snout Types

Technical Data

Diameter d			Diameter D			Width B		
mm	/	***inch***	mm	/	***inch***	mm	/	***inch***
6.3-7.6	/	***.248-.299"***	76.2	/	***3.00"***	25.4	/	***1.00"***
7.6-9.3	/	***.299-.366"***	76.2	/	***3.00"***	25.4	/	***1.00"***
9.3-13.0	/	***.366-.512"***	76.2	/	***3.00"***	25.4	/	***1.00"***
13.0-21.0	/	***.512-.827"***	76.2	/	***3.00"***	25.4	/	***1.00"***
21.0-25.4	/	***.827-1.00"***	76.2	/	***3.00"***	25.4	/	***1.00"***
25.4-38.4	/	***1.00-1.51"***	101.6	/	***4.00"***	25.4	/	***1.00"***
38.4-44.5	/	***1.41-1.75"***	101.6	/	***4.00"***	25.4	/	***1.00"***
44.5-50.8	/	***1.75-2.00"***	127.0	/	***5.00"***	25.4	/	***1.00"***
50.8-63.5	/	***2.00-2.50"***	127.0	/	***5.00"***	25.4	/	***1.00"***
63.5-76.2	/	***2.50-3.00"***	139.7	/	***5.50"***	25.4	/	***1.00"***

When ordering ring gages, please specify the following:

- Nominal workpiece dimensions
- Tolerance
- Desired magnification
- Instrument used
- Setting plug to be supplied?

Air Rings may be attached directly to a Dimensionair or used on a base and connected to the gage with a plastic hose. Vee type Guide Chutes can be furnished on one or both sides if Air Rings from 6.3 mm / .248" through 44.5 mm / 1.750". Tube type guide can be furnished on sizes from 6.3 mm / .248" through 63.5 mm / 2.500".

Dimensionair® Air Rings

Options for Air Rings

Carbide Wear strips

Air plugs are normally furnished chromed for long life. Other materials can be provided to improve the life of the ring when high volume or grinding grit may still remain on the part. Materials such as Ferrotic and addition of carbide strips can be provided.

Bases for air rings

Depending on the application there are many ways to hold an air ring. They may be hand held and placed over the part if the part is still on the machine. They may be front mounted, horizontally or vertically on the Dimensionair or for larger parts the can be mounted to a base and held vertically or horizontally.

Special bases are available the mount the ring horizontally and incorporate a part lifting mechanism to aid in part removal.

Guide chutes

Guide chutes and vees are available in a host of options to improve the inspection process. Vee type guide chutes can be furnished on one or both sides of an air ring from 6.3 mm / ***.248***" through 44.5 mm / ***1.75***". Other options include tube type guide chutes for sizes 6.3 mm / ***.248***" through 63.5 mm / **2.5**".

Standard length of the guide chutes are 63.5 mm / **2.5**" and affix to the side of the air ring. Normal length of the chute is 63.5 mm / **2.5**". Other options including heavy duty out riggers and universal vee stands can be provided.

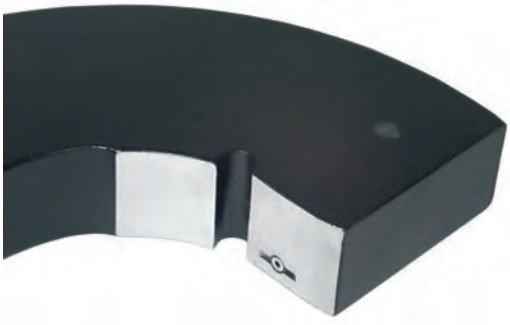
Options for Air Snaps

Since side clearances can present gaging problems with crankshaft diameters or similar applications, Mahr Federal designed a new line of air snaps that make the tough measurements easier and affordable.

We based our new air snap design on our own proven air tooling techniques, known for providing long life and high-resolution in tough shop environments. Now you can measure fixed sizes from 12.5 mm / ***.49***" through 184 mm / ***7.25***" using D-2500 and D-5000 systems. Widths are typically 19 mm / ***.75***" but can be customized to reach diameters having tight clearances.

Jet locations can be located central in the snap or positioned close to either side for exploring close to a shoulder.

Multiple circuit air snaps are available for speeding the process while checking the journal for size variation, taper, barrel or hourglass shape.



Dimensionair® Air Gages

AirProbes and JetProbes

- AirProbes and JetProbes provide modular, convenient gage heads for use in hand-held gages and for designing into fixture gages.
- 9.5 mm / ***.375***" bodies provide standardized mounting configurations.
- Compact size allows easy access to hard-to-reach dimensions.
- AirProbes and JetProbes are calibrated for instant use with Dimensionair® systems - just set zero and measure!
- Available in single-probe and matched-probe configurations.

AA-1-3 AirProbe and AAT-19 JetProbe Assembly

AirProbes

For use where contact-type measurement is required with 2500:1 Dimensionair Systems. AirProbes are available in Regular Action (counter-clockwise meter movement when spindle is depressed) or Reverse Action (clockwise meter movement when spindle is depressed) and in various ranges. When used with Model 2500:1 Dimensionair, the Meter Dial must be specified to match the AirProbe range (see table below). AirProbe and Dial are color coded - just match the color band on the AirProbe to the colored dot on the Dial to be sure that the AirProbe range matches the readout on the Dimensionair. AirProbes are provided with AAD-55 Straight Adaptor for attaching to Air Hoses.

Order no.	Range		Style / Color Code***	Matching Dial Model		Graduations	
	mm	***inch***		inch	metric	µm	***inch***
AA-1-3*	0.076	***.003"***	Regular / Red	**ADL-28****	**ADL-95****	1	***.00005"***
AA-2-3*	0.076	***.003"***	Reverse / Red	**ADL-28****	**ADL-95****	1	***.00005"***
AA-1-6	0.152	***.006"***	Regular / Green	**ADL-16**	**ADL-96**	2	***.0001"***
AA-2-6	0.152	***.006"***	Reverse / Green	**ADL-16**	**ADL-96**	2	***.0001"***
AA-1-30	0.762	***.030"***	Regular / Blue	**ADL-24**	**ADL-98**	10	***.0005"***
AA-2-30	0.762	***.030"***	Reverse / Blue	**ADL-24**	**ADL-98**	10	***.0005"***

* *.003" Range AirProbes can also be used with 5000:1 Dimensionairs, but the working range is reduced to .0015".*
** *These dials are the same as normally supplied on 2500:1 Dimensionairs, except for the color code.*
*** *Regular AirProbes have single color band; reverse AirProbes have double color band.*

AirProbes can be supplied in matched pairs, either two Regular Action AirProbes or one Regular and one Reverse Action AirProbe. Contact Mahr Federal Customer Resource Center to specify.

AirProbes JetProbes

JetProbes are similar to AirProbes, except they have an open jet at the end, instead of a contacting spindle. JetProbes are ideal for measuring flatness of surfaces which cannot be touched, or for building into fixture designs where air gaging is called for. JetProbes can be used with 2500:1, 5000:1 Dimensionairs, and are supplied singly or in matched pairs. **Order no. AAT-19** for single JetProbe or **AAT-20** for a matched pair. JetProbes are supplied with AHO-1 Air Hose, a zero setting valve, and hardware for mounting to the Dimensionair.

Air Gaging Accessories

Magnification Kits

Magnification Kits provide a means for checking Amplifier accuracy, traceable to the National Institute of Standards and Technology (NIST). Each Kit contains restrictors that provide pressure characteristics at zero and at both ends of the scale, a calibrated dial diagram and a Certification of Calibration.

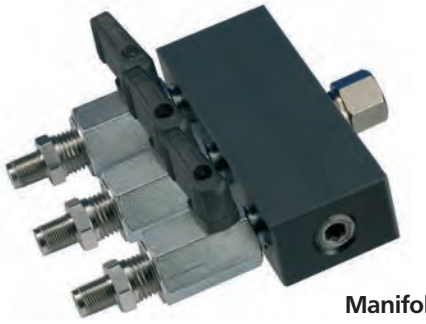
Order no.	For use with:	Tooling
AMR-SPEC-136	1250:1	DP/DR100
2094182	1260:1	DP/DR60
AMR-12	2500:1/4000:1	DP/DR50
AMR-13	5000:1/8000:1	DP/DR20
AMR-14	10000:1/16000:1	DP/DR10
AMR-15	20000:1/32000:1	DP/DR5

AMR-12

Manifolds

Manifolds allow connecting multiple pieces of air tooling to one Dimensionair. Toggle valves allow activation of the selected tool. Manifolds are compatible with Dimensionairs 1250:1 through 8000:1M Manifolds for use with other Dimensionairs, contact Mahr Federal Customer Resource Center — **1-800-333-4243.**

Order no.	Description
2248282	2-way Manifold
2248283	3-way Manifold
2248284	4-way Manifold
2248285	5-way Manifold



Manifold 2248283

Hoses

Supply hoses and hoses between Dimensionair and air tooling.

Order no.	Description	Thread
AHO-2	1.5 m / 5 ft Air Supply Hose. Fits all Dimensionair models. (rubber)	7/16-20
AHO-1	0.9 m / 3 ft Air hose for tooling for Models 1250:1 – 8000:1. (Tygon)	3/8-32
AHO-8	1.5 m / 5 ft Air hose for tooling on Models 1250:1 – 8000:1. (Tygon)	3/8-32
AHO-10	1.8 m / 6 ft Air hose for Models 1250:1 – 8000:1. (Tygon)	3/8-32
AHO-20	0.9 m / 3 ft Air hose for tooling on Models 10000:1 – 32000:1. (Tygon)	9/32-40
ARG-1	Replacement O-ring for AHO-1, -8, -10 Hoses and AHA-4, -5, -6, -20 Handles.	
ARG-6	Replacement O-ring for AHO-20 Hose, AHA-23 and -24 Handles.	
ARG-10	For AEX-1, AEX-2 and AHA-28	

Traps and Filters

Good gaging practice requires clean, dry air for gage performance. Dimensionair Models are furnished with a particle filter. Shop air contains water and oil, which should be removed, using Model **AFL-24** Oil and Water Separator Trap.

Order no.	Description
AFL-10	Particle Filter (normally furnished on all Dimensionair Models). Filter size: 5 microns; Maximum pressure: 250 p.s.i.; maximum working temperature: 175°F.
AFL-24	Oil and Water Separator Trap, includes mounting hardware. Filtering capacity: 99.7% removal of oil and water; filter size: 3-6 microns; maximum pressure: 150 p.s.i.; flow rate: 20 cubic feet of air/minute @ 80 p.s.i.
AFL-23	Replacement cartridge for AFL-24.
AFL-21	Replacement cartridge for AFL-10.

AFL-24 Trap

Millimar. Standard Elements

Modular

The use of **Millimar** standard elements allows multi-gage measuring devices to be designed and implemented for the widest possible range of workpieces, e.g. rotationally symmetrical and non-rotationally symmetrical parts.

Rotationally symmetrical workpieces can be mounted between centers or on prismatic supports, whereas non-rotationally symmetrical workpieces often require a special holder.

Versatile

The versatility of the **Millimar** standard elements means that the right solution can be provided, whatever the measurement task at hand.

Whether it's a question of external, internal or length measurements, the **Millimar** standard elements will be able to meet your requirements, even in the case of complex workpiece geometries.

Thanks to the space-saving design of the styli, a high number of measuring points can be inspected within a small area of the testpiece.

The pneumatic lifting mechanisms integrated into the measuring elements simplify the job of moving the testpiece into the measuring position and reduce the amount of wear on the styli.

Flexible

The modular concept using **Millimar** standard elements is continued throughout the construction of the whole system. A generous amount of travel in the styli (up to 20 mm / 0.79") allows a high degree of flexibility in terms of the variety of testpieces that can be accommodated.

Precise

The **Millimar** standard elements are specially designed for use in the workshop and are manufactured using a rigorous process. This guarantees that the measuring devices give stable and reliable measurements.

For example, using styli fitted with two ball-bearing guides for supporting the moving part, it is possible to achieve measurement accuracy at the µm scale, if this is required due to the tolerances of the feature being measured.

Reliable

All components are long-lasting and low-maintenance thanks to the use of rust-proof materials, the selection of appropriate heat treatments, and the use of a lifting mechanism to minimize the effects of friction acting on the styli when the workpiece is inserted.

Economical

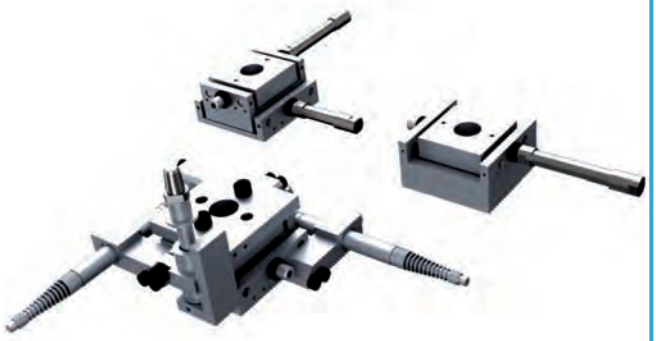
Our systems can either be constructed by the customer from standard elements obtained from the catalogue, or alternatively we can provide ready-built devices as turn-key solutions. Whichever option you choose, you can be sure that you are purchasing a system that is tailored to your specific requirements on the most favorable of terms.

Below are just a few examples of the many factors that contribute to the cost effectiveness of the **Millimar** standard elements:

- Reusability of standard elements: Once manufacture of a particular type of workpiece has ceased, all standard elements used in the test equipment can be reused for a different type of workpiece.
- A choice of different mechanisms for guiding the moving part of the stylus, according to the accuracy requirements of the measuring task (optimal price-performance ratio).
- Reduction in development and implementation time.
- Availability of the equipment: Our standard elements are manufactured under standard production conditions and are always available off the shelf and ready to use.

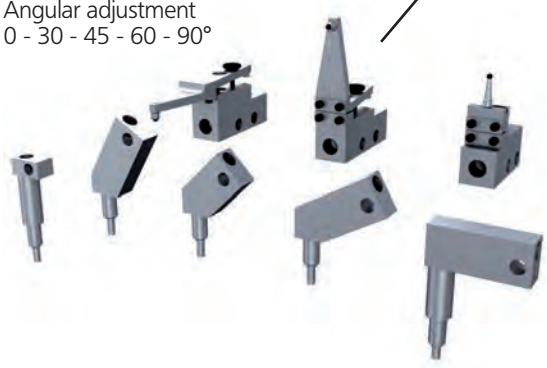
Gage module
Travel distance: 5 - 10 - 20 mm

XY tables
Travel distance: 2.5 - 5 - 7 mm



Styli

Angular adjustment
0 - 30 - 45 - 60 - 90°



For further Information please refer to Chapter 20 - MarSolution

If you require more detailed Information please consult our Millimar Components Catalog, www.mahr.com, Webcode 153 or

Visit our Mahr Online Product Catalog under https://eshop.mahr.com

YOUR STABLE PARTNER FOR MANUFACTURING.
MARSTAND.

The latest information on MARSTAND products can be found on our website:
www.mahr.de/en/Home, WebCode 20316

► | MarStand Indicator Stands, Comparator Stands and Run out Testing Instruments offer high stablity which ensures precise measurements. Whether you are using a dial indicator, a dial comparator, a test indicator or a measuring probe you will always have the best possible support. | ◄

► | MarStand. Indicator Stands, Comparator Stands, Run out Testing Instruments

Indicator Stands

MarStand 815 GN 8- 2
With Cast Iron Base
MarStand 2400 8- 2
For Electronic Measurements
MarStand 815 MA / 815 MB / 815 MG / 815 P 8- 3
With Magnetic Base

Post & Support Arm Assemblies

MarStand 815 XN / 815 XMA / 815 XMB / 815 XMS / 815 XMG / 815 XP 8- 7
With Mounting Thread and / or T-slot

Magnetic Bases

MarStand 815 Y / 815 YP 8- 7

Center Bench

MarStand 818 8- 8
With moveable Tail Stocks and Support Arms

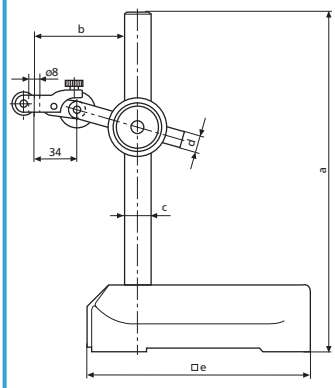
Comparator Stands

MarStand 820 N / 820 NC / 820 FC / 820 NG / 820 FG 35 B / NB-60 8-10
Small Version
MarStand 821 NG / 821 FG 8-14
Large Version
MarStand 824 NT / 824 FT / 824 GT 8-15
Heavy Version

Modular Units

MarStand 827 b 8-15

Indicator Stand 815 GN



Features

- Rugged base ensures both maximum stability and sturdiness
- The upper side of the base has a convenient hand grip
- Moves easily over surfaces without vibration
- Front of the base is ground to allow movement of the stand along edges and rules
- Stable due to the three point support
- Support arm can be finely adjusted
- Post and support arm are made from stainless steel
- Indicator can be rotated through ± 90°

Technical Data

Total height with base a		Max. projection of support arm b	Post dia. c	Post dia. d	Base surface e	Fine adjustment range	Weight	Order no.* Mount dia. 8H7	Order no.* Mount dia. 3/8"
mm	*inch*	mm	mm	mm	mm	mm	kg		
300	***12"***	185	18	14	150 x 150	2	4.2	**4413000**	**4413050**
500	***20"***	200	25	18	190 x 180	2	9	**4413001**	**4413051**
750	***30"***	230	35	25	190 x 180	2	10	**4413005**	**4413052**

** excludes indicating instrument*

Indicator Stand 2400

Features

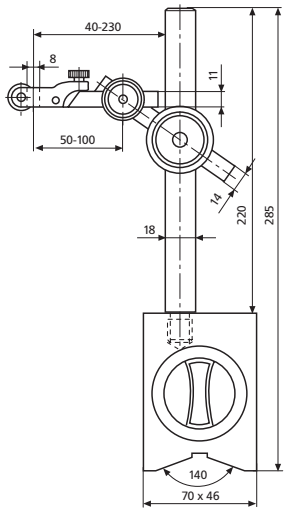
- A stable Height Stand for electronic measurement,
- Fine adjustment in the base allows easy operator set-up, even at high magnification. Up to 3.8 mm / .150" adjustment when arms fully extended
- Collar has Teflon bearings and metal-to-metal clamping.
- Post is thermally isolated from heat transfer from the base.
- Arm lock is independent of the pivot lock.
- Uses vertical lug mounting
- EHE-2056 Lever gage head mounts directly to arm (as shown) EHE-2048 Lever gage head requires an EAM-1071 adaptor
  CP-83 Extra arm and swivel clamp assembly (allows mounting two lever gage heads on one stand)

Technical Data

Total height with base			Arm reach			Post dia. force			Base surface			Fine adjustment range			Order no.*
mm	/	*inch*	mm	/	*inch*	mm	/	*inch*	mm	/	*inch*	mm	/	*inch*	
457	/	***18"***	254	/	***10"***	31.8	/	***1.25"***	161.7 x 94	/	***6.2 x 3.7"***	3.8	/	***0.150"***	**2400**

** excludes indicating instrument*

Indicator Stand 815 MA with magnetic base



Features

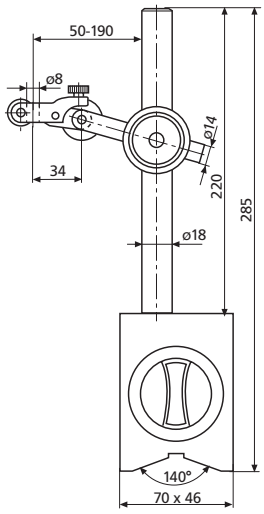
- Support arm with two joints
- Base has a powerful ON/OFF permanent magnet
- Magnetic force is active across the surfaces and the V-shaped bottom plus the front of the base
- Post and support arm are made from stainless steel
- Support arm can be finely adjusted

Technical Data

Total height with base		V-way for shaft dia.	Magnetic force	Fine adjustment range	Weight	Order no.* Mount dia.	Order no.* Mount dia.	Order no. wooden case
mm	***inch***	mm	N	mm	kg	8H7	3/8"	
285	***11.2"***	20 - 100	450	2	2.5	**4416000**	**4416050**	**4416001**

* *excludes indicating instrument*

Indicator Stand 815 MB with magnetic base



Features

- Support arm with one joint
- Base has a powerful ON/OFF permanent magnet
- Magnetic force is active across the surfaces and the V-shaped bottom plus the front of the base
- Post and support arm are made from stainless steel
- Support arm can be finely adjusted
- Indicating instrument can be rotated through ± 90°

Technical Data

Total height with base		V-way for shaft dia.	Magnetic force	Fine adjustment range	Weight	Order no.* Mount dia.	Order no.* Mount dia.	Order no. wooden case.
mm	***inch***	mm	N	mm	kg	8H7	3/8"	
285	***11.2"***	20 - 100	450	2	2.2	**4417000**	**4417050**	**4416001**

* *excludes indicating instrument*

Indicator Stand 815 MG with magnetic base

Features

- 3D indicator Stand, can reach any position within the operating range
- Easy to position all 3 joints, position can be securely fixed with a handle
- Robust well dimensioned components, excellent stability and accuracy
- Maintenance free mechanical clamping system
- Arm components are made of black anodized high quality aluminum
- Dial Indicator holder with mount dia. 8 mm and dovetail for Test Indicators
- Equipped with micro fine adjustment, free of backlash
- Outstandingly easy to set-up, high repeatability
- Very powerful ON/OFF magnet
- Ideal for measuring instruments with µm-resolution (only with 4420380)

Technical Data

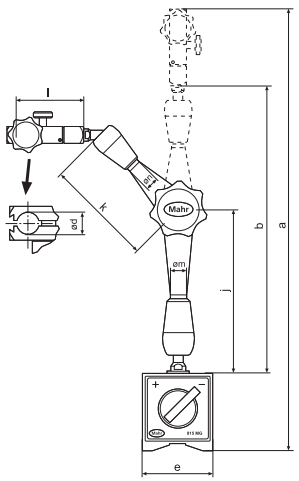
Total height with base		Projection (max.)	V-way for shaft dia.	Magnetic force	Mounting bore	Fine adjustment range	Weight	Order no.*
mm	*inch*	mm	mm	N		mm	kg	
224	***8.82"***	130	6 –120	300	8H7	2	1.6	**4420350**
316	***12.44"***	200		800			1.7	**4420360**
401	***15.78"***	280					1.8	**4420370**
444	***17.48"***	330		1000		5	1.9	**4420380**

* *excludes indicating instrument*

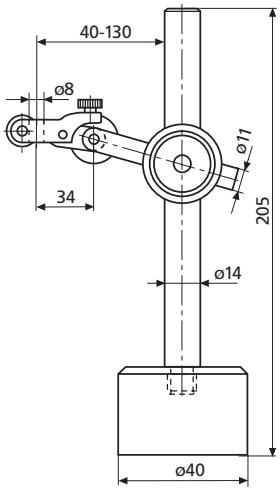
Dimensions

Dimensions in mm

a	b	d	e	j	k	l	m	Order no.
224	130	8	34 x 34	70	60	62	9	**4420350**
316	200	8	60 x 50	120	80	64	10	**4420360**
401	280	8	60 x 50	170	110	66	16	**4420370**
444	330	8	73 x 50	201	129	67	21	**4420380**



Indicator Stand 815 P with magnetic base



Features

- Support arm has one joint
- Sturdy circular base with permanent magnet
- Post and support arm are made from stainless steel
- Support arm can be finely adjusted
- Indicating instrument can be rotated through ± 90°

Technical Data

Total height with base		Magnetic force	Fine adjustment range	Weight	Order no.* Mount dia.	Order no.* Mount dia.
mm	***inch***	N	mm	kg	8H7	3/8"
205	***8"***	250	1.5	0.7	**4422000**	**4422050**

* *excludes indicating instrument*

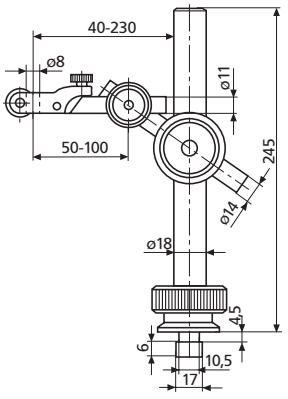
Post and Support Assemblies 815 X

For application in inspection equipment for conducting length and concentricity (run-out) tests

815 XN
for mounting in a T-slot

- Two joints
- Knurled nut for clamping to the post
- Post and support arm are made from stainless steel
- With fine adjustment

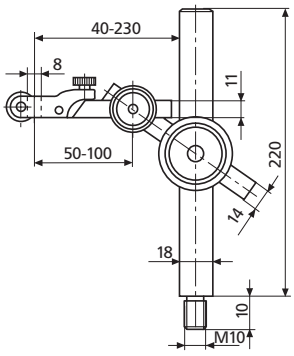
Order no. **4424000**



815 XMA
with mounting thread

- Two joints
- Post and support arm are made from stainless steel
- With fine adjustment

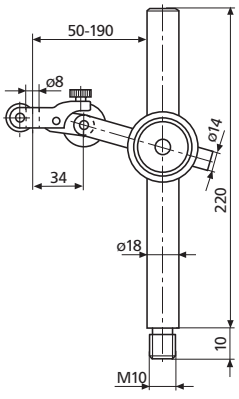
Order no. **4424005**



815 XMB
with mounting thread

- One joint
- Post and support arm are made from stainless steel
- With fine adjustment

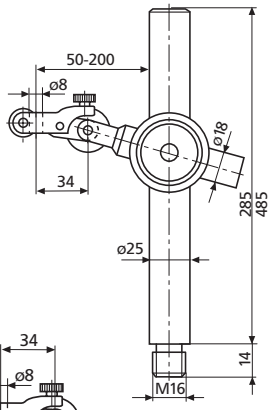
Order no. **4424006**



815 XMS
especially stable version with mounting thread

- One joint
- Post and support arm are made from stainless steel
- With fine adjustment

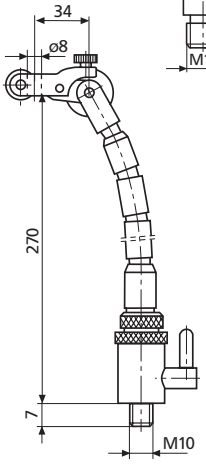
Post height	**Order no.**
285 mm	**4435011**
485 mm	**4435015**



815 XMG
with mounting thread

- Flexible in any direction, arm can be locked in position
- With fine adjustment

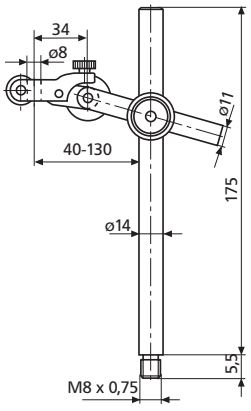
Order no. **4424010**



815 XP
with mounting thread

- One joint
- Post and support arm are made from stainless steel
- With fine adjustment

Order no. **4424015**



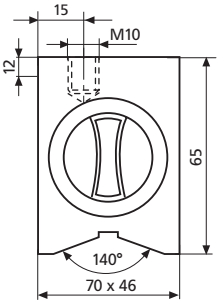
Magnetic Bases 815 Y

For the setting up of inspection equipment or as a base for adjusting devices on machine tools.

815 YM Standard Version

- Base has a powerful ON/OFF permanent magnet
- With threaded mounting hole
- V-groove in base
- Front is flat
- Magnetic force 450 N

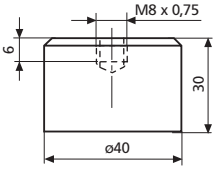
Order no. **4425000**



815 YP Round Version

- Permanent magnet plus threaded mounting hole
- Underside of the base is flat
- Magnetic force 250 N

Order no. **4425002**



Center Bench 818

Features

- Ideal for quick and accurate concentricity / run-out checks

Bench:
- Flatness of the surface is in accordance to DIN 876/1
- Two T-slots for Tailstock and / or Support Arm

Tailstock:
- Both Tailstocks can be relocated (slide into position)
- The Tailstock on the right side has a retractable (spring actuated) precision aligned center
- The Tailstocks have a peak height of 75 mm with a 90° prism for workpieces without a center, to a diameter of 20 mm (.79")

Support Arm 818 XNB:
- Support arm with one joint
- with fine adjustment

Technical Data

Height of centers mm	*(inch)*	Distance between centers mm	*(inch)*	Base size (L x W) mm	Lateral and/or height difference of Tailstocks mm	T-slot width mm	Weight kg	Order no.*
50	***(2")***	0 - 200	***(0-8")***	350 x 110	0.01	10H7	8	**4622200**
75	***(3")***	0 - 350	***(0-14")***	500 x 110	0.01	10H7	12	**4622201**
100	***(4")***	0 - 450	***(0-18")***	700 x 180	0.01	12H7	35	**4622202**
150	***(6")***	0 - 450	***(0-18")***	700 x 180	0.01	12H7	38	**4622203**

* *excludes indicating instrument*

Center Bench 818 with V-support

V-support height mm	Base size (L x W) mm	T-slot width mm	Weight kg	Order no. (excludes indicating instrument)
70	350 x 110	10H7	6.5	**4622260**
70	500 x 110	10H7	9.5	**4622261**
120	700 x 180	12H7	30	**4622262**

Center Bench 818 with Roller support

Roller support height mm	Base size (L x W) mm	T-slot width mm	Weight kg	Order no. (excludes indicating instrument)
70	350 x 110	10H7	6.5	**4622250**
70	500 x 110	10H7	9.5	**4622251**
120	700 x 180	12H7	30	**4622252**

Modular Units 818 for individual center benches

Accessories

V-support anvils 818 pe in pairs (to change with peaks)

Center height mm	Dia. range mm	Order no.
50 / 75	3 - 15	**4622210**
100	8 - 45	**4622211**

V-support 818 pb in pairs

Height * mm	Dia. range mm	T-slot width mm	Order no.
65	5 - 20	10	**4622215**
100	5 - 45	12	**4622216**

Roller support 818 ab in pairs

Height * mm	Dia. range mm	T-slot width mm	Order no.
65	3 - 20	10	**4622220**
100	3 - 45	12	**4622221**

* *referred to the center of shaft with dia. 10 mm*

Supporting table

Center height mm	Base size (L x W) mm	Order no.
50	350 x 110	**4622265**
75	500 x 110	**4622266**
100 / 150	700 x 180	**4622267**

Pointed support in pairs

Center height mm	Order no.
50	**4622270**
75	**4622271**
100	**4622272**
150	**4622273**

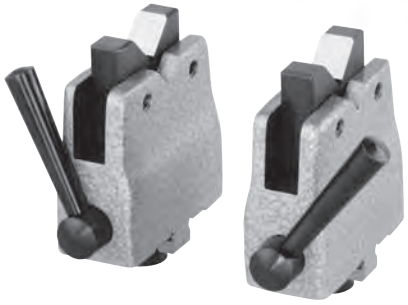
Support arm 818 XNB

Center height mm	Support Arm Dia. mm	Length mm	Order no.
50 / 75	18	210	**4622275**
100	18	260	**4622276**
150	18	360	**4622277**

818 pe

818 ab

818 pb



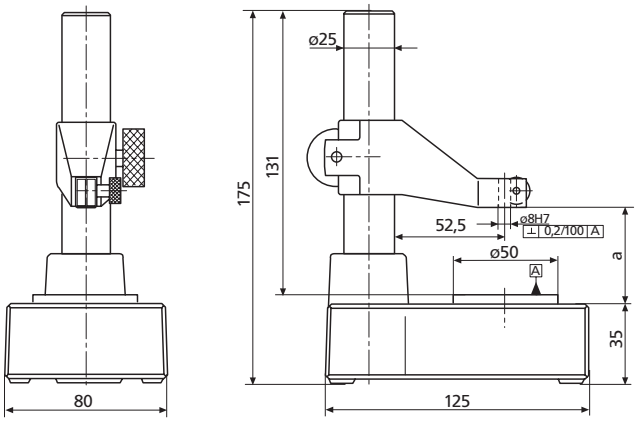
Small Comparator Stands 820

820 N

Indicating instruments are sold seperately

Features

- Sturdy design
- Plate is made from either hardened steel or black granite or ceramic
- Rugged ground post made of stainless steel
- Fine adjustment, consisting of a strong, rigid parallel spring assembly (Small Comparator Stands 820 FG and 820 FC)
- Adjustable support arm for a indicating instrument



820 N

Technical Data

	Working range a mm	*(inch)*	Grade	Flatness tolerance (DIN 876) mm	Fine adjustment range	Weight kg	Order no.* Mount dia. 8H7	Order no.* Mount dia. 3/8 inch	Remarks
820 N	0 - 110	***(0 - 4.3")***	steel	00		2.6	**4430000**	**4430018**	
820 NG	0 - 130	***(0 - 5.1")***	granite	0		3.2	**4430100**	**4430110**	
820 FG	0 - 130	***(0 - 5.1")***	granite	0	± 0.2	3.2	**4431100**	**4431110**	fine adjustment
820 NC	0 - 110	***(0 - 4.3")***	ceramic	00		4.0	**4432100**	**4432120**	
820 FC	0 - 110	***(0 - 4.3")***	ceramic	00	± 0.2	4.0	**4433100**	**4433110**	fine adjustment

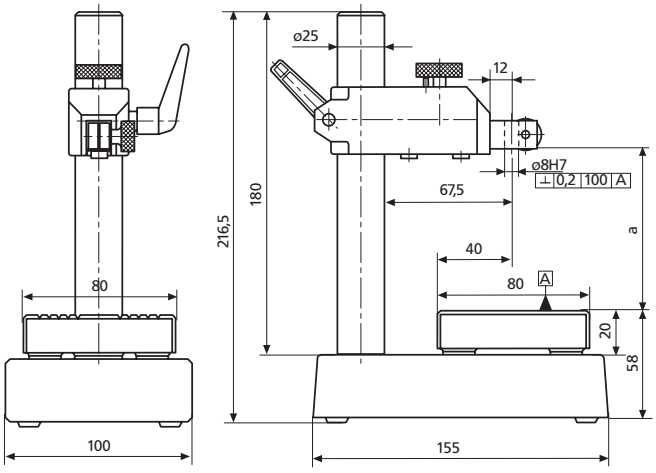
* *excludes indicating instrument*

Small Comparator Stands 820

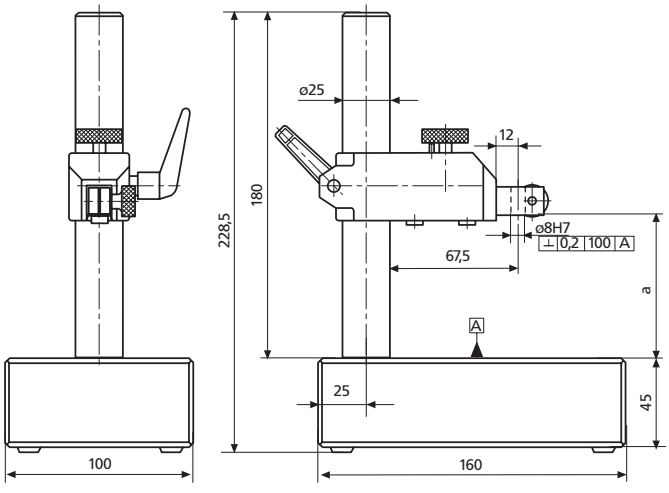
820 FC / 820 NC

820 FG / 820 NG

820 FC / 820 NC



820 FG / 820 NG



Accessories

V-Block 108° for checking small, cylindrical work pieces for out of roundness and polygon errors (for further details please refer to Page 12-9)

		Order no.
107 V	(Single)	**4229000**
	(Pair)	**4229001**

Comparator Stands 35 B

Excludes indicating instrument. Only indicating instruments that have a horiziontal lug back can be used.

Features

- Model 35B has a precision ground base. Indicator arms with and without fine adjustment are available. Models are also available with lapped anvils for the highest precision work.
- Alternate post lengths, Indicators, Anvils and special fixturing available upon request. Contact Mahr Federal Technical Assistance

Technical Data

Capacity	Post Diameter	Throat Depth	Reference Surface	Gaging Arm	Anvil	Order no. (w/o indicator)
0 - 8.75" 0 - 222 mm	***1.25"*** 31.75 mm	***2.5"*** 62.5 mm	***1 x 3"*** 25 x 75 mm	adjustable AM-146	plain	**OMI-35B-21**
				plain AM-3	none	**OMI-35B-30**
				adjustable AM-146	none	**OMI-35B-32**
				adjustable AM-146	serrated	**OMI-35B-41**

Accessories

Replacement Anvils

- Anvils for Comparator Stands 35B-21 and 35B-41 are available: Surface is lapped flat to within .00001"

Type	Dimensions	Order no.
plain surface	25 x 25 x 75 mm ***(1 x 1 x 3")***	**AL-96**
serrated surface	25 x 25 x 75 mm ***(1 x 1 x 3")***	**AL-97**

Fine Adjustment Arm

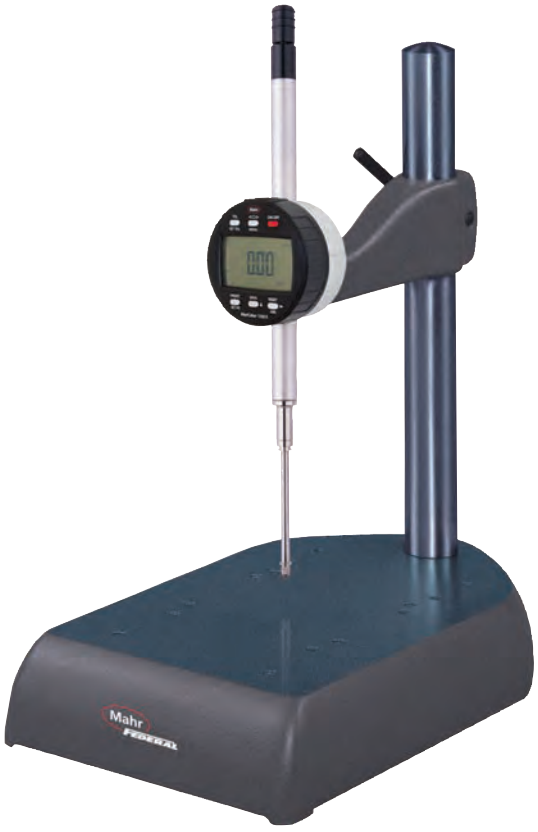
- The Fine Adjust Arm is available separately to convert 35B Comparator Stands with plain arms

Range	Order no.
1.5 mm / **0.060"**	**AM-146**

Readout Specification: Because of the versatility of the Series 35B and NB-60 Stands, almost any type of readout can be used.

- With Dial or Digital Indicators having a horizontal lug back

Comparator Stand NB-60



Shown with optional 1086 indicating instrument. Only indicating instruments that have a horiziontal lug back can be used.

Features

- Model NB-60 and NB-61 have the largest base and greatest throat depth. Indicator arms with and without fine adjust are available. Base has a pattern of 1/4-20 tapped holes for mounting platens or special tooling

Technical Data

Capacity	Post Diameter	Throat Depth	Reference Surface	Gaging Arm	Anvil	Order no. (w/o indicator)
0 - 8"	***1.25"***	***4.88"***	***9.38 x 6.5"***	plain AM-10011	none	**OMI-NB-60**
0 - 203 mm	31.75 mm	124 mm	238 x 165 mm	adjustable AM-147	none	**OMI-NB-61**

Accessories

Platens

Type	Dimensions	Order no.
serrated	114 x 152 mm ***(4.5 x 6")***	**PL-99**
serrated	152 x 203 mm ***(6 x 8")***	**PL-147**

Note: (4) screws SW-1338 are required

Fine Adjustment Arm

- The Fine Adjustment Arm is available separately to convert NB-60 Comparator Stands with plain arms

Range	Order no.
1.5 mm / ***0.060"***	**AM-147**

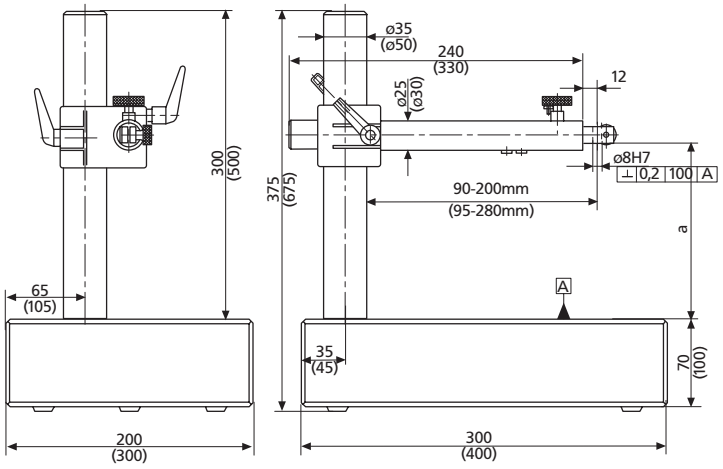
Readout Specification: Because of the versatility of the Series 35B and NB-60 Stands, almost any type of readout can be used.

- With Air Probes or Electronic Probes having a 3/8 in dia., order Mounting Adapter **AAD-66**

Large Comparator Stands 821

Features

- Extremely sturdy design
- Plate is made from lapped black granite
- Heavy duty post and adjustable support arm for maximum stability
- Post made from stainless steel and precision ground
- Support arm has a fall brake
- Fine adjustment, consisting of a strong, rigid parallel spring assembly (Large Comparator Stand 821FG)



821 FG

Technical Data

	Working range a		Flatness tolerance (DIN 876)	Fine adjustment range	Weight	Order no.* Mount dia. 8H7	Order no.* Mount dia. 3/8 inch	Remarks
	mm	*(inch)*	Grade	mm	kg			
821 NG	0 - 250	***(0 -10")***	0	–	15.8	**4435100**	**4435150**	
	0 - 430	***(0 -17")***	0	–	48	**4435110**	**4435160**	
821 FG	0 - 250	***(0 -10")***	0	± 0.2	15.8	**4435101**	**4435151**	Fine adjustment
	0 - 430	***(0 -17")***	0	± 0.2	48	**4435111**	**4435161**	Fine adjustment

* *excludes indicating instrument*

Accessories

V-Block 108° for checking small, cylindrical work pieces for out of roundness and polygon errors (for further details please refer to Page 12-9)

		Order no.
107 V	(Single)	**4229000**
	(Pair)	**4229001**

Heavy Comparator Stands 824

Precision Stand 824 NT

Without fine adjustment

Precision Stand 824 FT

With fine adjustment, consisting of a strong, rigid parallel spring assembly

Precision Stand 824 GT

For Large Type Millimess. With fine adjustment by way of vertical movement of the mounting socket

Features

Basic Units
- Sturdy, T-shaped base which is made from a special cast iron
- Extremely stable
- Fine adjustment, consisting of a strong, rigid parallel spring assembly
- Support arm has a rotation lock, height of the arm via the toothed rack is adjustable

Plates
- Measuring faces are hardened and lapped
- Longitudinal grooves
- Plates for sum measurements have a 8H7 mm mounting hole for Inductive Probes

Technical Data

Basic Unit

	Working range		Fine adjustment range	Weight	Order no.* Mount dia. 8H7	Order no.* Mount dia. 28H7	Order no.* Mount dia. 3/8 inch
	mm	*(inch)*	mm	kg			
824 NT	0 - 210	***(0 - 8.2")***	–	17	**4442100**		**4442105**
824 FT	0 - 210	***(0 - 8.2")***	± 0.2	19	**4443100**		**4443105**
824 GT	0 - 200	***(0 - 8.0")***	± 1.5	18		**4444200**	

* *excludes indicating instrument, excludes plate*

Plates

	Plate size			Flatness tolerance	Mounting hole	Weight	Order no.	Remarks
	mm			µm	mm	kg		
827 b 31	100	x	40	1		1.2	**4082731**	for single measurement
827 b 32	100	x	40	1	8H7	1.0	**4082732**	for sum measurement
827 b 33	130	x	130	1		2.5	**4082733**	for single measurement
827 b 34	130	x	130	1	8H7	2.5	**4082734**	for sum measurement

Accessories

V-Block 108° for checking small, cylindrical work pieces for out of roundness and polygon errors (for further details please refer to Page 12-9)

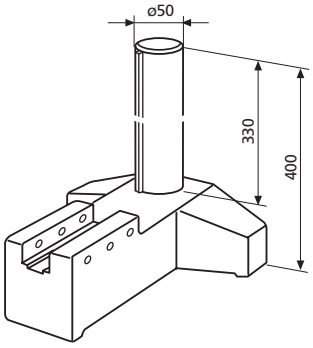
		Order no.
107 V	(Single)	**4229000**
	(Pair)	**4229001**

Modular Units 827 for individual comparator stands

For the combination of comparator stands for special tasks, to adapt existing stands as well as the incorporation into inspection equipment for all types of length measurements.

Base with Post

827 b 5

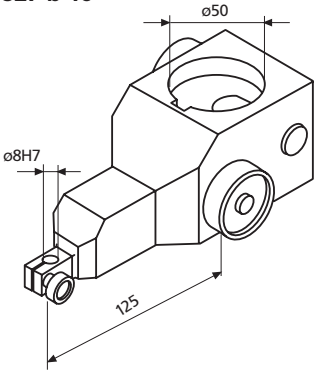


- T-shaped base which is made from a special cast iron
- Post has a chrome finish

Order no. **4082705**

Support Arms

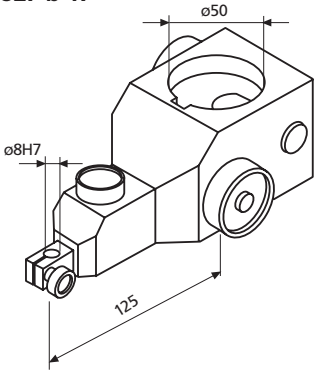
827 b 16



- Mounting hole 8 mm
- Without fine adjustment

Order no. **4082716**

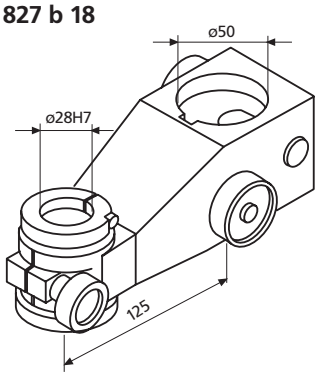
827 b 17



- Mounting hole 8 mm
- Fine adjustment, consisting of a strong, rigid parallel spring assembly

Order no. **4082717**

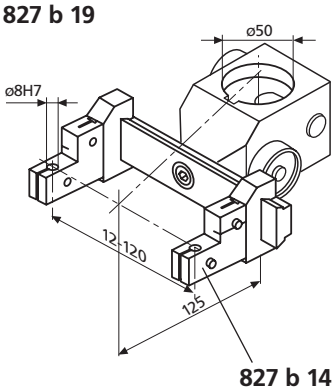
827 b 18



- Mounting hole 28 mm
- With fine adjustment

Order no. **4082718**

827 b 19



827 b 14

827 b 19
- Support arm with dovetail guide

Order no. **4082719**

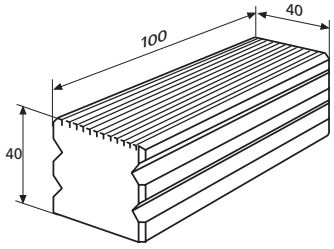
827 b 14
- With probe holder, mounting hole 8 mm

Order no. **4082714**

Modular Units 827 for individual comparator stands

Plates

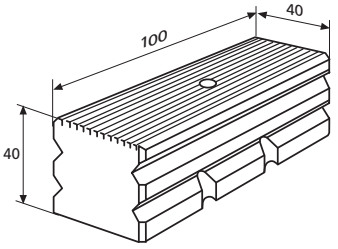
827 b 31



- For single measurement
- Hardened and lapped
- Reversible
- Measuring surface has longitudinal grooves
- Flatness deviation 1 µm

Order no. 4082731

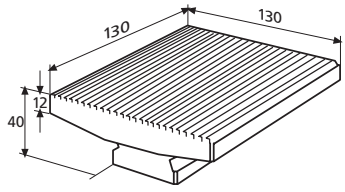
827 b 32



- For sum measurement
- Measuring surface has longitudinal grooves, hardened and lapped
- With mounting hole 8H7 mm/ .375" and a clamp for inductive probes
- Flatness deviation 1 µm

Order no. 4082732

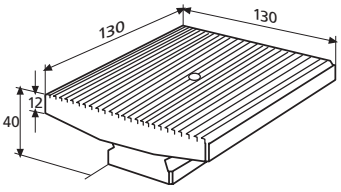
827 b 33



- For single measurement
- Large measuring surfaces which has longitudinal grooves, hardened and lapped
- Flatness deviation 1 µm

Order no. 4082733

827 b 34

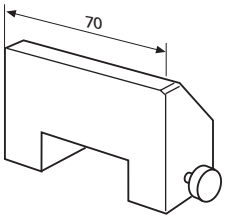


- For sum measurement
- Large measuring surfaces which have longitudinal grooves, hardened and lapped
- With mounting hole 8H7 mm/ .375" and a clamp for inductive probes
- Flatness deviation 1 µm

Order no. 4082734

Adjustable Stop

827 b 35

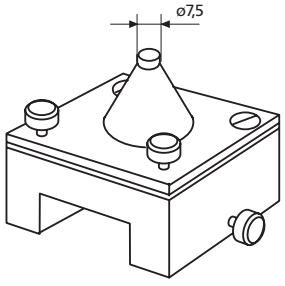


- Ensures that a work piece is correctly positioned
- To be attached to plates 827 b 31 and 827 b 32

Order no. 4082735

Attachment Stand

827 b 36



- With adjustment screws for parallel alignment of 2 plan surfaces
- Particularly suitable for mounting Pin Gages 426 M
- To be attached to plates 827 b 31 and 827 b 32

Order no. 4082736

THE BENCHMARK OF INDICATING MEASURING INSTRUMENTS. **MARAMETER.**

The latest information on MARAMETER products can be found on our website:
www.mahr.de/en/Home, WebCode 20327

► | MaraMeter is the ideal measuring instrument for highly precise measurements of internal and external diameters on either an individual part or on serial components. Our indicating measuring instruments obtain the best results due to their constant measuring force, their exact transmission lever system as well as their high parallelism on the measuring faces. For special measuring tasks such as threads, teeth, grooves or precision mechanical parts MaraMeter offers the right solution. | ◄

► | MaraMeter. Indicating Measuring Instruments

Indicating Measuring Instruments for Outside Dimensions, Indicating Snap Gages

MaraMeter 1000 P / 300 P / 840 F / 840 FC / 840 FH / 840 FG / 840 FM / 840 FS 9- 2
With fixed or interchangeable measuring faces

MaraMeter 840 E 9-18
For extremely high precision

MaraMeter 852 / 852 TS / 853 9-19
For threads, pitches, roots, serrations

Portable Thickness Gages

MaraMeter 22 P / 26 P / 838 A / 838 B / 838 AB / 57 B 9-26
With digital and/or analog display

Caliper Gages

MaraMeter 49 P / 838 TA / 838 EA / 838 TI / 838 EI 9-33
With digital and/or analog display

Depth Gages

MaraMeter 837 / 65 P-40 / 75 P-30 / 75 P-30 / 75 B-1 9-41

Indicating Measuring Instruments for Inside Dimensions,

Dimentron® Plug Inside Diameter Gages 9-46
Designed for high production I.D. gaging

MaraMeter 844 D 9-51
Indicating Plug Gage for rapid testing of serial components

MaraMeter 844 K 9-58
Self-centering Dial Bore Gage

MaraMeter 1280 P Adjustable Bore Gages 9-63
Superior accuracy for production and inspection

MaraMeter 844 N / NH / NR / NB 9-66
Self-centering Dial Bore Gage

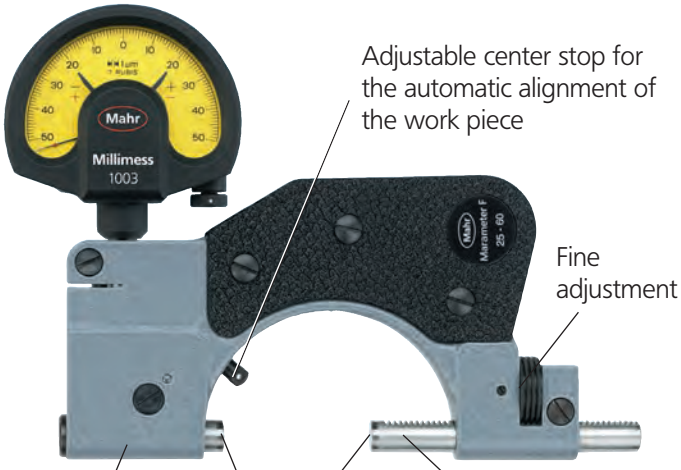
MaraMeter 844 Z 9-72
Dial Bore Gage for internal serrations

MaraMeter. Indicating Snap Gages

OVERVIEW

►| The Indicating Snap Gages **MaraMeter** 840 F / 300 P-1 are ideal for highly accurate and reliable results on cylindrical work pieces with a narrow tolerance. |◄

MaraMeter 840 F



Adjustable center stop for the automatic alignment of the work piece

Fine adjustment

Measuring spindle has a lever controlled retraction and is mounted in a long guide way

Constant measuring force

Both anvils are available in either hardened stainless steel, carbide tipped or ceramic (840 FC)

Rugged, forged steel frame with heat insulators

The measuring faces have excellent flatness and parallelism

MaraMeter 300 P-1

Indicator can be rotated to read from front or rear of the gage.

Patented "Channel Lock" design assures precisely parallel anvil surfaces throughout the full 25 mm / ***1"*** range of adjustment.

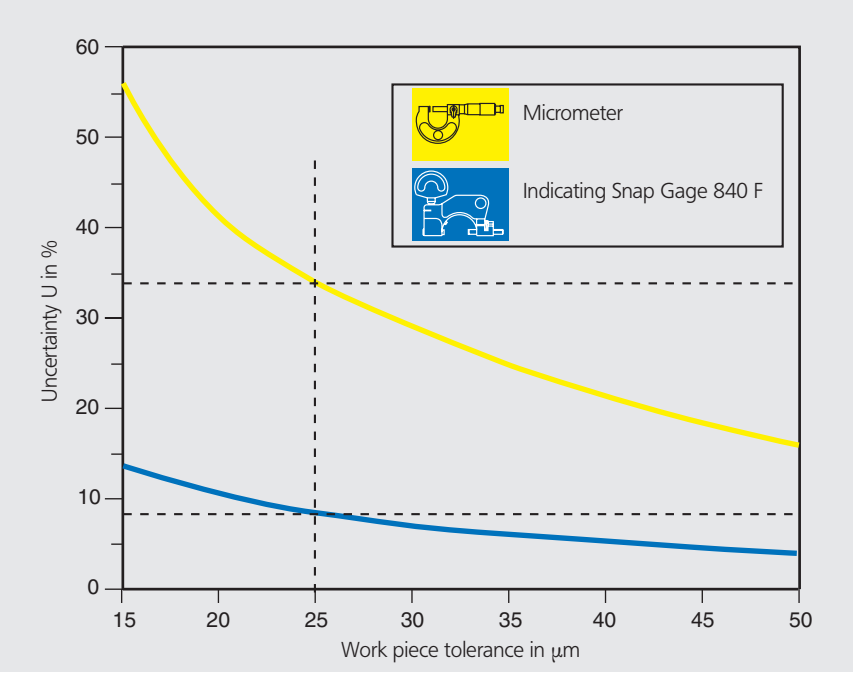
0.50 mm/ ***.020"*** Range of Sensitive Contact

Large 15.5 mm / ***.61"*** square tungsten carbide anvils provide flat, parallel, long-lasting working surfaces ensuring precision that lasts.

Advantages of the Snap Gage 840 F compared to a Micrometer

- **Reduced Measuring Uncertainity**

The MaraMeter Indicating Snap Gages have a notably reduced measuring uncertainty in comparison to to a Micrometer.



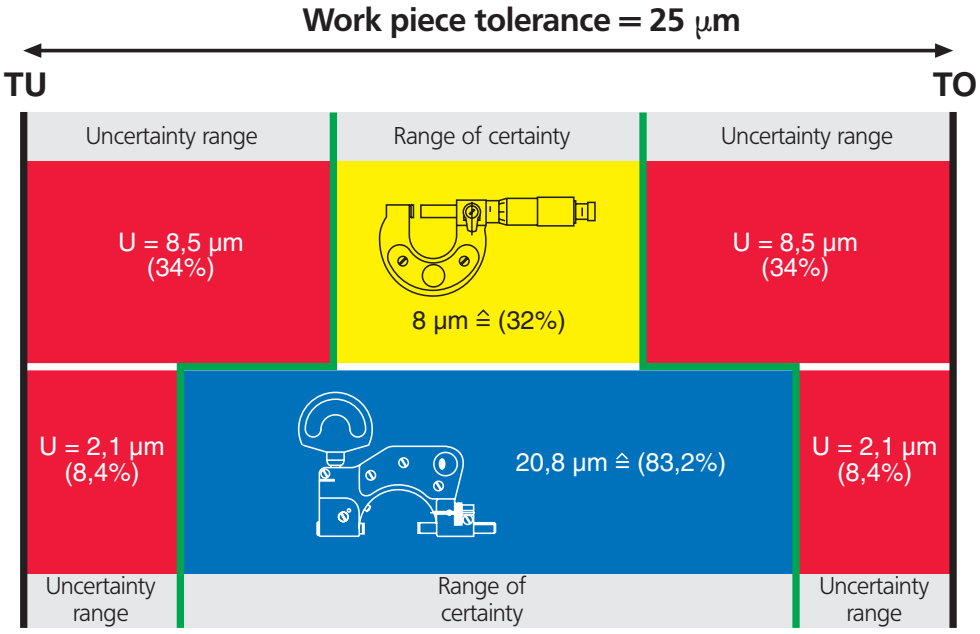
Measuring Uncertainty U is dependent upon the tolerance of the work piece

- **Better utilization of the tolerance zone**

Example:
Work piece tolerance 25 µm

The measured value in the uncertainty range can lie outside of the tolerance range, therefore the utilized tolerance of the Micrometer is reduced to only 32% (8 µm).

With a MaraMeter Indicating Snap Gage 840 F, 83% (20.8 µm) of the work piece tolerance can be utilized.



Advantage:
With the Indicating Snap Gage the tolerance zone can be used to far greater extent, thus reducing the production costs.

Snap Gages for Outside Diameters 1000P

The economical way to check outside diameters on the shop floor.

1000P-3
0.01 mm or .0005" Dial Indicator normally furnished

Features

- Flat lower anvil (reference) adjustable over a broad range.
- Radiused upper anvil (sensitive) spring-loaded to counter balance the weight of the gage.
- 0.01 mm grads. on Metric Models. .0005" grads. on Inch Models.
- 0.50 mm / .020" Range of Sensitive Contact.
- Indicator can be rotated to read from front or rear of the gage.
- Anvils are tungsten carbide for long life.

Technical Data

Capacity mm	Capacity *(inch)*	Reference Anvil Diameter mm / *inch*	Order no. Metric	Order no. Inch
0 - 25	***(0 - 1")***	13 / ***.50"***	**1000P-1M***	**1000P-1***
19 - 50	***(.75 - 2"***	13 / ***.50"***	**1000P-2M***	**1000P-2***
44 - 82	***(1.75 - 3.25")***	13 / ***.50"***	**1000P-3M**	**1000P-3**
76 - 114	***(3 - 4.5")***	16 / ***.625"***	**1000P-4M**	**1000P-4**
102 - 152	***(4 - 6")***	16 / ***.625"***	**1000P-5M**	**1000P-5**
152 - 203	***(6 - 8")***	19 / ***.75"***	**1000P-6M**	**1000P-6**
203 - 254	***(8- 10")***	19 / ***.75"***	**1000P-7M**	**1000P-7**

Series 1000P gages with greater capacity, alternate Indicators, alternate contact configurations, or other modification to suit specific applications are available – contact Mahr Federal.

* *Insulated grip not available.*

Snap Gages for Outside Diameters 300P

Superior precision for O.D. checks

EDI-301P-1
BA-26 Bench Stand (not included)

Features

- Patented "Channel Lock" design assures precisely parallel anvil surfaces throughout the full 25 mm / 1" range of adjustment.
- All Series 300P Snap Gages are fully adjustable with positive position locking at any point within the range.
- 0.50 mm / .020" Range of Sensitive Contact.
- Snap Gages available over a wide range of sizes, styles, and readout configurations.
- Large 15.5 mm / .61" square tungsten carbide anvils provide flat, parallel, long lasting working surfaces ensuring precision that lasts.
- Indicator can be rotated to read from front or rear of the gage.
- Optional lift-lever model (301P) available for retracting the upper anvil.
- All adjustments accomplished using a single hex wrench (furnished).

Technical Data

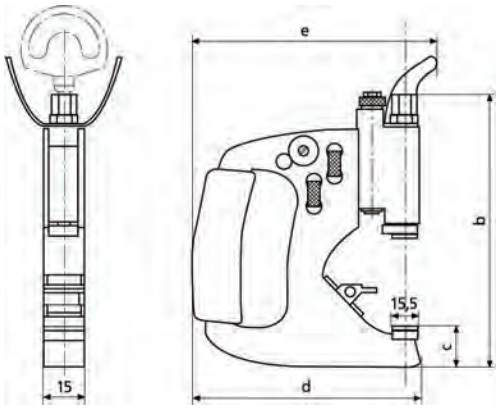
Style	Normally Furnished Indicating Instruments Readings	Snap Style	Separately, Order no.
12I/22I	***.0001"***	Flat Anvil	**IDT-102/IDT-106**
O1I/P1I	0.002 mm	Flat Anvil	**IDS-206/IDS-208**
2034201	0.0005 mm / ***.00002"***	Flat Anvil	**2034201**
B5M/C5M	***.0005"***	Groove Anvil	**IDS-101/IDS-105**
O6I/P6I	0.010 mm	Groove Anvil	**IDS-207/IDS-209**
Maxμm®/// (1)	selectable (3)	All	**2033109**
Maxμm®/// (2)	selectable (3)	All	**2033119**
with Air Probe for 2500:1		All	*
with Electronic Gage Heads		All	*

A300P-2

* *Call Mahr Federal.*
(1) With no Data Output
(2) With Data Output (6 pin)
(3) Selectable Readings – 0.001 mm / 0.005 mm / 0.0005 mm /.0001" / .0005" / .00002"

Snap Gages for Outside Diameters 300P

Technical Data



Dimensions

Meas. range mm / *inch*	b	c	d	e
0 - 25.4 / ***0-1"***	150 / ***6"***	29 / ***1.16"***	145 / ***5.8"***	158 / ***6.3"***
25.4 - 50.8 / ***1-2"***	175 / ***7"***	29 / ***1.16"***	141 / ***5.6"***	154 / ***6.16"***
50.8 - 76.2 / ***2-3"***	200 / ***8"***	29 / ***1.16"***	155 / ***6.2"***	167 / ***6.7"***
76.2 - 101.6 / ***3-4"***	226 / ***9"***	29 / ***1.16"***	167 / ***6.7"***	180 / ***7.2"***
101.6 - 127 / ***4-5"***	251 / ***10"***	29 / ***1.16"***	180 / ***7.2"***	193 / ***7.7"***
127 - 152.4 / ***5-6"***	278 / ***11"***	30 / ***1.2"***	203 / ***8"***	215 / ***8.6"***
152.4 - 177.8 / ***6-7"***	303 / ***12"***	30 / ***1.2"***	213 / ***8.5"***	226 / ***9"***
177.8 - 203.2 / ***7-8"***	329 / ***13"***	30 / ***1.2"***	231 / ***9.2"***	244 / ***9.7"***
203.2 - 228.6 / ***8-9"***	335 / ***13.5"***	30 / ***1.2"***	248 / ***9.9"***	261 / ***10.4"***

Ordering Information

Plain Anvils (Anvils included in price – choose from list below)

	No Indicator 3/8" Adaptor	No Indicator 3/8" Adaptor With Lift Lever	No Indicator 8 mm Adaptor	No Indicator 8 mm Adaptor With Lift Lever	With Dial Indicator 3/8" Adaptor .0001" Grads	With Dial Indicator 3/8" Adaptor With Lift Lever	With µMaxµm *II*	With Maxµm *III*
0 - 1"	OMI-300P-1	OMI-301P-1	2003100	2003110	300P-1	301P-1	EDI-300P-1	EMD-300P-1
1 - 2"	OMI-300P-2	OMI-301P-2	2003101	2003111	300P-2	301P-2	EDI-300P-2	EMD-300P-2
2 - 3"	OMI-300P-3	OMI-301P-3	2003102	2003112	300P-3	301P-3	EDI-300P-3	EMD-300P-3
3 - 4"	OMI-300P-4	OMI-301P-4	2003103	2003113	300P-4	301P-4	EDI-300P-4	EMD-300P-4
4 - 5"	OMI-300P-5	OMI-301P-5	2003104	2003114	300P-5	301P-5	EDI-300P-5	EMD-300P-5
5 - 6"	OMI-300P-6	OMI-301P-6	2003105	2003115	300P-6	301P-6	EDI-300P-6	EMD-300P-6
6 - 7"	OMI-300P-7	OMI-301P-7	2003106	2003116	300P-7	301P-7	EDI-300P-7	EMD-300P-7
7 - 8"	OMI-300P-8	OMI-301P-8	2003107	2003117	300P-8	301P-8	EDI-300P-8	EMD-300P-8
8 - 9"	OMI-300P-9	OMI-301P-9	2003108	2003118	300P-9	301P-9	EDI-300P-9	EMD-300P-9
9 - 10"	OMI-300P-10	OMI-301P-10	2063910	2064110	300P-10	301P-10	EDI-300P-10	EMD-300P-10
10 - 11"	OMI-300P-11	OMI-301P-11	2063911	2064111	300P-11	301P-11	EDI-300P-11	EMD-300P-11
11 - 12"	OMI-300P-12	OMI-301P-12	2063912	2064112	300P-12	301P-12	EDI300P-12	EMD300P-12
12 - 13"	OMI-300P-13	OMI-301P-13	2063913	2064113	300P-13	301P-13	EDI-300P-13	EMD-300P-13
13 - 14"	OMI-300P-14	OMI-301P-14	2063914	2064114	300P-14	301P-14	2063714	EMD-300P-14
14 - 15"	2063315	2063415	2063915	2064115	2063515	2063615	2063715	2063815
15 - 16"	2063316	2063416	2063916	2064116	2063516	2063616	2063716	2063816
16 - 17"	2063317	2063417	2063917	2064117	2063517	2063617	2063717	2063817
17 - 18"	2063318	2063418	2063918	2064118	2063518	2063618	2063718	2063818
18 - 19"	2063319	2063419	2063919	2064119	2063519	2063619	2063719	2063819
19 - 20"	2063320	2063420	2063920	2064120	2063520	2063620	2063720	2063820
Blade Anvils (Anvils included in price – choose from list below)					.0005" Grads	.0005" Grads		
0 - 1"	OMI-300P-31	OMI-301P-31	2063931	2064131	300P-31	301P-31	EDI-300P-31	EMD-300P-31
1 - 2"	OMI-300P-32	OMI-301P-32	2063932	2064132	300P-32	301P-32	2063732	EMD-300P-32
2 - 3"	OMI-300P-33	OMI-301P-33	2063933	2064133	300P-33	301P-33	2063733	EMD-300P-33
3 - 4"	OMI-300P-34	OMI-301P-34	2063934	2064134	300P-34	301P-34	2063734	EMD-300P-34
4 - 5"	OMI-300P-35	OMI-301P-35	2063935	2064135	300P-35	301P-35	2063735	EMD-300P-35
5 - 6"	2063336	2063436	2063936	2064136	2063536	2063636	2063736	2063836
6 - 7"	2063337	2063437	2063937	2064137	2063537	2063637	2063737	2063837
7 - 8"	2063338	2063438	2063938	2064138	2063538	2063638	2063738	2063838
8 - 9"	2063339	2063439	2063939	2064139	2063539	2063639	2063739	2063839

Larger capacities available on request.
To specify Metric models, add suffix "M" to the Model number. To specify Digital Output, add suffix "D" to Model numbers of EMD-300P and EMD-301P Series Gages. To specify both, add suffix "MD" to Model numbers of EMD-300P and EMD-301P Series Gages.

Examples: 300P-2 specifies a Snap Gage with a 12I (.0001" grad.) Dial Indicator, 25-50 mm / 1-2" capacity. EMD-301P-33D specifies a Groove Diameter Snap Gage with lift lever, 50-76 mm / 2-3" capacity, AL-110 Blade Anvils, 2033119 (selectable units and resolution) Maxµm/// Indicator with Digital Output

Snap Gages for Outside Diameters 300P

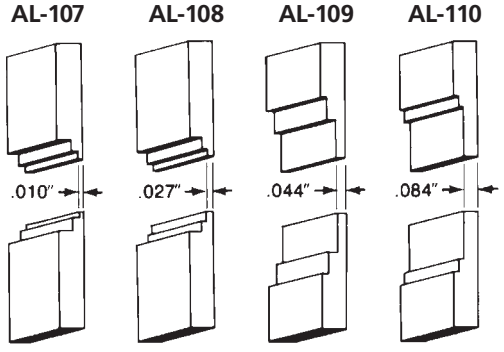
Accessories

BA-71
Bench Stand for Disc Masters

Groove Diameter Snap Gages – One pair of anvil inserts must be specified with each gage. Stocked anvils (shown below) are hardened steel. If no other anvils are specified, AL-110 will be provided.

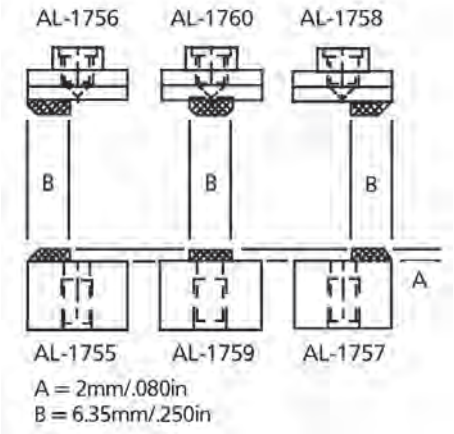
		Order no.
Bench Stand for Gages Clamps 300P and 1000P Series Gages firmly. A 6.4 mm / .25" mounting hole allows permanent fastening to bench surface.		**BA-26**
Bench Stand for Disc Masters Holds any AGD style 3 Disc up to 127 mm / 5" diameter and 27 mm / 1.12" wide. Two 6.4 mm / 0.25" mounting holes allow permanent fastening to bench surface		**BA-71**
Gaging pressure options		
For EMD, OMI and Dial Indicator models	Lighter	**SP-192**
	Heavier	**SP-118**
For EDI models only	Lighter	**2243295**
	Heavier	**2243297**

Anvil Inserts – For all Series 300P-30 and 301P-30 groove gages (2 required per gage).



Anvil Inserts

Plain Anvil Options
Front View



Blade Anvils

Width mm / *inch*	Depth mm / *inch*	Order no. Steel	T.C.
0.25 / ***.010"***	0.76 / ***.030"***	**AL-107**	**AL-1741**
0.69 / ***.027"***	1.02 / ***.040"***	**AL-108**	**AL-1742**
1.12 / ***.044"***	4.83 / ***.19"***	**AL-109**	**AL-1743**
2.13 / ***.084"***	6.35 / ***.25"***	**AL-110***	**AL-1744**

* *normally provided*

Indicating Snap Gages 840 F / 840 FC MaraMeter F

Features

- For cylindrical parts such as shafts, bolts and spindles, for thickness and length measurements
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle are both made of hardened stainless steel, carbide-tipped or ceramic (840 FC) measuring faces
- Adjustable center stop for automatic alignment
- Maximum wear resistance due to non-contact positioning in conjunction with carbide-tipped measuring faces
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable and extremely versatile. Each instrument spans a broad measuring range, within this range any dimension and fit can be very quickly and easily adjusted
- Supplied with: Wooden case, steel flat 903 indicator contact point

Technical Data

	Measuring range				Repeatability f_w	Distance of moveable anvil	Measuring force**	Measuring face Flatness	Measuring face Parallelism	Order no.*
	mm			*(inch)*	µm	mm	N	µm	µm	
840 F	0	-	25	***(0 - 1")***	≤ 0.5	2	7.5	≤ 0.2	≤ 1	**4450000**
	25	-	60	***(1 -2.36")***	≤ 0.5	2	7.5	≤ 0.2	≤ 2	**4450001**
	50	-	100	***(2 -4")***	≤ 1	2.5	7.5	≤ 0.2	≤ 2	**4450002**
	100	-	150	***(4 -6")***	≤ 1	2.5	7.5	≤ 0.2	≤ 2	**4450003**
	150	-	200	***(6 -8")***	≤ 1	2.5	7.5	≤ 0.2	≤ 2	**4450004**
840 FC	0	-	25	***(0 -1")***	≤ 0.5	2	7.5	≤ 0.2	≤ 1	**4450100**
	25	-	60	***(1 -2.36")***	≤ 0.5	2	7.5	≤ 0.2	≤ 2	**4450101**

* *Excludes indicating instrument* ** *Further measuring forces are available on request*

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

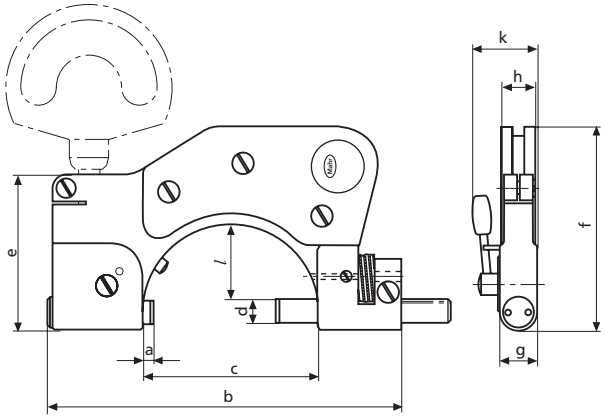
Dial Comparator	Readings mm / *inch*	Order no. mm / *inch*
Millimess 1004 / *1004 Z*	5 µm / ***.0001"***	**4333000 / *4333900***
Millimess 1003 / *1003 Z*	1 µm / ***.00005"***	**4334000 / *4334900***
Millimess 1003 XL	2 µm	**4334001**
Millimess 1002 / *1002 Z*	0.5 µm / ***.00002"***	**4335000 / *4335900***
Extramess 2000	0.2 µm / ***.00001"***	
	0.5 µm / ***.00002"***	**4346000***
	1 µm / ***.00005"***	
Extramess 2001	0.2 µm / ***.00001"***	
	0.5 µm / ***.00002"***	**4346100***
	1 µm / ***.00005"***	
µMaxµm II	0.0005 mm / ***.00002"***	**2034205****

2000

1003

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7

* *230 V, for 115 V please refer to page 6-5*
** *requires contact 4360107*



Meas. range mm	0 - 25	25 - 60	50 - 100	100 - 150	150 - 200
a*	5	5	6.5	6.5	6.5
b	97	140	193	258	316
c	34	68	110	162	212
d	8	9	10	12	12
e	54	60	60	70	75
f	65	77	103	141	171
g	12	13	14	16	16
h	13	13	13	12	12
k	23	25	28	31	31
l	14	30	54	81	106

* *In initial position*

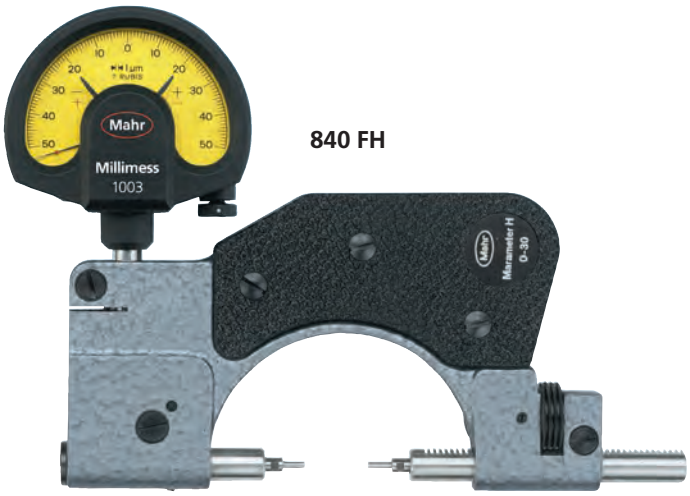
Accessories

Reference Discs 390 see Chapter 13

Gage Blocks see Chapter 13

Holder 840 Fk and **Stand 840 Ff** see Page 9-15

Indicating Snap Gage 840 FH with interchangeable anvils



840 FH

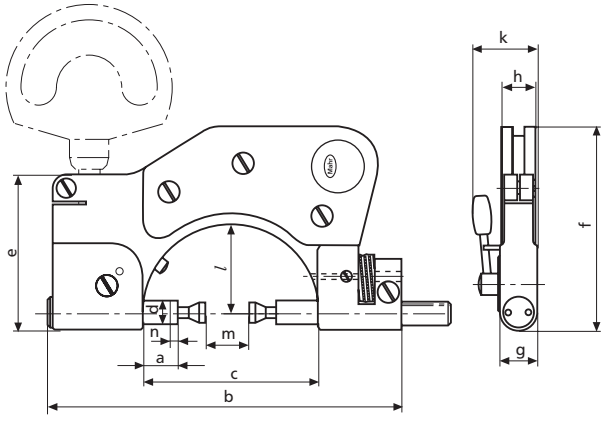
Features

- Measuring spindle and anvil spindle have precision tapered bores for mounting interchangeable anvils 40 He
- For cylindrical parts such as shafts, bolts and spindles
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle and both made from hardened stainless steel
- Maximum wear resistance due to non-contact positioning
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable
- All kinds of measurement problems can be solved with the broad range of interchangeable anvils
- Supplied with: Wooden case, steel flat 903 indicator contact point (for indicating instrument), spanner DIN 902-3.5. Excludes the indicating instrument and anvils

Technical Data

	Measuring range*		Repeatability	Distance of moveable anvil	Measuring force	Order no.**
	mm	*(inch)*	f_w µm	mm	N	
840 FH	0 - 30	***(0 - 1.18")***	≤ 1	2	7.5	**4451000**
	30 - 80	***(1.18 -3")***	≤ 1	2.5	7.5	**4451005**

* *Measuring is dependent upon the length of the anvils being used*
** *Excludes indicating instrument (and anvils)*



Meas. range m (mm)	**840 FH** 0 - 30	30 - 80
a*	12.5	7.5
b	140	193
c	68	110
d	9	10
e	60	60
f	77	103
g	13	13
h	13	13
k	25	28
l	34	59
n**	2	2.5

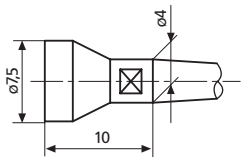
* *In initial position*
** *Distance of moveable anvil*

Interchangeable Anvils for Indicating Snap Gage 840 FH

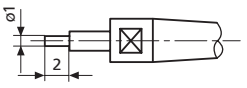
with tapered shank

Catalog no.	Features	Order no.
40 He 0H*	Flat faces	**4152036**
40 He 1	Stepped flat faces	**4152011**
40 He 1H*	Stepped flat faces	**4152033**
40 He 2	Stepped flat faces	**4152012**
40 He 2H*	Stepped flat faces	**4152032**
40 He 3	Discs	**4152013**
40 He 4	Discs with V-groove	**4152014**
40 He 5	Blades	**4152015**
40 He 6	Offset blades	**4152016**
40 He 7	Recessed blades	**4152017**
40 He 8	Recessed flat faces with V-grooves on sleeve	**4152018**
40 He 9	Recessed flat faces with slip on support	**4152019**
40 He 10	With clearance bores	**4152020**
40 He 11	Point	**4152021**

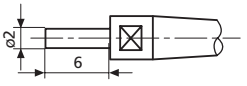
* *Carbide version*



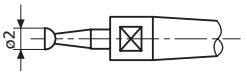
40 He 0H



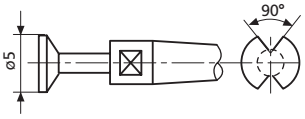
40 He 1



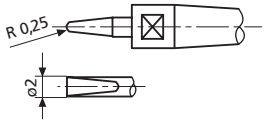
40 He 2



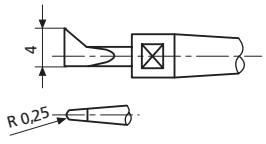
40 He 3



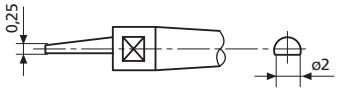
40 He 4



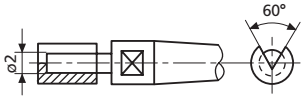
40 He 5



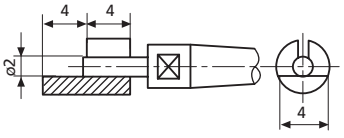
40 He 6



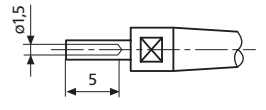
40 He 7



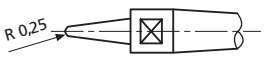
40 He 8



40 He 9



40 He 10



40 He 11

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Dial Comparator		Readings mm / *inch*	Order no. mm / *inch*
Millimess	**1004 / *1004 Z***	5 µm / ***.0001"***	**4333000/*4333900***
Millimess	**1003 / *1003 Z***	1 µm / ***.00005"***	**4334000/*4334900***
Millimess	**1003 XL**	2 µm /	**4334001**
Millimess	**1002 / *1002 Z***	0.5 µm / ***.00002"***	**4335000/*4335900***
Extramess	**2000**	0.2 µm / ***.00001"***	
		0.5 µm / ***.00002"***	**4346000***
		1 µm / ***.00005"***	
Extramess	**2001**	0.2 µm / ***.00001"***	
		0.5 µm / ***.00002"***	**4346100***
		1 µm / ***.00005"***	
µMaxµm II		.0005 mm / ***.00002"***	**2034205****

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7
** 230 V, for 115 V please refer to page 6-5 ** requires contact 4360107*

Accessories

Spanner (Included in scope of supply)
for **840 FH**, to loosen anvils
Order no. **4880210**

Reference Discs 390 see Chapter 13

Gage Blocks see Chapter 13

Holder 840 Fk and **Stand 840 Ff** see Page 9-15

Indicating Snap Gages 840 FG with interchangeable anvils

840 FG

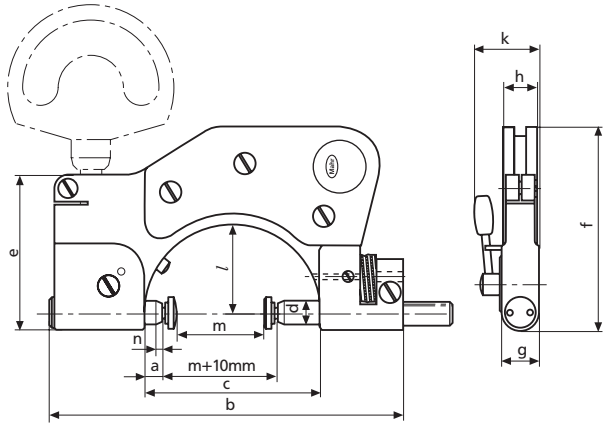
Features

- Measuring spindle and anvil spindle have a M 2.5 connection thread, thus enabling the use of interchangeable anvils that are also used in dial indicators and dial comparators
- For cylindrical parts such as shafts, bolts and spindles
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle and both made from hardened stainless steel
- Maximum wear resistance due to non-contact positioning
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable
- All kinds of measurement problems can be solved with the broad range of interchangeable anvils
- Supplied with: Wooden case, steel flat 903 indicator contact point. Excludes the indicating instrument and anvils

Technical Data

	Measuring range*				Repeatability	Distance of moveable anvil	Measuring force	Order no.**
	mm			*(inch)*	f_w µm	mm	N	
840 FG	0	-	50	***(0 - 2")***	≤ 1	2	7.5	**4454000**
	40	-	90	***(1.57 - 3.57")***	≤ 1	2.5	7.5	**4454001**

* *Measuring is dependent upon the length of the anvils being used*
** *Excludes indicating instrument (and anvils)*



Meas. range m (mm)	**840 FG** 0 - 50	40 - 90
a*	5	6.5
b	140	193
c	68	110
d	9	10
e	60	60
f	77	103
g	13	14
h	13	13
k	25	28
l	34	59
n**	2	2.5

* *In initial position*
** *Distance of moveable anvil*

Interchangeable Anvils for Indicating Snap Gage 840 FG

Catalog no.	Features	Order no.
901 H	Standard contact point with carbide ball, ball dia. 3 mm	**4360002**
902 H	Spherical contact point, with carbide face, R = 6 mm	
	Length *l* in mm	
	10	**4360041**
	15	**4360043**
	20	**4360044**
903 H*	Flat contact point, carbide tipped	
	Length *l* in mm	
	6	**4360101**
	10	**4360103**
	15	**4360105**
	20	**4360106**
904 H	Conical contact point, carbide tipped	**4360131**

906 H **Ball Contact Points**

with carbide ball,
manufacuring tolerance ball dia. 0/-6 µm

Ball dia. d mm	*l* mm	Order no.	Ball dia. d mm	*l* mm	Order no.
1	8.5	**4360150**	5.5	9	**4360161**
1.25	8.5	**4360151**	6	9	**4360162**
1.5	8.5	**4360152**	6.35 (1/4")	9	**4360163**
1.75	8.5	**4360153**	6.5	10	**4360164**
2	8.5	**4360154**	7	10	**4360165**
2.5	8.5	**4360155**	7.5	11	**4360166**
3	8.5	**4360156**	8	11	**4360167**
3.5	8.5	**4360157**	8.5	12	**4360168**
4	8.5	**4360158**	9	12	**4360169**
4.5	8.5	**4360159**	10	13	**4360170**
5	9	**4360160**			

Indicating Instruments

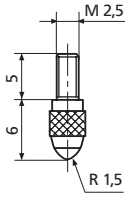
All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Dial Comparator		Readings mm / *inch*	Order no. mm / *inch*
Millimess	**1004 / *1004 Z***	5 µm / ***.0001"***	**4333000/*4333900***
Millimess	**1003 / *1003 Z***	1 µm / ***.00005"***	**4334000/*4334900***
Millimess	**1003 XL**	2 µm /	**4334001**
Millimess	**1002 / *1002 Z***	0.5 µm / ***.00002"***	**4335000/*4335900***
Extramess	**2000**	0.2 µm / ***.00001"***	
		0.5 µm / ***.00002"***	**4346000***
		1 µm / ***.00005"***	
Extramess	**2001**	0.2 µm / ***.00001"***	
		0.5 µm / ***.00002"***	**4346100***
		1 µm / ***.00005"***	
µMaxµm II		.0005 mm / ***.00002"***	**2034205****

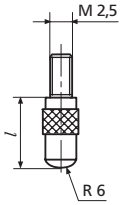
Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7

** 230 V, for 115 V please refer to page 6-5 ** requires contact 4360107*

901 H



902 H



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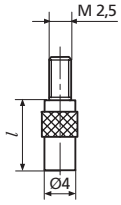
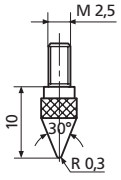


904 H



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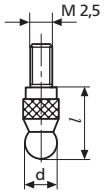

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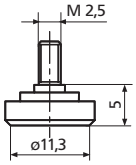

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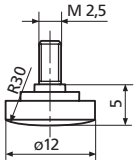
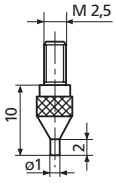


911 H



Catalog no.	Features	Order no.
907	Flat contact plates* steel, dia. 11.3 mm, A = 1 cm²	**4360200**
907 H	Flat contact plates*, carbide tipped, dia. 7 mm	**4360201**
908	Spherical contact plates, steel	**4360210**
908 H	Spherical contact plates, carbide tipped	**4360211**
911 H	Pin contact point, carbide tipped, dia. 1 mm, plan	**4360240**

** When using a flat contact plate the opposite facing anvil must be a spherical contact plate.*

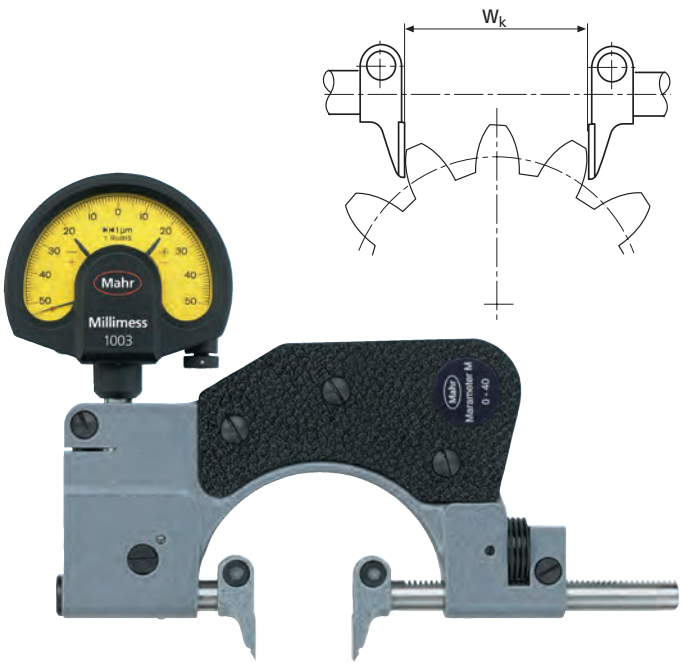
Accessories

Reference Discs 390 see Chapter 13

Gage Blocks see Chapter 13

Holder 840 Fk and **Stand 840 Ff** see Page 9-15

Indicating Snap Gages 840 FM MaraMeter M with measuring jaws



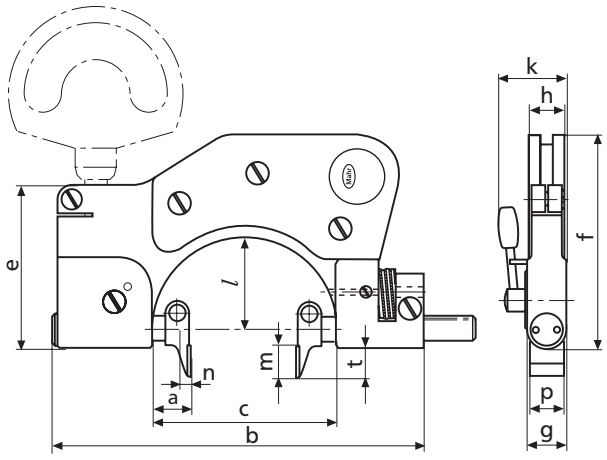
Features

- For diameters of small hubs, registers, shoulders on shafts and groove widths as well as for tooth span Wk as indirect, reference-free determination of tooth thickness on spur gears with straight and helical teeth
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Maximum wear resistance due to non-contact positioning in conjunction with carbide-tipped measuring faces
- Measuring spindle and anvil spindle made of hardened stainless steel; with extending carbide-tipped measuring jaws
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable and extremely versatile, each instrument spans a broad measuring range, within this range any dimension and fit can be very quickly and easily adjusted
- Supplied with: Wooden case, steel flat 903 indicator contact point

Technical Data

	Measuring range mm			(inch)	Repeatability f_w µm	Measuring force N	Measuring face Area mm	Flatness µm	Parallelism µm	Tooth span measurements as per module m	Order no.*
840 FM	0	-	40	***(0 - 1.57")***	1	7.5	12 x 12	≤ 0.5	≤ 2	0.5	**4452000**
	40	-	80	***(1.57 - 3")***	1	7.5	12 x 12	≤ 0.5	≤ 3	0.5	**4452001**
	80	-	130	***(3 - 5")***	1	9	15 x 17	≤ 0.5	≤ 3	1.0	**4452002**
	130	-	180	***(5 - 7")***	1	9	15 x 17	≤ 0.5	≤ 3	1.0	**4452003**

* *Excludes indicating instrument*



Dimensions

Meas. range (mm)	0 - 40	40 - 80	80 - 130	130 - 180
Dist mov. anvil n (mm)	2	2.5	2.5	2.5
a*	14	14	19	15
b	140	193	258	316
c	68	110	162	212
e	60	60	70	75
f	77	103	141	171
g	13	14	16	16
h	13	13	12	12
k	25	28	31	31
l	34	59	87	112
m	12	12	17	17
p	12	12	15	15
t	11	11	17	17

* *In initial position*

Accessories

Indicating instruments, see Page 9-9
Reference Discs 390 see Chapter 13
Gage Blocks see Chapter 13
Holder 840 Fk and **Stand 840 Ff** see Page 9-15

Accessories for Dial Indicators and Dial Comparators

Holder 840 Fk for Dial Indicators and Dial Comparators

- For attaching to the following measuring instruments **840 F/FC, 840 FH, 840 FG, 840 FM** and **852**
- Straight transfer of the spindle movement to the indicator
- Following the Abbe principle allows an even higher degree of accuracy than the already excellent level obtained with the standard set-up employing 90° transmission
- When the indicating instrument is in the shown position it is often easier to read
- For stationary application when in conjunction with the **Stand 840 Ff**

Catalog no.	Suitable for instruments with measuring ranges (mm)					Order no.
	840 F/FC	**840 FH**	**840 FG**	**840 FM**	**852**	
840 Fk/1	0 - 25					**4450050**
840 Fk/2	25 - 60	0 - 30	0 - 50	0 - 40	0 - 45	**4450051**
840 Fk/3	50 - 100	30 - 80	40 - 90	40 - 80	45 - 85	**4450052**
840 Fk/4	100 - 150 150 - 200			80 - 130 130 - 180	85 - 140 140 - 190	**4450053**

Stand 840 Ff

- For stationary application in conjunction with the following measuring instruments **840 F/FC, 840 FH, 840 FG, 840 FM, 840 E** and **852**
- User has both hands free for insertion of work piece and retraction of moving spindle
- Indicating instrument is always in operator's field of vision
- Rugged, rigid cast-iron stand with clamp for locking the indicating snap gage
- Indicating snap gage is locked in mounting hole for dial comparator
- Only in conjunction with **Holder 840 Fk**

Catalog no.	Suitable for instruments with measuring ranges (mm)					Order no.
	840 F/FC	**840 FH**	**840 FG**	**840 FM**	**852**	
840 Ff	0 - 25 25 - 60	0 - 30	0 - 50	0 - 40	0 - 45	**4450020**

Indicating Snap Gages 840 FS MaraMeter S

Features

- For all kinds of cylindrical work pieces, whether directly on a machine tool or in the production control
- Rigid frame; convenient handle with heat insulators open on one end to eliminate heat transfer from user's hand
- Both spindles are made of hardened stainless steel and mounted in long guide ways
- Carbide-tipped measuring faces slightly chamfered at the front to facilitate positioning
- Projects over width of frame for measurement of narrow registers or when measuring directly at shoulders
- Maximum accuracy. Straight transfer of spindle movement to indicator. During the measurement, the weight of the gage rests on the anvil spindle
- Adjustable center stop for automatic alignment
- Indicating instrument is protected against possible impact during handling by a laterally projecting guard
- Direct indication and evaluation of measurement results
- Universally applicable and extremely versatile, each instrument spans a broad measuring range, within this range any dimension and fit can be very quickly and easily adjusted
- Constant measuring force as a result of built-in spring, thus eliminating user influence

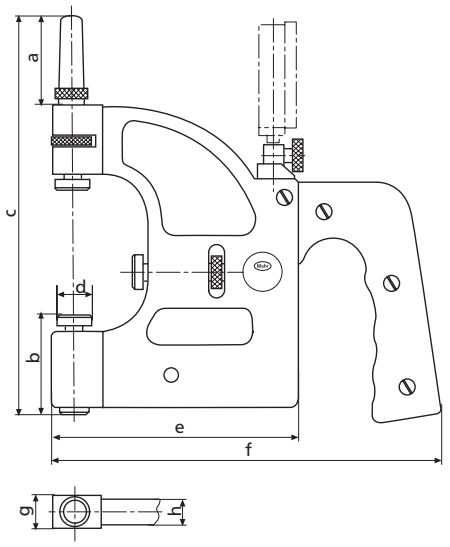
- Supplied with:
  Wooden case, Allen key

Technical Data

	Measuring range				Repeatability f_w	Measuring force	Distance of moveable anvil	Measuring faces		Weight	Order no.*
	mm			*(inch)*	µm	N	mm	Flatness µm	Parallelism µm	kg	
840 FS	10	-	30	***(.39 - 1.18")***	1	13.5	0.7	≤ 0.5	≤ 3	0.6	**4455000**
840 FS	30	-	60	***(1.18 - 2.36")***	1	13.5	0.7	≤ 0.5	≤ 3	0.9	**4455001**
840 FS	60	-	100	***(2.36 - 4")***	1	13.5	0.7	≤ 0.5	≤ 3	1.3	**4455002**
840 FS	100	-	150	***(4 - 6")***	1	15	0.7	≤ 0.5	≤ 3	1.7	**4455003**
840 FS	150	-	200	***(6 - 8")***	1	15	0.7	≤ 0.5	≤ 3	2.0	**4455004**
840 FS	200	-	250	***(8 - 10")***	1	15	0.7	≤ 0.5	≤ 3	2.2	**4455005**
840 FS	250	-	300	***(10 - 12")***	1	15	0.7	≤ 0.5	≤ 3	2.5	**4455006**
840 FS	300	-	350	***(12 - 14")***	1	15	0.7	≤ 0.5	≤ 4	3.3	**4455007**
840 FS	350	-	400	***(14 - 16")***	1	15	0.7	≤ 0.5	≤ 4	3.3	**4455008**
840 FS	400	-	450	***(16 - 18")***	1	15	0.7	≤ 0.5	≤ 4	4.3	**4455009**
840 FS	450	-	500	***(18 - 20")***	1	15	0.7	≤ 0.5	≤ 4	4.7	**4455010**

** Excludes indicating instrument*

Technical Data



Dimensions

Meas. range mm	dia. d	a	b	c	e	f	g	h
10 - 30	18	37	46	154	87	161	17	15
30 - 60	18	45	51	199	122	196	17	15
60 - 100	22	56	62	260	154	228	20	18
100 - 150	22	71	62	335	189	263	20	18
150 - 200	22	71	62	385	214	288	20	18
200 - 250	22	71	62	436	248	322	20	18
250 - 300	22	71	62	487	280	354	20	18
300 - 350	22	71	62	537	310	384	20	18
350 - 400	22	71	62	587	350	424	20	18
400 - 450	22	71	62	637	380	454	20	18
450 - 500	22	71	62	687	410	484	20	18

Accessories

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Dial Comparator		Readings mm / *inch*	Order no. mm / *inch*
Millimess	**1004 / *1004 Z***	5 µm / ***.0001"***	**4333000/*4333900***
Millimess	**1003 / *1003 Z***	1 µm / ***.00005"***	**4334000/*4334900***
Millimess	**1003 XL**	2 µm /	**4334001**
Millimess	**1002 / *1002 Z***	0.5 µm / ***.00002"***	**4335000/*4335900***
Extramess	**2000**	0.2 µm / ***.00001"***	
		0.5 µm / ***.00002"***	**4346000***
		1 µm / ***.00005"***	
Extramess	**2001**	0.2 µm / ***.00001"***	
		0.5 µm / ***.00002"***	**4346100***
		1 µm / ***.00005"***	
µMaxµm II		.0005 mm / ***.00002"***	**2034205****

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7
** 230 V, for 115 V please refer to page 6-5 ** requires contact 4360107*

2000

1003

Electronic Snap Gage 840 E MaraMeter E for extremely high accuracy

Features

- Inductive measuring system incorporated directly into frame
- Readings selectable down to 0.01 µm
- Rugged, forged steel frame with heat insulators
- Measuring spindle mounted in extra long guideway with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle made of hardened stainless steel; measuring faces carbide-tipped
- Adjustable center stop for automatic alignment
- Extremely accurate due to the straight transfer of spindle movement to the inductive measuring system according to the Abbe principle
- Universally applicable and extremely versatile, each instrument spans a broad measuring range, within this range any dimension and fit can be very quickly and easily adjusted
- Maximum wear resistance due to non-contact positioning in conjunction with carbide-tipped measuring faces
- Constant measuring force as a result of built-in spring, thus eliminating user influence

- Supplied with:
  Wooden case

Technical Data

	Measuring range mm	Readings / Resolution adjustable to* µm	Measuring force N	Measuring faces dia. mm	Repeatability f_w µm	Measuring faces Parallelism µm	Order no.**
840 E	0 - 25	0.01	4.5	7.5	≤ 0.1	≤ 0.3	**4453000**

* *Depending upon which indicating instrument is being used*
** *Excludes indicating instrument*

Accessories

Reference Discs 390 see Chapter 13

Gage Blocks see Chapter 13

Stand 840 Ff see Page 9-15

Recommended indicating instruments:
We recommend the following Electrical indicating instruments: C 1200, C 1216 M, C 1208 M and C 1240 M; please refer to Chapter 7, Millimar.

C 1200

C 1240 M

Indicating Bench Snap Gage 852 TS

Applications

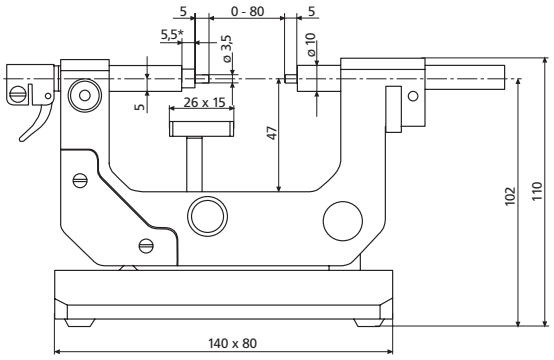
- For rapid measurements of diameters of cylindrical parts (shafts, bolts and shanks)
- For measuring pitch, root and outside diameters of all kinds of external threads as well as serrations
- For thickness and length measurement
- Particularly suited for batch produced parts

Features

- Rugged steel frame, can be inclined up to 45° from the sturdy base
- Measuring spindle and anvil spindle are both made of hardened stainless steel, with mounting bore for insertion of interchangeable anvils
- Anvil spindle can easily be fine adjusted
- Height adjustable stop
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable and extremely versatile, each instrument spans a broad measuring range

- Scope of supply:
  TC-tipped -anvils
  dia. D= 3.5 mm,
  Dial Comparator 1003

Technical Data



Measuring range** mm	(inch)	Repeatability f_w µm	Retraction mm	Measuring force N	Measuring face Parallelism µm	Mounting dia.	Order no.
0 - 80	***(0 - 3.15")***	1	1.2	6.5	≤ 2	8 mm	**4510030*** **
						8 mm	**4510031 +**
						.375"	**4510035 +**

* *In initial position* ** *Depending upon which anvils are being used* *** *Delivery with a different indicating instrument is available upon request*
\+ *Excludes indicating instrument, order indicating instrument seperately.*

Accessories

	Order no.
Standard TC-tipped anvils, dia. D= 3.5 mm	**4510840**

Interchangeable Anvils please refer to Pages 9-24 and 9-25

Indicating Thread Snap Gage 852

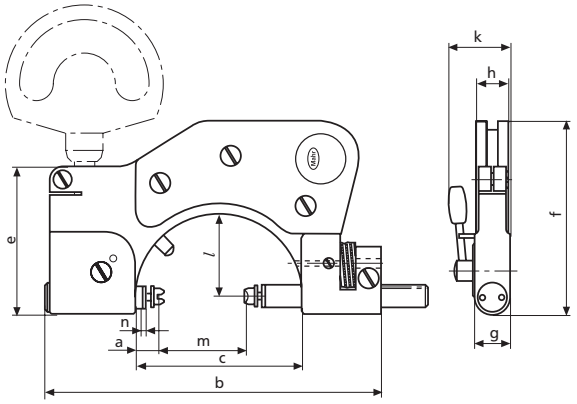
Features

- For measuring pitch, root and outside diameters of all kinds of external threads as well as serrations
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle are both made of hardened stainless steel, with mounting bore for insertion of interchangeable anvils
- Adjustable center stop for automatic alignment
- Maximum wear resistance due to non-contact positioning
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable and extremely versatile. each instrument spans a broad measuring range
- Supplied with:
  Wooden case, steel flat 903 indicator contact point

Technical Data

	Measuring range* mm			(inch)	Repeatability f_w µm	Measuring force N	Order no.**
852	0	-	45	***(0 - 1.77")***	1	7.5	**4510000**
852	45	-	85	***(1.77 - 3.34")***	1	7.5	**4510001**
852	85	-	140	***(3.34 - 5.51")***	1	9	**4510002**
852	140	-	190	**(5.51 - 7.48")**	1	9	**4510003**

* *Depending upon which anvils are being used, purchase seperately*
** *Excludes indicating instrument and anvils*



Meas. range m (mm)	0-45	45-85	85-140	140-190
Dist mov. anvil n (mm)	2	2.5	2.5	2.5
a*	13	8	10	6
b	140	193	258	316
c	68	110	162	212
e	60	60	70	75
f	77	103	141	171
g	13	14	16	16
h	13	13	12	12
k	25	28	31	31
l	34	59	87	112

a = In initial position*

Technical Data

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Dial Comparator		Readings mm / *inch*	Order no. mm / *inch*
Millimess	**1004 / *1004 Z***	5 µm / ***.0001"***	**4333000/*4333900***
Millimess	**1003 / *1003 Z***	1 µm / ***.00005"***	**4334000/*4334900***
Millimess	**1003 XL**	2 µm	**4334001**
Millimess	**1002 / *1002 Z***	0.5 µm / ***.00002"***	**4335000/*4335900***
Extramess	**2000**	0.2 µm / ***.00001"***	
		0.5 µm / ***.00002"***	**4346000***
		1 µm / ***.00005"***	
Extramess	**2001**	0.2 µm / ***.00001"***	
		0.5 µm / ***.00002"***	**4346100***
		1 µm / ***.00005"***	
µMaxµm II		.0005 mm / ***.00002"***	**2034205****

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7
** 230 V, for 115 V please refer to page 6-5 ** requires contact 4360107*

2000

1003

Accessories

Interchangeable Anvils please refer to Pages 9-19
Holder 840 Fk and **Stand 840 Ff** (for 0-45 mm) see Page 9-15

Indicating Thread Snap Gage 853 for taps

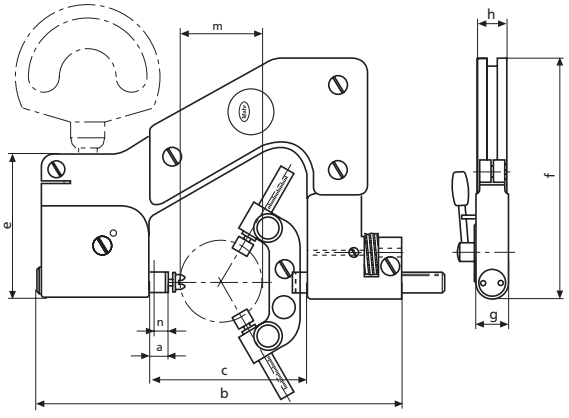
Features

- For pitch, root and outside diameters on taps in conjunction with inter-changeable anvils
- Measuring spindle mounted in long guideway, lever-controlled retraction with mounting bore for inter-changeable anvils
- Anvil spindle adjustable with thumbscrew via worm and rack, for mounting inter-changeable support yokes
- Measuring spindle and anvil spindle are made of hardened stainless steel
- Further features are similar to the model 852; for details please refer to Page 9-20
- Supplied with: Wooden case, steel flat 903 indicator contact point

Technical Data

	Measuring range mm			(inch)	Repeatability f_w µm	Measuring force N	Order no.*
853	1.2	-	35	***(.04 - 1.37")***	2	7.5	**4511000**
853	35	-	75	***(1.37 - 3")***	2	7.5	**4511001**

** Excludes indicating instrument and the support yokes 853 q & anvils*



Meas. range m (mm)	1.2-35	35-75
Dist mov. anvil n (mm)	8	8
a*	12	11.5
b	152	192
c	66	110
e	60	65
f	98	125
g	14	14
h	11.5	14

a = In initial position*

Technical Data

Interchangeable Support Yokes 853 q

Depending upon the number of flutes, allowance has to be made for a compensation factor when reading the result. See table below:

	No. of flutes of taps	For measuring range mm			Compensation factor**	Order no.
853 qk 3	3	1.2	-	35	x 1	**4511024**
853 qk 5	5	1.2	-	35	x 1.34	**4511026**
853 qk 7	7	1.2	-	35	x 1.42	**4511028**
853 qg 3	3	35	-	75	x 1	**4511025**
853 qg 5	5	35	-	75	x 1.34	**4511027**
853 qg 7	7	35	-	75	x 1.42	**4511029**

** *Allowance is to be made for other compensation methods when using the Holder 840 Fk*

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used.
Recommended are:

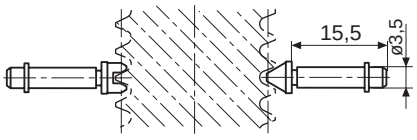
		Readings	Order no.
MarCator	**810 S**	0.001 mm	**4311000**
Millimess	**1004 / *1004 Z***	5 µm / ***.0001"***	**4333000 / *4333900***
Millimess	**1010 / *1010 Z***	0.01 mm / ***.0005"***	**4332000 / *4332900***
MarCator	**1087R / *1087 ZR***	1 µm / ***.00005"***	**4337660 / *4337670***

Accessories

Interchangeable Anvils see from Pages 9-24 and 9-25

Interchangeable Anvils for 852, 852 TS and 853

For pitch, root and outside diameters. Special wear-resistant hardened steel. With cylindrical mounting shank and retainer ring which ensures locking while permitting rotation in bore of indicating snap gages.



Sets consist of:

For pitch diameters
852 - 1 V-anvil and 1 blade
853 - 1 V-anvil and 2 radiused blades

For root diameters
852 - 1 V-anvil and 1 blade
853 - 1 V-anvil and 2 blades

For outside diameters
852 - 2 flat-face anvils
853 - 3 flat-face anvils

Anvils for pitch diameters for 852 and 852 TS

Metric thread (60°)			Whitworth thread (55°)			American UST thread (60°)		
Pitch	V-anvil	Blade	Pitch range	V-anvil	Blade	Pitch range	V-anvil	Blade
mm	**Order no.**	**Order no.**	tpi	**Order no.**	**Order no.**	tpi	**Order no.**	**Order no.**
0.2*	**4173007**	**4173707**	40 - 32	**4173043**	**4173743**	60 - 48	**4173113**	**4173813**
0.25*	**4173008**	**4173708**	32 - 24	**4173044**	**4173744**	48 - 40	**4173114**	**4173814**
0.3*	**4173009**	**4173709**	24 - 18	**4173045**	**4173745**	40 - 32	**4173115**	**4173815**
0.35*	**4173010**	**4173710**	18 - 14	**4173046**	**4173746**	32 - 24	**4173116**	**4173816**
0.4*	**4173011**	**4173711**	14 - 10	**4173047**	**4173747**	24 - 18	**4173117**	**4173817**
0.45*	**4173012**	**4173712**	10 - 7	**4173048**	**4173748**	18 - 14	**4173118**	**4173818**
0.5 - 0.7	**4173000**	**4173700**	7 - 4.5	**4173049**	**4173749**	14 - 10	**4173119**	**4173819**
0.7 - 1	**4173001**	**4173701**	4.5 - 3	**4173050**	**4173750**	10 - 7	**4173120**	**4173820**
1.25 - 2	**4173002**	**4173702**	3 - 2.5	**4179408**	**4179410**	7 - 4.5	**4173121**	**4173821**
2 - 3.5	**4173003**	**4173703**				4.5 - 3	**4173122**	**4173822**
3.5 - 5	**4173004**	**4173704**						
5 - 7	**4173005**	**4173705**						
7 - 9	**4173006**	**4173706**						

Anvils for pitch diameters for Indicating Thread Snap Gage 853

Metric thread (60°)			Whitworth thread (55°)			American UST thread (60°)		
Pitch	V-anvil	Blade	Pitch range	V-anvil	Blade	Pitch range	V-anvil	Blade
mm	**Order no.**	**Order no.**	tpi	**Order no.**	**Order no.**	tpi	**Order no.**	**Order no.**
0.2	**4173051**	**4174007**	40 - 32	**4173043**	**4176043**	60 - 48	**4173124**	**4176113**
0.25	**4173052**	**4174008**	32 - 24	**4173044**	**4176044**	48 - 40	**4173125**	**4176114**
0.3	**4173053**	**4174009**	24 - 18	**4173045**	**4176045**	40 - 32	**4173115**	**4176115**
0.35	**4173054**	**4174010**	18 - 14	**4173046**	**4176046**	32 - 24	**4173116**	**4176116**
0.4	**4173055**	**4174011**	14 - 10	**4173047**	**4176047**	24 - 18	**4173117**	**4176117**
0.45	**4173056**	**4174012**	10 - 7	**4173048**	**4176048**	18 - 14	**4173118**	**4176118**
0.5 - 0.7	**4173000**	**4174000**	7 - 4.5	**4173049**	**4176049**	14 - 10	**4173119**	**4176119**
0.7 - 1	**4173001**	**4174001**	4.5 - 3	**4173050**	**4176050**	10 - 7	**4173120**	**4176120**
1.25 - 2	**4173002**	**4174002**	3 - 2.5	**4179408**	**4179411**	7 - 4.5	**4173121**	**4176121**
2 - 3.5	**4173003**	**4174003**				4.5 - 3	**4173122**	**4176122**
3.5 - 5	**4173004**	**4174004**						
5 - 7	**4173005**	**4174005**						
7 - 9	**4173006**	**4174006**						

Carbide anvils for 852, 852TS and 853

1.25 - 2	**4511105**	**4511104**
2 - 3.5	**4511108**	**4511107**
3.5 - 5	**4511140**	**4511139**
5 - 7	**4511142**	**4511141**

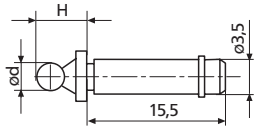
** V-anvil covers 3 pitches*

Interchangeable Anvils for 852 and 852 TS

Ball Anvils

For measuring gears and for special applications. Carbide ball. With cylindrical mounting shank and retainer ring.
For mounting into mounting bores of thread micrometers 40 Z and 852.

Shank dia. 3.5 mm
Shank length 15.5 mm
Manufacturing tolerance
Ball dia. ± 2 µm



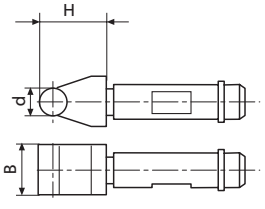
dia. **d** mm	**H** mm	**Order no.**	dia. **d** mm	**H** mm	**Order no.**	dia. **d** mm	**H** mm	**Order no.**
0.5	5.0	**4179150**	1.65	6.2	**4179168**	3.048	7.5	**4179182**
0.551	5.1	**4179151**	1.7	6.2	**4179169**	3.2	7.7	**4170570**
0.62	5.1	**4179152**	1.75	6.3	**4170553**	3.25	7.8	**4170566**
0.623	5.1	**4179153**	1.782	6.3	**4179170**	3.4	7.9	**4179183**
0.63	5.1	**4179154**	1.8	6.3	**4179171**	3.5	8.0	**4170558**
0.722	5.2	**4179155**	1.829	6.3	**4179172**	3.658	8.2	**4179184**
0.862	5.4	**4179156**	1.9	6.4	**4179173**	3.7	8.2	**4170571**
0.895	5.4	**4179157**	2	6.5	**4170554**	4	8.5	**4170559**
0.965	5.5	**4179158**	2.032	6.5	**4170568**	4.5	9.0	**4170560**
1	5.5	**4170550**	2.2	6.7	**4170569**	4.835	9.3	**4179185**
1.1	5.6	**4179159**	2.25	6.8	**4170564**	5	9.5	**4170561**
1.118	5.6	**4179160**	2.284	6.8	**4179174**	5.25	9.8	**4179186**
1.125	5.6	**4179161**	2.386	6.9	**4179175**	5.486	10.0	**4179187**
1.25	5.8	**4170551**	2.438	6.9	**4179176**	5.5	10.0	**4170562**
1.35	5.9	**4179162**	2.5	7.0	**4170556**	6	10.5	**4170563**
1.372	5.9	**4179163**	2.667	7.2	**4179177**	6.096	10.6	**4179188**
1.385	5.9	**4179164**	2.704	7.2	**4179178**	6.35	10.9	**4179189**
1.5	6.0	**4170552**	2.713	7.2	**4179179**	6.5	11.0	**4170567**
1.524	6.0	**4179165**	2.721	7.2	**4179180**	7	11.5	**4170572**
1.54	6.0	**4179166**	2.743	7.2	**4179181**	8	12.5	**4170573**
1.6	6.1	**4179167**	2.75	7.3	**4170565**	9	13.5	**4170574**
			3	7.5	**4170557**	10	14.5	**4170575**

Further sizes are available upon request (material: steel or carbide)

Roller Blades

For measuring gears and for special applications. The measuring roller is made of carbide.
To be mounted in the mounting bores of the 40 Z and 852.

Shank dia. 3.5 mm
Shank length 15.5 mm
Manufacturing tolerance
Ball dia. ± 2 µm



Further sizes are available upon request (material: steel)

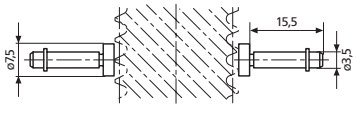
dia. **d** mm	**Dimension H** mm	**Dimension B** dia. mm	**Order no.**
1	5.5	5	**4510200**
1.25	5.8	5	**4510201**
1.5	6.0	5	**4510202**
1.75	6.3	5	**4510203**
2	6.5	5.5	**4510204**
2.5	7.0	5.5	**4510206**
3	7.5	5.5	**4510207**
3.5	8.0	5.5	**4510208**
4	8.5	5.5	**4510209**
4.5	9.0	5.5	**4510210**
5	9.5	6	**4510211**
5.5	10.0	6	**4510212**
6	10.5	6	**4510213**

For outside diameters

Anvil 40 Za, flat

Measuring face dia. with 853 smallest measurable O.D. dia. 7.5 mm / 5 mm

Hardened steel **Order no.** **4173210**
Carbide tipped **Order no.** **4511190**



Portable Thickness Gages 22 P

Portable measurement of sheet materials and small parts

Features

- Indicator built into gage frame for maximum ruggedness.
- Lift-lever for one-hand operation.
- Continuous reading dials with revolution counter for absolute measurement of thin materials, plastic films, a small parts.
- 6.3 mm / .25" diameter, flat steel contacts.
- Digital models can be Left/Right hand operated or front mounted and used with BA-26 Stand for bench applications.

22P-15

2057541 with **4337651 1086 ZR** Digital Indicator (front mounted) and BA-26 Stand (Stand not included)

2057541 with **4337651 1086 ZR** Digital Indicator

Technical Data

Metric	Inch	Capacity mm	/ *inch*	Throat Depth mm	/ *inch*	Graduation mm	/ *inch*
22P-10M	**22P-11**	0 - 2.54	/ ***0 - .10"***	28.6	/ ***1.13"***	.002	/ ***.0001"***
22P-15M	**22P-15**	0 - 12.70	/ ***0 - .50"***	50	/ ***2"***	.01	/ ***.001"***
22P-20M	**22P-20**	0 - 25	/ ***0 - 1"***	50	/ ***2"***	.01	/ ***.001"***
2057541*		25	/ ***0 - 1"***	50	/ ***2"***	.001 (Resolution)	/ ***.00005"***

* *integrated wireless option available, contact MF Technical Assistance*

Portable Thickness Gages 26 P

26P-7

Features

- Push-down movement.
- Molded body fits shape of hand; built-in indicator.
- Gage is normally open for easy part entry. Push-down button to close the contacts.
- Rugged and compact for roving inspection.
- 6.3 mm / .25" diameter, flat steel contacts.

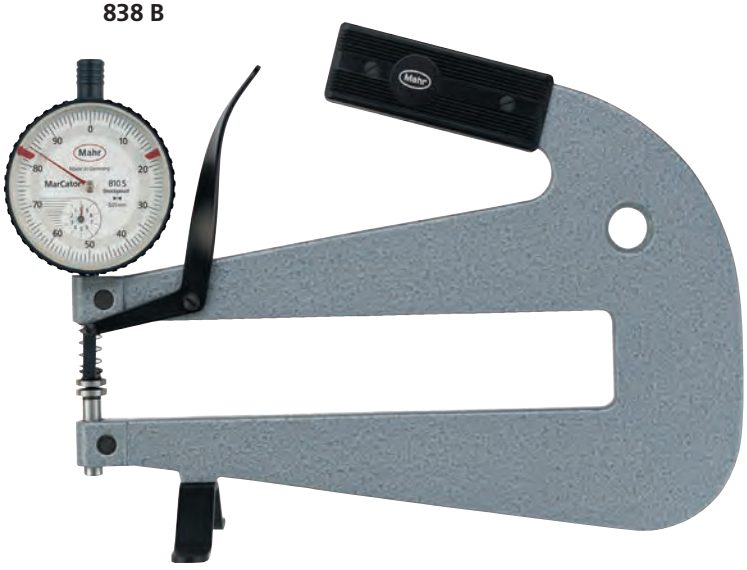
Technical Data

Metric	Inch	Capacity mm / *inch*	Throat Depth mm / *inch*	Graduation mm / *inch*
26P-7M	**26P-7**	0 - 7.6 / ***0 - .30"***	16 / ***.63"***	.01 / ***.001"***

Portable Thickness Gages 838

838 A

838 B



Features

- Rugged sturdy frame made from hard aluminum
- Built-in Digital or Dial Indicator
- With a lifting lever for the moveable upper measuring spindle
- Convenient heat insulated handle, open at one end
- Versions with a throat depth of 200 mm have a removable stand

Thickness Gage 838 A

- With flat measuring faces
- For measuring soft materials for example; foil, felt, rubber, paper and cardboard

Thickness Gage 838 B

- With spherical measuring faces
- For measuring hard materials for example; sheet metal, hardboard, wooden panels and panes of glass

Technical Data

	Throat depth		Measuring range		Measuring face dia.	Measuring face radius	Order no. with Indicator **810**	Order no. with Indicator **1075 R**	Order no. **Wooden case**
	mm	*(inch)*	mm	*(inch)*	mm	mm	0.01 mm Res	0.005mm/.0001" Res	
838 A	50	***(2")***	0 - 20	***(0 - .750")***	11.3 = 1 cm²	-	**4495000**	**4495120**	**4495050**
	100	***(4")***	0 - 20	***(0 - .750")***	11.3 = 1 cm²	-	**4495001**	**4495121**	**4495051**
	200	***(8")***	0 - 20	***(0 - .750")***	11.3 = 1 cm²	-	**4495002**	**4495122**	**4495052**
	50	***(2")***	0 - 20	***(0 - .750")***	20 = 3.14 cm²	-	**4495103**	**4495125**	**4495050**
	100	***(4")***	0 - 20	***(0 - .750")***	20 = 3.14 cm²	-	**4495104**	**4495126**	**4495051**
	200	***(8")***	0 - 20	***(0 - .750")***	20 = 3.14 cm²	-	**4495105**	**4495127**	**4495052**
	50	***(2")***	0 - 20	***(0 - .750")***	30 = 7.06 cm²	-	**4495109**	**4495130**	**4495050**
	100	***(4")***	0 - 20	***(0 - .750")***	30 = 7.06 cm²	-	**4495110**	**4495131**	**4495051**
	200	***(8")***	0 - 20	***(0 - .750")***	30 = 7.06 cm²	-	**4495111**	**4495132**	**4495052**
838 B	50	***(2")***	0 - 20	***(0 - .750")***	12	30	**4495010**	**4495135**	**4495050**
	100	***(4")***	0 - 20	***(0 - .750")***	12	30	**4495011**	**4495136**	**4495051**
	200	***(8")***	0 - 20	***(0 - .750")***	12	30	**4495012**	**4495137**	**4495052**

838 AB

Features

- Rugged sturdy frame made from hard aluminum
- Built-in Digital or Dial Indicator or Dial Comparator
- With a lifting lever for the moveable upper measuring spindle
- Convenient heat insulated handle, open at one end

Thickness Gage 838 AB

- Lower measuring face is flat
- Upper measuring face is spherical
- For measuring hard materials for example; sheet metal and hardboard

Technical Data

	Throat depth mm	Throat depth *(inch)*	Measuring range mm	Measuring range *(inch)*	Measuring face dia. mm lower	Measuring face radius mm upper	Order no. with Indicator **810** 0.01 mm Res	Order no. with Indicator **1075 R** 0.005mm/.0001" Res	Order no. **Wooden case**
838 AB flat / spherical	50	***(2")***	0 - 20	***(0 - .750")***	11.3 = 1 cm²	30	**4495504**	**4495140**	**4495050**
	100	***(4")***	0 - 20	***(0 - .750")***	11.3 = 1 cm²	30		**4495141**	**4495051**

	Throat depth mm	Throat depth *(inch)*	Measuring range mm	Measuring range *(inch)*	Measuring face dia. mm lower	Measuring face radius mm upper	Order no. with Indicator **1075 R** 0.001mm/.00005" Res	Order no. with Comparator **1003** 1 µm Res	Order no. **Wooden case**
838 AB flat / spherical	50	***(2")***	0 - 20	***(0 - .750")***	11.3 = 1 cm²	30	**4495145**	**4495519**	**4495050**
	100	***(4")***	0 - 20	***(0 - .750")***	11.3 = 1 cm²	30	**4495146**	**4495517**	**4495051**

Dead Load Thickness Gages 57B

2057551*

Features

- Solid casting with ribbed frame provides strength and rigidity for accurate measurements.
- 0.003 mm / .0001" parallelism with tables up to 19 mm / .75" diameter.
- 283 g / 10 oz. dead load weight for constant gaging pressure.
- 10 mm / .407" diameter flat upper 54.0 mm / 2.125" lower contacts.
- Indicator mounts with adjustable back for quick positioning for each gaging requirement.
- Available with Dial Indicator or Digital Electronic Indicator.
- Gage is supplied with a lift lever so work can be easily placed between the table and contact.
- Four-inch throat depth for part clearance.

Technical Data

Order no. Metric	Inch	Capacity mm / ***inch***	Description
57B-14M	**57B-14**	0 - 2.5 / ***0 - .10"***	Dial Indicator readout with 2.5 mm / .10" sensitive range and .002 mm / .0001" grads.
57B-15M	**57B-15**	0 - 25 / ***0 - 1"***	Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm / .001"grads.
2057551*			1086 Ri Digital Indicator with 25 mm / 1" range and .001 mm / .00005" resolution.

Alternate Indicators and contact points available upon request.
Contact Mahr Federal.
** Integrated wireless*

Wire Insulation Thickness Gages 57B

For checking wall thickness of wire insulation and other small-diameter tubular parts

2057550

Features

- Using the basic design of the Model 57B-13 (Model 57B-13M — Metric) Gage, the lower contact is PT-103, 1.10 mm / .043" diameter rod, mounted horizontally. The upper contact is a flat chisel contact , in line with the rod. By slipping tubular parts onto the lower contact, the gage can measure the thickness of the wall of the tube. An auxiliary weight on the Indicator provides a total dead-load weight of 25 grams. (Replacement lower rod: PS-43)

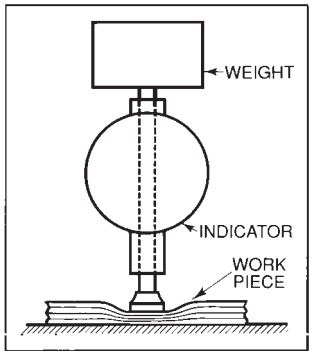
Technical Data

Order no. Metric	Inch	Capacity mm / *inch*	Description
57B-13M	**57B-13**	7.62 / ***0 - .30"***	Dial Indicator readout with 7.6 mm / .30" sensitive range and 0.01 mm / .0005" grads.
2057550			1086 Digital Indicator with 25 mm / 1" range and 0.001 mm / .00005" resolution.
Options			
PT-2245			0.050 mm / .02" diameter Pin, Lower Contact Assembly

Measuring Compressible Materials

Compressible materials such as paper, plastics, rubber or fabrics must be measured under controlled conditions. Many materials have measurement standards specified by A.S.T.M., U.L., or other industry standards organizations. Measurement standards specify dead load weight, upper and lower contact configurations, and Indicator resolution.

Series 57B Gages are easily modified to meet most of these industry standards. Mahr Federal has on file designs for the measurement of paper, latex foam rubber, sponge rubber, vulcanized rubber, asbestos tape and cloth, sheet and roll felt, and many other materials. When inquiring, specify A.S.T.M. Specification Number, if possible.



Thickness Gages 57B Bench Style

57B-12

Features

- Solid casting with ribbed frame provides strength and rigidity for accurate measurements.
- Gage is furnished with a lift lever so work can be easily placed between the contacts.
- Large 54 mm/ 2.125" diameter lower anvil provides convenient stage for small parts or flat materials.
- 4.75 mm/ .187" diameter radiused upper contact normally provided.
- 102 mm/ 4" throat depth for part clearance.
- Indicator mounts with adjustable back for quick positioning for each gaging requirement.
- Available with Dial Indicator or Digital Electronic Indicator.

Technical Data

Order no. Metric	Inch	Capacity mm / *inch*	Description
57B-11M	**57B-11**	0 - 25 / ***0 - 1"***	Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm /.001"grads.
2057548			1086 Digital Indicator with 25 mm/ 1" range and .001 mm / .00005" resolution.
EMD-57B-11		0 - 21.5 / ***0 - .85"***	Maxμm/// Digital Indicator with selectable range and resolution, 2033101.
EDI-57B-11			1086 Digital Indicator with 2 mm / .08" sensitive range, .0005 mm / .00002" resolution.
57B-12M	**57B-12**	0 - 12.5 ***/ 0 - .5"***	Dial Indicator readout with 12.50 mm/ .50" sensitive range and .01 mm / .0005" grads.
2057549			1086 Digital Indicator with 12.50 mm / .50" range and .001 mm / .00005" resolution.

Alternate Indicators and contact points available upon request.
Contact Mahr Federal.

Caliper Gages 49P

The most widely used gages for checking medium tolerance dimensions on patterns, castings, forgings, dies, sheet metal.

49P

Features

- The most widely used gages for checking medium tolerance dimensions on patterns, castings, forgings, dies, sheet metal.
- Generous clearance on jaws reaches over non-measured part protrusions for easy access to areas where thickness must meet critical dimensional specs.
- Retraction lever is conveniently located for one-hand operation.
- .02 mm or .1 mm / .01", .001", or 1/64" grads. available.
- Continuous reading dials with revolution counters normally provided.
- Cylindrical radius steel contact tips normally furnished.

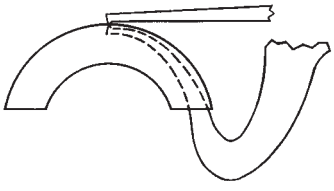
Technical Data

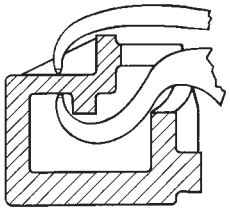
Order no. Metric	Inch	Capacity* mm / *inch*	Gaging Depth mm / *inch*	Minimum Graduation mm / *inch*	A	B
49P-17M	**49P-17**	0 - 50 / ***0 - 2"***	100 / ***4"***	0.02 / ***.001"*** grads.	1-1/4	1-1/4
49P-19M	**49P-19**	0 - 50 / ***0 - 2"***	200 / ***8"***	0.02 / ***.001"*** grads.	2-9/16	2
49P-1M	**49P-1**	0 - 75 / ***0 - 3"***	100 / ***4"***	0.1 / ***.01"*** grads.	1-1/4	1-1/4
49P-2M	**49P-2**	0 -75 / ***0 - 3"***	200 / ***8"***	0.1 / ***.01"*** grads.	2-9/16	2

* *Ordinarily this gage is used as a comparator. The actual measuring range of the instrument is 38 mm / 1.50".*
If the gage is used for direct linear measurement, chordal errors may need to be corrected.
Contact Mahr Federal Technical Assistance for details.

Special Applications

Series 49P and 149P Caliper Gages have many design possibilities. Specially shaped arms of various lengths can be designed to reach inaccessible spots or get around obstructions to make measurements possible which might otherwise go unchecked. For alternate contact shapes or materials, alternate capacities and gaging depths, and special designs to meet your application contact Mahr Federal Technical Assistance.





Gages (Metric) for External Measurement 838 TA to measure thickness and wall thicknesses

Features

- Contact points are made from carbide
- Absolute measuring instrument
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- IP protection class IP65 according to EN 60529

- Supplied with: Test certificate

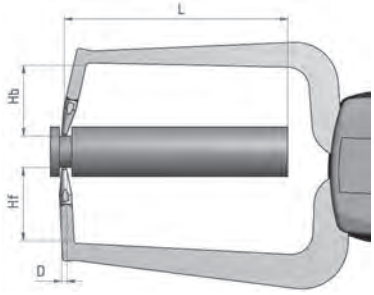
IP65

Application

- For measuring thicknesses and wall thicknesses

Technical Data and Dimensions

Measuring range	Meb	mm	0 - 10	0 - 20	0 - 20	0 - 50	0 - 50
Readings	Skw	mm	0.005	0.01	0.01	0.05	0.05
Error limit	G	mm	0.015	0.03	0.03	0.05	0.05
Repeatability limit	r	mm	0.005	0.01	0.01	0.025	0.025
Measuring depth	L	mm	35	85	85	167	169
Contact point - length (move.)	Hb	mm	19.1	24.6	24.6	30	30
Contact point - length (fixed)	Hf	mm	18.6	24.6	2.5	30	4.3
Contact point - ball dia.	D	mm	1.5	1.5	1.5	3	3
Measuring force	F	N	0.8 - 1.2	1.1 - 1.6	1.1 - 1.6	0.8 –1.7	0.8 –1.7
Order no.			**4495550**	**4495551**	**4495552**	**4495555**	**4495556**

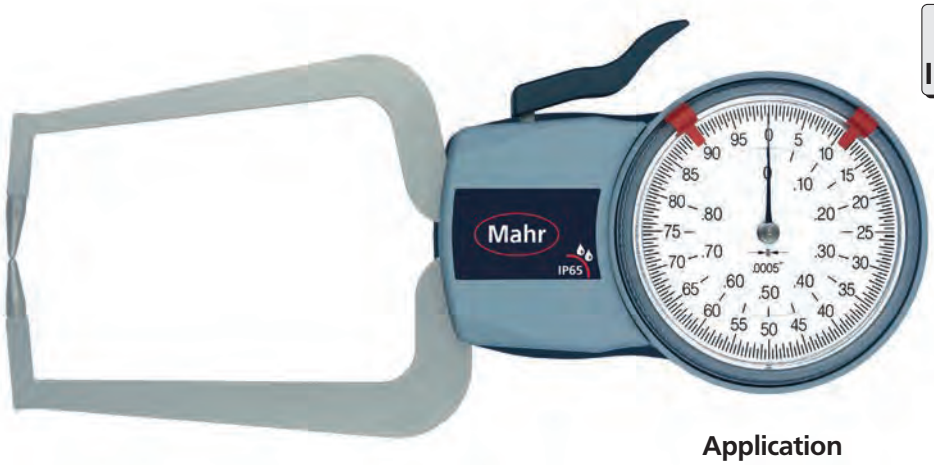


Gages (Inch) for External Measurement 838 TA to measure thickness and wall thicknesses

Features

- Contact points are made from carbide
- Absolute measuring instrument
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- IP protection class IP65 according to EN 60529

- Supplied with: Test certificate



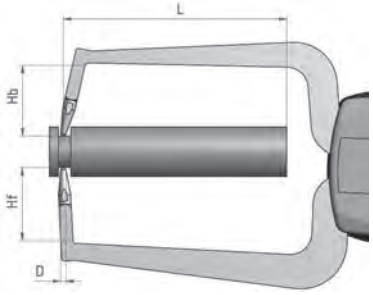
IP65

Application

- For measuring thicknesses and wall thicknesses

Technical Data and Dimensions

Measuring range	Meb	***inch***	***0 - .40"***	***0 - .80 "***	***0 - .80"***	***0 - 2.0"***	***0 - 2.0"***
Readings	Skw	***inch***	***.0002"***	***.0005"***	***.0005"***	***1"***	***1"***
Error limit	G	***inch***	***.0008"***	***.0015"***	***.0015"***	***2"***	***2"***
Repeatability limit	r	***inch***	***.0002"***	***.0005"***	***.0005"***	***.001"***	***.001"***
Measuring depth	L	***inch***	***1.37"***	***3.2"***	***3.2"***	***6.6"***	***6.7"***
Contact point - length (move.)	Hb	***inch***	***.75"***	***.97"***	***.97"***	***1.18"***	***1.18"***
Contact point - length (fixed)	Hf	***inch***	***.75"***	***.97"***	***.097"***	***1.18"***	***.17"***
Contact point - ball dia.	D	***inch***	***.06"***	***.06"***	***.06"***	***.12"***	***.12"***
Measuring force	F	N	0.8 - 1.2	1.1 - 1.6	1.1 - 1.6	0.8 –1.7	0.8 –1.7
Order no.			**4495950**	**4495951**	**4495952**	**4495955**	**4495956**



Electronic Gages for External Measurement 838 EA to measure thickness and wall thicknesses

Features

Functions:
ON/OFF, mm/inch, TOL (enter tolerance limit values), ABS (display can be set to zero, without losing the reference to the Preset value), DATA (Data transmission via connection cable)

- High contrast analog and digital LCD
- Specified measuring programs according to application
- Absolute/Relative measuring program
- Tolerance is displayed with 2 LEDs
- Data interface: Digimatic, USB
- Energy supply: Battery operation
- Protection class IP 67 according to EN 60529

- Supplied with:
Instruction manual, Battery, Test certificate

Applications

- For measuring thicknesses and wall thicknesses

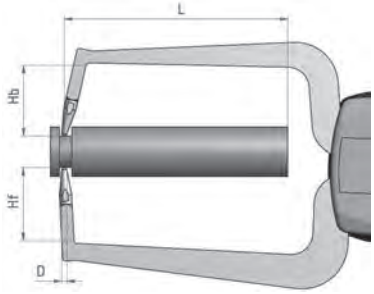
Technical Data and Dimensions

Measuring range	Meb	mm	0 - 10	0 - 20	0 - 20	0 –30	0 –50	0 –30	0 –50
Resolution	Skw	mm	0.005	0.01	0.01	0.02	0.02	0.02	0.02
Error limit	G	mm	0.015	0.03	0.03	0.04	0.06	0.04	0.06
Repeatability limit	r	mm	0.005	0.01	0.01	0.02	0.04	0.02	0.04
Measuring depth	L	mm	35	85	85	116	167	116	169
Contact point - length (move.)	Hb	mm	19.1	24.6	24.6	30	30	30	30
Contact point - length (fixed)	Hf	mm	18.6	24.6	2.5	30	30	4	4.3
Contact point - ball dia.	D	mm	1.5	1.5	1.5	3	3	3	3
Measuring force	F	N	0.8 - 1.2	1.1 - 1.6	1.1 - 1.6	0.9 –1.6	0.8 –1.7	0.9 –1.6	0.8 –1.7
Order no.			**4495560**	**4495561**	**4495562**	**4495563**	**4495564**	**4495565**	**4495566**

Accessories

		Order no.
Battery Alkaline AAA 1.5 V		**4243073***
Data Connection Cable USB (1.5 m)	838 usb	**4495079**
Data Connection Cable Digimatic (1.5 m)	838 di (A)	**4495083**

** 2 batteries are required*



Electronic Gages for Internal Measurement 838 EI for measuring bores and internal grooves

Features

Functions:
ON/OFF, mm/inch, TOL (enter tolerance limit values), ABS (display can be set to zero, without losing the reference to the Preset value), DATA (Data transmission via connection cable)

- High contrast analog and digital LCD
- Specified measuring programs according to application
- Absolute/Relative measuring program
- Tolerance is displayed with 2 LEDs
- Data interface: Digimatic, USB
- Energy supply: Battery operation
- Protection class IP 67 according to EN 60529

- Supplied with:
  Instruction manual, Battery, Test certificate

Applications

- For measuring bores and internal grooves

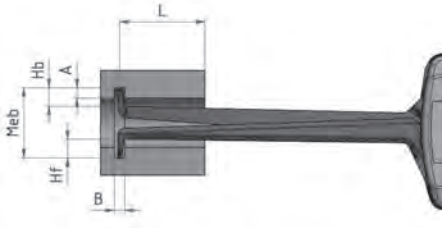
Technical Data and Dimensions

Measuring range	Meb	mm	5 - 15	10 - 30	20 - 40	30 - 50	40 - 60	50 - 70	13 –43	30 –60	50 –80
Resolution	Skw	mm	0.005	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Error limit	G	mm	0.015	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
Repeatability limit	r	mm	0.005	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Measuring depth	L	mm	35	85	85	85	85	85	127	132	132
Groove depth	A	mm	2.3	5.2	7.0	7.0	8.3	8.3	5.7	6.2	8.3
Groove width	B	mm	0.8	1.2	1.2	1.2	1.2	1.2	1.6	1.8	2.4
Contact point - length (move.)	Hb	mm	2.5	5.4	7.3	7.3	12.2	12.2	5.7	6.5	8.5
Contact point - length (fixed)	Hf	mm	2.5	5.4	7.3	7.3	12.2	12.2	5.7	6.5	8.5
Contact point - ball dia.	D	mm	0.6	1	1	1	1	1	1.3	1.5	2
Measuring force	F	N	0.8 - 1.2	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	1.2 - 1.7	1.2 - 1.7	1.2 - 1.7
Order no.			**4495590**	**4495591**	**4495592**	**4495593**	**4495594**	**4495595**	**4495598**	**4495599**	**4495600**

Accessories

		Order no.
Battery Alkaline AAA 1.5 V		**4243073***
Data Connection Cable USB (1.5 m)	838 usb	**4495079**
Data Connection Cable Digimatic (1.5 m)	838 di (A)	**4495083**

** 2 batteries are required*



Gages (Metric) for Internal Measurement 838 TI for measuring bores and internal grooves

Features

- Contact points are made from carbide
- Absolute measuring instrument
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- IP protection class IP65 according to EN 60529

- Supplied with:
  Test certificate

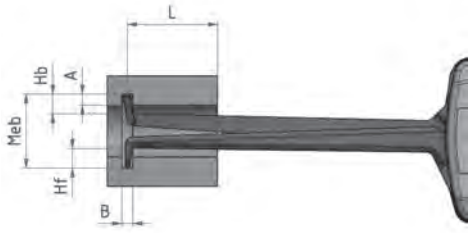
IP65

Applications

- For measuring bores and internal grooves

Technical Data and Dimensions

Measuring range	Meb	mm	5 - 15	10 - 30	20 - 40	30 - 50	40 - 60	50 - 70	15 - 65	40 - 90
Readings	Skw	mm	0.005	0.01	0.01	0.01	0.01	0.01	0.05	0.05
Error limit	G	mm	0.015	0.03	0.03	0.03	0.03	0.03	0.05	0.05
Repeatability limit	r	mm	0.005	0.01	0.01	0.01	0.01	0.01	0.025	0.025
Measuring depth	L	mm	35	85	85	85	85	85	188	192
Groove depth	A	mm	2.3	5.2	7.0	7.0	8.3	8.3	5.5	8.3
Groove width	B	mm	0.8	1.2	1.2	1.2	1.2	1.2	1.9	2.4
Contact point - length (move.)	Hb	mm	2.5	5.4	7.3	7.3	12.2	12.2	6	8.5
Contact point - length (fixed)	Hf	mm	2.5	5.4	7.3	7.3	12.2	12.2	6	8.5
Contact point - ball dia.	D	mm	0.6	1	1	1	1	1	1.5	2
Measuring force	F	N	0.8 - 1.2	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	0.9 –1.9	0.9 –1.9
Order no.			**4495580**	**4495581**	**4495582**	**4495583**	**4495584**	**4495585**	**4495586**	**4495587**



Gages (Inch) for Internal Measurement 838 TI for measuring bores and internal grooves

Features

- Contact points are made from carbide
- Absolute measuring instrument
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- IP protection class IP65 according to EN 60529

- Supplied with: Test certificate

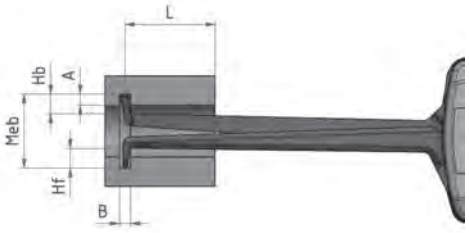
IP65

Applications

- For measuring bores and internal grooves

Technical Data and Dimensions

Measuring range	Meb	***inch***	***.20-.60"***	***.40-1.20"***	***.80-1.60"***	***1.20-2.00"***	***1.60-2.40"***	***2.00-2.80"***	***.60-2.60"***	***1.60-3.60"***
Readings	Skw	***inch***	***.0002"***	***.0005"***	***.0005"***	***.0005"***	***.0005"***	***.0005"***	***.001"***	***.001"***
Error limit	G	***inch***	***.0008"***	***.0015"***	***.0015"***	***.0015"***	***.0015"***	***.0015"***	***.002"***	***.002"***
Repeatability limit	r	***inch***	***.0002"***	***.0005"***	***.0005"***	***.0005"***	***.0005"***	***.0005"***	***.001"***	***.001"***
Measuring depth	L	***inch***	***1.37"***	***3.2"***	***3.2"***	***3.2"***	***3.2"***	***3.2"***	***7.5"***	***7.6"***
Groove depth	A	***inch***	***.09"***	***.19"***	***.26"***	***.26"***	***.31"***	***.31"***	***.2"***	***.2"***
Groove width	B	***inch***	***.032"***	***.06"***	***.08"***	***.08"***	***.08"***	***.08"***	***.08"***	***.1"***
Contact point - length (move.)	Hb	***inch***	***.097"***	***.21"***	***.29"***	***.29"***	***.33"***	***.33"***	***.25"***	***.33"***
Contact point - length (fixed)	Hf	***inch***	***.097"***	***.21"***	***.29"***	***.29"***	***.33"***	***.33"***	***.25"***	***.33"***
Contact point - ball dia.	D	***inch***	***.024"***	***.04"***	***.04"***	***.04"***	***.04"***	***.04"***	***.06"***	***.08"***
Measuring force	F	N	0.8 - 1.2	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	1.1 - 1.6	0.9 - 1.9	0.9 - 1.9
Order no.			**4495980**	**4495981**	**4495982**	**4495983**	**4495984**	**4495985**	**4495986**	**4495987**



Definition of Terms Specifications for inspection and test acceptance procedure of mechanical and electronic caliper gages

1. Basics

The inspection only follows approximately the testing methods and procedures of the German standard DIN 878 for dial gages and the testing statements for caliper gages according to VDI/VDE/DGQ 2618 sheet 12.1 and 13.1. The gages are referred to without special reference as gages for 'absolute' measurements and adjustable zero point.

2. Definitions

Definitions of length checking techniques see DIN 2257 part 1 and part 2 (see Illustration).

2.1 Application range Awb

Application range Awb of a gage corresponds to the sum of adjusting and measuring range.

2.2.Measuring range Meb

The measuring range of an indicating gage represents the range of measuring values in which agreed error limits must not be exceeded.

2.3 Reading Zw

The reading Zw of a numerical interval of a numerical scale is the modification of the value of a measured variable that causes the modification of the indication by one interval. The numerical interval corresponds to the scale interval of a line scale and is indicated in the unity of the measured variable.

2.4 Scale interval Skw

The scale interval Skw is indicated on the scale, i.e. 0.01 mm. It corresponds to the measuring value between two scale graduation marks.

2.5 Deviation within the measuring range f_M

The deviation within the measuring range (range of deviation) f_M represents the distance of ordinates between the highest and the lowest position in the deviation diagram when the movable caliper arm closes. The **error limits** G for f_M is symmetrically positioned to the zero line.

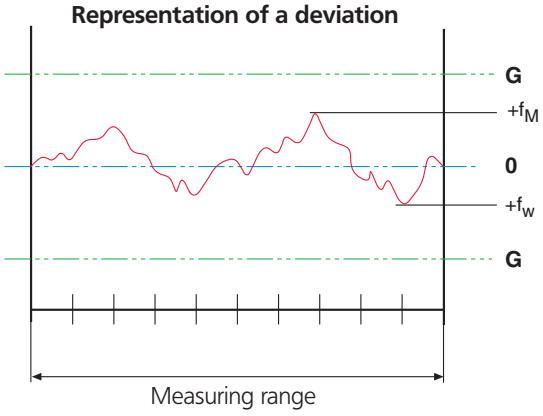
The deviation in the partial measuring range f_t can only be determined by using electronic testing methods during the preparation of certificates of quality.

2.6 Repeatability f_w

Repeatability f_w is a characteristic value for deviations of the measured variable within the measuring range in the same motion direction of the movable caliper arm (usually n is 5).

The limits of error f_w are refered to with **repeatability limit r.**

Representation of a deviation

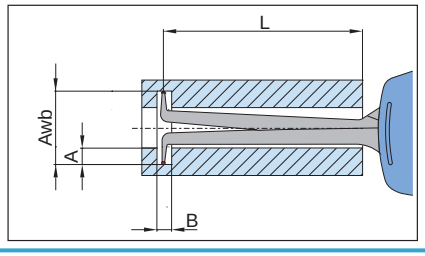


Measuring Capacity of Internal Measuring Instruments

Data listed in the table referring to groove depth A, groove width B and measuring depth L are only meant to be rough guidelines.
For each type of instrument there is dependence of these three values from each other and on the application range Awb. This is shown in the adjacent table of examples.
For each inside measuring instrument this table is available upon request in conjunction with a detailed data sheet.

Groove depth A (mm)	Application range Awb (mm) 10	11	12	13	14	15	16	17	18	19	20
0	0/55	0/55	0/56	0/56	0/57	0/57	0/57	0/57	0/57	0/57	0/58
0.5		1.4/55	1.4/56	1.4/56	1.4/56	1.4/56	1.4/56	1.4/56	1.4/57	1.4/57	1.4/57
1			1.4/56	1.4/56	1.4/56	1.4/56	1.4/56	1.4/56	1.4/56	1.4/56	1.4/57
1.5				1.4/55	1.4/55	1.4/55	1.4/55	1.4/56	1.4/56	1.4/56	1.4/56
2					1.4/55	1.4/55	1.4/55	1.5/55	1.5/55	1.5/56	1.5/56
2.5						1.4/55	1.5/55	1.5/55	1.6/55	1.6/55	1.6/55
3							1.5/54	1.6/54	1.6/55	1.6/55	1.6/55
3.5								1.6/54	1.6/54	1.6/54	1.6/55
4									1.7/54	1.7/54	1.7/54
4.5										1.7/53	1.8/54

Relationship W/L



B = Min. groove depth (mm)
L = Max. usable caliper arm length (mm)

Example: Awb = 12 B = 1.4
A = 0.5 L = 56

Indicating Depth Gage 837

Features

- Cross beam is hard chrome plated and hardened
- Measuring faces are finely lapped
- Supplied with: Cross beam, Anvil 902 12 mm

Technical Data

Length of cross beam mm	Width of cross beam mm	Flatness of the cross beam	Mounting hole mm	Order no.*
80	16	DIN 876/0	8H7	**4494010**
100	16	DIN 876/0	8H7	**4494011**
150	20	DIN 876/0	8H7	**4494012**

** Excludes indicating instrument*

Accessories

Spherical Contact Points 902

Depth measuring range* mm			L mm	Order no.
10	-	20	25	**4360015**
20	-	30	35	**4360017**
30	-	40	45	**4360026**
40	-	50	55	**4360031**
50	-	60	65	**4360035**
60	-	70	75	**4360020**
70	-	80	85	**4360036**
80	-	90	95	**4360029**

* for Indicators with a 10 mm measuring range

Indicating Instruments

Recommended are:

Indicator	Readings / Resolution mm	Measuring range mm	Order no.
810 AT	0.01	10	**4311060**
1075 R	0.01	12.5	**4336010**
1086 R	0.01	25	**4337130**
1086 R	0.01	50	**4337131**

Indicating Depth Gage 65P-40, 75P-30

75P-35

75P-30

65P-40

Features

- **65P-40** has a "V" shaped base and a needle contact. Movement is "Push-Down" style. Ideal for measuring etch depth, pits, or small, shallow recesses.
- **75P-30** Depth Gages have rectangular, flat base and a radiused contact point. 75P-30 is supplied with contact point, for measuring depths from the base as a reference. Contact points for other depths are available upon request.
- **75P-35** Depth Gages have three interchangeable contact points, allowing inspection of depths to 76 mm / 3". Check depths against a setting

Technical Data

Order no. Metric	Order no. Inch	Capacity	Range of Sensitive	Graduation Contact	Base Dimensions	Contact Style/ Length
65P-40M	**65P-40**	0-2 mm / ***0-.075"***	0-2 mm / ***0-.075"***	0.01 mm / ***.0005"***	64 mm / ***2.50"***	Needle
75P-30M	**75P-30**	0-4 mm / ***0-.15"***	0-4 mm / ***0-.15"***	0.01 mm / ***.0005"***	64x14 mm / ***2.5x.56"***	radiused: 3 mm / ***.13"***
75P-35M	**75P-35**	0-75 mm / ***0-3"***	0-75 mm / ***0-3"***	0.01 mm / ***.001"***	64x14 mm / ***2.5x.56"***	(3) radiused: 3 mm / ***.13"*** 28 mm / ***1.13"*** 54 mm / ***2.13"***

Depth Gages 75P-50

75P-52 with Setting Master

Features

- Modular depth gages for all applictions.
- Single and multi-purpose bases with choice of Dial Indicator for comparative or direct measurement.
- Indicator collet mounting allows easy interchangeability of Indicators and bases — use one Indicator with several bases or change Indicators to meet range requirements.
- Family of contact points available to cover wide range of depth measurement applications.
- Setting masters available with anvil ground to specified depth (± 0.0025 mm / ± .0001" in accuracy).

Technical Data

- **For Comparative Measurement:** Unless otherwise specified, a comparative measurement Indicator will be furnished. Correct contact point will be furnished for the gaging depth specified.

  Metric: Furnished with .01 mm grads. / 2.50 mm range, balance dial.

  Inch: Furnished with .0005" grads. / .075" range, balanced dial.

- **For Direct Measurement:** (Special Order) Contact point for 0-25 mm / 0-1" depth will be furnished unless otherwise specified.

  Metric: Model SP6IS (0.01 mm grads. / 25 mm range, continuous dial with revolution counter).

  Inch: Model 28ISN (.001" grads. / 1" range, continuous dial with revolution counter).

  Digital: Model 2034212 (.001 mm/.00005" resolution, 25 mm / 1" range)

- For long range models contact Mahr Federal.

Base Dimensions (all bases are 15 mm/ ***.59"*** high x 19 mm/ ***.75"*** wide)

Order no. Metric	Order no. Inch	Length mm / *inch*	Width mm / *inch*	Diameter mm / *inch*	Measuring Positions	Base only Model*
75P-50M	**75P-50**	50 / ***2"***	19 / ***.75"***	–	One	BA-42
75P-51M	**75P-51**	76 / ***3"***	19 / ***.75"***	–	One	BA-43
75P-52M	**75P-52**	102 / ***4"***	19 / ***.75"***	–	Two	BA-44
75P-53M	**75P-53**	152 / ***6"***	19 / ***.75"***	–	Three	BA-45
75P-54M	**75P-54**	203 / ***8"***	19 / ***.75"***	–	Three	BA-46
75P-55M	**75P-55**	–	–	19 / ***.75"***	One	BA-47
75P-56M	**75P-56**	–	–	32 / ***1.25"***	One	BA-76

Ordering Information

When ordering please specify:

1. Model Number.
2. Comparative or Direct Measurement.
3. Depth to be gaged.
4. Master Setting Block, if required.
5. Any special or optional features such as special contact points, Indicator Housing, or alternate Indicators.

* If base only is specified, it is supplied without the indicator holding collet, model AD-87.

Order collet seperately if required.

Depth Gages 75P-50

Contact Points

To increase the versatility of any **75P-50** Series Depth Gage, additional contacts may be used to extend the capacity of the gage. Specify additional contact points required from the table at right.

To order the entire set of points, order by Model **PT-750** Contact Point Set.

Gaging Depth mm	/	Gaging Depth *inch*	Contact Point model*	µMaxµm
0.00 - 1.60	/	***0 - .063"***	PT-201	PT-564
1.60 - 4.80	/	***.063 - .188"***	PT-232	PT-14
4.80 - 8	/	***.188 - .313"***	PT-305	PT-564
8 - 11	/	***.313 - .438"***	PT-565	PT-31
11 - 14	/	***.438 - .563"***	PT-239	PT-201
14 - 17.50	/	***.563 - .688"***	PT-50	PT-232
17.50 - 21	/	***.688 - .813"***	PT-235	PT-305
21 - 24	/	***.813 - .938"***	PT-241	PT-565
24 - 27	/	***.938 - 1.063"***	PT-100	PT-239
27 - 30	/	***1.063 - 1.188"***	PT-51	PT-50
30 - 33.40	/	***1.188 - 1.313"***	PT-243	PT-235
33.4 - 37	/	***1.313 - 1.438"***	PT-696	PT-241
37 - 40	/	***1.438 - 1.563"***	PT-101	PT-100
40 - 43	/	***1.563 - 1.688"***	PT-245	PT-51
43 - 46	/	***1.688 - 1.813"***	PT-102	PT-243
46 - 49	/	***1.813 - 1.938"***	PT-566	PT-696
49 - 52.4	/	***1.938 - 2.063"***	PT-247	PT-101

** For "C" size dial indicators, "EDI-" and µMaxµm Digital Indicators.*

Semi-finished Model

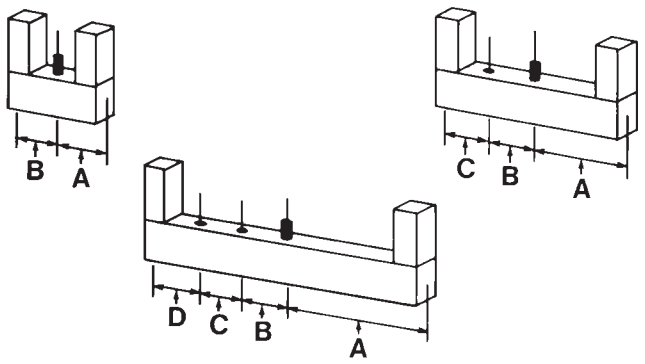
0-25 mm/ **0-1"**	25-50 mm/ **1-2"**	**Gaging Positions**	**Used with Model**	**"A"**	**"B"**	**"C"**	**"D"**
MR-501	**MR-502**	One	75P-50, 75P-30/35	25 mm/ ***1"***	25 mm/ ***1"***	–	–
MR-511	**MR-512**	One	75P-51	38 mm/ ***1.5"***	38 mm/ ***1.5"***	–	–
MR-521	**MR-522**	Two	75P-52	50 mm/ ***2"***	25 mm/ ***1"***	25 mm/ ***1"***	–
MR-531	**MR-532**	Three	75P-53	75 mm/ ***3"***	25 mm/ ***1"***	25 mm/ ***1"***	25 mm/ ***1"***
MR-541	**MR-542**	Three	75P-54	102 mm/ ***4"***	25 mm/ ***1"***	25 mm/ ***1"***	25 mm/ ***1"***
MR-551	**MR-552**	One 75P-56	75P-55, ***.68"***	17 mm/ ***.68"***	17 mm/	–	–

Six different setting masters are available for Series 75P Models. Setting masters are available in two styles: Finished (ground to final size) and Semi-finished (assembled but not ground to final size). Finished depths available from 0 - 50 mm / 0 - 2". Unground Anvil can be purchased separately. Specify **Model AL-89**.

For multi-position masters, please specify the anvil location.
Protective Housings for the Dial Indicator are available, see page 5-23.

For Series 75P-50 style depth gages with alternate Indicators, greater gaging depth, alternate contact configurations or other modifications, contact Mahr Federal Technical Assistance.

For master finished to size, specify size and add suffix "F". Example: MR-502F, size 1.265" (Master for 75P-50 set to 1.265").



Bench Depth Gages 75B-1

For inspecting small parts

75B-1

Features

- Available with Dial Indicator (75B-1 Models) or Maxμm®/// and μMaxμm®// Digital Electronic Indicators (EMD-75B and XLI-75B Models).
- 89 x 102 mm / 3.50 x 4" hardened, ground work surface provides excellent reference surface.
- Four #10-32 tapped holes provided for mounting part location fixturing.
- Indicator adjustable vertically over 32 mm / 1.25".
- Two contact points provided, 6 mm / .25" and 32 mm / 1.25" to check features up to 50 mm / 2" deep.

Technical Data

Order no. Metric	Order no. Inch	Indicator Range / Graduation or Resolution
75B-1M	**75B-1**	25 mm / .01 mm (***1" / .001"***) graduation Dial Indicator.
EMD-75B-1		Maxμm®/// Digital Indicator with selectable range and resolution, 2033201.
2057552		1086 R Digital Indicator, 25 mm / ***1"*** range, .001 mm / ***.00005"*** resolution
2057553		1086 R Digital Indicator, 12 mm / ***.50"*** range, .001 mm / ***.00005"*** resolution

To specify Digital Output on EMD-75B Models, add suffix "D". Example = EMD-75B-1D.
Output is standard with 1086 R and EDI models.

1086 R

Dimentron® Plug Gages

The Dimentron System - Built for Performance

Dimentron Plug Assembly – shown with *Maxμm®III* Indicator, Housing and Handle

Special depth gaging applications

Shown with bench stand 2239307 & plug holder 2248358

The Dimentron plug gage, which is formed by the plug body, the panto-assembly with contacts and the transfer rod, is the measuring system comprising the Dimentron plug. It can be interchanged by simply unscrewing it from the display assembly.

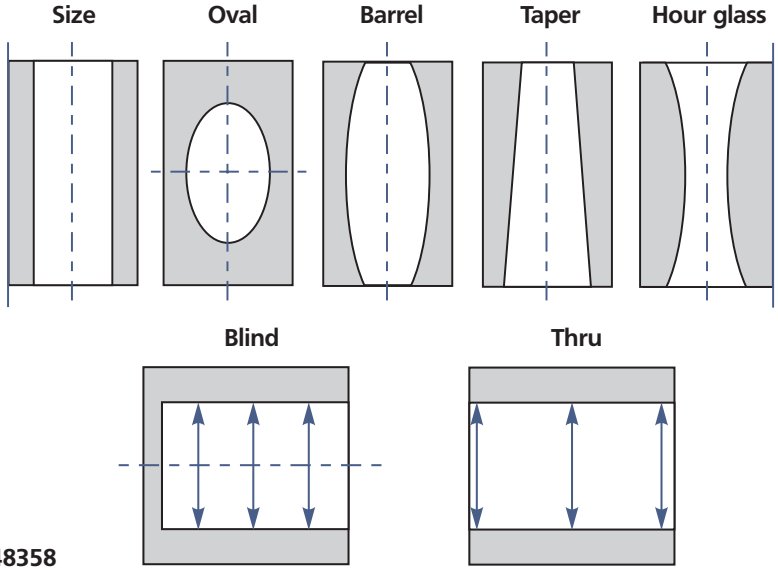
The **plug body** is made from through hardened 440 stainless steel, tempered and ground, with hardness 52-56 HRC, guides the plug gage; its easy entry guide facilitate introduction into the bore.

Standard **contacts** are made of tungsten carbide and based on the bore diameter range, come in two possible radii. Other contact materials are available based on the part being measured. Diamond, Ruby or hard-chrome-covered contacts are also available. Diamond or ruby contacts are suggested for soft aluminum or highly wearing applications; hard chromed ones (1000 HV) for aluminum and relevant alloys. Also based n the thickness of the surface available options cylindrical contacts may be ordered.

Either 2 or 4 steel spring assemblies **form panto-spring assemblies**. The design of the transfer assembly is determined by the diameter of the plug. This panto-design produces true straight-line transfer to the Vee-rod.

A **transfer rod**, with spherical tungsten carbide tip, slides on a tempered steel V-shaped guide and inclined plane, transferring the measurement to the display device. This unique floating system has been designed and tested to resist for over 10,000,000 measuring cycles.

Though designed for the toughest shop conditions, wear items do occasionally need replacement. Because of the individual components **service is fast and easy**. All parts are available separately from Mahr Federal and with standard tools, can be replaced in minutes to help maintain up time on the floor.



Dimentron® Plug Inside Diameter Gages

Thru-hole and Blind Hole Dimentron Plugs

Features

- Designed for high production I.D. gaging.
- High chrome content; hardened stainless steel bodies ground precisely for specified size measurement.
- Plug tooling interchangeable for quick changeover.
- Measuring is easy – just insert plug into diameter and read. No rocking needed.
- Set to nominal dimension with a single master ring.
- Long life: Tungsten carbide contacts and vee rod ensure durable motion transfer.
- Three styles of plugs available – Thru-hole, Blind Hole and Super-blind.
- Open design rinses clean easily.
- Explore bores for taper, barrel shape, bell-mouth and 2-point out-of-round.
- Stop Collars available for all standard sizes.
- Captive vee rod design.

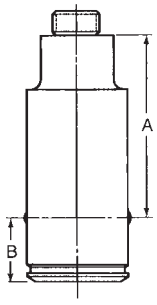
Technical Data

Blind Hole Plugs
Use Dimension "A" below. Dimension "B" is 4 mm / .157".

Super-blind Plugs
Use Dimension "A" below. Dimension "B" is 2 mm / .08", for 5.5 mm / .217" & up .108" for 3.2 mm / .125" to 5.5 mm / .217"

Super-Super blind Plugs
Use Dimension "A" below. Dimension "B" is 0.79 mm / .031". (4.500" to 9.00" are not available with this model.)

Dimentron Plug Dimensions



Blind Hole Plugs

A Dimentron Plug Gage with digital Electronic Indicator makes a compact, portable hand tool.

Thru-hole Plugs

Sizes above	To and include	A	B	Group*
mm / ***inch***	mm / ***inch***	mm / ***inch***	mm / ***inch***	
3.2 / ***.125"***	5.5 / ***.217"***	31.4 / ***1.23"***	6.4 / ***.25"***	no group*
5.5 / ***.217"***	8.2 / ***0.322"***	34.8 / ***1.37"***	6.5 / ***.256"***	5
8.2 / ***.322"***	9.5 / ***.375"***	34.8 / ***1.37"***	6.5 / ***.256"***	6
9.5 / ***.375"***	12.7 / ***0.50"***	35.4 / ***1.39"***	13 / ***.512"***	8
12.7 / ***.50"***	19.05 / ***.75"***	35.4 / ***1.39"***	13 / ***.512"***	8
19.05 / ***.75"***	25 / ***1"***	48.3 / ***1.90"***	16 / ***.63"***	12
25 / ***1"***	38 / ***1.50"***	48.3 / ***1.90"***	16 / ***.63"***	12
38 / ***1.50"***	63 / ***2.50"***	46.7 / ***1.84"***	19 / ***.748"***	12
63 / ***2.50"***	114.3 / ***4.5"***	46.7 / ***1.84"***	19 / ***.748"***	12
114.3 / ***4.50"***	228.6 / ***9.0"***	46.7 / ***1.84"***	9.5 / ***.375"***	12

* *Group Number specifies thread size on gaging plugs. Threaded bushings are provided with each plug to allow mounting to Maxμm® Adaptor or Electronic Handle Assembly.*

** *Only available as Thru- and Blind Hole Small Bore Probe. For larger or smaller plugs, alternate contact materials, extended gaging depths, more clearance, or other plug modifications - contact Mahr Federal Technical Assistance.*

Dimentron® Plug Inside Diameter Gages

shown with 1087 Digital Indicator and Housing

Dimentron Plug Assembly
shown with Maxμm®/// Indicator, Housing and Handle

Ordering Information

When ordering specify:

1. Diameter
2. Tolerance
3. Gaging depth
4. Plug style
5. Contact type – polished chrome steel or tungsten carbide
6. Stop collar

Gaging Range:
Dimentron Plugs are ground to one of four measuring ranges, based on part tolerance.

Technical Data

Sizes above mm / *inch*	To and include mm / *inch*	Maximum Part Tolerance Metric M01 Inch 050 mm / *inch*	M02 100 mm / *inch*	M05 200 mm / *inch*	M08 400 mm / *inch*
3.18 / ***.1250"***	3.62 / ***.1426"***	±0.025 / ***±.0010"***	±0.038 / ***±.0015"***		
3.62 / ***.1426"***	5.52 / ***.2171"***	±0.025 / ***±.0010"***	±0.046 / ***±.0018"***	±0.076 / ***±.0030"***	
5.50 / ***.2171"***	7.94 / ***.3125"***	±.0.025 / ***±.0010"***	±0.046 / ***±.0018"***	±0.069 / ***±.0027"***	±0.102 / ***±.0040"***
7.94 / ***.3125"***	9.50 / ***.375"***	±.0.030 / ***±.0012"***	±0.051 / ***±.0020"***	±0.069 / ***±.0027"***	±0.127 / ***±.0050"***
9.50 / ***.3750"***	12.7 / ***.500"***	±0.038 / ***±.0015"***	±0.058 / ***±.0023"***	±0.086 / ***±.0034"***	±0.137 / ***±.0054"***
12.7 / ***.5000"***	19.05 / ***.750"***	±0.038 / ***±.0015"***	±0.069 / ***±.0027"***	±0.102 / ***±.0040"***	±0.165 / ***±.0065"***
19.05 / ***.750"***	25.4 / ***1.000"***	±0.038 / ***±.0015"***	±0.076 / ***±.0030"***	±0.127 / ***±.0050"***	±0.180 / ***±.0071"***
25.4 / ***1.000"***	38 / ***1.500"***	±0.038 / ***±.0015"***	±0.076 / ***±.0030"***	±0.152 / ***±.0060"***	±0.221 / ***±.0087"***
38 / ***1.500"***	114.3 / ***4.50"***		±0.076 / ***±.0030"***	±0.152 / ***±.0060"***	±0.254 / ***±.0100"***
114.3 / ***4.5"***	229 / ***9.00"***			±0.152 / ***±.0060"***	±0.254 / ***±.0100"***

Order Maxμm Indicator and Accessories separately.

Maxμm/// Indicator
Inch: Specify **2033101 (2033111** if Digital Output is required) for .00005" resolution, .0001" grad., and "0" on the Indicator in the 12 o'clock position.
For "0" at 6 o'clock position, specify **2033201**.

Metric: Specify **2033101 (2033111** if Digital Output is required) for 0.001 mm resolution, 0.001 mm grad., and "0" at 12 o'clock.
For "0" at 6 o'clock position, specify **2033201**.

EKT-1120-W1 is required to mount the Maxμm/// Indicator to Dimentron Plugs. (Specify **EKT-1120-W2** for Maxμm/// Indicators with 8 mm stems). This adaptor kit includes mounting adaptor, hex wrench, and flat-end, contact point for the Indicator.

Other models include:
EKT-1120-W3 – EDI/Dial .375" stem – 4-48 thread
EKT-1120-W4 – EDI/Dial 8 mm stem – 2.5 thread
EKT-1120-W6 – 1002 - 1010 8 mm stem – 2.5 thread

Protective Housings for Plugs over 50 mm/ 2"
EHG-1172 For Maxμm/// Indicators without Output. Requires in-line or pistol style grip Handle (**HA-88** Handle and **AT-124** Adaptor).
EHG-1198 For Maxμm/// Indicators with Output. Requires pistol style grip Handle (**HA-88** and **AT-124** Adaptor).

B-12668 For Maxμm/// Indicators with Output. Complete with in-line style handle. **AT-125** Bench Stand Adaptor permits the Maxμm Indicator in a Protective Housing to be clamped in **BA-26** Bench Stand. (See pages 9-5 and 9-7)

Dimentron® Plug Inside Diameter Gages

With Electronic Gage Heads

Gage heads are mounted to Dimentron Plugs using HA-88 and AD-140 Adaptor. Electronic Gage Heads can be ordered separately. The following Handle Assemblies include Adaptor, Wrenches and Gage Head:

Handle Assemblies

Order no.	Description
EHA-1146	Flat Contact 3 m / 11 ft, coiled cable
EHA-1145	Flat Contact 1.5 m / 5 ft, straight cable

Accessories

Base, BA-100

Heavy cast base has tooling plate allowing plug to be mounted vertically or horizontally. Can be used with Electronic Gage Heads or Maxμm Remote Transducers or Maxμm/// Digital Transducers.

Stop Collars

Stop collars are available for all Dimentron Plugs.

Right Angle Adaptor AT-155

Extensions

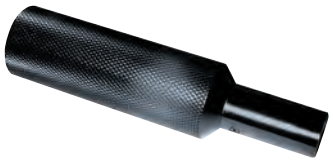
Extensions for Dimentron Plugs are available for Plugs over 9.5 mm / .375". See table below:

Group 8 Plugs 9.3 mm/.366" O.D.	Group 12 Plugs 16 mm/.63" O.D.	Extension Length
EX-204	**EX-210**	50 mm / ***1.97"***
EX-205	**EX-211**	100 mm / ***3.94"***
EX-206	**EX-212**	200 mm / **7.87"**

Consists of 1280P Indicator and Handle Assembly with stocked adaptor:

Order no.		Minimum graduation	
Inch	**550P-10**	Dial Indicator	***.0001"***
Metric	**550P-20**	Dial Indicator	.002 mm
EDI-550P-10		(with 2034101)	***.00005"*** / .001 mm
EDI-550P-20		(with 2034201)	***.00002"*** / .0005 mm

EDI-550P-10



Remote MaxμmTransducer or Maxμm/// Digital Transducer Dimentron Plug Handle/ Adaptor: **HA-141**

BA-100 (Dimentron Plug not included)

Dimentron® Plug Inside Diameter Gages

This table depicts available readouts for Dimentron Plug Inside Diameter Gages. After making a Plug selection, follow the chart for all the components needed to make up a gaging system suited to your application.

Dimentron Plug Gage	Adaptors	Handles	Readout	Housing Housings	Handle
Dimentron Plug					
Stop Collar			**2014802**		
			2034201		
			2033111	**B-12668**	
				EHG-1198	**AT-124** **HA-88**
Extension	**EKT-1120-WX**		**2033101**	**EHG-1172**	**AT-124** **HA-88**
	Change-WX suffix as required: *For adaptor selection see page 9-48*		**2033001** - no Data Output **2033011** - with Data Output **(6 pin)**		
		HA-141	**2033091** - canister style* **2033099** - pencil style* * ± 1 mm/ ±.040" Range Digital Transducer.		
			550P-10/20	**Dial Indicator**	
		EHA-1146 **EHA-1145**	**832 AMP**		
		BA-100			
		AAT-192 **AAT-193** **AAT-194**	**D-2500: 1 - 4000:1**		
		EDI-550P-10 **EDI-550P-20**	**µMaxµm//**		

Indicating Plug Gages 844 D

Features

- For the rapid testing of diameter, roundness and conicity of bores
- Especially suitable for testing batches with tight tolerances
- No rocking in the bore is required to determine the reversal point
- Therefore ideal for use in conjunction with a digital indicating instrument and for subsequent processing of measured values
- Measuring head has a hardened chromium plated guide cylinder and carbide tipped anvils
- The carbide expanding pin transfers radial movement to indicating instrument
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Measuring head, holder, depth extension, right angle attachments and depth stops are part of an extensive modular system

Technical Data of the Measuring Heads

Nominal diameter of the bore	Measuring range starting from the minimum bore dimension to be measured	
	844 Dk/844Dkr	**844 Dks** (from 4 mm)
2.98 - 8 mm	= - 0.02 + 0.1 mm	= - 0.02 + 0.1 mm
over 8 - 16 mm	= - 0.02 + 0.15 mm	= - 0.02 + 0.15 mm
over 16 - 32 mm	= - 0.02 + 0.2 mm	= - 0.02 + 0.15 mm
over 32 - 70 mm	= - 0.03 + 0.2 mm	= - 0.03 + 0.15 mm
over 70 - 200 mm	= - 0.04 + 0.2 mm	= - 0.04 + 0.15 mm

When placing an order please quote the nominal diameter and tolerances, for example:

Bore diameter	Tolerance	
35 D7	+ 80	+105 µm
35 H7	+ 0	+25 µm
35 R7	- 50	-25 µm

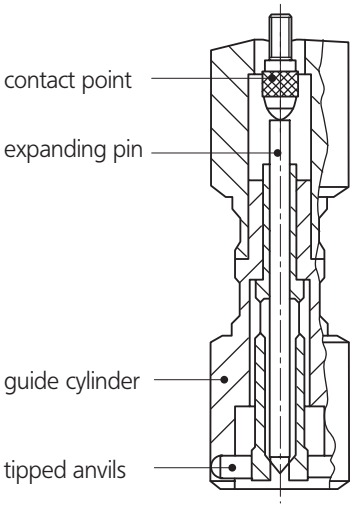
The diameter of the guide cylinder is produced between 0.02 and 0.07 mm smaller than the minimum dimension of the bore to be checked.

Example:
Plug Gage 844 Dk for bore 35 D7

Nominal diameter:	35 mm
Minimum dimension:	35.080 mm
Maximum dimension:	35.105 mm
Meas. range:	35.050 - 35.280 mm

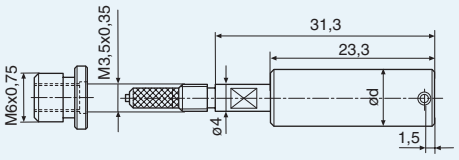
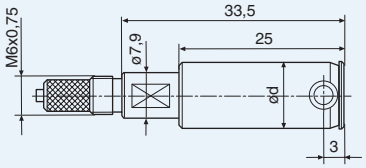
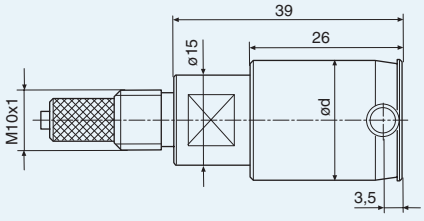
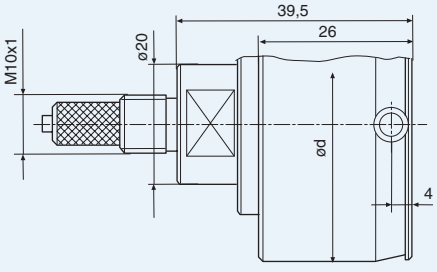
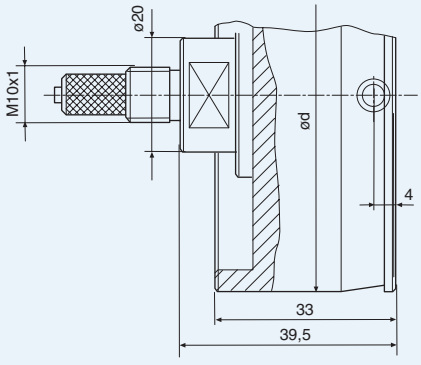
Accuracy

Hystersis	f_u	≤ 0.4 µm
Repeatability	f_w	≤ 1 µm
Linearity		≤ 1 %
Linearity 844 Dks >8 mm		≤ 2 %



Plug Gages

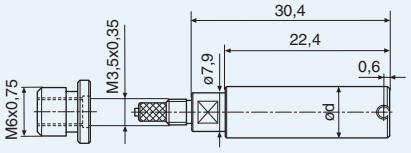
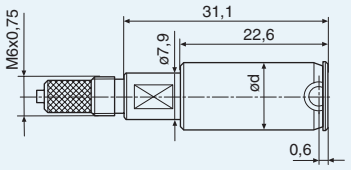
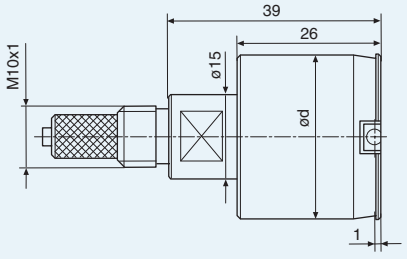
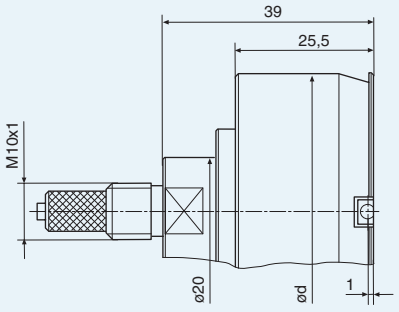
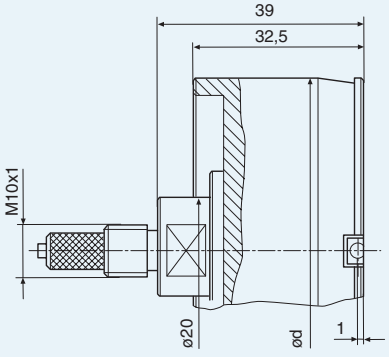
Measuring Head 844 Dk, Standard version

	Nominal① diameter mm		Manufacturing② tolerance mm	Meas. range③ dia. **d**	Order no.	
	2.98 - 3.99		-0.02/-0.04	0.1	**4480184***	
over	3.99 - 8		-0.02/-0.04	0.1	**4478200***	
over	8	- 16	-0.02/-0.04	0.15	**4478201**	
over	16	- 25	-0.02/-0.05	0.2	**4478202**	
over	25	- 32	-0.02/-0.05	0.2	**4478204**	
over	32	- 44	-0.02/-0.06	0.2	**4478205**	
over	44	- 50	-0.03/-0.06	0.2	**4478206**	
over	50	- 60	-0.03/-0.06	0.2	**4478207**	
over	60	- 70	-0.03/-0.06	0.2	**4478208**	
over	70	- 80	-0.04/-0.07	0.2	**4478209**	
over	80	- 90	-0.04/-0.07	0.2	**4478210**	
over	90	-100	-0.04/-0.07	0.2	**4478211**	
over	100	-110	-0.04/-0.07	0.2	**4478212**	
over	110	-120	-0.04/-0.07	0.2	**4478213**	
over	120	-130	-0.04/-0.07	0.2	**4478214**	
over	130	-140	-0.04/-0.07	0.2	**4478215**	
over	140	-150	-0.04/-0.07	0.2	**4478216**	
over	150	-160	-0.04/-0.07	0.2	**4478217**	
over	160	-170	-0.04/-0.07	0.2	**4478218**	
over	170	-180	-0.04/-0.07	0.2	**4478219**	
over	180	-190	-0.04/-0.07	0.2	**4478220**	
over	190	-200	-0.04/-0.07	0.2	**4478221**	

① *Nominal diameter =smallest bore diameter*
② *dia. d in reference to the smallest bore diameter*
③ *Measuring range refers to the nominal diameter*
* *With Adaptor for connection to the holder*

Plug Gages

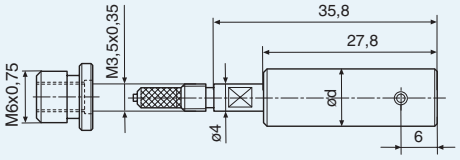
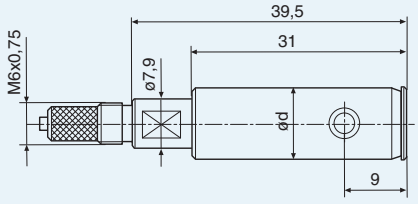
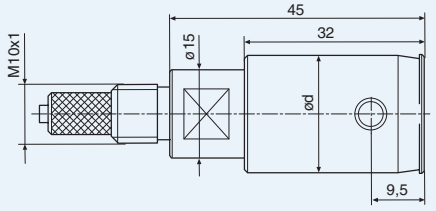
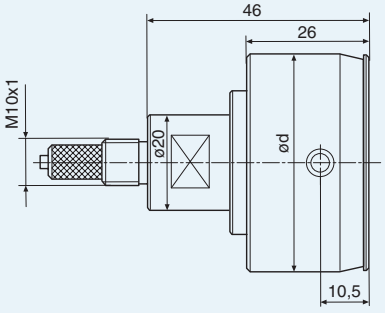
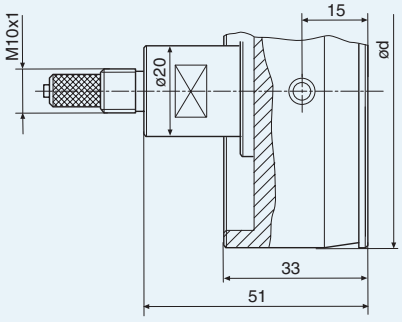
Measuring Head 844 Dks, for blind holes, to measure almost to the base of a bore

	Nominal① diameter mm	Manufacturing② tolerance mm	Meas. range③ dia. **d** mm	Order no.	
	4 - 8	-0.02/-0.04	0.10	**4478285***	
over	8 - 16	-0,02/-0,04	0,15	**4478245**	
over over over	16 - 25 25 - 32 32 - 44	-0.02/-0.05 -0.02/-0.05 -0.02/-0.06	0.15 0.15 0.15	**4478230** **4478232** **4478233**	
over over over	44 - 50 50 - 60 60 - 70	-0.03/-0.06 -0.03/-0.06 -0.03/-0.06	0.15 0.15 0.15	**4478234** **4478235** **4478236**	
over over over over over over over over	70 - 80 80 - 90 90 -100 100 -110 110 -120 120 -130 130 -140 140 -150	-0.04/-0.07 -0.04/-0.07 -0.04/-0.07 -0.04/-0.07 -0.04/-0.07 -0.04/-0.07 -0.04/-0.07 -0.04/-0.07	0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15	**4478237** **4478238** **4478239** **4478240** **4478241** **4478242** **4478243** **4478244**	

① *Nominal diameter = smallest bore diameter*
② *dia. d in reference to the smallest bore diameter*
③ *Measuring range refers to the nominal diameter*
* *With adaptor for connection to the holder*

Plug Gages

Measuring Head 844 Dkr, with an extended guide cylinder to measure through holes from the edge of a bore, ideal for narrow parts

	Nominal① diameter mm	Manufacturing② tolerance mm	Meas. range③ dia. **d** mm	Order no.	
	2.98 - 3.99	-0.02/-0.04	0.1	**4478272***	
over	3.99 - 8	-0.02/-0.04	0.1	**4478250***	
over	8 - 16	-0.02/-0.04	0.15	**4478251**	
over	16 - 25	-0.02/-0.05	0.2	**4478252**	
over	25 - 32	-0.02/-0.05	0.2	**4478254**	
over	32 - 44	-0.02/-0.06	0.2	**4478255**	
over	44 - 50	-0.03/-0.06	0.2	**4478256**	
over	50 - 60	-0.03/-0.06	0.2	**4478257**	
over	60 - 70	-0.03/-0.06	0.2	**4478258**	
over	70 - 80	-0.04/-0.07	0.2	**4478259**	
over	80 - 90	-0.04/-0.07	0.2	**4478260**	
over	90 -100	-0.04/-0.07	0.2	**4478261**	
over	100 -110	-0.04/-0.07	0.2	**4478262**	
over	110 -120	-0.04/-0.07	0.2	**4478263**	
over	120 -130	-0.04/-0.07	0.2	**4478264**	
over	130 -140	-0.04/-0.07	0.2	**4478265**	
over	140 -150	-0.04/-0.07	0.2	**4478266**	
over	150 -160	-0.04/-0.07	0.2	**4478267**	
over	160 -170	-0.04/-0.07	0.2	**4478268**	
over	170 -180	-0.04/-0.07	0.2	**4478269**	
over	180 -190	-0.04/-0.07	0.2	**4478270**	
over	190 -200	-0.04/-0.07	0.2	**4478271**	

① *Nominal diameter = smallest bore diameter*
② *dia. d in reference to the smallest bore diameter*
③ *Measuring range refers to the nominal diameter*
* *With adaptor for connection to the holder*

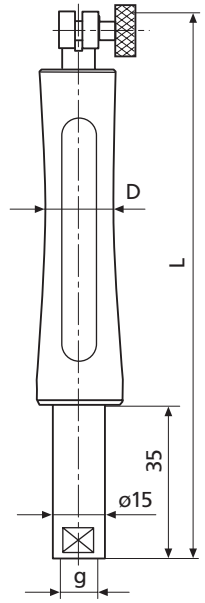
Modular Unit System 844 D

Standard Holder 844 Kg/844 Dg - Standard version

With locking clamp for an indicating instrument and a connecting thread for a measuring head. Heat insulated handle. The model 844 Dg is made from **Invar steel**.

Cat. no.	Connecting thread g	Length L mm	Handle dia. D mm	Order no.
844 Kg	M6 x 0.75	50	14	**4470851**
844 Dg	M10 x 1	150	26	**4478851**

844 Kg / 844 Dg

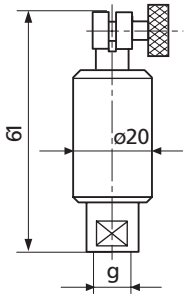


Short Holder 844 Dgk - Short version

With locking clamp for an indicating instrument and a connecting thread for a measuring head. Heat insulated handle.

Cat. no.	Connecting thread g	Length L mm	Handle dia. D mm	Order no.
844 Dgk	M10 x 1	61	20	**4478050**

844 Dgk

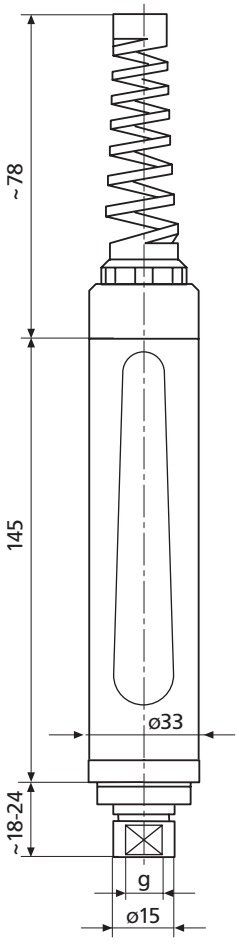


Holder 844 Dge for Inductive Measuring Probes

With long sleeve for shock and waterproof mounting of inductive measuring probes. Strain relief clamp for probe cable. Threaded connection for measuring heads. Heat insulated handle.

Cat. no.	Connecting thread g	Length L mm	Handle dia. D mm	Order no.
844 Dge	M6 x 0.75 M10 x 1	195 195	33 33	**4478020** **4478021**

844 Dge

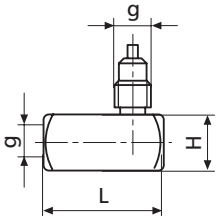


Right Angle (Elbow) Attachment

For measuring difficult to reach bores, e.g. in tight spaces, on a machine tool or when work piece bores are inconveniently located. For screwing in between holder and measuring head.

Cat. no.	Connecting thread g mm	Elbow Length L mm	Elbow Height H mm	Order no.
844 Kw **844 Dw**	M6 x 0.75 M10 x 1	26.5 36.7	22.5 17	**4470110** **4478110**

844 Kw / 844 Dw



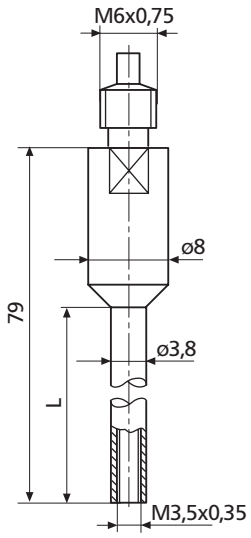
Modular Unit System 844 D

Extensions

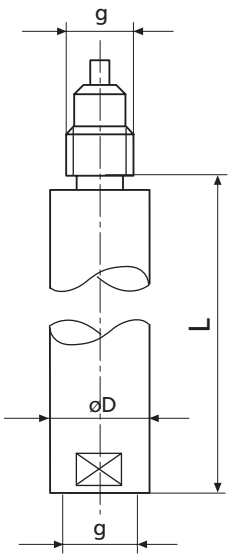
For extra-deep bores. Screws in between holder and measuring heads. Several extensions can be screwed together as of 8 mm. Models 844 Dv and 844 Dvk made of **Invar steel**.

Cat. no.	Connecting thread g	Length L mm/*inch*	dia. D mm/*inch*	Order no.
844 Dvk	M6x0.75 / M3.5x0.35	64 / ***2.5"***	3.8 /***.15"***	**4478080**
844 Kv	M6 x 0.75	64 / ***2.5"***	8 / ***.32"***	**4470070**
844 Dv	M10 x 1	64 / ***2.5"***	15 / ***.6"***	**4478070**
844 Dv	M10 x 1	80 / ***3"***	15 / ***.6"***	**4478071**
844 Dv	M10 x 1	100 / ***4"***	15 / ***.6"***	**4478072**
844 Dv	M10 x 1	125 / ***5"***	15 / ***.6"***	**4478073**
844 Dv	M10 x 1	250 /***10"***	15 / ***.6"***	**4478074**
844 Dv	M10 x 1	500 /***20"***	15 / ***.6"***	**4478075**

844 Dvk



844 Kv / 844 Dv

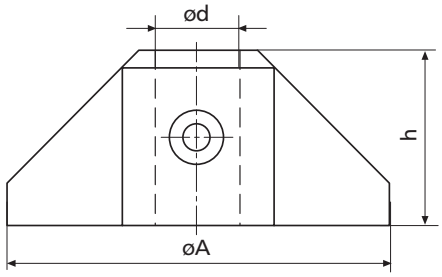


Depth Stops

For limiting depth of insertion of measuring head in bore. Can be attached to Extensions 844 Kv or 844 Dv. With clamping screw.

Cat. no.	Mounting hole dia. d mm/*inch*	Stop surface dia. A mm/*inch*	Height h mm/*inch*	Order no.
844 Kt	8 / ***.32"***	24 / ***1"***	60 / **2.36**	**4470115**
844 Dt	15 / ***.6"***	45 / ***1.8"***	30 / **1.18**	**4478115**
844 Dt	15 / ***.6"***	75 / ***3"***	30 / **1.18**	**4478116**
844 Dt	15 / ***.6"***	110 / ***4.3"***	30 / **1.18**	**4478117**
844 Dt	15 / ***.6"***	160 / ***6.3"***	30 / **1.18**	**4478118**
844 Dt	15 / ***.6"***	220 / ***8.6"***	30 / **1.18**	**4478119**

844 Kt / 844 Dt

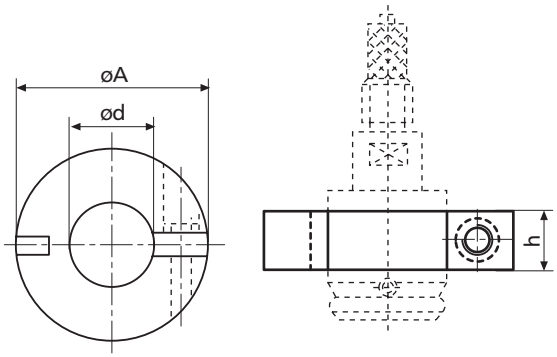


Depth Stop Rings

For limiting depth of insertion of measuring head in bore. Clamped onto the measuring head.

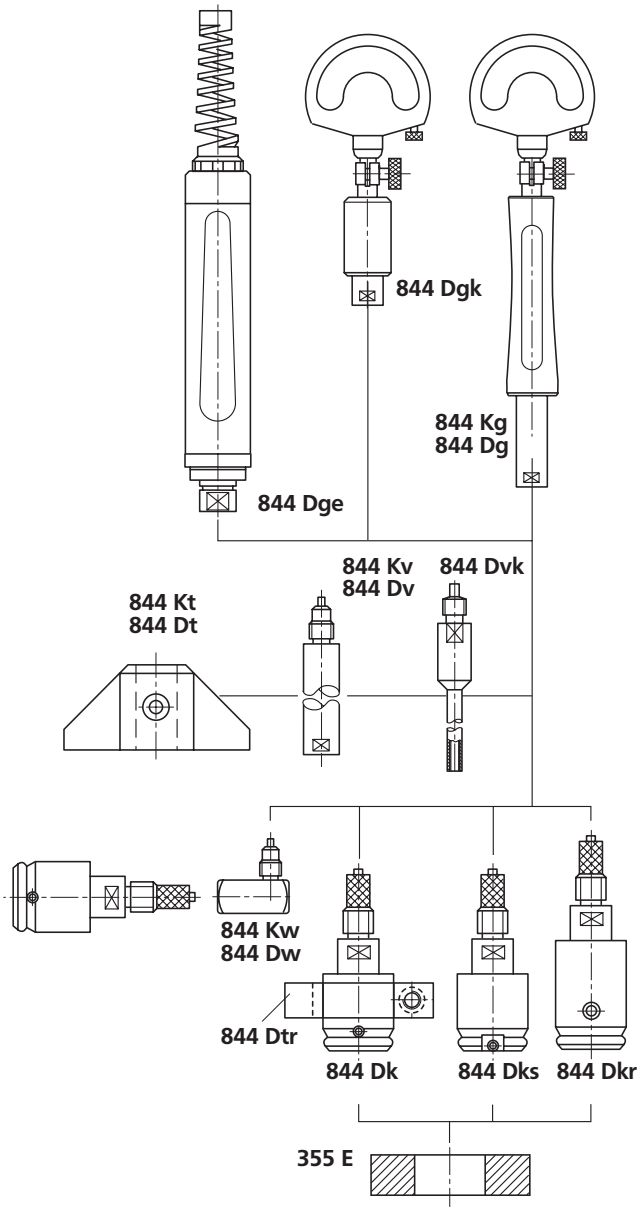
Cat. no.	Mounting **hole** dia. d mm	Stop **surface** dia. A mm/*inch*	Height h mm/*inch*	Order no.
844 Dtr	3 - 5	27 / ***1.1"***	10 / ***.4"***	**4478130**
	> 5 - 8	30 / ***1.2"***	10 / ***.4"***	**4478130**
	> 8 - 11	33 / ***1.3"***	10 / ***.4"***	**4478130**
	> 11 - 15	37 / ***1.5"***	10 / ***.4"***	**4478130**
	> 15 - 20	42 / ***1.7"***	10 / ***.4"***	**4478130**
	> 20 - 25	50 / ***1.9"***	12 / ***.5"***	**4478131**
	> 25 - 30	55 / ***2.1"***	12 / ***.5"***	**4478131**
	> 30 - 35	60 / ***2.3"***	12 / ***.5"***	**4478131**
	> 35 - 40	65 / ***2.5"***	12 / ***.5"***	**4478131**
	> 40 - 45	70 / ***2.8"***	12 / ***.5"***	**4478131**
	> 45 - 50	75 / ***3.0"***	12 / ***.5"***	**4478132**
	> 50 - 60	85 / ***3.3"***	12 / ***.5"***	**4478132**
	> 60 - 70	95 / ***3.7"***	12 / ***.5"***	**4478132**
	> 70 - 80	105 / ***4.1"***	12 / ***.5"***	**4478132**
	> 80 - 90	115 / ***4.5"***	12 / ***.5"***	**4478133**
	> 90 - 100	125 / ***4.9"***	12 / ***.5"***	**4478133**

844 Dtr



Modular units	Diameter of Measuring Heads 2.98 - 8 mm	8 - 16 mm	over 16 mm
844 Kg	**4470851**		
844 Dg			**4478851**
844 Dgk			**4478050**
844 Dge	**4478020**		**4478021**
844 Dvk **844 Kv** **844 Dv**	**4478080**	**4470070**	**4478070** to **4478076**
844 Kt **844 Dt**		**4470115**	**4478115** to **4478119**
844 Kw **844 Dw**	**4470110**		**4478110**
844 Dk **844 Dks** **844 Dkr**			
355 E	see page 9-71		

Modular unit	Diameter of Measuring Heads 2.98 - 20 mm	20 - 44 mm	44 - 80 mm	80 - 100 mm
844 Dtr	**4478130**	**4478131**	**4478132**	**4478133**



Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Indicator		Readings	Order no.
Millimess	**1004**	5 µm	**4333000**
Millimess	**1003**	1 µm	**4334000**
Millimess	**1002**	0.5 µm	**4335000**
MarCator	**1086 R**	1 µm	**4337620**
MarCator	**1086 Ri**	1 µm	**4337624**
Extramess	**2000**	0.2 µm, 0.5 µm, 1 µm	**4346000**
Extramess	**2001**	0.2 µm, 0.5 µm, 1 µm	**4346100**
Millimar	**C 1208 M**	0.1 µm, 1 µm	**5312080**
Millimar	**P 2004 M**		**5323010**

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7

Adjustment of Plug Gages 844 D

Ring Gage 355 E:

Special wear-resistant gage steel. Hardened and lapped. With actual deviation engraved.

Dimensions: DIN 2250, type C
Manufacturing tolerance: DIN 2250
Available diameters: see page 13-19

Self-Centering Dial Bore Gages 844 K Intramess

Features

- Measuring the diameter, roundness and conicity of bores
- Spring-loaded halves of measuring probe are split via expanding pin with precision lapped taper. This movement is transferred to indicating instrument
- Maximum wear-resistance due to hard chrome plating. From 4 mm alternatively with carbide tipped available on request
- Constant measuring force as a result of built-in spring thus eliminating user influence
- Highly versatile, each gage covers a large range. Within the respective limits, quickly and easily adjustable to any size and any type of measuring application
- Measuring probe, holder, depth extensions, right-angle attachments and depth stops are part of an extensive modular system
- Supplied with: Holder, probe, expanding pin and a wooden case, excludes an indicating instrument

Technical Data

Complete Instrument

844 K Measuring heads hard chrome plated, expanding pin made of stainless steel

844 KH Measuring heads carbide tipped on both sides, carbide expanding pin

844 KS Blind hole measuring heads hard chrome plated, expanding pin made of stainless steel

Catalog no.	Measuring range mm	Number of measuring probes	Order no.*
844 K	0.47 - 0.97	6	**4470000**
	0.95 - 1.55	5	**4470001**
	1.5 - 4.2	10	**4470002**
	3.7 - 7.3	7	**4470003****
	6.7 - 10.3	7	**4470004****
	9.4 - 18.6	9	**4470005****
844 KH	1.5 - 4.2	10	**4471002**
	3.7 - 7.3	7	**4471003****
	6.7 - 10.3	7	**4471004****
	9.4 - 18.6	9	**4471005****
844 KS	1.5 - 4.2	10	**4482163**
	3.7 - 7.3	7	**4482164****
	6.7 - 10.3	7	**4482165****
	9.4 - 18.6	9	**4482166****

** Excludes an indicating instrument*
***Additionally includes measuring force spring 4470828 and disk 4470821*

Accuracy

Deviation of linearity
≤ 2 % measuring ranges 0.47-1.55 mm
≤ 1 % measuring ranges 1.5-18.6 mm

Repeatability
1 µm manual measurement
≤ 0.5 µm measurement with Stand 844 Kst and Floating Holder 844 Ksts

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Indicators		Readings	Order no.
Millimess	**1004**	5 µm	**4333000**
Millimess	**1003**	1 µm	**4334000**
Millimess	**1003 XL**	2 µm	**4334001**
Millimess	**1002**	0.5 µm	**4335000**
Extramess	**2000**	0.2 µm, 0.5 µm, 1 µm	**4346000**
Extramess	**2001**	0.2 µm, 0.5 µm, 1 µm	**4346100**
MarCator	**1087 BR**	0.5 µm, 1 µm, 2 µm, 4 µm, 10 µm	**4337662**
MarCator	**1087 BRi**	0.5 µm, 1 µm, 2 µm, 4 µm, 10 µm	**4337664**

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7

Modular Unit System for 844 K Standard Measuring Probes

In addition complete Dial Bore Gages 844 K, modular units area available for assembly as required to suit an individual measuring task and or application.

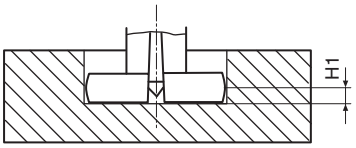
Measuring Probe 844 Kk, Expander Pin, individual Ring Gage for 844 Ke

Nominal dimension mm	Measuring range mm	Measuring depth mm	Measuring probe hard chrome plated	Expanding pin steel	Measuring probe carbide tipped	Expander pin carbide	Ring gage
0.50	0.47 - 0.53	1.25	4470586	4470801			4482300
0.55	0.52 - 0.58	1.5	4470587				4482301
0.60	0.57 - 0.67	1.7	4470588				4482302
0.70	0.65 - 0.77	2.2	4470589	4470802			4482303
0.80	0.75 - 0.87	2.55	4470590				4482304
0.90	0.85 - 0.97	2.65	4470591				4482305
1.00	0.95 - 1.15	10.5	4470592				4482306
1.10	1.07 - 1.25	10.5	4470593				4482307
1.20	1.17 - 1.35	10.5	4470594	4470803			4482308
1.30	1.27 - 1.45	10.5	4470595				4482309
1.40	1.37 - 1.55	10.5	4470596				4482310
1.75	1.50 - 1.90	16	4470597		4471234		4482311
2.00	1.80 - 2.20	16	4470598	4470804	4471206	4471207	4482312
2.25	2.05 - 2.45	16	4470599		4471812		4482313
2.50	2.30 - 2.70	21	4470600		4471813		4482314
2.75	2.55 - 2.95	21	4470601		4471814		4482315
3.00	2.80 - 3.20	21	4470602		4471208		4482316
3.25	3.05 - 3.45	21	4470603	4470805	4471815	4471819	4482317
3.50	3.30 - 3.70	21	4470604		4471816		4482318
3.75	3.55 - 3.95	21	4470605		4471817		4482319
4.00	3.80 - 4.20	21	4470606		4471204		4482320
4.00	3.70 - 4.30	38	4470607		4471607		4482320
4.50	4.20 - 4.80	38	4470608		4471608		4482321
5.00	4.70 - 5.30	38	4470609		4471609		4482322
5.50	5.20 - 5.80	38	4470610		4471610		4482323
6.00	5.70 - 6.30	38	4470611		4471611		4482324
6.50	6.20 - 6.80	38	4470612		4471612		4482325
7.00	6.70 - 7.30	38	4470613	4470806	4471613	4471200	4482326
7.50	7.20 - 7.80	38	4470615		4471615		4482327
8.00	7.70 - 8.30	38	4470616		4471616		4482328
8.50	8.20 - 8.80	45	4470617		4471617		4482329
9.00	8.70 - 9.30	45	4470618		4471618		4482330
9.50	9.20 - 9.80	45	4470619		4471619		4482331
10.00	9.70 - 10.30	45	4470620		4471620		4482332
10.00	9.40 - 10.60	45	4470621		4471621		4482332
11.00	10.40 - 11.60	45	4470622		4471622		4482333
12.00	11.40 - 12.60	45	4470623		4471623		4482334
13.00	12.40 - 13.60	45	4470624		4471624		4482335
14.00	13.40 - 14.60	45	4470625	4470808	4471625	4471202	4482336
15.00	14.40 - 15.60	45	4470626		4471626		4482337
16.00	15.40 - 16.60	80	4470627		4471627		4482338
17.00	16.40 - 17.60	80	4470628		4471628		4482339
18.00	17.40 - 18.60	80	4470629		4471629		4482340

for further technical data (e.g. nominal dimensions up to 40 mm) see **WebCode 11070**

Nominal dimension mm			L mm	H 1 mm
0.50			19.50	0.25
0.55			19.50	0.27
0.60			19.50	0.29
0.70			19.50	0.31
0.80			19.50	0.33
0.90			19.50	0.35
1.00	–	1.40	19.50	0.60
1.75	–	2.25	25.30	0.90
2.50	–	4.00	30.60	1.20
4.00	–	10.00	47.30	2.00
10.00	–	18.00	48.50	3.30

Minimum measurement height



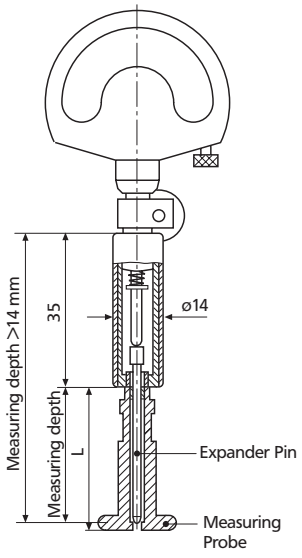
Modular Unit System for 844 KS Blind Hole Measuring Probes

In addition to complete Dial Bore Gages 844 KS, modular units are available for assembly as required to suit a individual measuring task and or application.

Blind Hole Measuring Probe 844 Kk, Blind Hole Expander Pin

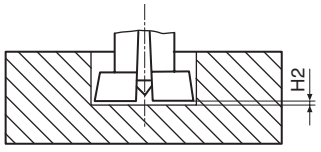
Nominal dimension mm	Measuring range mm	Measuring depth mm	Blind hole measuring probe hard chrome plated	Blind hole expander pin steel
1.75	1.50 - 1.90	16	**4482228**	**4482176**
2.00	1.80 - 2.20	16	**4482229**	
2.25	2.05 - 2.45	16	**4482230**	
2.50	2.30 - 2.70	21	**4470301**	**4482177**
2.75	2.55 - 2.95	21	**4482227**	
3.00	2.80 - 3.20	21	**4482178**	
3.25	3.05 - 3.45	21	**4482179**	
3.50	3.30 - 3.70	21	**4470300**	
3.75	3.55 - 3.95	21	**4482188**	
4.00	3.80 - 4.20	21	**4482180**	
4.00	3.70 - 4.30	38	**4482057**	**4482028**
4.50	4.20 - 4.80	38	**4482162**	
5.00	4.70 - 5.30	38	**4482056**	
5.50	5.20 - 5.80	38	**4470953**	
6.00	5.70 - 6.30	38	**4482140**	
6.50	6.20 - 6.80	38	**4482055**	
7.00	6.70 - 7.30	38	**4482108**	
7.50	7.20 - 7.80	38	**4482204**	
8.00	7.70 - 8.30	38	**4482054**	
8.50	8.20 - 8.80	45	**4482206**	
9.00	8.70 - 9.30	45	**4482170**	
9.50	9.20 - 9.80	45	**4482182**	
10.00	9.70 - 10.30	45	**4470375**	
10.00	9.40 - 10.60	45	**4482205**	**4482192**
11.00	10.40 - 11.60	45	**4482042**	
12.00	11.40 - 12.60	45	**4482112**	
13.00	12.40 - 13.60	45	**4482102**	
14.00	13.40 - 14.60	45	**4482181**	
15.00	14.40 - 15.60	45	**4482202**	
16.00	15.40 - 16.60	80	**4482021**	
17.00	16.40 - 17.60	80	**4482203**	
18.00	17.40 - 18.60	80	**4482113**	

for further technical data (e.g. nominal dimensions up to 40 mm) see **WebCode 11070**



844 Kk

Minimum measurement height



Nominal dimension mm			L mm	H 2 mm
1.75	–	2.25	25.30	0.30
2.50	–	4.00	30.60	0.30
4.00	–	10.00	47.30	0.50
10.00	–	18.00	48.50	1.00

Ring Gage Sets 844 Ke

For setting Dial Bore Gages 844 K, 844 KH and 844 KS. Supplied in sets to match the measuring ranges of these instruments. Can be stored in the wooden case of the bore gages.

Diameter tolerance ± 1 µm

Ring Gages 844 Ke are only available with the diameters shown in the table.
For all other dimensions, Ring Gages 355 E with dimensions as per DIN 2250 and with actual deviation engraved are available.

For Meas. range mm	Diameter mm	Order no.
0.47 - 0.97	0.5/0.55/0.6/0.7/0.8/0.9	**4470160**
0.95 - 1.55	1/1.1/1.2/1.3/1.4	**4470161**
1.5 - 4.2	1.75/2/2.25/2.5/2.75/ 3/3.25/3.5/3.75/4	**4470162**
3.7 - 7.3	4/4.5/5/5.5/6/6.5/7	**4470163**
6.7 - 10.3	7/7.5/8/8.5/9/9.5/10	**4470164**
9.4 - 18.6	10/11/12/13/14/15/ 16/17/18	**4470165**

Modular Unit System for 844 K

Holder 844 Kg
With locking clamp for an indicating instrument and a connecting thread for a **Measuring Head 844 Kk**. Heat insulated handle

Order no. 4470851

Extensions 844 Kv
For extra-deep bores. Screws in between Holder 844 Kg and Measuring Head 844 Kk for measuring range 10-18 mm.
Length 64 mm, ø 8 mm,

Order no. 4470070

Right Angle Attachment 844 Kw
For measuring bores which are difficult to reach, e.g. in tight spaces, on machine tools or when work piece bores are inconveniently located. For screwing in between Holder 844 Kg and Measuring Head 844 Kk

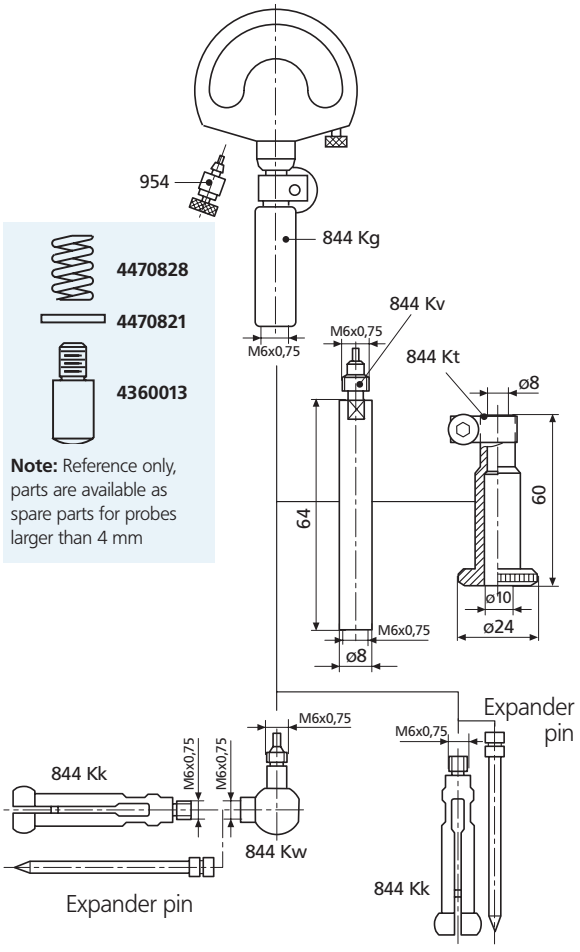
Order no. 4470110

Lifter 954
Facilitates insertion of measuring probe in bore by lifting measuring spindle of dial comparator.

Order no. 4372030

Depth Stop 844 Kt
For checking diameter of bores at prescribed depth. Only to be used with Extension 844 Kv.

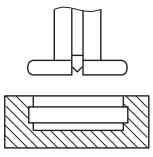
Order no. 4470115



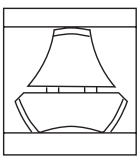
Measuring Probes for Special Applications

For measurement of blind holes, diameters of recesses, distances between plane-parallel surfaces, etc. special models of measuring probes are available on request.

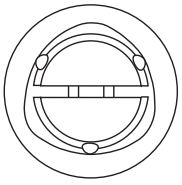
1. Measurement of the diameter of recesses



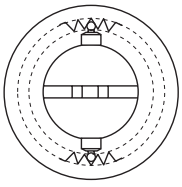
2. Measurement of plane-parallel surfaces



3. Measurement of polygon bores



4. Measurement of inside serrations, see 844 Z Page 9-72



Accessories

Stand 844 Kst

Features

For quick checks of bores in small work pieces. Hardened table plate can be raised with lever, thus moving test piece into position. Plate can be clamped at any height for checking eccentricity. Particularly suited to use with digital indicators, where appropriate in conjunction with data printers or computer equipment, in cases where the determination of the reversal point is inappropriate.

Table dia.	58 mm
Throat depth of arm	45 mm
Table stroke	30 mm
Max. work piece height	ca. 100 mm

Order no. **4470100**

Floating Holder 844 Ksts

Features

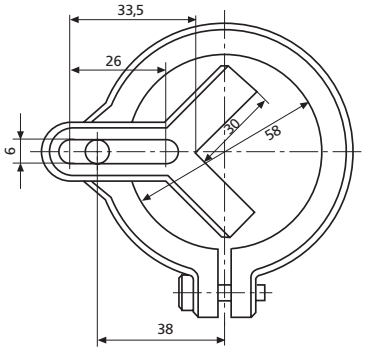
For use in conjunction with Stand 844 Kst. Enables measuring probe to find common axis of bore and measuring instrument quickly and easily on insertion into hole, thus providing optimum measuring speed and high accuracy. Particularly suitable for small diameters, as measuring confidence is considerably enhanced.

Order no. **4470105**

Angle Stop 844 Ka

Facilitates positioning of cylindrical work pieces under measuring instrument. For clamping to Stand 844 Kst.

Order no. **4470120**



Adjustable Bore Gages 1280 P

Superior Accuracy for Production and Inspection.

1280P Shown wireless Digital Indicators and 1280P-1W1

Features

- Rugged construction for long life and low maintenance: Stainless steel gaging head, one piece centralizing yoke with replaceable tungsten carbide balls.
- Heavy duty housing protects Indicator.
- Flow-through design makes Series 1280P Bore Gages swish clean, no disassembly required.
- Outstanding stability: Holds mastered value.
- Bore gages may be furnished with various Dial or Digital Indicators.
- Digital bore gages are available with standard or advanced indicators.
  - Standard models 1075 R and 1086 R provide live reading with data output.
  - Advanced models, Maxum /// and 1087 R, provide dynamic memory that hold the reading of a diameter measured in a single sweep.
- Wireless data collection with 1086 Ri, 1087 Ri provides more flexibility of movement during the measurement and increased portability by bringing the gage to the part.

Technical Data

With Dial Indicator
Range of Sensitive Contact: 0.63 mm / ***.025"***,
0.002 mm / ***.0001"*** grad.

With Maxμm®*///* Indicators
Range of Sensitive Contact: 0.39 mm /***.020"***.
Resolution: 0.001 mm / ***.00005"*** resolution,
0.001 mm / ***.001"*** grad.

If gage capacity is 25 mm / 1" or greater, the Maxμm®*///* Indicator is covered with a cast aluminum protective housing.
If under 25 mm / 1" capacity, the protective housing is not normally furnished.

With Dial Indicator	With Maxμm®*///* Digital Indicators	Capacity mm/*inch*	Gaging Depth mm/*inch*	End of Head to Contact mm/*inch*
1280P-1W1	**1282P-1W1**	12 - 25 / ***.50 - 1"***	76 / ***3"***	2.77 / ***.11"***
1280P-2W2	**1282P-2W2**	25 - 50 / ***1- 2"***	152 / ***6"***	4.37 / ***.17"***
1280P-3W2	**1282P-3W2**	50 - 203 / ***2 - 8"***	152 / ***6"***	7.92 / ***.31"***
1280P-1W2	**1282P-1W2**	12 - 25 / ***.50 - 1"***	152 / ***6"***	2.77 / ***.11"***
1280P-2W3	**1282P-2W3**	25 - 50 / **1 - 2"**	305 / ***12"***	4.37 / ***.17"***
1280P-3W3	**1282P-3W3**	50 - 203 / ***2 - 8"***	305 / ***12"***	7.92 / ***.31"***

See matrix on next page.
Note: Model numbers do not include extensions.

Series 1280P Adjustable Bore Gages are normally furnished with adjusting wrenches. Reference contacts for particular measurement sizes must be specified separately (see table on following page). If not specified, T.C. contacts will be furnished.
For alternate gaging depths, contact materials, and other modifications are available.

Example: **1282P-3MW3** with **PT-156 and EX-224** specifies an Adjustable Bore Gage with tungsten carbide reference contact and an extension to cover the range from 75 mm / 3" to 89 mm / 3.5".
The Gage is furnished with a Metric Maxμm/// Indicator, **2033119** (which has selectable resolution, units and includes Digital Output).

Adjustable Bore Gages 1280 P

Ordering Information

To order the correct bore gage to suit your measurement application, start with the base Model Number: **128XP-XXXX** and substitute the X with the appropriate number or letter from the boxes below:

128 X P - X X X X

Indicator

0 – Dial Indicator
2 – Maxμm®/// with Output

Capacity

1 – 12.50 - 25 mm / ***.50 - 1"*** gaging depth to 305 mm / ***12"***
2 – 25 - 50 mm / ***1 - 2"*** gaging depth to 610 mm / ***24"***
3 – 50 - 200 mm / ***2 - 8"*** gaging depth to 1220 mm / ***48"***

Units

– Omit for Inch
M – Metric

Configuration

W – Gage only
S – Complete kit with steel contacts*
T – Complete kit with T.C. contacts*

** Each kit is complete with components needed for capacity ranging from 12.70 - 203 mm / .50 - 8". A fitted case is furnished for all models with a gaging depth 150 mm / 6" or under. It contains a Dial or MaxμmIII Indicator with each tube assembly and all contacts, extensions, extenders, locknuts and necessary wrenches.*

Gaging Depth

1 – 76 mm / ***3"***
2 – 150 mm / ***6"***
3 – 300 mm / ***12"***
4 – 450 mm / ***18"***
5 – 600 mm / ***24"***
6 – 760 mm / ***30"***
7 – 910 mm / ***36"***
8 – 1220 mm / ***48"***

Example: If you chose **1282P-3S5** as your model number, you would have chosen an Inside Diameter gage with Maxμm/// Indicator, 50 - 200 mm / 2 - 8" capacity, inch units, having a complete kit with steel contacts and a gaging depth of 600 mm / 24". Metric equivalent Model would be: **1282P-3MS5**.

Handles / Housing

All 1280P gages have a removable handle as a part of the Indicator Housing.

All 1282P gages can be equipped with a handle which projects at 90° to the gage housing.

1282P gages with capacity 12-25 mm / .50-1" are not normally furnished with a protective housing. Handles and Housings may be ordered separately.

For Handles order **HA-88** with **AT-124** Adaptor. For Housings order **EHG-1198**.

Gaging Extensions

Specify the Reference Contact Gaging Extensions required from the table below. For all diameters below 50 mm /2" the Reference Contact is integral with each Extension. For diameters over 50 mm/ 2" the Reference Contact is separate and interchangeable among Extension Sets.

1282P-1W1
(Output Cable not included)

Technical Data

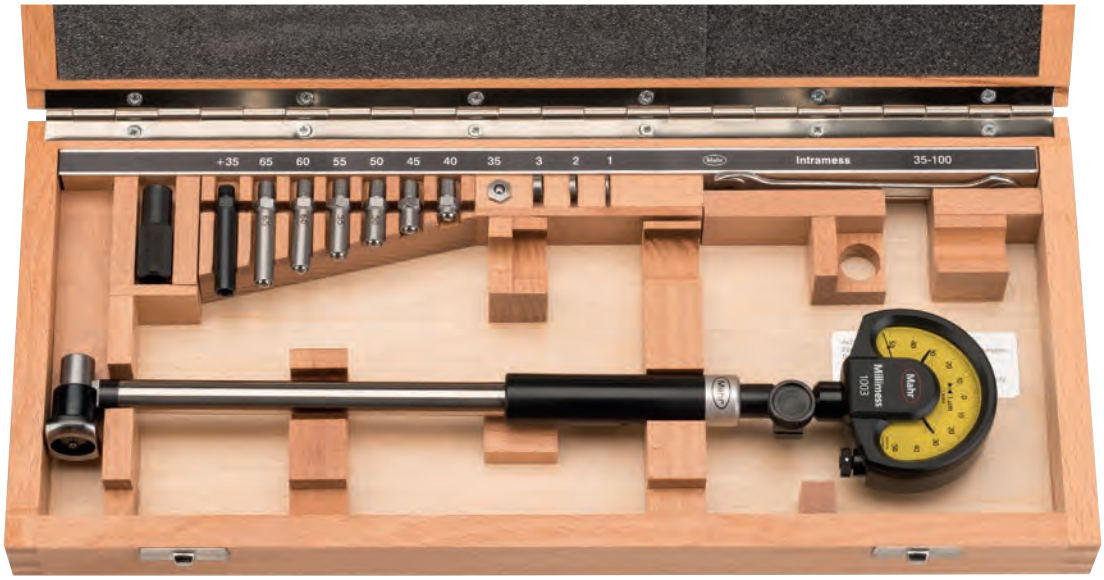
Diameter to be measured mm/*inch*	Extension Required Carbide	Steel	Used on Gage Model Numbers
12 - 16 / ***.50 - .625"***	**PT-562**	**PT-558**	1280P-1xxx
16 - 19 / ***.625 - .75"***	**PT-567**	**PT-559**	
19 - 22 / ***.75 - .875"***	**PT-568**	**PT-560**	1282P-1xxx
22 - 25 / ***.875 - 1"***	**PT-557**	**PT-561**	
25 - 32 / ***1 - 1.25"***	**PT-554**	**PT-555**	1280P-2xxx
32 - 38 / ***1.25 - 1.50"***	**PT-553**	**PT-556**	
38 - 45 / ***1.50 - 1.75"***	**PT-552**	**PT-569**	1282P-2xxx
45 - 50 / ***1.75 - 2"***	**PT-550**	**PT-551**	

For the gaging diameters listed below, select one Contact Point and at least one Extension Set.

Contact Point:	**Extension Required**	**Used on Gage Models**
Carbide	PT-156	1280P-3XXX
Steel	PT-2224	1282P-3XXX

Extension Sets: Diameter to be Measured mm/*inch*	**Extension Sets**	**Used on Gage Models**
50 - 64 / ***2 - 2.5"***	**EX-222**	
64 - 76 / ***2.5 - 3"***	**EX-223**	
76 - 89 / ***3 - 3.5"***	**EX-224**	1280P-3XXX
89 - 100 / ***3.5 - 4"***	**EX-225**	
100 - 127 / ***4 - 5"***	**EX-223 with EX-226**	1282P-3XXX
127 - 152 / ***5 - 6"***	**EX-225 with EX-226**	
152 - 178 / ***6 - 7"***	**EX-223 with EX-228**	
178 - 200 / ***7 - 8"***	**EX-225 with EX-228**	

Self-Centering Dial Bore Gages 844 N / 844 NH Intramess



Features

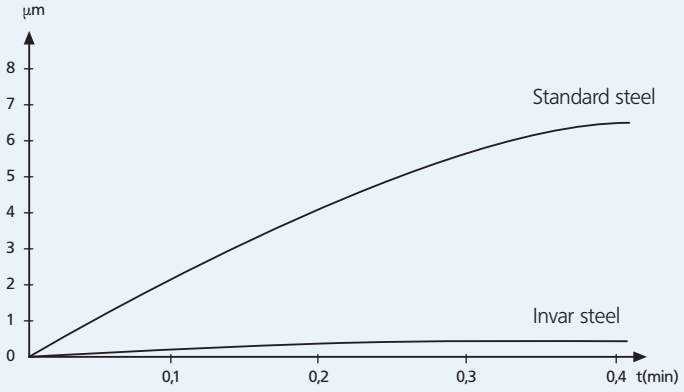
- Measuring the diameter, roundness and conical form of a bore as well as the distances of plane-parallel surfaces
- Measuring head consists of a carbide-tipped moving anvil and an interchangeable stationary anvil which has a hardened steel ball; alternatively a carbide ball is available
- Transmission lever system transfers movement of the movable anvil to indicating instrument
- The broad centering bridge ensures automatic centering in the bore
- Insensitive to temperature due to both the shank and transfer rod being made from heat resistant **Invar steel**
- Highly resistant to wear and tear due to the carbide tipped moving anvil
- Constant measuring force due to built-in spring thus eliminating user influence
- Universally applicable and extremely versatile as every instrument spans a broad measuring range, within this range it is quick and easy to adjust to any size
- Measuring head, holder, extensions, right-angle attachments and depth stops are all part of this extensive modular system
- Supplied with: Holder, measuring head, stationary anvil, wooden case, excludes an indicating instrument

The comparision between Invar and Standard steel

Invar steel has a particularly low expansion coefficient and thus makes the instrument totally insensitive to any kind of heat. Body heat from the user, increases in ambient temperature have no influence on the measuring results.

The graph on the right compares the Invar steel version to a standard type. Both gages were hand-held and thus influenced by body heat. The deviation when using Invar steel is negligible.

Change in length due to heat



Technical Data

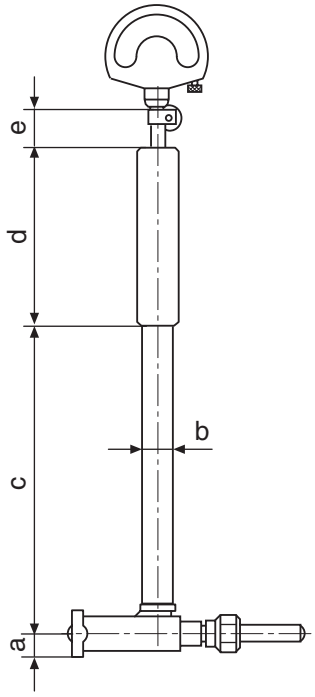
Measuring range mm			Measuring range *(inch)*	Error limit G_e µm	Repeatability f_w µm	Hysteresis f_u µm	Order no* 844 N	Order no* 844 NH
18	-	50	***(.7 - 2")***	2	0.5	2.5	**4474000**	**4475000**
35	-	100	***(1.4 - 4")***	2	0.5	2.5	**4474001**	**4475001**
100	-	250	***(4 - 10")***	2	0.5	2.5	**4474002**	**4475002**
250	-	400	***(10 - 16")***	3	1.5	3.5	**4474003**	**4475003**
400	-	800	***(16 - 32")***	3	1.5	3.5	**4474004**	**4475004**
250	-	800	***(10 - 32")***	3	1.5	3.5	**4474005**	**4475005**

* *Excludes indicating instrument*

Complete Instrument

844 N Carbide-tipped moving anvil; stationary anvil with steel ball

844 NH Moving anvil **and** stationary anvil are carbide-tipped



Measuring range mm	*(inch)*	a	b	c	d	e
18 - 50	***(.7 - 2")***	5.35	8	115	63	22
35 - 100	***(1.4 - 4")***	8.5	12	148	80	22
100 - 250	***(4 - 10")***	11.5	18	230	100	25
250 - 400	***(10 - 16")***	16	24	366	110	28
400 - 800	***(16 - 32")***	17.5	24	366	110	28

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Indicator		Readings mm / *inch*	Order no. mm / *inch*
Millimess	**1004/1004 Z**	5 µm /***.0001"***	**4333000/*4333900***
Millimess	**1003/1003 Z**	1 µm /***.00005"***	**4334000/*4334900***
Millimess	**1003 XL**	2 µm	**4334001**
Millimess	**1002/1002 Z**	0.5 µm /***.00002"***	**4335000/*4335900***
Extramess	**2001**	0.2 µm /***.00001"***	
		0.5 µm /***.00002"***	**4346100***
		1 µm /***.00005"***	
µMaxµm II		0.0005 mm /***.00002"***	**2034205****
		0.0005 mm / ***.00002"***	
		0.001 mm /***.00005"***	
MarCator	**1087 BR**	0.002 mm /***.0001"***	**4337662**
		0.004 mm /***.0005"***	
		0.010 mm /***.001"***	
		0.0005 mm / ***.00002"***	
		0.001 mm /***.00005"***	
MarCator	**1087 BRi**	0.002 mm /***.0001"***	**4337664**
		0.004 mm /***.0005"***	
		0.010 mm /***.001"***	

2001

1003

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7
** 230 V, for 115 V please refer to page 6-5 ** requires contact 4360043*

Modular Unit System 844 N

In addition to complete Dial Bore Gages 844 N, modular units can also be compiled as required to suit a individual measuring task and or application.

Measuring Head 844 Nk, steel

Measuring Head 844 NHk, carbide

With built-in lever transmission system, carbide-tipped anvil and extra-wide centering bridge. With interchangeable stationary anvil. Threaded connection for Holders 844 Ng and 844 Ngk.

Measuring range mm	*(inch)*	Order no. 844 Nk	Order no. 844 NHk
18 - 50	***(.7 - 2")***	**4474151**	**4474156**
35 - 100	***(1.37 - 4")***	**4474152**	**4474157**
100 - 250	***(4 - 10")***	**4474153**	**4474158**
250 - 400	***(10 - 16")***	**4474154**	**4474159**
400 - 800	***(16 - 32")***	**4474155**	**4474160**

Extension Set 844 Nes

For extending range of Measuring Head 844 Nk/NHk from 250-400 mm to 800 mm. Consists of additional centering bridge and two extensions.

Order no.: **4474010**

Holder 844 Ng

Shank and transfer rod made of heat-resistant Invar steel. With a locking clamp for indicator.

For meas. range mm (*inch*)		L mm/*inch*	d1 mm/*inch*	d2 mm/*inch*	Order no.
18 - 50	***(.7 - 2")***	200 / ***8"***	14 / ***.6"***	8 / ***.3"***	**4474040**
35 - 100	***(1.37 - 4")***	250 / ***10"***	18 / ***.7"***	12 / ***.5"***	**4474041**
100 - 250	***(4 - 10")***	350 / ***14"***	26 / ***1.0"***	18 / ***.7"***	**4474042**
250 - 800	***(10 - 32")***	500 / ***20"***	30 / ***1.2"***	24 / ***.9"***	**4474043**

Short Holder 844 Ngk

Shank and transfer rod made of heat-resistant Invar steel. With a locking clamp for an indicator.

For meas. range mm (*inch*)		L mm/*inch*	d1 mm/*inch*	d2 mm/*inch*	Order no.
18 - 50	***(.7 - 2")***	120/ ***5"***	14/ ***.6"***	8/ ***.3"***	**4474050**
35 - 100	***(1.37 - 4")***	120/ ***5"***	18/ ***.7"***	12/ ***.5"***	**4474051**
100 - 250	***(4 - 10")***	150/ ***6"***	26/***1.0"***	18/ ***.7"***	**4474052**
250 - 800	***(10 - 32")***	250/ ***10"***	30/***1.2"***	24/ ***.9"***	**4474053**

Right Angle Attachment 844 Nw

For measuring difficult to reach bores, e.g. in tight spaces, inconveniently located or on machine tools. For screwing in between 844 Ng or 844 Ngk and 844 Nk/NHK.

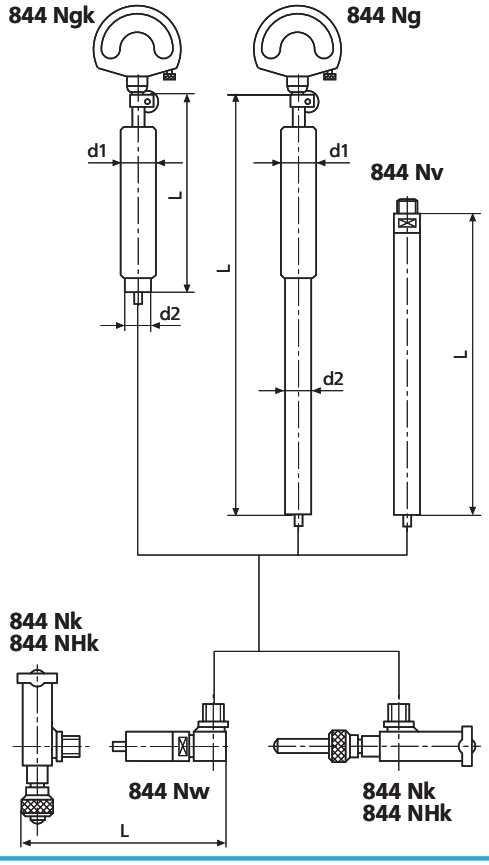
For meas. ranges mm	*(inch)*	Length* L mm/*inch*	Bore depth mm/*inch*	Order no.
18 - 50	***(.7 - 2")***	66 / ***2.6"***	45 / ***1.8"***	**4474070**
35 -100	***(1.37 - 4")***	80 / ***3.1"***	55 / ***2.2"***	**4474071**
100 -250	***(4 - 10")***	105 / ***4.1"***	70 / ***2.8"***	**4474072**

** With measuring heads 844 Nk/NHk*

Extension 844 Nv

For extra deep bores. For screwing in between 844 Ng and 844 Nk/NHk. Shank and transfer rod made of Invar steel.

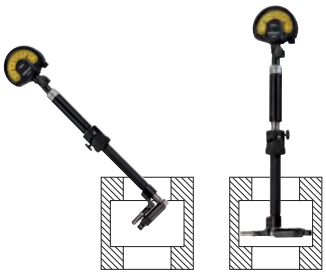
For instruments mm	*(inch)*	Length L (mm/*inch*)	Order no.
18 - 50	***(.7 - 2")***	250 / ***9.8"***	**4474066**
35 -100	***(1.37 - 4")***	250 / ***9.8"***	**4474060**
100 -250	***(4 - 10")***	250 / ***9.8"***	**4474061**
		500 / ***19.7"***	**4474062**
250 -800	***(10 - 32")***	250 / ***9.8"***	**4474063**
		500 / ***19.7"***	**4474064**



Self-Centering Dial Bore Gages 844 NR

Applications

- Ideal for measuring difficult to reach bore diameters, grooves and recesses.



Features

- Measuring head consists of a carbide-tipped moving anvil and an interchangeable stationary anvil with a carbide ball
- Transmission lever system transfers movement of the movable anvil to indicating instrument
- The broad centering bridge ensures automatic centering in the bore
- Insensitive to temperature due to both the shank and transfer rod being made from heat resistant **Invar steel** (for further information see page 9-66)
- Highly resistant to wear and tear due to the carbide tipped moving anvil
- Constant measuring force due to built-in spring thus eliminating user influence
- Universally applicable and extremely versatile as every instrument spans a broad measuring range, within this range it is quick and easy to adjust to any size
- Supplied with: Measuring holder, measuring head, anvil spindle, wooden case, excludes indicator

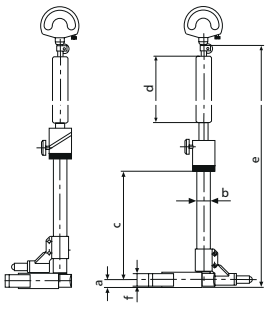
Technical Data

Measuring range mm	Measuring range *(inch)*	Error limit G_e µm	Repeatability f_w µm	Hysteresis f_u µm	Order no*
50 - 70	*(2 - 2.8")*	2	1	2.5	**4474580**
60 - 100	*(2.4 - 4")*	2	1	2.5	**4474590**
80 - 150	*(3.2 - 6")*	2	1	2.5	**4474600**
120 - 220	*(4.7 - 8.7)*	3	1.5	3.5	**4474610**
180 - 360	*(7.1 - 14.2")*	3	1.5	3.5	**4474620**
290 - 530	*(11.4 - 20.7")*	3	1.5	3.5	**4474630**

* *Excludes indicating instrument*

Dimensions

Measuring range mm	Measuring range *(inch)*	a	b	c	d	e	f
50 - 70	*(2 - 2.8")*	5	12	60	60	203	6
60 - 100	*(2.4 - 4")*	7	15	110	80	264	8
80 - 150	*(3.2 - 6")*	7	15	110	80	264	8
120 - 220	*(4.7 - 8.7)*	7.5	15	110	80	264	10
180 - 360	*(7.1 - 14.2")*	11	23	150	90	343	10
290 - 530	*(11.4 - 20.7")*	15	30	170	90	409	10



Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used.

Recommendations see page 9-67

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7

Self-Centering Dial Bore Gages 844 NB

Applications

- Ideal for measuring blind holes. Can be measured almost to the base of a bore

Features

- Measuring head consists of a carbide-tipped moving anvil and an interchangeable stationary anvil with a carbide ball
- Transmission lever system transfers movement of the movable anvil to indicating instrument
- The broad centering bridge ensures automatic centering in the bore
- Insensitive to temperature due to both the shank and transfer rod being made from heat resistant **Invar steel** (for further information see page 9-66)
- Highly resistant to wear and tear due to the carbide tipped moving anvil
- Constant measuring force due to built-in spring thus eliminating user influence
- Universally applicable and extremely versatile as every instrument spans a broad measuring range, within this range it is quick and easy to adjust to any size
- Supplied with: Measuring holder, measuring head, anvil spindle, wooden case, excludes indicator

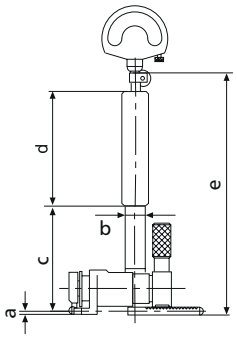
Technical Data

Measuring range mm	Measuring range *(inch)*	Error limit G_e µm	Repeatability f_w µm	Hysteresis f_u µm	Order no*
20 - 50	***(0.79 - 2")***	4	1	2.5	**4474179**
50 - 110	***(2 - 4.33")***	2.5	1	2.5	**4474180**
110 - 300	***(4.33 - 11.81")***	2.5	1	3	**4474186**

* *Excludes indicating instrument*

Dimensions

Measuring range mm	Measuring range *(inch)*	a	b	c	d	e
20 - 50	***(0.79 - 2")***	1.5	10	77	60	163
50 - 110	***(2 - 4.33")***	1.5	12	60	60	144
110 - 300	***(4.33 - 11.81")***	2	18	90	90	163



Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used.

Recommendations see page 9-67

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7

Accessories to set and adjust Dial Bore Gages

1. Setting Device
Uses standard gage blocks for setting any bore diameter and any tolerance. Replaces ring gages and is universally applicable.

2. Ring Gage 355 E
Special wear-resistant gage steel. Hardened and lapped.
With actual deviation engraved

Dimensions: DIN 2250, type C
Manufacturing tolerance: DIN 2250
Available diameters: see page 13-19

355 E

Components

Measuring Jaw 844 em

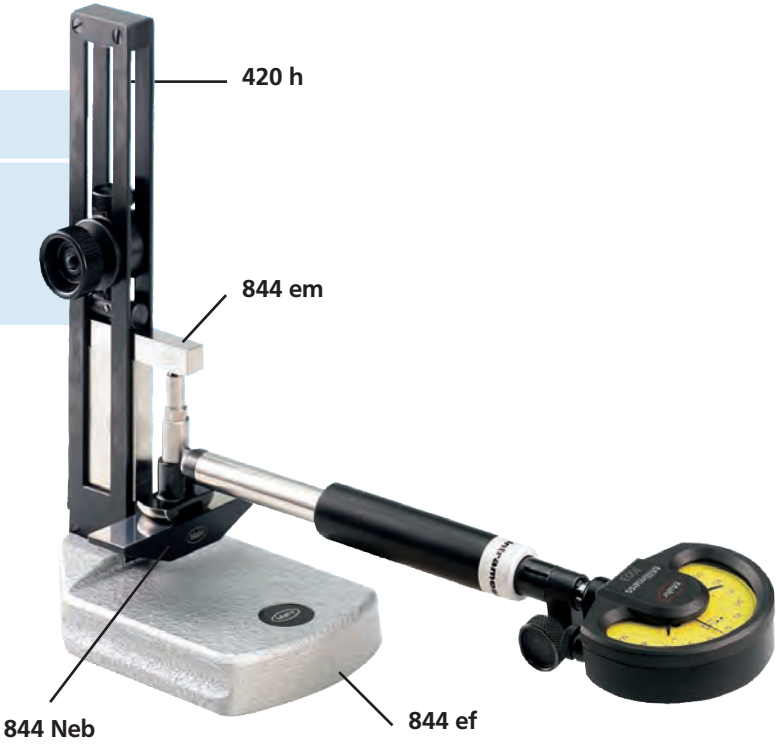
Measuring range mm *(inch)*	Dimensions mm/*inch*	Order no.
18 - 800 ***(.7 - 32")***	60 x 9.5 x 9 /***2.36 x .37 x .35"***	**4470095**

Setting Bridge 844 Neb

Measuring range mm *(inch)*	Width mm/*inch*	Height mm/*inch*	Order no.
18 - 250 ***(.7 - 10")***	70 / ***2.75"***	12 /***.47"***	**4474080**
18 - 400 ***(.7 - 16")***	165 / ***6.49"***	17 /***.67"***	**4474081**
18 - 800 ***(.7 - 32")***	320 /***12.59"***	20 /***.78"***	**4474082**

Gage Block Holder 420 h

Clamping range mm *(inch)*	Order no.
0 - 70 ***(0 - 2.75")***	**4800120**
0 - 120 ***(0 - 4.72")***	**4800121**
100 - 220 ***(4 - 8.66")***	**4800122**
100 - 420 ***(4 - 16.53")***	**4800123**
400 - 820 ***(16 - 32.28")***	**4800124**



Stand 844 ef

For mounting setting device up to 420 mm

Order no. **4470098**

Dial Bore Gage for Internal Serrations 844 Z

Dial Bore Gage 844 Z
Diametrical two ball measurement "Mdk" from **3.5 - 333 mm**

Modular Unit Parts 844 Kk
"Mdk" from **3.5 - 26.1 mm**
(see table below)

Modular Unit Parts 844 Z
"MdK" **26 - 333 mm** (see table on opposite page)

Features

- For diametrical two ball measurement MdK, to obtain the pitch diameter and conical form of internal gears in any position and at any depth
- For ball dimensions from 3.5 to 26.1 mm use the 844 Kk with carbide ball anvils and in conjunction with an expander pin
- For ball dimensions >26 mm the measuring heads 844 z1 or 844 z2 with the appropriate modular units are to be employed
- Maximum wear resistance due to carbide ball anvils
- Constant measuring force due to built-in spring thus eliminating user influence
- Anvils, measuring heads, holder, spacer (intermediate piece) and depth extensions form a very comprehensive modular system which can rapidly be converted to measure further gear sizes

Modular Unit Parts:

Diametrical two ball measurement „M_{dk}" from **3.5 - 26.1 mm**

Ball dimension M_{dk} (mm)	**Order no.** ball dia. 1-5 graduation 0.5	**Ball dia.** according to table	**Order no.** ball dia. 7.5-10 graduation 0.5	**Expander pin** Steel
3.5 - 4.1	**4482450**	**4482550**		**4470806**
4.0 - 4.6	**4482451**	**4482551**		
4.5 - 5.1	**4482452**	**4482552**		
5.0 - 5.6	**4482453**	**4482553**		
5.5 - 6.1	**4482454**	**4482554**		
6.0 - 6.6	**4482455**	**4482555**		
6.5 - 7.1	**4482456**	**4482556**		
7.0 - 7.6	**4482457**	**4482557**		
7.5 - 8.1	**4482458**	**4482558**		
8.0 - 8.6	**4482459**	**4482559**		
8.5 - 9.1	**4482460**	**4482560**		
9.0 - 9.6	**4482461**	**4482561**		
9.3 - 10.6	**4482462**	**4482562**	**4482662**	**4470808**
10.3 - 11.6	**4482463**	**4482563**	**4482663**	
11.3 - 12.6	**4482464**	**4482564**	**4482664**	
12.3 - 13.6	**4482465**	**4482565**	**4482665**	
13.3 - 14.6	**4482466**	**4482566**	**4482666**	
14.5 - 16.1	**4482467**	**4482567**	**4482667**	
15.5 - 17.1	**4482468**	**4482568**	**4482668**	
16.5 - 18.1	**4482469**	**4482569**	**4482669**	
17.5 - 19.1	**4482470**	**4482570**	**4482670**	
18.5 - 20.1	**4482471**	**4482571**	**4482671**	
19.5 - 21.1	**4482472**	**4482572**	**4482672**	
20.5 - 22.1	**4482473**	**4482573**	**4482673**	
21.5 - 23.1	**4482474**	**4482574**	**4482674**	
22.5 - 24.1	**4482475**	**4482575**	**4482675**	
23.5 - 25.1	**4482476**	**4482576**	**4482676**	
24.5 - 26.1	**4482477**	**4482577**	**4482677**	

Lifting Knob 954
enables the dial bore gage to gently guided into the serration. The measuring spindle of the indicating instrument can also be lifted.
Order no. **4372030**

Holder 844 Kg
with a clamping device for the indicating instrument. The mounting bore diameter 8 mm
Order no. **4470851**

Extension 844 Kv
for measuring in depth bores; length 64 mm
Order no. **4470070**

844 Kk Anvil
for internal serrations.
ball dimension „M_{dk}" from

3.5 - 26.1 mm

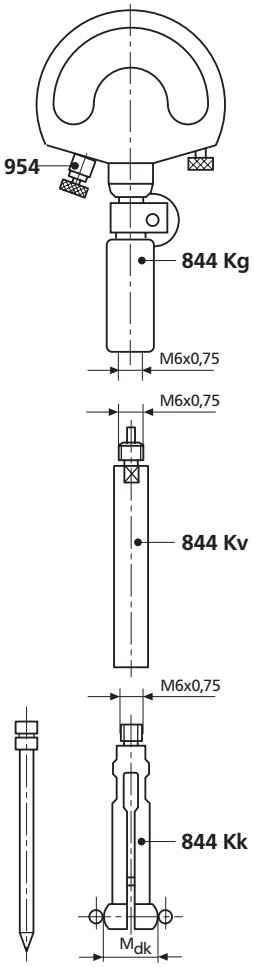


Table (Sizes in mm)

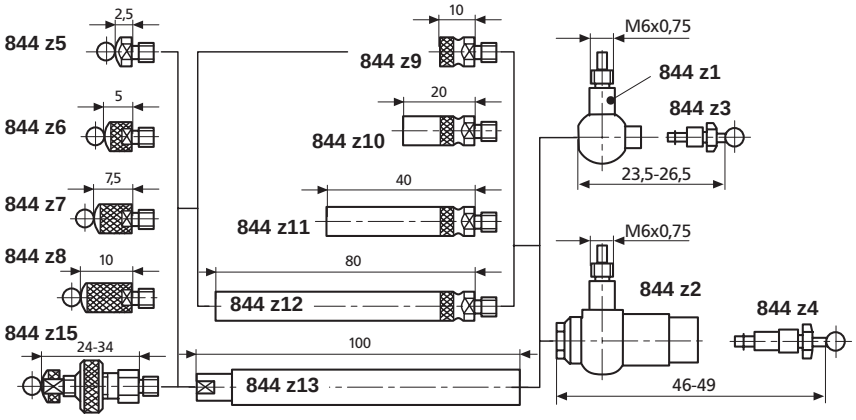
0.500 - 0.551 - 0.620 - 0.623 - 0.630 - 0.722 - 0.862 - 0.895 - 0.965 - 1.100 - 1.118 - 1.125 - 1.250
1.350 - 1.372 - 1.385 - 1.524 - 1.540 - 1.600 - 1.650 - 1.700 - 1.750 - 1.782 - 1.800 - 1.829 - 1.900
2.032 - 2.250 - 2.284 - 2.386 - 2.438 - 2.667 - 2.704 - 2.713 - 2.721 - 2.743 - 2.750 - 3.048 - 3.250
3.400 - 3.658 - 4.835 - 5.250 - 5.486 - 5.500 - 6.000 - 6.096 - 6.350 - 6.500 - 7.000

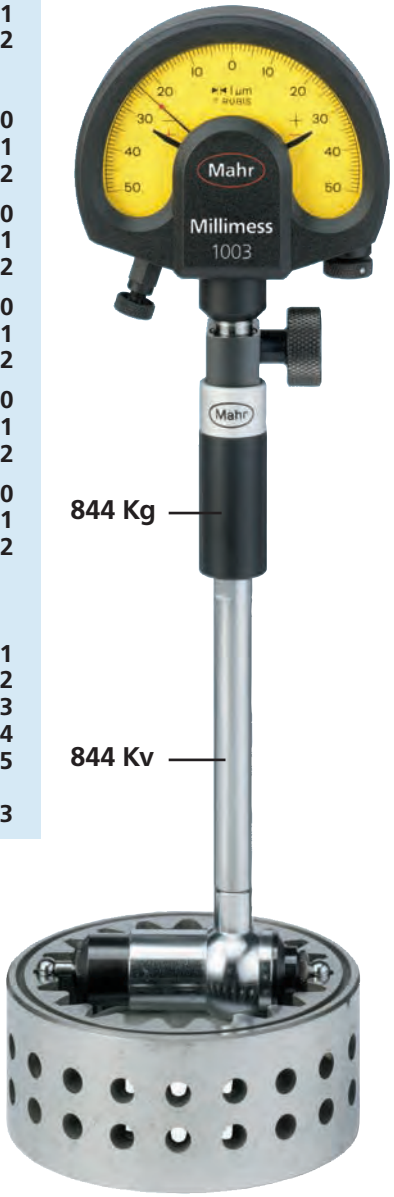
Modular Unit Parts

Diametrical two ball measurement from M_{dK} **26-333 mm**

Measuring Heads			**Order no.**
844 z1, for M_{dK} 26 - 130,5 mm			**4485000**
844 z2, for M_{dK} 48.5 - 333 mm			**4485001**
Floating Ball Anvils with carbide ball			
	Grad. (mm)	**Ball** dia. mm	
844 z3 Meas. range 3 mm, for Meas. Head 844 z1	0.5	1.0 - 5.0	**4488300**
		acc. to table	**4488301**
	0.5	7.5 - 10	**4488302**
844 z4 Meas. range 3 mm, for Meas. Head 844 z2	0.5	1.0 - 5.0	**4488310**
		acc. to table	**4488311**
	0.5	7.5 - 10	**4488312**
Ball Anvils with carbide ball			
844 z5, Length 2.5 mm	0.5	1.0 - 5.0	**4488320**
		acc. to table	**4488321**
	0.5	7.5 - 10	**4488322**
844 z6, Length 5.0 mm	0.5	1.0 - 5.0	**4488330**
		acc. to table	**4488331**
	0.5	7.5 - 10	**4488332**
844 z7, Length 7.5 mm	0.5	1.0 - 5.0	**4488340**
		acc. to table	**4488341**
	0.5	7.5 - 10	**4488342**
844 z8, Length 10.0 mm	0.5	1.0 - 5.0	**4488350**
		acc. to table	**4488351**
	0.5	7.5 - 10	**4488352**
844 z15, Length adjustable from 24-34 mm	0.5	1.0 - 5.0	**4488360**
		acc. to table	**4488361**
	0.5	7.5 - 10	**4488362**
Spacer (intermediate piece)			
	Length (mm)		
844 z9	10		**4486501**
844 z10	20		**4486502**
844 z11	40		**4486503**
844 z12	80		**4486504**
844 z13	100 *		**4486505**
Wooden case			**4485013**

** Only for 844 z2*





Dial Bore Gage for Internal Serrations 844 Z

Selecting Modular Unit Parts **Measuring Head 844 z1** and **Floating Ball Anvil 844 z3**

M_{dK} in mm	844 z5	844 z6	844 z7	844 z8	844 z15	844 z9	844 z10	844 z11	844 z12	844 z13
26.0 - 29.0	x									
28.5 - 31.5		x								
31.0 - 34.0			x							
33.5 - 36.5				x						
36.0 - 39.0	x					x				
38.5 - 41.5		x				x				
41.0 - 44.0			x			x				
43.5 - 46.5				x		x				
46.0 - 49.0	x						x			
47.5 - 60.5					x					
48.5 - 51.5		x					x			
51.0 - 54.0			x				x			
53.5 - 56.5				x			x			
56.0 - 59.0	x					x	x			
57.5 - 70.5					x	x				
58.5 - 61.5		x				x	x			
61.0 - 64.0			x			x	x			
63.5 - 66.5				x		x	x			
66.0 - 69.0	x							x		
67.5 - 80.5					x		x			
68.5 - 71.5		x						x		
71.0 - 74.0			x					x		
73.5 - 76.5				x				x		
76.0 - 79.0	x					x		x		
77.5 - 90.5					x	x	x			
78.5 - 81.5		x				x		x		
81.0 - 84.0			x			x		x		
83.5 - 86.5				x		x		x		
86.0 - 89.0	x						x	x		
87.5 - 100.5					x			x		
88.5 - 91.5		x					x	x		
91.0 - 94.0			x				x	x		
93.5 - 96.5				x			x	x		
96.0 - 99.0	x					x	x	x		
97.5 - 110.5					x	x		x		
98.5 - 101.5		x				x	x	x		
101.0 - 104.0			x			x	x	x		
103.5 - 106.5				x		x	x	x		
107.5 - 120.5					x		x	x		
117.5 - 130.5					x	x	x	x		

Example:

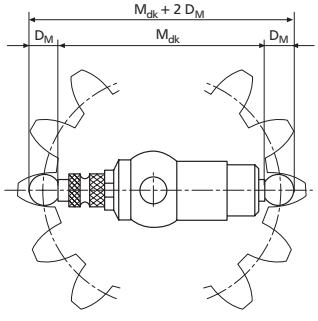
Diametrical two ball meas. M_{dK}	73.0	mm
Ball dia.	5.486	mm

When placing an order please quote the ball diameter of the modular unit system for 844 z3 - 844 z8, as well as 844 z15. On the basis of the above specifed example above result several combinations that are possible to choice from is dependent upon the work piece. For further details please refer to the illustration on Page 9-67.

The measuring application can be solved with either one of the following 4 versions:

Type	Description	Ball dia. mm	Length mm	Order no.
Version 1				
844 z1	Meas. Head		23.5-26.5	**4485000**
844 z3	Floating Ball Anvil	5.486		**4488301**
844 z7	Ball Anvil	5.486	7.5	**4488341**
844 z11	Spacer		40.0	**4486503**
Meas. range			71.0-74.0	
Version 2				
844 z1	Meas. Head		23.5-26.5	**4485000**
844 z3	Floating Ball Anvil	5.486		**4488301**
844 z15	Ball Anvil	5.486	24.0-34.0	**4488361**
844 z10	Spacer		20.0	**4486502**
Meas. range			67.5-80.5	
Version 3				
844 z2	Meas. Head		46.0-49.0	**4485001**
844 z4	Floating Ball Anvil	5.486		**4488311**
844 z6	Ball Anvil	5.486	5.0	**4488331**
844 z10	Spacer		20.0	**4486502**
Meas. range			71.0-74.0	
Version 4				
844 z2	Meas. Head		46.0-49.0	**4485001**
844 z4	Floating Ball Anvil	5.486		**4488311**
844 z15	Ball Anvil	5.486	24.0-34.0	**4488361**
Meas. range			70.0-83.0	

Determination of setting values



D_M = Ball diameter of the ball anvil

M_{dk} = Diametrical two ball measurement

$M_{dk} + 2\,D_M$ = Setting value (length of the gage block required for setting)

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Dial Comparator	Readings mm / ***inch***	Order no. mm / ***inch***
Millimess 1004/*1004 Z*	5 µm / ***.0001"***	**4333000/*4333900***
Millimess 1003/*1003 Z*	1 µm / ***.00005"***	**4334000/*4334900***

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7

Selecting Modular Unit Parts 844 Z **Measuring Head f 844 z2** and **Floating Ball Anvil 844 z4**

M_{dK} in mm	844 z5	844 z6	844 z7	844 z8	844 z15	844 z9	844 z10	844 z11	844 z12	844 z13
48.5 - 51.5	x									
51.0 - 54.0		x								
53.5 - 56.5			x							
56.0 - 59.0				x						
58.5 - 61.5	x					x				
61.0 - 64.0		x				x				
63.5 - 66.5			x			x				
66.0 - 69.0				x		x				
68.5 - 71.5	x						x			
70.0 - 83.0					x					
71.0 - 74.0		x					x			
73.5 - 76.5			x				x			
76.0 - 79.0				x			x			
78.5 - 81.5	x					x	x			
80.0 - 93.0					x	x				
81.0 - 84.0		x				x	x			
83.5 - 86.5			x			x	x			
86.0 - 89.0				x		x	x			
88.5 - 91.5	x							x		
90.0 - 103.0					x		x			
91.0 - 94.0		x						x		
93.5 - 96.5			x					x		
96.0 - 99.0				x				x		
98.5 - 101.5	x					x		x		
100.0 - 113.0					x	x	x			
101.0 - 104.0		x				x		x		
103.5 - 106.5			x			x		x		
106.0 - 109.0				x		x		x		
108.5 - 111.5	x						x	x		
110.0 - 123.0					x			x		
111.0 - 114.0		x					x	x		
113.5 - 116.5			x				x	x		
116.0 - 119.0				x			x	x		
118.5 - 121.5	x					x	x	x		
120.0 - 133.0					x	x		x		
121.0 - 124.0		x				x	x	x		
123.5 - 126.5			x			x	x	x		
126.0 - 129.0				x		x	x	x		
128.5 - 131.5	x								x	
130.0 - 143.0					x		x	x		
131.0 - 134.0		x							x	
133.5 - 136.5			x						x	
136.0 - 139.0				x					x	
138.5 - 141.5	x					x			x	
140.0 - 153.0					x	x	x	x		
141.0 - 144.0		x				x			x	
143.5 - 146.5			x			x			x	
146.0 - 149.0				x		x			x	
148.5 - 151.5	x									x
150.0 - 163.0					x				x	
151.0 - 154.0		x								x
153.5 - 156.5			x							x
156.0 - 159.0				x						x
158.5 - 161.5	x					x				x
160.0 - 173.0					x	x			x	
161.0 - 164.0		x				x				x
163.5 - 166.5			x			x				x
166.0 - 169.0				x		x				x
168.5 - 171.5	x						x			x
170.0 - 183.0					x					x
171.0 - 174.0		x					x			x
173.5 - 176.5			x				x			x
176.0 - 179.0				x			x			x
178.5 - 181.5	x					x	x			x
180.0 - 193.0					x	x				x
181.0 - 184.0		x				x	x			x
183.5 - 186.5			x			x	x			x
186.0 - 189.0				x		x	x			x

M_{dK} in mm	844 z5	844 z6	844 z7	844 z8	844 z15	844 z9	844 z10	844 z11	844 z12	844 z13
188.5 - 191.5	x							x		x
190.0 - 193.0					x		x			x
191.0 - 194.0		x						x		x
193.5 - 196.5			x					x		x
196.0 - 199.0				x				x		x
198.5 - 201.5	x					x		x		x
200.0 - 213.0					x	x	x			x
201.0 - 204.0		x				x		x		x
203.5 - 206.5			x			x		x		x
206.0 - 209.0				x		x		x		x
208.5 - 211.5	x						x	x		x
210.0 - 223.0					x			x		x
211.0 - 214.0		x					x	x		x
213.5 - 216.5			x				x	x		x
216.0 - 219.0				x			x	x		x
218.5 - 221.5	x					x	x	x		x
220.0 - 233.0					x	x		x		x
221.0 - 224.0		x				x	x	x		x
223.5 - 226.5			x			x	x	x		x
226.0 - 229.0				x		x	x	x		x
228.5 - 231.5	x								x	x
230.0 - 243.0					x		x	x		x
231.0 - 234.0		x							x	x
233.5 - 236.5			x						x	x
236.0 - 239.0				x					x	x
238.5 - 241.5	x					x			x	x
240.0 - 253.0					x	x	x	x		x
241.0 - 244.0		x				x			x	x
243.5 - 246.5			x			x			x	x
246.0 - 249.0				x		x			x	x
248.5 - 251.5	x						x		x	x
250.0 - 263.0					x				x	x
251.0 - 254.0		x					x		x	x
253.5 - 256.5			x				x		x	x
256.0 - 259.0				x			x		x	x
258.5 - 261.5	x					x	x		x	x
260.0 - 273.0					x	x			x	x
261.0 - 264.0		x				x	x		x	x
263.5 - 266.5			x			x	x		x	x
266.0 - 269.0				x		x	x		x	x
268.5 - 271.5	x							x	x	x
270.0 - 283.0					x		x		x	x
271.0 - 274.0		x						x	x	x
273.5 - 276.5			x					x	x	x
276.0 - 279.0				x				x	x	x
278.5 - 281.5	x					x		x	x	x
280.0 - 293.0					x	x	x		x	x
281.0 - 284.0		x				x		x	x	x
283.5 - 286.5			x			x		x	x	x
286.0 - 289.0				x		x		x	x	x
288.5 - 291.5	x						x	x	x	x
290.0 - 303.0					x			x	x	x
291.0 - 294.0		x					x	x	x	x
293.5 - 296.5			x				x	x	x	x
296.0 - 299.0				x			x	x	x	x
298.5 - 301.5	x					x	x	x	x	x
300.0 - 313.0					x	x		x	x	x
301.0 - 304.0		x				x	x	x	x	x
303.5 - 306.5			x			x	x	x	x	x
306.0 - 309.0				x		x	x	x	x	x
310.0 - 323.0					x		x	x	x	x
320.0 - 333.0					x	x	x	x	x	x

DO YOU HAVE DIVERSE MEASURING TASKS?
MULTIMAR MASTERS THEM WITH FLYING COLORS.

The latest information on MULTIMAR products can be found on our website:
www.mahr.de/en/Home, WebCode 20396

► | Regardless of whether gears, threads, cones or grooves are to be measured; the versatility of Multimar Universal Measuring Instruments combined with a broad range of accessories ensures a perfect solution for nearly all your internal and external measuring requirements. | ◄

► | Multimar. Universal Measuring Instruments

Multimar 25 EWR 10- 2
Digital Universal Caliper

Multimar 844 T 10- 4
Universal Measuring Instrument for Comparision Measurements

Accessories for Multimar 25 EWR / 844 T 10- 9

Multimar 36 B 10-21
Indicator Gage for Internal (I.D.) and External (O.D.) Measurements

Digital Universal Caliper 25 EWR

Illustration is shown with accessories, these are sold seperately

Applications

For measuring:
- Outside and inside dimensions
- Centering shoulders
- Narrow collars
- External and internal tapers
- Dovetails
- Grooves
- Distances between hole centers
- For scribing of work pieces

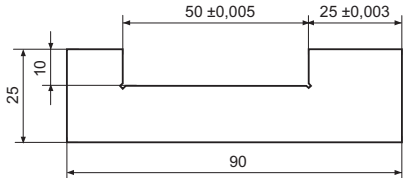
Features

Functions:
AUTO-ON / OFF
DATA (Data transmission via connection cable)
ON/OFF
PRESET (for entering a numerical value)
RESET (set display to zero)
Lock/Unlock
mm/inch

- Interchangeable measuring arms
- Due to the patented mounting fixture of the measuring arms and of measuring attachments provided on both the upper and lower longitudinal face of the arm holders, the digital display is always in the operator's line of vision
- The application range can be easily extended by reversing the measuring arms
- Both measuring arms can be moved along the beam thus having a well balanced weight distribution even with small dimensions
- Slide and beam are made of hardened stainless steel
- Data output: USB, Digimatic, Opto RS232C, Wireless
- Energy supply: Battery, life span ca. 3 years
- IP protection category: IP 65
- Supplied with: Battery, instruction manual, mounting and resting blocks, wooden case

Technical Data

Measuring range outside mm			(inch)	Resolution mm / inch	Order no.
0	-	300	***(0 - 12")***	0.01 / **.0005"**	**4119000**
0	-	600	***(0 - 24")***	0.01 / **.0005"**	**4119001**
0	-	1000	***(0 - 40")***	0.01 / **.0005"**	**4119002**
0	-	1250	***(0 - 50")***	0.01 / **.0005"**	**4119003**



25 Eel

Accessories

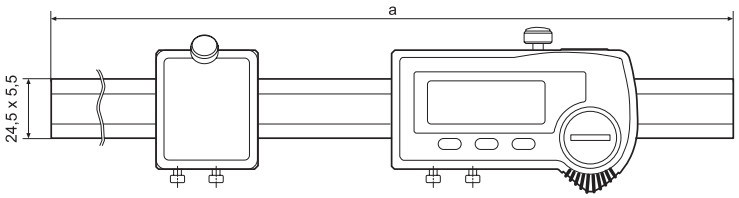
		Order no.
Mounting Attachments for outside dimensions	844 Tma	**4503030**
Mounting Attachments for inside dimensions	844 Tmi	**4503031**
Measuring Arms, 25 mm	844 Te	**4503024**
Measuring Arms, 35 mm	844 Te	**4503025**
Measuring Arms, 70 mm	844 Te	**4503026**
Measuring Arms, 100 mm	844 Te	**4503027**

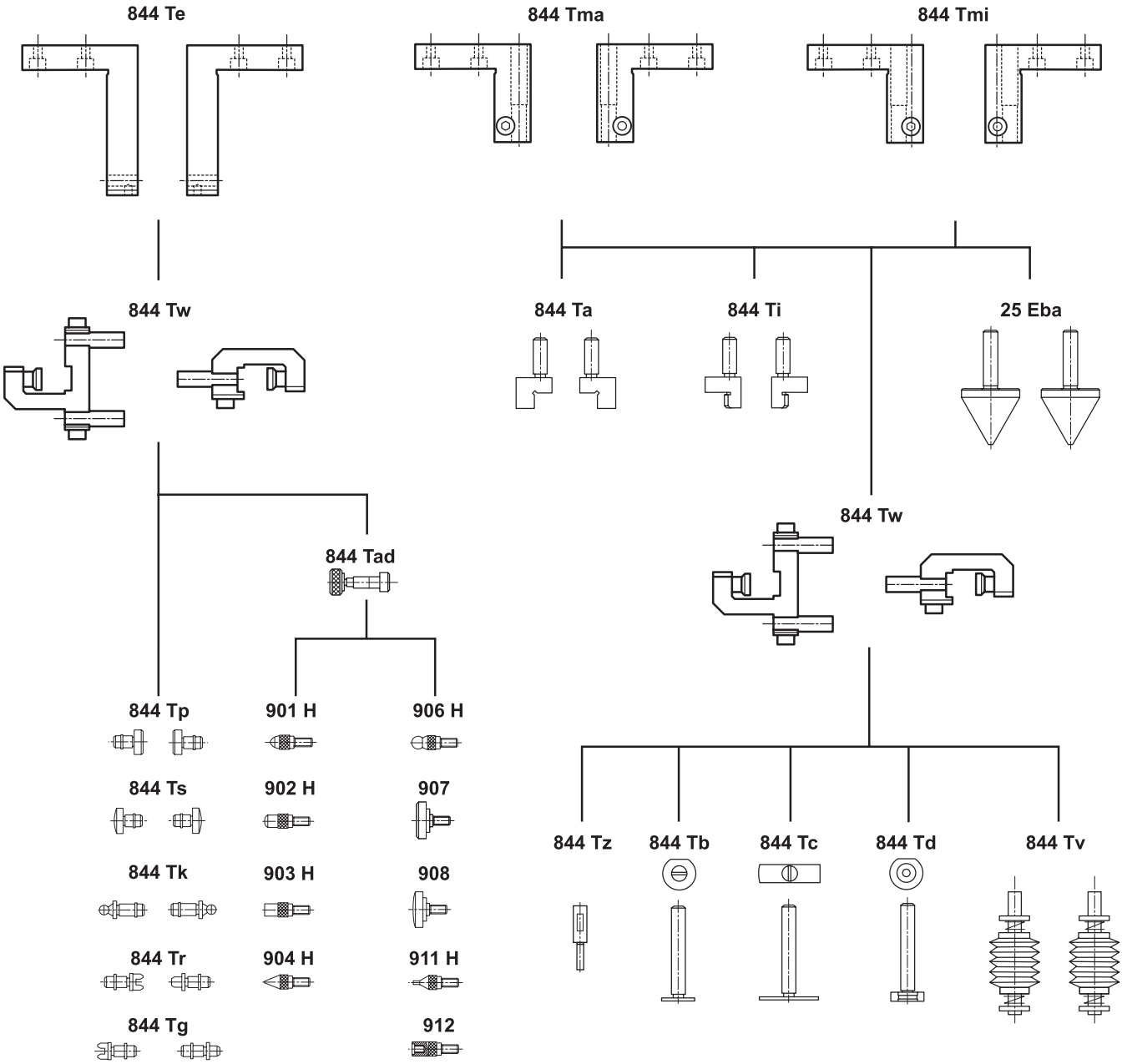
		Order no.
Depth Stops for 844 Tma, 844 Tmi, 844 Te	844 Tw	**4503109**
Measuring Tips for drill hole intervals, Ø 2-20 mm	25 Eba	**4119010**
Measuring Tips for drill hole intervals, Ø 10-40 mm	25 Eba	**4119011**
Setting Gage, hardened steel	25 Eel	**4118520**
Battery 3 V, CR 2032		**4102520**
Case for accessories	844 Tzb	**4503020**

Accessories for Data Processing see Chapter 11

Dimensions

Range of application mm	*(inch)*	a mm	/ inch
0 - 300	*(0 - 12")*	480	/ **18.89"**
0 - 600	*(0 - 24")*	780	/ **31.11"**
0 - 1000	*(0 - 40")*	1200	/ **47.24"**
0 - 1250	*(0 - 50")*	1450	/ **57.09"**





Multimar. Universal Gage 844 T for external and internal dimensions

OVERVIEW

► | The Universal Gage **Multimar** 844 T. Easy to use and versatile; ideal for all your measuring requirements in dimensional metrology.

Applications

For measuring:
- External and internal dimensions
- External and internal threads
- Centering shoulders, narrow collars, recesses and grooves
- External and internal tapers, external and internal tooth profiles / gears and lots more

Constant measuring force due to the built-in measuring force spring

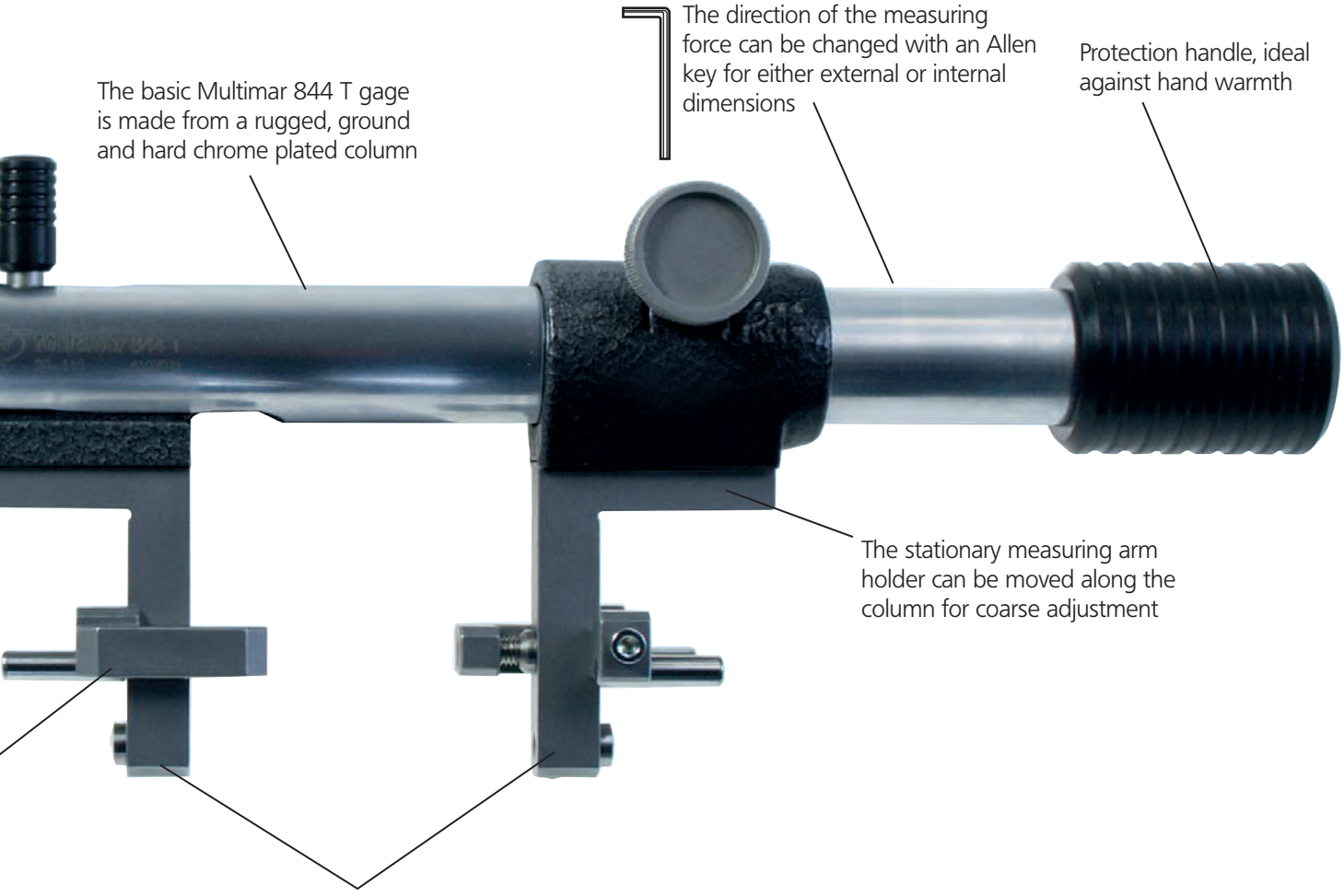
All indicating instruments with an 8 mm mounting shank can be used

The moveable measuring arm holder is mounted in a highly precision ball guide to eliminate both play and friction; it also has an extreme measuring sensitivity and accuracy due to the optimal stability and ease of movement

Stop with non-tilting 3-point support for adjusting the measuring depth

Features

- Extreme measuring sensitivity and accuracy due to the optimal stability and ease of movement of the moveable measuring arm holder
- Constant measuring force due to the built-in measuring force spring
- The direction of the measuring force can be changed for either external or internal dimensions
- Rugged, ground and hard chrome plated column
- The moveable measuring arm holder is mounted in a highly precision ball guide to eliminate both play and friction
- Lightweight construction of the basic body, made from carbon fiber reinforced plastic (CRP) tube, for measuring range 1000 -1500 mm.
- The stationary measuring arm holder can be moved along the column for coarse adjustment
- The direction of the measuring force can be changed with an Allen key for either external or internal dimensions
- Supplied with: Battery, Instruction manual, Mounting and resting blocks, wooden case



The basic Multimar 844 T gage is made from a rugged, ground and hard chrome plated column

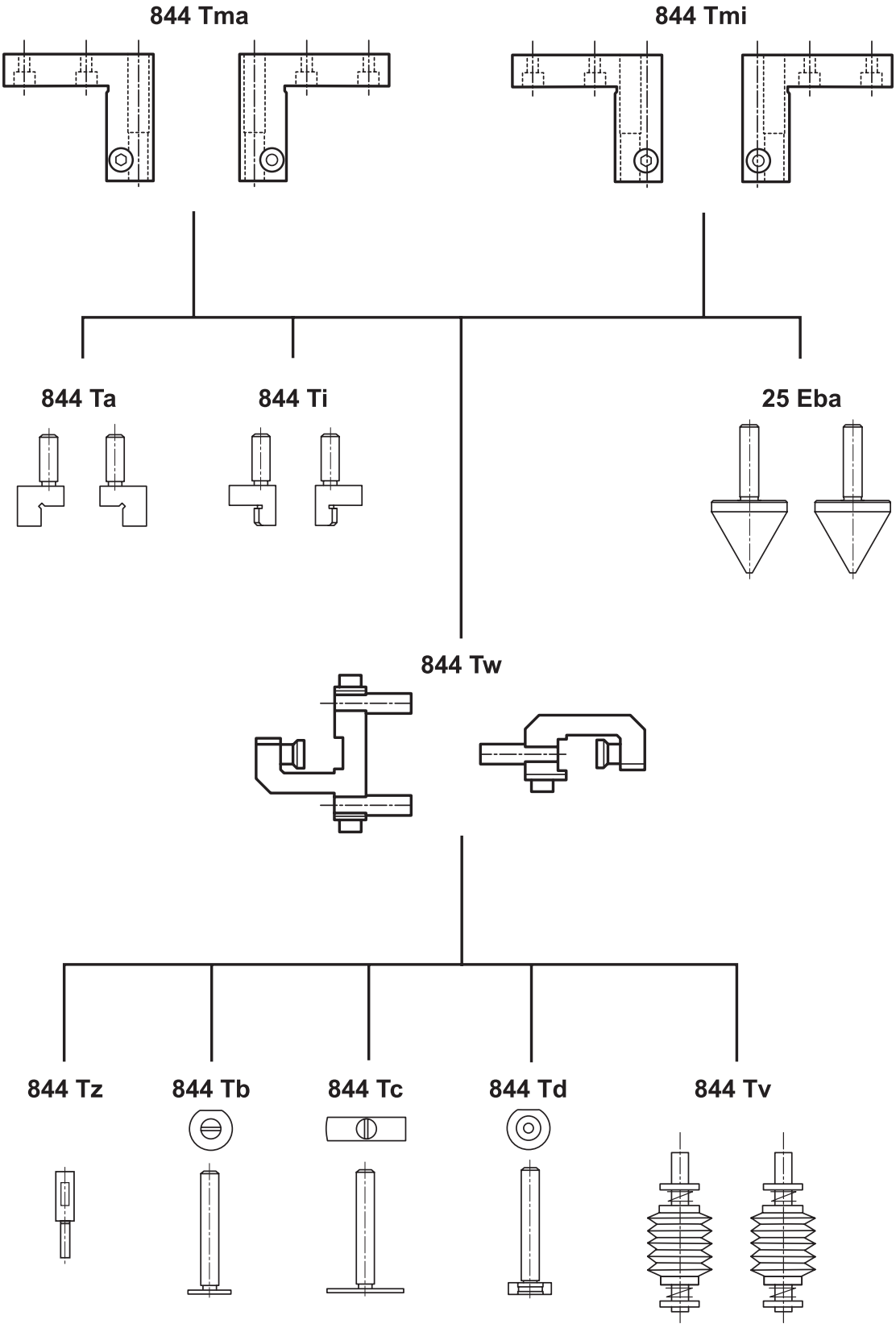
The direction of the measuring force can be changed with an Allen key for either external or internal dimensions

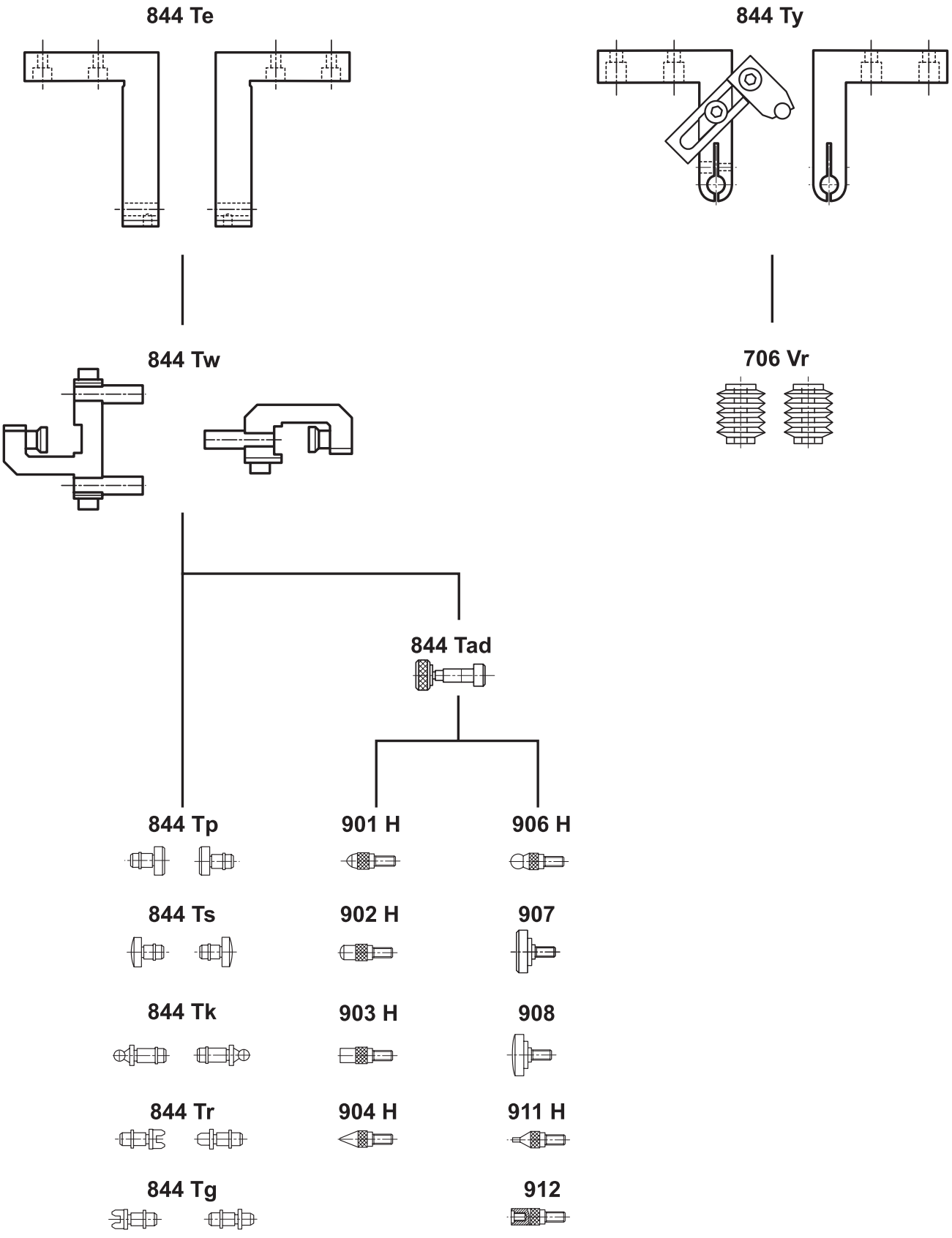
Protection handle, ideal against hand warmth

The stationary measuring arm holder can be moved along the column for coarse adjustment

The measuring arms for measurement of external and internal dimensions. By simply reversing the measuring arms the application range can be extended

Universal Gage 844 T



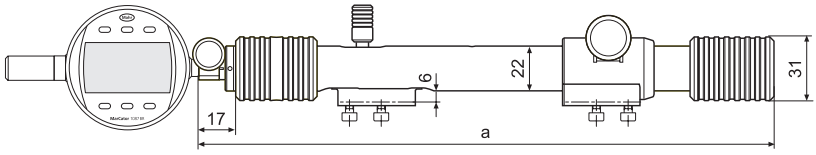

844 Te
844 Ty
844 Tw
706 Vr
844 Tad
844 Tp
901 H
906 H
844 Ts
902 H
907
844 Tk
903 H
908
844 Tr
904 H
911 H
844 Tg
912

Universal Gage 844 T

Illustration is shown with accessories, these are sold seperately

Technical Data

Application range outside		Application range inside		Measuring force	Distance of movable anvil			Dimension a			Weight			Order no.
mm	***inch***	mm	***inch***	N	mm	/	***inch***	mm	/	***inch***	kg	/	lbs	
0-85	***(0-3.35")***	30-115	***(1.18-4.52")***	5	12	/	***0.47***	280	/	***11.02"***	0,78	/	1.72	**4503001**
80-235	***(3.15-9.25")***	110-265	***(4.33-10.43")***	5	12	/	***0.47***	430	/	***16.92"***	1,01	/	2.20	**4503002**
230-585	***(9.06-23.03")***	260-615	***(10.23-24.21")***	5	12	/	***0.47***	740	/	***29.13"***	1,59	/	3.50	**4503003**
580-985	***(22.83-38.78")***	610-1015	***(24.02-39.96")***	5	12	/	***0.47***	1140	/	***44.88"***	2,22	/	4.89	**4503004**
970-1470	***(38.19-57.87")***	1000-1500	***(39.37-59.05")***	10	12	/	***0.47***	1680	/	***66.14"***	2,52	/	5.55	**4503005**
1470-1970	***(57.87-77.56")***	1500-2000	***(59.05-78.74")***	10	12	/	***0.47***	2180	/	***85.83"***	2,68	/	5.90	**4503006**
1970-2470	***(77.56-97.24")***	2000-2500	***(78.74-98.42")***	10	12	/	***0.47***	2690	/	***105.91"***	2,86	/	6.30	**4503007**



Accessories

	Unit quantity		Order no.
Precision Dial Indicator MarCator, 0.01 mm, 10 mm		**810 S**	**4311000**
Mechanical Dial Comparator Millimess 5 µm		**1004**	**4333000**
Mechanical Dial Comparator Millimess 0.01 mm, ±0.25 mm		**1010**	**4332000**
Digital Indicator MarCator, 0.0005 mm, 12.5 mm		**1087 BR**	**4337662**
Digital Indicator MarCator, 0.0005 mm, 12.5 mm		**1087 BRi**	**4337664**
Mounting attachments for outside dimensions	Pair	**844 Tma**	**4503030**
Mounting attachments for inside dimensions	Pair	**844 Tmi**	**4503031**
Measuring Arms, 25 mm	Pair	**844 Te**	**4503024**
Measuring Arms, 35 mm	Pair	**844 Te**	**4503025**
Measuring Arms, 70 mm	Pair	**844 Te**	**4503026**
Measuring Arms, 100 mm	Pair	**844 Te**	**4503027**
Depth Stops for 844 Tma, 844 Tmi, 844 Te	Pair	**844 Tw**	**4503109**
Protection for indicator		**844 Tsb**	**4503012**
Case for accessories		**844 Tzb**	**4503020**
Stand		**844 Tf**	**4450512**

810 S

1004

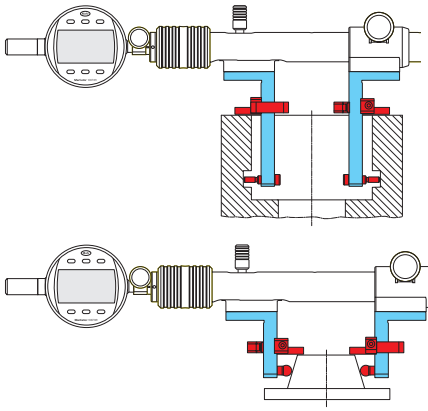
1087 BR

1087 BRi

Measuring external and internal dimensions

Depth Stops 844 Tw

- Depth Stops for 844 Tma, 844 Tmi and 844 Te Measuring Arms
- Equipped with non-tilting 3-point support
- Hardened stop pins, interchangeable and can be adjusted
- Supplied with:
  One pair of Depth Stops with three Ø5x20 mm depth pins, also one Ø5x16 mm and one Ø5x10 mm depth pin for a 1-point stop block



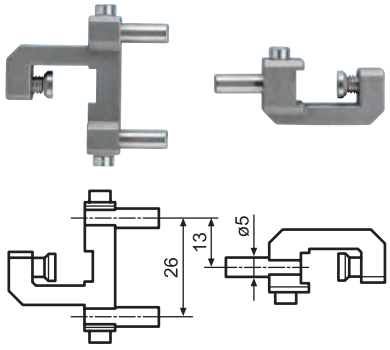


Illustration 1

Application:

- To set the exact measuring depth in the horizontal measurement position
- Precise support on the reference plane surface for repetitive accuracy when conducting comparison measurements in the second axis
- The Measuring Arms 844 Tma, 844 Tmi and 844 Te have a mm scale, which simplifies the positioning and adjustment of the measurement depth
- For highly accurate setting of the measuring depth (required for example with cone measurements) use a Rectangular Gage Block between the measuring anvil and the stop (see Illustration 1)

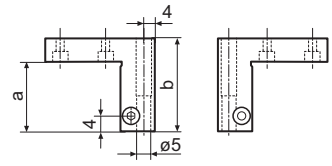
Accessories

		Unit quantity	Order no.
844 Tw	**Depth Stops** for 844 Tma, 844 Tmi, 844 Te	Pair	**4503109**

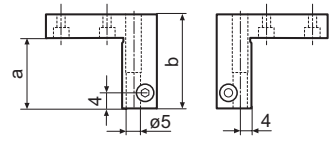
Measuring external and internal dimensions

Mounting Attachments 844 Tma / 844 Tmi

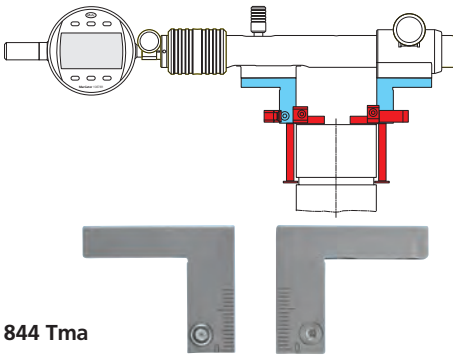
- Made from special stainless steel
- Lateral mm scale, for easy positioning and adjustable of the depth stops
- Measuring arms on the measuring arm holder are reversible, therefore extending the measuring range
- With a ø 5 mm mount, accommodates the interchangeable anvils 844 Ta, 844 Ti, 844 Tb, 844 Tc, 844 Td, 844 Tz and 844 Tv



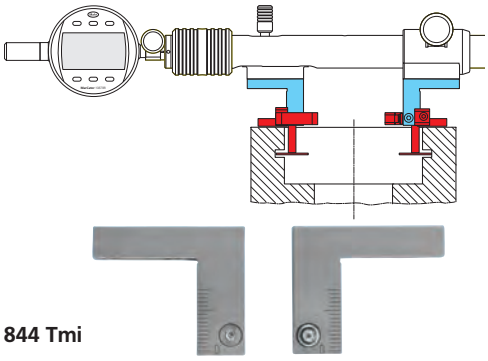
844 Tma



844 Tmi



844 Tma



844 Tmi

Technical Data

	Mounting hole mm	a mm	b mm	Unit quantity	Order no.
844 Tma	5	24	32	Pair	**4503030**
844 Tmi	5	24	32	Pair	**4503031**

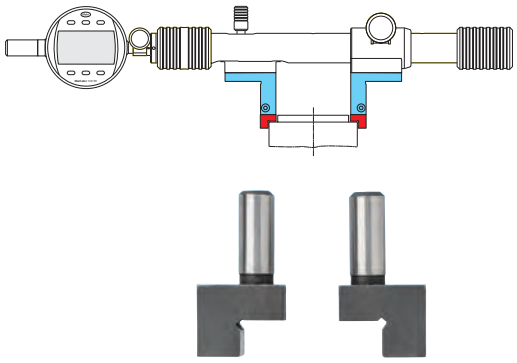
Accessories

		Unit quantity	Order no.
844 Ta	**Shoulder Anvils**, flat, hardened steel	Pair	**4500050**
844 Ti	**Shoulder Anvils**, spherical, hardened steel	Pair	**4500055**
844 Tb	**Measuring Anvils** with measuring blades, Platelet diameter 11 mm, Adjustment range 0-20 mm	Piece	**4503015**
844 Tb	**Measuring Anvils** with measuring blades, Platelet diameter 11 mm, Adjustment range 20-40 mm	Piece	**4503016**
844 Tc	**Measuring Anvils** with measuring blades, Platelet length 20 mm, Adjustment range 0-20 mm	Piece	**4503114**
844 Tc	**Measuring Anvils** with measuring blades, Platelet length 20 mm, Adjustment range 20-40 mm	Piece	**4503115**
844 Td	**Anvils** with round measuring faces, diameter 11 mm, Adjustment range 0-20 mm	Piece	**4503017**
844 Td	**Anvils** with round measuring faces, diameter 11 mm, Adjustment range 20-40 mm	Piece	**4503018**
844 Tw	**Depth Stops** for 844 Tma, 844 Tmi, 844 Te	Pair	**4503109**

Measuring external dimensions

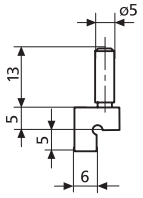
Shoulder Anvils 844 Ta

- For measuring narrow collars such as centering shoulders and other similar measuring tasks
- With cylindrical mounting shaft to attach into the mounting attachments 844 Tma / 844 Tmi
- Made from hardened steel
- Flat, for external diameters



Technical Data

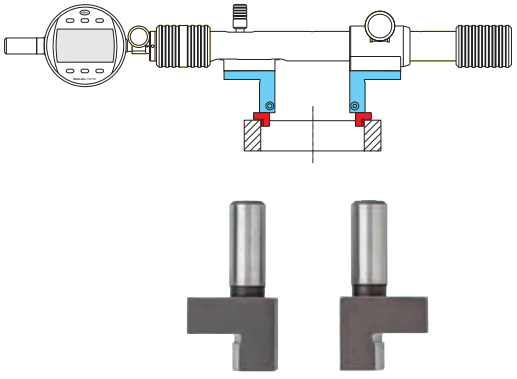
Mounting shaft diameter mm	Unit quantity	Order no.
5	Pair	**4500055**



Measuring internal dimensions

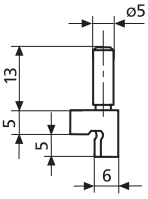
Shoulder Anvils 844 Ti

- For measuring narrow collars such as centering shoulders and other similar measuring tasks
- With cylindrical mounting shaft to attach into the mounting attachments 844 Tma / 844 Tmi
- Made from hardened steel
- Semi-cylindrical, for internal diameters



Technical Data

Mounting shaft diameter mm	Unit quantity	Order no.
5	Pair	**4500055**

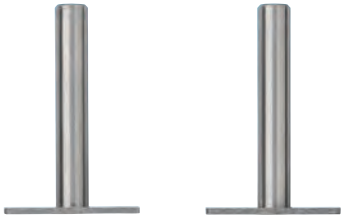


Measuring external and internal dimensions

Measuring anvils with measuring blades 844 Tb, 844 Tc, 844 Td

- With round measuring blades
- **844 Tb**
  Ideal for workpieces that have a narrow recess up to 3 mm in depth
- **844 Tc**
  Ideal for workpieces that have a narrow recess up to 7.5 mm in depth
- **844 Td**
  Ideal for workpieces that have a recess up to 3 mm in depth

844 Tb



844 Tc

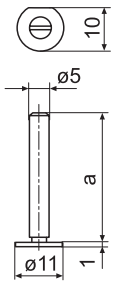
844 Td

Application:

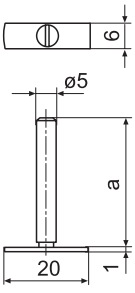
For measuring centering shoulders and recesses on internal and external diameters. For mounting into the Mounting Attachment 844 Tma / 844 Tmi.

Technical Data

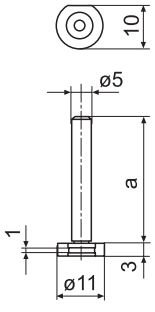
	Adjustment range mm	Mounting shaft diameter mm	Length a mm	Unit quantity	Order no.
844 Tb	0 - 20	5	30	Piece	**4503015**
844 Tb	20 - 40	5	50	Piece	**4503016**
844 Tc	0 - 20	5	30	Piece	**4503114**
844 Tc	20 - 40	5	50	Piece	**4503115**
844 Td	0 - 20	5	30	Piece	**4503017**
844 Td	20 - 40	5	50	Piece	**4503018**



844 Tb



844 Tc

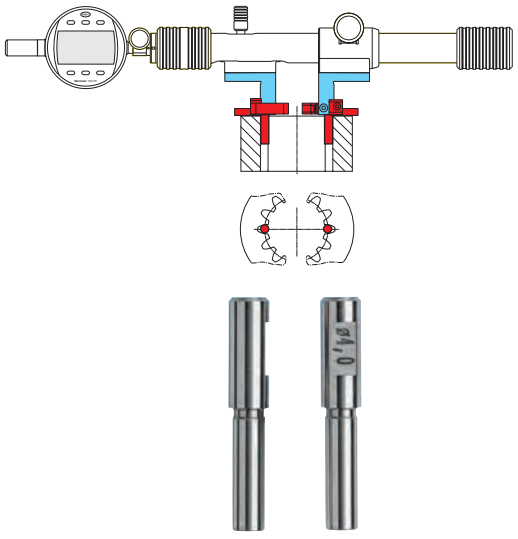


844 Td

Measuring external and internal tooth profiles

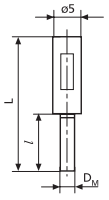
Cylindrical Measuring Pins 844 Tz

- Determination of the dimension over 2 pins for inner and outer gears
- Made from steel, with shank for mounting into the Mounting Attachment 844 Tma / 844 Tmi



Technical Data

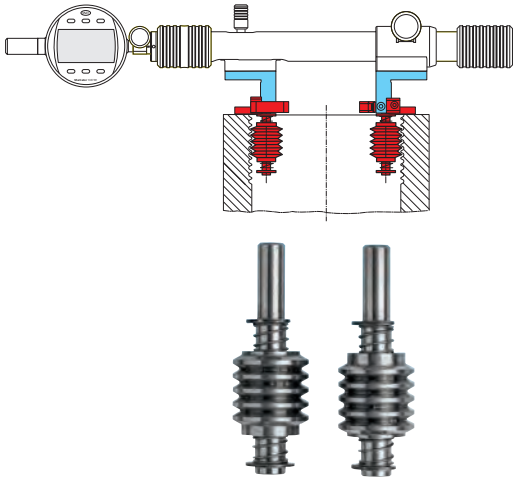
D	Mounting shaft diameter	Manufacturing tolerance +/-	L	*l*	Unit quantity	Order no.
mm	mm	µm	mm	mm		
1	5	2	19.5	6	Piece	**4500500**
1.25	5	2	19.5	6	Piece	**4500501**
1.5	5	2	19.5	6	Piece	**4500502**
1.75	5	2	23.5	10	Piece	**4500503**
2	5	2	23.5	10	Piece	**4500504**
2.5	5	2	23.5	10	Piece	**4500506**
3	5	2	28.5	15	Piece	**4500507**
3.5	5	2	28.5	15	Piece	**4500508**
4	5	2	28.5	15	Piece	**4500509**
4.5	5	2	33.5	20	Piece	**4500510**
5	5	2	33.5	20	Piece	**4500511**
5.5	5	2	33.5	20	Piece	**4500512**
6	5	2	33.5	20	Piece	**4500513**



Measuring external and internal dimensions

Interchangeable Measuring Rollers 844 Tv

- Determining the pitch diameter of outer and inner threads
- Mounting shank fits into Mounting Attachment 844 Tma / 844 Tmi
- Each has two springs to alleviate the positioning on the correct pitch thread
- Interchangeable Measuring Rollers for further thread pitches (metric 60°) as well as Whitworth and UST threads are also available upon request



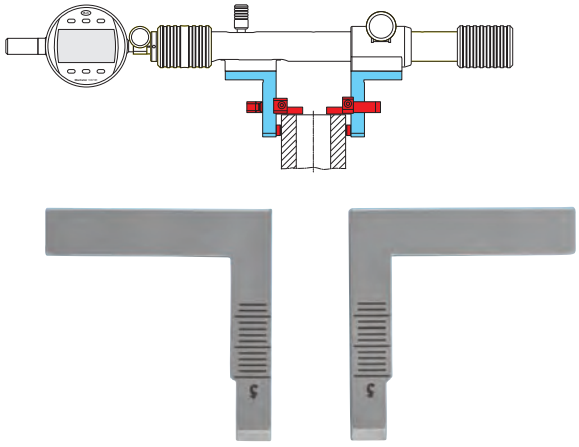
Technical Data

Flank angle	Type of thread	Thread pitch mm	Unit quantity	Order no.
60°	Metric thread	1	Pair	**4501711**
60°	Metric thread	2	Pair	**4501715**
60°	Metric thread	2.5	Pair	**4501716**
60°	Metric thread	3.5	Pair	**4501718**
60°	Metric thread	4	Pair	**4501719**
60°	Metric thread	5	Pair	**4501721**
60°	Metric thread	6	Pair	**4501723**

Measuring external and internal dimensions

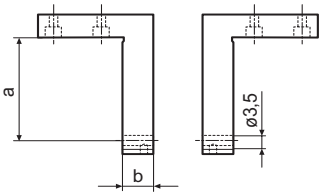
Measuring Arms 844 Te

- For internal and external diameters
- Measuring arms on the measuring arm holder are reversible, therefore extending the measuring range
- Lateral mm scale, for easy positioning and adjustment of the depth stops 844 Tw
- With a 3.5 mm (0.138") diameter mount, accommodates the interchangeable anvils 844 Tp, 844 Ts, 844 Tk, 844 Tr and 844 Tg



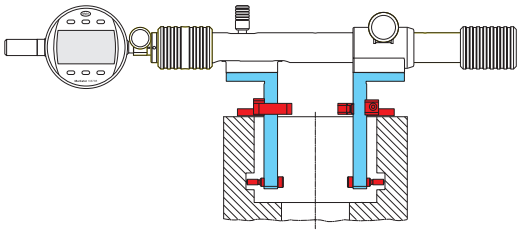
Technical Data

Mounting hole mm	Throat depth a mm	b mm	Unit quantity	Order no.
3.5	25	6	Pair	**4503024**
3.5	35	10	Pair	**4503025**
3.5	70	10	Pair	**4503026**
3.5	100	12	Pair	**4503027**

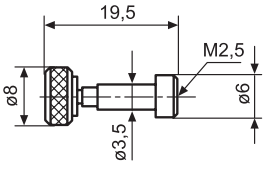


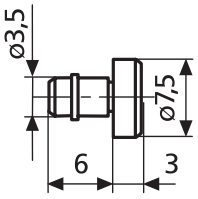
Accessories

		Unit quantity	Order no.
844 Tp	**Anvils for Measuring Arms**, flat, hardened steel	Piece	**4500040**
844 Ts	**Measuring Anvils**, spherical, hardened steel	Piece	**4500045**
844 Tad	**Adaptor** Ø 3.5 - M2.5 for measuring arms 844 Te	Piece	**4503080**
844 Tw	**Depth Stops** for 844 Tma, 844 Tmi, 844 Te	Pair	**4503109**

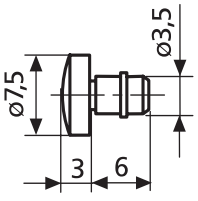


844 Tad

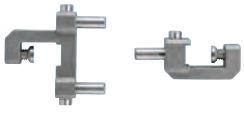




844 Tp



844 Ts



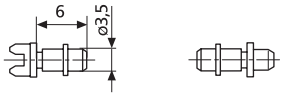
844 Tw

Measuring external and internal threads

Interchangeable Anvils 844 Tr / 844 Tg

- For pitch diameters
- Hardened, wear-resistant special steel
- With cylindrical mounting shank and retainer ring which ensures locking while permitting rotation in bore

844 Tr Anvils for external threads



844 Tg Anvils for internal threads

Accessories

Thread pitch in mm	**Taper Order no.**	**V-anvil Order no.**	**Blade Order no.**
Pitch diameter, external thread metric 60°			
0.5 –0.7		**4501000**	**4501200**
0.7 –1		**4501001**	**4501201**
1.25 –2		**4501002**	**4501202**
2 –3.5		**4501003**	**4501203**
3.5 –5		**4501004**	**4501204**
5 –7		**4501005**	**4501205**
7 –9		**4501006**	**4501206**
Pitch diameter, internal thread metric 60°			
0.5 –0.7	**4174600**	**4174300**	
0.7 –1	**4174601**	**4174301**	
1.25 –2	**4174602**	**4174302**	
2 –3.5	**4174603**	**4174303**	
3.5 –5	**4174604**	**4174304**	
5 –7	**4174605**	**4174305**	
7 –9	**4174606**	**4174306**	
Pitch diameter, external thread Trapezoid 30°			
1		**4501150**	**4501350**
1.5		**4501151**	**4501351**
2		**4501152**	**4501352**
3		**4501153**	**4501353**
4		**4501154**	**4501354**
5		**4501155**	**4501355**
6		**4501156**	**4501356**
7		**4501157**	**4501357**
8		**4501158**	**4501358**
9		**4501159**	**4501359**
10		**4501160**	**4501360**
12		**4501161**	**4501361**
14		**4501162**	**4501362**
16		**4501163**	**4501363**
18		**4501164**	**4501364**
20		**4501165**	**4501365**

Thread pitch in mm	**Taper Order no.**	**V-anvil Order no.**	**Blade Order no.**
Pitch diameter, internal thread Trapezoid 30°			
1		**4501831**	**4501830**
1.5		**4501833**	**4501832**
2		**4501835**	**4501834**
3		**4501837**	**4501836**
4		**4501839**	**4501838**
5		**4501841**	**4501840**
6		**4501843**	**4501842**
7		**4501845**	**4501844**
8		**4501847**	**4501846**
9		**4501849**	**4501848**
10		**4501851**	**4501830**
12		**4174981**	**4174961**
14		**4174982**	**4174962**
16		**4174983**	**4174963**
18		**4174984**	**4174964**
20		**4174985**	**4174965**

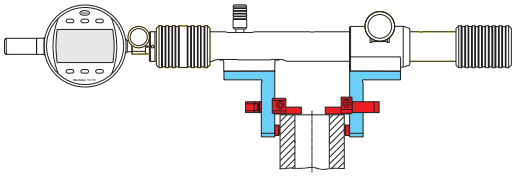
Accessories

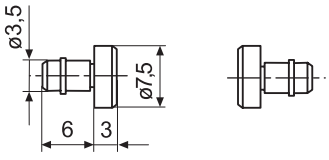
Thread pitch in TPI	**Taper** Order no.	**V-anvil** Order no.	**Blade** Order no.
Pitch diameter, external thread			
UST 60°			
40 – 32		**4501018**	**4501418**
32 – 24		**4501019**	**4501419**
24 – 18		**4501020**	**4501420**
18 – 14		**4501021**	**4501421**
14 – 10		**4501022**	**4501422**
10 – 7		**4501023**	**4501423**
7 – 4.5		**4501024**	**4501424**
4.5 – 3		**4501025**	**4501425**
Whitworth 55 °			
40 – 32		**4501007**	**4501207**
32 – 24		**4501008**	**4501208**
24 – 18		**4501009**	**4501209**
18 – 14		**4501010**	**4501210**
14 – 10		**4501011**	**4501211**
10 – 7		**4501012**	**4501212**
7 – 4.5		**4501013**	**4501213**
4.5 – 3		**4501014**	**4501214**
Pitch diameter, internal thread			
UST 60°			
40 – 32	**4174615**	**4174415**	
32 – 24	**4174616**	**4174416**	
24 – 18	**4174617**	**4174417**	
18 – 14	**4174618**	**4174418**	
14 – 10	**4174919**	**4174419**	
10 – 7	**4174620**	**4174420**	
7 – 4.5	**4174621**	**4174421**	
4.5 – 3	**4174622**	**4174422**	
Whitworth 55 °			
40 – 32	**4174643**	**4174343**	
32 – 24	**4174644**	**4174344**	
24 – 18	**4174645**	**4174345**	
18 – 14	**4174646**	**4174346**	
14 – 10	**4174647**	**4174347**	
10 – 7	**4174648**	**4174348**	
7 – 4.5	**4174649**	**4174349**	
4.5 – 3	**4174650**	**4174350**	

Measuring external and internal dimensions

Measuring Anvils 844 Tp

- Flat; for external diameters, distances and widths
- Made of hardened steel
- With cylindrical mounting shank and retainer ring which allows free rotation inside the bore of Measuring Arms 844 Te





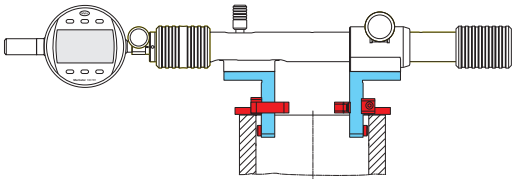
Technical Data

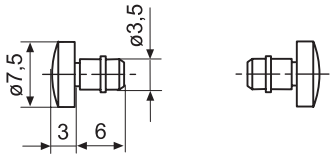
Mounting shaft diameter mm	Unit quantity	Order no.
3.5	Piece	**4500045**

Measuring external and internal dimensions

Measuring Anvils 844 Ts

- Spherical; for internal diameters
- Made of hardened steel
- With cylindrical mounting shank and retainer ring which allows free rotation inside the bore of Measuring Arms 844 Te





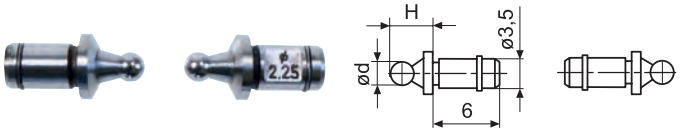
Technical Data

Mounting shaft diameter mm	Unit quantity	Order no.
3.5	Piece	**4500045**

Measuring external and internal dimensions

Ball Anvils 844 Tk

• Made of carbide. With cylindrical mounting shank and retainer ring which allows free rotation inside the bore of Measuring Arms 844 Te.

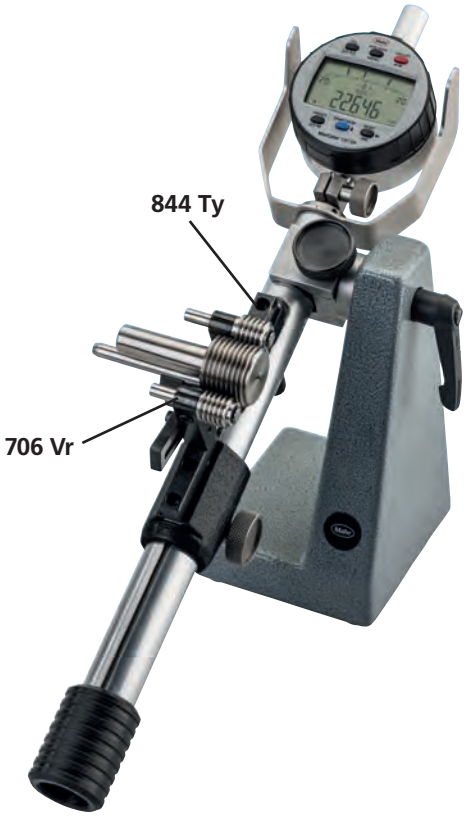


d mm	H mm	Order no.	d mm	H mm	Order no.
0.5	3	**4502620**	2.3	4.8	**4502544**
0.551	3.1	**4502621**	2.386	4.9	**4502645**
0.62	3.1	**4502622**	2.438	4.9	**4502646**
0.623	3.1	**4502623**	2.5	5	**4500356**
0.63	3.1	**4502624**	2.667	5.2	**4502647**
0.722	3.2	**4502625**	2.704	5.2	**4502648**
0.862	3.4	**4502626**	2.713	5.2	**4502649**
0.895	3.4	**4502627**	2.721	5.2	**4502650**
0.965	3.5	**4502628**	2.743	5.2	**4502651**
1	3.5	**4500350**	2.75	5.3	**4500618**
1.1	3.6	**4502629**	3	5.5	**4500357**
1.118	3.6	**4502630**	3.048	5.5	**4502652**
1.125	3.6	**4502631**	3.25	5.8	**4502541**
1.25	3.8	**4500351**	3.4	5.9	**4502653**
1.35	3.9	**4502632**	3.5	6	**4500358**
1.372	3.9	**4502633**	3.658	6.2	**4502654**
1.385	3.9	**4502634**	4	6.5	**4500359**
1.5	4	**4500352**	4.5	7	**4500360**
1.524	4	**4502635**	4.835	7.3	**4502655**
1.54	4	**4502636**	5	7.5	**4500361**
1.6	4.1	**4502637**	5.25	7.8	**4502656**
1.65	4.2	**4502638**	5.486	8	**4502657**
1.7	4.2	**4502639**	5.5	8	**4500362**
1.75	4.3	**4500353**	6	8.5	**4500363**
1.782	4.3	**4502640**	6.096	8.6	**4502658**
1.8	4.3	**4502641**	6.35	8.9	**4502545**
1.829	4.3	**4502642**	6.5	9	**4502542**
1.9	4.4	**4502643**	7	9.5	**4502547**
10	12.5	**4502550**	8	10.5	**4502548**
2	4.5	**4500354**	9	11.5	**4502549**
2.032	4.5	**4502543**			
2.25	4.8	**4502540**			
2.284	4.8	**4502644**			

Measuring Roller Holder 844 Ty

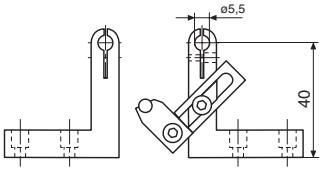
Features

- Location bolts for the Measuring Rollers 706 Vr, with stop and stop pin
- Interchangeable Measuring Rollers for further thread pitches (metric 60°) as well as Whitworth and UST threads, available upon request



Application:

- Determining the pitch diameter of outer threads

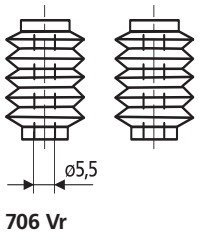


Technical Data

Unit quantity	Order no.
Pair	**4502463**

Accessories

		Unit quantity	Order no.
706 Vr	**Thread Measuring Rollers 60°**, Thread pitch 1 mm	Pair	**4521111**
706 Vr	**Thread Measuring Rollers 60°**, Thread pitch 2 mm	Pair	**4521115**
706 Vr	**Thread Measuring Rollers 60°**, Thread pitch 3 mm	Pair	**4521117**
706 Vr	**Thread Measuring Rollers 60°**, Thread pitch 4 mm	Pair	**4521119**
706 Vr	**Thread Measuring Rollers 60°**, Thread pitch 5 mm	Pair	**4521121**
706 Vr	**Thread Measuring Rollers 60°**, Thread pitch 6 mm	Pair	**4521123**
844 Tf	**Stand**		**4450512**



706 Vr

I.D./O.D. Indicator Gage 36 B for Internal and External Dimensions

The economical way to check outside diameters on the shop floor.

EMD-36B-10

Features

- Adjustable retraction of sensitive contact allows measurement of grooves and races. Retraction, normally set at 6 mm / 0.25", is adjustable to 10 mm / 0.40".
- Frictionless reed-spring (pantograph) motion transfer for repeatability.
- Gaging pressure is adjustable from 0 - 35 N / 0 - 8 lb.
- Two styles available. 2-point "T"-Plate or 3-point "V"-Plate.
- Two sizes available.
- Adjustable base: Gage can be positioned on any angle from horizontal to vertical.
- Variety of readout devices available.
- Reverse the top-plate to change from I.D. to O.D. measurement.
- Supplied with JW-9 Jaws.

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Catalog no.	Resolution switchable	Order no.
MarCator 1087 R	0.0005 / 0.001 / 0.002 / 0.005 / 0.01 mm	**4337660**
MarCator 1087 R	***.00002" / .00005" / .00001" / .0002" / .0005"***	**4337661**

Technical Data

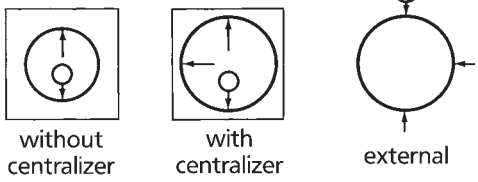
Style	Capacity I.D.	Capacity O.D.	Order no. with .0001" Dial Indicator	Order no. with 0.002 mm Dial Indicator	Order no.* with Maxμm®*III*	Order no.* with Maxμm®*III* & Output	Order no.* with *μMaxμm* & Output	Order no.*** w/o Indicator, metric 8 mm mount shank
"T" Plate	.75 - 3.5" 19 - 89 mm	.25 - 5" 6 - 127 mm	**36B-10**	**36B-10M**	**EMD-36B-10**	**EMD-36B-10D**	**EDI-36B-10**	**2003200**
"T" Plate	.75 - 7.75" 19 - 197 mm	.25 - 8.75" 6 - 222 mm	**36B-20**	**36B-20M**	**EMD-36B-20**	**EMD-36B-20D**	**EDI-36B-20**	**2003201**
"V" Plate	.812 - 4.625" 21 - 117 mm	.312 - 5" 8 - 127 mm	**36B-9**	**36B-9M**		**EMD-36B-9D**	**EDI-36B-9**	
"V" Plate	.812 - 9" 21 - 229 mm	.312 - 9.5" 8 - 241 mm	**36B-19**	**36B-19M**		**EMD-36B-19D**	**EDI-36B-19**	

** Selectable Resolution*

	Order no.
36B-10 with **1087B** and **Y & T Plate Sets**	**2061657**
36B-20 with **1087B** and **Y & T Plate Sets**	**2061658**

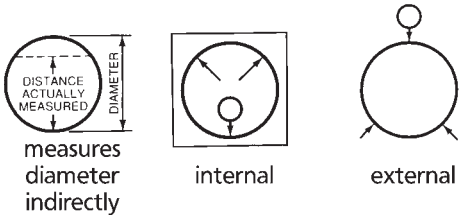
I.D./O.D. Indicator Gage 36 B for Internal and External Dimensions

"T" Plates



"T"-plates give a diameter reading directly across the diameter. A third contact may be used as a side-stop or centralizer.

"V" Plates



"V"-plates are self-centralizing. Three jaws are used and the measurement is of the distance between the sensitive contact and the chord formed by the two reference contacts. This measurement bears a direct relationship to the diameter and compensation is made by a special ratio indicator so diameter is read directly.

Used to inspect parts with odd number lobing conditions.

Jaw Sets

Model numbers on the preceding page include a set of **Model JW-9** Jaws. **Model JW-58** Jaws (tungsten carbide)

JW-9 Jaws (normally furnished)

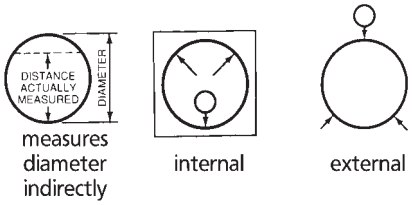
Order no. (3 jaw set)	Adjustment Height	Material: Contact and Rest Surface	Replacement Contact Pins (3 required)
JW-9	0.79-19 mm / ***.031-.75"***	Steel	**PS-55**
JW-58	0.79-18 mm / ***.031-.72"***	Carbide	**PS-226**
2220461*	0.79-18 mm	Steel	**2225694**

* *Normally furnished with Metric Version.*
For special jaw configurations or for other indicators contact Mahr Federal Customer Resources Center.

Maxμm®*III* Indicator for "V"-Plate Models

Digital Range	Stem Length	Order no.
± 1 mm / ***± .040"*** or ± .199 mm / ***± .020"***	17 mm / ***.670"***	**2033145***

* *Maxμm® III 4:5 ratio model includes Data Output (6 pin) and user selectable setup for range, resolution, units and measuring direction.*



EMD-36B-19D
I.D./O.D. Gage

I.D./O.D. Indicator Gage 36 B for Internal and External Dimensions

Special Contacts: Steel

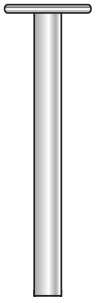
Special steel ball contacts can be made in a variety of different diameters for your measurement applications.

Special Contacts: Tungsten Carbide

Side mounted Tungsten Carbide spherical contacts can be made for measuring internal and external gears and splines.

Special Contacts: Doughnut

Specially designed Doughnut shaped contacts are used, as an example, in the bearing industry calling out for wider than normal contacts to reach into bearing raceways.

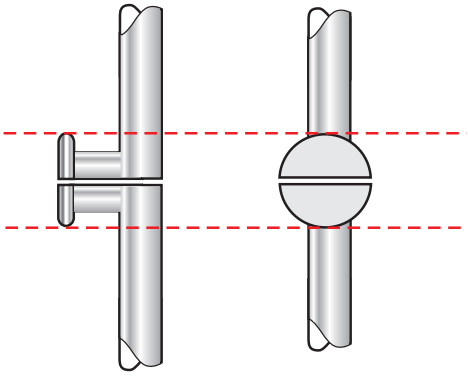


Special Contacts: TC Ball

Spherical diameter tips are ideal for measuring inside or outside radial formed recesses of precision parts.

Special Contacts: Pie Plate

Special jaws shaped like large half-discs, are used by the plastic industry to accurately measure semi-flexible round cups where reduced deflection is important.



JW-58 w/TC Wear Pads

Specially designed jaws supplied with Tungsten Carbide wear surfaces provide extra long jaw life.

Additional Contacts

844T Contact Points for use with 36B Gage
We have added to the list of standard contacts by modifying the JW-9 jaws to accept some of the Universal Gage 844T contacts. This modification was done by reaming out the jaws from .186" to .196" diameters so that they will accept the contacts that are used with 844 Ta, 844 Ti, 844 Tb, 844 Tc, 844 Td, 844 Tz and 844 Tv. With the added addition of the anvils below we have more measurement possibilities with the 36B gage such as Pitch Diameters of gears, Threads (Metric, Whitworth and American UST), Taper diameters and recesses.
For cylindrical pins please see catalog pages 10-13; for threads please refer to catalog page 10-14.

		Order no.
Flat shoulder anvils	Sold as a pair	**4500050**
Inside taper anvils	Sold as a pair	**4500046**
Measuring blades	Sold as a pair	**4500114**
Cylindrical Pins	Sold as a pair	**See page 10-13**
Semi-cylindrical anvils	Sold as a pair	**4500055**
Outside taper anvils	Sold as a pair	**4500047**
Measuring blades	Sold as each	**4500015**
External / internal threads	Sold as a pair	**See page 10-14**

ARE YOU SEARCHING FOR THE RIGHT CONNECTIONS?
THEY'RE RIGHT HERE AT MARCONNECT.

The latest information on MARCONNECT products can be found on our website:
www.mahr.de/en/Home, WebCode 20453

► | Our new digital hand held measuring instruments are all equipped with the flexible MarConnect interface. Regardless of which interface standard you us: Integrated Wireless, USB, Opto RS232 or Digimatic; MarConnect will always provide you with the optimal connection. | ◄

MarConnect. Data Processing

Overview
MarConnect MarCom Professional 5.0 11- 2

MarConnect MarCom Standard 5.0 / Professional 5.0
Clear and flexible data acquisition 11- 4

MarConnect Wireless Data Transmission

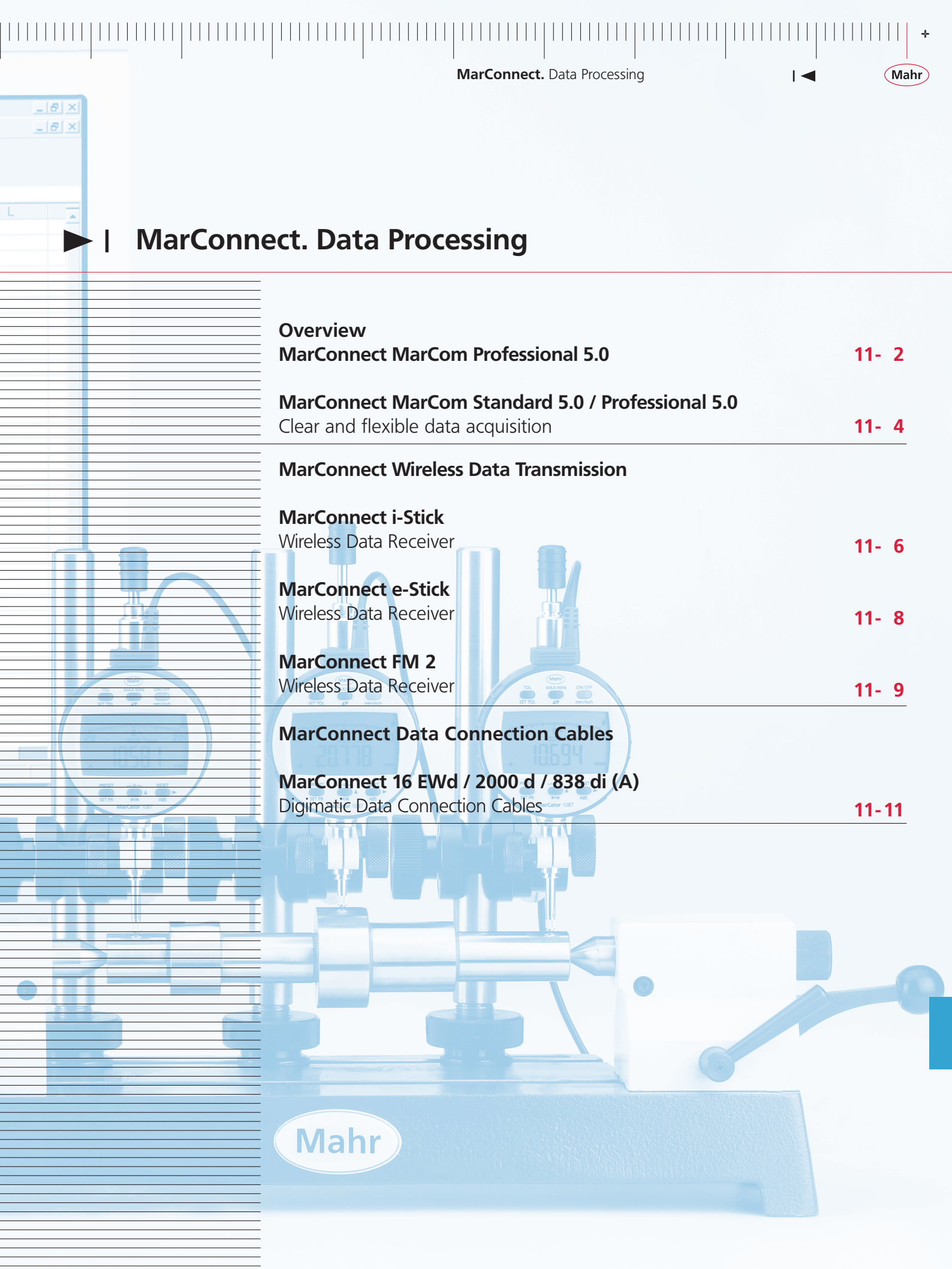
MarConnect i-Stick
Wireless Data Receiver 11- 6

MarConnect e-Stick
Wireless Data Receiver 11- 8

MarConnect FM 2
Wireless Data Receiver 11- 9

MarConnect Data Connection Cables

MarConnect 16 EWd / 2000 d / 838 di (A)
Digimatic Data Connection Cables 11-11



MarConnect MarCom Professional 5.0

►| Whether you are using the tried and tested MarConnect interface or the new wireless data transmission Integrated Wireless, the MarCom software enables you to transmit data quickly and easily from a measuring station to a PC. |◄

Measuring Instruments

Wireless Transmission

Data Transmission via cable

Trigger a sending command:

- On the measuring instrument

- Using a remote control

Data Transmission

- Footswitch

- Keyboard

- Timer function

Universal Software MarCom Profession

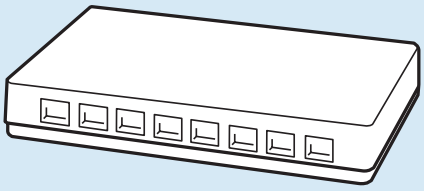
Interface on device: 4 x 8

Interface on device:
Data cable USB 128
i-Stick 4 x 8
e-Stick 1 x 8

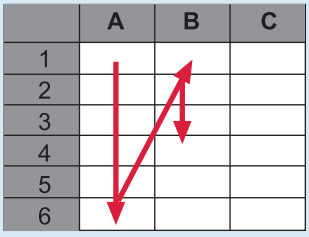
Interface on device:
Data cable USB 128
i-Stick 4 x 8
e-Stick 1 x 8

Interface on device:
Data cable USB 128
i-Stick 4 x 8
e-Stick 1 x 8

- Interface
al 5.0

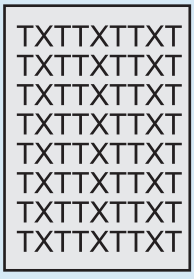


Virtual Interface Box



Intelligent Excel Interface

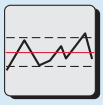
Keyboard Emulation



Text - File

Data Acquisition

SPC Software



The MarCom Professional 5.0 has integrated virtual interface boxes. This enables a simple and user friendly connection of measuring instruments to an SPC program which use the MUX50 data format from manufacturers such as Babtec, Q-DAS and others.

Microsoft Office Excel®

Irrespective of whether you are using existing Excel templates or those designed for your requirements, the MarCom cell controller is highly flexible.

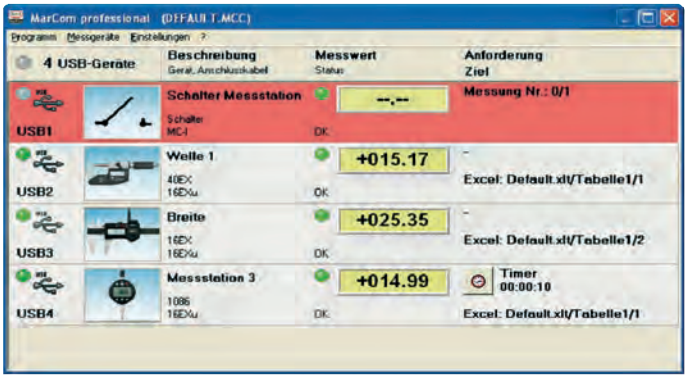
Any Windows Software

Do you use an application which does not support the integration of a measuring instrument? No Problem, with the MarCom keyboard emulation the measured values will be sent directly to the active cell of the program in use.

Flexible data transmission

MarCom is extremely flexible and enables freely configurable measuring cycle; regardless of whether you are sending data using a foot switch, on the measuring instrument, a Timer function or a Keyboard.

Software interface MarCom Std. 5.0 / MarCom Prof. 5.0 / MarCom Upd. 5.0



Features

- Directly transfer meas. values into MS Excel (from Version 97), **into SPC-Software using virtual interface box (MUX50 format)**, a text file or key code
- Measured values from each device can be sent to a different column, table or folder in Excel
- USB hub is also suitable as a measuring instrument interface
- Clear portrayal of selected measuring devices with the aid of icons
- Freely definable / configurable measurement cycles
- Data transmission via Data-button on meas. devices or on the data cable; via a PC, timer, keyboard, remote control or a foot switch connected to a USB interface
- Supplied with: Driver, operating instructions

Technical Data

	MarCom Std. 5.0	MarCom Prof. 5.0	MarCom Upd. 5.0
Number of connectable wireless receivers for i-stick	1	4	
Number of connectable measuring instruments with integrated wireless	1	32	
Number of connectable wireless receivers for e-stick		1	
Number of connectable transmission modules for e-stick	1	8	
Number of connectable wireless receivers FM		1	
Number of connectable transmission modules for wireless receiver FM	1	100	
Number of connectable measuring instruments with USB interface	1	128	
Number of connectable USB foot switches	1	128	
Number of connectable measuring instruments with RS232C interface	1	2	
Number of virtual interface boxes (8 inputs)		4	
Languages:	German, English, French, Italian, Spanish, Dutch, Russian, Polish, Portuguese, Czech, Chinese		
Order no.	**4102211**	**4102212**	**4102213**

Accessories

		For Measuring Instruments	Order no.
i-Stick	Receiver incl. Software MarCom Std.	MarCal 16 EWRi / 30 EWRi MarCator 1086 Ri / 1087 Ri / 1087 BRi	**4102220**
e-Stick	Receiver incl. Software MarCom Std.	Transmitter 16 EWe, 2000 e, RS232 e, 1082 e	**4102230**
FM 2	Receiver incl. Software MarCom Std.	Transmitter 16 EXf, 1082 f, 2000f, 817 f, RS232 f	**4102305**
16 EWe	Transmitter for e-Stick	MarCal 16 ER, 16 EWR, 16 EWV, 30 EWR, 30 EWN Digimar 814 SR Micromar 40 EWR, 40 EWS, 40 EWV, 44 EWR, 46 EWR MarCator 1075 R, 1086 R, 1087 R, 1087 BR MarSurf PS1	**4102231**
16 EXf	Transmitter for FM 2	MarCal 16 ER, 16 EWR, 16 EWV, 30 EWR, 30 EWN Digimar 814 SR Micromar 40 EWR, 40 EWS, 40 EWV, 44 EWR, 46 EWR MarCator 1075 R, 1086 R, 1087 R, 1087 BR	**4102306**
16 EXu	Data Connection Cable USB (2 m) incl. Software MarCom Std.	MarCal 16 ER, 16 EWR, 18 EWR, 30 EWR, 30 EWN Digimar 814 SR Micromar 40 ER, 40 EWR, 40 EWV, 40 EWS, 44 EWR, 46 EWR MarCator 1075 R, 1086 R, 1086 Ri, 1087 R, 1087 Ri, 1087 BR, 1087 BRi MarSurf PS1, M300, M300C	**4102357**

Accessories

		For Measuring Instruments	Order no.
16 EXr	Data Connection Cable RS232C (2 m)	MarCal 16 ER, 16 EWR, 18 EWR, 30 EWR, 30 EWN Digimar 814 SR Micromar 40 ER, 40 EWR, 40 EWV, 40 EWS, 44 EWR, 46 EWR MarCator 1075 R, 1086 R, 1086 Ri, 1087 R, 1087 Ri, 1087 BR, 1087 BRi MarSurf PS1, M300, M300C	**4102410**
2000 e	Transmitter for e-Stick	Digimar 816 CL MarCator 1088 / 1088 W Millimess 2000, 2001, 2100, µMaxµm // Millimar C1200	**4102232**
2000 f	Transmitter for FM 2	Digimar 816 CL, Millimar C 1200 MarCator 1088 / 1088 W Millimess 2000, 2001, 2100, µMaxum //	**4102309**
2000 usb	Data Connection Cable USB (2 m) incl. Software MarCom Std.	Digimar 816 CL, Millimar C1200 MarCator 1088, 1088 W Millimess 2000, 2001, 2100, µMaxum //	**4346023**
2000 r	Data Connection Cable RS232C (2 m)	Digimar 816 CL, Millimar C1200 MarCator 1088, 1088 W Millimess 2000, 2001, 2100, µMaxum //	**4346020**
	Data Connection Cable RS232C (3 m)	Digimar 817 CLM Millimar C1208, C1216, 1240, C1245, S1840, S1841, X1715, X1745	**7024634**
RS232 e	Transmitter for e-Stick	Millimar C1208, C1216, C1245, S1840, Digimar 817 CLM	**4102233**
	Adaptor Cable RS232-USB (1 m) incl. Software MarCom Std.	Millimar C1208, C1216, 1240, C1245, S1840, S1841, X1715, X1745 (in conjunction with cable 7024634)	**4102331**
817 f	Transmitter for FM 2	Digimar 817 CLM	**4102310**
817 usb	Adaptor Cable RS232-USB (1 m) incl. Software MarCom Std.	Digimar 817 CLM (in conjunction with cable 7024634)	**4102333**
RS232 f	Transmitter for FM 2	Millimar C1208, C1216, C1245, S1840	**4102311**
1082 e	Transmitter for e-Stick	Digimar M814 N/G Multimar 25 ES MarTool 106 ES	**4102235**
1082 f	Transmitter for FM 2	Digimar M814 N/G Multimar 25 ES MarTool 106 ES	**4102307**
16 ESv	Data Connection Cable RS232C (2 m)	Digimar 814 G, 814 N Multimar 25 ES MarTool 106 ES	**4102510**
Opto usb	Adaptor Cable RS232-USB (1 m) incl. Software MarCom Std.	Digimar M814 (in conjunction with cable 4102510) Multimar 25 ES (in conjunction with cable 4102510) MarTool 106 ES (in conjunction with cable 4102510)	**4102330**
800 EWu	Data Connection Cable USB (2 m) incl. Software MarCom Std.	MarCal 31 EW MarTest 800 EW, 800 EWL	**4305121**
800 EWr	Data Connection Cable RS232C (2 m)	MarCal 31 EW MarTest 800 EW, 800 EWL	**4305122**
838 usb	Data Connection Cable USB (1,5 m) incl. Software MarCom Std.	Marameter 838 EI, 838 EA	**4495079**
USB-Hub	USB-Hub 7-fold industrial model		**4102553**
MC-I	Data Connection Cable USB (0.1 m)	Foot Switch 16 ESf	**4102782**
16 ESf	Foot Switch to trigger data transmission		**4102058**
MC-R	Remote control for MarCom		**4102221**

Receiver MarConnect i-Stick

USB MarConnect integrated wireless

Integrated wireless has been approved in: the EU, EFTA, Turkey, USA, Mexico, Canada, Japan, China and Korea.

Features

- **Measurement without the nuisance of additional modules:** Unlike conventional wireless solutions, which have a large external transmitter with separate battery, the transmitter in Integrated Wireless is fully integrated.
- **Highly mobile:** Integrated Wireless gives you much more mobility. There is no cable to get in the way, either at the measuring station or when measuring on or at the machine or at large workpieces
- **Easy data transfer:** With Integrated Wireless you can transfer your measured values to the PC simply using the iStick. As with a data cable, the measured values are accepted via the MarCom software directly into MS Excel© or via a keyboard code into any Windows application
- **Reliable transfer:** With Integrated Wireless you can be sure that your data will arrive safely. Measuring instruments with Integrated Wireless display messages to confirm whether the transmitted data has been correctly transferred or whether you are within receiving range of the i-Stick receiver
- **Long battery life:** The integrated wireless interface makes the measuring instrument exceptionally energy-efficient. And unlike conventional wireless systems, no additional battery is required
- **Affordable:** With Integrated Wireless you can connect up to 8 measuring instruments per i-Stick receiver. Expensive interface boxes are no longer necessary. With even one connected measuring instrument you get a wireless connection for the price of a cable
- Supplied with: Software MarCom Standard, Driver

Technical Data

Number of channels		3
Frequency band	MHz	2400
Radio range		up to 6 m
Number of connectable wireless receivers for i-stick		4
Number of connectable measuring instruments with integrated wireless		32
For measuring instrument		MarCal 16 EWRi / 30 EWRi MarCator 1086 Ri / 1086 WRi / 1087 Ri / 1087 BRi
Order no.		**4102220**

Accessories

		Order no.
MarCom Prof. 5.0	**Software interface**	**4102212**
16 EWRi	**Digital Caliper**, 0.01 mm, 0 - 150 mm	**4103400**
16 EWRi	**Digital Caliper**, 0.01 mm, 0 - 150 mm	**4103401**
16 EWRi	**Digital Caliper**, 0.01 mm, 0 - 150 mm	**4103402**
16 EWRi	**Digital Caliper**, 0.01 mm, 0 - 150 mm	**4103403**
16 EWRi	**Digital Caliper**, 0.01 mm, 0 - 200 mm	**4103404**
16 EWRi	**Digital Caliper**, 0.01 mm, 0 - 200 mm	**4103405**
16 EWRi	**Digital Caliper**, 0.01 mm, 0 - 300 mm	**4103406**
16 EWRi	**Digital Caliper**, 0.01 mm, 0 - 300 mm	**4103407**
30 EWRi	**Digital Depth Gage**, 0.01 mm, 0 - 150 mm	**4126755**
30 EWRi	**Digital Depth Gage**, 0.01 mm, 0 - 300 mm	**4126756**
30 EWRi	**Digital Depth Gage**, 0.01 mm, 0 - 500 mm	**4126757**
1086 Ri	**Digital Indicator**, 0.0005 mm, 12.5 mm	**4337624**
1086 Ri	**Digital Indicator**, 0.0005 mm, 25 mm	**4337625**
1086 Ri	**Digital Indicator**, 0.0005 mm, 50 mm	**4337626**
1086 Ri	**Digital Indicator**, 0.0005 mm, 100 mm	**4337627**
1086 Ri	**Digital Indicator**, 0.0005 mm, 25 mm	**4337628**
1086 Ri	**Digital Indicator**, 0.01 mm, 12.5 mm	**4337134**
1086 Ri	**Digital Indicator**, 0.01 mm, 25 mm	**4337135**
1086 Ri	**Digital Indicator**, 0.01 mm, 50 mm	**4337136**
1086 Ri	**Digital Indicator**, 0.01 mm, 100 mm	**4337137**
1086 WRi	**Digital Indicator**, 0.0005 mm, 12.5 mm	**4337142**
1086 WRi	**Digital Indicator**, 0.0005 mm, 25 mm	**4337143**
1086 WRi	**Digital Indicator**, 0.01 mm, 12.5 mm	**4337147**
1086 WRi	**Digital Indicator**, 0.01 mm, 25 mm	**4337148**
1087 Ri	**Digital Indicator**, 0.0005 mm, 12.5 mm	**4337663**
1087 Ri	**Digital Indicator**, 0.0005 mm, 25 mm	**4337665**
1087 BRi	**Digital Indicator**, 0.0005 mm, 12.5 mm	**4337664**

Receiver MarConnect e-Stick

The e-Stick Receiver and Transmitter has been approved in: the EU, EFTA, Turkey, USA, Mexico and Canada.

Features

- To retrofit on all Mahr Hand Measuring instruments that have a data interface
- Wireless data transmission from a measuring instrument to a PC
- Secure data transmission due to the acknowledgement dialog of the received data from the PC to the measuring instrument
- Optical confirmation of received data on the transmitter
- Compact transmitter without an external antenna
- Bi-directional radio link (remote control from measuring instruments)
- Radio frequency is 2400 MHz
- Supplied with: Software MarCom Standard, Driver

Technical Data

Frequency band	MHz	2400
Radio range		up to 6 m
Number of connectable wireless receivers for e-stick		1
Number of connectable transmission modules for e-stick		8
For measuring instrument		Transmission modules 16 EWe, 2000 e, RS232 e, 1082 e
Order no.		**4102230**

Accessories

		For measuring instrument	Order no.
MarCom Professional 5.0	Software-Interface		**4102212**
16 EWe	Transmitter for e-Stick	MarCal 16 ER, 16 EWR, 16 EWV, 30 EWR, 30 EWN Digimar 814 SR Micromar 40 EWR, 40 EWS, 40 EWV, 44 EWR, 46 EWR MarCator 1075 R, 1086 R, 1087 R, 1087 BR MarSurf PS1	**4102231**
2000 e	Transmitter for e-Stick	Digimar 816 CL MarCator 1088 / 1088 W Millimess 2000, 2001, 2100, µMaxµm // Millimar C1200	**4102232**
RS232 e	Transmitter for e-Stick	Millimar C1208, C1216, C1245, S1840 Digimar 817 CLM	**4102233**
1082 e	Transmitter for e-Stick	Digimar M814 N/G Multimar 25 ES MarTool 106 ES	**4102235**

Receiver MarConnect FM 2

The FM2 Receiver and Transmitter has been approved in: the EU, EFTA and Turkey.

Features

- Wireless data transmission from a measuring instrument to a PC
- Secure data transmission due to the acknowledgement dialog of the received data from the PC to the measuring instrument
- Optical confirmation of received data on the transmitter
- TWIN receiver for USB and RS232 interfaces
- Compact transmitter without an external antenna
- Theoretically unlimited amount of measuring instruments can be connected to a receiver
- Distance of radio wave up to 100 m (depending on the working environment)
- Radio frequency is 433 MHz (Further frequencies are available upon request)
- Up to 69 channels are available per receiver, several receivers can be used at any one time
- Bi-directional radio link (remote control from measuring instruments)
- Triggering data via a hand switch is possible
- Supplied with: Software MarCom Standard, Driver, USB-cable

Technical Data

Number of channels		69
Frequency band	MHz	433
Radio range		up to 100 m (depending on the working environment)
Number of connectable wireless receivers FM		1
Number of connectable transmission modules for wireless receiver FM		100
For measuring instrument		Transmission modules 16 EXf, 1082 f, 2000f, 817 f, RS232 f
Order no.		**4102305**

Receiver MarConnect FM 2

Accessories

		For measuring instrument	Order no.
MarCom Professional 5.0	Software Interface		**4102212**
16 EXf	Transmitter for FM 2	MarCal 16 ER, 16 EWR, 16 EWV, 30 EWR, 30 EWN Digimar 814 SR Micromar 40 EWR, 40 EWS, 40 EWV, 44 EWR, 46 EWR MarCator 1075 R, 1086 R, 1087 R, 1087 BR	**4102306**
1082 f	Transmitter for FM 2	Digimar M814 N/G Multimar 25 ES MarTool 106 ES	**4102307**
2000 f	Transmitter for FM 2	Digimar 816 CL, Millimar C 1200 MarCator 1088 / 1088 W Millimess 2000, 2001, 2100, µMaxum //	**4102309**
817 f	Transmitter for FM 2	Digimar 817 CLM	**4102310**
RS232 f	Transmitter for FM 2	Millimar C1208, C1216, C1245, S1840	**4102311**
HTF 1	Hand switch for remote control		**4102314**

16 EXf

2000 f

Digimatic data cable MarConnect 16 EWd / 2000 d / 838 di (A)

Features

- For connection to Digimatic-compatible interfaces and evaluation devices

Technical Data

	Cable length m	For measuring instrument	Order no.
16 EWd	2	MarCal 16 ER, 16 EWR, 18 EWR, 30 EWR, 30 EWN Digimar 814 SR Micromar 40 ER, 40 EWR, 40 EWV, 40 EWS, 44 EWR, 46 EWR MarCator 1075 R, 1086 R, 1086 Ri, 1087 R, 1087 Ri, 1087 BR, 1087 BRi MarSurf PS1, M300, M300C	**4102915**
2000 d	2	Digimar 816 CL MarCator 1088, 1088 W Millimess 2000, 2001, 2100, µMaxum // Millimar C1200	**4346021**
838 di (A)	1.5	Marameter 838 EI, 838 EA	**4495083**

THE COMPLETE SUPPORT FOR YOUR INSPECTION.
MARTOOL

The latest information on MARTOOL products can be found on our website:
www.mahr.de/en/Home, WebCode 20463

► | MarTool measuring and inspection equipment are indispensable aids for dimensional metrology. Their simple handling make them the most versatile instruments for daily use in either the inspection room or the workshop; whether measuring an angle on a work piece or inspecting the surface plate for a height measuring instrument with the outstanding quality from MarTool you cannot go wrong. | ◄

► | MarTool. Measuring and Inspection Equipment

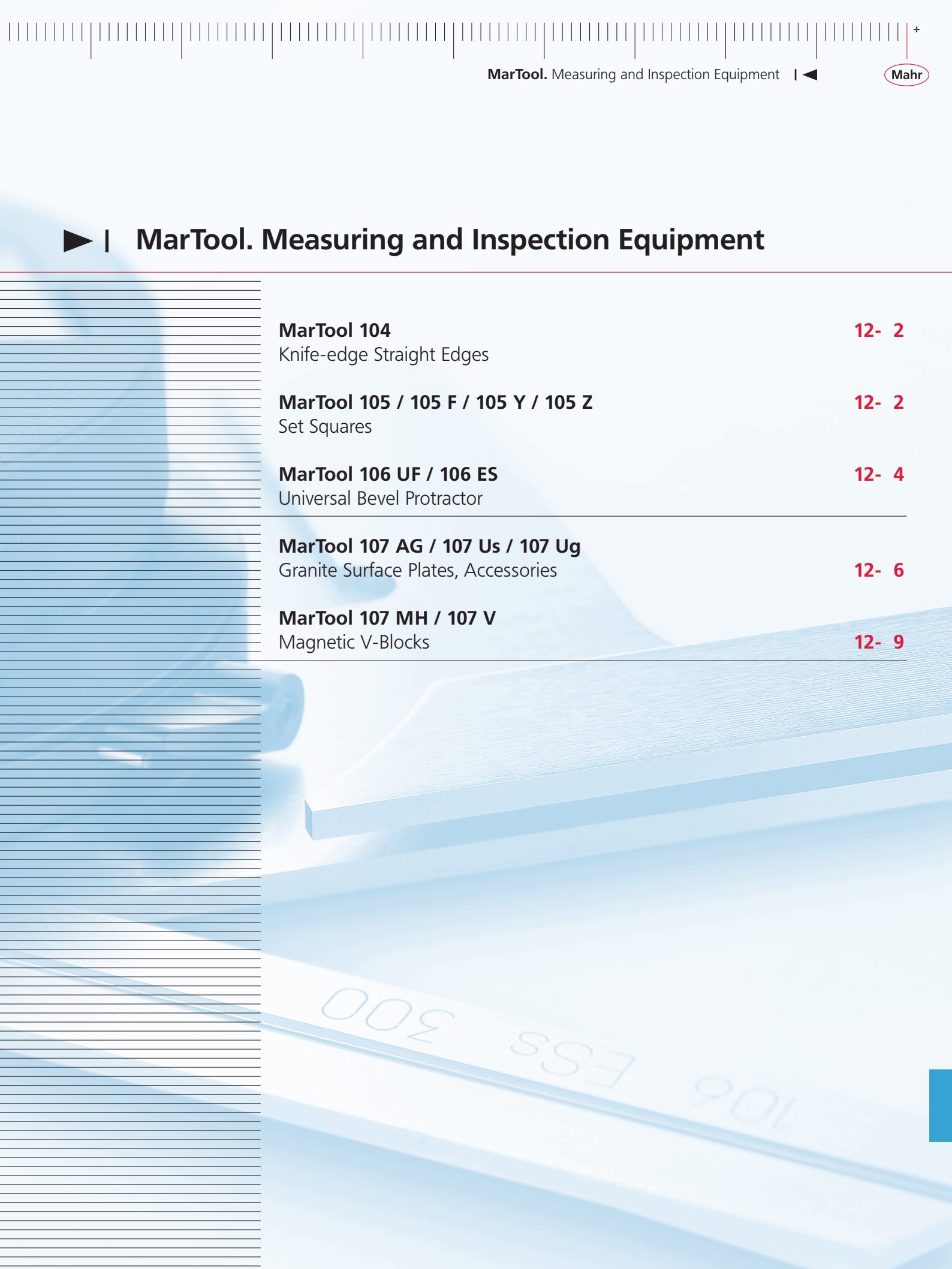
MarTool 104 12- 2
Knife-edge Straight Edges

MarTool 105 / 105 F / 105 Y / 105 Z 12- 2
Set Squares

MarTool 106 UF / 106 ES 12- 4
Universal Bevel Protractor

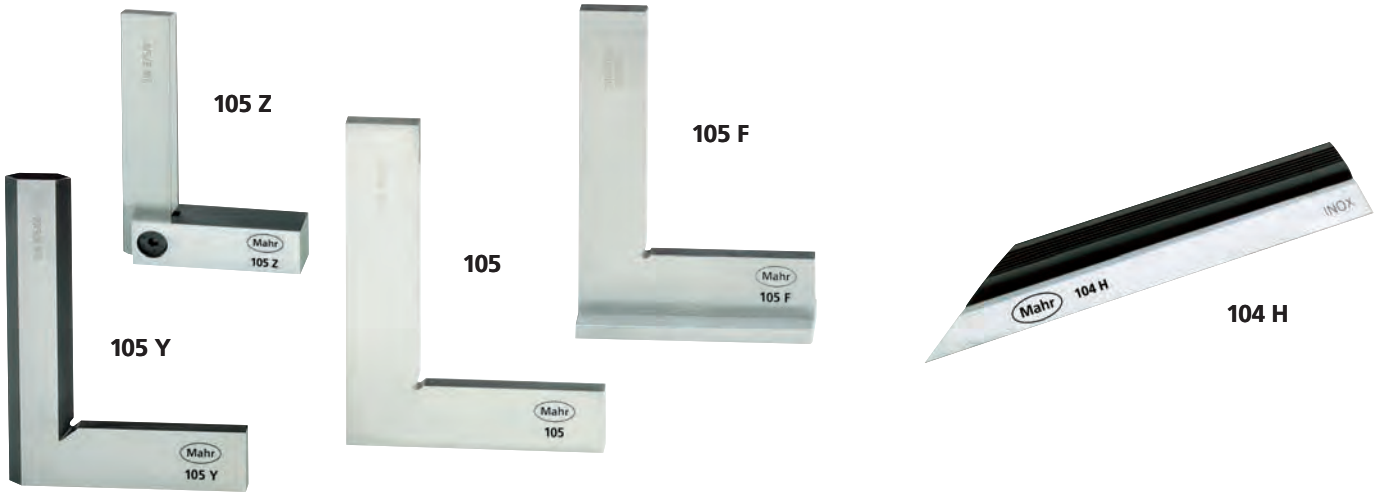
MarTool 107 AG / 107 Us / 107 Ug
Granite Surface Plates, Accessories 12- 6

MarTool 107 MH / 107 V
Magnetic V-Blocks 12- 9



MarTool. Measuring and Inspection Equipment

OVERVIEW STRAIGHT EDGES AND SQUARES



Knife-edge Straight Edge 104 H

Features

- Stainless steel, hardened throughout and ground
- Heat insulators
- One end has a pointed tip
- Supplied with: Carton

Accuracy

according to **DIN 874**, sheet 2

To determine the straightness tolerance t of the knife edge use the following formula:

$$t = 2 + \frac{l}{250}\ \mu m$$

Length l in mm

Technical Data

Length mm	Length (inch)	Cross section mm	Weight kg	Order no.
75	(3″)	22 x 6	0.05	**4205000**
100	(4″)	22 x 6	0.07	**4205001**
125	(5″)	22 x 6	0.09	**4205002**
150	(6″)	22 x 6	0.11	**4205003**
200	(8″)	22 x 6	0.15	**4205004**
300	(12″)	30 x 7	0.25	**4205005**
400	(16″)	40 x 7	0.75	**4205007**
500	(20″)	40 x 7	0.91	**4205006**

Flat Square 105/0

Features

- Hardened stainless steel
- Supplied with: Carton

Accuracy

Grade **0 DIN 875**

Technical Data

Length mm			Length (inch)	Cross section mm	Weight kg	Order no.
50	x	40	(2 x 1.6″)	14 x 4	0.04	**4207008**
75	x	50	(3 x 2″)	15 x 4	0.05	**4207009**
100	x	70	(4 x 3″)	20 x 5	0.11	**4207000**
150	x	100	(6 x 4″)	25 x 6	0.22	**4207001**
200	x	130	(8 x 5.1″)	30 x 7	0.54	**4207002**
300	x	200	(12 x 8″)	40 x 8	1.12	**4207004**

Flanged Beam Square 105 F/0

Features

Accuracy

Grade **0 DIN 875**

To determine the right angle tolerance t of the test surface use the following formula:

$$t = 5 + \frac{l}{50}\ \mu m$$

(Length l is the longer beam in mm)

Technical Data

Length of beams mm			(inch)	Cross section mm	Weight kg	Order no.
50	x	40	(2 x 1.6")	13.5 x 5	0.05	**4208008**
75	x	50	(3 x 2")	15 x 4	0.08	**4208009**
100	x	70	(4 x 3")	20 x 5	0.20	**4208000**
150	x	100	(6 x 4")	25 x 6	0.46	**4208001**
200	x	130	(8 x 5.1")	30 x 7	0.75	**4208002**
300	x	200	(12 x 8")	40 x 8	1.68	**4208004**

Knife-edge Square 105 Y

Features

- Hardened stainless steel
- Supplied with:
  Carton

Accuracy

Grade **00 DIN 875**

Technical Data

Length of beams mm			(inch)	Cross section mm	Weight kg	Order no.
50	x	40	(2 x 1.6")	14 x 4	0.03	**4210000**
75	x	50	(3 x 2")	16 x 4	0.05	**4210001**
100	x	70	(4 x 3")	20 x 5	0.10	**4210002**
150	x	100	(6 x 4")	25 x 6	0.26	**4210003**
200	x	130	(8 x 5.1")	30 x 7	0.43	**4210004**
300	x	200	(12 x 8")	40 x 8	0.96	**4210005**

Square 105 Z

Features

- Hardened stainless steel
- Precision ground narrow beam and a wide beam
- Without a knife edge
- Supplied with:
  Carton

Accuracy

Grade **0 DIN 875**

To determine the right angle tolerance t of the test surface use the following formula:

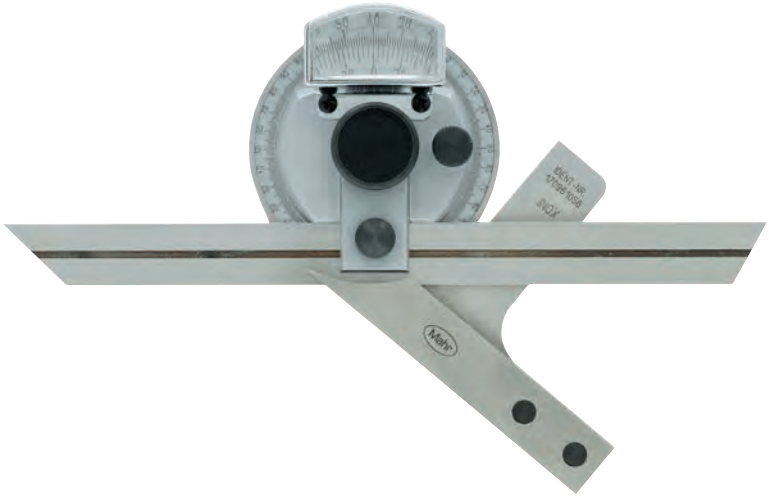
$$t = 5 + \frac{l}{50}\ \mu m$$

(Length l is the longer beam in mm)

Technical Data

Length of beams mm			(inch)	Cross section narrow beam mm	Cross section wide beam mm	Weight kg	Order no.
50	x	40	(2 x 1.6")	16 x 2	14 x 10	0.05	**4211005**
75	x	50	(3 x 2")	16 x 2	14 x 10	0.06	**4211000**
100	x	70	(4 x 3")	20 x 3	18 x 12	0.13	**4211001**
150	x	100	(6 x 4")	26 x 3	24 x 14	0.32	**4211002**
200	x	130	(8 x 5.1")	30 x 4	28 x 16	0.75	**4211003**
300	x	200	(12 x 8")	40 x 6	38 x 20	1.60	**4211004**

Universal Bevel Protractor 106 UF



Features

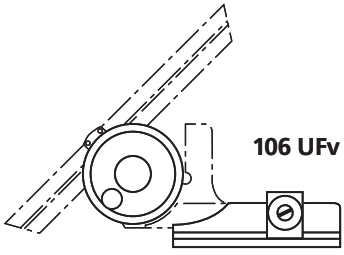
- With fine adjustment
- Stainless steel
- Vernier scale and main scale both have a satin chrome finish to prevent glare and to enable parallax free reading on the same plane
- Knurled screw for clamping the interchangeable beam into position
- Supplied with: Magnifying reading lens, interchangeable beam and case

Technical Data

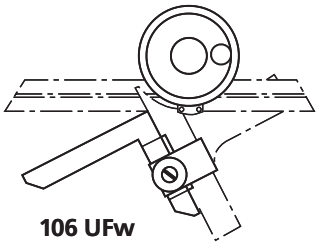
Blade length mm	Range degrees	Readings minutes	Deviation minutes	Order no.
150	360°	5′	5′	**4214050**
200	360°	5′	5′	**4214051**
300	360°	5′	5′	**4214052**

Accessories

		Order no.
Interchangeable Beams Stainless steel, hardened (standard accessories)	**106 Us**	
Beam length	150 mm / 6″	**4214010**
	200 mm / 8″	**4214011**
	300 mm / 12″	**4214012**
Additional Accessories		
Stand Featuring flat and V-surface for dia. 5 – 30 mm length 90 mm, width 25 mm	**106 UFv**	**4214061**
Acute Angle Attachment for particularly small acute angles, screws onto the beam	**106 UFw**	**4214062**



106 UFv



106 UFw

Digital Universal Bevel Protractor 106 ES

RS232C IP51

Features

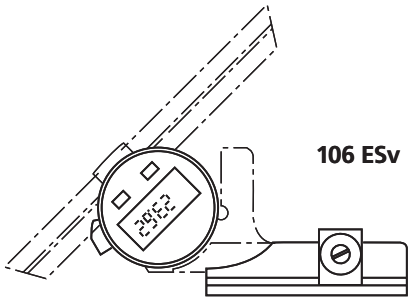
- Easy to read high contrast 8,5 mm high LCD
- Displays the angular degrees and angular minutes or decimal degrees
- Zero setting at any position of the measuring range
- Beam can be clamped with a push button
- Fine adjustment for easy setting of a desired angle
- Locking lever to prevent accidental adjustment
- Base plate and beam are made of stainless steel, the measuring edges hardened
- Data output: Opto RS232C
- Max. setting speed 3 rotations per second
- Capacitive measuring system, life of the battery ca. 2 years
- Supplied with: Battery, 300 mm beam and case

Technical Data

Range	Resolution switchable	Deviation	Order no.
1 x 360° or 2 x 180° or 4 x 90°	1 minutes or 0.01°	± 2 minutes	**4214600**

Accessories

			Order no.
Interchangeable Beams Stainless steel, hardened	**106 ESs**		
beam length	150 mm /	6"	**4214620**
	200 mm /	8"	**4214621**
	300 mm /	12"	**4214622**
Battery 3V, Type CR 2032			**4102520**
Data Connection Cable Opto RS232C (2 m), with SUB-D Jack 9 pin	**16 ESv**		**4102510**
Stand Featuring flat and V-surface for dia. 5 – 30 mm, length 90 mm, width 25 mm	**106 ESv**		
Acute Angle Attachment for particularly small acute angles, screws onto the beam	**106 UFw**		**4214062**



Surface Plate 107 G made from granite

Features

- For measuring tasks, layout work, for touching up and lapping precision parts
- Made of choice fine-grain black granite (Diabas)
- High density structure thus extremely homogeneous
- Hardness 6-7 on the Mohs' hardness scale
- Surface plate is lapped and has a satin matt finish to prevent glare
- 100 % corrosion-proof
- Non-magnetic and non-conductive
- Measuring instruments and test equipment are easy to slide over surface

Technical Data

Size of plates mm			Thickness of plate mm	Weight kg	Order no.* Grade 00 DIN 876	0 DIN 876	1 DIN 876
400	x	250	60	18	**4221500**	**4221520**	**4221540**
400	x	400	60	29	**4221501**	**4221521**	**4221541**
630	x	400	80	60	**4221502**	**4221522**	**4221542**
630	x	630	80	95	**4221503**	**4221523**	**4221543**
800	x	500	100	120	**4221504**	**4221524**	**4221544**
1000	x	630	100	190	**4221505**	**4221525**	**4221545**
1200	x	800	150	432	**4221506**	**4221526**	**4221546**
1500	x	1000	150	675	**4221507**	**4221527**	**4221547**
2000	x	1000	200	1200	**4221508**	**4221528**	**4221548**

Flatness tolerance t_1 of the surface plate are derived from the following formulas:

Grade acc to DIN 876	**Flatness tolerance** in µm
00	$t_1 = 2\,(1 + l/1000)$
0	$t_1 = 4\,(1 + l/1000)$
1	$t_1 = 10\,(1 + l/1000)$

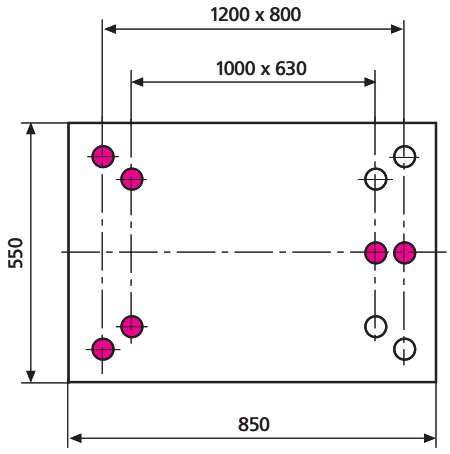
Length l in mm

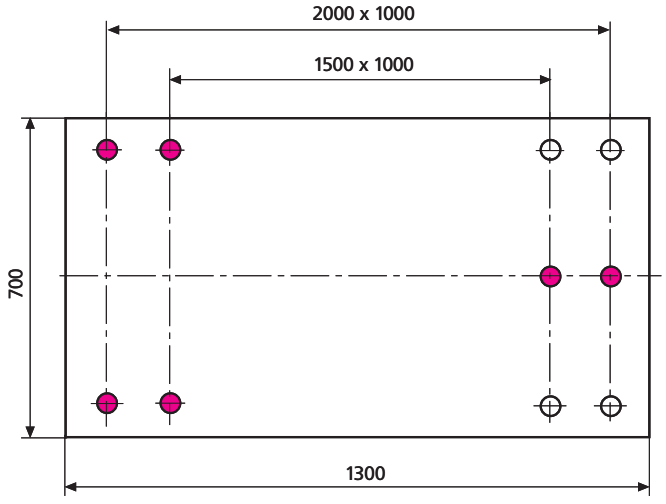
Surface plates are available in other dimensions upon request

* *Excludes stand with cabinet*

Mounting of Surface Plates 107 G up to 2000 x 1000 mm

Distortion of the surface plates is minimized if supported at the support points A.
For plates with edge lengths over 1000 mm it is advised to provide anti-tilt elements at the B support points.
Support points A (Bessel points, 0.22 x l or w from the edge of the plate). Support points B are for the anti-tilt elements.





● Support point A

○ Support point B

Accessories

	Quantity	Order no.
Adjustable Plate Supports 107 Asa For mounting the surface plates upon work benches or cabinets; three plates are for support and two plates are to prevent tilting	**1 piece**	**4221069**

Stand with Cabinet 107 Us

Features

- Extremely sturdy design due to the rectangular tubes, covered with sheet metal
- With three height adjustable supports
- For plates sizes that are greater than 1000 mm, two additional height adjustable supports are required to prevent tilting
- All 4 corners have a support to prevent slipping and to protect against a collision
- Doors can be locked

Technical Data

For plate sizes mm			Height mm	Order no.*
630	x	400	900 - 1000	**4221560**
630	x	630		**4221561**
800	x	500		**4221562**
1000	x	630		**4221563**
1200	x	800		**4221564**
1500	x	1000		**4221565**
2000	x	1000		**4221566**

** Excludes surface plate*

Stand 107 Ug

Features

- Extremely sturdy design due to the rectangular tubes
- With three height adjustable supports
- For plates sizes that are greater than 1000 mm, two additional height adjustable supports are required to prevent tilting
- All 4 corners have a support to prevent slipping and to protect against a collision

Technical Data

For plate sizes mm			Height mm	Order no.*
630	x	400	900 - 1000	**4221570**
630	x	630		**4221571**
800	x	500		**4221572**
1000	x	630		**4221573**
1200	x	800		**4221574**
1500	x	1000		**4221575**
2000	x	1000		**4221576**

** Excludes surface plate*

Magnetic V-Blocks 107 MH

Features

- To used in an inspection room and workshop for both measuring and scribing
- To clamp work pieces during drilling, grinding and light milling work
- Integrated magnetic system, protected against the intrusion of moisture
- Constant magnetic force
- With the switch the upper, lower and opposite face are all simultaneously magnetized
- Surfaces and measuring faces and both hardened and ground
- Available individually or as a matched pair

Technical Data

Accuracy (deviation):	
Flatness and parallelism	≤5 µm
Angle between front and side faces respectively the V-slots	≤5 µm
Symmetry of the V-slots	≤5 µm
Height difference of the V-slots of pairs	≤5 µm
Length x Width x Height	100 x 70 x 95 mm
For shaft dia.	5 - 65 mm
V-angle	90°
Weight per piece	4 kg
Magnetic force on a flat surface	≈1000 N (100 kp)
Magnetic force of V-block	≈750 N (75 kp)
Order no. V-block	**4230000**
Order no. pair of V-blocks	**4230001**

Accessories

	Order no.
Wooden case (for 1 V-block)	**4230005**

V-Block 107 V

Features

- For testing of small cylindrical work pieces for there ovality and polygon error
- With 108° V-slot
- Made from special hardened and ground steel
- Available individually or as a matched pair

Technical Data

Accuracy (deviation):	
Parallelism of the V-slot to the underside of the base	≤2 µm
Height difference of the V-slots of pairs	≤5 µm
Length x Width x Height	30 x 30 x 30 mm
For shaft dia.	2 - 25 mm
V-angle	108°
Weight per piece	0.2 kg
Order no. V-block	**4229000**
Order no. pair of V-blocks	**4229001**

MADE TO MEASURE.
MARGAGE

The latest information on MARGAGE products can be found on our website:
www.mahr.de/en/Home, WebCode 20475

► | In 1871, at the foundation of the German Empire and during the introduction of the metric system, Mahr was already supplying dimensional standards to the weights and measurement office of several individual German states. Today, the measurement standards such as gage blocks are the basis of dimensional metrology, they are used as a setting standard for an indicating measuring instrument or applied in the calibration laboratory as a reference standard. Due to our accreditation from the PTB - Physikalisch-Technischen Bundesanstalt (German metrology institute providing scientific and technical services) and the careful selection of the materials we use, we can grant you the highest possible quality! | ◄

► | MarGage. Standards, Gages and Gage Blocks

Rectangular Gage Blocks 13- 2
according to DIN EN ISO 3650

MarGage 402 / 404 / 406 / 408 / 409 13- 4
Rectangular Gage Blocks made of steel

MarGage 411 / 415 13- 4
Test Sets for Calipers

MarGage 417 13- 5
Individual Rectangular Gage Blocks made of steel

MarGage 402 C / 404 C / 406 C / 408 C / 409 C 13- 6
Rectangular Gage Blocks made of ceramic

MarGage 417 C 13- 8
Individual Rectangular Gage Blocks made of ceramic

MarGage 418 C 13- 9
Protective Rectangular Gage Blocks made of ceramic

MarGage 419 C 13- 9
Test Sets for Micrometers

Accessories for Rectangular Gage Blocks 13-10

Inch Gage Blocks 13-12
according to ANSI

Pin Gages / Plug Gages 13-14

MarGage 426 / 426 G / 426 S 13-14
Pin Gages made of steel

MarGage 426 D / 426 DS 13-16
Plug Gages made of steel

MarGage 426 A / 426 M 13-17
Thread Pin Gages

Settings Standards 13-18

AGD Masters 13-18
Master Rings / Master Discs / Master Plugs

MarGage 355 E / 390 / 708 E / 715 E 13-19
Setting Standards

Calibration Services 13-21

MarGage. Standards, Gages and Gage Blocks

RECTANGULAR GAGES BLOCKS

Application

- As comparison reference and utilization standards in the field of length measurement
- For checking gages and measuring instruments
- For setting devices of all types designed for length measurement and in particular their displays
- Can be used individually or in combinations by wringing several blocks together (see illustration)

Accuracy

The manufacturing process is based on DIN EN ISO 3650, Mahr gage blocks are produced with the utmost care.

Marking

Gage blocks of all grades are clearly and individually marked with an identification number.

Material

Mahr gage blocks are made either of stainless steel or of the ceramic compound zirconium oxide ZrO_2 (Circonimar).

Heat Expansion Coefficient

Steel	$11.5 \times 10^{-6}\ K^{-1}$
Circonimar	$9.5 \times 10^{-6}\ K^{-1}$

Calibration Certificate

Gage blocks in sets are supplied with a Mahr calibration certificate stating deviations from the nominal size, this confirms the traceability to National Standards.
For single gage blocks Mahr calibration certificates are available on request.
A calibration certificate from the Mahr DKD Calibration Laboratory is recommended for gage blocks of calibration grade K in the range between 0.5 and 100 mm

Dimensions

	Nominal dimension mm	Cross section mm
from	0.5 - 10	30 x 9
over	10 - 1000	35 x 9

DEUTSCHER KALIBRIERDIENST

DKD

GERMAN CALIBRATION SERVICE
Calibration Laboratory for Length Measurement
ACCREDITED BY THE PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB)

As a part of the German Calibration Service, the Mahr Calibration Laboratory calibrates steel and ceramic gage blocks of all brands in the range between 0.5 and 100 mm and issues calibration certificates. The gage block sets are marked with the official DKD calibration label.
Calibration is based on the contract concluded between the Physikalisch-Technischen Bundesanstalt in Braunschweig and the company Mahr.

Selection of Rectangular Gage Block Sets

There are three criteria's to be considered:

1 Calibration and Tolerance classes according to DIN EN ISO 3650

Four tolerances classes are available.

Calibration class K
As primary factory standard, particularly for the calibration of subsidiary test laboratories, e.g. for gage blocks of lower tolerance classes. Supplied on request with DKD calibration certificate, indicating the deviation from the nominal size for each gage block.

Calibration class 0
For maximum accuracy requirements. To be used as basic standards in test laboratories and precision inspection rooms, where other gage blocks and high accuracy measuring instruments are calibrated.

Tolerance class 1
For high standards of accuracy. As reference gage block for the inspection room. Designed to perform particularly accurate measurements. For setting indicating measuring instruments and for checking precision gages.

Tolerance class 2
For checking production gages of quality IT 6 and IT 7. For setting indicating measuring instruments and for checking accurate dimensions in the jig and tool industry.

404

2 Material

Steel or ceramic, depending on application.

3 Size of Sets

The gage block sets 404 or 404 C are very convenient, each set contains 46 gage blocks including one for each decimal. Larger sets are particularly suited to inspection rooms and gage testing facilities, since they offer the following advantages:

- A required dimension can be made up quicker as fewer gage blocks are needed
- Several gage block combinations can be formed from the same dimension
- Greater accuracy as individual deviations add up to smaller overall error
- Less wear as a given gage block is not used as often

Rectangular Gage Blocks made of Steel

Sets

- Vertical arrangement to save space
- Scope of supply: wooden case with clear labeling strips, Mahr calibration certificate (see Page 13-2)
- See the following table for nominal sizes, increments and tolerance classes:

Catalog no.	Tolerance class	Order no.	Quantity per set	Nominal sizes mm	Increments mm	Gage blocks
402/K	K	**4800403**	32	1.005	-	1
402/0	0	**4800400**		1.01 - 1.09	0.01	9
402/1	1	**4800401**		1.1 - 1.9	0.1	9
402/2	2	**4800402**		1 - 9	1	9
				10 - 30	10	3
				50	-	1
404/K	K	**4800003**	46	1.001 - 1.009	0.001	9
404/0	0	**4800000**		1.01 - 1.09	0.01	9
404/1	1	**4800001**		1.1 - 1.9	0.1	9
404/2	2	**4800002**		1 - 9	1	9
				10 - 100	10	10
406/K	K	**4800014**	87	0.5	-	1
406/0	0	**4800010**		1.001 - 1.009	0.001	9
406/1	1	**4800011**		1.01 - 1.49	0.01	49
406/2	2	**4800012**		1 - 9.5	0.5	18
				10 - 100	10	10
408/K	K	**4800027**	111	0.5	-	1
408/0	0	**4800020**		1.001 - 1.009	0.001	9
408/1	1	**4800021**		1.01 - 1.49	0.01	49
408/2	2	**4800022**		1 - 24.5	0.5	48
				25 - 100	25	4
409/K	K	**4800033**	121	0.5	-	1
409/0	0	**4800030**		1.001 - 1.009	0.001	9
409/1	1	**4800031**		1.01 - 1.49	0.01	49
409/2	2	**4800032**		1.6 - 1.9	0.1	4
				1 - 24.5	0.5	48
				25, 30, 40, 50, 60, 70, 75, 80, 90, 100		10

Test Sets for Calipers

Catalog no.	Tolerance class	Order no.	Quantity per set	Nominal sizes mm
411/1	1	**4800343**	5	30 / 41.3 / 131.4 / 243.5 / 281.2
411/2	2	**4800344**	5	30 / 41.3 / 131.4 / 243.5 / 281.2
415/1	1	**4800339**	6	30 / 41.3 / 131.4 / 243.5 / 281.2 / 481.1
415/2	2	**4800340**	6	30 / 41.3 / 131.4 / 243.5 / 281.2 / 481.1

Individual Rectangular Gage Blocks 417

- Tolerance classes K, 0, 1, 2
- Nominal sizes greater than 125 mm, the gage blocks are supplied in a wooden case
- Special sizes are available on request

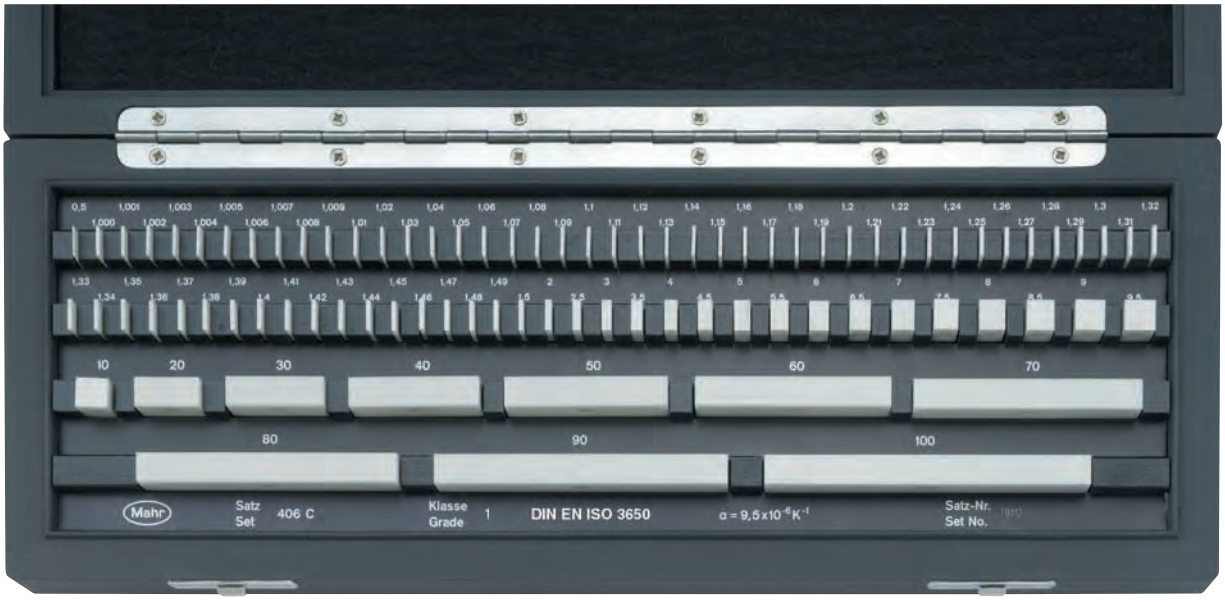
Tolerance Class K	XX=34
Tolerance Class 0	XX=10
Tolerance Class 1	XX=12
Tolerance Class 2	XX=14

Nominal sizes	Order no.	Nominal sizes	Order no.
0.50	**480XX09**	1.31	**480XX59**
1	**480XX19**	1.32	**480XX60**
1.001	**480XX20**	1.33	**480XX61**
1.002	**480XX21**	1.34	**480XX62**
1.003	**480XX22**	1.35	**480XX63**
1.004	**480XX23**	1.36	**480XX64**
1.005	**480XX24**	1.37	**480XX65**
1.006	**480XX25**	1.38	**480XX66**
1.007	**480XX26**	1.39	**480XX67**
1.008	**480XX27**	1.40	**480XX68**
1.009	**480XX28**	1.41	**480XX69**
1.01	**480XX29**	1.42	**480XX70**
1.02	**480XX30**	1.43	**480XX71**
1.03	**480XX31**	1.44	**480XX72**
1.04	**480XX32**	1.45	**480XX73**
1.05	**480XX33**	1.46	**480XX74**
1.06	**480XX34**	1.47	**480XX75**
1.07	**480XX35**	1.48	**480XX76**
1.08	**480XX36**	1.49	**480XX77**
1.09	**480XX37**	1.5	**480XX78**
1.10	**480XX38**	1.6	**480XX79**
1.11	**480XX39**	1.7	**480XX80**
1.12	**480XX40**	1.8	**480XX81**
1.13	**480XX41**	1.9	**480XX82**
1.14	**480XX42**	2	**480XX83**
1.15	**480XX43**	2.5	**480XX84**
1.16	**480XX44**	3	**480XX85**
1.17	**480XX45**	3.5	**480XX86**
1.18	**480XX46**	4	**480XX87**
1.19	**480XX47**	4.5	**480XX88**
1.20	**480XX48**	5	**480XX89**
1.21	**480XX49**	5.5	**480XX90**
1.22	**480XX50**	6	**480XX91**
1.23	**480XX51**	6.5	**480XX92**
1.24	**480XX52**	7	**480XX93**
1.25	**480XX53**	7.5	**480XX94**
1.26	**480XX54**	8	**480XX95**
1.27	**480XX55**	8.5	**480XX96**
1.28	**480XX56**	9	**480XX97**
1.29	**480XX57**	9.5	**480XX98**
1.30	**480XX58**	10	**480XX99**

Tolerance Class K	XX=35
Tolerance Class 0	XX=11
Tolerance Class 1	XX=13
Tolerance Class 2	XX=15

Nominal sizes	Order no.	Nominal sizes	Order no.
10.5	**480XX00**	175	**480XX41**
11	**480XX01**	200	**480XX42**
11.5	**480XX02**	250	**480XX43**
12	**480XX03**	300	**480XX44**
12.5	**480XX04**	400	**480XX46**
13	**480XX05**	500	**480XX48**
13.5	**480XX06**	600	**480XX49**
14	**480XX07**	700	**480XX50**
14.5	**480XX08**	800	**480XX51**
15	**480XX09**	900	**480XX52**
15.5	**480XX10**	1000	**480XX53**
16	**480XX11**		
16.5	**480XX12**		
17	**480XX13**		
17.5	**480XX14**		
18	**480XX15**		
18.5	**480XX16**		
19	**480XX17**		
19.5	**480XX18**		
20	**480XX19**		
20.5	**480XX20**		
21	**480XX21**		
21.5	**480XX22**		
22	**480XX23**		
22.5	**480XX24**		
23	**480XX25**		
23.5	**480XX26**		
24	**480XX27**		
24.5	**480XX28**		
25	**480XX29**		
30	**480XX30**		
40	**480XX31**		
50	**480XX32**		
60	**480XX33**		
70	**480XX34**		
75	**480XX35**		
80	**480XX36**		
90	**480XX37**		
100	**480XX38**		
125	**480XX39**		
150	**480XX40**		

Rectangular Gage Blocks made of Ceramic



406 C

Features

- Resistant to both impact and breakage. Virtually no warping of material if surfaces become scratched or edges damaged. Longer retention of wringing ability
- Extremely durable, thus providing a long service life as well being highly robust compared to all other materials currently be used in metrology. Therefore the interval between inspections are distinctly greater
- The corrosion-resistant Circonimar is even without protective measures extremely resistant to alkalis, acids, oil, grinding fluid and other aggressive media
- Similar coefficient of expansion to steel, thus allowing unrestricted use even at unfavorable temperatures
- Non-magnetic Circonimar is anti-static, anti-magnetic and non-conductive. It does not attract dust or dirt and is suitable to use in the presence of magnetic fields
- Ideal for all applications. The outstanding features of all ceramic gage blocks from Mahr provide unrivalled flexibility in practical use. Circonimar is equally well suited to inspection-room conditions and the rigors of workshop applications
- Easy to handle. No material is easier to handle than Circonimar; Circomimar has excellent wringing properties, no corrosion, no need for lubrication, low weight and scratch resistant

Sets

- Vertical arrangement to save space
- Scope of supply: wooden case with clear labeling strips, Mahr calibration certificate (see Page 13-2)

Nominal sizes, increments and tolerance classes

Please refer to the table below:

Catalog no.	Tolerance class	Order no. per set	Quantity mm	Nominal sizes mm	Increments blocks	Gage
402 C/K	K	**4800094**	32	1.005	-	1
402 C/0	0	**4800095**		1.01 - 1.09	0.01	9
402 C/1	1	**4800096**		1.1 - 1.9	0.1	9
402 C/2	2	**4800097**		1 - 9	1	9
				10 - 30	10	3
				50	-	1
404 C/K	K	**4800088**	46	1.001 - 1.009	0.001	9
404 C/0	0	**4800008**		1.01 - 1.09	0.01	9
404 C/1	1	**4800009**		1.1 - 1.9	0.1	9
404 C/2	2	**4800004**		1 - 9	1	9
				10 - 100	10	10
406 C/K	K	**4800016**	87	0.5	-	1
406 C/0	0	**4800018**		1.001 - 1.009	0.001	9
406 C/1	1	**4800019**		1.01 - 1.49	0.01	49
406 C/2	2	**4800017**		1 - 9.5	0.5	18
				10 - 100	10	10
408 C/K	K	**4800025**	111	0.5	-	1
408 C/0	0	**4800028**		1.001 - 1.009	0.001	9
408 C/1	1	**4800029**		1.01 - 1.49	0.01	49
408 C/2	2	**4800026**		1 - 24.5	0.5	48
				25 - 100	25	4
409 C/K	K	**4800036**	121	0.5	-	1
409 C/0	0	**4800038**		1.001 - 1.009	0.001	9
409 C/1	1	**4800039**		1.01 - 1.49	0.01	49
409 C/2	2	**4800037**		1.6 - 1.9	0.1	4
				1 - 24.5	0.5	48
				25, 30, 40, 50, 60, 70, 75, 80, 90, 100		

Individual Rectangular Gage Blocks 417 C

- Tolerance classes K, 0, 1, 2
- Special sizes are available on request

	Tolerance Class K	XX=46			
	Tolerance Class 0	XX=40			
	Tolerance Class 1	XX=42			
	Tolerance Class 2	XX=44			
Nominal sizes	**Order no.**	**Nominal sizes**	**Order no.**	**Nominal sizes**	**Order no.**
0.50	**480XX00**	1.21	**480XX40**	1.7	**480XX71**
1	**480XX10**	1.22	**480XX41**	1.8	**480XX72**
1.001	**480XX11**	1.23	**480XX42**	1.9	**480XX73**
1.002	**480XX12**	1.24	**480XX43**	2	**480XX74**
1.003	**480XX13**	1.25	**480XX44**	2.5	**480XX75**
1.004	**480XX14**	1.26	**480XX45**	3	**480XX76**
1.005	**480XX15**	1.27	**480XX46**	3.5	**480XX77**
1.006	**480XX16**	1.28	**480XX47**	4	**480XX78**
1.007	**480XX17**	1.29	**480XX48**	4.5	**480XX79**
1.008	**480XX18**	1.30	**480XX49**	5	**480XX80**
1.009	**480XX19**	1.31	**480XX50**	5.5	**480XX81**
1.01	**480XX20**	1.32	**480XX51**	6	**480XX82**
1.02	**480XX21**	1.33	**480XX52**	6.5	**480XX83**
1.03	**480XX22**	1.34	**480XX53**	7	**480XX84**
1.04	**480XX23**	1.35	**480XX54**	7.5	**480XX85**
1.05	**480XX24**	1.36	**480XX55**	8	**480XX86**
1.06	**480XX25**	1.37	**480XX56**	8.5	**480XX87**
1.07	**480XX26**	1.38	**480XX57**	9	**480XX88**
1.08	**480XX27**	1.39	**480XX58**	9.5	**480XX89**
1.09	**480XX28**	1.40	**480XX59**	10	**480XX90**
1.10	**480XX29**	1.41	**480XX60**	10.5	**480XX91**
1.11	**480XX30**	1.42	**480XX61**	11	**480XX92**
1.12	**480XX31**	1.43	**480XX62**	11.5	**480XX93**
1.13	**480XX32**	1.44	**480XX63**	12	**480XX94**
1.14	**480XX33**	1.45	**480XX64**	12.5	**480XX95**
1.15	**480XX34**	1.46	**480XX65**	13	**480XX96**
1.16	**480XX35**	1.47	**480XX66**	13.5	**480XX97**
1.17	**480XX36**	1.48	**480XX67**	14	**480XX98**
1.18	**480XX37**	1.49	**480XX68**	14.5	**480XX99**
1.19	**480XX38**	1.5	**480XX69**		
1.20	**480XX39**	1.6	**480XX70**		

Tol. Class K	XX=47		
Tol. Class 0	XX=41		
Tol. Class 1	XX=43		
Tol. Class 2	XX=45		
Nominal sizes	**Order no.**		
15	**480XX00**		
15.5	**480XX01**		
16	**480XX02**		
16.5	**480XX03**		
17	**480XX04**		
17.5	**480XX05**		
18	**480XX06**		
18.5	**480XX07**		
19	**480XX08**		
19.5	**480XX09**		
20	**480XX10**		
20.5	**480XX11**		
21	**480XX12**		
21.5	**480XX13**		
22	**480XX14**		
22.5	**480XX15**		
23	**480XX16**		
23.5	**480XX17**		
24	**480XX18**		
24.5	**480XX19**		
25	**480XX20**		
30	**480XX21**		
40	**480XX22**		
50	**480XX23**		
60	**480XX24**		
70	**480XX25**		
75	**480XX26**		
80	**480XX27**		
90	**480XX28**		
100	**480XX29**		

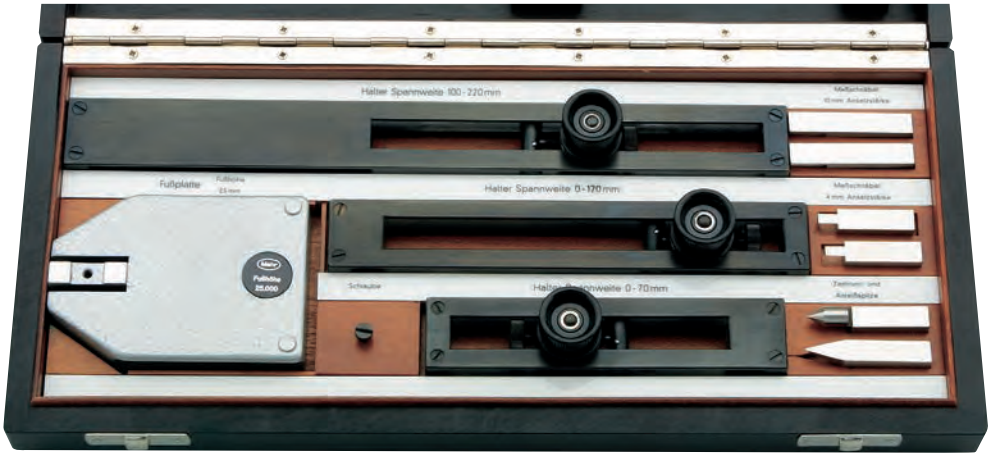
Pair of Protective Rectangular Gage Blocks 418 C

Catalog no.	Tolerance class	Order no.	Quantity per set	Nominal sizes mm	Increments mm	Gage blocks
418 C/0	0	**4800085**	2	2	–	2
418 C/1	1	**4800086**	2	2	–	2

Test Set for Micrometers 419 C (DIN 863)

Catalog no.	Tolerance class	Order no.	Quantity per set	Nominal sizes mm
419 C/1	1	**4800090**	10	2.5 / 5.1 / 7.7 / 10.3 / 12.9 / 15.0 / 17.6 / 20.2 / 22.8 / 25 plus 1 optical parallel dia. 30 mm

Accessories for Rectangular Gage Blocks



Rectangular Gage Block Holder and Measuring Jaws Accessory Set 420

- To be used in conjunction with Gage Blocks for gaging both work pieces and fixtures
- To check, set and adjust setting gages and measuring instruments
- For scribing and marking
- Supplied with:
  Wooden case

Order no. **4800100**

Components include:

2 Pairs of Measuring Jaws 420 m
1 Scriber Point 420 a
1 Centering Point 420 z
3 Holder 420 h for Gages Blocks
clamping width 0-70, 0-120, 100-220 mm
1 Stand 420 f for Gage Block Holder

Individual Accessories

Components included in the 420 set are also individually available:

Measuring Jaws 420 m

Cross section 9 x 9 mm

For internal and external measurements in conjunction with a Gage Block Holder 420 h and Gage Blocks

Thickness mm	**Order no.**
2 x 2 mm = 4 mm	**4800110**
2 x 5 mm = 10 mm	**4800111**

Scriber Point 420 a cross section 9 x 9 mm

Centering Point 420 z cross section 9 x 9 mm

Order no. **4800113**

Holder 420 h for Rectangular Gage Blocks

Clamping width mm	**Order no.**
0 - 70	**4800120**
0 - 120	**4800121**
100 - 220	**4800122**
100 - 420	**4800123**
400 - 820	**4800124**

Stand 420 f for Holder 420 h*

Hardened and lapped. Height 25 mm
Tolerance ± 2 µm

Order no. **4800114**

** Clamping width up to 420 mm*

Optical Flat 421

- To test the surface flatness on precision components or measuring instruments according to the interference principle
- Supplied with:
  Wooden case

Dia. mm	Thickness mm	Flatness deviation µm	Order no.
45	11	≤ 0.1	**4800140**
100	20	≤ 0.1	**4800135**
150	30	≤ 0.1	**4800136**
300	50	≤ 0.4	**4800137**

Optical Parallel 421 P

Dia. mm	Thickness mm	Flatness deviation µm	Parallelism deviation µm	Order no.
30	12	≤ 0.15	0.4	**4800180**

Contact Thermometer 422

- For checking/taking the temperature
- With silver contact base, gold-plated to prevent tarnishing
- With a holding magnet to be attached to the thermometer in vertical or on inclined surfaces
- U-shaped with clamping screw
- Supplied with:
  Thermometer, magnet and wooden case

Readings 0.2°C
Measuring range 16-26°C

Order no. 4800170

Wooden Tongs 423

- To prevent heat transfer when handling gage blocks
- Self closing. See illustration below.

Order no. 4800142

Maintenance Set 424

- The most important equipment for inspecting and maintaining gage blocks
- Supplied with: Wooden case

Order no. 4800130

Components include:

Optical Flat 421
- To test the surface flatness of measuring surfaces according to the interference principle. Diameter 45 mm

Wooden Tongs 423
- To prevent heat transfer when handling gage block, self closing

Granite Lapping Stone
- To remove burr and other damage on surfaces of gage blocks. High accuracy version

Jar of special Vaseline
- To protect steel gage blocks against the rust

Brush and Suede Cloth
- To clean the gage blocks

Inch Gage Blocks

Features

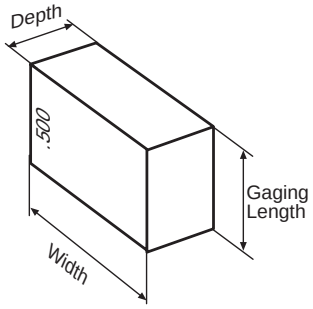
- Long used as the practical standards of dimensional measurement in precision manufacturing. With accuracies, materials and manufacturing methods greatly refined, gage blocks are now of highest quality and precision.
  - As comparison reference and utilization standards in the field of length measurement.
  - For checking gages and measuring instruments.
  - Used individually or in combinations by wringing several blocks together.
- Mahr Federal gage blocks are available from stock individually and as full sets in inch (rectangular only).
- Sets are manufactured to Grade **0** only, which meet or exceed ASME B89.1.9-2002 specifications.
- Offered in steel to suit a wide range of service conditions. Steel blocks are extremely stable, hardened to Rc 62 minimum, and processed through a thorough seasoning cycle to relieve internal stresses before finish lapping.
- All sets blocks are serialized and supplied in a fitted storage case. Certification priced seperately.

Mahr Federal Calibration System is certified to ISO-17025 and accredited by NVLAP and ISO-9001 certified by NQA

Technical Data

Dimensions – Standard Size Blocks

Block Style	Gaging Length	Width mm / *inch*	Depth mm / *inch*
Inch – Rectangular	.400" or less	30 / ***1.181"***	9 / ***.352"***
	.400" and over	35 / ***1.378"***	9 / ***.352"***



Inch Gage Blocks Set

Ordering Information

Inch Rectangular

An 81 block set containing

Series	Number of blocks	Size
.0001″	9	.1001 - .1009
.001″	49	.101 - .149
.050″	19	.050 - .950
1.000″	4	1.000 - 4.000

Order no. 2176361

Inch Rectangular

An 49 block set containing

Series	Number of blocks	Size
.0001″	9	.1001 - .1009
.001″	9	.101 - .109
.01″	9	.010 - .090
.01″	9	.110 - .190
.10″	9	.100 - .900
1.000″	4	1.000 - 4.000

Order no. 2176362

Technical Data

Grade 0 Length Tolerances

Nominal Length

Greater than equal to	Less than or (1 µinch)	Unit 0.000001″
0	0.4	± 5
0.4	1	± 6
1	2	± 8
2	3	± 10
3	4	±12

Pin Gages 426 according to DIN 2269

Features

- To be used as setting standards for indicating measuring instruments, testing the distances between axes, tapers and other work pieces in conjunction with gage blocks. Can also be used for determining pitch diameter of threads or pitch circle diameter on gears and serrations

Pin Gages 426 made from steel, without a handle from dia. 5.01 mm inscribed with diameter on the end face

Ø mm	Wear-resistant gage steel, hardened, multi-aged, ground and **lapped** **Grade 0, DIN 2269** Manufacturing tolerance ± 0.5 µm **426/0**			Wear-resistant gage steel, hardened multi-aged, ground and **lapped** **Grade 1, DIN 2269** Manufacturing tolerance ± 1.0 µm **426/1**			Wear-resistant gage steel, hardened multi-aged and precision ground **Better than Grade 2, DIN 2269** Manufacturing tolerance ± 1.5 µm **426/2**	
	Length	**Increments**		**Length**	**Increments**		**Length**	**Increments**
		Order no.	**Order no.**		**Order no.**	**Order no.**		**Order no.**
	mm	0.01 mm	0.001 mm	mm	0.01 mm	0.001 mm	mm	0.01 mm
0.30 - 0.49	30	**4828103**	**4828303**	40	**4828113**	**4828313**	40	**4828133**
0.50 - 0.99	30	**4828104**	**4828304**	40	**4828114**	**4828314**	40	**4828134**
1.00 - 2.99	60	**4828105**	**4828305**	70	**4828115**	**4828315**	70	**4828135**
3.00 - 5.99	60	**4828106**	**4828306**	70	**4828116**	**4828316**	70	**4828136**
6.00 - 9.99	60	**4828107***	**4828307**	70	**4828117**	**4828317**	70	**4828137**
10.00 - 11.99				70	**4828118**	**4828318**	70	**4828138**
12.00 - 13.99				70	**4828119**	**4828319**	70	**4828139**
14.00 - 15.99				70	**4828120**	**4828320**	70	**4828140**
16.00 - 18.99				70	**4828121**	**4828321**	70	**4828141**
19.00 - 20.00				70	**4828122**	**4828322**	70	**4828142**

Pin Gages 426 G made from steel, with a handle

Ø mm	Wear-resistant gage steel, hardened, multi-aged, ground and **lapped** **Grade 0, DIN 2269** Manufacturing tolerance ± 0.5 µm **426 G/0**			Wear-resistant gage steel, hardened, multi-aged, ground and **lapped** **Grade 1, DIN 2269** Manufacturing tolerance ± 1.0 µm **426 G/1**			Wear-resistant gage steel, hardened multi-aged and precision ground **Better than Grade 2, DIN 2269** Manufacturing tolerance ± 1.5 µm **426 G/2**	
	Effective Length	**Increments**		**Effective Length**	**Increments**		**Effective Length**	**Increments**
		Order no.	**Order no.**		**Order no.**	**Order no.**		**Order no.**
	mm	0.01 mm	0.001 mm	mm	0.01 mm	0.001 mm	mm	0.01 mm
0.10 - 0.19	28	**4828151**	**4828351**	33	**4828161**	**4828361**	33	**4828171**
0.20 - 0.29	28	**4828152**	**4828352**	33	**4828162**	**4828362**	33	**4828172**
0.30 - 0.49	28	**4828153**	**4828353**	33	**4828163**	**4828363**	33	**4828173**
0.50 - 0.99	28	**4828154**	**4828354**	33	**4828164**	**4828364**	33	**4828174**
1.00 - 2.99	57	**4828155**	**4828355**	62	**4828165**	**4828365**	62	**4828175**
3.00 - 5.99	57	**4828156**	**4828356**	62	**4828166**	**4828366**	62	**4828176**
6.00 - 10.00	57	**4828157**	**4828357**	62	**4828167**	**4828367**	62	**4828177**

Length of handle see Page 13-16 (426 D)

Accessories

Wooden case with plastic inlay for pin gages up to D = 10 mm

Number of pin gages	**Order no.**
max. 50 pin gages (without handle)	**4827609**
max. 50 pin gages (with handle)	**4827610**
max. 100 pin gages (without handle)	**4827611**

Pin Gage sets 426 S made of steel, without a handle in a high quality wooden box with pedestral

Technical Data

dia. mm			Wear-resistant gage steel, hardened, multi-aged, ground and **lapped** **Grade 0, DIN 2269** Manufacturing tolerance ± 0.5 µm			Wear-resistant gage steel, hardened, multi-aged, ground and **lapped** **Grade 1, DIN 2269** Manufacturing tolerance ± 1.0 µm			Wear-resistant gage steel, hardened multi-aged and precision ground **Better than Grade 2, DIN 2269** Manufacturing tolerance ± 1.5 µm		
			Increments	**Quantity**	**Order no.**	**Increments**	**Quantity**	**Order no.**	**Increments**	**Quantity**	**Order no.**
1.00	-	10.00				0.1	91	**4828190**	0.1	91	**4828210**
0.10	-	0.50	0.01	41	**4828181**	0.01	41	**4828191**	0.01	41	**4828211**
0.50	-	1.00	0.01	51	**4828182**	0.01	51	**4828192**	0.01	51	**4828212**
0.10	-	1.00	0.01	91	**4828183**	0.01	91	**4828193**	0.01	91	**4828213**
1.00	-	2.00	0.01	101	**4828184**	0.01	101	**4828194**	0.01	101	**4828214**
2.00	-	3.00				0.01	101	**4828195**	0.01	101	**4828215**
3.00	-	4.00				0.01	101	**4828196**	0.01	101	**4828216**
4.00	-	5.00				0.01	101	**4828197**	0.01	101	**4828217**
5.00	-	6.00				0.01	101	**4828198**	0.01	101	**4828218**
6.00	-	7.00				0.01	101	**4828199**	0.01	101	**4828219**
7.00	-	8.00				0.01	101	**4828200**	0.01	101	**4828220**
8.00	-	9.00				0.01	101	**4828201**	0.01	101	**4828221**
9.00	-	10.00				0.01	101	**4828202**	0.01	101	**4828222**

Pin gage lengths are the same as the individual pin gages

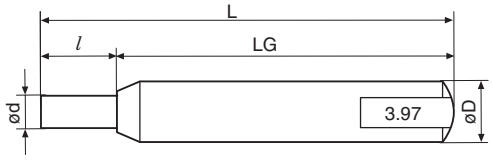
Individual Plug Gages 426 D made from steel, with a handle

Features

- For testing diameters of small bores
- To be used as setting standards for indicating measuring instruments, testing the distances between axes, grooves and slots on work pieces in conjunction with gage blocks
- Unbreakable plastic handle inscribed with the diameter

Technical Data

Wear-resistant gage steel. hardened. multi-aged, ground and **lapped** plastic handle inscribed with the diameter.
Manufacturing tolerance ± 0.5 µm
Increment 0.01 mm



dia. d mm	Order no.	Dimensions dia. d mm			l mm	dia. D	LG	L
0.06 - 0.09	**4828230**	0.06	-	0.30	2.0	4	32	34
0.10 - 0.19	**4828231**	> 0.30	-	0.50	3.5	4	32	35.5
0.20 - 0.29	**4828232**	> 0.50	-	1.50	5.0	4	32	37
0.30 - 0.49	**4828233**	> 1.50	-	2.00	6.0	4	32	38
0.50 - 0.99	**4828234**	> 2.00	-	3.50	8.0	5	35	43
1.00 - 2.99	**4828235**	> 3.50	-	6.00	10.0	8	45	55
3.00 - 5.99	**4828236**	> 6.00	-	8.00	14.0	10	45	59
6.00 - 10.00	**4828237**	> 8.00	-	10.00	18.0	10	45	63

Plug Gage Sets 426 DS made from steel, with a handle in a high quality wooden box with pedestral

Technical Data

Wear-resistant gage steel, hardened, multi-aged, ground and **lapped** plastic handle inscribed with the diameter.
Manufacturing tolerance ± 0.5 µm

Supplied with: Wooden case with plastic inlay

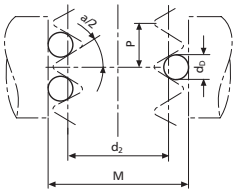
dia. mm	Increment	Quantity	Length	Order no.	dia. mm	Increment	Quantity	Length	Order no.
0.06 - 0.50	0.01	45	2*	**4825000**	5.01 - 5.50	0.01	50	10	**4825010**
0.51 - 1.00	0.01	50	5	**4825001**	5.51 - 6.00	0.01	50	10	**4825011**
1.01 - 1.50	0.01	50	5	**4825002**	6.01 - 6.50	0.01	50	14	**4825703**
1.51 - 2.00	0.01	50	6	**4825003**	6.51 - 7.00	0.01	50	14	**4825704**
2.01 - 2.50	0.01	50	8	**4825004**	7.01 - 7.50	0.01	50	14	**4825705**
2.51 - 3.00	0.01	50	8	**4825005**	7.51 - 8.00	0.01	50	14	**4825706**
3.01 - 3.50	0.01	50	8	**4825006**	8.01 - 8.50	0.01	50	18	**4825707**
3.51 - 4.00	0.01	50	10	**4825007**	8.51 - 9.00	0.01	50	18	**4825708**
4.01 - 4.50	0.01	50	10	**4825008**	9.01 - 9.50	0.01	50	18	**4825709**
4.51 - 5.00	0.01	50	10	**4825009**	9.51 - 10.00	0.01	50	18	**4825710**

**dia. > 0.3 mm = 3.5 mm long*

Thread Pin Gages 426 M in holders 426 A with an eyelet

426 M

426 A



Features

426 M

- For determining pitch diameter of external threads according to the three-wire method
- In conjunction with micrometers, indicating measuring instruments or measuring machines
- Each pair consists of: 1 holder with 1 pin gage and 1 holder with 2 pin gages
- Holder has a satin chrome finish, the retainer ring can be locked yet the measuring spindle can still rotate
- Pin gages are hardened and lapped. Freely floating in holder to allow proper positioning and contact with thread flanks

Manufacturing tolerance ± 0.5 µm
Mounting hole 7.5 mm
(Mounting hole 6.35 mm = 1/4", 6.5 mm and 8 mm
on request)

426 MS
Set of thread Pin Gages in Holder consists of:
18 Holder Pairs 426 M

Diameter 0.17 - 3.2 mm
Delivered in a wooden box

		Order no.
Mounting hole	7.5 mm	**4820000**
Mounting hole	6.5 mm	**4820003**

426 A

- For determining pitch diameter of external threads according to the three-wire method
- Designed to be suspended over a test specimen
- Set consists of 3 Pin Gages

Manufacturing tol. ± 0.5 µm
Pin gage length 32 mm

Technical Data

Pin Gage	Order no.			for thread pitch										
				Metric			Whitworth range tpi			American UST range tpi			Trapezoid	
dia. mm	426 M Pair dia. 7.5 mm	426 M Pair dia. 6.5 mm	426 A Set	mm									mm	
0.17	**4820010**	**4820132**	**4821000**	0.25		0.3								
0.195	**4820011**	**4820149**	**4821001**								80			
0.22	**4820012**	**4820133**	**4821002**		0.35						72			
0.25	**4820013**	**4820131**	**4821003**		0.4						64			
0.29	**4820014**	**4820134**	**4821004**	0.45		0.5					56			
0.335	**4820015**	**4820135**	**4821005**		0.6						48			
0.39	**4820016**	**4820150**	**4821006**					40		44		40		
0.455	**4820017**	**4820137**	**4821007**	0.7	0.75	0.8		32			36			
0.53	**4820018**	**4820151**	**4821008**					28		32		28		
0.62	**4820019**	**4820139**	**4821009**		1		26		24		24			
0.725	**4820020**	**4820140**	**4821010**		1.25		22		20		20			
0.895	**4820021**	**4820141**	**4821011**		1.5		19	18	16		18			
1,1	**4820022**	**4820142**	**4821012**		1.75		14			16	14	13	2	
1.35	**4820023**	**4820143**	**4821013**		2		12		11	12		11		
1.65	**4820024**	**4820144**	**4821014**		2.5		10		9	10		9	3	
2.05	**4820025**	**4820145**	**4821015**	3		3.5	8		7	8		7	4	
2.55	**4820026**	**4820146**	**4821016**	4		4.5		6			6		5	
3.2	**4820027**	**4820147**	**4821017**	5		5.5	5		$4^1/_2$	5		$4^1/_2$	6	
4	***4820028**	***4820152**	**4821018**		6		4		$3^1/_2$		4		7	

* *These holder pairs require the use of a 3 mm gage block for the holder with 2 pin gages to enlarge the measuring face. This gage block is inserted into the holder recess provided.*

417/1 Gage Block -steel Grade 1
Nominal size 3 mm **Order no.** **4801285**

Setting Standards for indicating measuring instruments

AGD Masters

Master Rings

- Traceable certification and calibration available on request.
- Lapped to size and polished.
- Non-gaging areas black oxidized – ring faces ground.
- Meet all requirements of ANSI Specification B47.1-1988
- Manufactured in accordance with ANSI Specification B89.1.6-1984.

Master Discs AGD Style 3

- Traceable certification and calibration available on request.
- Lapped to size and polished.
- Non-gaging areas black oxidized – ring faces ground.
- Meet all requirements of ANSI Specification B47.1-1988
- Manufactured in accordance with ANSI Specification B89.1.5.
- Furnished with clear insulators.
- All dimensions are AGD style 3.

Master Plugs

- Traceable certification and calibration available on request.
- Stabilized and hardened.
- 100 % usable gaging surface.
- Ends ground square
- Lapped finish.

Setting Standards for indicating measuring instruments

Ring Gages 355 E

Features

- Special wear-resistant gage steel. Hardened and lapped

Dimensions	DIN 2250, Type C
Manufacturing tolerance	DIN 2250
Uncertainty of actual deviation	1/2 IT 1
Nominal diameter	1 - 200 mm

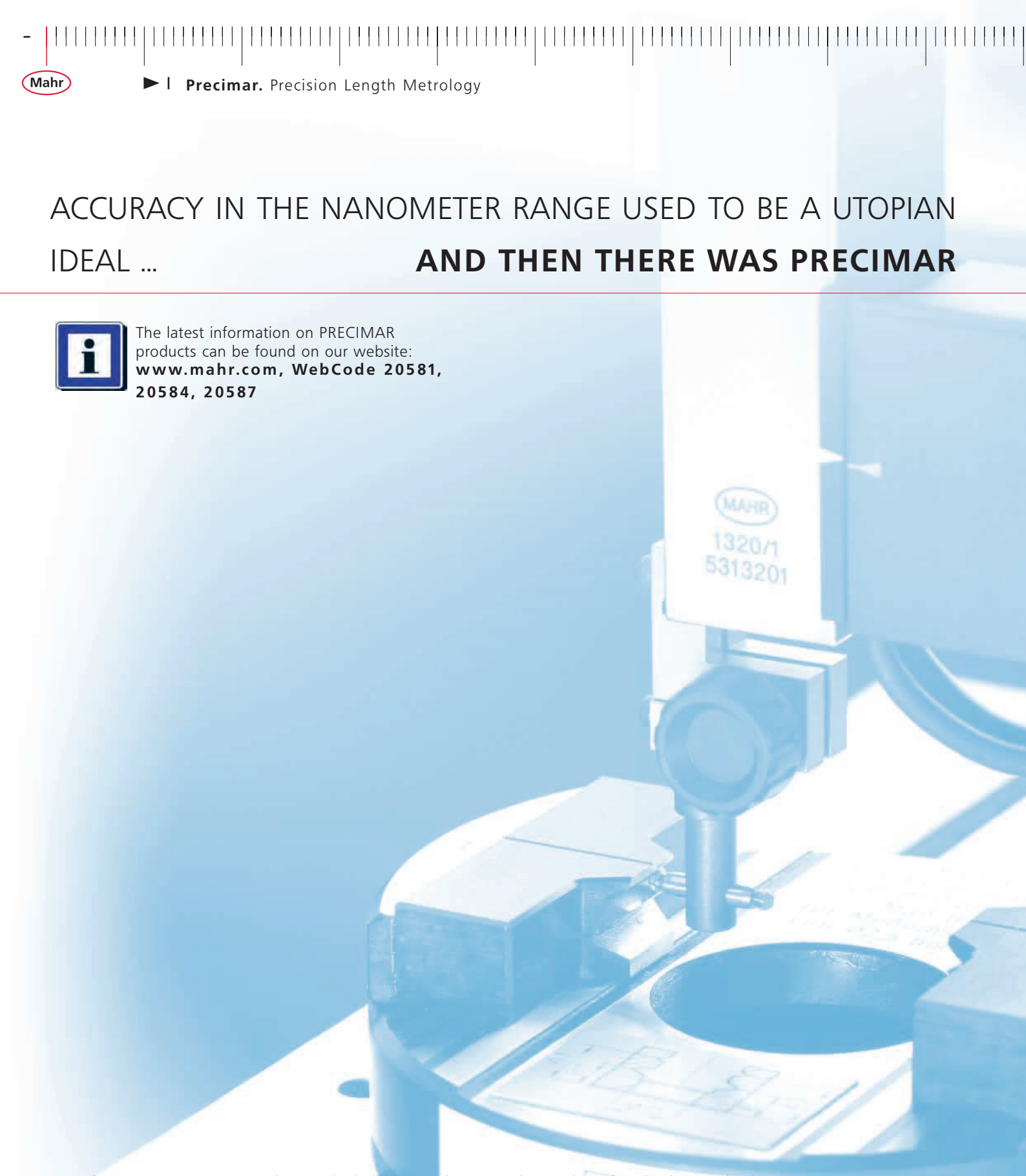
Diameter increments 1 mm

ø mm	Order no.	ø mm	Order no.	ø mm	Order no.	ø mm	Order no.	ø mm	Order no.	ø mm	Order no.*
1	**4710006**	21	**4710041**	41	**4710061**	61	**4710081**	81	**4710101**	>100-105	**4714201***
2	**4710010**	22	**4710042**	42	**4710062**	62	**4710082**	82	**4710102**	>105-110	**4714202***
3	**4710014**	23	**4710043**	43	**4710063**	63	**4710083**	83	**4710103**	>110-115	**4714203***
4	**4710018**	24	**4710044**	44	**4710064**	64	**4710084**	84	**4710104**	>115-120	**4714204***
5	**4710020**	25	**4710045**	45	**4710065**	65	**4710085**	85	**4710105**	>120-124	**4714205***
6	**4710022**	26	**4710046**	46	**4710066**	66	**4710086**	86	**4710106**	>125-130	**4714206***
7	**4710024**	27	**4710047**	47	**4710067**	67	**4710087**	87	**4710107**	>130-135	**4714207***
8	**4710026**	28	**4710048**	48	**4710068**	68	**4710088**	88	**4710108**	>135-140	**4714208***
9	**4710028**	29	**4710049**	49	**4710069**	69	**4710089**	89	**4710109**	>140-145	**4714209***
10	**4710030**	30	**4710050**	50	**4710070**	70	**4710090**	90	**4710110**	>145-150	**4714210***
11	**4710031**	31	**4710051**	51	**4710071**	71	**4710091**	91	**4710111**	>150-155	**4714211***
12	**4710032**	32	**4710052**	52	**4710072**	72	**4710092**	92	**4710112**	>155-160	**4714212***
13	**4710033**	33	**4710053**	53	**4710073**	73	**4710093**	93	**4710113**	>160-165	**4714213***
14	**4710034**	34	**4710054**	54	**4710074**	74	**4710094**	94	**4710114**	>165-170	**4714214***
15	**4710035**	35	**4710055**	55	**4710075**	75	**4710095**	95	**4710115**	>170-174	**4714215***
16	**4710036**	36	**4710056**	56	**4710076**	76	**4710096**	96	**4710116**	>175-180	**4714216***
17	**4710037**	37	**4710057**	57	**4710077**	77	**4710097**	97	**4710117**	>180-185	**4714217***
18	**4710038**	38	**4710058**	58	**4710078**	78	**4710098**	98	**4710118**	>185-190	**4714218***
19	**4710039**	39	**4710059**	59	**4710079**	79	**4710099**	99	**4710119**	>190-195	**4714219***
20	**4710040**	40	**4710060**	60	**4710080**	80	**4710100**	100	**4710120**	>195-200	**4714220***
								125	**4710121**	175	**4710122**

* When placing an order please inform us of the diameter

ACCURACY IN THE NANOMETER RANGE USED TO BE A UTOPIAN IDEAL ... **AND THEN THERE WAS PRECIMAR**

The latest information on PRECIMAR products can be found on our website: **www.mahr.com, WebCode 20581, 20584, 20587**



► | The Precimar range specializes in high-precision dimensional metrology for absolute and relative measurements. Typical applications include products and test equipment for the aerospace and automotive industries and series testing of test equipment in calibration laboratories. Various universal length measuring machines enable the reliable measurement and testing of lengths, inside and outside diameters, cylindrical and conical threads, plain tapers, micrometers, snap gages, dial indicators, dial comparators, probes, gage blocks and precision products, right down to the nanometer range. Mahr also offers special measuring instruments for dial indicators, dial comparators, probes and gage blocks. | ◄

Precimar. Precision Length Metrology

Precimar Dial Indicator Testing Instruments 14- 2
Precimar Optimar 100.
Universal Dial Indicator Testing Machine 14- 3

Precimar for Gage Block Metrology 14- 4
Precimar 130B-24, 130B-16. Gage Block Comparators 14- 4
Precimar 826 PC. Gage Block Comparator 14- 5

Precimar for Workshop Length Metrology 14- 6
Precimar LINEAR 100.
Universal Single-Axis Length Measuring Unit 14- 7
Precimar LINEAR Serie.
Universal Single-Axis Length Measuring and Setting Unit 14- 7

Precimar for Calibration Metrology 14- 8
Precimar ULM 300-E / 600-E / 1000-E / 1500-E
Universal Length Measuring Machines 14- 8
Precimar ULM 520 S-E / 1000 S-E.
Universal Length Measuring Machines
with large direct measuring range 14- 9
Precimar ULM 800 L-E / 1500 L-E.
Universal Length Measuring Machines with Laser System 14-10

Precimar for Precision Length Metrology 14-11
Precimar PLM 600-E.
Universal Length Measuring Machine 14-11
Precimar 828 CiM 1000.
Precision Length Measuring Unit 14-12

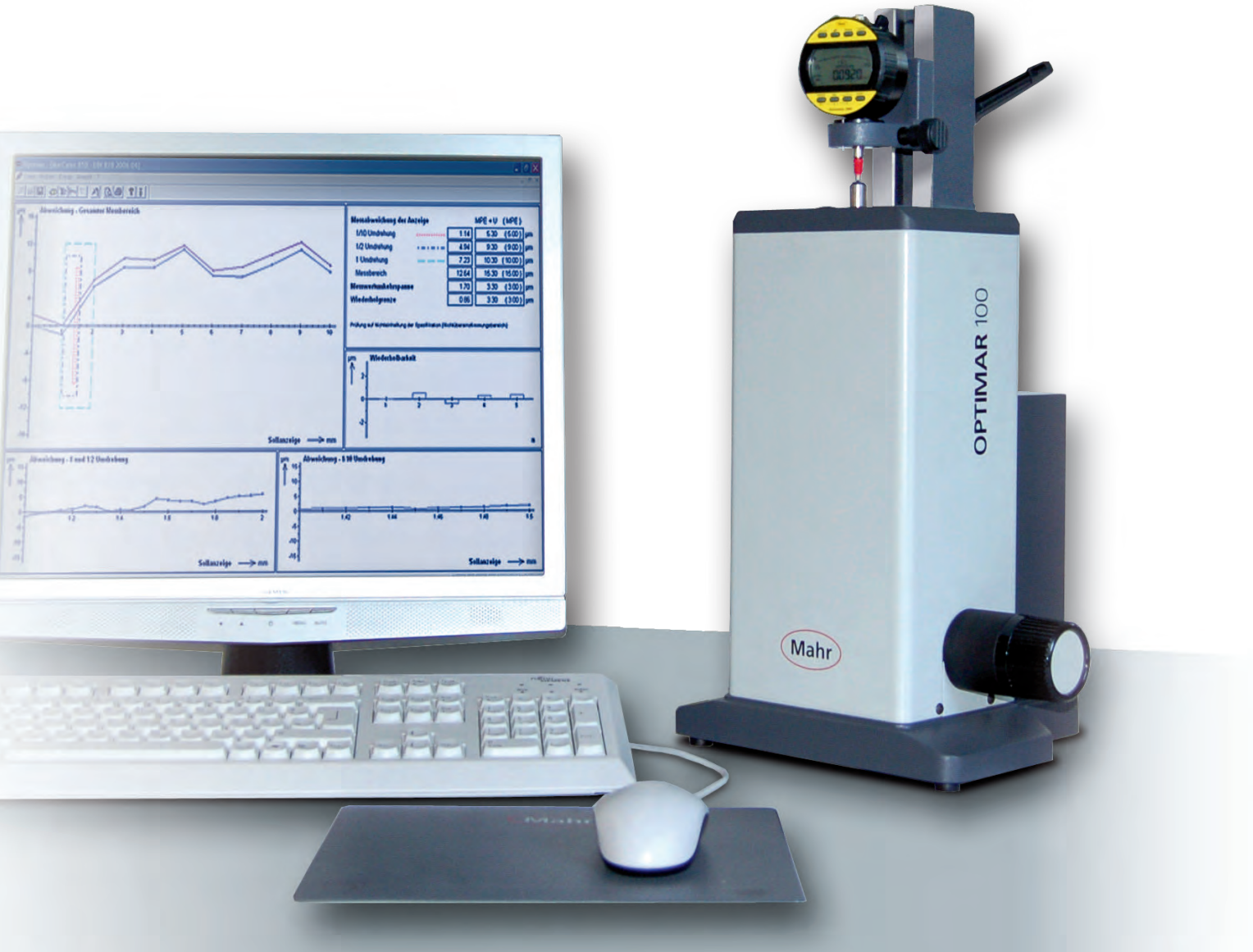
Data Overview
All precision length measuring machines 14-13

Request catalog

Precimar. Dial Indicator Testing Instruments

SEMI- AND FULLY AUTOMATED TESTING OF MEASURING EQUIPMENT WITH DISPLAYS

► | Dial indicator testing instruments from Mahr ensure efficient and precise metrology. These instruments provide absolute measurements for dial indicators, dial comparators, lever-type test indicators, inside micrometers and inductive and incremental probes. Typical applications include dial indicator testing in all branches of industry, inspection rooms, calibration laboratories and series testing by dial indicator manufacturers. With the Optimar 100, Mahr offers a practical solution for both cost-effective, semi-automated testing of analog dial indicators and efficient, fully automated testing of digital measuring equipment. | ◄

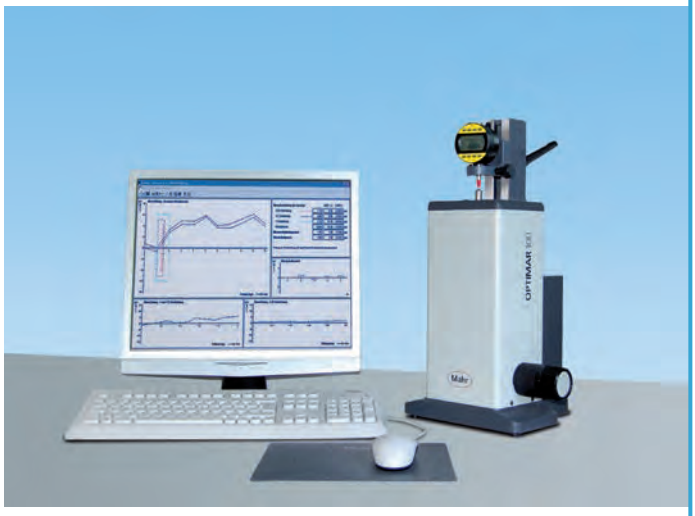


Precimar Optimar 100. Universal Deal Indicator Testing Instrument

Description

The cost-effective testing station for semi- or fully automated testing of dial indicators, dial comparators, lever-type test indicators, 2-point inside measuring devices, and inductive and incremental probes.

Designed as a table-top unit, the **OPTIMAR 100** is user-friendly and ensures fast test runs. It features a motorized drive and is equipped with a high-resolution measuring system. The test run is software-controlled.



Features

- For dial indicators, dial comparators, lever-type test indicators, 2-point inside measuring devices, digital dial indicators and inductive and incremental probes
- Automation of sub-processes (automated pre-positioning) using motorized measuring spindle drive
- Fully automated measuring run for digital devices
- **OPTIMAR 100** may be used horizontally (e.g. for measuring inside micrometers)
- Testpiece mounting via vertical guide. Height can be adjusted quickly (adaptation of testpieces to different measuring ranges)
- Box-shaped and thus rigid machine casing
- For testpieces with a shaft diameter of 8 mm, 28 mm or 3/8"
- Electronic handwheel for manual control of the measuring spindle's movement. Self-adjusting sensitivity of the electronic handwheel for adaptation to the specific test specimen
- Ergonomic design of all control elements
- Compliance with the Abbe comparator principle for maximum measuring accuracy
- LIF 101 measuring system with computer-aided error compensation. Testing of 2-point inside measuring devices without loss of accuracy
- Length measuring deviation in vertical and horizontal directions: MPE = (0.2 + L/250) µm*, L in mm at T = 20 °C ±0.5 °C, permissible temperature gradient 0.1 K/h
- **Mahr software** or **QMSOFT software**

** for serial no. 2041/11 and higher*

Application

- For both analog dial indicators, dial comparators, lever-type test indicators and 2-point inside measuring devices and digital dial indicators and inductive and incremental probes.

Request catalog or see WebCode 2421

Accessories

- Mount for lever-type test indicators
- Large selection of adapters for digital dial indicators and inductive and incremental probes
- Please ask for customized adapters if required
- Probe can be connected to Optimar via probe box
- Holder and software for testing 2-point inside measuring devices with a movable measuring bolt (tesing as per VDI/VDE/DGQ 2618, sheet 13.2., 2005)
- Device for force sensor on request
- **OPTIMAR** recalibrated on site by Mahr Service Center (standard or DAkkS/DKD Certificate)
- Calibration set for calibration by the operator

Technical Data

Optimar 100	**Order No. 5320005**
Range of measuring spindle	100 mm, 4 in (101.6 mm)
Measuring system	LIF 101 with correction of measured values
Digital increment	0.02 µm (0.8 µin)
Length measuring deviation (MPE)	(0.2 + L/250) µm*, (L in mm)
Positioning speed	Max. 2 mm/s (0.08 in/s)
Positioning	
Pre-positioning:	Automatic
Fine positioning:	Electronic knob
Supply voltage	Via plug-in power supply unit 110/230 V/9 V AC, 18 VA
Dimensions (L x W x H)	235 mm x 216 mm x 480 mm (9.3 in x 8.5 in x 18.9 in)

** for serial no. 2041/11 and higher*

Precimar. Gage Block Tester 130B-24, 16

Now even better: Models 130B-24 and 130B-16.
Gage block comparators

Description

The **130B-24** gage block comparator from **Mahr Federal** is the preferred choice of many major calibration laboratories. It is specifically designed for comparative gage block measurements. The **130B-24** model measures the industry's key dimensional standards with the ultimate in resolution and reproducibility.

Features

- A unique "floating measuring frame" ensures precise point-to-point measurement
- Single-sensor design minimizes electronic noise
- Finely balanced system optimizes control of measuring forces
- Resolution of 0.1 µin (0.001 µm)
- Reproducibility of 0.2 µin (0.005 µm) ($6\sigma < 1$ µin/0.025 µm)
- Measuring capacity of 0.010 in to 4 in (0.25 mm to 100 mm)
- Integrated measuring software and user interface
- Built-in positioner for reproducible measuring positions

Gage block positioner
An accurate positioner is built into the platen of the **130B-24**. The reference gage block and the testpiece gage block are loaded into the openings in the template. The device swivels between the contact points and positions the gage blocks – first the reference gage block and then the testpiece gage block in its reference position and in the corners of the gage block. Three easily exchangeable templates are included, one for square and two for rectangular (30 mm and 35 mm/1.18 in and 1.38 in) gage blocks.

Other templates are available as optional extras. The positioner is suitable for gage blocks from 0.20 in (0.5 mm) to 4 in (100 mm) long. It can be fitted for right- or left-handed users or removed completely if necessary. An acrylic breath shield is included to protect the measuring area against body heat. Please see our special brochure for further information on the **software**.

Technical Data 130B-24 / 130B-16

Size (without computer)	Approx. 15 in x 15 in x 23 in (385 mm x 385 mm x 590 mm)
Weight (without computer)	Approx. 225 lbs (100 kg)
Max. gage block length	0.010 in to 4 in (0.25 mm to 100 mm)
Measuring force (upper contact) (lower contact)	 3 oz (0.8 N) 1 oz (0.3 N)
Contact tip material	Tungsten carbide (diamond - optional)
Contact tip radius	0.125 in (3.175 mm)
Sensor range	± 0.015 in (± 0.38 mm)
Measuring range	± 500 µin (±10.0 µm)
Reproducibility	6 σ < 1 µin (25 nm) measured on a 1 in gage block without removing the gage block
Linearity	Deviation <1 µin over the central ± 50 µin and <1 µin in any 50 µin within the ± 500 µin measuring range < 20 nm over the central ± 1.0 µm and < 20 nm in any ± 1.0 µm over a measuring range of ±10.0 µm

Precimar 130B-16

Model 130B-16 for longer gage blocks

The same highly linear, stable electronics as the 130B-24

Designed for gage blocks of up to 600 mm (24 in) but can also measure shorter blocks.

Approx. size (without computer)
385 mm x 385 mm x 1,016 mm
(15 in x 15 in x 40 in)
Approx. weight (without CPU)
140 kg (309 lbs)
Measuring length
2.5 mm to 600 mm (0.10 in to 23.6 in)
Measuring force
(upper probe) 4 oz., 1.1 N
(lower probe) 2 oz., 0.6 N

All other data as for the **130B-24**.

Request catalog or see WebCode 10259.

Precimar 826 PC Gage Block Measuring Unit

Description

The **826 PC** gage block measuring unit is fast, reliable and extremely precise. In comparative measurement, it achieves a reproducibility of 0.01 µm.

An open and extremely rigid L-shaped stand forms the basis for the two opposing high-precision probes, and the perfectly level measuring table.

Work is made easy thanks to straightforward one-handed operation for manipulating reference and test gage blocks on the measuring table. The open design allows visual contact during testing.

The user is able to view the measuring process at all times which helps to ensure a unique level of process reliability.

Two professional measuring and evaluation programs (software) meet all the needs of internal gageblock tests, calibration laboratories and gageblock manufacturers.

The **826** enables quick and straightforward high-precision testing of European and US gage blocks up to 170 mm (6.69 in) long in accordance with ISO 3650.

Features

- Rigid cast-iron stand ensures a stable temperature and insensitivity to heat
- Easily adjustable vertical slide with upper probe
- Very ergonomic and convenient one-handed operation for positioning the gage block under the probe
- Fine adjustment via rigidly connected parallelogram springs
- Electropneumatic lifting of the probes
- Extremely smooth manipulator operation thanks to high-precision ball bushings
- Measurement not influenced by manual force applied
- Gage blocks easy to move on the measuring table thanks to round, hardened high-precision support pins
- No zero point setting required, since the set value is offset by the stored actual allowance of the respective reference gage block
- Very effective protection from heat due to an acrylic glass screen along the sides of the unit
- Flattening correction
- Correction of differing coefficients of thermal expansion
- Calculation of mean values

Accessories

- **QMSOFT® / QM-Block** for calibration and management of gage blocks and gage block sets
- The evaluation software operable under Microsoft Windows® 7
- Very effective protection from heat due to an acrylic glass screen along the sides of the unit
- Lifting device 826 Va HS for the fast and quiet pneumatic lifting of the inductive probes via footswitch.
- Temperature compensation
- Wooden tongs, pneumatic gage block lifter, optical flat, surface thermometer

Technical Data

826 gage block measuring unit Order No. 4448003

Application range	0.5 mm to 170 mm (0.02 in to 6.69 in)
Usable table surface	60 mm x 55 mm (2.36 in x 2.17 in)
Reproducibility	± 0.01 µm (0.4 µin)
Stylus ball radius, upper probe	1.5 mm (0.06 in)
Stylus radius, lower probe	1.5 mm (0.06 in)
Direct measuring range	0.2 mm (0.0008 in)
Weight	37 kg (81.6 lbs)

For testing gage blocks over 170 mm long (central length lm) we recommend the **ULM**, **828 CiM** or **PLM** universal measuring machines.

Request catalog or see WebCode 2335

Precimar. Length Measuring Machines for Every Area of Use

► I Length metrology is used today in the most different areas. The LINEAR length measuring units are ideal for use as setting and adjusting instruments in the manufacturing environment. The well-established ULM universal length measuring instruments are standard quality assurance instruments in industrial manufacturing environments and reference instruments for gage and test equipment calibration. They are also used for high-precision length measurements on precision parts. The motorized PLM and CIM units enable operator-friendly, fast and reliable measurements with the smallest uncertainty. Typical applications include precision parts and test equipment. With an extensive selection of products ranging from the straightforward LINEAR to the ULM instruments to the ulta-precise, semi-automated CiM universal length measuring machine, Mahr offers practical solutions for manufacturing environments, inspection rooms and calibration laboratories. In other words, high-precision metrology with extremely efficient measurement processes. I ◄

Precimar LINEAR 100 for Workshop Length Metrology

Description

Linear 100 is a universal, user-freindly length measuring instrument for rapid, precise internal and external measurements up to 100 mm (4 in), directly in the manufacturing environment. The unit's simple design makes it possible to carry out measurements in no time at all and adapt quickly to new measurement tasks.

Features

- Damped measuring spindle with 2 pre-selectable measuring forces
- Measuring force remains virtually constant over the entire measuring range
- Direct measuring range of 50 mm
- Integrated measuring system based on the Abbe principle
- Infinitely adjustable measuring tables for precise measuring position adjustment
- Combined internal/external measurement possible without recalibration
- Solid cast body to avoid stresses and twisting errors from the outset
- MarCheck measuring value display with 2 channels (optionally with stand)
- MarCheck with RS 232 interface, for easy transfer of measured values to PCs.

Universal single-axis length measuring unit

Request brochure or see WebCode 12282

Precimar LINEAR Serie

Description

The **LINEAR** length measuring instruments from **Mahr** are ideal for use as setting and adjusting instruments in the manufacturing environment. They allow precise setting of internal and external comparators, 2-point inside measuring devices, indicating snap gages and many other measuring devices.

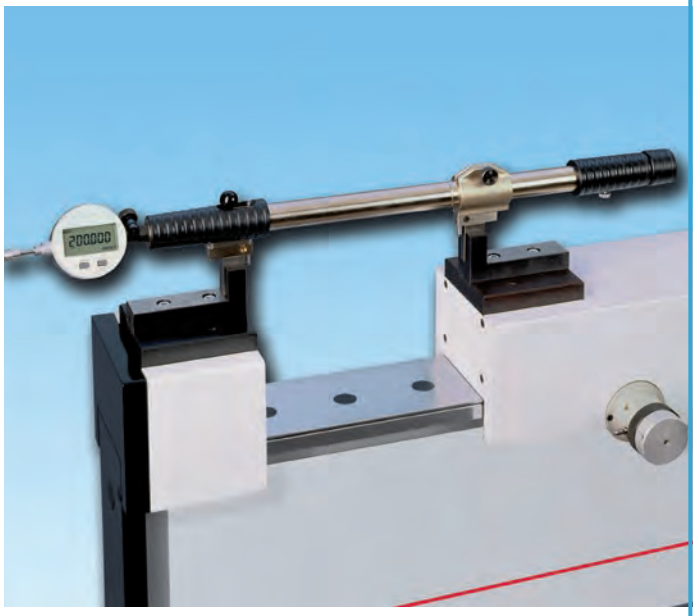
Features / Applications

- Setting measuring instruments with displays such as the Multimar 844 T
- Setting two-point internal measuring instruments such as the Multimar 844 N
- Setting indicator snap gages such as MaraMeter 840 F
- Testing and checking setting external micrometers
  Checking setting dimensions, pins etc.
- Checking calipers
- Testing and setting inside micrometers
- Measuring cylindrical parts
- Measuring internal dimensions and bores, etc.

Versions

LINEAR 800
LINEAR 1200
LINEAR 2000

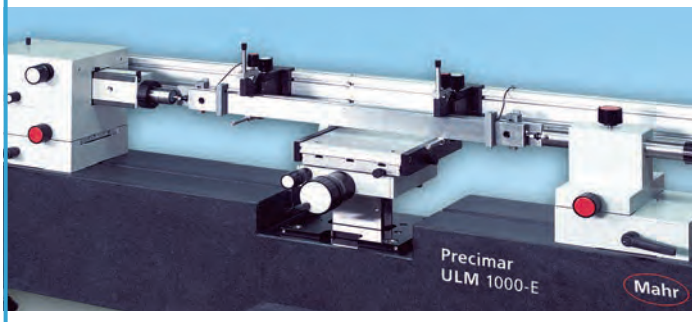
Universal single-axis length measuring and setting instruments



Request brochure or see WebCode 12283

Precimar ULM 300-E / 600-E / 1000-E / 1500-E for Calibration Metrology

Universal length measuring machines



Description

Model
Comparator with horizontal base (highly homogeneous and rigid granite)

Measuring system

X-axis:	Incremental, high-precision Heidenhain length measuring system, 100 mm (4 in) long
Z-axis	Incremental high-precision RENISHAW length measuring system, 80 mm (3.15 in) long

Drives

X-axis:	Manual movement and fine motion control
Y-axis:	Micrometer, 25 mm (0.98 in) (analog or digital)
Z-axis:	Permanent field motor for motorized adjustment of object table height with ergonomic manual control panel

Measuring force generation
Mechanical using weights

Operation
- Measuring spindle, manual
- Air bearings make it very easy to position the measuring element and counter-bearing (not with ULM 300-E)
- Height of object table can be adjusted using buttons (also positioning of given increments)

Features

- Excellent measuring accuracy
- 100% compliance with Abbe comparator principle
- Online temperature measurement with 2 to 3 sensors
- Computer-aided correction of systematic machine errors (CAA)
- Computer-aided stabilization of instrument zero point
- Computer-aided correction of temperature and measuring force influences
- Measuring force remains constant over the entire measuring spindle adjustment range
- Large object table (load capacity 25 kg (55 lbs)) guided with high precision in the Z-direction
- Automatic reversal point recognition for static and dynamic measured value acquisition
- Inside thread measurement is supported by automatic Z-positioning
- Great flexibility in the application range
- Large number of modular accessory sets and components to solve the most diverse measurement tasks, including threads, tapers, taper threads and gears
- Measuring and evaluation software **Mahr 828 WIN** operable under Microsoft Windows®
- Possible to use measuring axis risers

Details on metrological accessories are available on request.

Versions

ULM 300-E
ULM 600-E
ULM 1000-E
ULM 1500-E

Request brochure or see WebCode 10454

Precimar ULM 520 S-E / 1000 S-E for Calibration Metrology

Description

Model
Comparator with horizontal base (highly homogeneous and rigid granite)

Measuring system

X-axis:	In the measuring element, incremental high-precision Heidenhain length measuring system, 100 mm (4 in) long; in the base, incremental Heidenhain reflected light measuring systems over entire length of base to left and right of object table
Z-axis:	Incremental high-precision RENISHAW length measuring system, 80 mm (3.15 in) long

Drives

X-axis:	Manual movement and fine motion control
Y-axis:	Micrometer, 25 mm (0.98 in) (analog or digital)
Z-axis:	Permanent field motor for motorized adjustment of object table height with ergonomic manual control panel

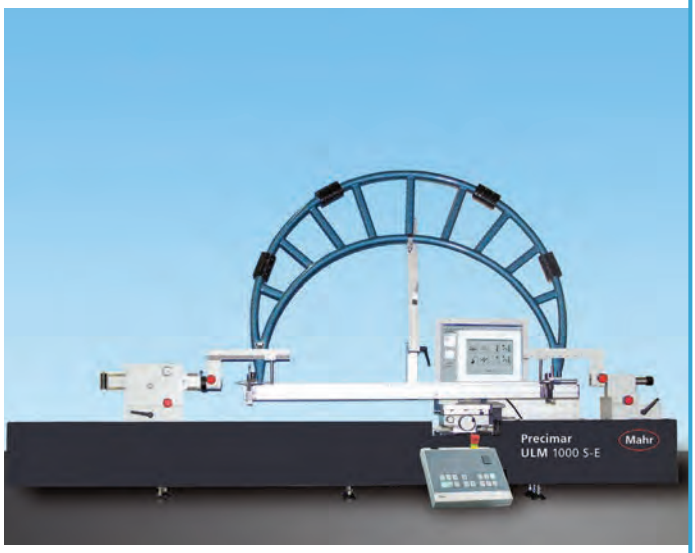
Measuring force generation
Mechanical using weights

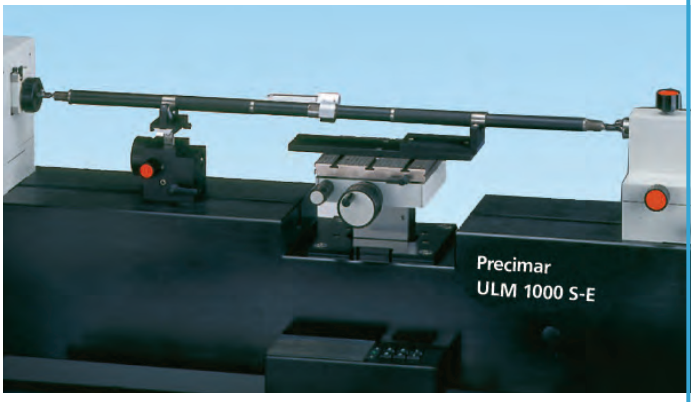
Operation
- Measuring spindle, manual
- Air bearings make it very easy to position the measuring element and counter-bearing
- Height of object table can be adjusted using buttons (also positioning of given increments)

Features

- Combined measuring instrument for very high-precision measurements in the range up to 100 mm (4 in) and standard-precision measurements over the entire range of movement of the measuring element and counter-bearing. X measured value formed from the measuring systems of the measuring element and the base
- Particularly recommended for measurements on large testpieces, but also suitable for measurements on smaller testpieces
- Online temperature measurement with 3 sensors
- Computer-aided stabilization of instrument zero point and correction of systematic machine errors (CAA)
- Measuring force remains constant over the entire measuring spindle adjustment range
- Computer-aided correction of temperature and measuring force influences
- Large object table (load capacity 25 kg (55 lbs)) guided with high precision in the Z-direction
- Large number of modular accessory sets and components to solve the most diverse measurement tasks, including threads, tapers, taper threads, gears and ball faces
- Measuring and evaluation software **Mahr 828 WIN** operable under Microsoft Windows®

Large universal length measuring instruments with large direct measuring range





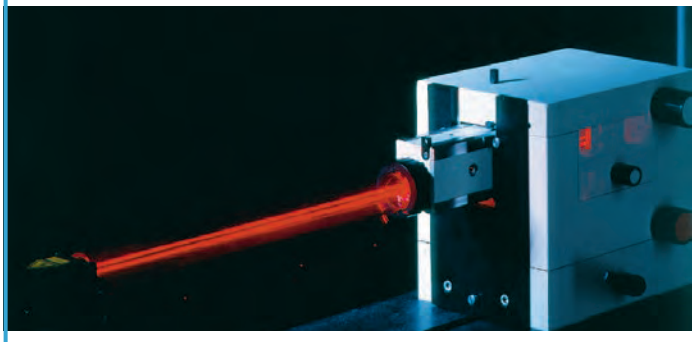
Versions

ULM 520 S-E
ULM 1000 S-E

Request brochure or see WebCode 10455

Precimar ULM 800 L-E / 1500 L-E for Calibration Metrology

Universal length measuring instrument with laser measuring system



Description

Model
Comparator with horizontal base (highly homogeneous and rigid granite)

Measuring system

X-axis:	Interferential laser measuring system, 525/1,115 mm (20.67/43.90 in) long
Z-axis:	Incremental high-precision RENISHAW length measuring system, 80 mm (3.15 in) long

Drives

X-axis:	Manual movement and fine motion control
Y-axis:	Micrometer, 25 mm (0.98 in) (analog or digital)
Z-axis:	Permanent field motor for motorized adjustment of object table height with ergonomic manual control panel

Measuring force generation
Mechanical using weights

Operation
- Measuring spindle, manual
- Air bearings make it very easy to position the measuring element (with laser reflector) and counter-bearing
- Height of object table can be adjusted using buttons (also positioning of given increments)

Features

- A high-end length measuring instrument with a large direct measuring range
- 100% compliance with Abbe comparator principle
- Correction of laser in terms of environmental influences such as temperature and air pressure (humidity optional)
- Separate laser generating unit outside the measuring instrument and supply by means of light-conducting cable plus laser unit cover
- Computer-aided stabilization of instrument zero point and correction of systematic machine errors (CAA)
- Online temperature measurement and computer-aided correction of temperature and measuring force influences
- Measuring force remains constant over the entire measuring spindle adjustment range
- Large object table (load capacity 25 kg) guided with high precision in the Z-direction
- Automatic reversal point recognition for static and dynamic measured value acquisition
- Very flexible application range (both the very smallest and large testpieces can be measured)
- Large number of modular accessory sets and components to solve the most diverse measurement tasks, including threads, tapers, taper threads and gears

Main areas of application

For the calibration of
- Plain plug and ring gages
- Setting rings
- Snap gages
- Spherical gages, gages for deep bores
- Gage blocks
- Thread gages
- Taper thread gages
- Gear tooth gages
- Dial indicators
- Dial comparators
- 2-point inside measuring devices
- Micrometers

Versions

ULM 800 L-E
ULM 1500 L-E

Request brochure or see WebCode 10456

Precimar PLM 600-E for Precision Length Metrology

Description

Design
Comparator according to Ernst Abbe with horizontal base (highly homogeneous and rigid granite)

Measuring system

X axis	incremental, high-precision Heidenhain length measuring system, 200 mm long
Z axis	incremental measuring system, 100 mm long

Drives

X axis	motor-controlled measuring slide and automatic contacting
TY axis	motorized Y adjustment (25 mm) manual and automatic/CNC-controlled
TZ axis	motorized height adjustment of work table manual and automatic/CNC-controlled
TB axis	motorized tilting axis

Measuring force generation
Electronically controlled measuring force generation

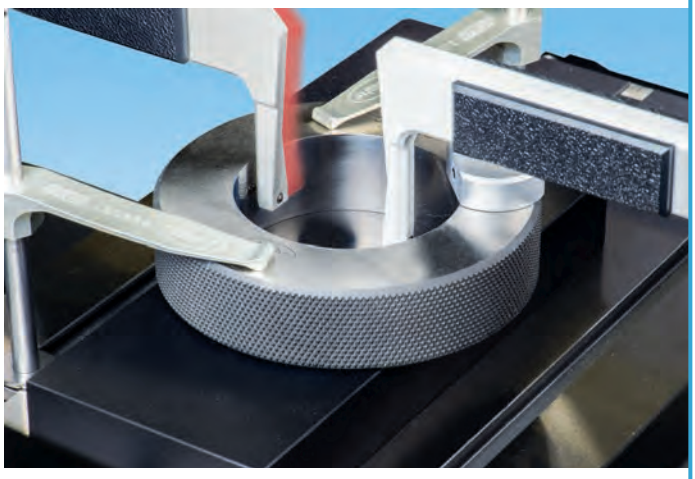
Operation
- Measuring spindle motorized via joystick as well as automatic contacting
- Measuring slide and tailstock are easily positionable due to air bearing
- Motorized height, horizontal and tilt adjustment of object table via joystick, handwheel, function keys or CNC-controlled

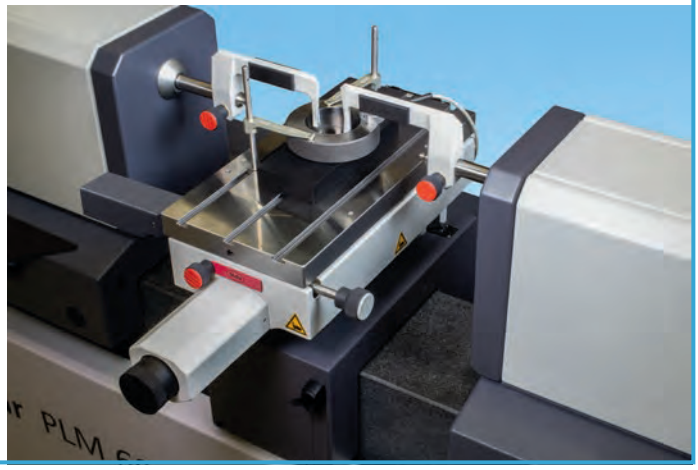
Features

- The **Precimar PLM 600-E** has a large universal object table with 5 axes with a loading capacity of 35 kg, a modern PC-based, multi-axis machine control, including PC workstation and **828 WIN** "Free measurement" basic software
- Automatic detection of outer and inner measurements and computer-aided search for reversal points
- Simple operating procedure by means of measuring force-adjusted and joystick-controlled measuring slides with progressive deflection characteristic and automatic contact detection
- Motorized measuring slide allows for high travel speeds
- CNC-controlled motorized vertical movement of the universal measuring table for highly efficient measurement
- State-of-the-art machine control (MarEcon)
- Measuring data recording, processing, logging and transfer via powerful software and menu-driven controls
- Software compensation of thermal dimensional deviations
- Easy setting of measuring force via software
- Aerostatic guides for all slides mounted on the machine bed ensure low measuring uncertainties
- Electronic measuring force adjustment and automatic contacting
- Subjective influences are largely eliminated and unintended collisions with the testpiece avoided
- Automatic bore and inner thread measurement
- Automatic TY-adjustment: Unique is that a manual TY adjustment is still possible
- Motorized tilting axis (TB) can be adjusted using the manual control panel or the 828 WIN software
- A factory calibration or DAkkS/DKD calibration can be offered together with the Precimar PLM 600-E

Request brochure or see WebCode 20817

Universal length measuring machine





Precimar 828 CiM 1000 for Precision Length Metrology

Precision length measuring machine

Description

Model type
Comparator according to the Abbe principle with horizontal basic bed (highly homogeneous and rigid granite)

Measuring system

X-axis:	High quality, high-precision incremental length measuring system (LIF), 300 mm length
Z-axis:	Incremental Heidenhain illumination system, 70 mm length

Drives

X-axis	Motor-driven measuring slide and automatic contacting
Y-axis:	Micrometer 25 mm (analog or digital)
Z-axis:	motorized adjustment of object table (semi-automatic / CNC-controlled)

Measuring force generation
Electronically controlled measuring force generation

Operation
- Measuring spindle via joystick as well as automatic contacting
- Measuring slide and tailstock are easily positionable due to air-bearings
- Motorized height adjustment of object table using joystick or CNC-controlled

Features

- **Precimar 828 CIM 1000** has the highest measuring accuracy: Unique low length measuring uncertainty for precision products and gage calibration management
- Fast and reliable measurements
- 100% adherence to the comparator principle according to Ernst Abbe
- Online temperature monitoring
- Software-supported mesuring force generation, especially advantageous for thin-walled workpieces and gage calibration devices
- Semi-automatic bore measurement and inside measurement
- High flexibility in the application range
- Numerous accessory sets and components in a modular system to solve different measuring tasks, incl. thread pitch, thread, tapered thread, toothing
- Measuring and evaluation software **Mahr 828 WIN** operable under Microsoft Windows® XP or Microsoft Windows® 7
- Patented measuring procedure
- Minimum measuring uncertainty due to the use of aerostatic guides for all slides supported by the machine bed, the mobile bearing of the measuring spindle over a spring parallelogram which is free of both play and friction, electronic regulation of measuring forces and automatic contacting. Subjective influences are therefore minimized and unintentional collisions with the tespiece prevented

Request brochure or see WebCode 2092.

Precimar Dial Gage Tester

	Optimar 100
Measuring range (mm)	100
Measuring uncertainty MPE_{E1} (µm)	(0.2 + L/250)
Testing direction	vertical und horizontal
Type of operation	semi-automatic, fully-automatic

Precimar Gage Block Testers

	826 PC	130B-24	30B-16
Application range (mm)	0.5 - 170	0.25 - 100	2.5 - 600
Gage blocks	European (rectangular) and US (square)	0.010" - 4"	0.10" - 24"
Repeatability (µm)	0.01	6 σ <1 µin (25 nm)	

Precimar Length Measuring Units for Production

	LINEAR 100	LINEAR 800	LINEAR 1200	LINEAR 2000
External measuring range (mm)	0 - 100	0 - 815	0 - 1215	0 - 2015
Internal measuring range (mm)	6 - 100	40 - 855	40 - 1255	40 - 2055
Measuring uncertainty MPE_{E1} (µm)	(0.7 + L/1000)	(0.7 + L/1000)	(0.7 + L/1000)	(0.7 + L/1000)
Type of operation	manual	manual	manual	manual

Precimar Length Measuring Machines for Calibration and Precision Metrology

	ULM Series	PLM 600-E	CiM 1000
External measuring range (mm)	0 - 1620*	0 - 600	0 - 1000
Internal measuring range (mm)	0.5 - 1465*	0.5 - 445	0.5 - 845
Direct meas. span (mm)	100 - 1115*	200	300
Measuring uncertainty MPE_{E1} (µm)	(0.09 + L/2000) or (0.3 + L/1500) ULM L-E: MPE_{E1}= (0.1 + L/2000)	(0.085 + L/1500)	(0.055 + L/1500)
Repeatability (µm)	0.05 / 0.1	<0.05	<0.03
Measuring force (N)	in increments 1 - 11	0 - 13.9 no increments	0 - 13.9 no increments
Object table size (mm)	160 x 160	350 x 150	350 x 150
Object table capacity (N)	250	350	250
Operation type	manual, motorized	motorized, CNC-controlled	motorized, CNC-controlled

** depending upon unit type*

IN THE PAST THERE WAS THE THUMBNAIL TEST.
TODAY THERE IS MARSURF.

The latest information on MARSURF products can be found on our website:
www.mahr.com, WebCode 158

► | Wherever surface structures influence the function, processing or appearance of components or products, careful testing is essential. But how can surfaces be tested? At the beginning of the 20th Century, experts still had to test by eye and touch. A practiced eye can detect features in the µm range, and even the much maligned thumbnail test delivered perfectly acceptable results. Now however, we live in an age of exchangeable parts, fits and internationalization, where subjective tests like this are no longer adequate. Today, computer-aided measuring instruments provide objective data. Measurement and evaluation have become considerably easier. For decades, Mahr has been a worldwide pioneer in this area, as demonstrated by the company's numerous innovations and patented solutions in the field of surface roughness metrology. The interplay between the stylus, drive and measuring setup plays a key role in influencing the quality of surface measurement tasks. This is where Mahr's core expertise comes in, as demonstrated by the company's numerous innovations and patented solutions. Over this time, we have succeeded in perfecting the stylus method, which is now in widespread use throughout the world. We can meet even the most demanding requirements for non-contact measurement, e.g. where extremely soft materials or ultra-short measuring times are involved, thanks to the range of optical sensors offered in the MarSurf product family. Developed with Mahr quality, expertise and know-how, MarSurf is the solution for all your surface metrology needs. | ◄

► | MarSurf. Surface Metrology

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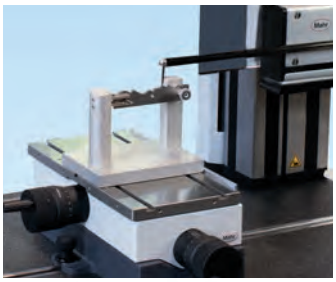
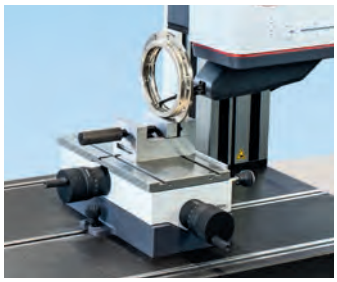
GD 120

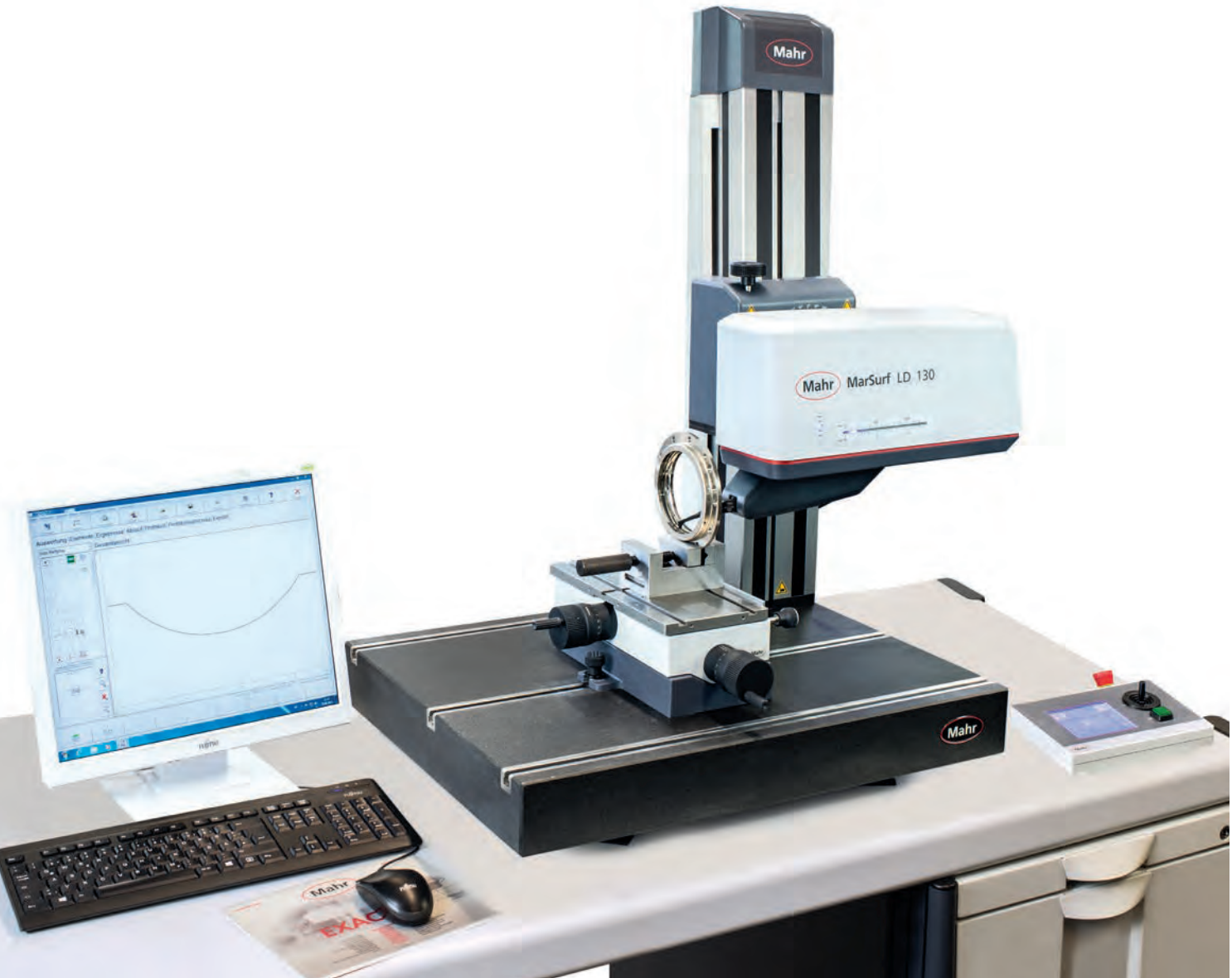
MarSurf. Surface Metrology System for all your industrial requirements

THE RIGHT SOLUTION FOR EVERY TASK

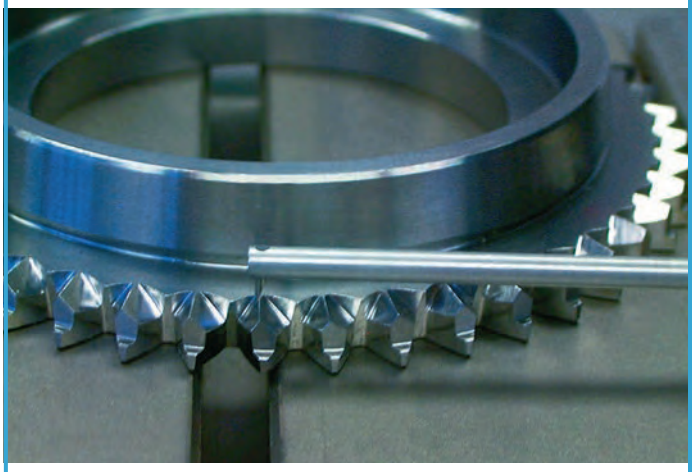
► | In surface metrology, a distinction is made between mobile units, stationary shop-floor units and PC-based surface measuring instruments. The latter provide the very best measurement and evaluation performance for surface measurement tasks. They fulfill all the key requirements of a state-of-the-art PC-based measuring and evaluation system, including compliance with international standards, versatile evaluation methods, comprehensive documentation, large storage capacity, data export and import and networking with other systems. Comprehensive QA procedures ensure the highest quality and stability of software and hardware. | ◄







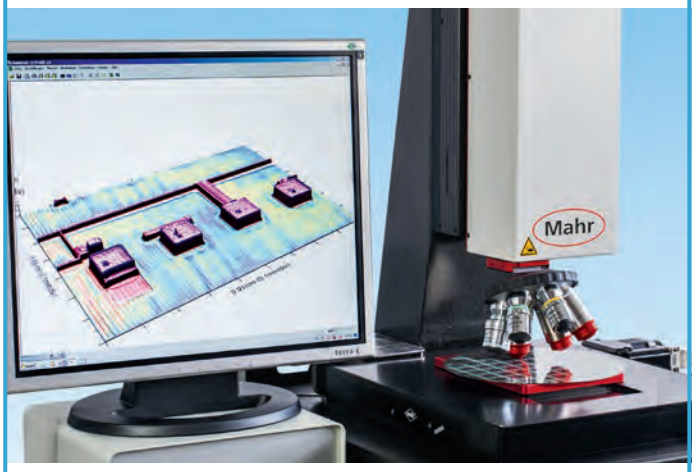
Automotive Industry



Measurements on synchronizer rings
The automotive industry is often at the forefront of surface and contour measurement. Typical applications include measurements on crankshafts, camshafts, transmission components and engine parts. The measurement of the root geometry including roughness measurement for synchronous rings ensures both easy and smooth gear changing and a long service life.

WebCode 14953

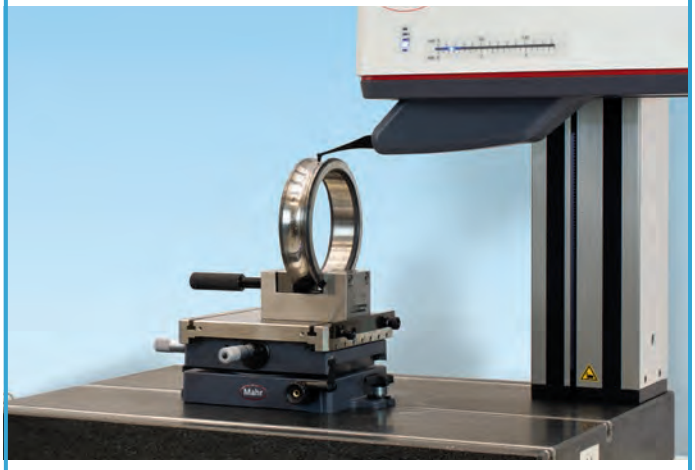
Electronics Industry



Measurements on wafer surfaces
In the semiconductor industry, precise, fast and reliable quality assurance is a must. This applies to the production of wafers. Fast, automatic inspection of selected areas on a wafer by white light interferometer or with the confocal mode can provide a perfect analysis of the structures on the wafer. Due to the flexibility of the CWM 100, finest structures can be analyzed interferometrically and for coarse structures or elements like dies, bonding structures etc. the confocal mode can do the job.

WebCode 14892

Mechanical Engineering Industry



Measurements on ball rings
Ball races today need high-precision radii and minimum form deviation. Roughness measurement ensures smooth running and long service life with as little running noise as possible. MarSurf meets these requirements through user-friendly evaluation software and extremely quiet drive units.

WebCode 14886

Medical Technology

Measurements on hip joints
Hip joint measurements need to be extremely accurate. Both the contour and roughness of the ball and/or socket affect the durability and performance of the joint.

WebCode 14887

MarSurf. Handy and Precise for On-site Roughness Measurements

MOBILE ROUGHNESS MEASUREMENT DEVICES

► | Mahr has played a key role in ensuring the success of mobile roughness measurement devices. As early as the 1980s, Mahr was setting new standards with the M4P. The products have developed in line with changing production monitoring requirements. Today's devices meet the highest international standards. Mobile roughness measurement devices from Mahr are lightweight with a handy shape for flexible handling. They offer high-precision measurements in different positions and easy positioning using V-blocks, a practical shape and light weight. | ◄

MarSurf. Mobile Surface Roughness Measuring Instruments

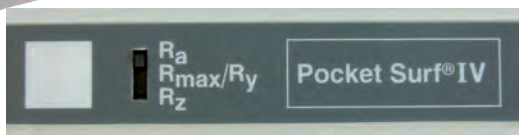
OVERVIEW

		PocketSurf IV	MarSurf PS 1	MarSurf M 300	MarSurf M 300 C
Page		15-6	15-10	15-12	15-13
Measuring principle		Skid probe system	Skid probe system		
Probe system		Piezoelectric	PHT probe range		
Probe		Stylus tip 5 or 10 µm, measuring force 15.0 mN	Inductive skidded probe, 2 µm stylus tip, measuring force ca. 0.7 mN		
Traversing length		ISO/ASME/DIN/MIL .075", .135", .195" 2 mm, 3.5 mm, 5 mm	ISO/JIS: 1.75 mm, 5.6 mm, 17.5 mm; automatic MOTIF: 1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm		
Measuring range		Ra - 6.35 µm/250 µin, Ry, Rmax, Rz - 25.3 µm/999 µin	350 µm, 180 µm, 90 µm (changes automatically)		
Profile resolution		0.01 µm/ 1 µin	32 nm, 16 nm, 8 nm (changes automatically)		
Evaluation lengths		.030",.090",.150"/ .8, 2.4, 4 mm	1.25 mm, 4.0 mm, 12.5 mm		
Number of parameters available		3	31	33	33
Parameters	DIN / ISO	Ra, Ry, Rz, Rmax	Ra, Rq, Rz, Rmax, Rp, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Vo, Rt, R3z, RPc, Rmr, RSm, Rsk, CR, CF, CL, R, AR, Rx	Ra, Rq, Rz, Rmax, Rp, Rv, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Vo, Rt, R3z, RPc, Rmr, RSm, Rsk, R, AR, Rx, W, CR, CF, CL	Ra, Rq, Rz, Rmax, Rp, Rv, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Vo, Rt, R3z, RPc, Rmr, RSm, Rsk, R, AR, Rx, W, CR, CF, CL
	JIS	–	Ra, Rq, Ry (equiv. to Rz), RzJIS, tp (equiv. to Rmr), RSm, S	Ra, Rq, Ry (equiv. to Rz), RzJIS, Rp, Rv, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Rt, tp (equiv. to Rmr), RSm, Rsk, S, R, AR, Rx, W, CR, CF, CL	Ra, Rq, Ry (equiv. to Rz) RzJIS, Rp, Rv, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Rt, tp (equiv. to Rmr), RSm, Rsk, S, R, AR, Rx, W, CR, CF, CL
	ASME	Ra, Ry, Rz, Rmax	Rp, Rpm, RPc, Rsk	RpA, Rpm, Rmr, RSm, Rsk	RpA, Rpm, Rmr, RSm, Rsk
	MOTIF	–	R, AR, Rx, CR, CF, CL	R, AR, Rx, W, CR, CF, CL	R, AR, Rx, W, CR, CF, CL
Bluetooth		–	–	Yes	–
Large color display		–	–	Yes	Yes
Built-in printer		–	–	Yes	Yes
Integrated roughness standard for Standard probe PHT 6-350		–	Yes	Yes	–*
Cylindrical drive unit with hand-held Vee-block		–	–	–	Yes
Drive unit with transverse tracing (optional)		–	–	–	RD 18 C2
Internal memory		–	max. 15 Profiles max. 20000 Results	max. 30 Profiles max. 40000 Results	max. 30 Profiles max. 40000 Results
Software (optional)		MarCom, Explorer	MarCom, Explorer, MarSurf XR 20	Explorer, MarSurf XR 20	Explorer, MarSurf XR 20
Order no.	2 µm	**2191800 10 µm radius**	**6910210**	**6910401**	**6910431**
Order no.	5 µm	**2191802 5 µm radius**	**6910214**	**6910411**	**–**

*Scope of supply

Pocket Surf® IV the portable surface roughness gage

A pocket-sized economically priced, completely portable instrument which performs traceable surface roughness measurements on a wide variety of surfaces; can be used confidently in production, on the shop floor and in the laboratory.



Nothing is easier than Pocket Surf IV's single button operation

Built in measurement output

Economical and simple to replace battery

Features

- Solidly built, with a durable cast aluminum housing, to provide years of accurate, reliable surface finish gaging.
- Can be used to measure any one of four, switch selectable, parameters: Ra, Rmax/Ry, Rz
- Then review any of the parameters after the measurement is complete
- Selectable traverse length 1, 3 or 5 cut-offs of 0.8 mm/0.030"
- Operates in any position – horizontal, vertical, and upside down
- Four switchable probe positions – axial (folded) or at 90°, 180° or 270°
- Even difficult-to-reach surfaces such as inside and outside diameters are accessible
- MarConnect data output for easy SPC-processing that is compatible with the most common data processing systems
- Easy-to-read LCD readout presents the measured roughness value, in microinches or micrometers, within half a second after the surface is traversed.
- Out-of-range (high or low) and "battery low" signals are also displayed
- Improved digital calibration process eliminate scandrivers and potentiometers to simplify and enhance the calibration process
- Improved battery life with easy to replace standard 9V battery

Technical Data

Dimensions		140 x 76 x 25 mm	/ ***5.5" x 3" x 1"***
Weight		435 g	/ 14 oz
Measuring Ranges	R_a	0.03 µm to 6.35 µm	/ ***1 µinch to 250 µinch***
	R_y	0.2 µm to 25.3 µm	/ ***8 µinch to 999 µinch***
	R_{max}	0.2 µm to 25.3 µm	/ ***8 µinch to 999 µinch***
	R_z	0.2 µm to 25.3 µm	/ ***8 µinch to 999 µinch***
Display Resolution		0.01 µm	/ ***1 µin***
Measurement Accuracy		Meets ASME-B46.1, ISO, DIN standards and MIL specifications	
Digital Readout		LCD with, "Battery low" signal; "H" and "L" (measured values out-of-range)	

Technical Data

Probing and Traverse Lengths

Parameters	Traverse Length (Nominal)	Evaluation Length	Number of Cutoffs/ Switch Position*
R_a/R_y	2.0 mm/ ***.075"***	0.8 mm/ ***.030"***	1
	3.5 mm/ ***.135"***	2.4 mm/ ***.090"***	3
$R_a/R_z/R_{max}$	5.0 mm/ ***.195"***	4.0 mm/ ***.150"***	5
Traverse Speed	5.08 mm/ ***.2"*** per second		
Cutoff	0.8 mm/ ***.030"*** ASME 2 RC-filter		
Probe Type	Piezoelectric		
Maximum Stylus Force	15.0 mN / 1500 mgf		
Power	Consumer-type alkaline battery, 9 Volt		
Battery Capacity	Approx. 2500 measurements, depending on frequency of use and output option		
Operating Temperature	10° to 45°C / 50° to 113° F		
Storage Temperature	-20° to 65°C / -4° to 149° F		

** Othercutoff/switch positions may be used*

Pocket Surf Sets

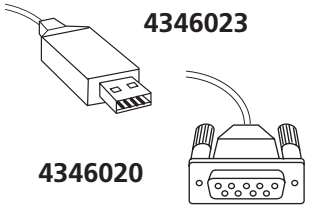
Order no.		
2191800	EGH-1019	Probe, 90°, 10 µm radius, PMD-90101 Certified Specimen, incl. Test Certificate
2191802	EGH-1026	Probe, 90°, 5 µm radius, EMD-90101 Certified Specimen, incl. Test Certificate

A Pocket Surf kit is furnished complete in a fitted case, and includes a Pocket Surf unit with a General Purpose Probe** and a 3.2 µm/***125 µinch*** (nominal) Reference Specimen**, 9 Volt battery and Riser Plate.

*** Part Numbers listed in table above.*

MarConnect - USB ready

The Pocket Surf IV® employs the MarConnect interface from Mahr. Marconnect simplifies data transmission to a PC and enables quick and universal assembly of a multiple measuring station.



		Order no.
Data Connection Cable USB (2 m) incl. MarCom Standard	**16 EXu**	**4346023**
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	**16 EXr**	**4346020**
Software MarCom Professional 4.0 Allows for up to 68 wired devices		**4102552**
Software MarCom Standard 3.1 Allows for 1 wired device		**4102551**

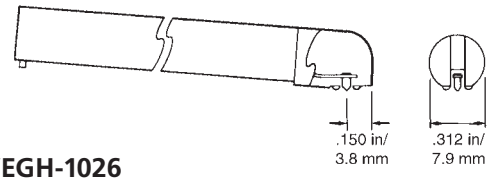
Accessories for Data Processing, see Dimensional Metrology Catalog Chapter 11

Pocket Surf® IV the portable surface roughness gage

Probes

General Purpose Probes

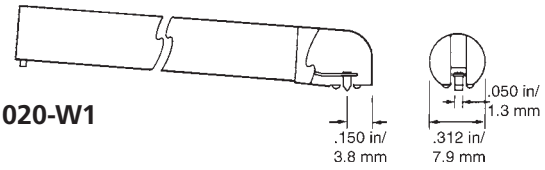
EGH-1019/EGH-1026
For most surface roughness applications.
EGH-1026
With a 90° conical diamond stylus, 5 µm/ .0002" radius*.
EGH-1019
With a 90° conical diamond stylus, 10 µm/ .0004" radius.



EGH-1019/EGH-1026

Transverse Chisel Probe

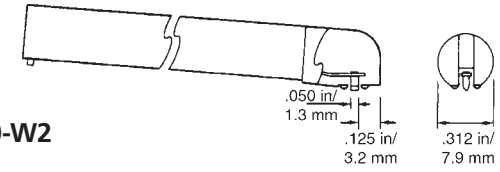
EGH-1020-W1
For gaging sharp edges or small O.D.'s where probe is aligned with (in 180° or closed position) to axis of traverse. 90° sapphire chisel, 10 µm./ .0004" radius.



EGH-1020-W1

Parallel Chisel Probe

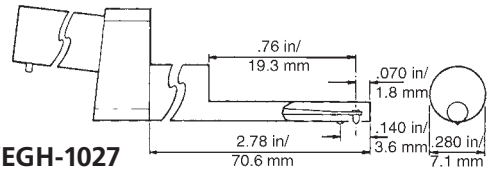
EGH-1020-W2
For gaging sharp edges or small O.D.'s where probe is perpendicular (in 90°- or 270° position) to axis of traverse. 90° sapphire chisel, 10 µm. / .0004" radius. Also used with EAS-2421 Vee fixture for O.D.'s smaller than 6,35 mm / .25".



EGH-1020-W2

Small Bore Probe

EGH-1021/EGH-1027
For gaging small bores (3,2 mm/ .125" minimum I.D.) up to a depth of 19 mm/ .75".
EGH-1027
With a 90° conical diamond stylus, 5 µm/ .0002" radius*.
EGH-1021
With a 90° conical diamond stylus, 10 µm/ .0004" radius.

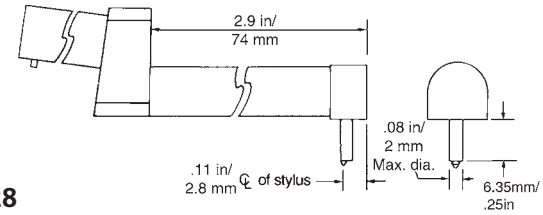


EGH-1021/EGH-1027

Groove Bottom Probe

EGH-1028
For measuring the bottom of grooves, recesses and small holes to depths of 6.35 mm/ .25".
Also used for short lands and shoulders.
With 90° conical diamond stylus, 10 µm/ .0004" radius.
Note: Small Bore and Groove Bottom Probes can only be used in 180° position with the Pocket Surf unit supported in a height stand or other fixture.

** Yellow dot at connector end signifies 5 µm/ .0002" radius.*



EGH-1028

Using the Groove Bottom Probe to check an "O" ring groove.

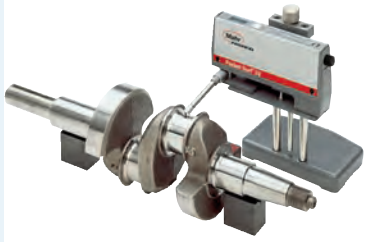
Shown with optional Height Stand EAS-2496

Applications and Accessories

Height Stand EAS-2496

A compact, convenient fixture with a bracket to hold the Pocket Surf gage. Designed for making measurements on a granite surface plate or on any suitable, flat working surface to a maximum height of about 111 mm / 4.375".

Order no. **EAS-2496**



Portable vee fixture EAS-2421

For measuring small parts with outside diameters from 3.1 mm /.125" to 25 mm / 1" for lengths of 25 mm / 1" minimum - includes PS-145 setting pin.

Order no. **EAS-2421**

Bore Adapter Kit EAS-2839

For timesaving hand-held measurement of bores without having to fix the workpiece. Accommodates all inside diameters from:
25 mm/ 1" to 150 mm / 6";
depths from 25 mm / 1" to 60 mm/ 2.4".

Order no. **EAS-2839**

Bottom Plate EAS-2584

For measuring cylindrical workpieces too short (less than 89 mm / 3.5" long) for the "closed" probe position; for workpieces with short O.D.'s from 6.35 mm / .25" (minimum 38 mm / 1.5" long).

Order no. **EAS-2584**

Vee-Adapter Kit EAS-2739

Attaches to bottom of Pocket Surf unit, permitting convenient, hand-held measurements of hard-to-reach cylindrical surfaces, such as crankshaft journals without having to fix the work piece. Suitable for parts with diameters from 5.0 mm/ .19" to 125 mm/ 5".

Order no. **EAS-2739**

EAS-3048 Mounting Bracket for use with height gages

For mounting the Pocket Surf to most standard height gages. The bracket includes a rectangular bar that is 11.5 mm x 6.35 mm (0.45" x 0.25") to fit the holder of the height gage. A swivel feature is included to permit the Pocket Surf to be set anywhere within a 360° rotation.

Order no. **EAS-3048**

Universal Stand EAS-2426

A heavy-duty stand equipped with an adjustable bracket to hold the Pocket Surf for measuring of workpieces, up to 213 mm / 8.37" tall.

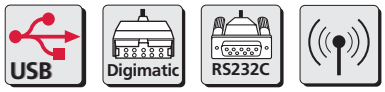
Order no. **EAS-2426**

Height Stand with Swivel

A compact, convenient fixture with an adjustable bracket to hold the Pocket Surf, anywhere within a 360° rotation, for making measurements on a surface plate or on any suitable, flat working surface.

Order no. **2236687**

Mobile Surface Roughness Measuring Instrument MarSurf PS 1 Absolute mobility



Applications

- On-site surface roughness measurement
- Measuring during the production process
- Universal use on processing machinery
- For incoming goods inspection

Features

- Small and lightweight; ideal as mobile surface roughness measuring instruments
- Large display
- Very simple to operate
- Start button is positioned on both the right and left side of the PS1; easy to operate regardless of whether you are left or right-handed but also practical for conducting upside down measurements
- Can be used horizontally, vertically, upside down etc.
- 31 parameters: offer the same range of functions as a laboratory instrument
- Parameters can be selected directly Ra, Rz
- Freely programmable, use the F1 button for direct access to any of your chosen parameters
- Evaluation of most common parameters conforming to standards and in accordance to ISO/JIS as well as characteristic curves, parameter lists (e.g. material ratio curve)
- Integrated roughness standard for the standard pick-up PHT 6-350
- Dynamic calibration function
- Select standards (DIN-ISO/JIS/ ASME/MOTIF)
- Automatic cutoff selection (patented) to ensure correct measuring results
- Individual sampling lengths and shortened cutoff can be selected
- Setting of unsymmetric intersection lines for peak count calculation
- Tolerance monitoring
- Lock settings and/or password protection
- Date and/or time of measurement
- Integrated memory to store ca. 20000 reults and 15 profiles
- Data transmission via the USB interface to a PC
- Evaluation with PS1/M 300 Explorer Software, MarSurf XR 20 Evaluation Software or with a MarSurf XR 20
- MarConnect interface, to connect e.g. a PC via the MarCom Software
- Main free operation: the built-in rechargeable battery can used for up to 500 measurements before being recharged
- Supplied with: MarSurf PS1 base unit, drive unit, standard pick-up (conforming to standards), built-in battery, roughness standard integrated into base unit, height adjustment accessory, pick-up protection, charger / mains adapter with 3 mains power adapters, carrying case with shoulder strap and belt loop, USB cable, Mahr calibration certificate, operating instructions

Technical Data

Unit of measurement		Metric / inch
Measuring principle		Stylus method
Pick-up		Inductive skidded pick-up, measuring force ca. 0.7 mN
Parameters	DIN / ISO	Ra, Rq, Rz, Rmax, Rp, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Vo, Rt, R3z, RPc, Rmr, RSm, Rsk, CR, CF, CL, R, AR, Rx
	JIS	Ra, Rq, Ry (equiv. to Rz), RzJIS, tp (equiv. to Rmr), RSm, S
	ASME	Rp, Rpm, RPc, Rsk
	MOTIF	R, AR, Rx, CR, CF, CL
Languages		English, German, French, Italian, Spanish, Portuguese, Dutch, Swedish, Czech, Polish, Russian, Japanese, Chinese, Korean, Turkish
Measuring range		350 µm, 180 µm, 90 µm (automatic switching)
Profile resolution		32 nm, 16 nm, 8 nm (automatic switching)
Filter*		Phase-correct profile filter (Gaussian filter) according to DIN EN ISO 11562, Special filter according to DIN EN ISO 13565-1, ls filter according to DIN EN ISO 3274 (can be disabled)
Cutoff lc*	mm (inch)	0.25 / 0.8 / 2.5 (0.010" / 0.030" /0.100"); automatic
Traversing length Lt*	mm (inch)	1.75/ 5.6 /17.5 (0.069" / 0.22" / 0.69"); automatic
Traversing length (according to MOTIF)	mm (inch)	1 / 2 / 4 / 8 / 12 / 16 (0.040" / 0.080" / 0.160" / 0.320" / 0.480" / 0.640")
Short cutoff*		Selectable: 1 to 5
Evaluation length ln*	mm (inch)	1.25 / 4.0 / 12.5 (0.050", 0.15", 0.50")
Number n of sampling lengths*		Selectable: 1 to 5
Calibration function		Dynamic
Memory		max. 15 profiles, max. 20000 results
Additional functions		Lock settings / password potection, Date/Time
Dimensions	mm (inch)	140 × 50 × 70 (5.51" × 1.97" × 2.76")
Weight		400 g (0.88 lbs)
Rechargeable battery		Li-ion battery
Interfaces		USB, MarConnect (RS232/USB/Digimatic)
Long-range power supply		100 V to 264 V

Order no.	2 µm	**6910210** (Set Includes pick-up No. 6111520 PHT 6-350 2 µm/90°)
Order no.	5 µm	**6910214** (Set Includes pick-up No. 6111526 PHT 6-350 5 µm/90°)

** In accordance to ISO/JIS*

MarSurf PS1 with height adjustment

Underside of the **MarSurf PS1**

Mobile Surface Roughness Measuring Instrument MarSurf M 300 A step ahead

M 300

RD 18

Applications

- On shafts, housing parts
- On large scale machines
- For large workpieces
- On milling and turning parts
- For use on grinding and honing components
- On the production line, or directly upon a machine. Ideal for rapid testing of the surface roughness of a workpiece in or on a machine
- A simple universal measuring station for checking surface roughness

Features

- Bluetooth wireless connection between the evaluation unit and drive unit (up to 4 m)
- Bright, illuminated color display
- Automatic selection of filter and traversing length conforming to standards
- Integrated thermal graphics printer of high print quality
- Print the R-profile via the thermal graphics printer
- Printed log either by pressing a button or automatically
- Data transfer of results and profiles via USB-interface to your PC
- Evaluation of most common parameters conforming to standards and in accordance to ISO/JIS as well as characteristic curves, parameter lists (e.g. material ratio curve)
- Printing of R-profile (ISO/ASME/JIS), P-profile (MOTIF), material ratio curve, measuring record
- Measuring units (µm/µinch) and standards (ISO/JIS/ASME/MOTIF) are selectable
- Tolerance monitoring
- Integrated memory for the results of up to 40000 measurements and 30 profiles
- Setting of unsymmetric intersection lines for peak count calculation
- Individual sampling lengths and short cutoff can be selected
- Key pad lock and/or password protection for instrument settings
- Built-in rechargeable battery with power management
- Integrated roughness standard for the standard pick-up PHT 6-350
- Dynamic calibration function
- Date and/or time of measurement
- Software MarSurf PS1/M 300 Explorer for recording measurements (option)
- Supplied with: Evaluation unit M 300, drive unit RD 18 with integrated roughness standard, standard pick-up PHT 6-350 (conforming to standards), charger / mains adapter with 3 mains power adapters, height adjustment accessory, pick-up protection, pick-up protection with prismatic underside, end face vee-block, 2 x USB cables, 1 roll of thermal paper, shoulder strap, carrying case, Mahr calibration certificate, operating instructions

Mobile Surface Roughness Measuring Instrument MarSurf M 300 C A step ahead

M 300 C

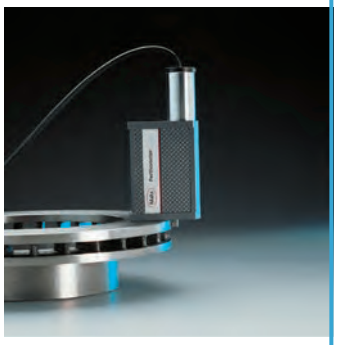
RD 18 C + Handheld Vee block
(detachable)

Applications

- On shafts, housing parts
- On large scale machines
- For large workpieces
- On milling and turning parts
- For use on grinding and honing components
- On the production line, or directly upon a machine. Ideal for rapid testing of the surface roughness of a workpiece in or on a machine
- A simple universal measuring station for checking surface roughness

Example: Measurement with height adjustment

Example: Upside down measurement



Example: Measurement on an end face vee

Features

- Bright, illuminated color display
- Automatic selection of filter and traversing length conforming to standards
- Integrated thermal graphics printer of high print quality
- Easy to use due to the large color display and the operator guidance
- Printing of R-profiles with the thermo printer
- Printed log either by pressing a button or automatically
- Data transfer of results and profiles via USB-interface to your PC
- Evaluation of most common parameters conforming to standards and in accordance to ISO/JIS as well as characteristic curves, parameter lists (e.g. material ratio curve)
- Printing of R-profile (ISO/ASME/JIS), P-profile (MOTIF), material ratio curve, measuring record
- Measuring units (µm/µinch) and standards (ISO/JIS/ASME/MOTIF) are selectable
- Integrated memory for the results of up to 40000 measurements and 30 profiles
- Tolerance monitoring
- Setting of unsymmetric intersection lines for peak count calculation
- Cylindrical drive unit with handheld vee block and PHT pick-up protection
- Individual sampling lengths and short cutoff can be selected
- Lock instrument settings
- Date and/or time of measurement
- Can be expanded to be an stationary measuring station
- Software MarSurf PS1/M 300 Explorer for recording measurements (option)
- Supplied with: Evaluation unit M 300 C, cylindrical drive unit RD 18 C incl. 1.8 m data connection cable, handheld vee block with height adjustable feet, standard pick-up PHT 6-350/2µm (conforming to standards), roughness standard PRN 10 with Mahr calibration certificate, 1 roll of thermal paper, pick-up protection with prismatic underside, dia. 8 mm mounting clamp for drive unit, charger / mains adapter with 3 mains power adapters, 1 x USB cable (for connection to a PC), shoulder strap, carrying case, operating instructions

Mobile Surface Roughness Measuring Instrument MarSurf M 300 / M 300 C

Technical Data

Measuring principle		Stylus method
Traversing speed	mm (inch)	0.5 mm/s (0.02"/s)
Measuring range		350 µm (0.014")
Profile resolution		90 µm, 180 µm, 350 µm (automatic switching) 8 nm, 16 nm, 32 nm (automatic switching)
Filter		Gaussian filter, Ls-Filter (switchable)
Cutoff	mm (inch)	0,25, 0,8, 2,5 (0.010", 0.032", 0.100")
Short Cutoff		wählbar
Traversing lengths as per DIN / ISO / ASME / JIS	mm (inch)	1,75, 5,6, 17,5 (0.070", 0.2242, 0.700")
Traversing lengths as per EN ISO 12085 (MOTIF)	mm	1, 2, 4, 8, 12, 16
Evaluation lengths	mm (inch)	1,25, 4, 12,5 (0.05", 0.16", 0.5")
Number of sampling lengths selectable:		1-5
Parameters	DIN / ISO:	Ra, Rq, Rz, Rmax, Rp, Rv, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Vo, Rt, R3z, RPc, Rmr, RSm, Rsk, R, AR, Rx, W, CR, CF, CL
	JIS:	Ra, Rq, Ry (equiv. to Rz), RzJIS, Rp, Rv, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Rt, tp (equiv. to Rmr), RSm, Rsk, S, R, AR, Rx, W, CR, CF, CL
	ASME:	RpA, Rpm, Rmr, RSm, Rsk
	MOTIF:	R, AR, Rx, W, CR, CF, CL
Vertical scale		Automatic/selectable
Horizontal scale		Depending on the cutoff
Record contents		R -profile, MRK, P-profile (MOTIF), results
Printing		Automatic/manual Record with time
Surface hardness		Ideal for surface hardness >50 Shore
Calibration function		Dynamic
Memory		Integrated memory For the storage up to 40000 measurements and up to 30 profiles
Measuring units		µm/µinch selectable
Languages selectable:		English, German, French, Italian, Spanish, Portuguese, Dutch, Swedish, Czech, Polish, Russian, Japanese, Chinese, Korean, Turkish
Blocking instrument settings		Yes
Password protection		Yes
LCD		High resolution color display, 3.5", 320 x 240 pixel
Printer		Thermal printer, 384 points/horizontal line, 20 characters/line
Printing speed		ca. 6 lines/second corresponds to approx. 25 mm/s (1"/s)
Thermal paper		Dia. 40.0 mm-1.0 mm, width 57.5 mm-0.5 mm, coated
Interface		USB, MarConnect
Power supply		NiMH battery, capacity: approx. 500 measurements (depending on the number and length of record printouts), plug-in power pack with three mains plugs, for input voltages from 90 V to 264 V
Power management		Yes
Connections		Drive unit, power pack, USB, MarConnect
Protection class	M 300 / M 300 C	IP 42
	RD 18 / RD 18 C	IP 40
Temperature range for storage		-15°C to +55°C (5°F to 131°F)
Temperature range for operation		+5°C to +40°C (41°F to 104°F)
Relative humidity		30 % to 85 %
Dimensions (L x W x H)	M 300 / M 300 C	190 x 140 x 75 mm (7.5" x 5.5" x 3")
Dimensions (L x W x H)	RD 18	130 x 70 x 50 mm (5.1" x 2.7"x 2")
Dimensions (L x dia.)	RD 18 C	139 x 26 mm (5.5" x 1")
Dimensions (L x W x H)	RD 18 C*	82 x 34 x 59 mm (3.2" x 1.3" x 2.3")
Weight	M 300 / M 300 C	ca. 1 kg
	RD 18	ca. 300 g
	RD 18 C	ca. 165 g
	RD 18 C*	ca. 55 g
Order no.	**M 300 Set** 2 µm	**6910401**
Order no.	**M 300 Set** 5 µm	**6910411**
Order no.	**M 300 C Set** 2 µm	**6910431**

* Handheld Vee block

Mobile Surface Roughness Measuring Instrument MarSurf M 300

Drive Unit MarSurf RD 18

Bluetooth Technology

Unique: Cable-free connection between evaluation unit and drive unit!

A further advantage is the connection of several drive units to only one evaluation unit.

Features

- The well-proven PHT-skid probes are implemented in the drive unit.
- Can be connected via a cable
- Supplied with:
  Drive unit RD 18 with integrated roughness standard

Technical Data

Tracing direction	Longitudinal
Traversing length	adjustable on M 300
as per DIN/ISO	1.75 mm, 5.6 mm, 17.5 mm (0.07 ", 0.22", 0.7")
as per EN ISO 12085	1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm
Traverse speed	0.5 mm/s
Dimensions (w/o pick-up protection)	dia. 24 mm, L = 112 mm
Bluetooth range	up to 4 m
Order no.	**6910403**

Drive Unit MarSurf RD 18 C2 for transverse tracing

Features

- During the manufacturing process, surface measurements of work pieces usually require special tools to find the right solution for a particular task; e.g. transverse scanning on a crank or camshafts, or measuring bearings. For such tasks the drive unit RD 18 C2 is available for transverse scanning.
- The well-proven PHT-skid probes are implemented in the drive unit.
- The drive unit RD 18 C2 is attached in the same way as the RD 18.
  By being able to use both types of drive units the range of application offered by the mobile MarSurf M 300 C is broadened.
- Supplied with:
  Drive unit RD 18 C2, pick-up protection with prismatic underside, pick-up protection and a screwdriver

Technical Data

Tracing direction	Transverse
Traversing length	adjustable on M 300
as per DIN/ISO	1.75 mm, 5.6 mm (0.07 ", 0.22")
as per EN ISO 12085	1 mm, 2 mm, 4 mm
Traverse speed	0.1 mm/s and 0.5 mm/s
Dimensions (w/o pick-up protection)	dia. 24 mm, L = 142 mm
Order no. RD 18 C2	**6910426**
Order no. chuck RD 18 C2 for Ø 5 mm to Ø 80 mm	**6850738**

Optional probes for MarSurf PS1 / M 300 / M 300 C

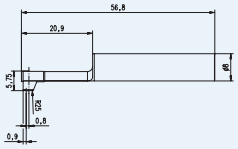
Probes for various measuring tasks

The P-probes are characterized by special construction features:

- Stylus tip geometry as per EN ISO 3274, standard 2 µm/90°
- Measuring force of approx. 0.7 mN (as per EN ISO 3274)
- Reliable inductive converter
- Robust, rigid housing
- Self-aligning, elastic bearings
- Reliable plug and socket connections

Pick-up PHT 6-350 (standard probe)

System	Single-skid pick-up with spherical skid
Skid radius	in traversing direction 25 mm (.984"), at right angles 2.9 mm (.114")
Contact point	0.8 mm (.0315") in front of the stylus
Meas. range	350 µm (0.014")
Specification	for plane surfaces, bores with a dia. larger than 6 mm (.236") and a max. depth of 17 mm (.669"), grooves with a width larger than 3 mm (.118"); min. workpiece length = traversing length + 1 mm (.0394")

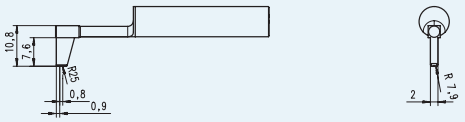


Order no. **6111520*** probe with 2 um/90o tip, (Black Tip)
Order no. **6111526*** probe with 5 um/90o tip, (Blue Tip)

** Included in scope of supply with selected Order No.*

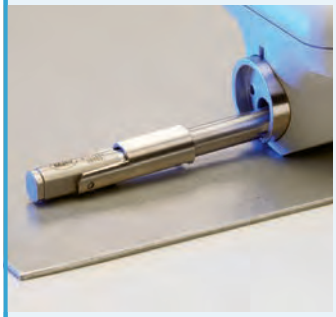
Pick-up PHT 11-100

System	Single-skid pick-up with spherical skid
Skid radius	in traversing direction 25 mm (.984"), at right angles 2.9 mm (.114")
Contact point	0.8 mm (.0315") in front of the stylus
Meas. range	100 µm (.00394")
Specification	for plane surfaces, bores with a dia. larger than 11 mm (.433") and a max. depth of 14 mm (.551"), grooves with a width larger than 2.5 mm (.098")

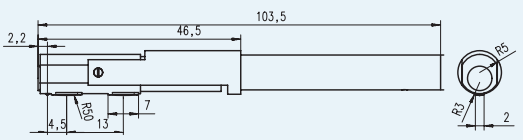


Order no. **6111524**

Pick-up PT 150



System	Dual-skid pick-up with spherical skid
Skid radius	in traversing direction 50 mm (1.969"), at right angles 3 mm (.118")
Contact point	4.5 mm (.177") in front of the stylus
Meas. range	150 µm (.006")
Specification	for measurements on metal sheets and roller surfaces according to DIN EN 10049 (SEP). min. workpiece length = tracing length + 5 mm (.197")

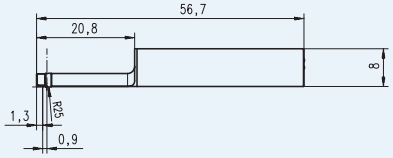


Order no. **6111523**

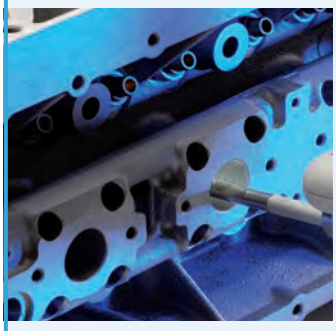
Pick-up PHT 3-350

System	Single-skid pick-up with spherical skid
Skid radius	in traversing direction 25 mm (.984"), at right angles 1.45 mm (.0571")
Contact point	0.9 mm (.0354") in front of the stylus
Meas. range	350 µm (0.014")
Specification	for bores with a dia. larger than 3 mm (.118") and a max. depth of 17 mm (.669 ") min. workpiece length = traversing length + 1 mm (.0394")

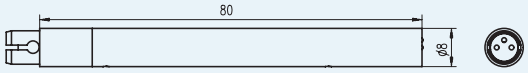
Order no. **6111521**



Pick-up extension PHT (80 mm) for P probes



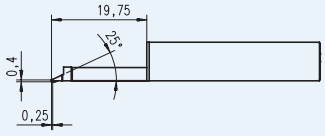
Order no. **6850540**

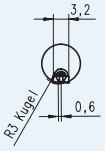


Pick-up PHTF 0.5-100

System	Single-skid pick-up with spherical skid
Skid radius	in traversing direction 25 mm (.984"), at right angles 1.45 mm (.0571")
Contact point	0.6 mm (.0236") at the side the stylus
Meas. range	100 µm (.00394")
Specification	e.g. for gear tooth flanks with a modulus larger than 0.8
Calibration	via Geometric standard PGN

Order no. **6111522**

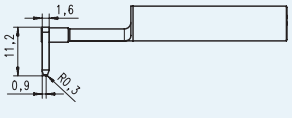




Pick-up PHTR-100

System	Single-skid pick-up with lateral, spherical skid
Skid radius	in traversing direction 0.3 mm (.012")
stylus radius	2 µm (.0008"), 90°
Specification	for measurements on concave and convex surfaces
Calibration	via Geometric standard PGN

Order no. **6111525**



MarSurf PS 1 / M 300 Accessories

Transverse tracing adapter with vee-block holder for PS 1 / RD 18

For hand-held transverse tracing of cylindrical measuring objects, a pick-up adapter and a vee-block can be mounted to the MarSurf PS1 / RD 18 unit. According to the diameter of the measuring object, two different vee-blocks are available:

- Vee-block with 120° angle of Vee, for diameters from 5 up to 50 mm (0.2" to 2")
- Vee-block with 150° angle of Vee, for diameters from 50 up to 130 mm (2" to 5.1").

	Order no.
Adapter for transverse tracing	**6850541**
Vee-block holder	**6850542**

End face vee-block for PS 1 / RD 18*

Suitable for measurements on flat end face of cylindrical and planar components.

* optional

	Order no.
End face vee-block	**6910203**

Pick-up protection for PS1 / RD 18 / RD 18 C

	Order no.
Pick-up protection, steel	**6850716**
Pick-up protection with header vee-block, steel	**6850715**
Pick-up protection, plastic*	**7028532**
Pick-up protection header vee-block, plastic**	**7028530**

** With PS 1 and M 300 Set included in the scope of supply*
*** With M 300 and M 300 C Set included in the scope of supply*

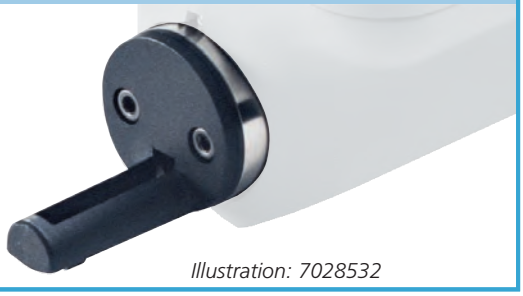


Illustration: 7028532

MarSurf PS1 / M 300 / M 300 C Accessories

Mount for measuring stand ST

Accessories for measuring stands (these are not included in the measuring stands scope of supply):

Mount for MarSurf PS1 / RD 18
The drive unit RD 18 can in the mount be pivoted and locked in any position (±15°)

Order no. **6910201**

Mount for MarSurf RD 18 C
The drive unit RD 18C can in the mount be pivoted and locked in any position (±15°)

Order no. **6851304**

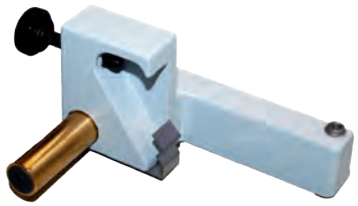


Illustration: 6910201

Measuring stand ST

Measuring stand ST-D

Height adjustment	0 to 300 mm, with a hand wheel
Dimensions (L x W x H)	175 x 190 x 385 mm
Weight	ca. 3 kg

Order no. **6710803**

Measuring stand ST-F
Grantie plate. The required measuring height can be adjusted with a hand wheel for convenient and accurate positioning of the drive unit.

Height adjustment	0 to 300 mm, with a hand wheel
Dimensions (L x W x H)	400 x 300 x 415 mm
Weight	ca. 35 kg

Order no. **6710806**

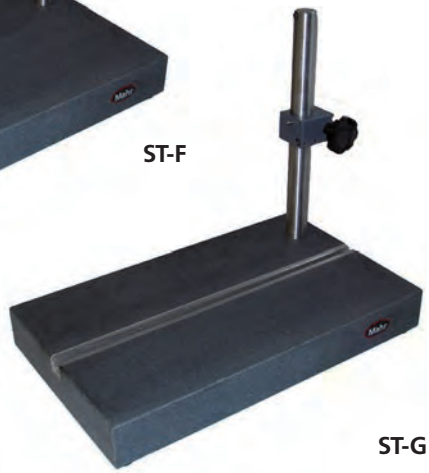
Measuring stand ST-G
Grantie plate with a 10 mm (.39 in) T-slot for mounting work pieces. The required measuring height can be adjusted with a hand wheel for convenient and accurate positioning of the drive unit.

Height adjustment	0 to 300 mm, with a hand wheel
Dimensions (L x W x H)	500 x 300 x 415 mm
Weight	ca. 35 kg

Order no. **6710807**

ST-D

ST-F



ST-G

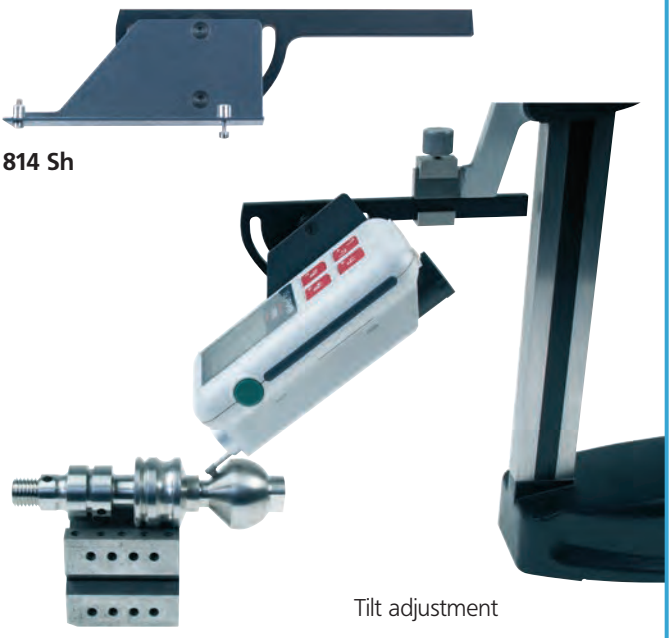
MarSurf PS1 / M 300 Accessories

Mounting bracket for Digimar 814 SR

		Order no.
814 Sh	Adjustable mounting bracket to connect the PS 1 / RD 18 to a 814 SR	**2247086**

RD 18

PS 1



814 Sh

Tilt adjustment

For additional Product Information and Technical Data regarding the Digimar 814 SR for MarSurf PS 1 / RD 18, please refer to page 2-19

Efficient Application Aids for Manufacturing

MarSurf MDR-2

MarSurf MBF-2

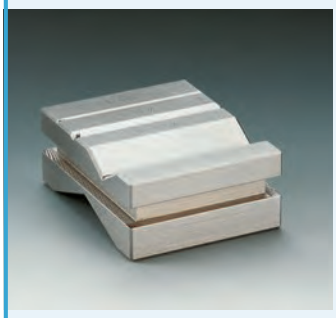
Tough manufacturing environments require quick and easy roughness measurements. The shop floor is particularly demanding on measuring instruments. **Application aids** from **Mahr** are the perfect solution.
They work together with the evaluation units of the M 300 series. A calibration / resting station is already included in the scope of delivery.

- Special design allows precise, easy positioning of measuring instrument
- Easy to use even without specialist metrological knowledge
- Drive unit protected from environmental influences that might disrupt the measurement
- Probe protection, i.e. probe is only extended during measurement
- Surface protection material ensures measurement leaves no marks on the workpiece

MarSurf MCB-7

MarSurf PS 1 / M 300 / M 300 C Accessories

Vee-block PP



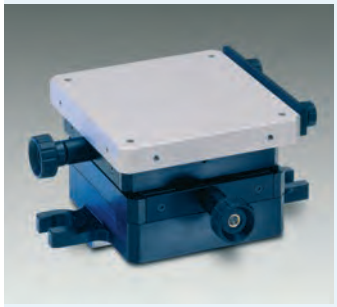
With four different prisms for mounting axis-symmetrical workpieces with diameters from 1 mm to 160 mm (.0394" to 6.30").

Dimensions (L x W x H)
80 x 100 x 40 mm
3.91" x 3.15" x 1.58"
Weight 1.5 kg / 3.31 lb

Including clamping springs for holding light workpieces in the prism.

Order no. **6710401**

XY table CT



For mounting and aligning workpieces. Can be adjusted in two coordinates by 15 mm (.591").

Table surface 120 x 120 mm
Table surface 4.728" x 4.728" with two brackets.

Order no. **6710529**

Parallel vice PPS

For mounting rectangular and cylindrical workpieces

Jaw width	70 mm / 2.76"
Jaw height	25 mm / .984"
Span	40 mm / 1.58"
Total height	58 mm / 2.28"
Weight	2 kg / 4.41 lb

Order no. **6710604**

Mini Precision Vise 109 PS as set

With mini precision vises. Depending on the version with prism jaws, carrier plates, stands and mini dividing attachment. Included in a plastic case

Width of jaws 15 / 25 / 35 mm

Order no. **4246819**

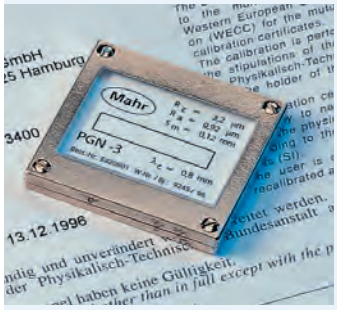
Roughness standard PRN 10

With Mahr calibration certificate. Roughness standard with turned profile, chromed. Profile depth ca. 10 µm (.394 µinch), for checking the roughness measuring station.

Order no. **6820420***

** With the M 300 C Set this is included in the scope of supply.*

Geometric Standard PGN



Surface standard with sinusoidal groove profile for dynamic monitoring of the roughness measuring station. Ra, Rz, Rmax. Optical flat. The following versions are available:

		Order no.
PGN 1	Profile depth ca. 1.5 µm (60 µinch), groove distance ca. 0.10 mm (0.0039")	**6820602**
PGN 3	Profile depth ca. 3 µm (120 µinch), groove distance ca. 0.12 mm (0.0047")	**6820601**
PGN 10	Profile depth ca. 10 µm (394 µinch), groove distance ca.0.20 mm (0.0079")	**6820605**
Mahr-calibration certificate for PGN		**9027715**
DKD (German Calibration Service) calibration certificate for PGN		**6980102**

MarSurf PS 1 / M 300 / M 300 C Accessories

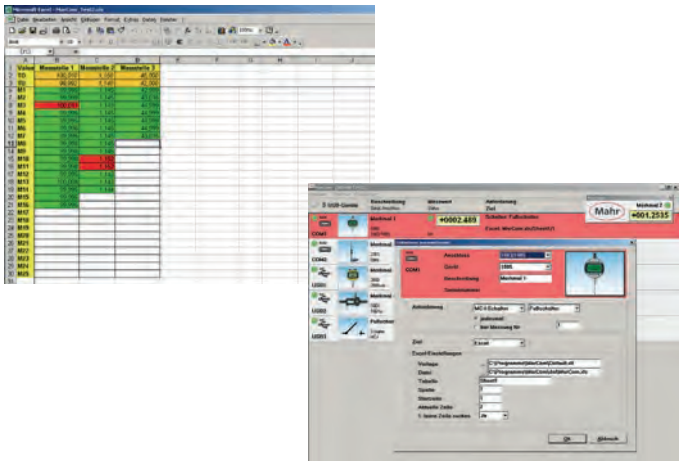
MarCom Software for PS 1 / M 300 / M 300 C

Software MarCom Professional

- Measured values can be directly transferred into MS Excel (from version 97) or into a text file or key code
- The measured values from each instrument can be sent to a different column, table or folder in Excel
- Data transmission via. USB and/or 2 serial COM interfaces
- Flexible and comfortable data transmission: you can either press the "Data" button on the measuring instrument or on the data cable; via a computer keyboard, timer; or by activating a foot switch connected to an USB interface

Software MarCom Standard
(included with the USB data cable)

Features and system requirements are identical to MarCom Professional, except that it only has one USB and one serial COM interface.

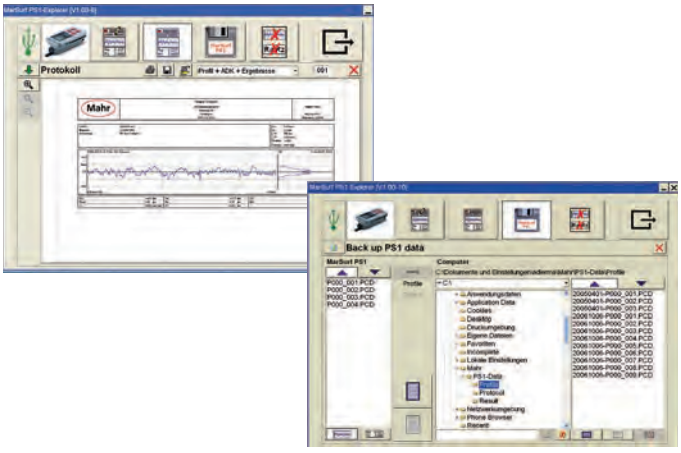


	Order no.
Software MarCom Professional	**4102552**
Software MarCom Standard	**4102551**
Data Cable 16 EXu incl. MarCom Standard	**4102357**

Software MarSurf PS 1 / M 300 Explorer

- The software can be used to secure and document your measuring results and profiles (simply use Drag & Drop)
- The stored data can for example, be printed out on a A4 sheet or in any other format
- The measuring data can be displayed in different forms: profile and results, results, profile + MRC + results, statistics, and much more

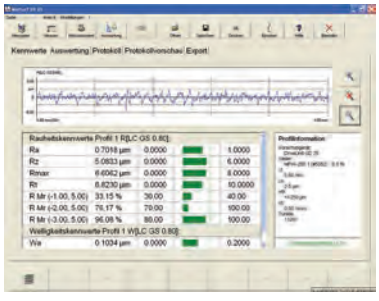
Order no. **6910205**



Evaluation Software MarSurf XR 20

- An easy way to evaluate and document data based on MarWin
- Evaluation and documentation of the results can be conducted independently and away form the measuring station
- Filing including documentation is made simple
- Workstation version avaliable

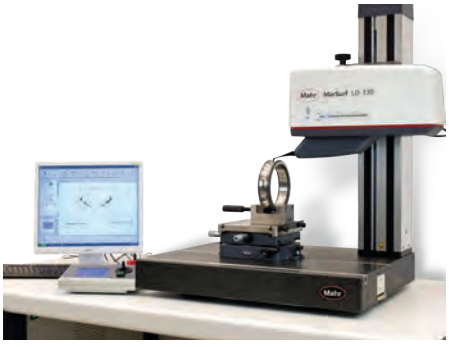
Order no. **6299054**

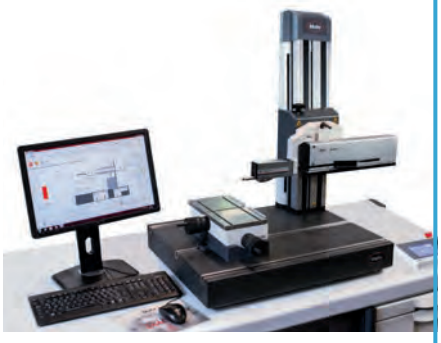


MarSurf. Surface Metrology

MOBILE ROUGHNESS MEASUREMENT

MOBILE AND STATIONARY SURFACE MEASUREMENT FOR ROUGHNESS AND CONTOUR





MarSurf M 400. The Best of the "Mobiles"

Easy. Fast. Innovative. With skidless tracing and automatic zero setting.

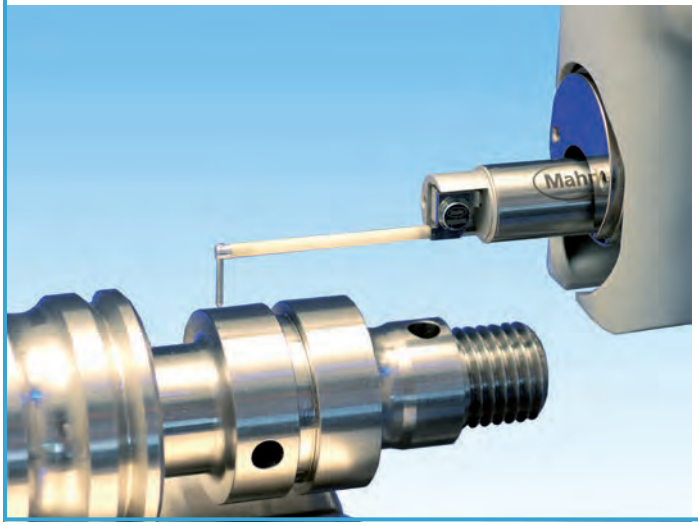
Bluetooth

Measuring in production

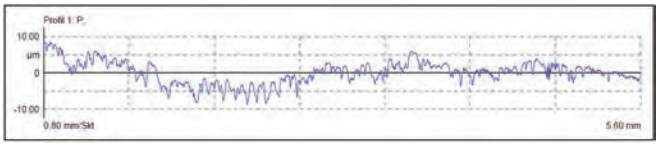
Description

The need for high quality mobile surface metrology is increasing. In many cases, a skidded measurement is no longer sufficient and skidless tracing is required instead. Especially when determining parameters from the unfiltered P profile or waviness parameters, a skidless measurement is absolutely necessary.
MarSurf M 400 fulfills these characteristics completely and additionally has the advantage of easy operation even for complex measuring tasks.

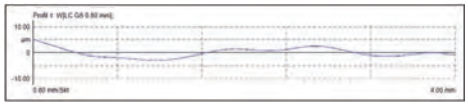
The automatic zero setting option spares the user complicated manual zero setting. After pressing the start button, zero setting and subsequent measurement are started right away.



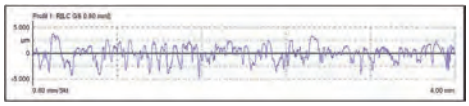
P profiles



W profiles

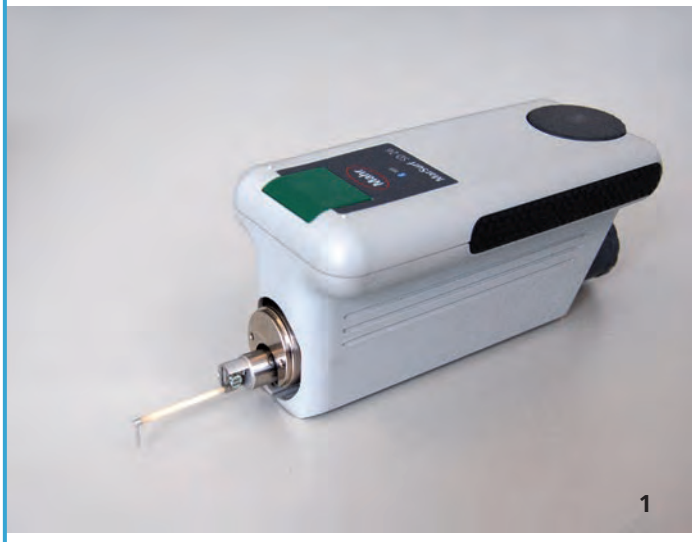


R profiles



MarSurf M 400. The Best of the "Mobiles"

Drive Unit SD 26 and Probe System BFW-250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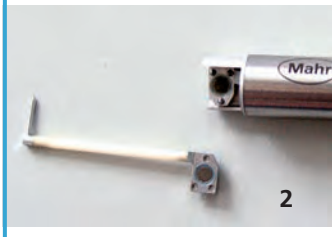

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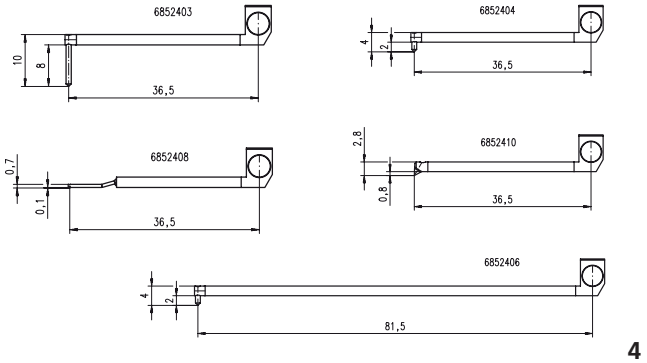


4

The possibility to expand the mobile surface measuring unit to a small stationary work station can be easily and quickly realized by adding only a few components from the line of MarSurf accessories.

Fast and easy alignment of the drive unit relative to the testpiece thanks to the inclination adjustment option.

The MarSurf M 400 enables the evaluation of parameters from the P, W and R profiles.

Features

- **Skidless tracing** with high precision probe system (1)
- **Fast probe arm change** due to magnetic probe arm holder (2, 3, 4)
- **Protection from damage**
- **Only a few seconds of setting time required** due to motorized height adjustment of the drive unit with automatic zero setting
- **Flexible handling** with cable-free *Bluetooth* connection
- **Concise, clear and easy** due to brilliant color display for the depiction of results and operator guidance
- **Mobile use** due to operation with AC adapter or built-in battery
- **Internationally up to date** with all common parameters as per ISO, JIS, ASME, many integrated languages
- **Documentation with quality** with integrated thermal printer for printout of profile and results
- **Standardized measuring point** density despite increased measuring speed

Upside down measurement with vee-block
Automatic zero setting of the BFW-250

MarSurf measuring station with measuring stand ST-G

MarSurf M 400 The Best of the "Mobiles"

Scope of Delivery

- Evaluation unit MarSurf M 400
- Drive unit MarSurf SD 26 incl. probe system BFW-250
- Standard probe arm (6852403)
- 1 thermo paper roll
- Wide-range AC adapter mit 3 adapters
- 2 x USB cables (to connect to PC and for use with cable)
- Operating instructions

All items are delivered in a practical carrying case.

MarSurf M 400 set: **Order no. 6910404**

Applications

Mechanical engineering
Bearings, shafts, racks, valves

Automotive industry
Steering, brake systems, transmissions, crankshafts, camshafts, cylinder heads, cylinder blocks, turbochargers

Steel industry
Measurement of sheet metal surfaces
Measurement of roller surfaces

Medical industry
Roughness depth measurement of hip and knee prosthetics

Aerospace
Turbine components

WebCode 20553

Technical Data

Measuring principle	Tactile stylus method
Probes	BFW skidless probe system
Measuring range	+/–250 µm (to +/–750 µm for triple probe arm length)
Profile resolution	Measuring range ±250 µm: 8 nm Measuring range ±25 µm: 0.8 nm
Filter as per ISO/JIS	Gaussian filter as per ISO 11562 Filter as per ISO 13565
Cutoff lc as per ISO/JIS	0.25 mm, 0.8 mm, 2.5 mm, automatic, variable
Number n of individual measuring paths as per ISO/JIS	1–5
Probe speed	0.2 mm/s; 1.0 mm/s
Measuring force	0.7 mN
Parameters	Over 50 parameters for R-, P-, W-profiles according to current standards ISO/JIS or motif (ISO 12085)

Accessories

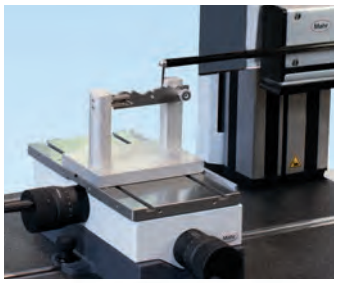
Measuring stands
- ST-D, ST-F and ST-G
- Mount on measuring stand

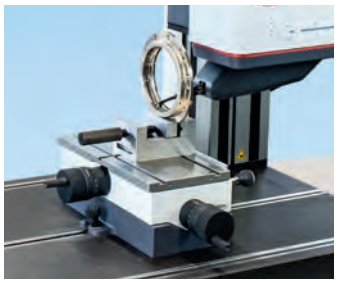
Further accessories
XY table CT 120, parallel vice, prism block
Diverse probe arms for the probe system BFW

MarSurf. PC-based Stationary Surface Measuring Stations

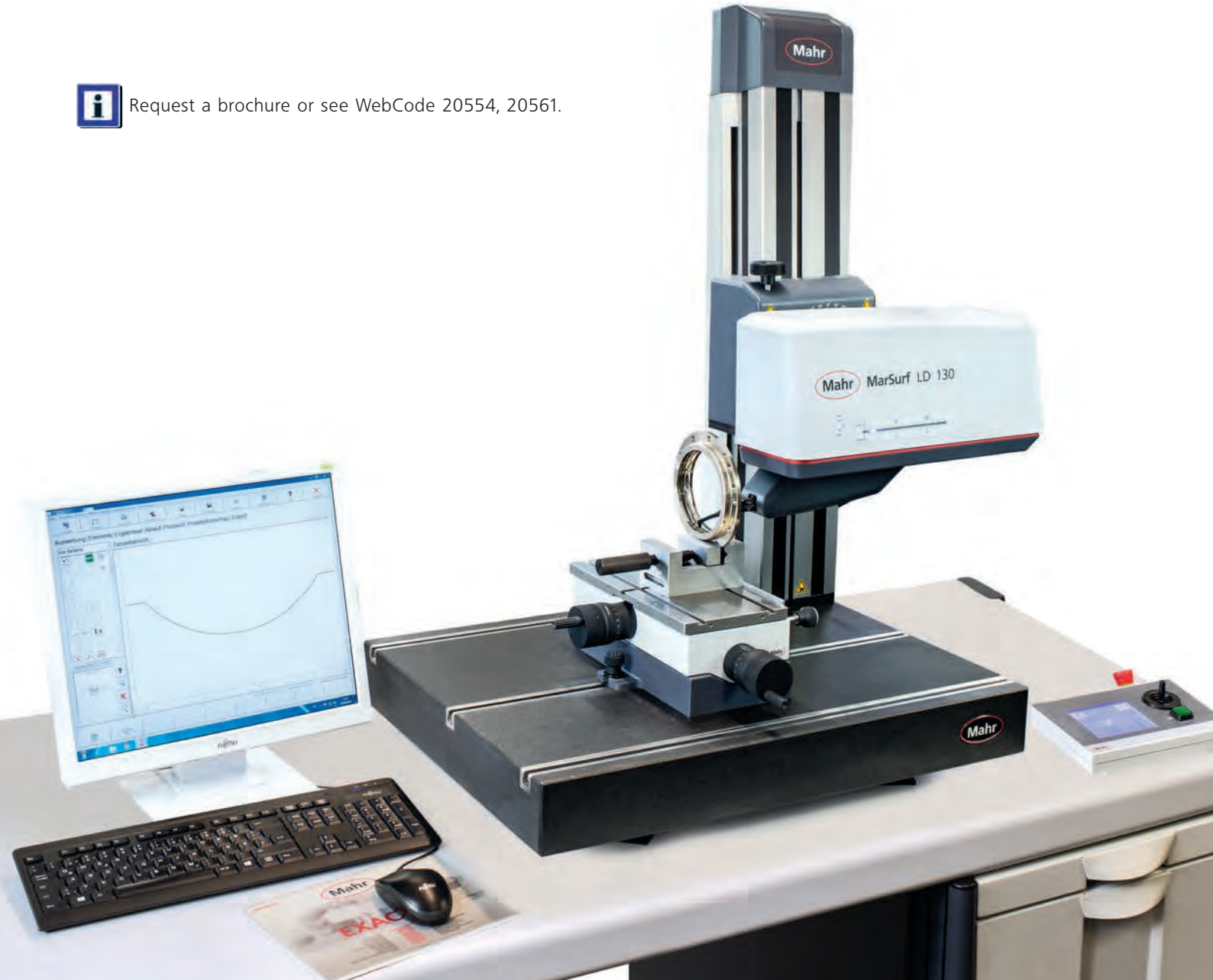
VERSATILE, HIGH-PERFORMANCE UNITS FOR INSPECTION ROOM AND LABORATORY

► | This equipment facilitates manual and automated operation. By means of different software components and connection of various drive units measurement of roughness, contour and topography is possible. | ◄





Request a brochure or see WebCode 20554, 20561.



MarSurf XR 1

Description

MarSurf XR 1. The right unit to inexpensively enter into the world of convenient surface metrology.
Whether in the measuring room or in production, the PC-based unit provides all common parameters and profiles of international standards. MarSurf XR 1 at Mahr means future-oriented roughness software.

Features

- Over 80 parameters for R, P, W profiles according to current standards, ISO/JIS or MOTIF (ISO 12085) selectable
- Band pass filter Ls according to current standards, Ls can also be switched off or freely varied
- Extensive measuring records
- Quick and Easy measuring programs can be quickly created in a user-guided function. Automatic function for the selection of cutoff and measuring path according to standards (patented)
- Different calibration methods are supported (static and dynamic) with specification of parameters Ra or Rz
- Selectable maintenance and calibration intervals
- Many measuring station configurations are possible for each individual application case
- System flexibility due to different options
- Different user levels protect from erroneous use of the unit and ensure that unauthorized users cannot operate the device

Software

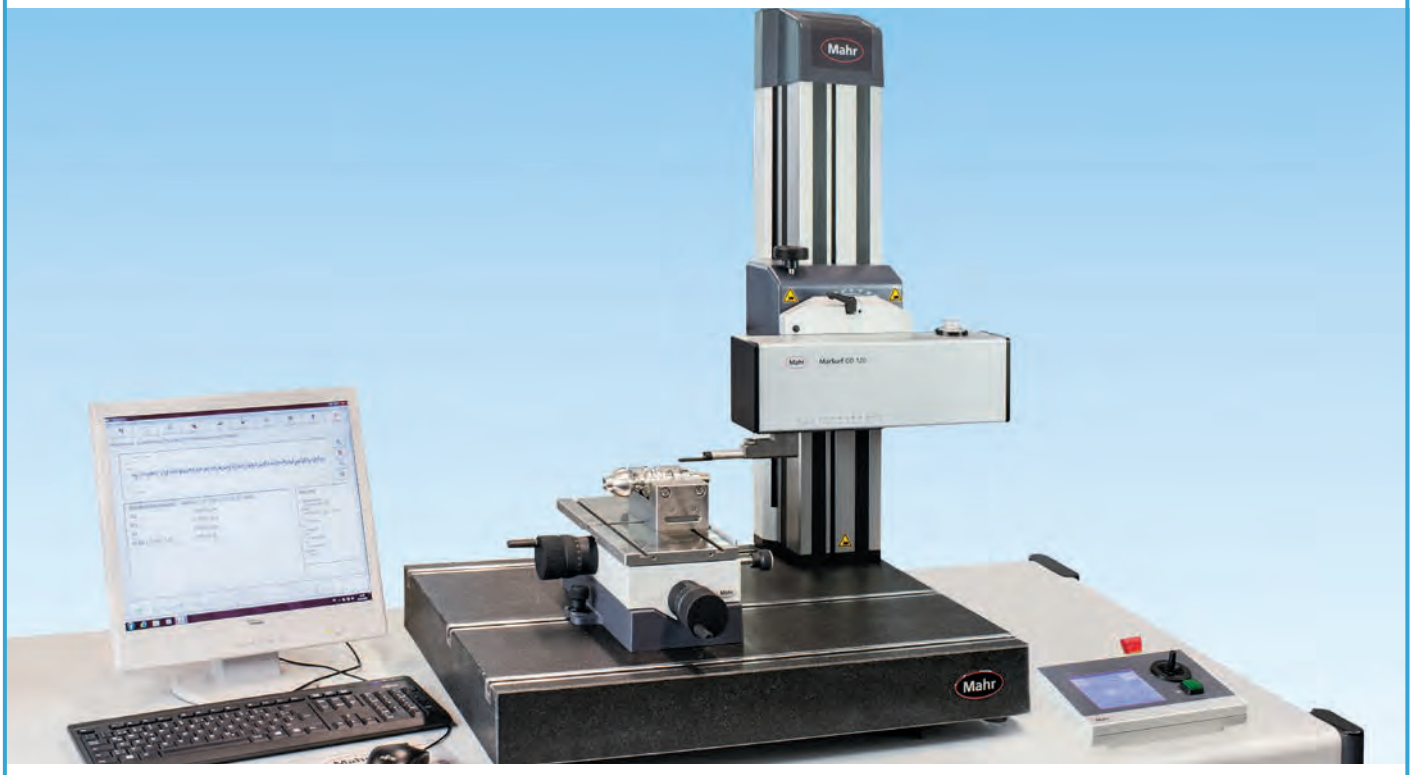
General software options
- Option - Dominant waviness (WDc) for MarWin
- Option - Parameters ISO 13565–3
- Option - QS-STAT / QS-STAT Plus
- Option - Profile processing
- Option - User-defined parameters
- Option - Contour 1 for MarSurf XR 1 / XR 20 (in connection with drive unit MarSurf SD 26)
- All options on one MLK (Mahr License Key)

Software options
- Option - Extended evaluation
- Option - Multiple measurements
- Option - Measuring record extensions
- Option - Integration of script programs
- Option - Digital I/O set

WebCode 20555

MarSurf XR 20

Roughness and waviness measurement made easy



Description

MarSurf XR 20 is the perfect unit for moving into top-flight surface metrology. This PC-based unit supplies all the common parameters and profiles in accordance with international standards, both in the inspection room and on the shop floor. The high-performance **MarSurf XR 20** is the fruit of decades of surface metrology experience combined with forward-looking technology, clear symbols and straightforward operating aids.

Features

- Over 100 parameters may be selected for R, P and W profiles as per ISO / JIS / ASME or MOTIF (ISO 12085)
- Tolerance monitoring and statistics for all parameters
- Fast creation of Quick & Easy measuring programs using Teach-in mode
- Comprehensive logging
- Automatic function for selecting standard-compliant selection of filters and traversing lengths (patented)
- Support for different calibration methods (static / dynamic) with specification of Ra or Rz parameter
- Adjustable servicing and calibration intervals
- Simulation mode to help users familiarize themselves with the system quickly
- Numerous measuring station configurations for customized applications
- Different user levels can be set up
- Flexible system thanks to various options and creation of customer-specific parameters
- Different user levels protect unit from operator error and ensure that no unauthorized users are able to operate the device

Accessories, Software Options

- Connection options for Mahr **GD 25**, **GD 120** drive units
- Software options
  - QS-STAT / QS-STAT plus
  - Dominant waviness
  - User defined parameters
  - Topography

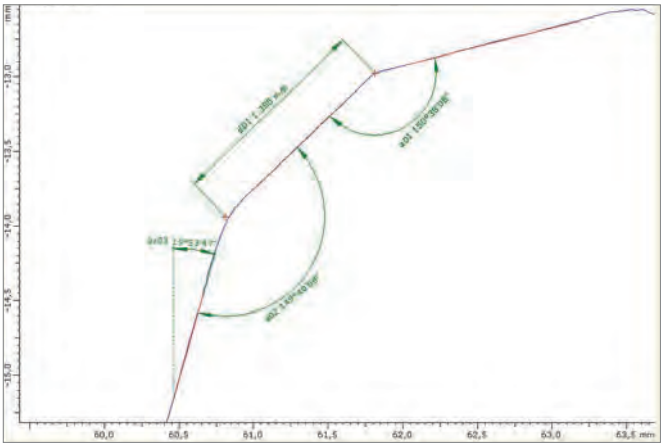
WebCode 20556, 20557

MarSurf XC 2

For entry-level, high-precision contour measurement

Description

Measuring and evaluating geometries of workpieces and tools that are relevant for correct functioning is one of the primary requirements of research, technology and industry. The fast, straightforward and cost-effective 2D contour measuring system is increasingly winning out over other systems. The tried-and-tested, user-friendly **MarSurf XC 2** is the best example of this. Not only does it meet all requirements in terms of accuracy and different evaluation criteria, it also delivers reliable results time after time.



Features

- Creates regression straight lines and circles
- Creates points, intersection points, free points, center points, maximum and minimum points
- Determines radii, distances, angles, coordinates and line form deviations
- Performs nominal/actual comparisons
- Tolerance monitoring
- Associative elements, i.e. immediate change of variables dependent on reference elements when changes occur
- User access rights using password protection prevents incorrect operation
- Excellent calibration procedure thanks to many years' experience, i.e. including geometry calibration, measuring force calibration, bend compensation, etc.
- Stability and rigidity of the probes
- The drive unit is very smooth-running, highly stable and extremely accurate

CD 120 Drive Unit

The **CD 120** drive unit has a patented probe arm mount for fast and flexible changing of probe arms without the need for tools. The calibration data for each probe arm is stored separately. It is also easy to calibrate several identical probe arms.

Features

- Max. measuring range of 120 mm (4.72 in) measuring length and 50 mm (1.97 in) measuring stroke
- Automatic lifting and lowering of the probe arm with adjustable speed
- Variable setting of measuring force from 1 mN to 120 mN
- High positioning speed
- Collision protection thanks to patented probe arm mount

The **MarSurf XC 2** can also be delivered optionally with the drive unit **PCV 200**.

Software

Software options:
- QS STAT / QS STAT plus
- Tangential elements
- Tangential elements (only XC 2)
- Topography

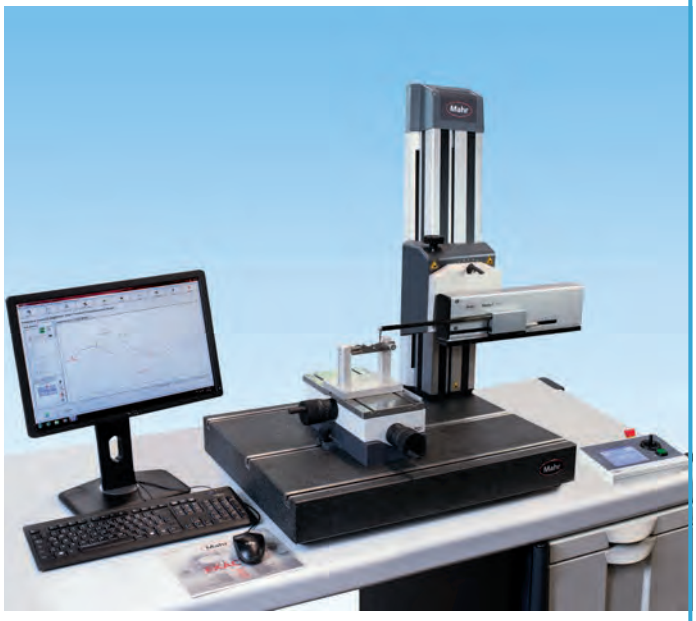
WebCode 20562

MarSurf XC 20

The new generation of contour measurement systems

Description

When it comes to contour evaluation, **MarSurf XC 20** is simply the best. What started over 30 years ago with the Conturograph – consisting of a drive unit and x-y plotter – has developed into a state-of-the-art contour measurement system with the very latest technology. This perfectly coordinated configuration of instruments meets the highest performance standards. Both the drive unit and the measuring stand are controlled and positioned using the reliable measurement and evaluation software.



Features

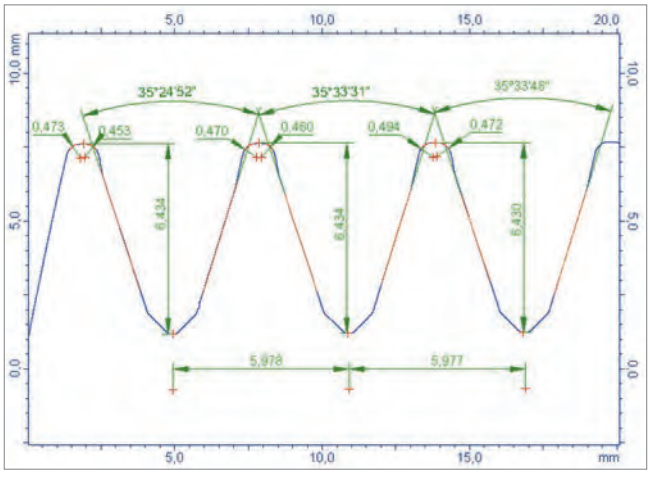
In addition to the functions of the **MarSurf XC 2** entry-level unit, **MarSurf XC 20** also provides additional features:

- Notes on the operating sequence can be displayed
- Interactive control elements support evaluations and automatic operating sequences
- Measurement of upper and lower contours with "twin stylus probe"; these contours can also be evaluated in relation to each other
- Creation of profile sections with evaluations of different parameters for each section
- Segmented measurement across obstacles such as bores or steep sides is possible
- Import of DXF files for nominal/actual comparison
- **PCV 200** drive unit with patented probe arm mount allows tool-free, reproducible changeover of probe arms
- Flexible measuring station thanks to patented probe system
- Manual, freely variable tracing forces also support flexibility
- Synthetic creation of nominal profiles from straight lines and arcs
- Straightforward comparison of nominal and actual profiles. Several ranges can be defined within a measured profile and each of these ranges can be assigned a different tolerance and different evaluations

Software

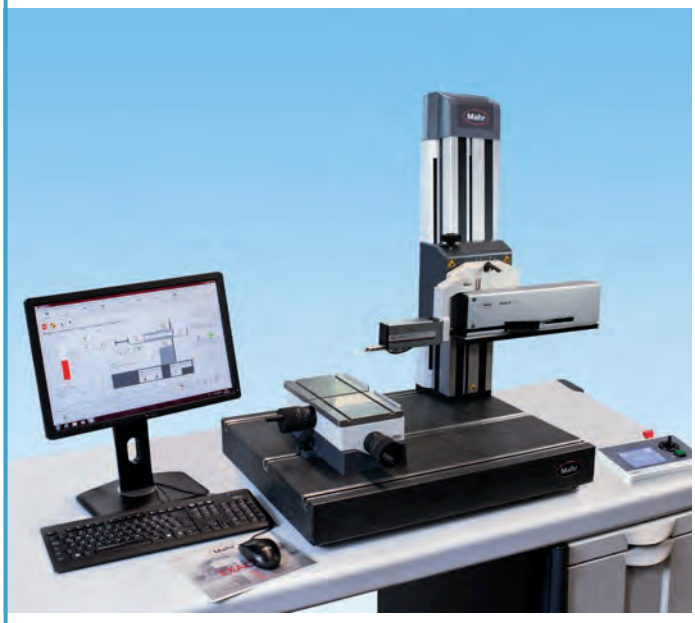
Software options:
- QS STAT / QS STAT plus
- Thread evaluation
- Topography XT 20
- Topography XT incl. MfM
- Topography XT incl. MfM plus

WebCode 20563



MarSurf XCR 20

The new generation of combined roughness and contour measurement systems



Description

MarSurf XCR 20 is ideal for combining contour and roughness depth evaluation.
Marsurf XC 20 + **MarSurf XR 20** = **MarSurf XCR 20**
This system includes absolutely everything you need, saving both time and space. There are separate user interfaces for the roughness and contour software. **MarSurf XCR 20** is **Mahr**'s top surface measurement system and enables even semi-automated operating sequences to be performed.

Versions

- Combimeasuring station with one measuring stand and two drive units (**PCV 200** and **MarSurf GD 25**)
- Combimeasuring station with quick-change mounts (**GD 120**, **PCV 200**)
- **MarSurf UD 130** enables high-precision contour and roughness evaluation on components

WebCode 20558

Features

- Saves space because both drive units (**MarSurf PCV 200** contour drive unit and **GD 25** roughness drive unit) can be adapted using the corresponding combi-mount on the **ST 500** or **ST 750** measuring stand
- Roughness and contour evaluations possible from a single measurement
- High-precision contour and roughness evaluation with the **MarSurf UD 130** measuring system on components requiring a large stroke and very high resolution
- Option of rapidly switching between roughness and contour measurements thanks to straightforward changeover within the software platform and changing of mechanical components such as drive unit and probe.

MarSurf UD 130 / LD 130 / LD 260

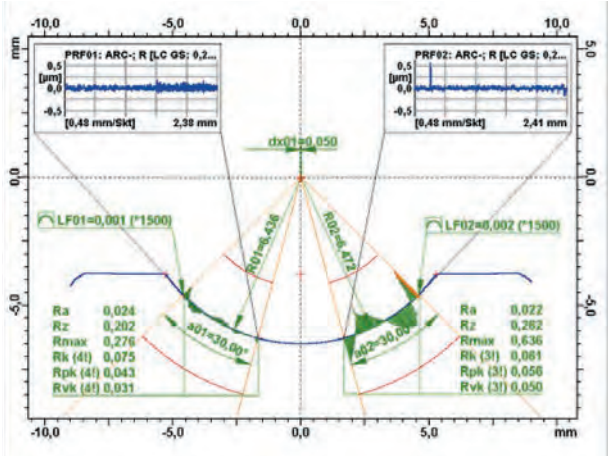
Two in one. Contour and roughness depth measurement in a single stroke

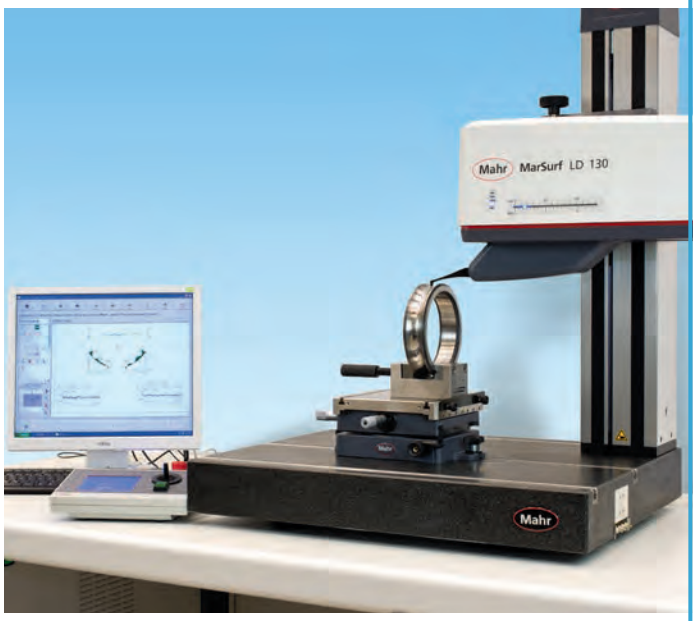
Description

MarSurf UD 130 / LD 130 / LD 260. The step into a new dimension
Combining contour and roughness measurements "in one stroke" can be excellently solved with the leading technology of Mahr measuring units. The measuring stations MarSurf UD 120, LD 130 and MarSurf LD 260 are characterized by consistent further development and integration of experiences gained from the first generation of units.

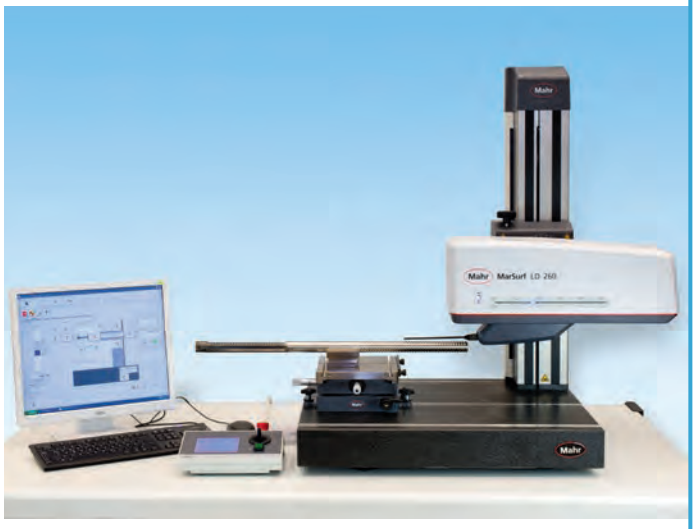
Features

- Large measuring range 130 mm / 260 mm
- Roughness and contour in one measurement
- High measuring and positioning speed greatly minimizes measuring time
- Innovative probe system solution
- Faster and secure exchange of probe arms with simultaneous probe arm recognition by the magnetic holder
- Long measuring path up to 260 mm (MarSurf LD 260) for a measuring stroke of 13 mm (and 100 mm probe arm length) or 26 mm (for 200 mm probe arm length)
- Service-friendly due to modular construction
- Maintenance possible without complete disassembly of measuring stand
- High measuring and positioning speed





MarSurf LD 130



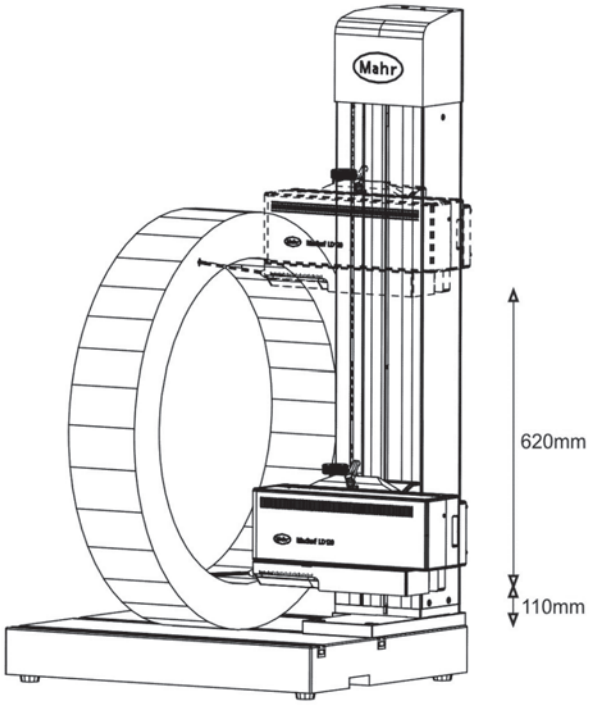
MarSurf LD 260

Versions

MarSurf UD 130 with measuring stand
Entry into the world of high-precision roughness and contour metrology by means of an integrated optical tracing system.

WebCode 20559, 20808, 20560

MarSurf Measuring Stand ST 750 D. Measuring Contours in New Dimensions



Sketch: UD 120 with ST 750 D

Description

Contour metrology from Mahr has been successfully used by hundreds of customers worldwide for decades. Due to many excellent customer solutions, many of them patented, contour metrology has undergone many important developments.

Mahr was the first manufacturer of contour metrology offering the possibility of measurements with a twin stylus with simultaneous switching of the measuring force. This makes it possible not only to measure contours in one tracing direction but also to perform upside down measurements, thus enabling pairs of opposed profiles to be recorded and set off against each other, for diameter measurements, for example.

Today we are proud to present to you a decisive development that builds upon these possibilities.

In connection with the measuring stand **MarSurf ST 750 D**, the measuring stations UD 130 /LD 130 / LD 260 as well as XC 20 CNC can use the entire measuring length of 620 mm of the vertical axis.

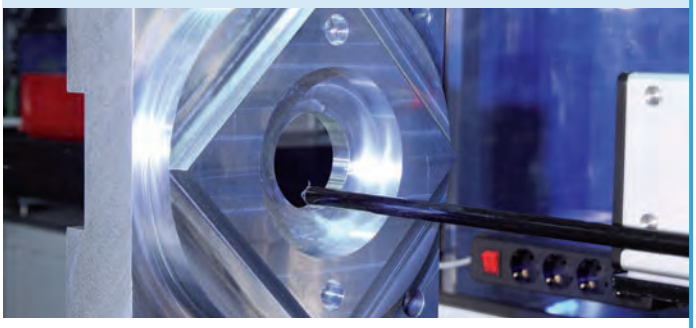
The greatly expanded measuring and evaluation possibilities result from the following basic principle and measuring procedure.

1. Measurement of the lower contour range "measuring force below"
2. Moving the slide on the measuring stand in the upper position.
3. Measuring the upper contour range "measuring force above"
4. Evaluation (distance, diameter) of the two profiles related to each other

By using a twin-stylus probe arm and the UD 130 / LD 130 / LD 260 or PCV drive unit, the individual contour areas are measured using a measuring program. After the geometries of the upper side of the ring have been measured, the slide of the measuring stand moves the drive unit down by the diameter range of the workpiece. Now the geometries of the lower side of the ring are measured.

An exact computation of the travel path of the slide on the measuring stand enables the reference dimensions of the upper and lower contour to be related to each other.

This enables the measurement of diameters, distances and contours in the range up to 620 mm.



Technical Data

Positioning length:	620 mm (deepest position approx. 110 mm above the granite plate)
Traversing length:	620 mm
Working temperature	21°C ±1° K [1]
Accuracy	
with UD 130 /LD 130 /LD 260	MPE ±(1.4 + L/100) µm L = measuring length in mm [2]
with PCV	MPE ±(2.5 + L/100) µm L = measuring length in mm [3]
Workpiece weight:	Up to 90 kg with XY table CT 200

1) A deviating working temperature can lead to a deviation in accuracy

2) With probe arm	item no. 6852008
3) With probe arm	item no. 9045820

MarSurf LD 130 Aspheric / LD 260 Aspheric

High-precision 2D / 3D Measuring Station for Measurement and Evaluation of Optical Components

Desription

An increasingly more compact and favorable system design is demanded on optical systems such as zoom lenses, optics for DVD drives and lenses in the cameras of mobile phones, for example. For this purpose, in addition to classic spherical lense shapes (sphere-shaped), the optics industry is increasingly producing aspherical (not sphere-shaped) lenses.

The evaluation program serves to analyze measurements on spherical surfaces with Mahr contour measuring units. Measured profiles are imported, the nominal form of the aspheres are defined and the residual error is determined compared to the nominal form.

The data of the determined differential profile is made available in a machine-readable format for readjustment of the processing machine (closed loop).

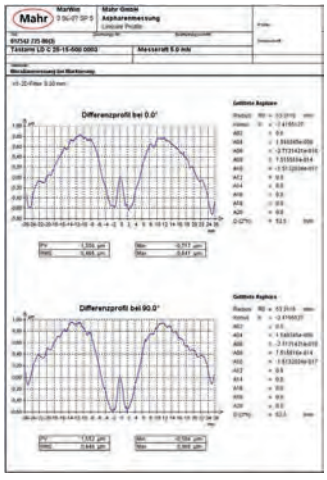
In comparison to the laser interferometer, the tactile measuring technology also allows 2D and 3D measurement of optically rough surfaces, so that testing and correction is possible already early on in the production process (grinding).

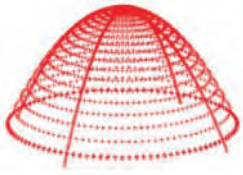
Measuring Principle

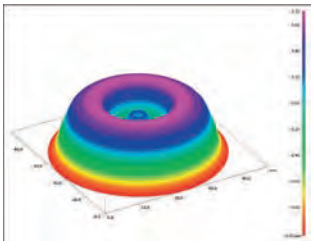
For a 3D measurement, two parallel linear profiles offset by 90° are measured across the zenith of the asphere. The several concentric circular profiles are gathered by turning the C-axis. These measured points are used to create the topography.

As the probe arms can be positioned automatically, i.e. lifted-off and contact, even discontinuous surfaces, e.g. with a hole in the center, can be measured.

The use of the machine in a vibration-damped enclosure keeps ambient influences such as vibrations and impurities away from the measuring object.







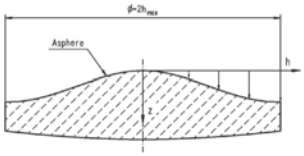
Asphere Definition

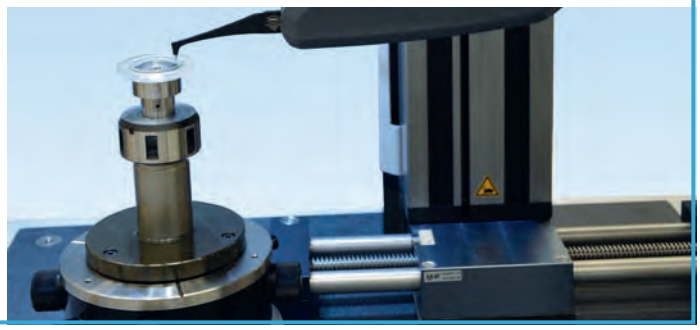
An aspherical surface is a refracting or reflecting surface which deviates from a spherical surface.

The mathematical description of the sagitta Z (dependance of the vertical height to the horizontal coordinates) of aspherical surfaces based on a conical section is given in the following equation:

$$z(h) = \frac{\frac{h^2}{R_0}}{1+\sqrt{1-(1+k)\left(\frac{h}{R_0}\right)^2}} + \sum_{n=2}^{5} A_{2n} \cdot h^{2n}$$

Ro = Radius of curvature
h = Radius of the area of application of the asphere
k = Conical constant
Ai = Aspheric coefficients

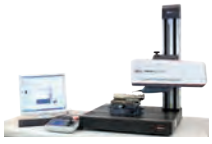




MarSurf Data Overview XR 1 / XR 20

	MarSurf XR 1	**MarSurf XR 20**
Parameters	Over 80 parameters for R-, P-, W-profiles as per current standards ISO/JIS or motif (ISO 12085)	Over 100 roughness, waviness, P-profiles and motif parameters
Probe	BFW skidless probes system with drive unit MarSurf SD 26 and/or skidded probe system PHT with drive unit MarSurf RD 18	MFW 250, R probe
Drive Unit	Skidless tracing - BFW-250 probe, skidded tracing - **RD 18, RD 18 C, RD 18 C2**	Usable GD 25, GD 120
Traversing length	**SD 26:** automatic; 0.56 mm; 1.75 mm; 5.6 mm; 17.5 mm; 56 mm; measure to stop; variable **RD 18:** automatic; 1.75 mm; 5.6 mm; 17.5 mm	Depending upon drive unit 0.56 / 1.75 / 5.6 / 17.5 / 56; Lt var 0.56 to 120.0
Measuring range	**SD 26:** ± 250 µm (with double probe arm length ± 500 µm **RD 18:** ± 350 µm	
Measuring force (in Z)	0.7 mN	
Resolution (Z)	±25 µm / 0,7 µm; ±250 µm / 7 µm; ±2500 µm / 50 µm	± 25 µm = 0.5 nm; ± 250 µm = 5 nm

MarSurf Data Overview UD 130 / LD 130 / LD 260



	MarSurf UD 130	**MarSurf LD 130 / LD 260**
Parameters	Roughness parameters, waviness parameters, P-parameters, see MarSurf XR 20	Roughness parameters, waviness parameters, P-parameters, see MarSurf XR 20
Contour elements	Radii, distances, angles, see MarSurf XC 20	Radii, distances, angles, see MarSurf XC 20
Probe	LP D 14-10-2/60	LP D 14-10-2/60 LP D 14-10-500
Drive unit	MarSurf UD 130	MarSurf LD 130 / MarSurf LD 260
Traversing length	0.1 mm to 130 mm	0.1 - 130 mm / O.1 - 260 mm
Measuring range	10 mm	13 mm (100 mm probe arm) 26 mm (200 mm probe arm)
Measuring force (in Z)	1 mN to 30 mN	0.5 mN to 30 mN, can be set by software
Resolution (Z)	2 nm	0.8 nm
Positioning speed	0.1 to 30 mm/s	0.02 mm/s up to 200 mm/s
Residual value when vt = 0.1 mm/s	Rz0 ≤ 40 nm	Rz0 ≤ 20 nm Rq0 ≤ 1 nm, typical

MarSurf. Data Overview XC 2 / XC 20

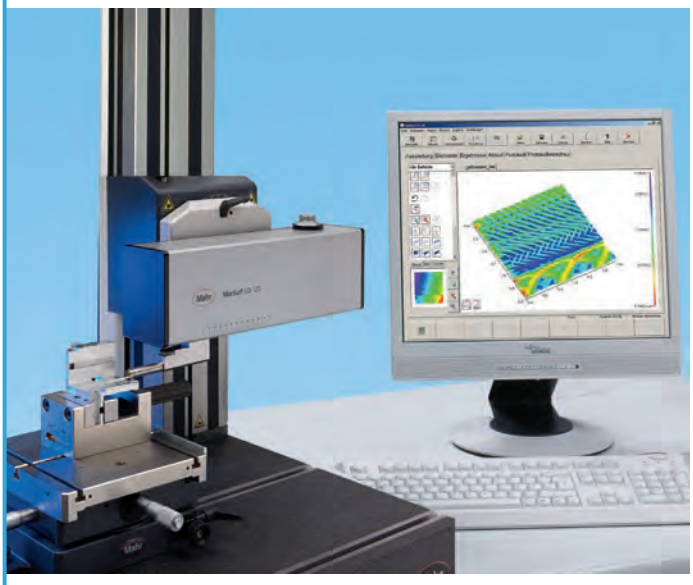
	MarSurf XC 2 / XC 20
Parameters	Radii, angles, distances, coordinates, fitting in of regression straight lines, best-fit circles, circle sections. Defining points, circles and circle sections and much more. Multiple measurements, double contours, DXF import (only XC 20)
Probes	350 mm probe arms, 175 mm probe arms complete with probe stylus tips
Drive unit	MarSurf CD 120 / MarSurf PCV 200 (only XC 20)
Traversing length	1 mm to 120 mm, 1 mm to 200 mm (only XC 20)
Measuring range	± 25 mm with 350 mm probe arm
Profile resolution	350 mm probe arm = 0,5 µm; 175 mm probe arm = 0,25 mm
Measuring force (in Z)	1 mN to 120 mN, variably adjustable
Dimensions (L x B x H)	Approx. 700 mm x 550 mm x 720 mm (of compl. meas. stand ST 500)
Weight of measuring station	Approx. 140 kg (with ST 500 meas. stand)
Power supply	230 V (or 115 V possible)

MarSurf WM 100 / CWM 100. Data Overview

	WM 100	**CWM 100**
Measuring principle	Interferometric, white light-interferometric light source (WLI): high-performance-LED, 505 nm	Interferometric, white light-interferometric and confocal light source (KFM and WLI): high-performance-LED, 505 nm
Measuring range	Sensor unit can be manually moved over 200 mm manually in Z Object table can be manually moved in X and Y Interferometer, white light-interferometric: Measuring range (WLI): up to 100 µm (vertically)	Sensor unit movable 100 mm in Z, CNC-controllable object table movable 100 mm in X and Y, CNC-controllable Interferometer, white light-interferometer light source (WLI): up to 4 mm (depending upon lens) Confocal microscope: Measuring range (KFM): up to over 800 µm (depending upon resolution in Z and lens)

MarSurf XR 20 with Topography XT 20

Upgrade to a powerful topography measuring station



Description

For some applications, a single tactile profile of the surface form is inadequate. 3D topographic representation and evaluation offers the opportunity to obtain more comprehensive profile information. The **MarSurf XR 20** measuring station can be turned into a topography measuring station both simply and cost-effectively, whether based on an order or an upgrade requirement. All that is needed in addition to the standard scope of delivery is a **CT 200-MOT** Y-drive for the **CT 200** XY table and the **MarWin XT 20 software**.

Measuring Station Components

As described on pages 15-17 to 15-21, plus:

Topography measuring station extension

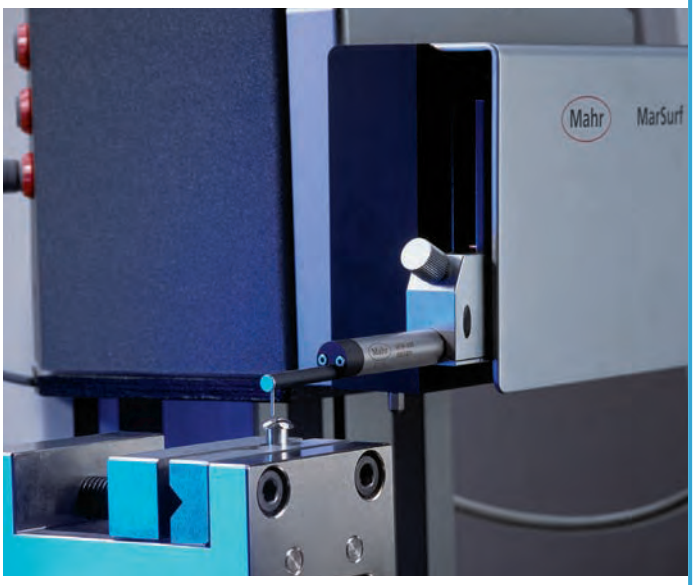
MarSurf XT 20 software	**Order No. 6299034**
CT 200-MOT Y-drive	**Order No. 6710548**

CT 200-MOT Technical Data

CT 200-MOT technical data as for CT 200 but with motorized Y-drive

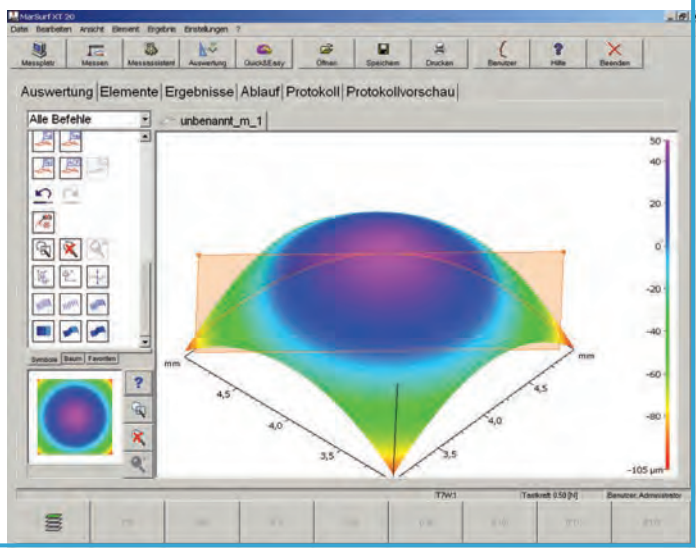
Adjustment path in Y	17.5 mm (0.7 in)
Resolution	0.375 µm (15 µin)

3D measurement of molds for use in the medical industry



Description

In the case of molds for items such as contact lenses, the surface topography is also of interest in addition to the individual profile for determining the roughness depth. The form and surface roughness depth over the entire topography range are critical when it comes to product function.



MarSurf CNC *modular*

Description

Beginning with a standard surface measuring station, by adding additional table axes and a measuring enclosure it can be turned into a convenient, semi-automatic CNC measuring station.

- Plug and play configuration between control
- Easy to operate via MarSurf
- "Clever" universal concept for workpiece mounting and clamping
- Minimal training required

Delivery scope:
- Measuring station MarSurf XR 20 with GD 120
- alternatively: Measuring station MarSurf XC 20 with PCV
- alternatively: Measuring station MarSurf LD 130 / LD 260
- Including midrange control CNC
- Measuring stand MarSurf ST 500 / 750 CNC
- Manual control panel MCP 21

Optional table axes
- T1S-L linear axis 200 mm
- T1S-R rotational axis
- T3S-LLR 3 table axes consisting of 2 linear and one rotational axis

Optional measuring enclosure

Accessories:

Table plate with clamping ball adapter and universal clamping plate.

Upgrade from a standard measuring station to MarSurf CNC *modular*.

Technical Data

T1S-L linear axis
Including control moduel for midrange CNC
Adjustment range 200 mm
Dimensions 510 mm x 200 mm x 200 mm
Load 50 kg

T1S-R rotational axis
Including standard mounting plate and control module for midrange CNC
Usable as TA- or TC-axis
Dimensions 270 mm x 200 mm x 210 mm
Load 30 kg

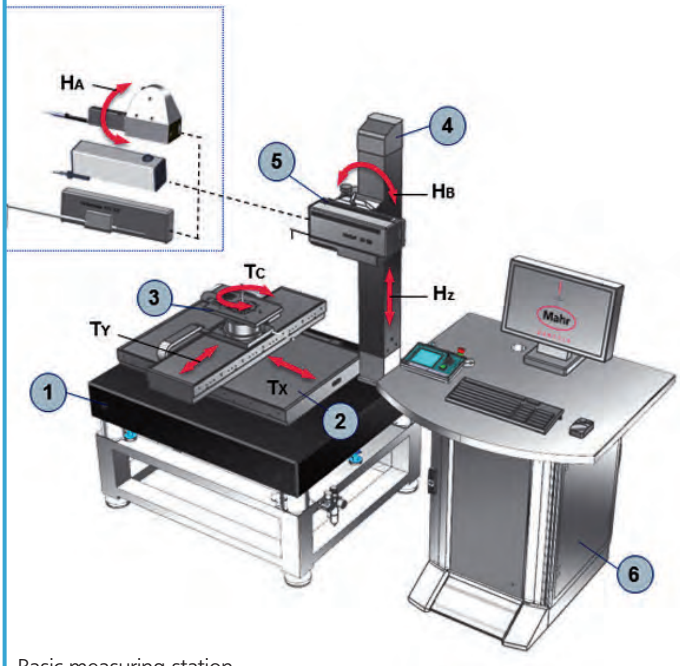
T3S-LLR 3-axis combination
Including standard mounting plate and control module for midrange CNC
Multi-axis, monolithic construction from the axes TX-TY-TC
Load 30 kg

Applications

Measuring on the shop floor
- Palette measurements
- Topography measurements
- Multiple measuring points on one part without reclamping
- Automatic alignment of the X-axis
- Universal measuring station for various measuring tasks
- Automatic zenith search

WebCode 20569

MarSurf CNC *premium*



Basic measuring station
1. Base with regulation (pneum.)
2. Table axes
3. Adapter plate
4. Measuring column
5. Drive unit, adapted to the measuring task
6. Work station with accessories

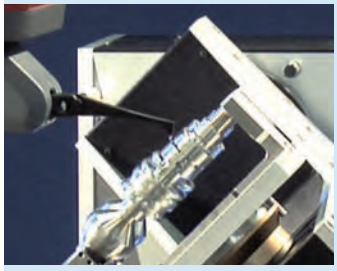
Description

The MarSurf CNC concept offers the high quality solution in fully automatic production processes for roughness depth and contour measurements.
With this measuring station concept, Mahr has set standards worldwide. Complex measurement tasks can be performed reliably and process-safe fully automatically without operator influence.
In conjunction with the probe arm changing unit, fully automated processes are possible even in complex diverse measurement tasks without operator influence by manual probe arm exchange.

A coordinated component program from various motorized table and and auxiliary axes as well as the proven drive units and probe systems are the ideal basis for an optimal solution.

With the Mahr software platform MarWin you are using a sophisticated, modular, cross-product control and evaluation system that provides the necessary flexibility and process reliability especially for CNC operation.

Probe arm changing unit TWE
Up to 10 different LD probe arms can be changed fully automatically.



Your advantages with MarSurf CNC *premium*
- Universal machine concept for the automatic measurement of workpiece contours and roughness depths
- Based on the size of the workpiece, the workpiece weight and the geometry, appropriate models and an optimally suited table and auxiliary axes system provide the basis for the measuring station configuration.
- An environmentally-suited enclosure system including the necessary security modules is available
- In addition to the manual workpiece loading, an automatic loading station can be configured

Application

Automotive industry
- Injection technology components
- Motor parts: cylinder heads, cylinder block, crankshaft, camshaft, conrod
- Automatic transmission
- Rack/steering nut
- Brake system components

MarWin Software

Description

The software platform MarWin gives the user the possibility to use a service that is characterized by ease of operation and various measuring and evaluation criteria. Standardized symbols, clearly structured operation processes even for different applications, an explicit regulation of user rights, are only some of the many features that make it easier for the user.

Operation is made easier with clearly recognizable symbols. Since many operators create measuring procedures according to their own priorites, symbols can be selected as favorites. Help can be activated for the selected symbol at any time.

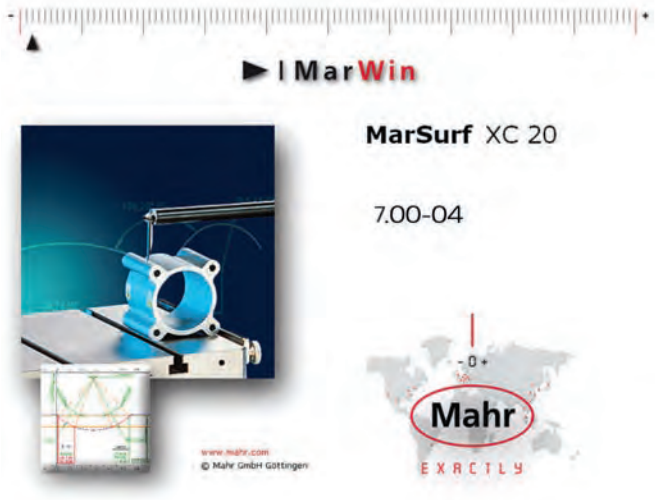
The setting of the measurement conditions, the positioning of the probe in the "loading position" as well as measuring position and the positioning after the measurement together wtih all conditions are configured in the "measuring assistant".

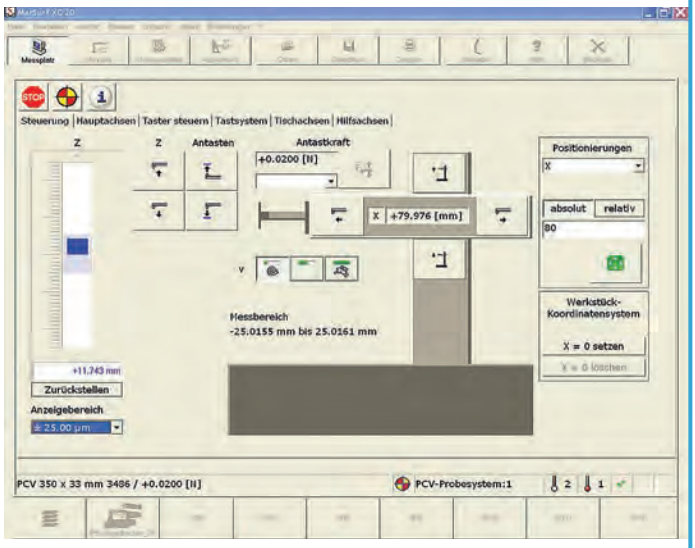
Multiple measurements, notes during a measurement procedure and much more are provided in easily manageable operation procedures.

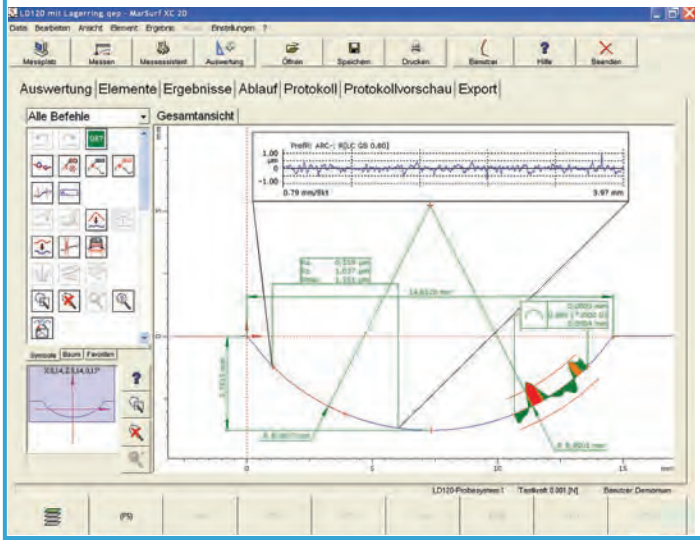
Top technology even in the software
Years of further development of the contour-roughness depth software and topography software with the possibility to select additional interesting options give the user access to one of the most high performing platforms worldwide.

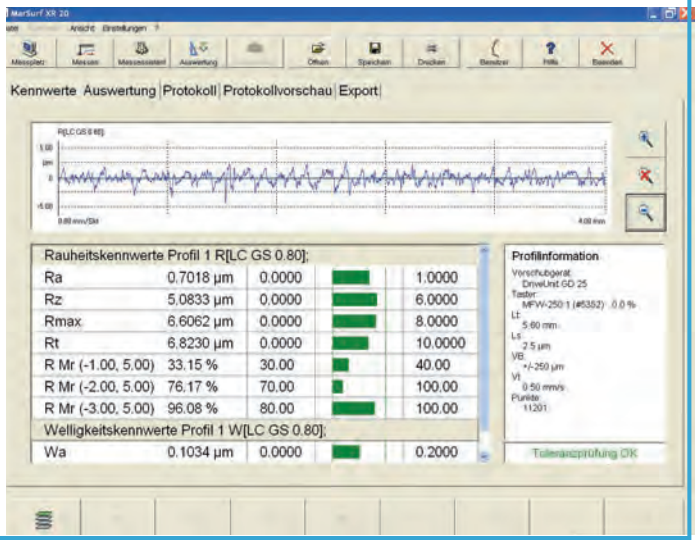
Thanks to an easily understandable user interface, the steps of the measuring and evaluation procedures can be carried out quickly and in a user-friendly manner.

Expansion options
like Data Export QS STAT, Thread Evaluation and others are available.



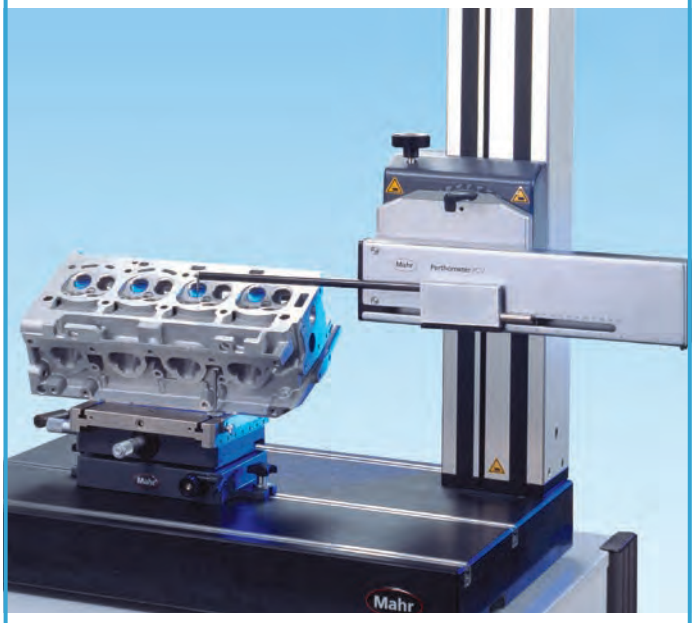






MarSurf PCV 200 Drive Unit

Contour drive unit



Description

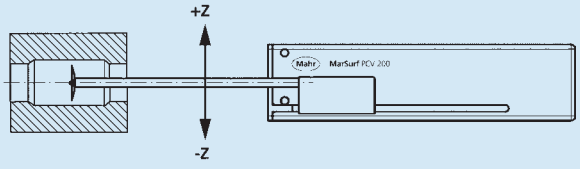
The **PCV 200** contour drive unit supports measuring paths of up to 200 mm (7.87 in).

Many contour measurement tasks, e.g. calculating double contours using the twin stylus, can be performed in conjunction with the **MarSurf XC 20** software.

Features

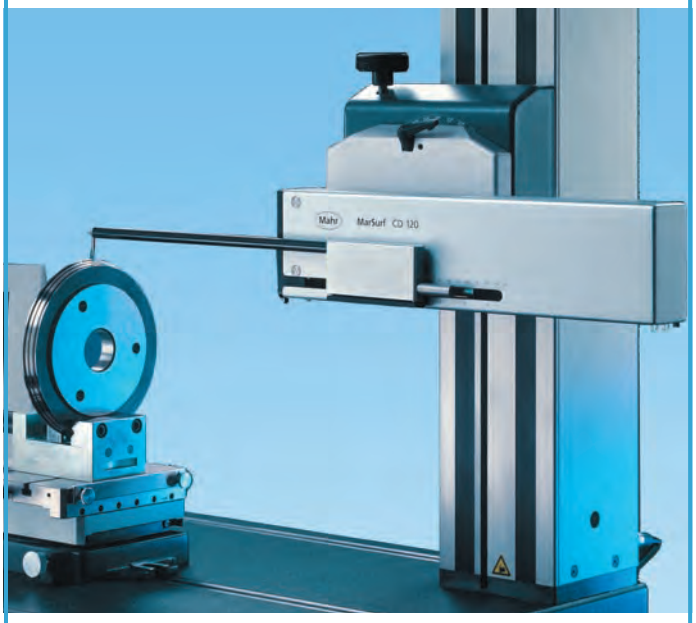
- Probe arm collision protection thanks to patented probe arm mount
- Programmed measuring run with lifting and lowering of the probe arm and positioning
- Selection of different measuring speeds ranging from 0.2 mm/s to 4 mm/s (0.008 in/s to 0.16 in/s)
- Variable setting of measuring force from 1 mN to 120 mN
- Measuring force remains constant over the entire measuring range

The drive unit supports a large number of probe arms of different shapes and sizes.



MarSurf CD 120 Drive Unit

Contour drive unit



Description

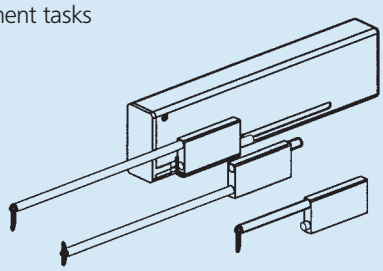
The **CD 120** contour drive unit is based on the technology of the **PCV 200** drive unit. It measures contour elements such as radii, distances, angles, etc. simply and precisely.

In conjunction with the **MarSurf XC 2** software, it constitutes the basic contour measurement unit.

Features

- Automatic lifting and lowering of the probe arm with adjustable speed
- Probe arms available for bores larger than 2 mm (0.079 in)
- Selection of different positioning speeds ranging from 0.2 mm/s to 10 mm/s (0.008 in/s to 0.39 in/s)
- Variable setting of measuring force from 1 mN to 120 mN
- Patented probe arm mount for reproducible probe arm exchange without the need for tools

The use of complete probe arms, each with their own separately stored calibration data, allows the evaluation system to switch between different measurement tasks quickly and flexibly.

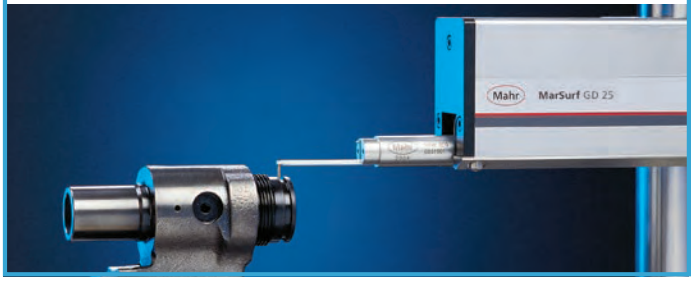


MarSurf GD 25. Drive Unit

The standard drive unit for surface measurements

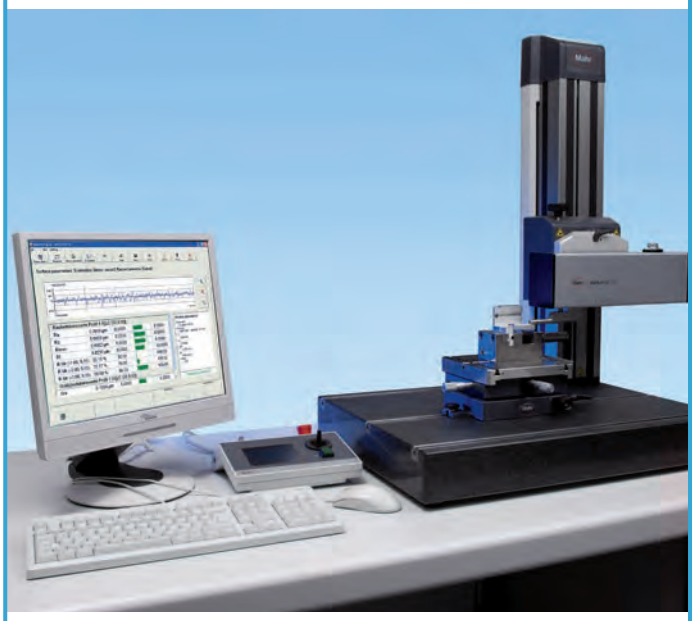
Description

This unit provides excellent straightness precision and smooth running over a measuring length of 25.4 mm (1 in). A patented motorized height adjustment accessory ensures the probe is positioned in the range of 4 mm (0.15 in) and enables motorized probe zero setting. The MFW 250 B skidless probe can be used along with all probes of the R series.



MarSurf GD 120. Drive Unit

The high-precision drive unit of the new generation



Description

In addition to high-precision roughness measurements, the **GD 120** drive unit is used for waviness measurements over long traversing lengths of up to 120 mm (4.72 in). Patented motorized probe zero setting over 10 mm (0.39 in) saves both setup work and time. The drive unit optionally supports problematic measuring positions such as transverse or vertical tracing using simple, adaptable probe mounts. The **GD 120** allows precise positioning on the X-axis. In addition to very quiet running (residual value Rz < 30 nm/0.1 mm/s), this unit offers fast probe clamping and also protects the unit by means of a collision protection device on the probe mount.

MarSurf. Accessories

Probes for virtually any application

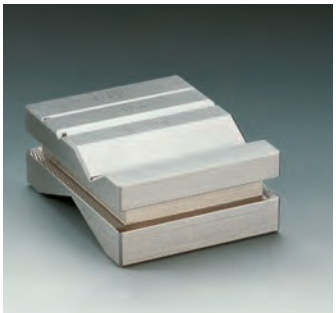
1 Probe head
2 Probe arm protection with skid
3 Probe arm protection without skid
4 Probe arm
5 Probe arm
6 Probe arm

Probe system MFW 250 B

Probe system with magnetic holder principle for probe arms. The MFW probe system can be used as a skidless or skidded probe. It is distinguished by the following characteristics:

- low linearity deviation (< 1 %),
- high resolution (100,000-/200,000: 1),
- large measuring range (± 250 µm).

Double length tracing arms enlarge the measuring range to ±500 µm.
The simple tracing arm interchange ensures a particularly wide field of application. The rugged, rigid design avoids natural vibration.



Accessories

Depending upon the measuring task, different accessory components, parallel vices or prisms can be ordered.

XY table CT 300 **Order No. 6710530**
Table surface 300 mm x 150 mm
XY-adjustment by 25 mm each using micrometer caliper.
C-axis adjustable by ± 2.5° for highly precise workpiece alignment

XY table CT 120 **Order No. 6710529**
for mounting and aligning workpieces.
Can be adjusted in two coordinates by 15 mm (.591).
Table surface: 120 mm x 120 mm (4.728 in x 4.728 in) with two brackets.

PP vee-block **Order No. 6710401**
with four different prisms for mounting axis-symmetrical workpieces with diameters from 1 mm to 160 mm.
Incl. clamping springs for holding light workpieces in the prism.

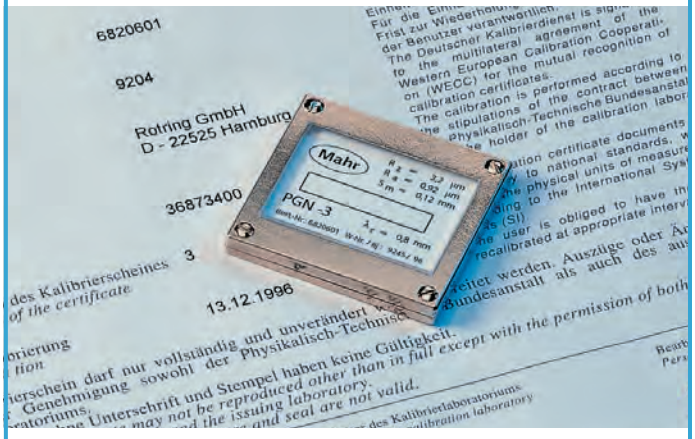
PPS parallel vice **Order No. 6710604**
for clamping measuring objects

Parallel vice **Order No. 6710631**
for clamping small workpieces
Jaw width 32 mm
Dimensions (L x W x H): Approx. 130 mm x 32 mm x 40 mm

Parallel vice with joint **Order No. 6710632**
Parallel vice with angled foot
axis can be swiveled
by ±45° **Order No. 6710633**

PGN Geometric Standard

DIN EN ISO 5436 type C1 sinusoidal groove profile



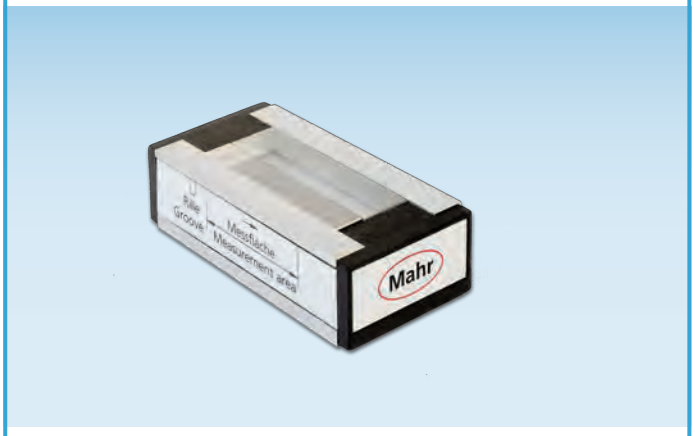
Surface roughness standard with a sinusoidal groove profile. Profile depth approx. 3 µm (120 µin), groove spacing approx. 0.12 mm (.00472 in). For checking the roughness measuring station. The following types are available:

PGN 1 Profile depth approx. 1.5 µm, groove spacing approx. 0.10 mm
PGN 3 Profile depth approx. 3 µm, groove spacing approx. 0.12 mm
PGN 10 Profile depth approx. 10 µm, groove spacing approx. 0.20 mm

DAkkS/DKD and Mahr calibration certificate upon request.

MSS-3 Surface combination standard

DIN EN ISO 5436 type A1 surface combination standard



Surface measurement standards are used for dynamic adjusting and calibrating the vertical profile components of surface texture measuring instruments. The optical flat is needed to determine vibrations of the measuring station and verify the straightness deviation of the drive unit's datum plane. Sine-wave periodic profiles are for testing the drive speed and motion.

DAkkS/DKD and Mahr calibration certificate upon request.

PRN 10 Geometric Standard

Turned roughness profile

With Mahr calibration certificate. Roughness standard with turned profile, chromed.
Profile depth approx. 10 µm (.394 µin). For checking the roughness measuring station. Ra, Rz, Rmax.

KN 100 Contour Standard

Standard for test contour measuring systems

The contour standard **KN 100** was developed in cooperation with the PTB. Testing for confirmation and acceptance purposes can now be conducted traceable back to the PTB due to concrete reference to realistic geometries.
The standard fulfills the requirements of the VDI/VDE guidelines 2629.

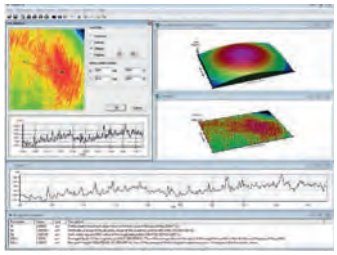
MarSurf. Optical metrology from Mahr

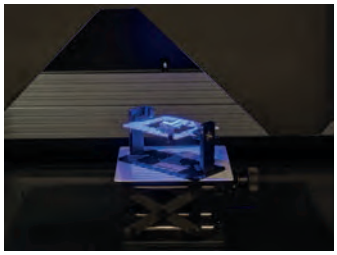
3D measuring systems for surface analyses and component geometries

►I In addition to tactile metrology, optical metrology has become important, especially in recent years. Reasons for choosing visual inspection of workpieces are manifold:

- No damage or deformation on soft or liquid surfaces
- No wear of the sensing elements
- Time gained by area measurements and also evaluation of new standardized area parameters
- Statistically reliable results of heterogeneous surfaces with no clearly defined machining directions
- Fast and complete measurement of component geometries

With Mahr as your metrology partner you get the solution that is right for you. Decades of experience with both tactile as well as optical sensors give you the guarantee to get reliable results with the suitable device. I◄





WebCode 20564

MarSurf CWM 100

Description

The high-precision, computer-controlled optical measuring instrument **MarSurf CWM 100** with subnanometer resolution. A combined 3D measurement system consisting of a confocal microscope and white light interferometer.

- Universal suitability for technical, optical and reflective surfaces, and surfaces of printed circuit boards and semiconductors and biological tissues
- 2D surface analysis and measuring evaluation
- Topographic 3D surface analysis and measuring value evaluation
- Fast measurements – short measuring times
- Microscopic image field dimensions, easily extendable with fully automatic stitching process
- Automatic table and object positioning: 100 mm x 100 mm, longer distance upon request
- Large selection of objectives enables ideal adaptation to the measuring object
- Solid construction with granite base plate and granite column for best vibration damping
- Professional evaluation software based on MountainsMap©

Delivery scope

- Sensor system, consisting of:
  - Confocal microscope KFM with 6x objective turret
  - Camera 768 pixel x 582 pixel, up to 48 images/s
  - CNC-controlled Z-axis with integrated Heidenhain glass scale
  - WLI software module, software "Inspector"
- Granite base and column with sensor system and CNC-controlled object table
- Motorized mutli-axis control for Z-axis and XZ table for sample positioning and image field merging
- Objective 50x0.8 EPI (confocal microscope)
- Objective 20x0.4 DI (white light interferometer)

Applications

Mechanical engineering
Metallic surfaces of all types (ground, rolled, etc.), also laser-textured surfaces, ceramic and plastic surfaces, surfaces of molds

Medical industry
Metallic, ceramic and plastic surfaces of implants, prostheses and instruments.

Electronics industry
Surface analysis of coatings, measurement and analysis of electronic and semiconductor components.

Optics industry
Form and roughness analysis of diverse optical components (all materials).

Accessories

Tilting table CT 120, biaxial
Angle adjustment table +/–30°
Set of standards
Confocal microscope:
KFM objectives 10x0.5; 20x0.75; 50x0.6 with 11 mm wd; 50x0.8; 100x0.9 and many more
White light interferometer:
WLI objectives 2.5x0.075; 5x0.13; 10x0.3; 20x0.4; 50x0.55; 100x0.7
Vibration damping
With optional active vibration damping for optimum damping of vibrations for measuring in the nanometer and subnanometer range.

Technical Data

Measuring principle	Interferometric, white light-interferometric and confocal light source (KFM and WLI): high-performance-LED, 505 nm
Measuring range	Sensor unit movable 100 mm in Z, CNC-controllable object table movable 100 mm in X and Y, CNC-controllable Interferometer, white light-interferometer light source (WLI): up to 4 mm (depending upon lens) Confocal microscope: Measuring range (KFM): up to over 10 mm (depending upon resolution in Z and lens)

WebCode 20566

MarSurf WM 100

Technical Data

Measuring principle	Interferometric, white light-interferometric light source (WLI): high-performance-LED, 505 nm
Measuring range	Sensor unit can be manually moved over 200 mm manually in Z Object table can be manually moved in X and Y Interferometer, white light-interferometric Measuring range (WLI): up to 100 µm (vertically)

Accessories

Tilting table CT 120, biaxial

Angle adjustment table +/–30°

Set of standards

White light interferometer:
WLI objectives 2.5x0.075; 5x0.13; 10x0.3; 20x0.4; 50x0.55; 100x0.7

Vibration damping
With optional active vibration damping for optimum damping of vibrations for measuring in the nanometer and subnanometer range.

Description

The high-precision optical measuring unit **MarSurf WM 100** subnanometer resolution and measuring accuracy. A 3D white light interferometer measuring system.

- Universal suitability for optical and reflective surfaces, fine technical, surfaces as well as surfaces of printed circuit boards and semiconductors and biological tissues
- 2D surface analysis and measuirng evaluation
- Topographic 3D surface analysis and measuring evaluation
- Fast measurements - short measuring times
- Manual table and object positioning in up to 4 axes
- Large selection of lenses enables the ideal adaptation to the measuring object
- Sturdy construction with granite base plate
- Professionelle Auswertesoftware auf Basis von MountainsMap©

Delivery scope:
- Sensor system consisting of:
  - WLI Sensor head
  - Camera 768 pixel x 582 pixel, up to 48 images/s
  - 100 µm Z-axis with Piezo drive
  - WLI software module, software "Inspector"
- Granite base and column with manual Z-positioning of the sensor system
- Manual XY-objective table for sample positioning
- Objective 20x0.4 DI (white light interferometer)

Applications

Mechanical engineering
Fine metallic surfaces of all kinds (ground, rolled, etc.) also laser-structured surfaces, fine ceramic and plastic surfaces, surfaces of molds.

Medical industry
Metallic, ceramic and plastic surfaces of implants, prostheses and instruments.

Electronics industry
Surface analysis of coatings, measurement and analysis of electronic and semiconductor components.

Optics industry
Roughness analysis of diverse optical components (all materials).

WebCode 20565

MarSurf Topography Software XT 20, MfM, MfM plus

Description

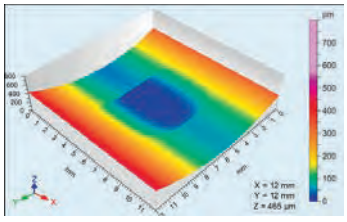
Surface structures that are functionally relevant can often only by assessed and evaluated when depicted as a 3D topography.

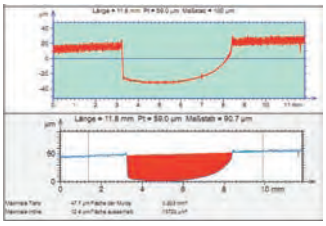
With the surface evaluation options **MarSurf XT 20, MarSurf MfM** and **MfM plus** you receive optimally tailored topography packages that can be used with tactile as well as optical metrology.

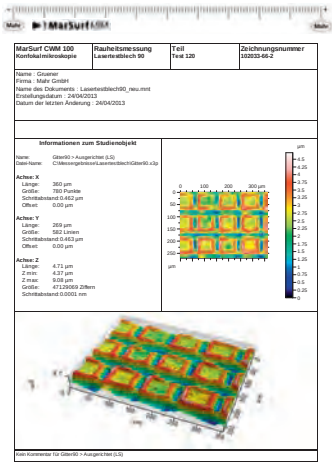
The easy availability of different depiction types, such as:
- 2D depiction of tracing section
- 3D topographical image
- false-color depiction
- photo-realistic depiciton
  and much more

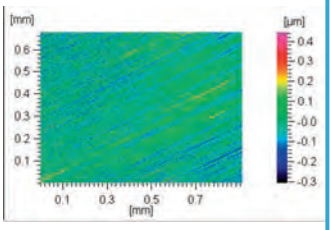
enable a comprehensive and clear evaluation of the surface structure.

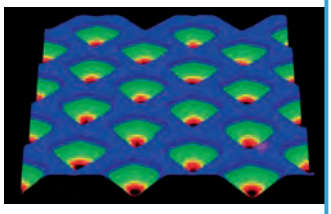
For topographical evaluation, wear testing is also required.
Not only 2D parameter but also 3D height parameter and volume parameters are needed to reliably analyze wear.











The essential evaluation features of the software MarSurf MfM and MfM plus

MarSurf MfM

Basis
Documentation
8 languages
Tolerances

Depiction and evaluation
Photosimulation
False color view
3D view
Abbott-Firestone curve
3D basic parameter

Evaluation
Include / exclude zones
Zoom, symmetries, rotations
Surface substraction
Repair surface
Merge surfaces
....

MarSurf MfM plus

Basis
Documentation
8 languages
Tolerances

Depiction and evaluation
Photosimulation
False color view
3D view
Abbott-Firestone curve
3D basic parameter

Auswertungen
Include / exclude zones
Zoom, symmetries, rotations
Surface substraction
Repair surface
Merge surfaces
FFT
Auto correlation
Intercorrelation
Special filter methods
3D advanced parameters
3D motif evaluation
Peak count distribution
Spectral analysis
Island volume
....

IN OUR VIEW, FORM DEVIATION IS NOT A QUESTION OF PERCEPTION. **THAT IS WHY WE HAVE MARFORM**

The latest information on MARFORM products can be found on our website: **www.mahr.com, WebCode 20575, 20570, 21052**

► | To ensure the problem-free functioning and durability of a workpiece, the key factors are its dimensions and, above all, its form. Requirements in terms of roundness, flatness, straightness, coaxiality or run-out – particularly when it comes to axis-symmetrical workpieces – are becoming increasingly tough. These requirements can only be reliably tested and met using high-precision formtesters optimized for this specific purpose. Whether you are dealing with fuel injection technology, microelectronics, precision mechanics or medical technology, the key functional components are becoming ever smaller and ever more precise. To enable the production department to take advantage of the specified tolerances, measuring uncertainty must be kept as low as possible. MarForm helps you to cut process costs without increasing testing costs thanks to stable, innovative instruments with the highest possible level of automation, flexibility and precision. MarForm offers the ideal solution for all requirements. | ◄

MarForm. Form Measuring Instruments

Formtesters

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Reference Formtesters

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MarForm. Formtesters for a Wide Range of Applications

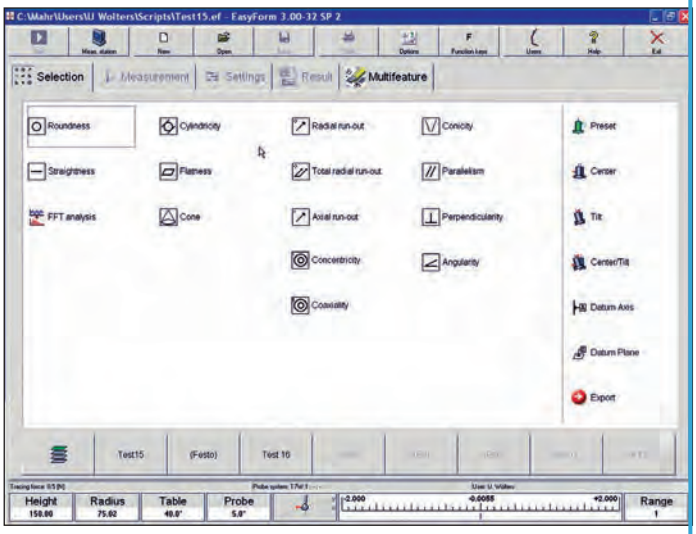
FORM MEASURING INSTRUMENTS FOR THE WORKBENCH OR INSPECTION ROOM

► | There are many aspects of our daily lives where we need to be able to rely on technical components functioning correctly. Take for example the ABS braking system, injection system or gearbox of a car, the drive of a PC, the compressor in an air-conditioning system, the blade of an electric razor or the landing flaps of an aircraft. For the moving components to function efficiently over long periods of time, it is vital they work together smoothly. To ensure this is the case, axis-symmetrical workpieces with narrow tolerances from the ideal are needed. Compliance with these tolerances can only be verified reliably using precision formtesters that have been specifically optimized for this application. MarForm helps you to cut process costs without increasing testing costs thanks to stable, innovative instruments exhibiting the highest possible precision. MarForm offers the ideal solution for all requirements. | ◄

MarForm MMQ 100

The Formtester with the simplest operation

Formtester MarForm MMQ 100



EasyForm

(1) (1) (1) (1)

Features

The MarForm MMQ 100 Formtester offers outstanding accuracy in a robust package designed for use in production environments. Used in combination with EasyForm software, it represents the perfect solution for performing measurement tasks simply, yet effectively.

- Precise and fast measurement results
- Reliable thanks to mechanical bearings
- Large measuring volume
- Mobile due to its low weight and convenient size
- Fast computer-assisted workpiece alignment
- Centering and tilting screws for rough and fine adjustment
- Universal and reliable
- Suitable for use on the shop floor as no compressed air connection is required
- No keyboard or mouse required
- Digital encoders in Z and X transmit the measuring position directly to the software

The **MMQ 100** can also be operated from a laptop, thereby enabling mobile use. All you need is a power outlet!

Optimized for the most frequent form measuring tasks

- Roundness (also in a section)
- Flatness (from a circle)
- Concentricity
- Coaxiality
- Radial run-out
- Axial run-out
- Plane parallelism from opposite circles
- Fourier/waviness analysis

Versions

MMQ 100 with EasyForm as a powerful, PC-based evaluation system running on Windows®7 offers informative color records with easy-to-use software for evaluation of form and positional tolerances (DIN ISO 1101) such as roundness, roundness sector, radial run-out, axial run-out, concentricity, coaxiality, flatness(1), straightness(1), parallelism(1) and perpendicularity(1).

The **MMQ 100 EasyForm measuring station** comes complete:

Form Measuring Station MMQ 100
consisting of:
MarForm MMQ 100 with
digital encoders in X/Z and with T20W probe
Measuring and operating software EasyForm
PC Intel class, Windows 7 Ultimate 64 bit
24" TFT monitor

Options for MMQ 100:
Advanced Form for comprehensive evaluations, based on EasyForm
17" Touch-Screen monitor

Mahr Data Transfer Tools for simple transfer of measuring results into statistical evaluation programs such as QS-STAT or MS Excel.

Request a brochure or see WebCode 20571

(1) from either a single or several polar traces

MarForm MMQ 150

The MMQ 150 - The entry into the world of cylindricity metrology

Features

An overview of the most important features of the MMQ 150:

- High-precison roundness measuring machine (C)
- Motorized vertical measuring axis (Z)
- Motorized horizontal positioning axis (X)
- Manual centering and tilting table
- Manual lenth measuring probe T20W
- Ergonomic operating panel enables the activation of selected measuring programs (P1, P2, P3)
- Compact, space-saving construction
- All-in-One touchscreen PC
- Easy to use and intuitively learnable software EasyForm

Options

- Rim chuck Ø 100 mm
- Various other clamping devices
- Option commutator evaluation
- Option Velocity Analysis
- Probe arms with different length and probe ball geometries
- Various double probe arms
- Various calibration standards
- Various unit tables, also with vibration compensation

Description

The MMQ 150 is an automatic measuring machine for the testing of form and location tolerances:

- Use in production or measuring room
- Fast and easy operation
- Measuring accuracy, optimized for cylindricity tolerances
- Reduces number of rejected parts, saves time, lowers production costs
- Maintenance-free, high-precision mechanical bearings

The MMQ 150 measuring station offers you a complete system solution for the monitoring of form and position tolerances for the quality assurance of your products. The MMQ 150 was designed for accuracy, speed and easy operation, all in a very compact const-ruction. Only highly precise, maintenance-free mechanical bearings are used, thus eliminatng the need for regular maintenance and exchange of compressed air components.

The use of mechanical air bearings havebeen successfully used for many years in other Mahr formtesters, such as the table formtester MMQ 400 and reference formtester MFU 100. The interplay of rotary table axis and vertical axis have been optimized in such a manner, that the MMQ 150 is especially suited for the meaurement of cylinder form tolerance deviations. The operating and measuring software EasyForm is very easy to used and can be intuitively learned. No programming knowledge is required in order to perform a simple measurement with measuring record in only a few steps. With the help of the teach-in programming included in the software, program runs with a user-defined complete measuring record can just as easily be created. The created measuring programs can easily be activated via the user interface with the 32 freely available operation keys or the 3 freely configurable program keys on the operation panel of the MMQ 150.

Applications

- Roundness
- Concentricity / Coaxiality
- Cylindricity
- Radial run-out
- axial run-out
- Total radial run-out (from circular traces) (1)
- Straightness
- Parallelism
- Perpendicularity (from a circular trace) (1)
- Angularity
- Flatness (from a circular trace) (1)
- Conicity
- Taper
- Fourier analysis

MarForm MMQ 200

The MMQ 200 is the standard form measuring instrument for both your shop floor and precision inspection rooms

Description

Characteristics of MarForm MMQ 200

- High-precision roundness measuring axis (C)
- Motorized measuring axis vertical (Z)
- Motorized positioning axis horizontal (X)
- Manual tilting and centering table
- Manual length measuring probe T20W or
- Motorized probe T7W
- Ergonomic control panel, also starts selected measuring programs (P1, P2, P3)

Versions

MarForm **MMQ 200** is available in two versions.
As a measuring station with the universal measuring probe **T20W** and as a measuring station with the motorized measuring probe **T7W**, allowing for an additional level of automation due to its unique motorization.
The **MMQ 200** is operated with the software **EasyForm.** Operation takes place with touchscreen technology and is thus also for the mouse operation unique and easy.

Form measuring station with T20W
- Formtester MarForm MMQ 200
- Length measuring probe T20W, manual, with probe arm
- Measuring and operating software EasyForm
- PC Intel class, Windows 7 Ultimate 64 bit
- 24" TFT monitor
- Deskjet printer with cable
- Rim chuck with diameter of Ø 100 mm

Form measuring station with T7W
- Formtester MarForm MMQ 200
- Motorized length measuring probe T7W with probe arm
- Measuring and operating software EasyForm
- PC Intel class, Windows 7 Ultimate 64 bit
- 24" TFT monitor
- Deskjet printer with cable
- Rim chuck with diameter of Ø 100 mm

Options:
- 17" touchscreen TFT monitor instead of 24" standard TFT monitor
- Option roughness measurement and evaluation with MMQ 200/T7W
- Software AdvancedForm (expanded functionality and programming)
- Different clamping devices
- Probe arms with different lengths and probe ball geometries
- Different double probe arms
- Different calibration standards

Request a brochure or see WebCode 20573

Features

The **MMQ 200** features a high-precision motorized Z column, opening up a whole new dimension in form metrology compared to the roundness measuring instrument **MMQ 100.**

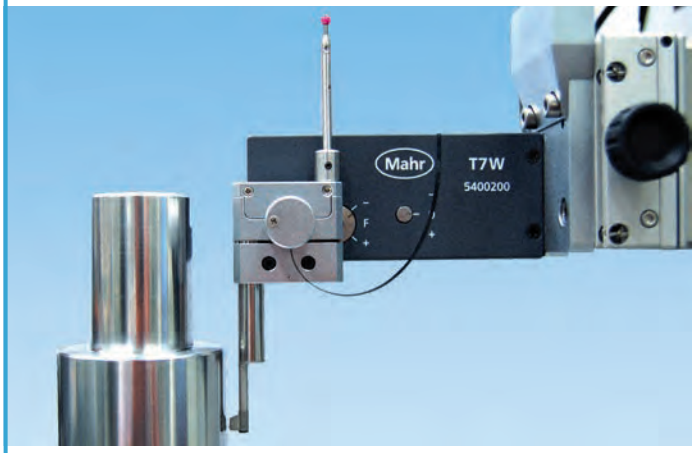
The Formtester **MarForm MMQ 200** fully-automatically determines the following form and location deviations as per DIN/ISO 1101 so that you can verify the quality of your products:

- Roundness
- Straightness
- Flatness (from a single polar trace)(1)
- Parallelism
- Conicity
- Concentricity, coaxiality
- Run-out, total radial run-out
- Cylindricity
- Taper
- Perpendicularity (from a single polar trace)
- Pitch
- Angular sector (from roundness, flatness or run-out)
- Evaluation of straightness sections

(1) from either a single or several polar traces

MarForm MMQ 400-2

The MMQ 400-2 is the universal form measuring machine for both your shop floor and precision inspection rooms



Option Roughness Measurement

Combine the testing of form and location tolerances with roughness parameter monitoring.
Document typical roughness parameters such as R_a and R_z while testing the form of your workpieces with a **MarForm MMQ 400-2**, without having to set up the workpiece on a different measuring station.

The motorized, program-controlled change between the form probe arm with ruby ball and the roughness probe arm PHT 6-350 makes it possible. Without user intervention, the corresponding probe arm is automatically positioned from the vertical contacting position to the horizontal one. The motorized swivel axis of the form probe T7W is used here for positioning the probe arm unit in increments of 1°.

Features

The **MMQ 400-2** is the universal measuring machine for extensive workpiece evaluation as per DIN ISO 1101. High-precision measuring axes in Z and X make every form measurement task possible.
MarForm MMQ 400-2 for:
- High-precision workpieces
- Unusually long workpieces
- Large and heavy workpieces
- Use in production environments or precision inspection rooms

The **MarForm MMQ 400-2** is available in five versions which are designed to meet your requirements and solve any of your measuring tasks.
- Motorized or manual centering and tilting table
- Vertical axis (Z) with measuring length of either 500 mm (19.67 in) or 900 mm (35.4 in) and horizontal axis (X) with measuring ength of 280 mm (11.02 in) or
- Vertical axis (Z) with measuring length of 350 mm (13.78 in) and horizontal axis (X) with measuring length of 180 mm (7.09 in)
- With digital position decoders in the linear axes X and Z for best reproducability of measurements.

Your **MarForm MMQ 400-2** is available as a semi-automated measuring station with manual centering and tilting table or as a fully automated measuring station which, in conjunction with a motorized centering and tilting table and T7W probe, is perfect for the high-precision testing of your parts without any operator intervention.

Motorized Form Probe T7W

The **T7W** probe is fitted with a motor-driven rotational axis. This makes it possible to move the probe arm in steps of less than one degree to the required contacting position. Measurements can be performed on the generating surfaces and end faces. As a zero position probe, the **T7W** can also switch automatically between internal and external measurements or between end face measurements from above and below without operator intervention. Fully automatic measurement processes on complex workpieces can be carried out without operator intervention too.

The probe arms of the **T7W** are exchangeable. Its motor-driven rotational axis enables the construction of "multi-point probe arm units" - i.e. probe arm units with a variety of contacting elements - making it possible to switch between different stylus ball geometries within a single measurement run.

Request a brochure or see WebCode 20574

MarForm Overview of Standard Form Measuring Machines

Formtester	**MMQ 100**	**MMQ 150**	**MMQ 200** Z= 250 mm	**MMQ 400-2** Z = 350 mm/ X = 180 mm / Z = 500 mm/ X = 280 mm	**MMQ 400-2** Z = 900 mm X = 280 mm
Roundness measuring unit, C-axis					
Roundness deviation (µm+µm/mm meas. height)**	0.05 + 0.0006	0.03 + 0.0006	0.03 + 0.0006	0.02 + 0.0005	0.02 + 0.0005
Roundness deviation (µm+µm/mm meas. height)*	0.025 + 0.0003	0.015 + 0.0003	0.015 + 0.0003	0.01 + 0.00025	0.01 + 0.00025
Axial run-out (µm+µm/mm meas. radius)**	0.04 + 0.0006	0.04 + 0.0006	0.04 + 0.0006	0.04 + 0.0002	0.04 + 0.0002
Axial run-out (µm+µm/mm meas. radius)*	0.02 + 0.0003	0.02 + 0.0003	0.02 + 0.0001	0.02 + 0.0001	0.02 + 0.0001
Centering and tilting table	manual	manual	manual	man. / autom.	autom.
Table diameter (mm)	160	160	160	285	285
Table load, centric (N)	200	200	200	600	400
Revolutions per minute (rpm) 50 Hz / 60 Hz	5 / 6	1 to 6	1 to 15	1 to 15	1 to 15
Vertical straightness measuring unit, Z-axis					
Positioning path (mm)	300, manual		-	-	-
Measuring path motorized (mm)	-	250	250	350 / 500	900
Straightness deviation /100 mm meas. path (µm)**	-	0.4	0.15	0.15	0.15
Straightness deviation /total meas. path (µm)**	-	1	0.3	0.3 / 0.4	0.4
Parallelism deviation Z-/C-axis in tracing direction (µm/mm)	-	1	-	0.5 /350 / 0.8/500	2 / 900
Measuring speed (mm/s)	-	0.5 to 20	0.5 to 5	<0.1 to 10	<0.1 to 10
Positioning speed (mm/s)	-	0.5 to 50	0.5 to 100	<0.5 to 100	<0.5 to 100
Horizontal straightness measuring unit, X-axis					
Positioning path (mm)	man. 180.	mot. 150	mot. 150	-	-
Measuring path, motorized (mm)	-	-	-	180 / 280	280
Straightness deviation/100 mm meas. path (µm)**	-	-	-	0.4 / 0.8	1.5
Straightness deviation /total meas. path (µm)**	-	-	-	0.8/180 / 0.8/280	1.5
Perpendicularity X-/C-axis (µm)	-	-	-	1/180 / 2/280	2
Positioning speed (mm/s)	-	0.5 to 30	0.5 to 30	<0.5 to 30	<0.5 to 30
Measuring speed (mm/s)	-	<0.5 to 10	<0.5 to 10	<0.5 to 10	<0.5 to 10

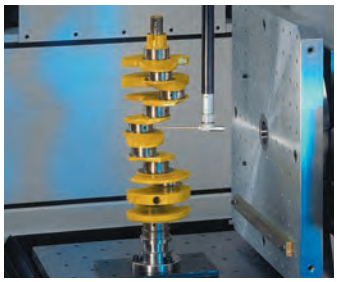
* Values as max. deviation from reference circle LSC, filter 15 upr.

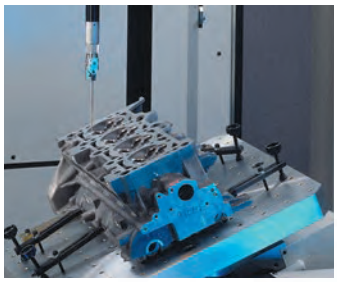
** All values acc. to DIN ISO 1101 at 20 °C ±1 °C in oscillation-neutral environment, filter 15 upr LSC or 2.5 mm LSS, 5 rpm or 5 mm/s and standard probe arm with ball Ø 3 mm. Tested on a standard using compensation algorithms.
Due the vast variety of Formtester types and variants, only a few machines are described as examples. Technical data of "your" MMQ can be received from Mahr upon request.

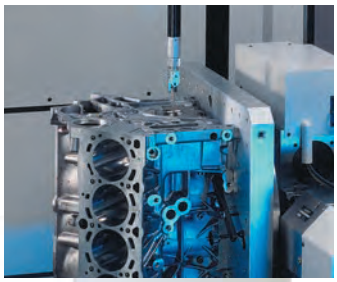
MarForm. The Reference Machines for Form and Positional Tolerances

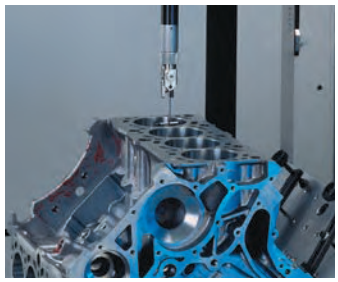
OUR MOST ACCURATE FORM MEASURING INSTRUMENTS EVER

► | **High-precision form measurements cut costs!** MarForm is the name of our ultra-precise form measuring systems. They can be used wherever there is a need to obtain information about the geometry of workpieces with very narrow tolerances. ISO 1101 describes roundness, cylindricity, straightness, parallelism etc. as form and positional deviations. These features are all monitored by Formtesters. The high precision of form measuring instruments cuts costs because the tolerance ranges are no further narrowed by the uncertainty of the measuring machine but can be fully exploited in production. With MarForm, you have a high-precision roundness and cylindricity measuring instrument at your disposal. | ◄









MarForm MFU 100

Taking reference form measurement to a new level

The road from high-precision measuring axes to reliable measurements is often a long one – and no instrument is better suited for this purpose than the **MFU 100**. Only the **MFU 100** has integrated reference elements for real-time spatial compensation of geometrical deviations and therefore records all profiles as high-precision 3D coordinates.

For decades, MarForm measuring instruments have been renowned for their precision and stability. The new **MarForm MFU 100** was developed with the objective of testing the form and positional features of parts with measuring volumes of a liter cost-effectively in a production environment. Our many years of experience have taken the new **MFU 100** to a new level.

With the **MarForm MFU 100**, you have a high-precision measuring instrument at your disposal whose extremely low measuring uncertainty increases the tolerance range in production environments and thus cuts production costs.

Features

The **MarForm MFU 100** comes complete with:

- Roundness axis, circular (C)
- Motorized centering and tilting table (X, Y, A, B)
- Straightness measuring axis, vertical (Z)
- Straightness measuring axis, horizontal (X)
- Tangential multi-function axis (Y)
- Motorized probe T7W
- MarWin evaluation software for form and positional features

All the axes are coordinated to ensure maximum measuring certainty.
The horizontal X-axis extends beyond the center of the workpiece, therefore making it possible to test the "true parallelism" free from other measuring influences.
The tangential Y-axis is a new and innovative feature. For conventional formtesters. It makes it possible to locate the zenith of very small workpiece geometries automatically and free from user influence. This means that the actual precision measurement can be started at exactly the right location, thus significantly increasing the process accuracy.

In addition, the tangential Y-axis, in combination with the vertical Z-axis and the horizontal X-axis, enables you to determine the workpiece diameter. At a unique price/performance ratio, this axis makes it now possible to verify tolerances in the sub-µm range according to standards using the maximum material principle.

In combination with the machine electronics, high-resolution digital scales ensure a level of positioning quality that makes it possible to test even the smallest component geometries.
The **MarForm MFU 100** is also ideally suited to scanning surfaces.

The **MarWin** software package offers the complete range of functions you would expect from a modern measuring and evaluation software package, including attractive records and electronic documentation in your corporate network.

Due to the deliberate separation of control and evaluation, the **MarForm MFU 100** is future-proof and expandable.
New language versions, special evaluations and new standards can all be incorporated with ease. The **MFU 100** has also been designed to accommodate sensors developed in the future.

In short, the **MarForm MFU 100** represents a new generation of reference form measuring instrument for precision inspection rooms and production environments.

The new **MarForm MFU 100 WP** is also available with an optional optical sensor to alternate with the T7W (motorized).

Request a brochure or see WebCode 20576

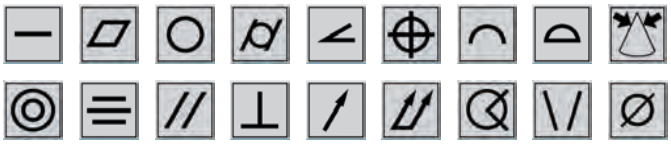
MarForm Overview Reference and Large Formtesters

Formtester	MFU 100
Roundness measuring device, C-axis	
Roundness deviation (µm+µm/mm meas. height)**	0.02 + 0.0004
Roundness deviation (µm+µm/mm meas. height)*	0.01 + 0.0002
Axial run-out deviation (µm+µm/mm meas. radius)**	0.04 + 0.0004
Axial run-out deviation (µm+µm/mm meas. radius)*	0.02 + 0.0002
Resolution (interpolated)	0.0001°
Centering and tilting table	automatic
Table diameter (mm)	180
Table load capacity, centric (N)	200
Speed (rpm) 50 Hz/60 Hz	0.1 to 15
Vertical straightness measuring unit, Z-axis	
Measuring path (mm)	320
Straightness deviation /100 mm (µm)**	0.1
Straightness deviation /200 mm (µm)**	0.2
Straightness deviation / measuring path (µm)**	0.3
Parallelism deviation of Z-/C-axis in tracing direction (µm)	0.6
Measuring speed (mm/s)	0.1 to 50
Positioning speed (mm/s)	0.1 to 50
Positioning uncertainty (µm) with probe return positioning	1
Positioning uncertainty (µm) (total positioning P to VDI 3441)	2
Resolution (interpolated) (µm)	0.001
Horizontal straightness measuring unit, X-axis	
Measuring path (mm)	190
Straightness deviation /100 mm (µm)**	0.15
Straightness deviation /meas. path (µm)**	0.3
Perpendicularity of X/C-axis (µm)	0.3
Measuring speed (mm/s)	0.1 to 50
Positioning speed (mm/s)	0.1 to 50
Positioning uncertainty (µm) with probe return positioning	1
Positioning uncertainty (µm) (total positioning P to VDI 3441)	2
Diameter measuring accuracy (µm)	0.2
Resolution (interpolated) (µm)	0.001
Horizontal straightness measuring unit, Y-axis	
Measuring path (mm)	6
Straightness deviation (µm/5 mm, filter 0.25 mm)	0.5
Perpendicularity Y-/X-axis (µm)	1
Resolution (interpolated) (µm)	0.005

* Values as maximum deviation from reference circle LSC, filter 15 upr.
** All values in accordance with DIN ISO 1101 at 20 °C ± 1 °C in vibration-free environment, filter 15 upr LSC or 2.5 mm LSS, 5 rpm or 5 mm/s and standard probe arm with ball dia. 3 mm.
Tested on a standard using compensation algorithms.

MarForm MFK 500 and MFK 600

The reference form measuring centers for laboratories and inspection rooms



MFK form measuring center for comprehensive workpiece assessment
MFK formtesters are particularly suited to testing engine blocks, cylinder heads, gearboxes, hydraulic components, crankshafts and camshafts.
Generous, optimized construction ensures high measuring accuracy over the entire machine volume. Large measuring and travel paths enable easy and safe changing of workpieces.

The **MarForm MFK 600** and **MFK 500**, made from coordinated components, offer flexibility and can be adapted for a wide range of metrology applications.

The formtester has a distortion-free granite base which is oscillation-isolated. Its high-precision horizontal surface forms the reference plane for the measuring setup. The workpiece mounting table carries and guides heavy workpieces over the granite surface using air bearings.

Features

- Universal form measuring station with large measuring volume for heavy workpieces
- The **MFK 600** has 5 measuring axes and 2 (4) alignment axes for measuring form elements and determining positions
- The **MFK 500** has 3 measuring axes and 4 alignment axes for measuring form elements
- Rotating probe and automatically positioned workpieces for easy use and quick setup
- Low maintenance and able to handle continuous loads thanks to air bearings
- Collision-protected probe systems for a wide range of measurement tasks
- Large workpiece mounting area for large individual workpieces or pallets holding several workpieces
- Roundness measuring unit with automatic adjustment to the diameter of the workpiece even if the position is eccentric
- Straightness measurements in 3 main coordinate directions
- ISO 1101-compliant workpiece evaluation
- Testing in machine and workpiece coordinates in line with manufacturing requirements
- Comprehensive evaluation of form and positional features, diameters and positional values
- A wide range of accessories and probes offer an optimum solution for all measurement tasks
- Easily expandable with additional axes of movement for rotating workpieces while the program is running. This means that highly complex measurement tasks, such as those required for V engine blocks, can be performed without operator intervention

Roundness measuring unit
In addition to the measuring spindle (C-axis), the roundness measuring unit includes an axis for automatically adjusting the probe to the workpiece diameter (X-axis). When performing roundness measurements, the X-axis positions the probe such that it tracks the contour of the workpiece, even it its eccentricity error exceeds the probe measuring range.

Straightness measuring unit
The vertical straightness measuring unit (Z-axis) guides the roundness measuring unit along a granite surface. With the **MFK 600**, the accuracy of the horizontal straightness measuring unit (T_x- and T_y-axes) is not affected by the workpiece's size, form or weight because the guides are separated from the supporting air bearings. With the **MFK 500**, the T_x/T_y-axes of the motorized centering and tilting table are also used as positioning axes.

The alignment axes (T_a and T_b) are integrated in the workpiece mounting table and can automatically align workpieces mechanically within the machine volume.

Measuring capacity
Automatic alignment functions integrated in measuring runs allow continuous operation. Recording and processing measured values in parallel cuts the measurement time. The form measuring station's range of applications is extended by a comprehensive range of accessories.

Request a brochure or see WebCode 20580.

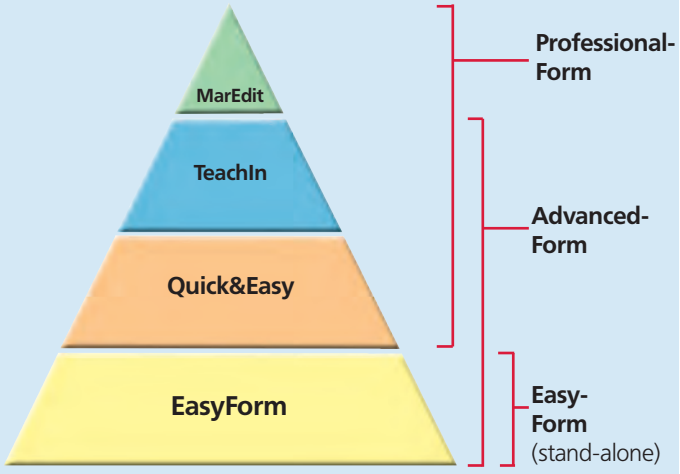
MarWin. Software Modules for MarForm

AdvancedForm gives you total control over your form measuring station. You can perform positioning, alignment, measurement or documentation tasks with a click of the mouse – and the graphical user interface gives you a constant overview.

As with other Windows® applications, functions can be selected from menu bars with pull-down menus using the mouse.

Many functions, such as printing results, loading measuring programs or changing a program step, can be activated simply by clicking the appropriate icons.

With **AdvancedForm** you always have complete control over the form measuring station. For example, you can track the profile during measurement and intervene if necessary. Operation can be adapted to suit individual requirements, regardless of whether you want to perform a quick single measurement, conduct a program run on a series part or convert a complex measurement task into a measuring program. **AdvancedForm** provides the ideal operating strategy whatever the task. Given that tasks can vary a great deal, no operating strategy is exactly right for every application.



Consequently, **AdvancedForm** provides several different operating strategies:

- **Measuring run preferences**
  for measurement with an existing measuring program.
- **Quick&Easy**
  for rapid measurement, obtaining a measuring result quickly with the minimum of effort.
- **Teach-in programming**
  for creating, modifying and running a measuring program with a large number of options.
- **MarEdit (optional)**
  the operating level for applications engineers and trained specialists, to solve the most challenging and complex of tasks.

AdvancedForm provides a clear overview of all the required measuring and evaluation parameters. Many of these parameters have default settings which simply have to be confirmed for the majority of measurement tasks. It is, of course, also possible to adapt individual parameters to the relevant task.

AdvancedForm has a powerful **teach-in programming** function to create measuring programs for workpieces that are to be measured repeatedly. It can also be used for measuring runs with special positionings, measurements, evaluations and forms of presentation.

With teach-in programming, as soon as you click the mouse on an icon – e.g. for a run-out measurement and evaluation – a window opens where you can describe the feature in more detail if necessary (e.g. radial or axial run-out, datum, brief designation, tolerance, etc.). The number of measurements and their type (measurement or re-evaluation of profiles already measured) are also specified in this window. Separate windows can be opened to change measuring, evaluation and display parameters but in many cases this is not necessary because logical defaults that apply to a large number of measurement tasks have already been entered.
If different settings are required for specific measurement tasks, the clearly structured window helps you to quickly find what you are looking for and optimize the settings in no time at all.

The layout of a measuring record, for example, can be modified right down to the finest detail. The color of the profile, reference line and borders can be selected individually; the scaling (in µm/µin per scale division), the type of graph (polar or linear, centered or uncentered) and the additional display parameters can be set in any combination you choose.

Measuring programs for series parts to be measured repeatedly can be saved and called up at any time to start a measuring run (see above).

Informative profile graphs – if required with several profiles in a single graph, displayed in different colors and in different ways – are then immediately available on the large color screen. If you are looking for exact numerical values, you can opt to display the results in a table.

With the new **AdvancedForm**, standards-compliant measurements and evaluations are displayed in a way which is both clear and representative.
Even interactive layout options with a 3D preview in real time are possible.

MarWin. Software Moduls for MarForm

MarWin software modules in detail

If you need to carry out form measurements, rather than creating long measuring programs you may prefer to gain direct access to a comprehensive and informative measuring record. In order to be able to do so, it is particularly important for the software to be transparent. Immediately after logging on in the **MarWin** user administration, you are directed to the MarShell, a clearly arranged user interface comparable with the Windows Desktop. It is from this **MarShell** that you start the finished measuring programs in the Preferences view. These preferences can be easily identified by each operator due to expressive images and icons already saved to the system. One click is all that is needed to start the measuring program.
The **MarShell is** also used to start the measuring wizard module, Quick&Easy (QE).

The **Quick&Easy** wizards provide support for "quick measurements by the fly" and, with little effort, guide the user quickly to his objective, namely a highly informative measuring record.
A further click results in all **Quick&Easy** wizards that have so far been run being adopted as a chronological sequence into teach-in programming function of **AdvancedForm/MarWin**.
This sequence merely has to be saved and the measuring program is then ready.
In **AdvancedForm**, additional functions can be added to the measuring program. The following Quick&Easy wizards assist in this process:

1. PREPARATION FOR MEASUREMENT

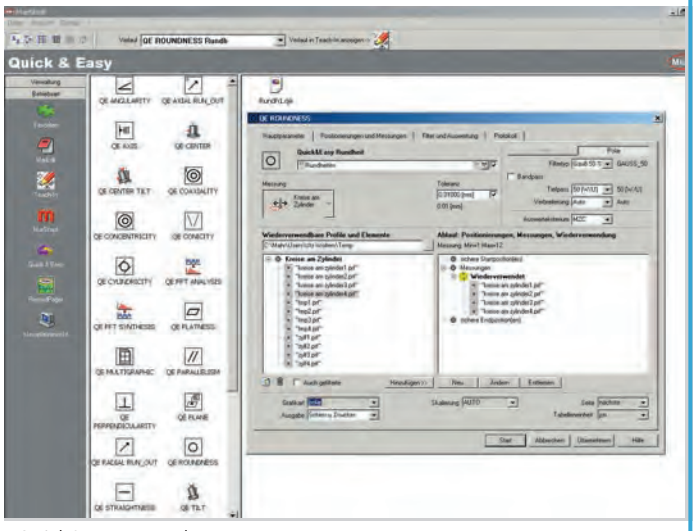
- **QE Determine starting position**
- **Measuring station, positioning**
- **QE Axial run-out alignment**
- **QE Centering**
- **QE Centering and tilting**

- **QE Set parameters**
- **QE Zenith**
- **QE Edge search**
- **QE Switch coordinate system**
- **QE Move to calculated position**

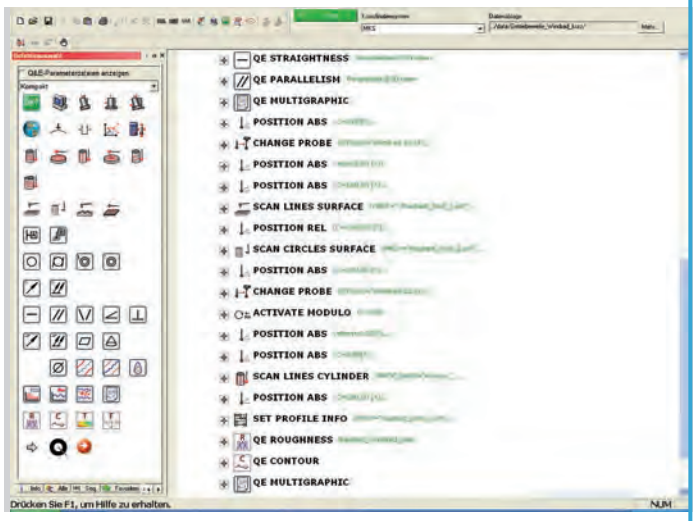
2. PROFILE RECORDING

- **QE Circles on cylinder**
- **QE Circles on plane/end face**
- **QE Lines on cylinder**
- **QE Lines on plane/end face**

Preferences view for starting the measuring programs



Quick&Easy Roundness



Teach-in listing

MarWin. Software Modules for MarForm

3. EVALUATION

- QE Axis
- QE Plane

- QE Roundness
- QE Cylindricity
- QE Coaxiality
- QE Concentricity

- QE Radial run-out
- QE Total radial run-out

- QE Straightness
- QE Parallelism
- QE Conicity
- QE Angularity
- QE Perpendicularity

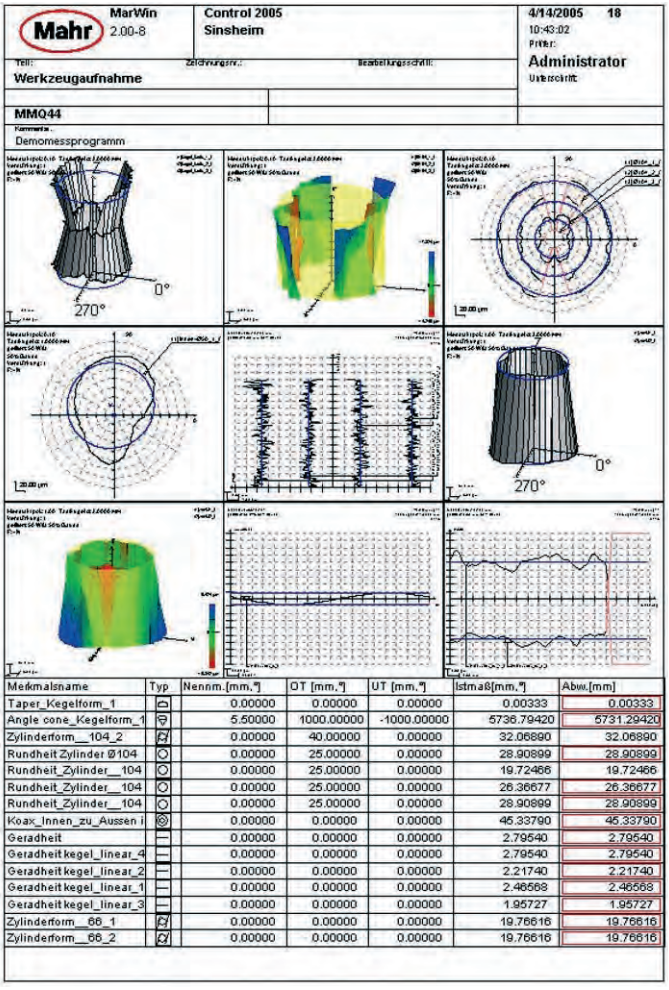
- QE Axial run-out
- QE Total axial run-out
- QE Flatness
- QE Taper

4. SPECIAL EVALUATION

- QE Fourier analysis
- QE Fourier synthesis (optional)
- QE Profile arithmetics
- QE Roughness measurement (optional)
- QE Contour measurement (optional)
- QE Diameter measurement (optional)
- QE Tolerance band evaluation (optional)
- QE Cam evaluation (optional)
- QE Dominant Roundess Waviness (optional)

5. RECORD

- QE Multigraphics



Merkmalsname	Typ	Nennm.[mm,°]	OT [mm,°]	UT [mm,°]	Istmaß[mm,°]	Abw.[mm]
Taper_Kegelform_1		0.00000	0.00000	0.00000	0.00333	0.00333
Angle cone_Kegelform_1		5.50000	1000.00000	-1000.00000	5736.79420	5731.29420
Zylinderform__104_2		0.00000	40.00000	0.00000	32.06890	32.06890
Rundheit Zylinder Ø104		0.00000	25.00000	0.00000	28.90899	28.90899
Rundheit_Zylinder__104		0.00000	25.00000	0.00000	19.72466	19.72466
Rundheit_Zylinder__104		0.00000	25.00000	0.00000	26.36677	26.36677
Rundheit_Zylinder__104		0.00000	25.00000	0.00000	28.90899	28.90899
Koax_Innen_zu_Aussen i		0.00000	0.00000	0.00000	45.33790	45.33790
Geradheit		0.00000	0.00000	0.00000	2.79540	2.79540
Geradheit kegel_linear_4		0.00000	0.00000	0.00000	2.79540	2.79540
Geradheit kegel_linear_2		0.00000	0.00000	0.00000	2.21740	2.21740
Geradheit kegel_linear_1		0.00000	0.00000	0.00000	2.46568	2.46568
Geradheit kegel_linear_3		0.00000	0.00000	0.00000	1.95727	1.95727
Zylinderform__66_1		0.00000	0.00000	0.00000	19.76616	19.76616
Zylinderform__66_2		0.00000	0.00000	0.00000	19.76616	19.76616

Multigraphic record

6. DATA EXPORT

- QE Result export (optional)
- QE QS-STAT (optional)

Software Packages for Special Applications

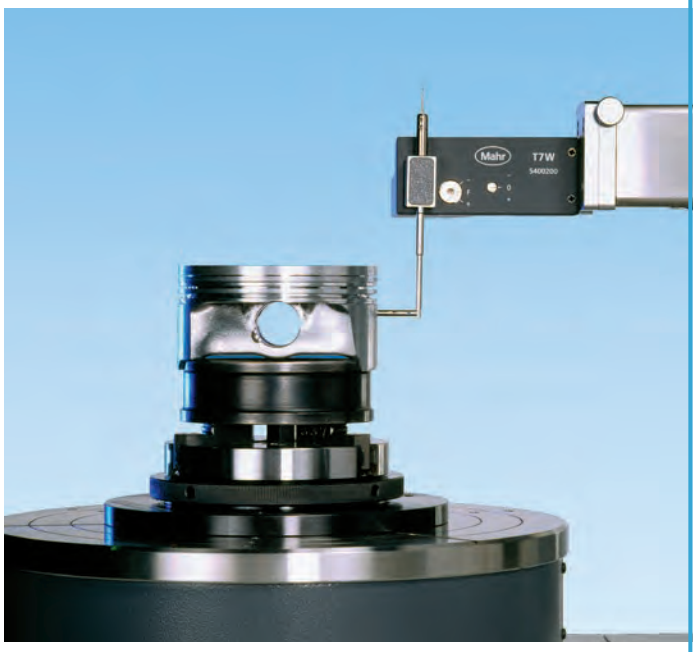
Expansion package for piston mesasurement and evaluation

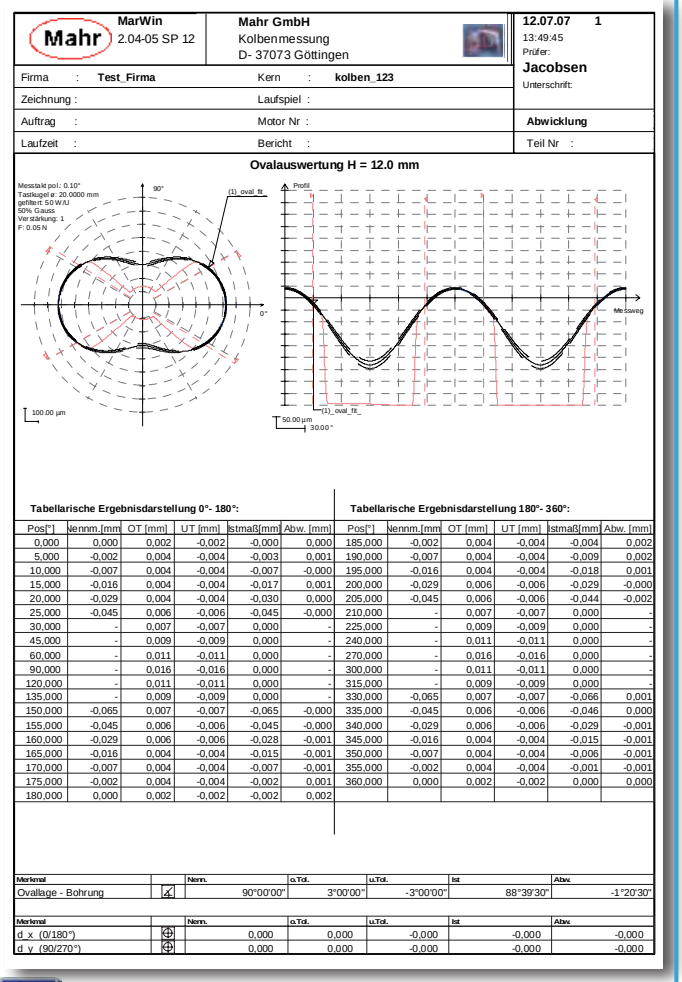
Can be used in conjunction with **MarForm MMQ 400-2** with **T7W** probe and Mahr's **MarWin** evaluation software, consisting of:

- Software package for piston-specific evaluation based on MarWin evaluation software
- Probe arms for piston measurement optional and customized on request

With the option "Piston measurement and evaluation", piston specific measuring tasks can be carried out, for example

- Determining the position of the main ovality axis
- Determining the position of the pin bore (from segment measurements in the bore) and using this position to determine the angular offset of the main ovality axis
- Testing up to 10 ovalities using tolerance tables (symmetrical and asymmetrical ones) / radius- or diameter-based input and output records for each oval: polar and linear graphs and results table; changes possible upon request depending on the work involved
- Testing 2 meridians using tolerance tables (symmetrical and asymmetrical) / radius- or diameter-based input and output / records: both meridians on a single page with diagram and result table; changes possible upon request depending on the work involved
- Determining the offset of the piston head relative to the piston axis computed
- Testing the following features in the grooves (for each groove, measurements in up to 4 angular positions are possible)
  - Long-wave (0 to 50 upr) and short-wave (15 to 150 upr) portions of upper and lower groove flanks
  - Groove opening angle (total and individual) of trapezoidal grooves, output in either degrees, minutes, seconds or as a decimal
  - Straightness, axial run-out and perpendicularity of upper and lower groove flanks relative to the piston axis
- Determining special linear forms of the piston's pin bore using tolerance tables (e.g. "trumpet shape") in the same clamping (2 measurements for each bore section)
- Determining special linear (e.g. "trumpet shape") and polar (e.g. "ovalities on one side") forms of the piston's pin bore using tolerance tables, clamped with centered bore (up to 4 linear and up to 2 polar measurements for each bore section)





MarWin 2.04-05 SP 12

Mahr GmbH
Kolbenmessung
D- 37073 Göttingen

12.07.07 1
13:49:45
Prüfer:
Jacobsen
Unterschrift:

Firma : Test_Firma
Kern : kolben_123
Zeichnung :
Laufspiel :
Auftrag :
Motor Nr :
Abwicklung
Laufzeit :
Bericht :
Teil Nr :

Ovalauswertung H = 12.0 mm

Messtaktpol.: 0.10°
Tastkugel ø: 20.0000 mm
gefiltert: 50 W/U
50% Grauss
Verstärkung: 1
F: 0.05 N

90°
(1) oval_fit
0°
100.00 µm

Profil
Messweg
(1) oval_fit
50.00 µm
30.00 °

Tabellarische Ergebnisdarstellung 0°- 180°:

Pos[°]	Nennm.[mm	OT [mm]	UT [mm]	Istmaß[mm]	Abw. [mm]
0,000	0,000	0,002	-0,002	-0,000	0,000
5,000	-0,002	0,004	-0,004	-0,003	0,001
10,000	-0,007	0,004	-0,004	-0,007	-0,000
15,000	-0,016	0,004	-0,004	-0,017	0,001
20,000	-0,029	0,004	-0,004	-0,030	0,000
25,000	-0,045	0,006	-0,006	-0,045	-0,000
30,000	-	0,007	-0,007	0,000	-
45,000	-	0,009	-0,009	0,000	-
60,000	-	0,011	-0,011	0,000	-
90,000	-	0,016	-0,016	0,000	-
120,000	-	0,011	-0,011	0,000	-
135,000	-	0,009	-0,009	0,000	-
150,000	-0,065	0,007	-0,007	-0,065	-0,000
155,000	-0,045	0,006	-0,006	-0,045	-0,000
160,000	-0,029	0,006	-0,006	-0,028	-0,001
165,000	-0,016	0,004	-0,004	-0,015	-0,001
170,000	-0,007	0,004	-0,004	-0,007	-0,001
175,000	-0,002	0,004	-0,004	-0,002	0,001
180,000	0,000	0,002	-0,002	-0,002	0,002

Tabellarische Ergebnisdarstellung 180°- 360°:

Pos[°]	Nennm.[mm	OT [mm]	UT [mm]	Istmaß[mm]	Abw. [mm]
185,000	-0,002	0,004	-0,004	-0,004	0,002
190,000	-0,007	0,004	-0,004	-0,009	0,002
195,000	-0,016	0,004	-0,004	-0,018	0,001
200,000	-0,029	0,006	-0,006	-0,029	-0,000
205,000	-0,045	0,006	-0,006	-0,044	-0,002
210,000	-	0,007	-0,007	0,000	-
225,000	-	0,009	-0,009	0,000	-
240,000	-	0,011	-0,011	0,000	-
270,000	-	0,016	-0,016	0,000	-
300,000	-	0,011	-0,011	0,000	-
315,000	-	0,009	-0,009	0,000	-
330,000	-0,065	0,007	-0,007	-0,066	0,001
335,000	-0,045	0,006	-0,006	-0,046	0,000
340,000	-0,029	0,006	-0,006	-0,029	-0,001
345,000	-0,016	0,004	-0,004	-0,015	-0,001
350,000	-0,007	0,004	-0,004	-0,006	-0,001
355,000	-0,002	0,004	-0,004	-0,001	-0,001
360,000	0,000	0,002	-0,002	0,000	0,000

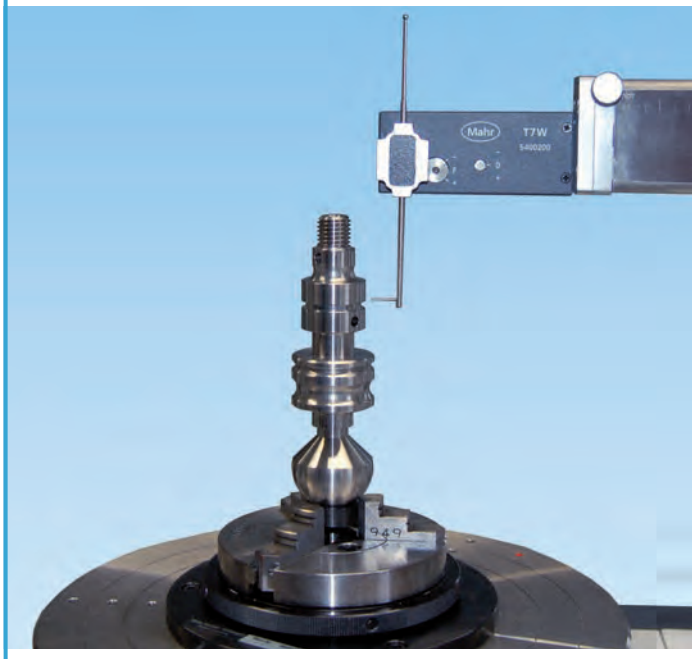
Merkmal		Nenn.	o.Tol.	u.Tol.	Ist	Abw.
Ovallage - Bohrung	⊿	90°00'00"	3°00'00"	-3°00'00"	88°39'30"	-1°20'30"

Merkmal		Nenn.	o.Tol.	u.Tol.	Ist	Abw.
d_x (0/180°)	⊕	0,000	0,000	-0,000	-0,000	-0,000
d_y (90/270°)	⊕	0,000	0,000	-0,000	-0,000	-0,000

Request a brochure or see WebCode 21056.

MarWin. Lead Measurement and Analysis with MarForm Formtesters

Expansion package for MarForm Formtesters as per Mercedes Benz Standard MBN31007-7, version 2



Description

Measured value acquisition

The surface structure of the sealing surface of a shaft influences the flow behaviour of the fluid that is to be sealed and therefore greatly influences the sealing function.

A lead structure on the sealing surface can interfere with both the shaft surface, fluid and sealing lip contact length creating leakage due to a conveying effect.

Lead is a surface feature appearing over the entire circumference on rotationally symmetrical surfaces. The evaluation of the macro lead is conducted with the option "Lead measurement" as per the Mercedes Benz Standard 31007-7.

Measurement of n generating lines (72 as per MB Standard, MBN 31007-7)

A T7W probe arm with two styli is used to assess the measuring values.

- Stylus # 1 with 3 mm hard metal ball for mechanically centering and tilting of the workpiece on the Formtester
- Stylus # 2 with diamond stylus tip for measuring lead and surface roughness parameters

Scope of application

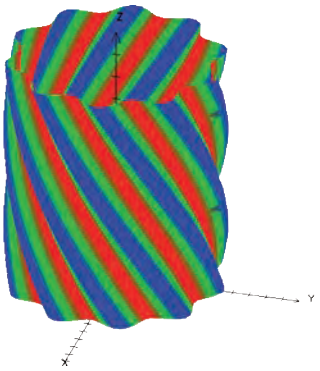
External measurement on workpiece diameters between 2 and 200 mm

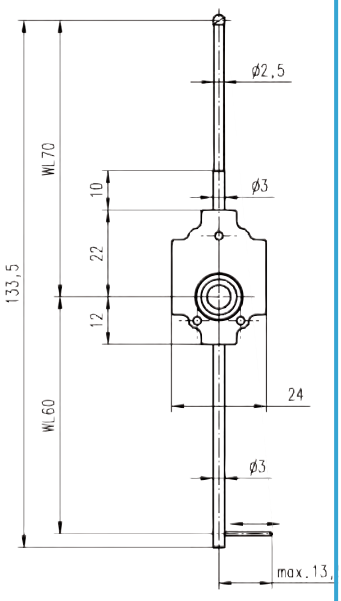
Expansion package: Lead measurement and analysis

For use on MarForm MMQ 200, MMQ 400-2, MFU 100 with motorized probe T7W and the Mahr evaluation software MarWin, consisting of:

- Software package "Lead mesurement and analysis" based on MarWin evaluation software
- T7W probe arm unit for lead measurement, double-ended with diamond tip 5 µm and 3 mm hard metal ball for alignment (5400234)

Order no.: 5440675





Request a brochure or see WebCode 21055.

Expansion Package for MarForm Formtesters. Lead Measurement and Analysis

Form and lead evaluation

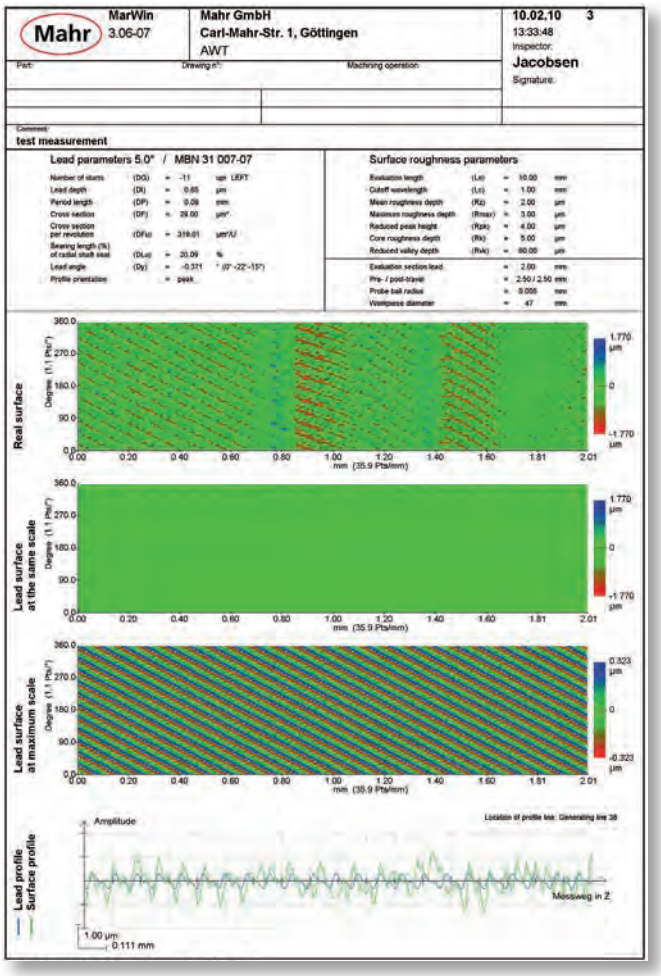
- Form/positional evaluation for conicity / parallelism / parallel to lead evaluation
- Form/positional/lead evaluation of several upr values

Evaluation and recording

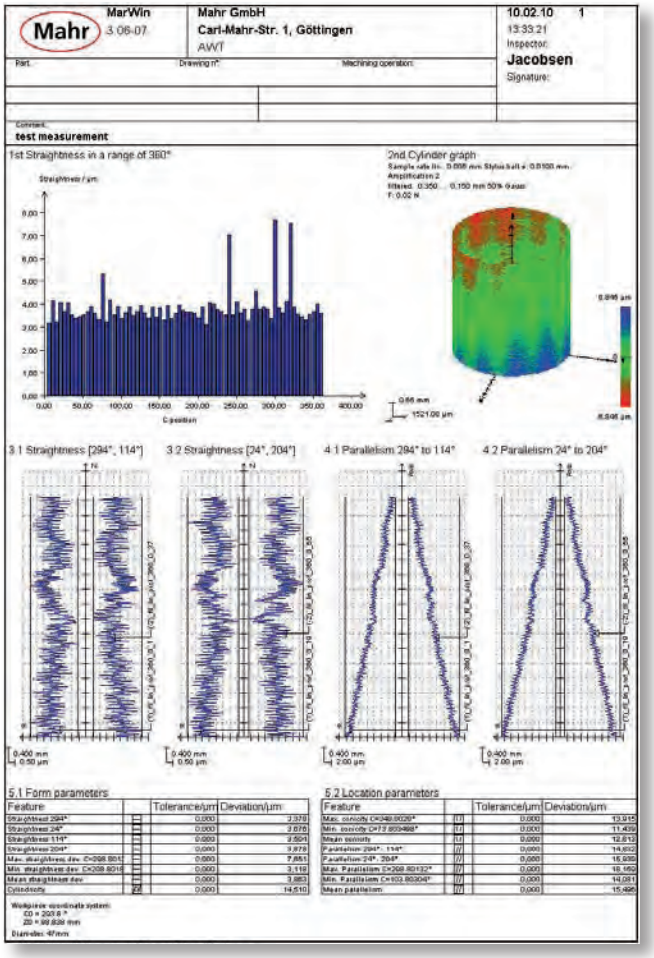
After the measurements have been performed, measurement records with the following content are generated:

Lead parameters:

- Number of threads DG (upr)
- Period length DP (mm)
- Lead angle Dγ (degrees)
- Lead direction
- Lead depth Dt (µm)
- Theoretical supply cross section DF (µm²)
- Theoretical supply cross section per turn DFu (µm/U)
- Contact length of radial seal DLu (%)



Record lead measurement



Graphic output:

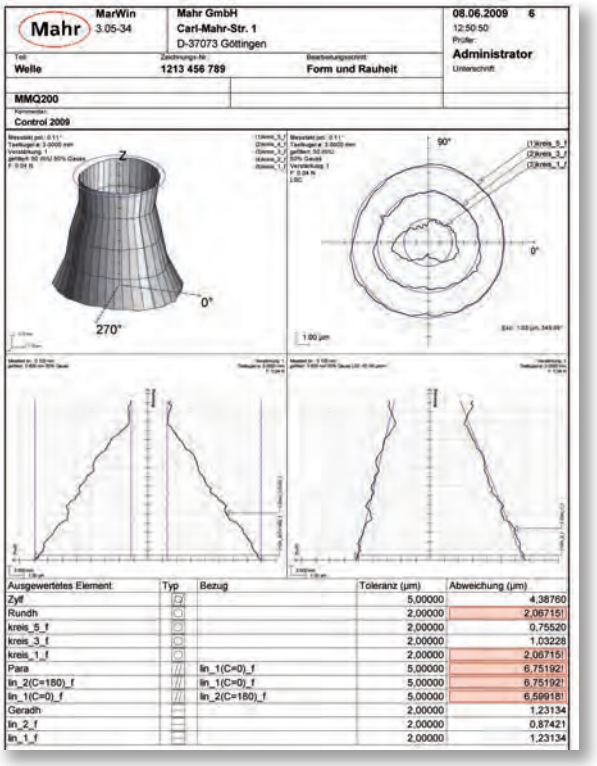
The measured profiles are output in the record as graphs.
Various diagram types are available:

- 3D cylinder (in color, traditional and unwound)
- Every assessed generating line profile is shown in a linear graph to juede the form and the positional parameters.
- Amplitude spectra of the linear profiles in a bar graph

Or as per MBN 31007-7: unwound 3D cylinder colored

- Surface structure
- Lead surface
- Display of surface profile and lead profile

Roughness Measurements with MarForm Formtesters

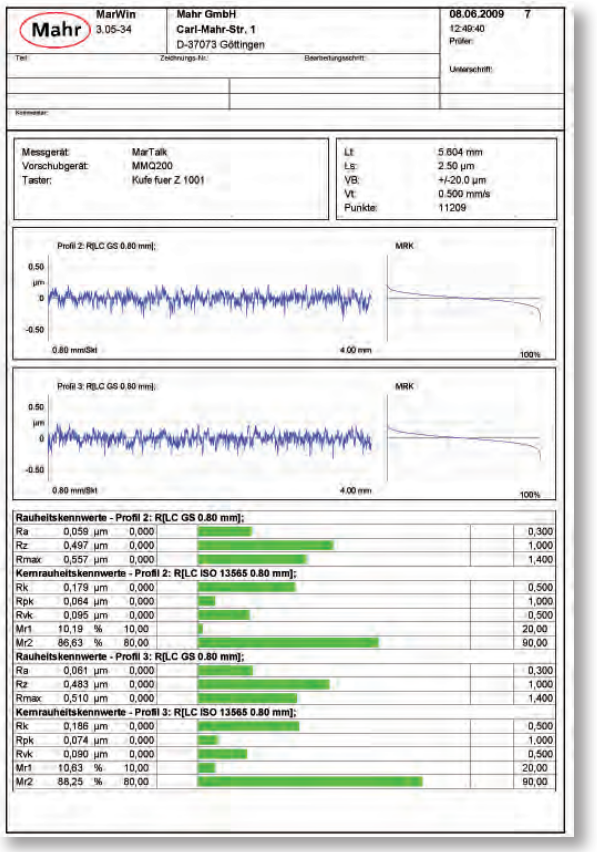


What is more obvious than assessing and documenting the surface roughness parameters of your workpiece while checking it for form and positional tolerances?

Why not assess e.g. the Ra and Rz values with a MarForm form measuring instrument?

User benefits:
If you do so, you can be sure of uncompromisingly high quality for the pick-up or probe required for the relevant measuring task is always in optimum measuring position.

Profit from:
- Reduced testing times and costs due to complete workpiece assessment in a single set up and in just one run
- Higher accuracies due to the automatic selection and positioning of the probe or pick-up for each measuring task
- Simple operation due to a software which is equally well suited for surface roughness as well as form and position measurements
- Detailed and telling measuring records
- Well-proven surface roughness metrology combined with equally well-proven form metrology



Roughness Measurements with MarForm Formtesters

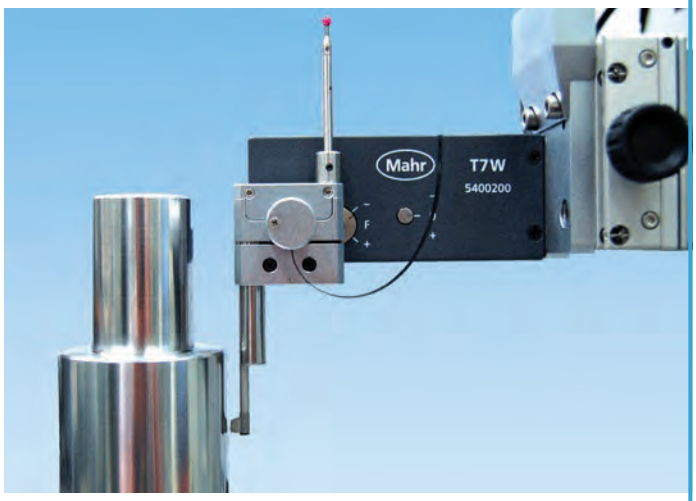
Mahr as the market leader in the field of form metrology offers form measuring machines of utmost precision and for many customers Mahr measuring machines are the standard in mechanical form metrology. And the very well proven stylus method has been perfected at Mahr

Mahr, the specialist for inductive probes, combines the advantages of its universal motorized **T7W** probe with the precision of its **PHT 6-350** pick-up. Probe and pick-up grow together. The MarForm MMQ automatically swivels the probe or pick-up required for the measuring task to the optimum measuring position!

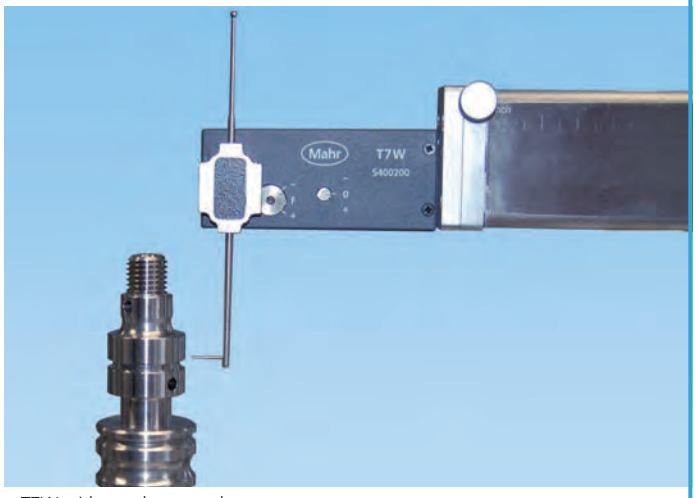
This is possible as the change between the form probe with ruby ball and the **PHT 6-350** pick-up with diamond tip is fully-automatic and program-controlled. Changing from vertical to horizontal measuring positions is also fully automatic. Owing to the rotary axis of the **T7W** probe which positions any probe arm in steps of less than 1° with utmost precision, operator interventions are completely superfluous.

Combine the testing of form and positional tolerances with the monitoring of roughness paramters.
Record and file typical surface roughness parameters such as Ra and Rz while checking the dimensional stability of your workpieces on a MarForm MMQ in one go. You will not be bothered with having to clamp it again on a surface roughness measuring station.

In addition to the possiblility to measure the surface roughness parameters with the PHT 6-350 pick-up attached to the T7W probe arm unit, it is also possible to assess the parameters with just a diamond stylus attached to the T7W probe arm unit. This application strategy is suitable when, for example, the **PHT 6-350** cannot be used due to its geometry or when the tolerances for the roughness Rz lies in the range of > 2 µm The double point probe arm unit is swivelled automatically without any user interference when contacting with the diamond stylus or the ruby ball is required.



T7W with PHT measuring head



T7W with roughness probe arm

Delivery Scope

Scope of delivery with option Roughness Measurement for MMQ 200 or MMQ 400-2

Combined hardware und software package for roughness measurement and evaluation on MarForm MMQ 200 or MMQ 400-2 with motorized T7W probe including:

Hardware package
- PHT 6-350 pick-up with a 90° stylus tip of radius 2 µm
- Double probe arm holder for PHT 6 as well as the probe arm for form measurement
- Adapter for connecting PHT 6 to MarForm MMQ

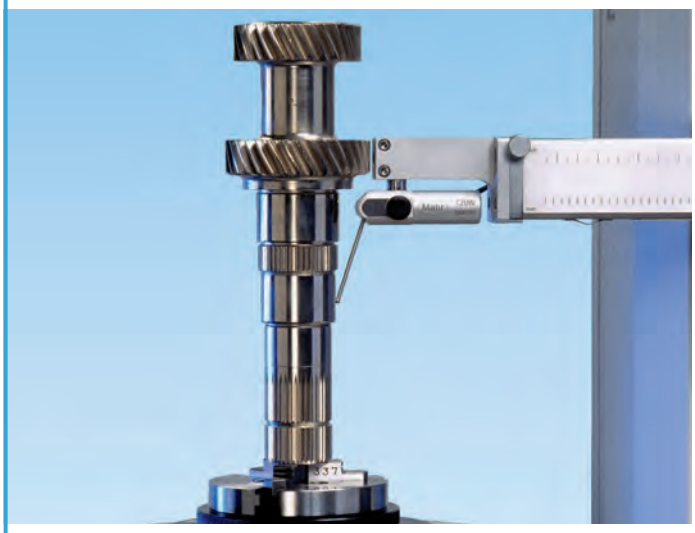
Software package
- Software license for evaluating surface roughness with AdvancedForm
- AdvancedForm software for use with MMQ

Technical Data

Pick-up PHT 6-350	**Order No. 6111520**
System	One-skildded probe
Skid radius laterally 2.9 mm	In tracing direction 25 mm,
Contact point	0.8 mm in front of the probe tip
Measuring range	350 µm
Specification	For level surfaces, for bores from 6 mm Ø to 17 mm depth, grooves from 3 mm width, min. workpiece length = tracing length + 1 mm
Probe tip geometry	2 µm/90° diamond
Motorized probe T7W	**Order no. 5400200**
Technical data on pg. 16-20	

Accessories for MarForm

The optimum solution using accessories



Manual T20W Probe

The inductive **T20W** probe is universally applicable. The fact that the probe arm can be moved in a range of 190° and that there are a variety of clamping options for the probe means that measurements can also be performed in areas that are difficult to access. You can combine easily exchangeable probe arms with a variety of styluses in order to adapt the probe to the relevant measurement tasks or workpieces.

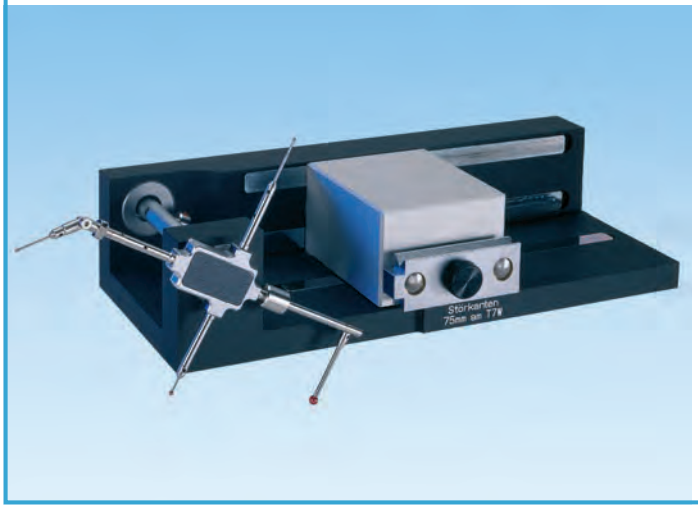
T20W probe with probe arm range of 190°
- Measuring range ± 1,000 µm
- Measuring force adjustable from 0.01 N to 0.12 N
- Switchable measuring direction
- Exchangeable probe arm
- Free travel limitation adjustable in contacting direction
- Clamping shaft dia. 8 mm (0.31 in)

Motorized T7W Probe

The **T7W probe** is fitted with a motorized rotational axis. This makes it possible to move the probe arm gradually to the required contacting position. As a result, measurements can be performed on cylindrical surfaces and end faces. As a zero position probe, the **T7W** can also switch automatically between internal and external measurements or between end face measurements from above and below without operator intervention. Fully automatic measurement runs on complex workpieces can be carried out without operator intervention too. The probe arms of the **T7W** are exchangeable. Its motorized rotational axis enables the construction of multi-point probe arms – i.e. probe arms with several different contacting elements – making it possible to switch between different stylus ball geometries within a single measurement run.

Motorized T7W probe
with probe arm moveable around 360° for MMQ 400, MMQ 400 CNC and MFU 100

- Total range of 2,000 µm (0.079 in)
- Zero probe working range ± 500 µm (0.02 in)
- Measuring force adjustable from 0.01 N to 0.2 N
- Two-way measuring direction
- Contacting angle freely selectable in 1° steps
- 360° adjustable (motorized)
- Probe arms easily exchangeable (magnetic mount)
- Flexible multi-point probe possible
- Mechanical and electrical overload protection



Accessories for T7W
Probe arm module set with adjustment device (see picture on left)

Accessories for MarForm

The optimum solution using accessories

Clamps

Three-jaw chuck, dia. 100 mm (3.94 in)
with mounting flange dia. 160 mm (6.30 in) and reversible jaws for external and internal clamping. External clamping range 1 to 100 mm (0.040 to 3.93 in), internal 36 to 90 mm (1.42 to 3.54 in). Total height with flange 47 mm (1.85 in). Adjustment by means of rotating ring.

Rim chuck with 8 jaws, dia. 150 mm (5.91 in)
with mounting flange dia. 198 mm (7.80 in) and separate jaws for external and internal clamping. External clamping range 1 to 152 mm (0.039 to 5.98 in), internal 24 to 155 mm (0.94 to 6.10 in).
Total height with flange 52 mm (2.05 in). Cannot be used with MMQ 10/MMQ 100 Formtester.

Three-jaw chuck, dia. 110 mm (4.33 in) (not illustrated)
with mounting flange dia. 164 mm (6.46 in). External clamping range 3 to 100 mm (0.12 to 3.94 in), internal 33 to 100 mm (1.29 to 3.94 in). Total height with flange 73 mm (2.87 in).

Three-jaw chuck, dia. 80 mm (3.14 in)
with mounting flange dia. 124 mm (4.88 in). External clamping range 2 to 78 mm (0.079 to 3.07 in), internal 26 to 80 mm (1.02 to 3.15 in). Total height with flange 65.5 mm (2.58 in). Adjustment by means of T-wrench.

Quick-clamping device (collet chuck)
Dia. 1 to 12 mm (0.039 to 0.47 in) with mounting flange dia. 124 mm (4.88 in), for external clamping. Supplied with collet chucks of dia. 1 to 8 mm (0.039 to 0.31 in) in 0.5 mm (0.02 in) steps. Total height 80 mm (3.15 in).
Further collet chuck devices are available on request.

Clamping disks/clamping jaws
Clamping disk set. Adjustable workpiece stop for pre-centering and clamping in series measurements.
For clamping diameter of 36 to 232 mm (1.42 to 9.13 in) depending on machine type. Comprises two stop disks with slot and an eccentric clamping disk.

Clamping jaws (2). With M5 fastening thread. Clamping height 40 mm (1.57 in).
Further part-specific clamps are available on request.

Test Standards

Roundness standard, 40 nm
Ultra-precise measuring sphere for testing measuring spindle radial run-out accuracy. Dia. approx. 50 mm (1.97 in). Roundness deviation 0.04 µm (1.57 µin).

Roundness standard, 100 nm (not illustrated)
High-precision measuring sphere for testing measuring spindle radial run-out accuracy. Dia. approx. 12.7 mm (0.5 in). Roundness deviation 0.10 µm (3.94 µin).

Optical flat
Dia. 150 mm (5.91 in), for testing and adjusting the horizontal measuring unit relative to the measuring spindle axis. Flatness deviation 0.2 µm (8 µin).

Universal cylinder square with calibration standard
High-precision cylinder square with two surfaces for dynamic testing of probe calibration. Dia. 20 mm (0.79 in), length 150 mm (5.91 in).

Cylinder square
for checking and adjusting the measuring spindle axis relative to the Z-axis. Length 250 mm (9.84 in), dia. 80 mm (3.15 in). Deviation from cylindricity max. 1 µm (40 µin). Weight approx. 11.5 kg (25.35 lbs).

Cylinder square (not illustrated)
for checking and adjusting the measuring spindle axis relative to the Z-axis. Length 360 mm (14.17 in), dia. 100 mm (3.94 in). Deviation from cylindricity max. 1 µm (40 µin). Weight approx. 13 kg (28.66 lbs).

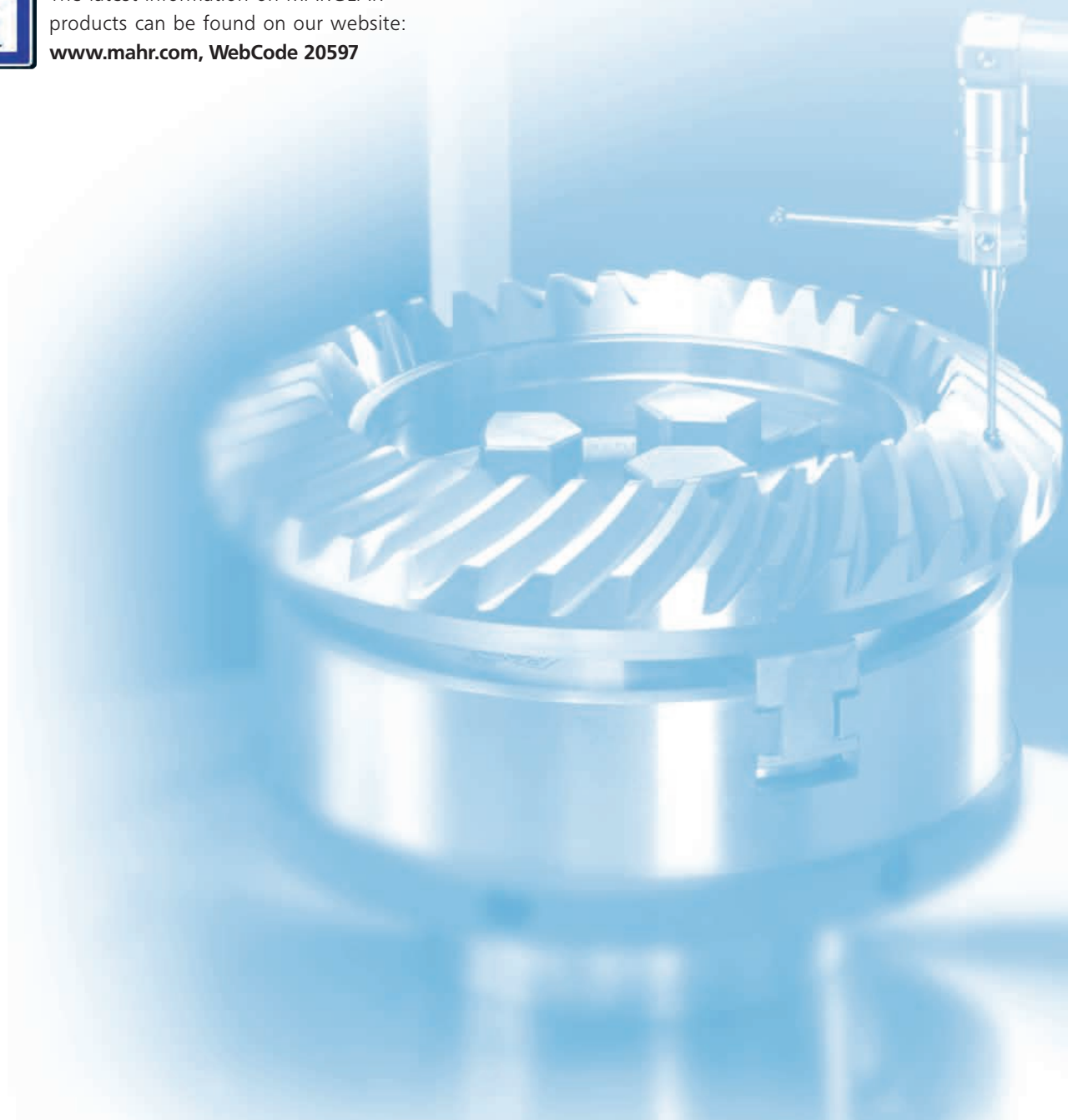
Magnification standard with a flattened section (not illustrated)
Cylinder L = 50 mm (1.97 in), dia. 20 mm (0.79 in) with minimally flattened section for testing probe sensitivity.

Multi-wave standard (not illustrated)
Cylindrical base unit with sinusoidal waves on outside diameter. 15, 50, 150 and 500 upr. Used to test the sensitivity of the probesignal and the filters in form testing.

INNOVATIVE METROLOGY IMPROVES YOUR GEAR QUALITY.

THAT IS WHY WE HAVE MARGEAR

The latest information on MARGEAR products can be found on our website:
www.mahr.com, WebCode 20597



► | Maximum precision in the production environment is an important factor for a company's success. MarGear gear metrology solutions enable you to perform measurement tasks on gears and gearing tools quickly, simply and precisely in a single setup. The flexible systems – requiring no mechanical alignment or reclamping and combining gear metrology with form and positional analysis – create the ideal conditions to ensure your business remains competitive. Fully integrating metrology into the manufacturing process creates a closed-loop quality control system for gear manufacture. | ◄

MarGear. Gear Metrology

MarGear. GMX 275 C, GMX 400 C, GMX 400 ZL, GMX 600 17- 3

MarGear. Industry Solutions 17- 4

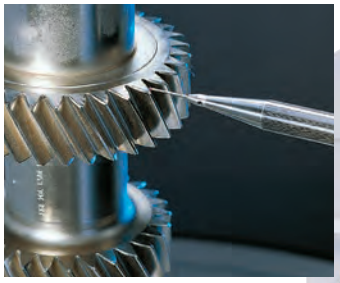
MarGear. Software Solutions
MarLib, Gear CuT, Closed Loop 17- 6

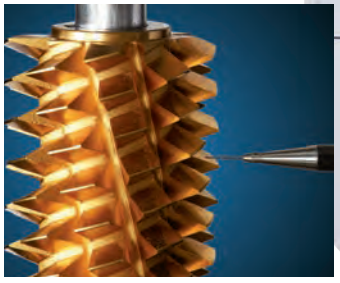
Request a brochure or see WebCode 20597.

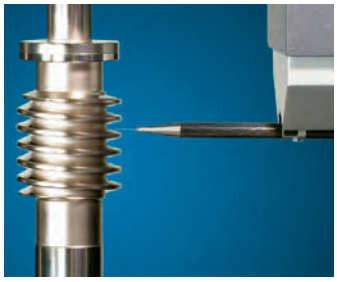
MarGear. Gear Metrology from Experienced Specialists

CUTTING-EDGE GEAR METROLOGY SOLUTIONS

► | The highly precise and flexible GMX systems represent the ideal combination of gear and form measurement in a single system. From highly specialized gear analysis to fully integrated series measurement, MarGear is your perfect partner for all levels of modern gear manufacturing. | ◄







MarGear. GMX 275 C / 400 C / 400 ZL

Universal gear measurement centers

Description

For fast and precise measurement and analysis of gears of all types up to an outside diameter of 275 or 400 mm (10.83 or 15.75 in). The ideal solution for both universal and specialized gear manufacturing processes. System solutions ensure maximum flexibility and availability within modern gear component manufacturing environments.

Fully automatic inspection of:
- Straight and helical cylindrical gears
- Spiral and hypoid bevel gears
- Crown gears
- Cylindrical worm shafts
- Conical cylindrical gears
- Segment gears
- Hobs
- Shaving cutters
- Shaping cutter
- Pinion-shaped cutters
- Beveloid gears
- Synchronous gears
- 3D geometry, form and positional measurements, diameters and distances
- Special gearing tools upon request

Accuracies
Class I accuracy gear measuring machine for gear measurements in accordance with **VDI/VDE 2612/2613 Group 1** at 20 °C ± 2 °C, *rotational axis: formtester accuracy.*

WebCode 20598, 20599, 20600

MarGear. GMX 600

Universal form and gear inspection system

Description

The perfect combination for gear and form testing applications in a single setup. This combination saves time as well as investment and maintenance costs.

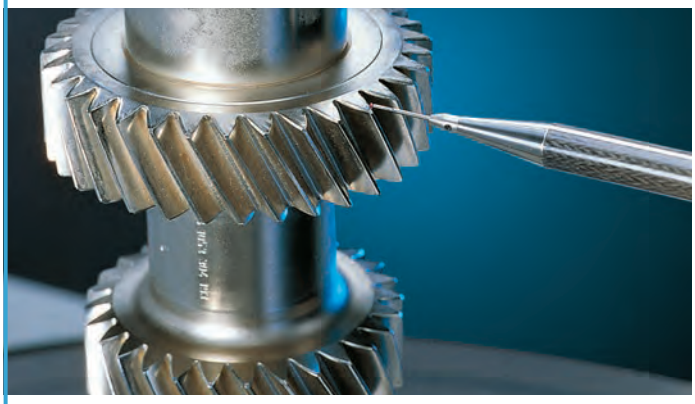
Full form testing functionality for outside diameters up to 600 mm (23.62 in). The **GMX 600** is a complete solution that can also be used to measure crankshafts, camshafts and pistons.

Fully automatic inspection of:
- Straight and helical cylindrical gears
- Spiral and hypoid bevel gears
- Cylindrical worm shafts
- Conical cylindrical gears
- Segment gears
- Shaving cutters
- Shaping cutter
- Hobs
- Pinion-shaped cuttuers
- Synchronous gears
- Beveloid gears
- 3D geometry
- Form measurements with centering and tilting table
- Camshafts, crankshafts & pistons *
- Special gearing tools upon request

Accuracies
Class I accuracy gear measuring machine for gear measurements in accordance with **VDI/VDE 2612/2613 Group 1** at 20 °C ± 2 °C, *rotational axis: formtester accuracy.*

Request a brochure or see WebCode 20601.

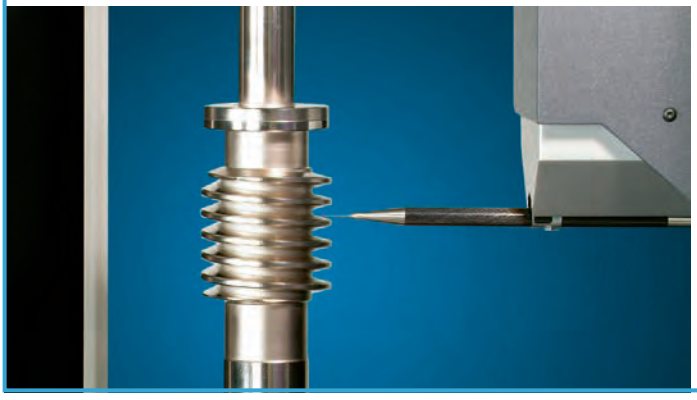
MarGear. Industry Solutions



Measurement of spur gears
- Measurement and analysis of internal and external gears up to a 90° helix angle
- Analysis according to DIN 3962 or free tolerances
- Measurement and analysis of profile, flank lines (lead), pitch, run-out errors, tooth thickness and diameter over balls/pins
- Crowned and conical gears
- Root and tip reliefs
- Tolerance bands, K-charts
- Measurement of twist
- Measurement of tip and root diameter
- Measurement of segment gears
- Measurement and analysis up to modulus of 0.3

Measurement of bevel gears
- Measurement and analysis of flank topography based on nominal data or a master gear plus gear pitch and run-out errors
- Topography point matrix definition with up to 20 x 20 points
- Calculation of the average flank form
- Calculation of tooth thickness in normal and transverse section
- Measurement and analysis of tooth depth, face angle and root angle
- Calculation of pressure and spiral angles
- Deviation from flank form measurement
- Calculation of pitch errors according to DIN 3965

Measurement of shaving cutters
- Measurement and analysis of shaving cutters
- Analysis according to DIN 3962 or free tolerances
- Measurement and analysis of profile, flank lines (lead), pitch, run-out errors, tooth thickness and diameter over balls/pins
- Analysis of crowning
- Automatic adjustment of measurement paths
- Automatic recognition of serration positions of plunge-type shaving cutters
- Measurement and analysis of burnishing cutters

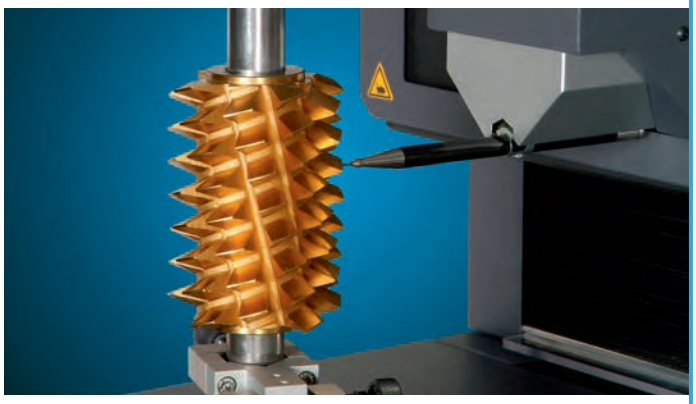


Measurement of worm shafts
- Measurement and analysis of profile, flank lines (lead), pitch and tooth thickness on worm shafts
- Analysis of worm shafts with A, N, I or K profile
- Measurement and analysis of duplex worm shafts
- Measurement of pitch in axial or transverse plane
- Measurement of twist
- Analysis of crowning
- Analysis based on K-charts
- Analysis based on freely definable tolerances
- Z_A; Z_N; Z_I; Z_K

MarGear. Industry Solutions

Hob measurement

- Measurement and analysis of axial and radial run-out on the collar
- Measurement of flute spacing and flute direction
- Profile measurement across or behind the cutting edge
- Measurement of thread and contact pitch variation
- Analysis of form and position errors of the cutting edge
- Calculation of tooth thickness
- Analysis conforming to DIN 3968 and other standards



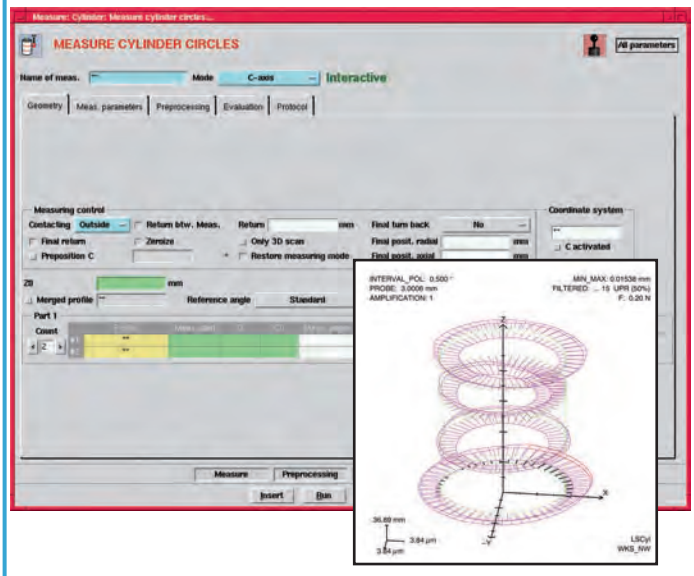
Measurement of camshafts

- Measurement and analysis of camshafts based on design data
- Analysis of cam form and cam angle position relative to the reference groove
- Analysis of cam curves, angles and diameters and acceleration curves
- Measurement and analysis of unknown cam profiles, which can be stored as nominal or reference data
- Flexible record design
- Mask-based input without the need for time-consuming teach-in processes

Measurement of crankshafts (GMX 600 only)

- The software package for crankshaft testing offers a wide variety of functions to measure and analyze parameters on the crankshaft's main and stroke bearings, flange and journals. All form parameters are always measured in form testing mode
- Fully automatic measurement of roundness, cylindricity, parallelism and diameter on main and stroke bearings
- Fully automatic measurement of roundness, cylindricity, parallelism, diameters and distances on the crankshaft flange
- Data input direct from the drawing
- Flexible record design

MarGear. Software solutions – MarLib. 3D Form and Position Measurements



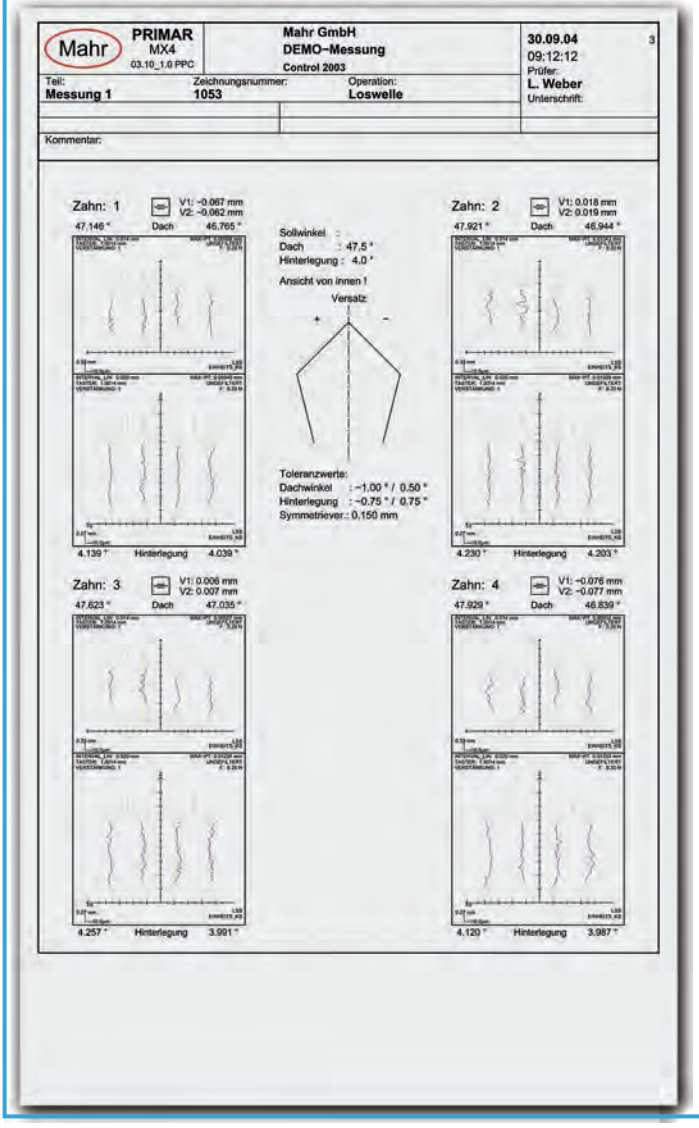
Measurement philosophy

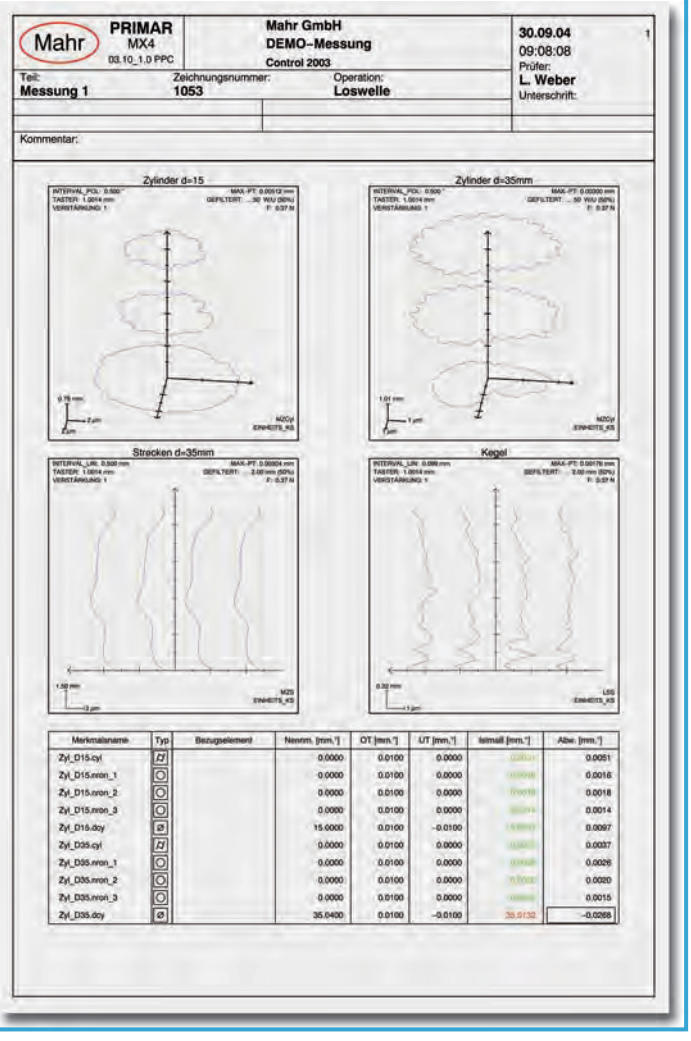
- Includes approx. 30 complex functions defined using parameter masks
- Geometry-oriented programming
- Each module is split into measurement, analysis and recording

Advantages

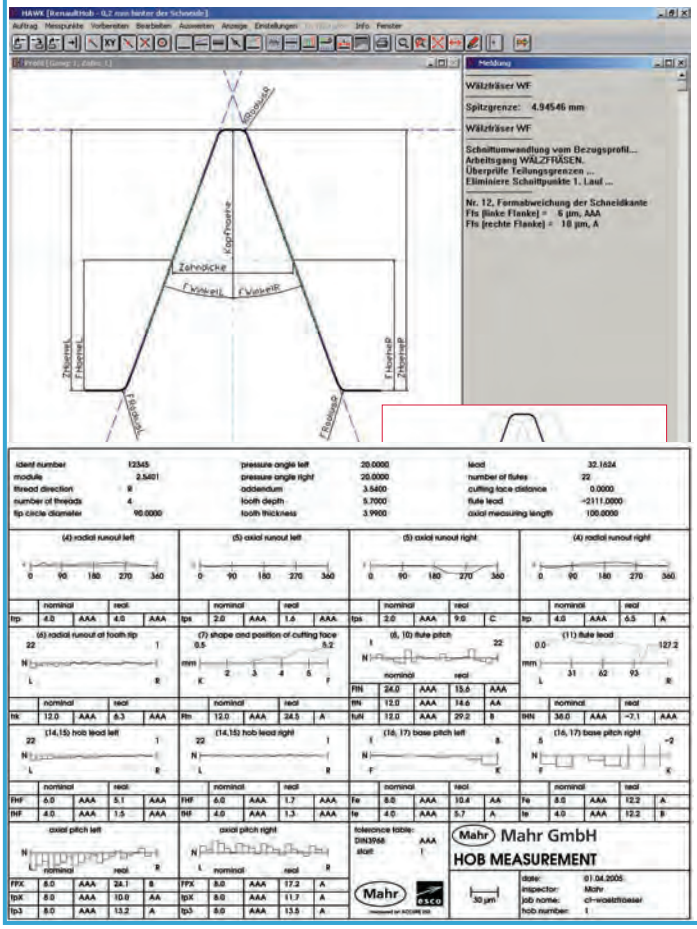
- Short, clear and structured programs
- Quick and easy programming
- **MarLib** modules can be saved as a program
- Analysis of specific parameters such as roundness, cylindricity, diameter, etc.
- Analysis of various parameters from a single geometric element

Below: Sample record for form and position analysis, taking the example of a synchronous gear and camshaft.





MarGear. Software Solutions – Gear CuT* Module



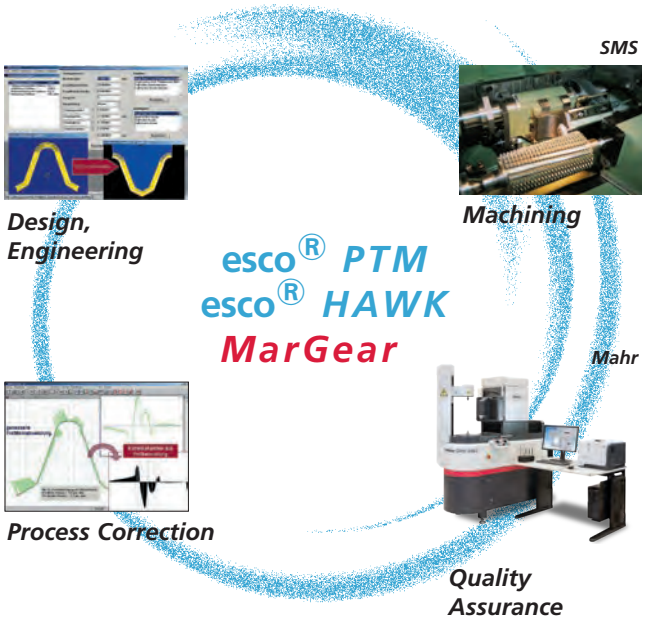
Gear CuT – software for manufacturers of gearing tools for standard and special profiles

Measurement philosophy
- Tactile scanning of the geometry
- Comparison of nominal and actual contours and analysis for in-process inspection
- Control of the grinding process in gear manufacture

Advantages
- Measuring machine programmed simply by setting dimensions in the inspection drawing
- Parameterized description of the reference profile
- Choice between analysis in the axial section or reference profile
- Profile measurement across or behind the cutting edge
- Parameter programs for standard hobs
- CAD link

*Gear CuT: Partner product of Esco GmbH Herzogenrath, Germany

MarGear. Software Solutions – Closed Loop*



Philosophy
- Influencing the manufacturing process
- Measuring machine becomes part of production

Principle
- Production data available for input via CAx interfaces
- Measuring programs created automatically control the measuring machine and the scanned geometries are directly available in **Gear CuT** for profile comparison
- The high accuracy of the measuring machines and the sheer density of information that can be obtained from the measurements permit precise corrections which result in reproducibly tolerance-compliant workpieces after a single correction run

Advantages
- Time savings of up to 80%
- Higher manufacturing accuracies
- Operator influence is minimized

*Closed Loop: Partner product Esco GmbH Herzogenrath, Germany

THE SECOND DIMENSION IN METROLGOY
OPTICAL METROLOGY FROM MAHR

The latest Information on MARVISION optical measuring instruments can be found on our website:
www.mahr.de/en/Home, WebCode 20543

► | In all branches, quality control in production is changing: Workshops need to measure faster, more precisely and at the same time even more economically. This is where the modern concept of measuring micrscopes from Mahr comes in. They can control, for example, the distances of bores, form, angle or radii of workpieces, measure contact-free the smallest components or PCB tracks. Measuring microscopes are in use in almost all branches: in mechanical engineering or electronics just as in the plastics industry or in medical technology, and even in the food and pharmaceutical industries or in forensic laboratories. Testing and calibration labs, research labs, research facilites and training centers also use Mahr microscopes in order to attain precise measuring results at an interesting price. | ◄

► | MarVision. Optical Measuring Instruments

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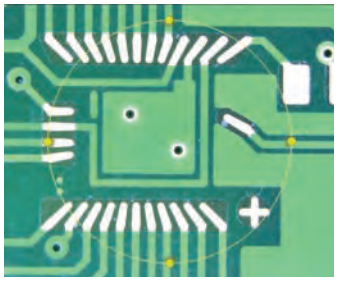
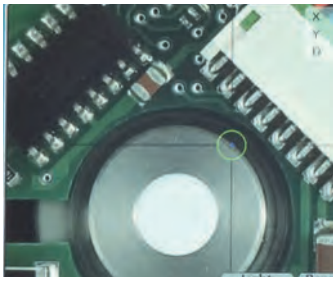
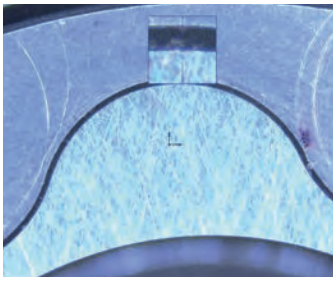
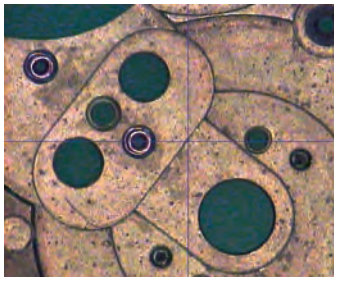
MarVision. Measuring Microscopes for Shop Floor and Laboratory

MOBILE AND FAST QUALITY CONTROL

► I The product group MarVision offers you the best Optical Measuring Instruments for every application imaginable: starting from the simplest Illuminated Magnifiers up to the high-end Workshop Measuring Microscope with a Touchsreen PC for the determination of geometric elements with automatic edge detection. I ◄

Industrial branch based solutions

Plastics Industry

In the synthetics industry there are numerous thin-walled components that cannot be measured using tactile measuring instruments.

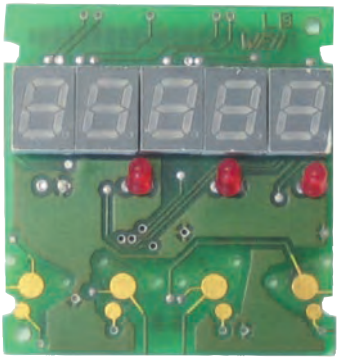
The MarVision MM 420 makes fast, non-contact measurements of plastic or rubber parts possible so that whereby the workpieces are not deformed. The color camera and the LED ring light ensure an optimum color depiction.

Medical Technology

Medical technology demands high-precision measurements on delicate components. The measuring objects are often very small. Measuring microscopes offer a high number of measuring points despite their smaller dimensions. and thus giving more reliably measuring results. Programming for the measuring parts simplifies the measurement of recurring parts.

The operator is optically led, and settings such as light and number of measuring points are saved in the measuring program, so that the measurements are always performed under the same conditions.

Electronics Industry



The measuring microscopes are excellently suited to test the distances of small bores and PCB tracks as well as for optical inspection.

The MarVision MM 420 with the M3 Software and the Touchscreen PC offers image processing, that is to view, measure, detail, dimension, evaulate and record geometric elements.

An integrated laser pointer makes orientation on the large components easy.

Mechanical Engineering

Tolerances are becoming increasingly smaller, especially in the field of mechanical engineering. Optical measuring instruments offer a high accuracy with short measuring time. The Optical Measuring Microscopes from MarVision are the cost effective solution for entering optical metrology; the broad range of accessories enables a greater flexibility. Turned parts, for example, can thus be sharply depicted with transmitted light.

Illuminated Magnifier MarVision 130 WR*

* **Not for Sale in North America (230 Volts only)**

Illuminated Magnifier 130 WR with circular fluorescent tube
For checking sunken surfaces, e.g. bores, internal threads, etc

Attention:
Table base 130 t or Table clamp 130 kl are required!

Features

- Aid for visual spot checks, adjustments, assembly of small parts and all types of precision work
- Illumination head with swiveling arm has to be used either with Table base 130 t or Table clamp 130 kl
- 3D-joint illumination head can be positioned at any level
- Spring-relieved joints for easy positioning over a large-scale action range without any re-adjustments
- Large-diameter, cut glass lenses with sharpness to the edge provides distortion free magnification
- Lenses diameter 120 mm with double magnification
- Fluorescent tubes provide a bright, almost shadow free illumination of objects and working area
- Low energy consumption due to energy-saving lamp

- Supplied with:
exludes base (optional required accessory), fluorescent tube and operating instructions

Technical Data

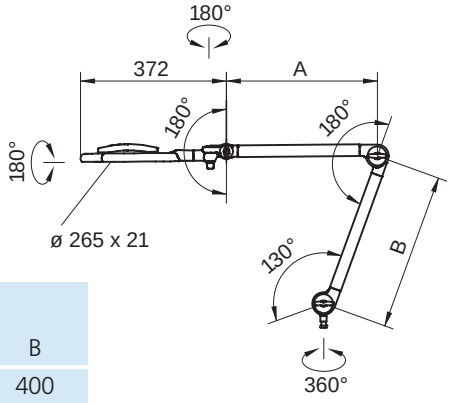
	Type of lamp	Power supply	Dioptric power	Magnification	Order no.
130 WR	Circular fluorescent tubes	230 V~ / 50 Hz	4	2	**4299300**

Accessories

		Order no.
Table base for stable installation on working table	**130 t**	**4298310**
Table clamp for mounting on work bench or working table clamping range: 0 – 140 mm	**130 kl**	**4298320**
Circular fluorescent tube for **130 WR**		**4299005**

130 kl

Illuminated Magnifier MarVision 130 LR



Dimensions		
mm	A	B
130 LR	384	400

Features

- Aid for visual spot checks, adjustments, assembly of small parts and all types of precision work
- Head of the magnifier can be positioned at all levels due to the 3D-joint
- Large radius due to the movement head joint
- Completely scratch resistant glass magnifier
- Made from sturdy aluminum and high-performance plastic
- High quality LED technology with 48x LEDs
- 4 segments, 3 can be individually switched ON/OFF ideal for high contrast or shadow free observation
- Continuously dimmable
- Maintenance-free – LEDs have a life span of up to 50.000 hours
- Color reproduction 1A
- Large field of vision, with ø153 mm for distortion free vision, 3.5 diopters and with an additional bonded on lens with 11.5 diopters
- Powerful, up to 6.000 lx for only 14 W
- Save up to 40 % more energy compared to traditional magnifiers
- Various fastenings are also available as accessories

- Supplied with: Table mount 130 Tb, magnifier cover and operating instructions

Technical Data

	Type of lamp	Power supply	Dioptric power	Output	Order no.
130 LR	LED-48x	100-240 VAC / 50-60Hz	3.5/11.5	Max 14 V	**4299350**

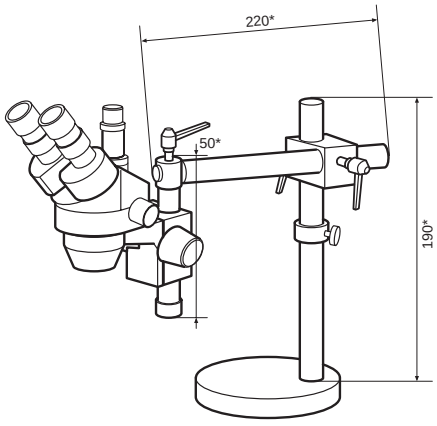
Accessories

		Order no.
Table clamp for 130 LR	**130 Tk**	**4299355**
Table mount for 130 LR*	**130 Tb**	**4299356**
Additional magnifier for 130 LR with 3.5 diopter	**130 Zl**	**4299357**

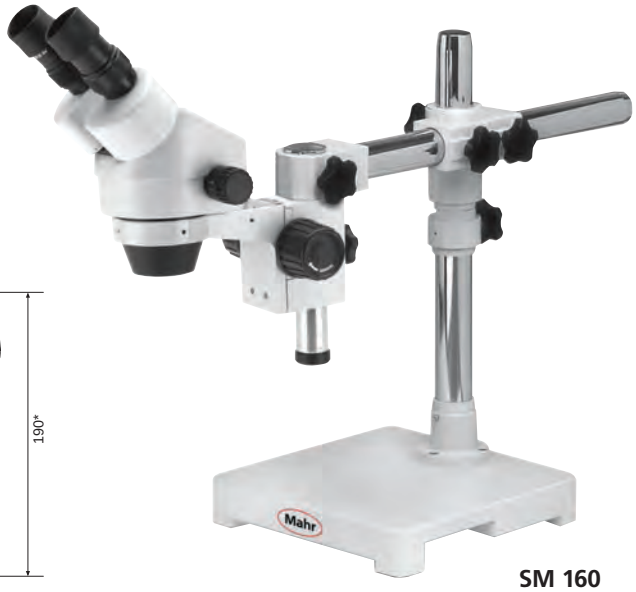
* *Included in the scope of supply*

Stereo-Zoom Microscopes MarVision SM 150 / SM 160

SM 150



* Adjustment range



SM 160

Application

- For the inspection of workpieces either on the production line and in the quality assurance

Features

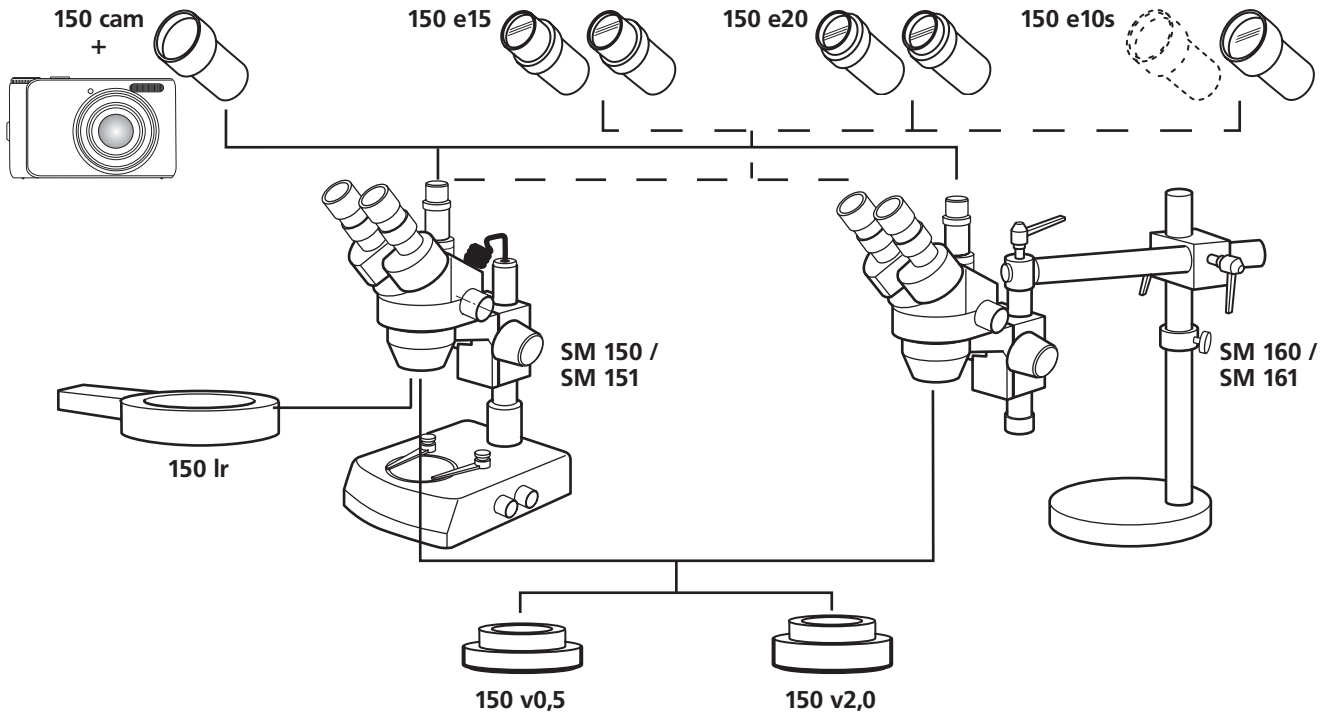
- High quality optics for light intensive and sharp three dimensional images
- Continuously variable magnification due to the adjustable zoom lenses
- Focusing with an ergonomic hand wheel, mounted either side, ideal for either a left or right handed operator
- Prism head tilted to 45° and rotatable through 360°, adjustable pupillary distance (54 - 76 mm) with the dioptric adjustment
- Integrated incident and transmitted illumination, continuously variable (SM 150 / SM 151)
- Optional mounting of a digital camera is a possible (SM 151 / SM 161)

- Supplied with: Microscope, ocular 10x, dust cover, glass plate and white / black plate (SM 150 / SM 151), operating instructions

Technical Data

		SM 150	SM 151	SM 160	SM 161
Magnification		variable 7x - 45x (0.7 / 0.8 / 1 / 1.5 / 2 / 3 / 4 / 5)			
Field of view	mm	28 - 5			
Observation tube angle		45°			
Optical tube		Binocular	Trinocular	Binocular	Trinocular
Camera connector			●		●
Working distance	mm	75			
Max. height of test piece	mm	110		–	–
Illumination		12 V / 15 W Incident and transmitted light, variable	12 V / 15 W Incident and transmitted light, variable	–	–
Base dimensions	mm	260 x 200	260 x 200	230 x 230	230 x 230
Order no.	220 V	**4245001**	**4245002**	**4245003**	**4245004**
Order no.	110 V	**4245061**	**4245062**	**4245063**	**4245064**

Accessories



Illumination

		Order no.
LED ring light, adjustable D= 75 mm, incl. mains adaptor, 90 - 265 V	**150 lr**	**4245030**
Cold light source luminance / brightness 8 Mlx, Output 30 W, Power input 50VA / 240 V	**200 fs***	**4245043**
Cold light source luminance / brightness 8 Mlx, Output 30 W, Power input 100 - 120 V	**200 fs***	**4245053**
Flexible fiber optic light guide 2-Arm, L=500 mm, D=4 mm	**200 fl***	**4245042**

Eyepieces / Ocular

	Reticule (plate)	Quantity		Order no.
Magnification 15x		2	**150 e15**	**4245010**
Magnification 20x		2	**150 e20**	**4245011**
Magnification 10x	●	1	**150 e10s**	**4245012**

Ancilliary Lenses

		Order no.
Magnification 0.5x	**150 v0,5**	**4245020**
Magnification 2.0x	**150 v2,0**	**4245021**

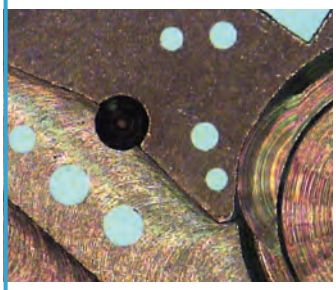
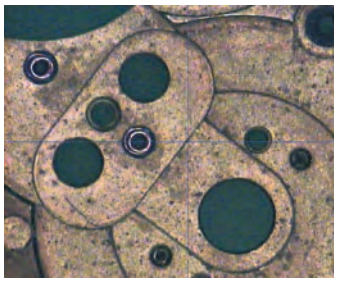
Camera

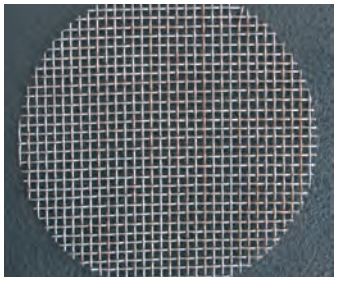
		Order no.
CamSet incl. digital camera and adaptor	**150 cam****	**4245026**

* *See page 18-21* ** *Only for SM 151 and SM 161, see page 18-8*

Stereo-Zoom Microscopes MarVision SM 150 / SM 160

MarVision SM 151 / SM 161 with digital camera



Features

- High quality digital camera with ca. 12 Megapixel and 4x optical zoom. Ideal to document workpieces (e.g. inspection of incoming goods, first sample examination, etc.)
- Supplied with: Digital camera (type of camera is dependent on the current model range), retaining ring and adaptor

Ill.: Type of camera is dependent on current the model range, retaining ring and adaptor to connect the camera objective to the microscope for high-quality microscopic photographs for the documentation of workpieces. Similar to illustration

Workshop Measuring Microscope MarVision MM 200

Applications

- For measuring distances and angles (with the ocular head 200 w) for example: punched and flexible parts, plastic components as well as electronic circuit boards

Features

Measuring Microscope
- High quality optics for light intensive and sharp three dimensional images
- Zoom lenses with continuous variable magnification and/or fixed lenses
- Focusing with an ergonomic hand wheel, mounted either side, ideal for either a left or right handed operator
- Prism head tilted to 45°; with dioptric adjustment
- LED ring light, dimmable
- LED transmitted light, dimmable
- Sturdy granite base
- Stable XY table precision mounted
- Supplied with: Microscope, ocular 10x with cross line reticules, 2 digital micrometer heads - 50 mm, illumination box, with test certificate, operating instructions

Digital Micrometer Head

Functions:
Zero setting, PRESET (enter a numerical value), mm/inch, Absolute/Relative measurement

- High contrast LCD with 6 mm high digits
- Bezel can be rotated through 270°
- Data output via RS232C or USB

Note: Also available without Micrometer Heads

Technical Data

Measuring range X / Y	mm	50 / 50	
Measuring table dimensions	mm	150 x 150	
Max. table load	kg	15	
Measuring system:		Micrometer Head	
- Readings	mm	0.001	
- Error limit	µm	8	
- Repeatability	µm	2	
Magnification		Fixed lenses 32x	Variable zoom 8 - 40x (0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 4)
Field of view	mm	6	23 - 4
Working distance	mm	75	
Max. height of test piece	mm	190	
Illumination		LED Incident and transmitted light, individually adjustable	
Interfaces		USB or Opto RS232	
Dimensions* H x W x D	mm	535 x 410 x 470	
Order no.	220 V	**4246000**	**4246001**
Order no.	110 V	**4246005**	**4246006**

* *Measuring table is centered*

Workshop Measuring Microscope MarVision MM 220

Applications

- For measuring distances (QC 100); bore holes and angles and determination of geometric elements (points, lines, circles, distances, intersections, etc.) (QC 200) for example: punched and flexible parts, plastic components as well as electronic circuit boards

Operating and display unit QC 200

Technical Data

Measuring range X / Y	mm	100 / 100	200 / 100	250 / 170
Z travel	mm	200 / 400**		
Max. table load	kg	20		
Measuring system:		built-in incremental measuring scale		
- Resolution	mm	0.001		
- E_1 / E_2 X / Y in µm		$E_1 = 1.9 + (L/100)$ $E_2 = 2.9 + (L/100)$ L in mm		
Magnification		Variable 8 - 40x (0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 4		
Field of view	mm	23 - 4		
Working distance	mm	75		
Max. height of test piece	mm	180 / 330**		
Illumination		LED Incident and transmitted light, individually adjustable		
Interfaces		RS232 / USB		
Dimensions* H x W x D	mm	550 x 480 x 430	550 x 650 x 530	550 x 700 x 600
Order no. with QC 100	220 V	**4246100**	**4246101**	**–**
Order no. with QC 100	110 V	**4246105**	**4246106**	**–**
Order no. with QC 200	220 V	**4246200**	**4246201**	**4246202**
Order no. with QC 200	110 V	**4246205**	**4246206**	**4246207**

* *Measuring table is centered* ** *Option*

Features

Measuring Microscope
- High quality optics for light intensive and sharp three dimensional images
- Zoom lenses with continuous variable magnification
- Focusing with an ergonomic hand wheel, can be mounted either side, ideal for either a left or right handed operator
- Prism head tilted to 45° with dioptric adjustment
- LED ring light, dimmable
- LED transmitted light, dimmable
- Sturdy granite base
- Stable XY table precision mounted
- Quick and fine adjustment of all axes
- Excellent accuracy and reliability due to the optical incremental measuring system

- Supplied with: Microscope, standard stop bar, operating and display unit QC 100 or QC 200, operating instructions

Operating and Display Unit QC 100
- Large, high contrast backlit graphic LCD display
- Displays for X and Y-Axis

Functions QC 100:
- Zero setting the axis
- PRESET (enter a numerical value)
- mm/inch
- Absolute/Relative measurement
- RS232 interface for processing measured data

Operating and Display Unit QC 200
- Large, high contrast backlit graphic LCD display
- Measurement and evaluation functions for points, lines, circles, angles, distances and intersecting straight lines
- "Magic" function is a time saving feature that automatically recognizes the geometric pattern of data points
- Simply create a measuring program with the Teach-In mode
- Easy program sequence due to on screen graphic guidance
- Operator prompts are available in several languages
- RS232 interface for processing measured data

Operating and display unit QC 200

Accessories

Optional Optics

		Order no.
Ocular head, with angular measuring device, rotatable through 360°. Use in exchange to the standard ocular	**200 w**	**4246010**

Optional Illumination

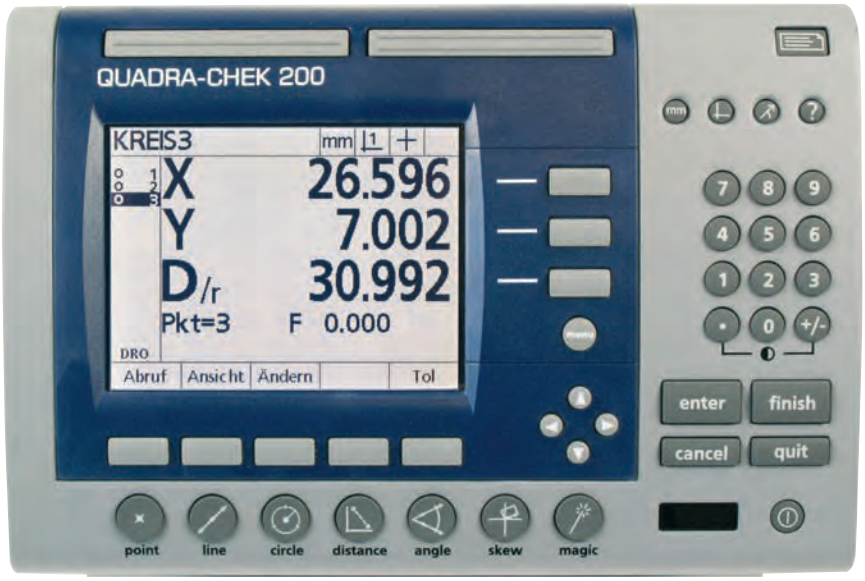
		Order no.
Telecentric LED transmitted light for measuring rotationally symmetric parts	**200 ld**	**4247050**
Iris diaphragm		**4246250**

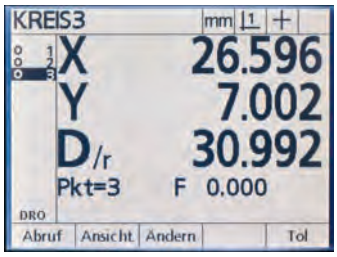
Optional Z-Axis

		Order no.
Z-Axis extension 200 mm	**320 zv**	**4246051**

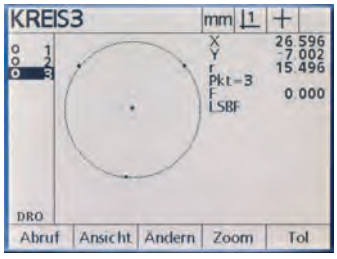
Workshop Measuring Microscopes MarVision MM 200 / MM 220

Operating and Display Unit QC 200





Digital display



Graphic mode

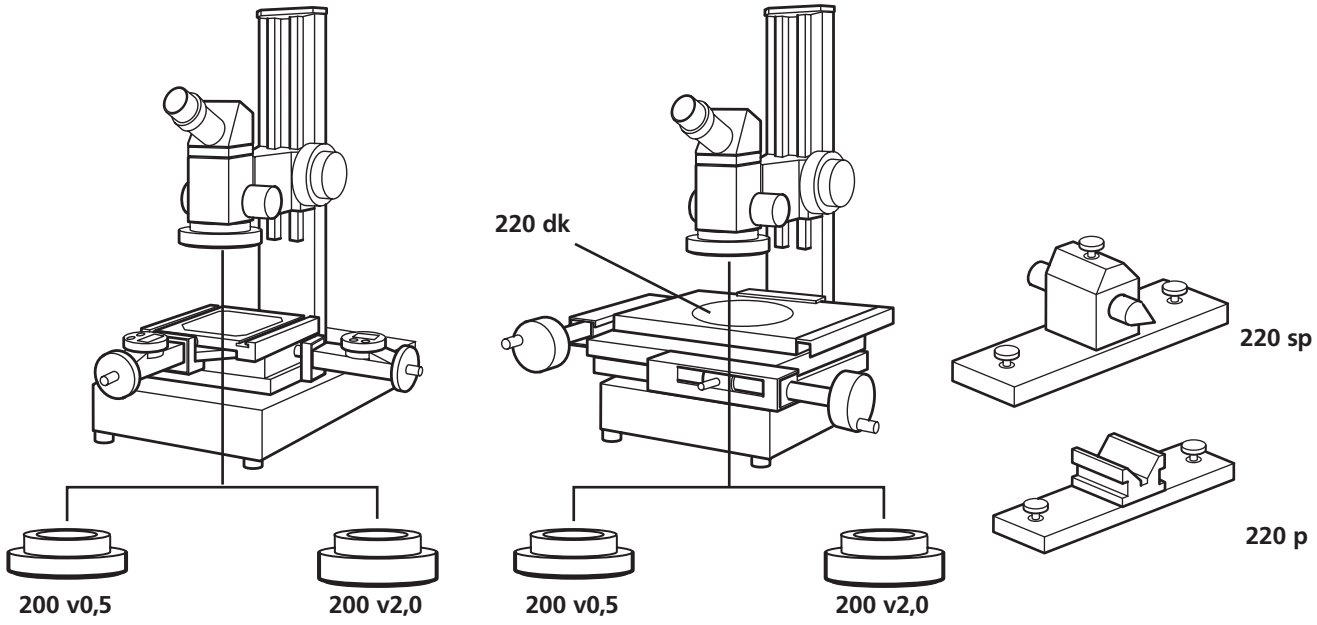
Measurement and Evaluation Functions

Point		e.g. intersecting straight lines
Line		e.g. line of best fit, centerline
Circle		e.g. index circle, pitch circle
Distance		e.g. distance between point-point, point-line
Angle		Taken from 2 lines
Alignment of axis		Alignment of the coordinate system on the test piece
Magic		Automatically recognizes the geometric pattern of measuring points

Accessories for Operating and Display Units QC 100 / QC 200 / MM 200

		Order no.
Foot switch for capturing measuring points	**200 qcs**	**4246111**
Data cable RS232 for the Micrometer Heads (MM 200)	**800 EWr**	**4305122**
Data cable USB for the Micrometer Heads (MM 200)	**800 EWu**	**4305121**

Accessories for MarVision MM 200 / MM 220



Optics / Ancilliary Lenses MM 200 / MM 220

		Order no.
Ocular head, with angular measuring device, rotatable through 360°. Use in exchange to the standard ocular	**200 w**	**4246010**
Magnification 0.5x	**200 v0,5**	**4246020**
Magnification 2.0x	**200 v2,0**	**4246021**

Illumination MM 200 / MM 220

		Order no.
Cold light source luminance / brightness 8 Mlx, Output 30 W, Power input 50VA / 240 V	**200 fs**	**4245043**
Cold light source luminance / brightness 8 Mlx, Output 30 W, Power input 100 - 120 V	**200 fs**	**4245053**
Flexible fiber optic light guide 2-Arm, L=500 mm, D=4 mm	**200 fl**	**4245042**

For Measuring Tables MM 220

		Order no.
Pair of V-blocks for diameters 5-55 mm to be mounted on the measuring table 200 x 100 mm	**220 p**	**4246801**
Pair of center supports height 40 mm to be mounted on the measuring table 200x100 mm	**220 sp**	**4246802**
Rotary glass plates D=100 mm for measuring table 200 x 100 mm	**220 dk**	**4246920**
Rotary glass plates D=100 mm for measuring table 250 x 170 mm	**220 dg**	**4246921**
Stop bar 90° with object clamps	**220 as90**	**4246821**

Dust Covers MM 200 / MM 220

	Order no.
Dust cover for MM 200	**4246070**
Dust cover for measuring ranges 100 / 100 and 200 / 100	**4246071**
Dust cover for measuring range 250 / 170	**4246072**

Workshop Measuring Microscope MarVision MM 420 with M3-Software and a Touchscreen-PC

MM 420

M3-Touchscreen-PC

Zoom stages	Depiction in display	Field on image
0.7 x	35 x	9.4 x 7.0 mm²
1.0 x	50 x	6.5 x 4.9 mm²
2.0 x	94 x	3.2 x 2.4 mm²
3.0 x	142 x	2.1 x 1.6 mm²
4.0 x	195 x	1.6 x 1.2 mm²
4.5 x	225 x	1.3 x 0.9 mm²

Technical Data

Measuring range X/Y#	mm	100 / 100	200 / 100	250 / 170	400 / 250
Z travel	mm	200 / 400**			
Measuring table dimensions	mm	270 x 210	370 x 210	420 x 280	600 x 480
Max. table load	kg	20			
Measuring system:		built-in incremental measuring scale			
- Resolution	mm	0.001			
- MPE E_1 X / Y in µm (L in mm)		1.9 +(L/100)			3.9 +(L/100)
- MPE E_2 XY in µm (L in mm)		2.9 +(L/100)			4.9 +(L/100)
Field of view		see table on page 18-19			
Working distance	mm	85			
Max. height of test piece	mm	ca. 65 / 300**			300
Illumination		LED Incident and transmitted light. individually adjustable			
Dimensions* H x W x D	mm	700 x 480 x 430	700 x 650 x 550	700 x 700 x 600	800 x 1000 x 900
Magnification* **		Zoom 35-225x			
Order no. with M3	220 V	**4247600**	**4247601**	**4247602**	**4247603**
Order no. with M3	110 V	**4247605**	**4247606**	**4247607**	**4247608**

** Measuring table is centered ** extensions are optional *** on screen*
 # Specialized table sizes are available upon request, up to 1000 x 250 mm travel path

Applications

- For measuring and / or the determination of geometric elements (points, lines, circles, distances, intersection etc.) via automatic edge detection, for example: punched and flexible parts, plastic components as well as electronic circuit boards.

For further applications and industrial branch based solutions see Webcode: 14894-16206

Features

Measuring Microscope
- Integrated color camera
- Zoom lens
- LED ring light: 1 ring and 4 segments, each can be individually switched on/off or dimmed
- LED transmitted light: dimmable
- Sturdy granite base
- Stable XY table precision mounted
- Quick and fine adjustment of the axis
- Excellent accuracy and reliability due to the optical incremental measuring system
- Laser pointer for positioning asisstance

- Supplied with: Measuring Microscope, Stop bar standard, M3-Software with Touchscreen PC
- Operating instructions in a PDF file
- Test certificate

Operating and Display Unit M3-Software with Touchscreen PC
- 23" Touchscreen with keyboard a mouse
- Based on Windows; therefore additional software can be installed
- Operated via the Multi-Touch on the monitor or via mouse/ keyboard
- Large video image
- Target / actual evaluation with tolerance data
- Protocol print out with company logo
- Represented graphically with dimensions
- Automatic edge detection even with low constrast parts

- Options:
  - Integration of DXF-files
  - Training
  - Calibration
  - Maintenance

Optional Optics

		Order no.
Motorized Navitar Zoom Lens 6.5:1, additional cost to the Zoom lens (0.7x - 4.5x)	**320 zmo**	**4247028**
TV-Adaptor 0.67x for zoom lenses additional cost to the standard TV-Adaptor (1.0)	**320 tv0,67**	**4247027**

Optional Illumination

		Order no.
Telecentric LED transmitted light illumination for measuring rotationally symmetric parts	**200 ld**	**4247050**
Coaxial LED top light for measuring plain-colored surfaces (e.g. ceramic gage blocks) and optionally for measuring the Z-Axis	**320 kaz**	**4245300**

Optional Z-Axis

		Order no.
Z-Axis extended by 200 mm	**320 zv**	**4246051**
Z-Axis with measuring system	**320 zm**	**4246050**
Z-Axis extended by 200 mm with measuring system	**320 zvm**	**4246052**
Z-Axis extend the measuring system by 200 mm for larger tables (standard extension)	**320 zvl**	**4246054**

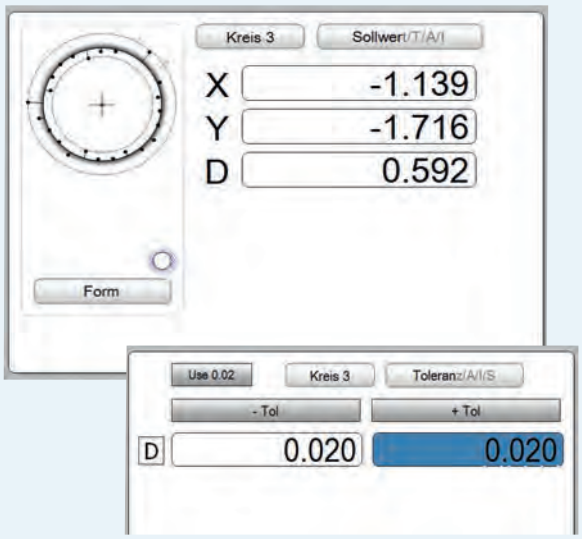
Note: Microscopes with a measuring Z-Axis, a coaxial incident light is recommended!

Workshop Measuring Microscope MarVision MM 420 with image processing

M3-Software

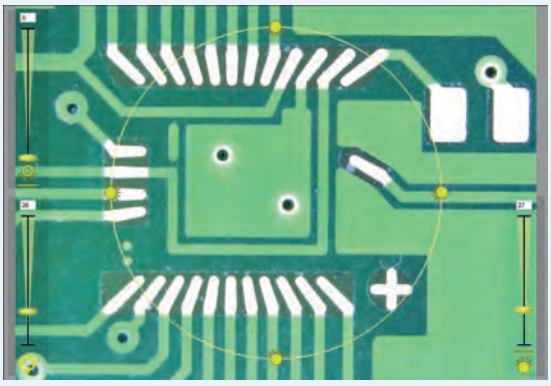
View – Measure – Detailed – Dimensioned – Evaluate – Record

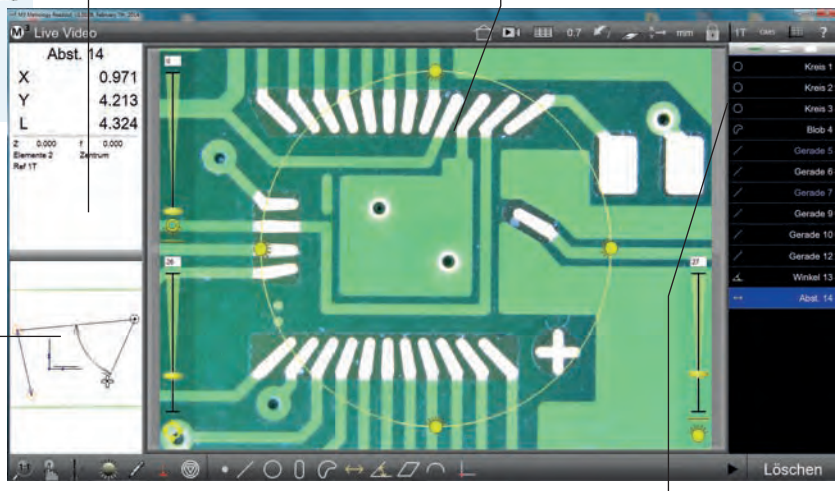
Coordinates window



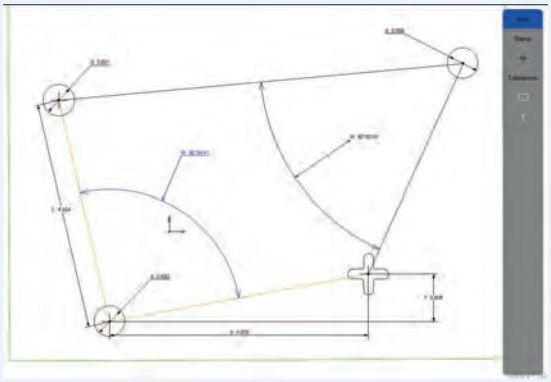
Form and Location tolerances

Live Video Imaging

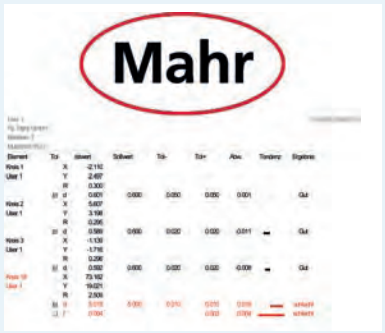




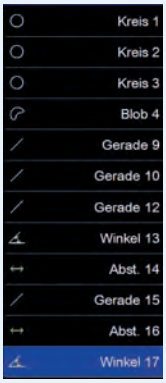
View of parts with dimensions



Protocol



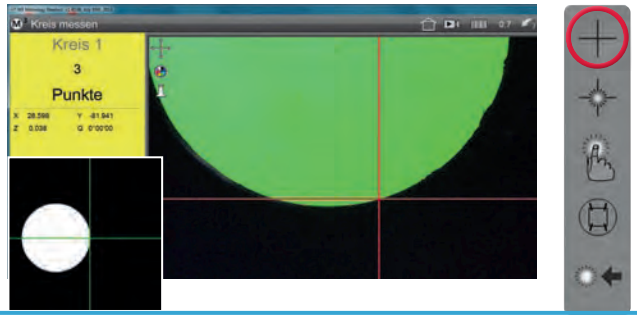
List of features



Measuring Tools

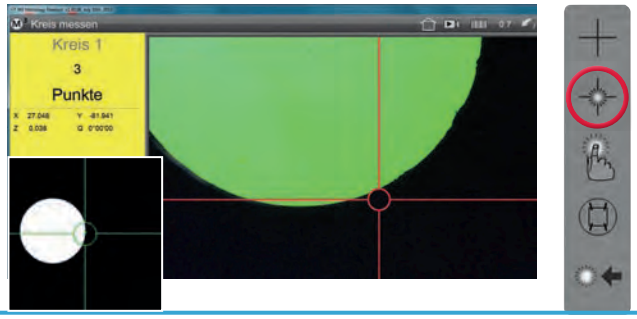
Reticule / Cross Hair

- Manual measurement with a cross hair
- Move to defined positions
- Rotate to a defined angle



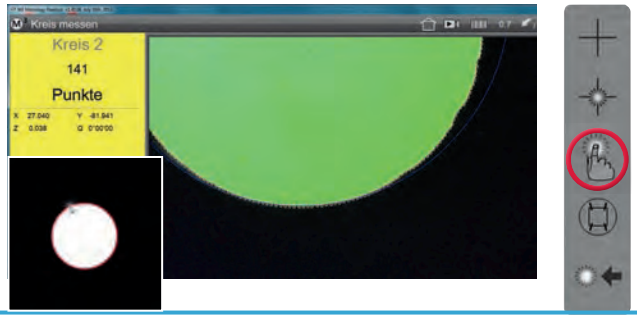
Active Cross Hair

By clicking on the edge of the element the dynamic cross hair automatically detects the edge, thus increasing the speed of measurement and improving measuring accuracy.



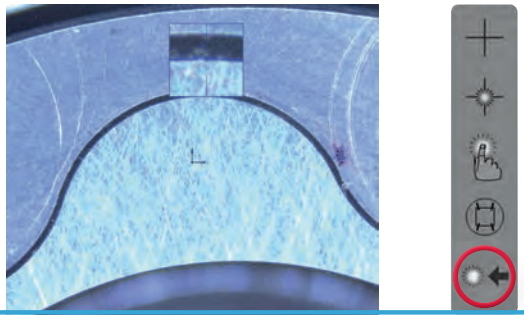
Multi-Point Measurement

Automatically detect the features. Simply click on the element edge in the Camera window; elements such as circles, straight lines, grooves and also free outlines (contours) can then be determined quickly.



Automatic Contrast Detection

- Learn and recognize constrast between 2 elements.



Workshop Measuring Microscope MarVision MM 420 with image processing

M3-Software - Additional Functions

Dimensioning during Live Imaging, e.g. Pitch measurement

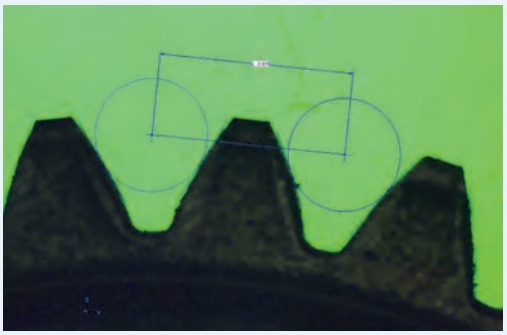
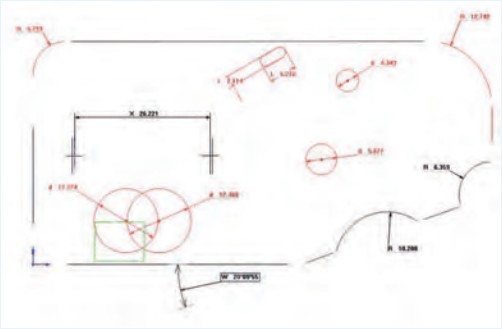
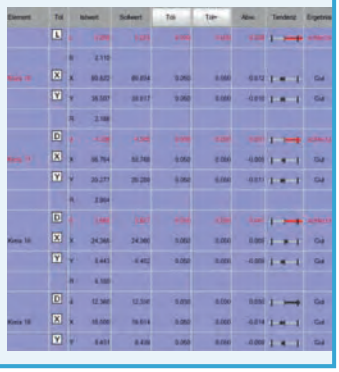


Diagram with dimensions

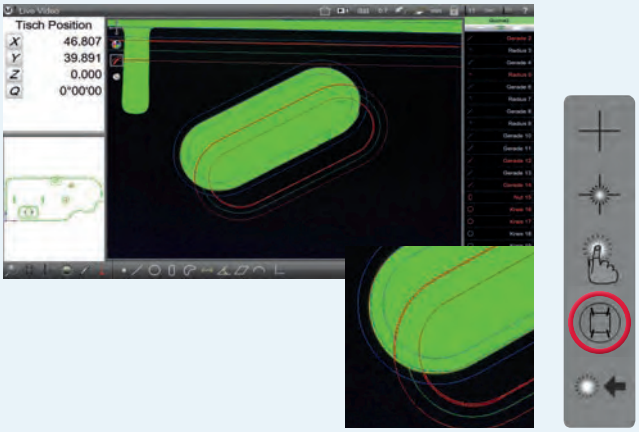


List of results with targeted and actual evaluation

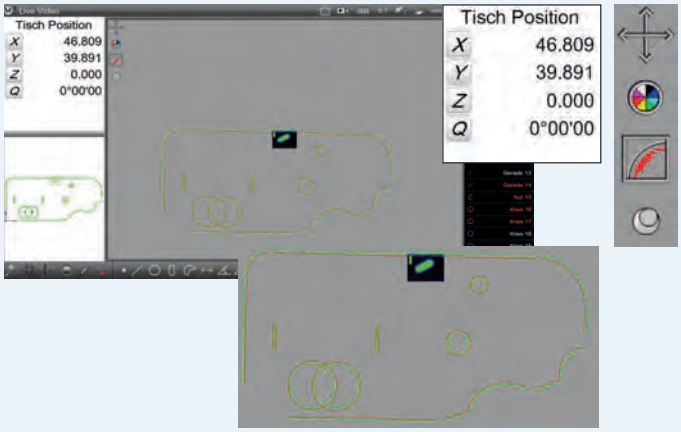


Software-Option-DXF

Define the tolerance bands

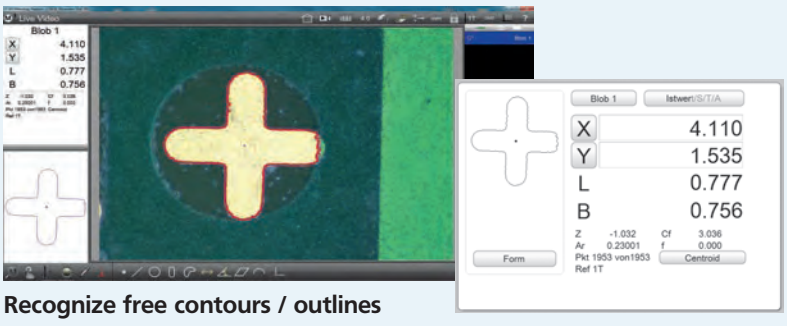


Export and import DXF files



Create overlays (e.g. cross hairs)

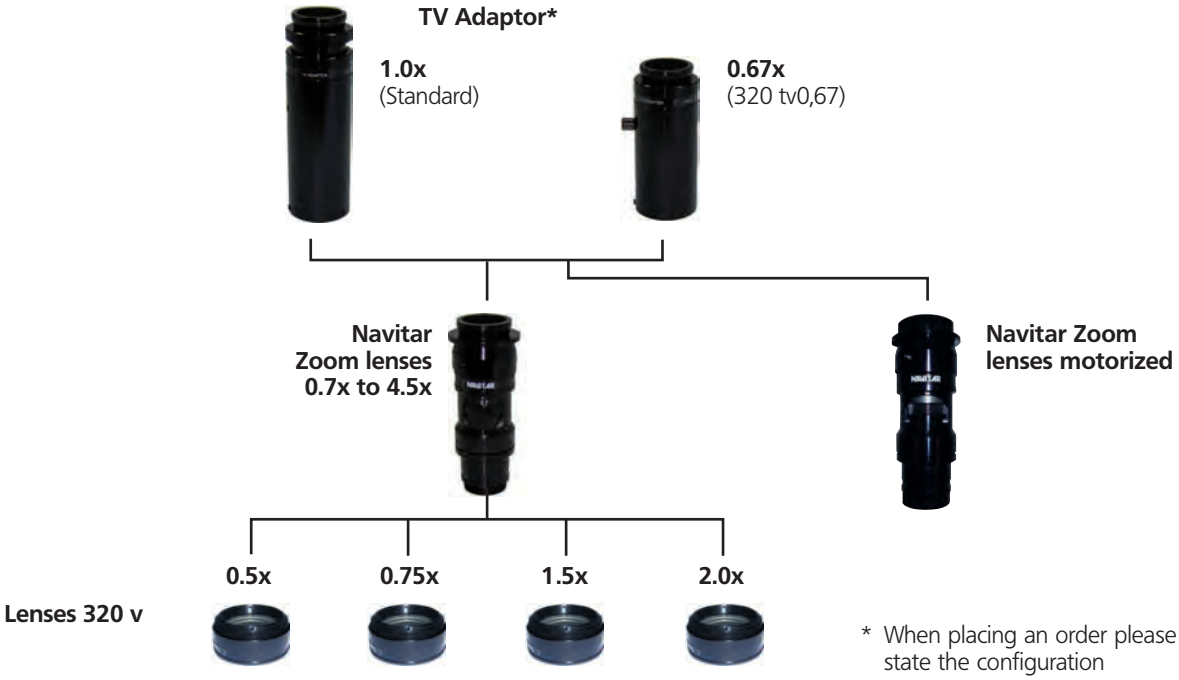
Images details can be used to learn diagrams



Recognize free contours / outlines

Calculate the circumference and determine the area

Configuration of the Optics for MarVision MM 420



* When placing an order please state the configuration

Ancilliary Lenses

		Order no.
Magnification 0.5x	**320 v0,5**	**4247020**
Magnification 0.75x	**320 v0,75**	**4247021**
Magnification 1.5x	**320 v1,5**	**4247022**
Magnification 2.0x	**320 v2,0**	**4247023**

Magnification / Image details

		Zoom-Magnification					
TV Adaptor	**Lenses**	0.7x 👁 / ○	1.0x 👁 / ○	2.0x 👁 / ○	3.0x 👁 / ○	4.0x 👁 / ○	4.5x 👁 / ○
0.67	–	23 / 14.3	34 / 10.3	67 / 5.4	101 / 3.6	134 / 2.5	151 / 2.2
0.67	0.5	12 / 28.7	17 / 20.6	34 / 10.7	50 / 7.2	67 / 5.1	75 / 4.5
0.67	0.75	18 / 21.5	25 / 15.4	50 / 8.1	75 / 5.4	101 / 3.8	113 / 3.4
0.67	1.5	35 / 10.7	50 / 7.7	101 / 4.0	151 / 2.7	201 / 1.9	226 / 1.7
0.67	2.0	47 / 7.2	67 / 5.1	134 / 2.7	201 / 1.8	268 / 1.3	302 / 1.1
1.0	–	35 / 9.6	49 / 6.9	94 / 3.6	141 / 2.4	200 / 1.7	225 / 1.5
1.0	0.5	18 / 19.2	25 / 13.8	47 / 7.2	71 / 4.8	100 / 3.4	113 / 3.0
1.0	0.75	26 / 14.4	37 / 10.4	71 / 5.4	106 / 3.6	150 / 2.6	169 / 2.3
1.0	1.5	53 / 7.2	75 / 5.2	150 / 2.7	225 / 1.8	300 / 1.3	338 / 1.1
1.0	2.0	70 / 4.8	98 / 3.5	188 / 1.8	282 / 1.2	400 / 0.9	450 / 0.8

👁 Magnification on screen ○ Field of view in mm

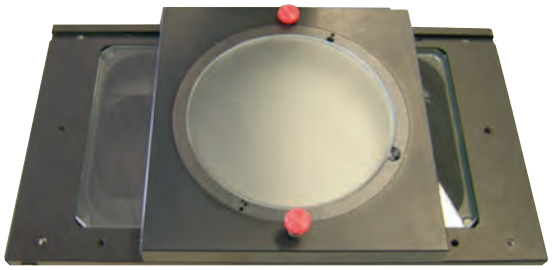
Workshop Measuring Microscope MarVision MM 420 with image processing

Accessories

LED transmitted light (telecentric is optional for more focused measurement of rotationally symmetric parts).

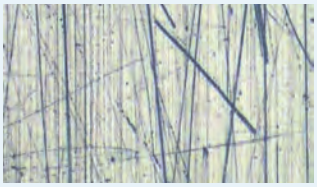
with telecentric transmitted light

without telecentric transmitted light



Rotary glass plate

Optional coaxial incident light for ideal illumination of plain-colored surfaces (e.g. ceramic gage blocks), and optionally for measuring the Z-Axis



with coaxial incident light

without coaxial incident light

Calibration standard with certificate

For Measuring Tables

		Order no.
Rotary glass plates D=100 mm for measuring table 200 x 100 mm	**220 dk**	**4246920**
Rotary glass plates D=100 mm for measuring table 250 x 170 mm	**220 dg**	**4246921**
Telecentric LED transmitted light illumination for measuring rotationally symmetric parts	**200 ld**	**4247050**
Coaxial LED top light for measuring plain-colored surfaces (e.g. ceramic gage blocks) and optionally for measuring the Z-Axis	**320 kaz**	**4245300**

Calibration Standards

		Order no.
Calibration standard with circles incl. calibration certificate	**320 nkz**	**4246901**

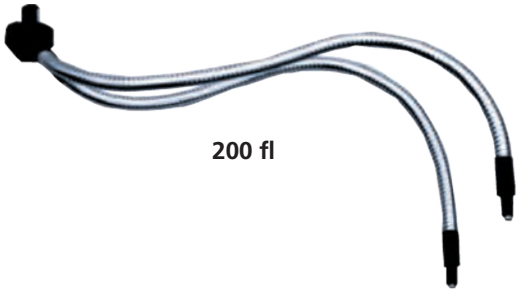
Dust Covers*

	Order no.
Dust cover for measuring ranges 100 / 100 and 200 / 100	**4246071**
Dust cover for measuring ranges 250 / 170	**4246072**
Dust cover for measuring ranges 400 / 250	**4246073**

* *Not suitable for extended Z-Axis*

Cold Light Sources for MarVision Measuring Microscopes

200 fs



200 fl

Features

Cold light source 200 fs
- Extremely bright
- With 30% more light efficiency due to electronic control setting
- Offers colder color temperature for the measurement of colored surfaces
- Even illumination due to the patented light distribution

Technical Data

		For Microscope				
	Catalog no.	SM 150 / 160	MM 200	MM 220	MM 420	Order no.
Cold light source Luminance / brightness 8 Mlx Output 30 W Power input 50VA / 240V	**200 fs**	●	●	●	●	**4245043**
Power input 100 - 120V	**200 fs**	●	●	●	●	**4245053**
Flexible fiber optic light guide 2-Arm, L=500 mm, D=4 mm	**200 fl**	●	●	●	●	**4245042**

Clamping Elements

220 p

220 sp

220 as 90

Features

- For clamping, centering work-pieces

Technical Data

		Order no.
Pair of V-blocks 200 x 100 with clamping bracket	**220 p**	**4246801**
Pair of V-blocks 250 x 170 with clamping bracket	**220 p**	**4246831**
Pair of V-blocks 400 x 250 with clamping bracket	**220 p**	**4246832**
Pair of center supports 200 x 100 with moveable chucks	**220 sp**	**4246802**
Pair of center supports 250 x 170 with moveable chucks	**220 sp**	**4246833**
Pair of center supports 400 x 250 with moveable chucks	**220 sp**	**4246834**
Center support rotary 200 x 100, H=50 mm, distance between centers 130 mm	**220 sps**	**4246806**
Center support rotary 250 x 170, H=50 mm, distance between centers 130 mm	**220 sps**	**4246807**
Center support rotary 400 x 250, H=50 mm, distance between centers 130 mm	**220 sps**	**4246808**
Stop bar 90° with object clamps	**220 as 90**	**4246821**

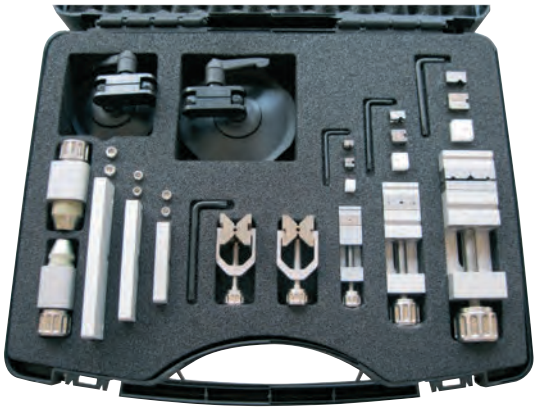
Mini Precision Vise MarTool 109 PS in set

Features

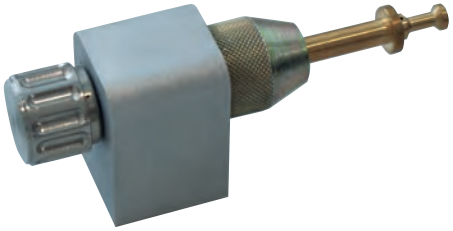
- With mini precision vises. Depending upon set are clamping prisms, support plates., stands and mini dividing attachments. Supplied in a plastic case

Technical Data

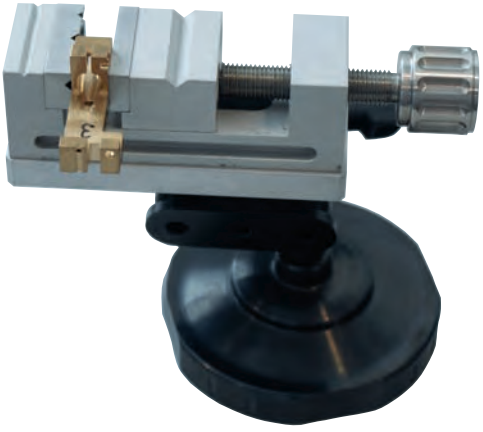
Case set	Order no.
Width of jaws 15 / 25	**4246816**
Width of jaws 25 / 35	**4246817**
Width of jaws 15 / 25 / 35 incl. stand, clamping prism	**4246818**
Width of jaws 15 / 25 / 35 additional mini dividing attachments	**4246819**



Applications



Mini rotary table, available in 2 sizes

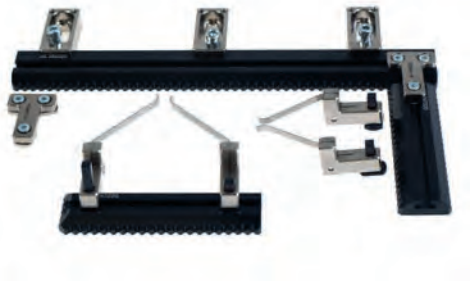


Precision vise with stand, available in 3 sizes

Prism with clamping bracket

Clamping Elements

Set 1



Set 2

Set 3

Features

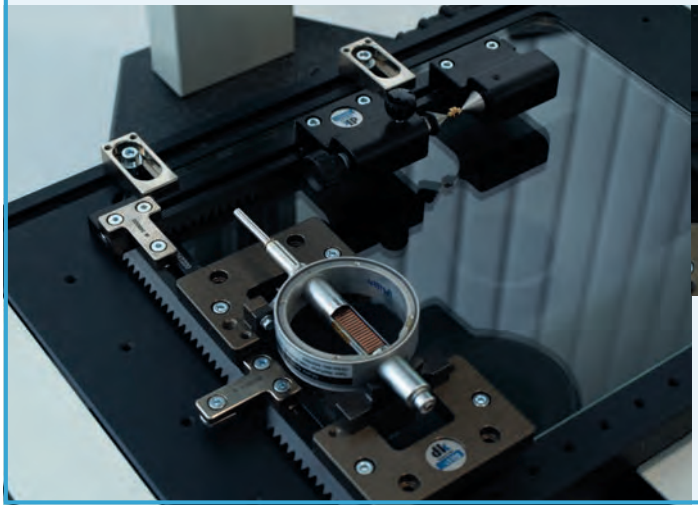
- **Set 1:** Clamping Set in a wooden case
- **Set 2:** Base Rail Set in different sizes
- **Set 3:** V-Block support, three-jaw chuck and tailstocks as accessories for base rail sets

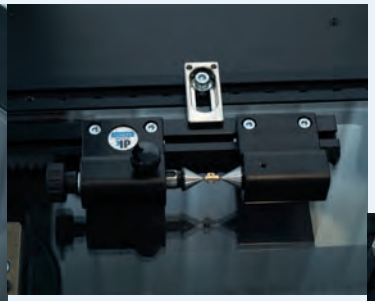
Technical Data

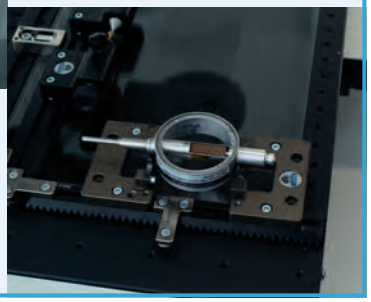
		Order no.
Clamping Set in a wooden case	**220 Set 1**	**4246850**
Base Rail Set for measuring ranges 200 x 100 mm	**220 Set 2/1**	**4246851**
Base Rail Set for measuring ranges 250 x 170 mm	**220 Set 2/2**	**4246852**
Base Rail Set for measuring ranges 400 x 250 mm	**220 Set 2/3**	**4246853**
V-Block support, three-jaw chuck and Tailstocks	**220 Set 3**	**4246854**
Rotary swivel mount without jaw chuck or rails	**220 ds**	**4246855**

Rotary swivel mount for small diameters. Illustration: with jaw chuck and rails

Applications







Video Workshop Measuring Microscope MarVision QM 300 with M3-Software and Touchscreen-PC

QM 300

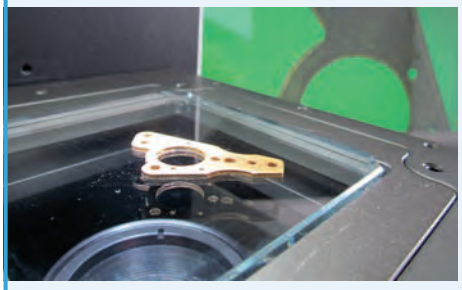
High resolution camera plus LED incident and transmitted light

User friendly measurement software

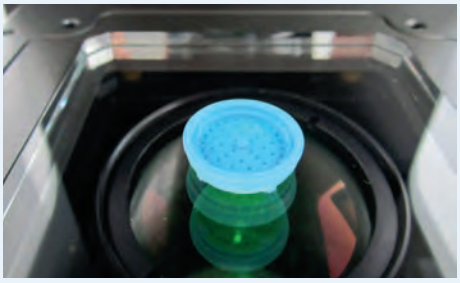
23" Touchscreen-PC

Illustration: Similar to illustration (depends upon the PC manufacturer)

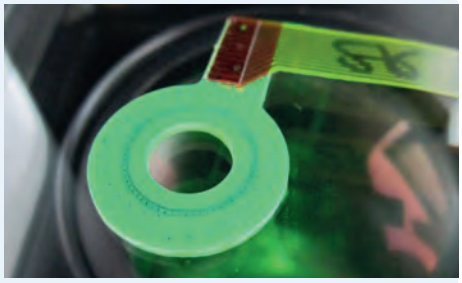
Example of Applications



Laser punched parts



Sieve



Circuit board

Technical Data

Measuring range / image field	mm	32 x 24	57 x 42	96 x 72
Height adjustment	mm		30	
Measurement error E_2		4.0+L/50 (L in mm)	4.5+L/50 (L in mm)	7.5+L/50 (L in mm)
Camera system			5 Megapixel USB 3	
Incident light			LED ring light	
Transmitted light			LED telecentric	
Dimensions QM 300, D x W x H	mm	330 x 230 x 580	330 x 240 x 720	340 x 250 x 820
Order no.	220 V	**4247800**	**4247801**	**4247802**
Order no.	110 V	**4247803**	**4247804**	**4247805**

Applications

- For measuring and / or the determination of geometric elements (points, lines, circles, distances, intersection etc.) via automatic edge detection, for example: punched and flexible parts, plastic components as well as electronic circuit boards.

For further applications and industrial branch based solutions see Webcode: 14813-15767

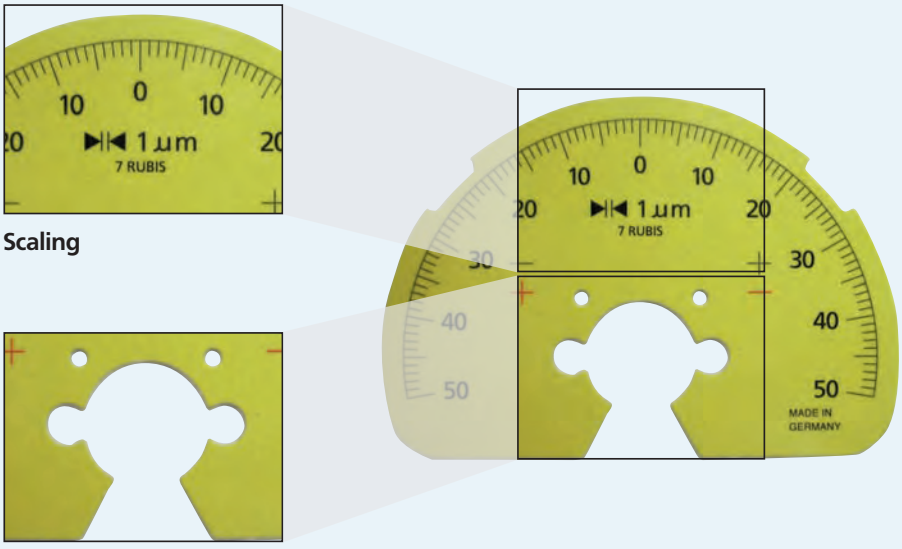
Features

- Telecentric fixed lens
- Integrated USB color camera
- LED ring light: dimmable
- LED transmitted light
- Height adjustable measuring table
- Large, high contrast backlit color LCD display
- Automatic edge detection
- Automatic measurement of all features of a component within the image field
- Depth of focus ca. 10 mm
- DXF function: compares measurement with the CAD drawing
- Measurement and evaluation functions for points, lines, circles, angles, distances and intersecting straight lines. "Magic" function is a time saving feature which automatically recognizes the geometric pattern of data points
- Simply create a measuring program with the Teach-In mode
- Easy program sequence due to on screen graphic guidance
- Lighting controls
- Operator prompts are available in several languages
- USB printer port
- USB port
- Updates can be obtained via an USB stick, thus future is secured
- Supplied with: Measuring Microscope, operating instructions in a PDF file, test certificate and a dust cover

Range of Parts

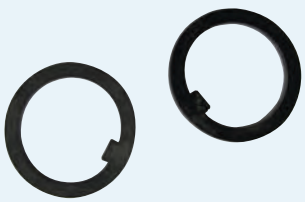
Punched parts

Gears



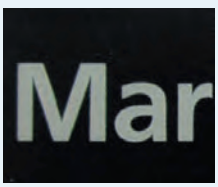
Scaling

Measure a section



Rubber seals

Incription



MAXIMUM PRECISION OF SHAFT-SHAPED PARTS ON THE SHOP FLOOR.

SHAFT METROLOGY FROM MAHR

The latest information on MARSHAFT products can be found on our website:
www.mahr.com, WebCode 20593

► | In order to be able to produce the growing variety of parts cost-effectively, manufacturers now require not only flexible production facilities, but also equally flexible measuring equipment. This is particularly true of the automotive industry and its suppliers. Given that customized vehicles with different engines and transmission systems are now the norm, items such as shaft-shaped parts need to be manufactured in a number of different designs, then measured and tested for quality assurance purposes. To measure the different parts produced in small lots, it is not cost-effective to purchase and maintain the individual multi-gaging units that were used in the past for these customized designs. A better option is to use a universal measuring machine. Such a machine should be able to adapt very quickly and flexibly to a number of different designs while also allowing fast quality assurance thanks to short measuring times. Mahr has a number of appropriate solutions. | ◄

MarShaft. Shaft Measuring Systems

MarShaft. Measurement of Shaft-Shaped Parts on the Shop Floor **19- 2**

MarShaft MAN
Manual Tactile Shaft Measuring Machine **19- 3**

MarShaft SCOPE *plus*
Optical Shaft Measuring Machine **19- 3**

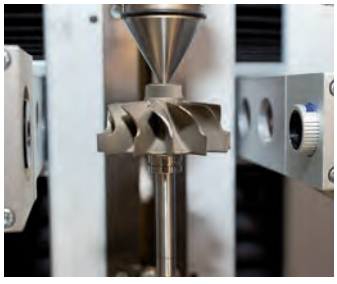
MarShaft
Data Overview **19- 5**

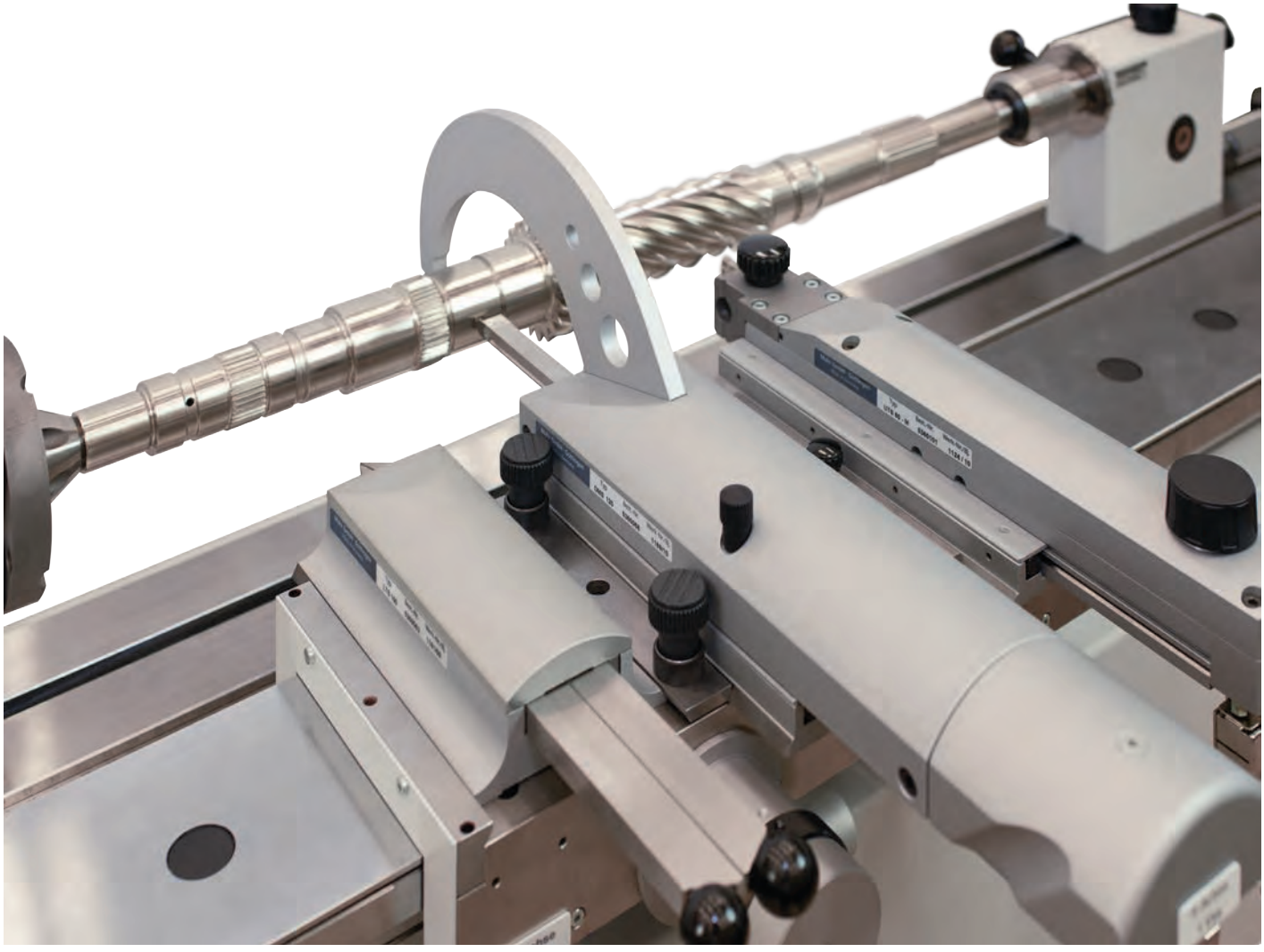
Request a brochure.

MarShaft.

MEASUREMENT OF SHAFT-SHAPED PARTS ON THE SHOP FLOOR

► | MarShaft shaft measuring machines are primarily used on the shop floor but their excellent measuring accuracy means they can also be used in measurement laboratories. The machines come in various sizes and, thanks to their modular design, can be optimized to suit the relevant measuring tasks. Measuring directly on the shop floor during production saves you having to perform time-consuming measurements in the inspection room and improves product reliability. | ◄





MarShaft MAN

Description

The modular design of the **MarShaft MAN** shaft measuring machine allows rotationally symmetrical parts to be measured quickly and flexibly.
- No operator influence
- Highly accurate measuring results
- Excellent repeatability
- Measuring system for all typical measuring tasks such as length, diameter, radial run-out, axial run-out, groove width, taper angle, roundness, coaxiality, concentricity and many others besides

Features

- Measuring force regulator to avoid operator influences
- Ideal for use on the shop floor so can be used directly in production environments
- **MarCheck** display unit which is easy to operate (2 models)

Application

Measurement of round parts such as:
- Gear shafts, camshafts, crankshafts, drive shafts, toothed racks, hollow shafts, etc.

Manually operated shaft measuring machine

Request brochure or see WebCode 20595

MarShaft SCOPE plus

Description

Optical measuring instrument for turned parts with matrix camera for direct use on the shop floor.
- Flexible optical measuring system for round parts
- Maximum precision directly on the shop floor
- Reliable measuring results without operator influence

Features

- Matrix camera, camera picture approx. 8 mm x 8 mm (0.31 x 0.31 in)
- Easy operation thanks to touchscreen monitor
- Record generator

Application

Measurement of round parts such as:
- Precision turned parts, amshafts, drive shafts, gear shafts, toothed racks, hollow shafts, etc.
- Tactile measuring unit for radial and axial run-outs (optional)
- Temperature compensation (optional)
- Thread software (optional)

Optical shaft measuring machine

Request brochure or see WebCode 20594.

MarShaft SCOPE 250 *plus*

Optical and tactile shaft measuring units

Request brochure or see WebCode 20818

Description

With the flexible shaft Measuring Machine MarShaft SCOPE 250 plus Mahr offers the right measurement solution for the fast, precise and fully automatic measurement of rotationally symmetrical workpieces in production.

Features

- New, high-resolution CMOS matrix camera with 40 mm large live image field enables for quick scanning with more than 120 frames per second
- High accuracy for diameter and length meausrement
- Extremely short measuring times due to high measuring speeds up to 200 mm/s
- With use of the Mahr software platform MarWin, all decades of experience in the fields of length, form, position and contour measurement available
- Very good entry price into the segment of small optical shaft measuring machines

Application

Turned parts, journals, hollow shafts, drive shafts, turbocharger shafts, bone screws, balance shafts, hydraulic parts, valves (gasoline engine), injection valves and many more

Measuring and Evaluation Unit MarCheck

Description

- The measuring and evaluation computer MarCheck serves to calculate, process and display measuring and form deviations.
- The operation of the unit can be quickly learned. The operator is guided through the menus and can specifically conduct the measurements using the operation keys.
- Retrofit package for numerous shaft and length measuring units

Features

- 3 measuring channels, can be freely configurated
- Large display
- All 3 measuring channels can be displayed at once
- Possibility to create records
- Modern interface USB e.g. data export to external PC
- Learning programming
- Increased measuring accuracy due to correction data
- Resolution: switchable in increments from 0.0001 to 0.1 mm

MarShaft. Data Overview

	MarShaft MAN	MarShaft SCOPE	MarShaft SCOPE 250 *plus*
Measuring Range			
Length (Z) (mm)	400 / 800 / 1600/ 2000 / 2400	350 / 750 / 1000	250
Diameter (X) (mm)	120 or 220	80 or 120	40
Workpiece			
Weight (max.) (kg)	20/60	15	5
Resolution (settable)			
Lengths/Diameter (mm)	0.0001	0.01 to 0.0001	0.001 to 0.0001
Angle (Degree)	0.001	0.01 to 0.0001	0.01 to0.0001
Error Limits*			
Lengths (µm), L (length) in mm	(3+L/100)	(2+L/125) SCOPE 1000: (3+L/125)	(3+L/100)
Diameter (µm) L (lengths) in mm	(0.8+L/100)	(1.5+L/125) SCOPE 1000: (2+L/125)	(2+L/100)
Drive	Manual	Servo motors	Servo motors
Optics	Camera or measuring microscope possible	Telecentric precision lens system, high-resolution CCD array	Telecentric precision lens system, high-resolution CCD array

* (2 σ at 20 °C ± 1 °C relative to reference standard)

MarCheck. Technical Data

Dimensions (L x W x H)	260 mm x 180 mm x 50 mm
Weight	Electronics with plug-in power supply: 2 kg (without unit base)
Display	LCD monochrome, 240 x 160 pixels with background illumination Digit size measuring axes ca. 13 mm
Resolution per measuring channel can be independently set	0.0001 mm; 0.001 mm; 0.01 mm 0.00001 inch; 0.0001 inch; 0.001 inch 0.001°decimal; ° min, sec
Incremental inputs	T1; T2; T3 sin/cos 1Vss 15 pol. sub D
Data interfaces	1x RS 232, 1x USB slave connection to PC for data exchange and software installation, 1 x USB master 16FAT max. 3 GB USB stick; connection to USB printer, preferrably Mahr no. 4429015 Only the print record HP PCL5 is supported
Unit of measure	mm / inch can be set in the MENU

DIMENSIONAL METROLOGY FOR USE ON THE SHOP FLOOR

MAHR CUSTOMER SPECIFIC METROLOGY

Current Information on MARSOLUTION customer solutions can be found on our website
www.mahr.de, WebCode 14520

►I The design and manufacture of high-precision, reliable part-specific gages requires extensive metrological experience and expertise. Cutting-edge Millimar length measurement components provide reliable measuring instruments for a wide range of different workpiece geometries with different levels of automation. Our portfolio covers all the necessary project stages up to the point where the measuring device is handed over, ready for operation, to the customer. These include project planning, design, manufacture, assembly, putting into service and training. I◄

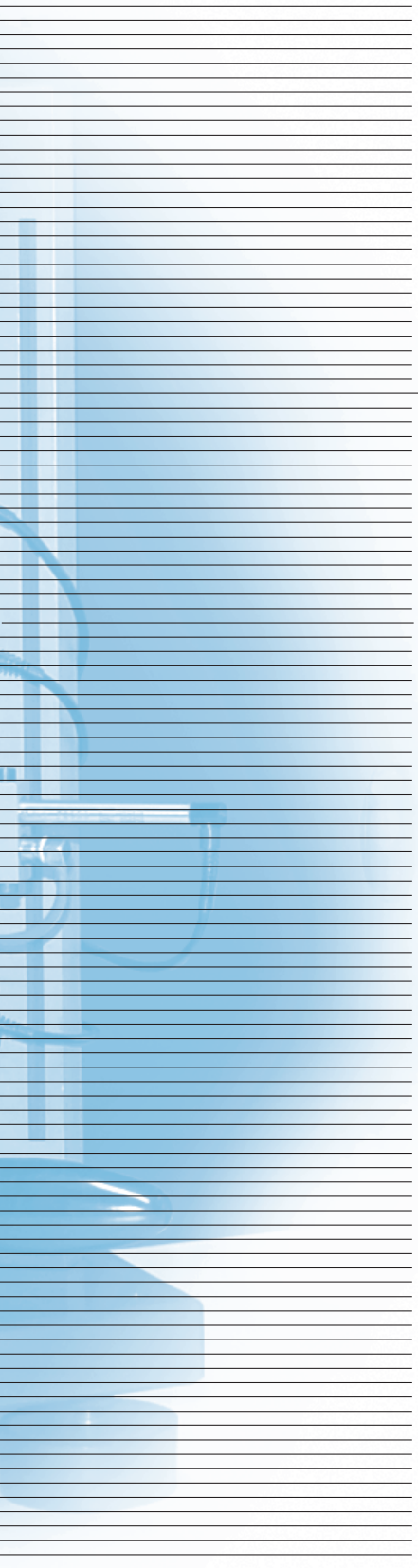
MarSolution. Customer Specific Metrology

MarSolution. Millimar Standard Components 20- 2

MarSolution. Standardized Measuring Devices 20- 4

MarSolution. Customer Specific Measuring Units 20- 5

MarSolution. Software D1200X 20- 7



Request a brochure or see WebCode 19304

MarSolution. Measuring Units Based on Millimar Standard Components

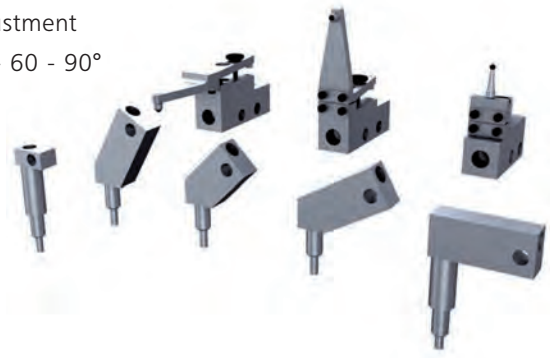
►I The use of Millimar Standard Elements allows multi-gage measuring devices to be designed and implemented for the widest possible range of workpieces, e.g. rotationally symmetrical and non-rotationally symmetrical parts. Rotationally symmetrical workpieces can be mounted between centers or on prismatic supports, whereas non-rotationally symmetrical workpieces often require a special holder. I◄

Gage modules
Travel distance: 5 -10 -20 mm

XY tables
Travel distance
2.5 - 5 - 7 mm

Measuring inserts

Angular adjustment
0 - 30 - 45 - 60 - 90°



MarSolution. Measuring Devices Bases on Millimar Standard Components

Description

Versatile

The versatility of the Millimar Standard Elements means that the right solution can be provided, whatever the measurement task at hand.

Whether it's a question of external, internal or length measurements, the Millimar Standard Elements will be able to meet your requirements, even with complex workpiece geometries.

Thanks to the space-saving design of the styli, a high number of measuring points can be inspected within a small area of the testpiece.

The pneumatic lifting mechanisms integrated into the measuring elements simplify the job of moving the testpiece into the measuring position and reduce the amount of wear on the styli.

Flexible

The modular concept using Millimar Standard Elements is continued throughout the construction of the whole system. A generous amount of travel in the styli (up to 20 mm / 0.79") allows a high degree of flexibility in terms of the variety of testpieces that can be accommodated.

Precise

The Millimar Standard Elements are specially designed for use in the workshop and are manufactured using a rigorous process. This guarantees that the measuring devices give stable and reliable measurements.

For example, using styli fitted with two ball-bearing guides to support the moving part, it is possible to achieve measurement accuracy on the µm scale, if this is required due to the tolerances of the feature being measured.

Reliable

All components are long-lasting and low-maintenance thanks to the use of rust-proof materials, the selection of appropriate heat treatments, and the use of a lifting mechanism to minimize the effects of friction acting on the styli when the workpiece is inserted.

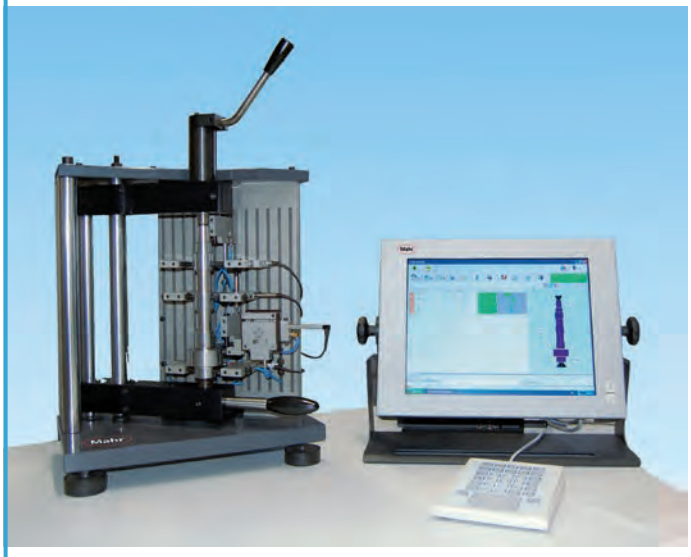
Economical

Our systems can either be constructed by the customer from standard elements obtained from the catalog, or alternatively we can provide ready-built devices as turn-key solutions. Whichever option you choose, you can be sure that you are purchasing a system that is tailored to your specific requirements on the most favorable of terms.

Below are just a few examples of the many factors that contribute to the cost effectiveness of the Millimar Standard Elements:

- Reusability of standard elements: Once manufacture of a particular type of workpiece has ceased, all standard elements used in the test equipment can be reused for a different type of workpiece.
- A choice of different mechanisms for guiding the moving part of the stylus, according to the accuracy requirements of the measuring task (optimal price-performance ratio).
- Reduction in development and implementation time.
- Availability of the equipment: Our standard elements are manufactured under standard production conditions and are always available off the shelf and ready to use.

MarSolution. Standardized Measuring Devices



Description

With the product group „MarSolution", Mahr offers special customer-specific solutions for dimensional metrology - semi- and fully automatic measuring systems that operate directly on the shop floor. Mahr uses its proven standard components (Millimar measuring interface, probes and other standard measuring components) thus offering reliable and precise metrology. Always the right solution for your task. Mahr offers solutions for various industries and branches.

Vertical measuring device with pivoting clamping of workpiece between centers

These measuring devices allow inspection of diameter, length, and radial and axial run-out for rotationally symmetrical parts. With manual or automatic swivelling of the workpiece mount between centers.

Dynamic measurement of the workpiece is also possible thanks to motorized rotation.

Measuring device with rotary table

Measuring devices with rotary table allow combined external and internal measurements as well as automatic radial and axial run-out testing.

These measuring devices can also be motorized to enable dynamic measurements.

Horizontal measuring device

Workpiece mounting on prisms or between centers, including work-piece loading table

The horizontal measuring devices allows workpieces to be held on prismatic supports or between centers. These systems are particularly suitable for heavy workpieces.

The workpiece can be loaded into the workpiece holder outside of the actual measuring station.

WebCode 19305

MarSolution. Customer Specific Measuring Devices

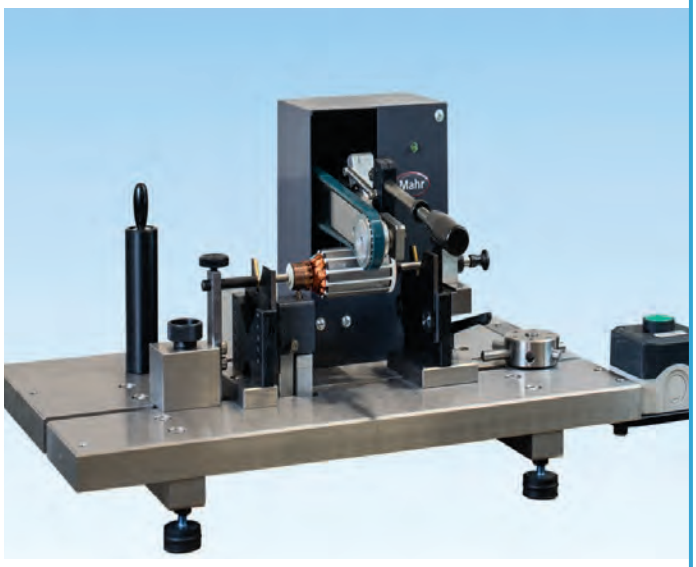
Description

RPM series - commutator shaft measuring device

The RPM measuring device for the measurement of diameter, roundness, runout or segment gap of e.g. commutator shaft, turbocharger shaft or precision shaft in electric motors.

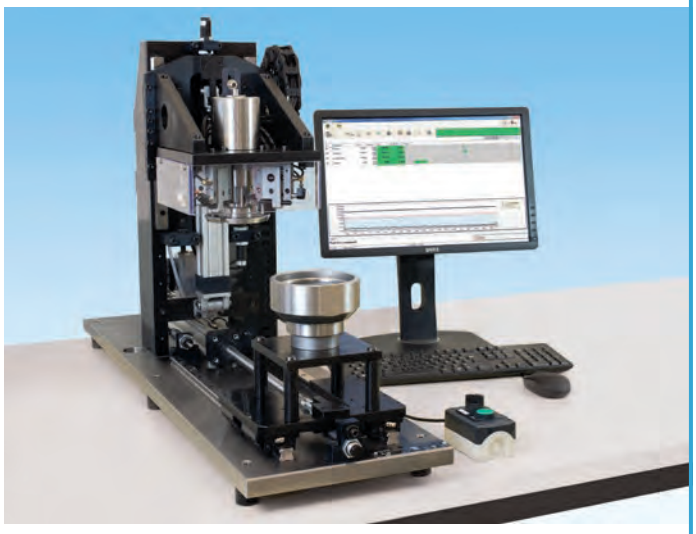
The RPM has the following advantages:

- Easy operation for an efficient measurement
- Fast measurement
- High-performance function analysis with help of the software D1200X



TC series - housing measuring device

Wtih this measuring device, different housing types can be measured. For example, turbochargers, pumps, electric motors or housing. The measuring device can be used as a stand-alone version for use close to production or as an in-line integrated measuring gage for 100% control of production.



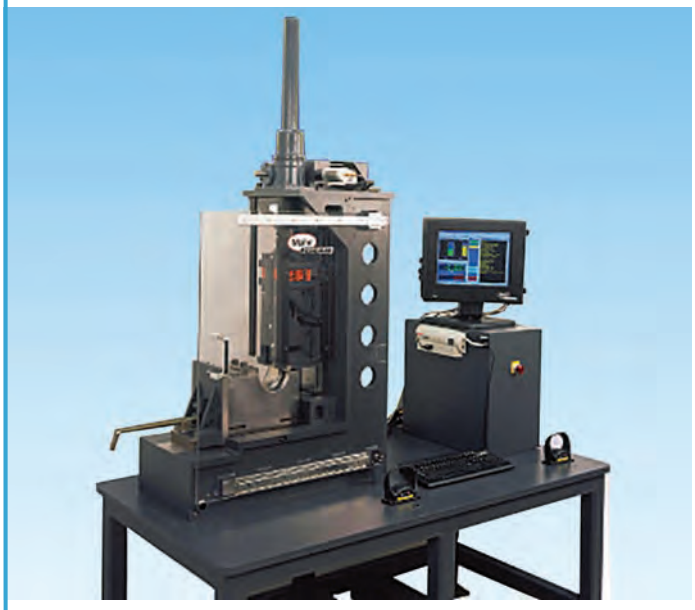
CR 240A: Automated conrod measuring device

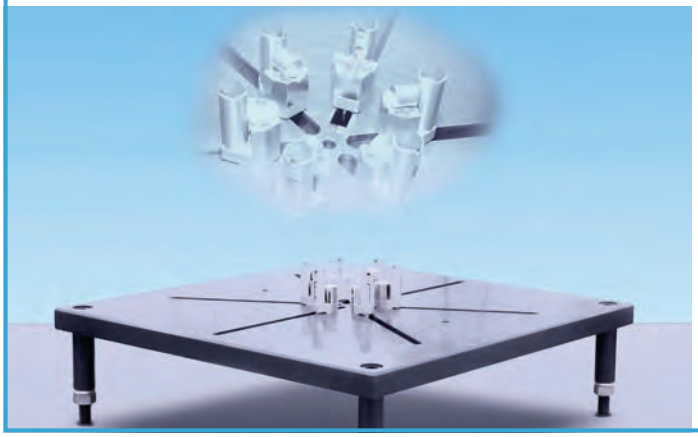
To monitor different work steps, simple measuring devices can be used. Automatic solutions can realize the complete measuring task of the final inspection.

For example, the measuring station CR 240A enables the measurement of common dimensional features on a conrod and offers the following additional functions:

- Exchangeable measuring heads with pneumatic measuring plug and inductive measuring probe Millimar P2004
- Conrod laser engraving. The complete housing protects from laser beams
- Camera for control reading
- Precise weighing system
- Measuring software D1200X with clear and easy operator guidance
- Measuring results can be evaluated online for workpiece correction, statsitcial processing etc.

MarSolution. Customer Specific Measuring Devices





Description

Dynamic measurements of the inside diameter of cylinder bores and wall thickness

The Cylinder Liner Gage is a stand-alone automatic gage to measure the bore ID and flange thickness of a diesel cylinder liner. It is situated to be fed by conveyors that bring and take away cylinder liners from the gage. The gage is designed as a pass through gage with about a 2 second cycle time.

The gage comprises a three stage stations:

- The first station is the load station where one part stops and a temperature measurement is made.
- In station two, the air plug's home position is in the zero master assembly. This allows for zero mastering at a specified frequency. It also allows the air plug to stay on scale, minimizing stabilization time as the air plug enters the liner's bore.
- In station three, the flange thickness assembly is introduced to the flange. The measuring contacts are retracted while the assembly is in motion and engage the part only after the assembly reaches the gaging position.

Dynamic measurement of cylinder bore ID and cylinder flange

Model 2152447 is an automatic, free standing gage to measure the crush" dimension of half bearings and consists of two operating modes - fully automatic and manual.

The half bearing is fully automatically lead to the measuring machines and placed in the corresponding nest (semi-circular mount), fixed on one side and pressed against on the other side with a defined pressing pressure (e.g. depending upon the operation type of the later motor component group). At the same time, a tactile measuring system measuring the dimensional changes in the circumference of the half bearing. After the halb bearing has been measured, an extraction mechanism pushes the part up from the nest for removal.

To ensure the measuring accuracy during the process, the measuring unit is fully automatically calibrated at regular intervals with a setting master.

The entire process is computer driven with selectable parameters, capable of data collection, generating printable reports and database building.

Measuring device for diameter testing on large rings

Large rings (e.g. bearing rings) are subject to the stricted tolerances. To test these, a flexible measuring gage is needed that can cover numerous inside and outside diameters.

The measuring device for large rings offers the possibility to measuring inside and outside diameters with one unit.

Inside measurements from 63.5 mm up to a maxiumu of 825 mm and outside diameters from 76.2 mm up to a maxiumum of 831 mm can be measured.

MarSolution. Software D1200X

Description

The Mahr D1200X software enables optimal operation of the measuring machine.

A user friendly interface makes it easy to create measuring programs. Forms and formulas can be freely programmed via a simple and ergonomic editor.

The measuring results can:
- be displayed as a bar graph, XY graph, polar graph
- show measured values with workpiece picture
- depict single measurement values, average values and standard deviation.

Exploitation of measuring results

SPC function:	X/S, X/R control chart, Pareto, histogram according to Q101 Ford and CNOMO standard
Capability:	R&R calculation integrated a standard function
Data transfer:	QDAS, QUA SAR, ASCII and EXCEL format

Automation and connection to the manufacturing machines

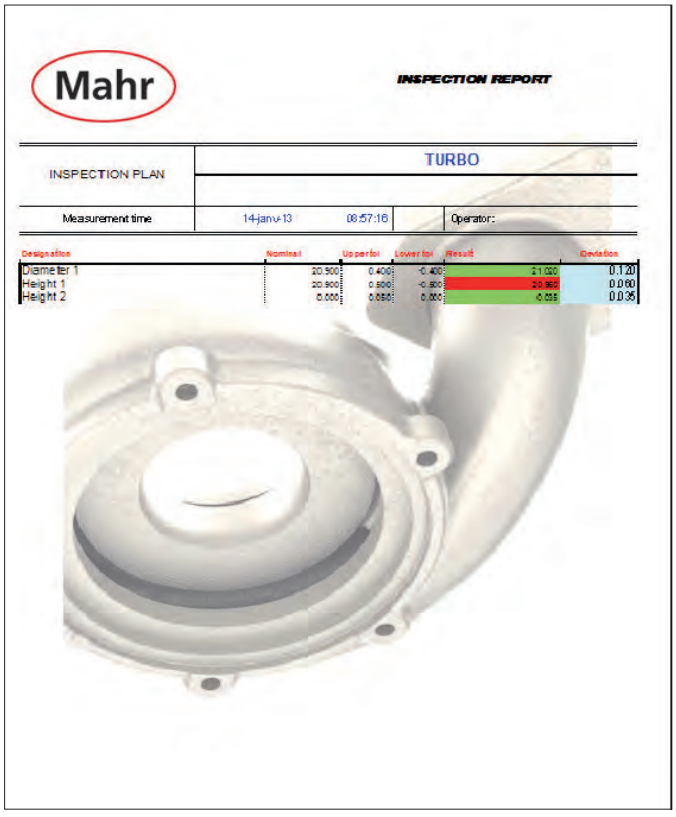
The D1200X software can be used in manual, semi-automatic or full-automatic mode. It can be connected to robots or manufacturing machines via I/O, Profibus, Profinet.

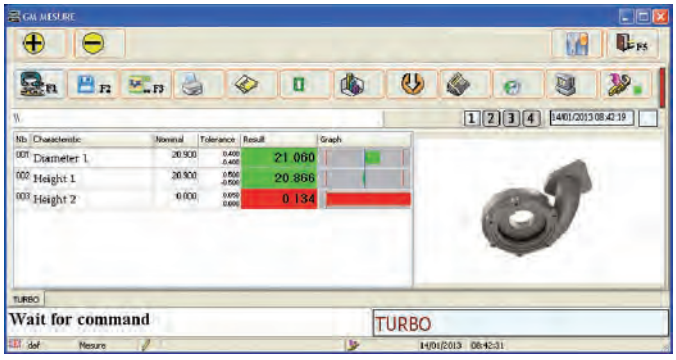
Administrator tools

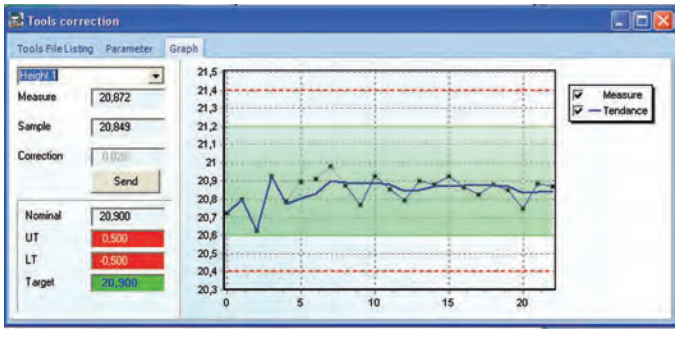
Easy adjustment of the sensors by graphic display
Probe check and alert in case of drift
Calibration follow-up and history
Pre-defined calibration intervals
Maintenance module

Technical features

Languages:	German, English, French, Portuguese, Turkish, Spanish
Operating system:	Windows XP-PRO, Windows 7, Windows 8



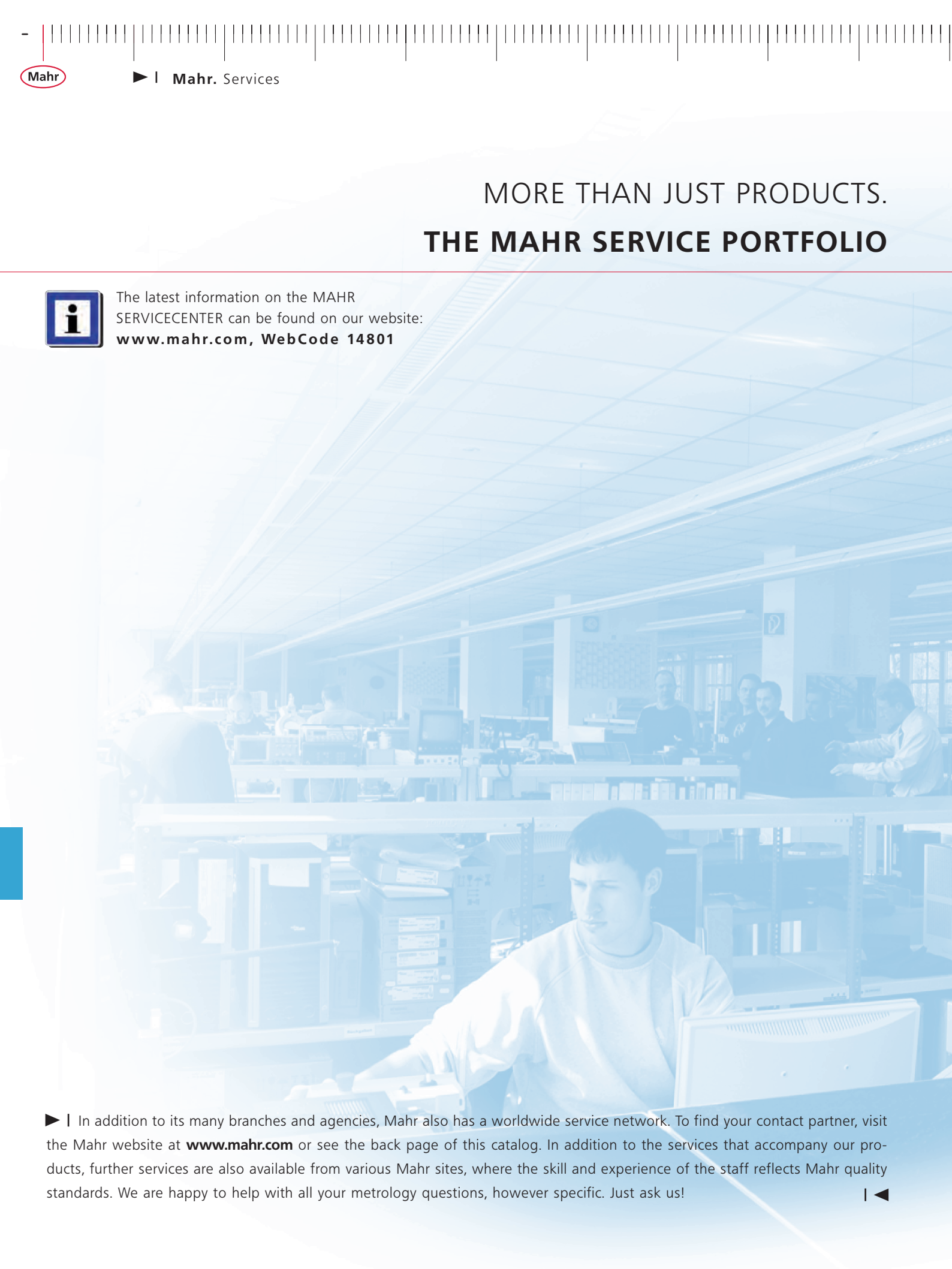




MORE THAN JUST PRODUCTS.

THE MAHR SERVICE PORTFOLIO

The latest information on the MAHR SERVICECENTER can be found on our website:
www.mahr.com, WebCode 14801



► | In addition to its many branches and agencies, Mahr also has a worldwide service network. To find your contact partner, visit the Mahr website at **www.mahr.com** or see the back page of this catalog. In addition to the services that accompany our products, further services are also available from various Mahr sites, where the skill and experience of the staff reflects Mahr quality standards. We are happy to help with all your metrology questions, however specific. Just ask us! | ◄

► | Mahr. Services.

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For more information visit www.mahr.com

Mahr Academy

The **Mahr Academy** offers you applications-specific product training and basic seminars, either at predefined seminar venues on specific dates or arranged internally within your company. Whichever type of training you choose, the aim is the same – to help your business become even more reliable and efficient and produce even higher quality goods in the future. The subjects offered are relevant to all employees who work either directly or indirectly on production tasks, from new employees on the shop floor, in the inspection room and in the design department to employees who would like to update and deepen their knowledge.

The MahrExpert seminars stand for:

- Trainers with practical experience
- Didactically structured training concepts
- Extensive, always up-to-date training documents
- Qualified training completion certificates upon request
- Competent advising in all questions on improved quality of technical products

We offer the following seminars:

- Product training in 3 levels (easy, advanced, professional)
- Practice training for designers (tolerating form, waviness and roughness according to task
- Basic training and seminar (on length metrology, surface metrology, monitoring of testing equipment, measuring uncertainty according to GUM, measuring instrument capability and process capability
- Professional training as an authorized measuring instrument representative and lab representative according to ISO/IEC 17025 (in cooperation with the Academy for Quality Assurance (AfQ) and the Technical Academy Wuppertal (TAW))

WebCode 14872

Application Advising

Do you need support when working on solutions for metrological tasks? Do you need to create measuring programs for complex workpieces? Do your users need thorough product training?

Take advantage of the services offered by our applications engineering specialists, with their extensive knowledge and many years of experience in the dimensional metrology sector.

The names **Precimar**, **MarForm, MarSurf**, **Millimar** and **MarShaft** represent core skills in the fields of length metrology, form, contour and roughness metrology and shaft metrology. Our applications engineering and technical service specialists also offer:

- Sample measurements
- Assistance with putting equipment into service
- Program creation
- Product training
- Measuring equipment capability investigations
- User training

WebCode 14870.

Technical Service

Mahr measuring instruments are developed and produced with the utmost care according to **Mahr quality guidelines** and using the very latest technology. This ensures that your measuring instrument is of the very highest quality.

To provide your machine/measuring station with optimum care, Mahr has an efficient worldwide Service Organization. The **Mahr Service Organization**, run by trained expert personnel, is equipped with cutting-edge tools and instruments, many of which have been specially developed, and has an extensive selection of spare parts.
Mahr works according to progressive, tried-and-tested guidelines and offers a range of complementary services. To ensure the best results from your **Mahr measuring instruments** at all times, we recommend you use only the services offered by the **Mahr Service Organization**. This is the only way to ensure that only **original Mahr spare parts** and servicing procedures are used, reflecting the **Mahr quality standard**.

Visit the Mahr website at **www.mahr.com** to find out where your **Mahr ServiceCenter** is located.

WebCode 14794

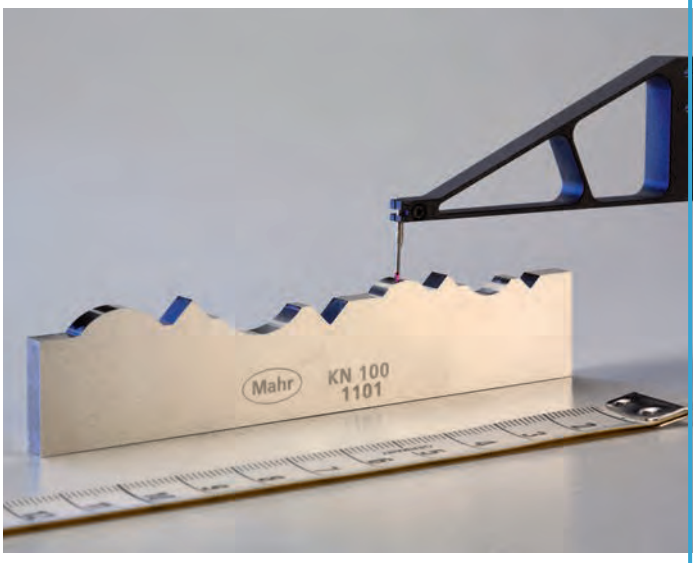
Maintenance for Measuring Systems

The **operational availability** of your measuring equipment is very important to you. To ensure smooth operation over many years, Mahr recommends you have your equipment **regularly inspected**. The inspection of your measuring equipment, which is dependent on your conditions of use and defined with your agreement, brings you **considerable advantages**:

- Unscheduled equipment failures are prevented
- Wear parts are exchanged in good time and within the framework of the agreed service intervals
- Regular servicing keeps your equipment running at peak performance, including incorporation of future product improvements
- Regular inspections of your measuring equipment provide the best conditions for your quality assurance system
- With a service agreement you minimize operation costs and optimally retain the value of your machine. Preventative maintenance can be planned and leads to an undisturbed operation of production
- Maximal operational readiness by the setting of all mechanisms, pneumatic and electronic functions as well as the examination of software used
- Complete, intensive examination is conducted only by Mahr specialists
- Calibration certificates are issued
- Early detection of trouble due to wear leads to a decrease in idle time and ensuing costs

WebCode 14864

Calibration. Services



Mahr operates **laboratories** for **various instruments** and **sizes** in the field of **length metrology**. These ensure high dimensional accuracy and **very low measuring uncertainties**. In principle, **all measuring equipment** can be calibrated. Specific core skills are offered for the following calibration services:

- Calibration of testing devices (length) *
- Parallel gage blocks *
- Setting rings / setting plug gages / setting discs / pin gages*
- Geometry and roughness standards*
- Optical flats
- Inductive probes with/without display unit *
- Thread plug gages / thread ring gages
- Incremental probes
- Vertical length measuring units / height measuring units *
- Calipers / external micrometers *
- Dial gages / dial comparators / dial test indicators
- Setting dimensions *
- Magnification standards (flicks)*
- Contour standards*
- Stylus instruments / roughness measuring units
- Cylinder squares *
- Roundness standards *
- Length measuring units *
- Multi-wave standards *
- Dial comparator and dial gage testers *
- Super fine roughness standards *
- Customized objects on request

ilac-MRA

DAkkS
Deutsche
Akkreditierungsstelle
D-K-15074-01-00

The **DAkkS/DKD** (German Calibration Service) is a signatory of the multi-lateral agreement of the *European cooperation for Accreditation* (**EA**) and the *International Laboratory Accreditation Cooperation* (**ILAC**) for mutual recognition of calibration certificates.

Your **Mahr contact partner** will provide you with information on national and international recognition, e.g. as part of the multi-lateral agreement
www.european-accreditation.org and
www.ilac.org

* Calibrations with officially recognized calibration certificates that comply with national and international standards, e.g. **NIST** (National Institute of Standards and Technology), and **DAkkS/DKD** (German Calibration Service).

NIST is the national standards institute in the United State

WebCode 19301

Calibration Logistics. Hand Tools

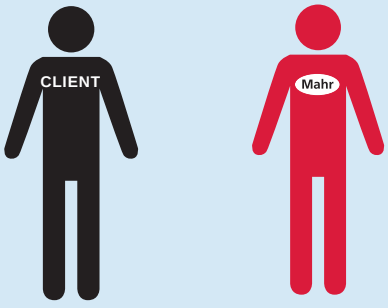
Would you like to have your measuring devices calibrated by Mahr? With our logistics system, you can simply send us your hand tools. This is how it works:

- Request a Mahr system box from us by email at **systembox@mahr.de** or call this number **+49 711 6312-653**. Integrated insulating material assures that this box we lend you free of charge, will safely transport your hand tools.
- Fill out the check list for hand tool services included in the system box. This must only be filled out for the first shipment if you declare it to be valid also for following deliveries. We can tend to your calibration requests. An online version of this check list can be found under Webcode 13102.
- Fill the system box with your measuring devices and the check list.
- Send the box via your forwarding agency.
- Mahr will take care of the rest.

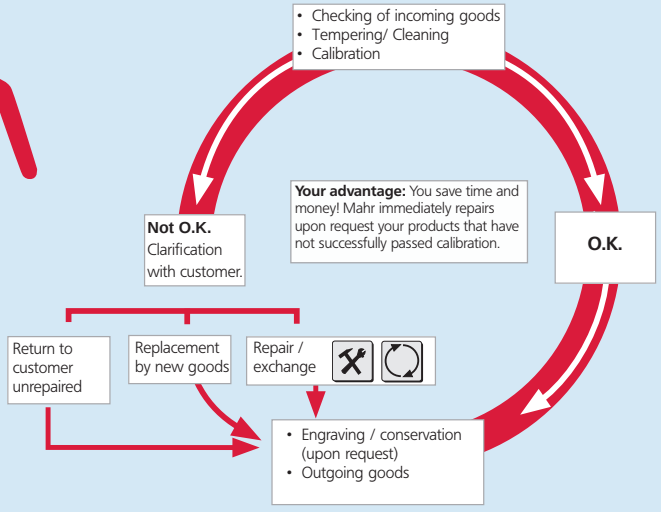
1. Outgoing goods customer

- Request a Mahr system box: by e-mail at: **systembox@mahr.de** or call this number **+49 0711 6312-653**
- Fill out the check list
- Send to:
  Mahr GmbH
  Kalibrierzentrum
  Reutlinger Straße 48
  73728 Esslingen a. N.

System box including insulating material



2. Incoming goods Mahr



3. Outgoing goods Mahr

- Return of testing devices (Mahr system box)
- Records on paper, PDF or comfortably as an automatic data import into the gage calibration software MarSoftCal.WEB

4. Outgoing goods customer

- Receipt of calibration measuring devices

WebCode 19300.

Gage Management

Would you like to reduce the yearly costs for the calibration of your measuring devices and optimize the processes for management and maintenance of the testing devices? Our service staff will support you! But there is even more: With the help of modern software from Mahr, you reduce the time needed for gage management by up to 70%!

Mahr optimizes your stock of testing devices
Testing device management is usually an individually organized matter which must fulfill very specific demands depending upon the company. That is why we take your needs very carefully into consideration and will work out optimized solutions with you. Possible individual services in this field include:

Recording of testing device stock
- Support in recording testing, measuring and supporting devices
- Allocation to testing and supporting devices
- Specifiying appropriate testing intervals
- Introduction of a blocked stock storage area for measuring devices to reduce yearly calibration costs

Managing testing device stock
- Organization of simple factory-internal processes for the calibration, maintenance and servicing of testing device stock
- Software solutions for testing device management
- Measuring devices and software solutions for self-calibration
- Logistic solutions (e.g. pick-up service)
- Personnel training

Optimization of testing device stock
- Selection of suitable testing devices
- Evaluation and improvement of testing processes
- „Cleaning out" testing device stock

Gage Management with MarSoftCal.WEB

Testing device management is very easy. Provided that you have an intuitive and quickly learnable software system that completely covers your internal management and can also exchange data with your calibration lab.

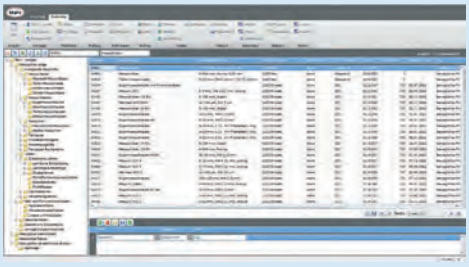
For example MarSoftCal.WEB: With this system, Mahr offers a WEB-based software solution suited for multi-users that provides expandable functions in different expansion stages. Transfer and storage of testing device data takes place automatically on the servers of Mahr GmbH. You can access your data at any time using the World Wide Web without having to install any software.

Data from existing testing device monitoring systems can generally be transferred into MarSoftCal.

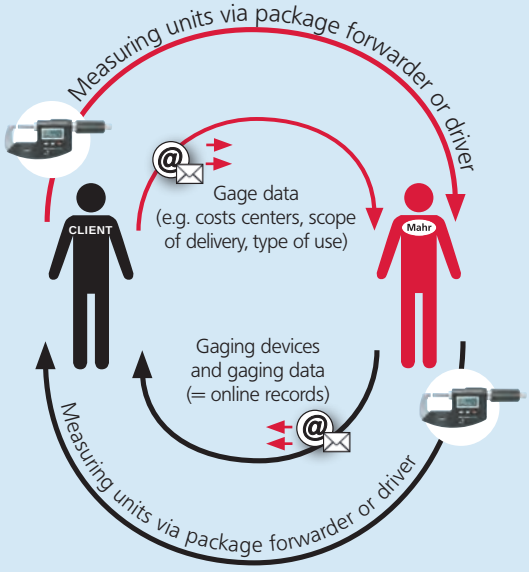
And this is how the data transfer with Mahr works:
When the goods leave our lab, you can immediately access the current version of all management data and records.

You save the work of entering data and reduce the time required for the management of your testing devices by up to 70%!

WebCode 14869.



Your advantage:
Reducing gage management time by up to 70 %



Repair or Trade In

Repair or exchange?

What should you do if your measuring devices are used around the clock but are in need of repair? Even in such cases, you can rely on Mahr. With manufacturer competence, we offer you an extensive repair service. In our service workshops, your unit is disassembled, cleaned, maintenanced and newly reassembled. A professonally refurbished measuring unit will therefore be sent back to you.

With many of our units, you save almost the entire repair time with the help of our exchange pool. Your downtime is reduced to an absolute minimum. Units for which you have the choice between repair or exchange are indicated with an exchange symbol in the price list.

Our exchange pool contains measuring unit such as indicating snap gages, all sorts of electrical and mechanical precision indicators as well as inductive measuring probes. As long as you do not exclude the option "exchange" in your order, we will opt for an exchange instead of a repair in every case. This is our way of guaranteeing that you receive units as quickly as possible that can be used again.

The choice is yours

- **Exchange** (Mahr units)
  Send us your defective unit and you will receive a refurbished, if applicably newly lacquered measuring unit from our trade pool. Upon request we will envgrave your item no. on the unit again. Replacement parts are already included in the trade in price.

  Your advantage: You save the repair time and your down time is reduced to a minimum.

- **Repair**
  You of course also have the possibility to have your own until repaired. We will fix operating defects, rework the measuring surface and improve optical damanges. Replacement parts are already included in the repair price here as well.

  Your advantage: You have the security that our manufacturer know-how will give you a unit after repair that corresponds to the specifications and accuracies of a new unit.

- **Repair regardless of the manufacturer**
  We will repair for you hand tools from all well-known brands (Mahr, Helios, TESA, Mitutoyo , etc.) for the measuring dimension length.

  Your advantage: You have a contact person for the repair of your measuring units.

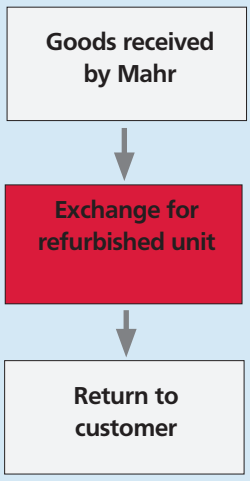
- **Refurbishing** (Mahr units)
  For refurbished units not only errors are corrected but worn out wear parts are pro-actively exchanged and optical defects are taken care of. The metrological characteristics of the units are thus comparable to those of a new unit.

  Your advantage: A unit is sent back to you whose metrological characteristics correspond to that of a new unit.

WebCode 14860, 19294

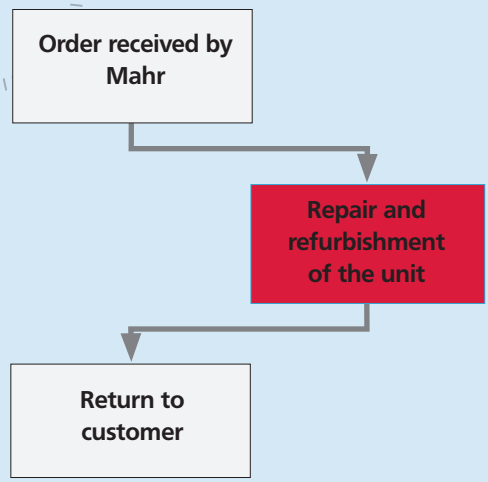
EXCHANGE

Delivery time: approx. 3 work days



REPAIRS

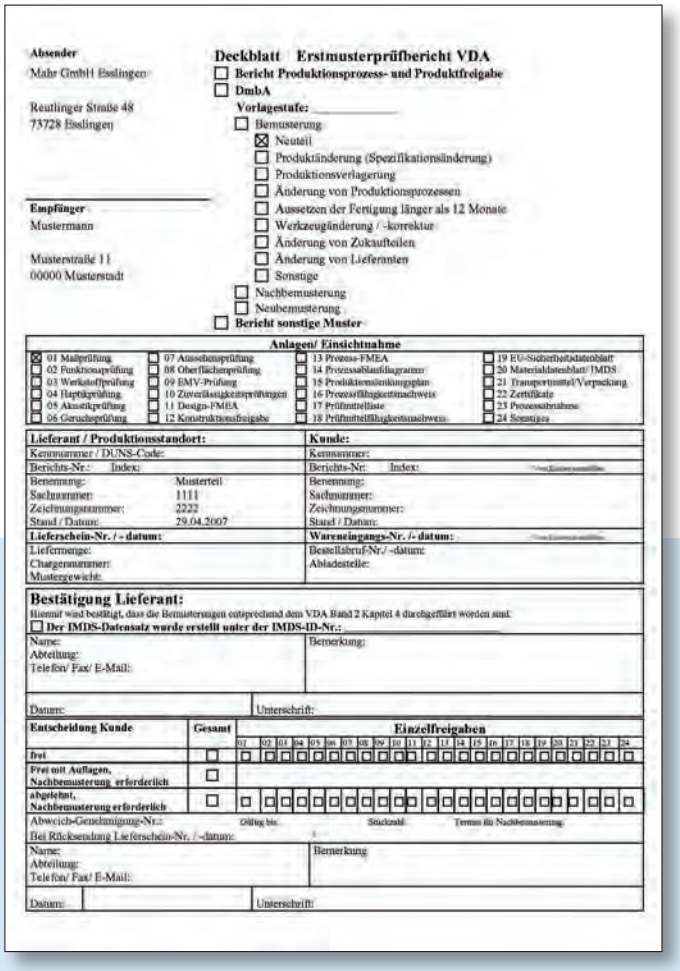
Delivery time: independent of unit



Subcontract Measurements and Services with Mahr

Subcontract measurements and capability testing

- We measure what your measuring units cannot.
  Your advantage: You save money by not having to purchase expensive new units.
- We support you when your measuring capacities are overloaded.
  Your advantage: You do not need any additional staff and machines.
- We test the capability of your measuring systems and the suitability of your measuring devices to your tasks.
  Your advantage: When tolerances are close, you can be sure you are working with the right devices.



Absender
Mahr GmbH Esslingen
Reutlinger Straße 48
73728 Esslingen

Empfänger
Mustermann
Musterstraße 11
00000 Musterstadt

Deckblatt Erstmusterprüfbericht VDA

- ☐ Bericht Produktionsprozess- und Produktfreigabe
- ☐ DmbA
- Vorlagestufe: _____
- ☐ Bemusterung
  - ☒ Neuteil
  - ☐ Produktänderung (Spezifikationsänderung)
  - ☐ Produktionsverlagerung
  - ☐ Änderung von Produktionsprozessen
  - ☐ Aussetzen der Fertigung länger als 12 Monate
  - ☐ Werkzeugänderung / -korrektur
  - ☐ Änderung von Zukaufteilen
  - ☐ Änderung von Lieferanten
  - ☐ Sonstige
- ☐ Nachbemusterung
- ☐ Neubemusterung
- ☐ Bericht sonstige Muster

Anlagen/ Einsichtnahme

☒ 01 Maßprüfung	☐ 07 Aussehensprüfung	☐ 13 Prozess-FMEA	☐ 19 EU-Sicherheitsdatenblatt
☐ 02 Funktionsprüfung	☐ 08 Oberflächenprüfung	☐ 14 Prozessablaufdiagramm	☐ 20 Materialdatenblatt/ IMDS
☐ 03 Werkstoffprüfung	☐ 09 EMV-Prüfung	☐ 15 Produktionslenkungsplan	☐ 21 Transportmittel/Verpackung
☐ 04 Haptikprüfung	☐ 10 Zuverlässigkeitsprüfungen	☐ 16 Prozessfähigkeitsnachweis	☐ 22 Zertifikate
☐ 05 Akustikprüfung	☐ 11 Design-FMEA	☐ 17 Prüfmittelliste	☐ 23 Prozessabnahme
☐ 06 Geruchsprüfung	☐ 12 Konstruktionsfreigabe	☐ 18 Prüfmittelfähigkeitsnachweis	☐ 24 Sonstiges

Lieferant / Produktionsstandort:		Kunde:	
Kennnummer / DUNS-Code:		Kennnummer:	
Berichts-Nr.: Index:		Berichts-Nr: Index:	
Benennung:	Musterteil	Benennung:	
Sachnummer:	1111	Sachnummer:	
Zeichnungsnummer:	2222	Zeichnungsnummer:	
Stand / Datum:	29.04.2007	Stand / Datum:	
Lieferschein-Nr. / - datum:		**Wareneingangs-Nr. /- datum:**	
Liefermenge:		Bestellabruf-Nr./ -datum:	
Chargennummer:		Abladestelle:	
Mustergewicht:			

Bestätigung Lieferant:
Hiermit wird bestätigt, dass die Bemusterungen entsprechend dem VDA Band 2 Kapitel 4 durchgeführt worden sind.
☐ **Der IMDS-Datensatz wurde erstellt unter der IMDS-ID-Nr.:** _____

Name: Abteilung: Telefon/ Fax/ E-Mail:	Bemerkung:
Datum:	Unterschrift:

Entscheidung Kunde	Gesamt	Einzelfreigaben 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
frei	☐	☐ ☐
Frei mit Auflagen, Nachbemusterung erforderlich	☐	
abgelehnt, Nachbemusterung erforderlich	☐	☐ ☐

Abweich-Genehmigung-Nr.: Gültig bis: Stückzahl: Termin für Nachbemusterung:
Bei Rücksendung Lieferschein-Nr. / -datum:

Name: Abteilung: Telefon/ Fax/ E-Mail:	Bemerkung
Datum:	Unterschrift:

Initial sampling inspection record as per VDA

Mahr conducts the following subcontract measurements and services:

1. Measurements on 3D coordinate measuring machines with one of the following methods
   a) tactile,
   b) optic (non-contact) or
   c) with 3D laser scanning
2. Form and location measurements
3. Roughness and surface
4. Contour measurements
5. Initial sample inspection according to the regulations of the Association of the German Automotive Industry (VDA) and other regulations

Prices

Most of the subcontract measurements are charged by the hour. Only an initial sample inspection as per VDA and other specifications are calculated according to work expenditure.

Measuring records

After sample inspection of your workpiece you will receive a professional measuring record from us to which you can refer if any necessary inspections should arise (e.g. if errors in production arise).

Digitalization

We also take care of digitlization tasks for you - that means we create CAD data sets to be read into production machines. In the so-called reverse engineering procedure, 3D laser scanners exactly depict a workpiece in the form of high-resolution point clouds. These point clouds form the basis for the CAD data set that is created from it.

Request brochure or see WebCode 14868

Capability Testing

Mahr tests the capability of your measuring machines

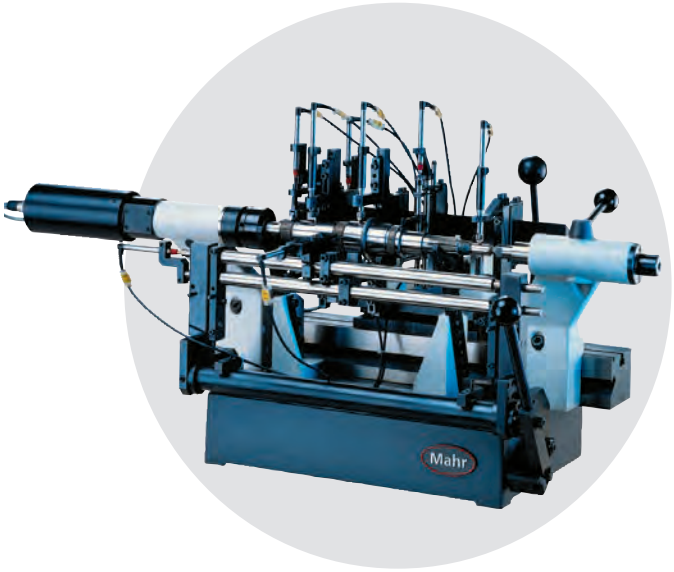
Do your measuring machines and your measuring devices operate precisely enough to fulfill the constantly increasing demands of tolerated deviation?
When workpiece tolerance demands are high, measuring systems often reach the limit of their capabilites. This is why Mahr tests for you if your measuring machines and measuring devices are suitable for the upcoming tasks.
There are two procedures suited for such capability testing. The effects different factors can have and that lead to imprecise measuring results can be more precisely limited.

Procedure 1:
In this procedure, the general capabilities of the devices are determined. This is usually carried out in our laboratory - in individual cases also in your measuring room.

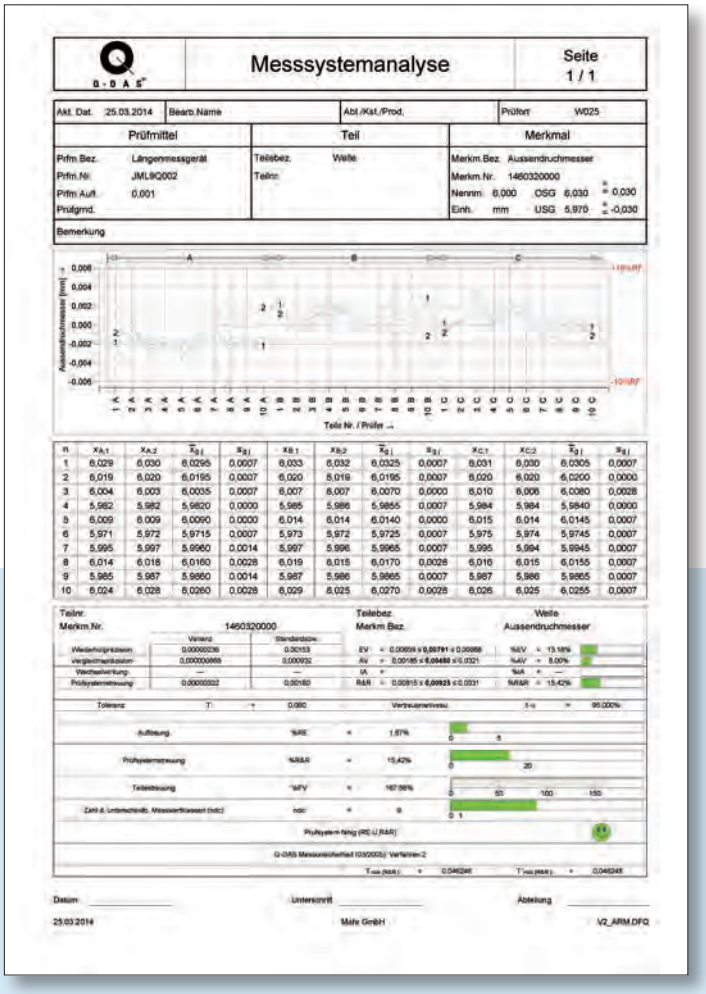
Procedure 2:
This procedure determines the influence of the operator on the measuring results. For this purpose, we test the units at your site under the normal operating conditions. We also involve the staff that will be working with the devices later on.
As is the case with calibration, a certificate is issued after the capabilities of the measuring systems have been determined (in this case a record). The evaluation is oriented towards the specifications of different businesses (e.g. Bosch, BMW, Daimler).

Procedure 3:
In this procedure, an examination is carried out on the automatic measuring device. The operator influence that is determined in Procedure 2 is excluded here. This procedure usually takes place on 25 workpieces during two test procedures.

We offer to conduct these procedures at our site in a pre-inspection or at your site in the form of a final inspection. This assures you that you can also guarantee a high level of quality of measuring accuracy at your site. The measuring conditions must of course be adhered to.



Test measuring device



Messsystemanalyse

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Akt. Dat. 25.03.2014	Bearb.Name	Abt./Kst./Prod.	Prüfer W025

Prüfmittel	Teil	Merkmal
Prfm.Bez. Längenmessgerät	Teilebez. Welle	Merkm.Bez. Aussendruchmesser
Prfm.Nr. JML9Q002	Teilnr.	Merkm.Nr. 1460320000
Prfm.Auf. 0,001		Nennm. 6,000 OSG 6,030 ± 0,030
Prüfgrnd.		Einh. mm USG 5,970 ± -0,030

Bemerkung

Aussendruchmesser [mm]

Teile Nr. / Prüfer →

n	$x_{A,1}$	$x_{A,2}$	$\bar{x}_{g,j}$	$s_{g,j}$	$x_{B,1}$	$x_{B,2}$	$\bar{x}_{g,j}$	$s_{g,j}$	$x_{C,1}$	$x_{C,2}$	$\bar{x}_{g,j}$	$s_{g,j}$
1	6,029	6,030	6,0295	0,0007	6,033	6,032	6,0325	0,0007	6,031	6,030	6,0305	0,0007
2	6,019	6,020	6,0195	0,0007	6,020	6,019	6,0195	0,0007	6,020	6,020	6,0200	0,0000
3	6,004	6,003	6,0035	0,0007	6,007	6,007	6,0070	0,0000	6,010	6,006	6,0080	0,0028
4	5,982	5,982	5,9820	0,0000	5,985	5,986	5,9855	0,0007	5,984	5,984	5,9840	0,0000
5	6,009	6,009	6,0090	0,0000	6,014	6,014	6,0140	0,0000	6,015	6,014	6,0145	0,0007
6	5,971	5,972	5,9715	0,0007	5,973	5,972	5,9725	0,0007	5,975	5,974	5,9745	0,0007
7	5,995	5,997	5,9960	0,0014	5,997	5,996	5,9965	0,0007	5,995	5,994	5,9945	0,0007
8	6,014	6,016	6,0160	0,0028	6,019	6,015	6,0170	0,0028	6,016	6,015	6,0155	0,0007
9	5,985	5,987	5,9860	0,0014	5,987	5,986	5,9865	0,0007	5,987	5,986	5,9865	0,0007
10	6,024	6,028	6,0260	0,0028	6,029	6,025	6,0270	0,0028	6,026	6,025	6,0255	0,0007

Teilnr. 1460320000 | Teilebez. Merkm.Bez. | Welle Aussendruchmesser

Toleranz T: + 0,060 | Vertrauensniveau 1-α = 99,000%

Auflösung %RE = 1,67%

Prüfsystemstreuung %R&R = 15,42%

Teilestreuung %PV = 167,59%

Zahl d. Unterschiedlic. Messwerte(Ndc) ndc = 9

Prüfsystem fähig (RE ≤ R&R)

Datum | Unterschrift | Abteilung

25.03.2014 | Mahr GmbH | V2_ARM.DFQ

Record of a capability test according to Procedure 2

Request brochure or see WebCode 14871.

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