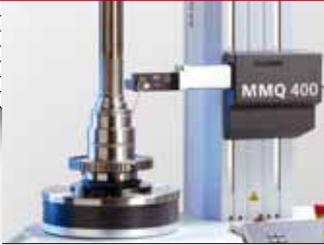


CATALOG I DIMENSIONAL METROLOGY



150 YEARS



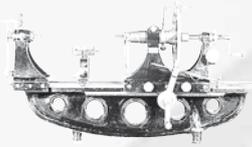
EXACTLY

1870



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

1900



Length measuring machine from 1908. Reading on the vernier 1/10,000 mm

1930



Millimess precision probe, constructed in 1937. First indicating unit for reliably recording dimensional differences down to 1/1,000 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

► | **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 concern with over 1,500 employees. We have grown up in the world of metrology and have collected much expertise along



CARL MAHR, ESSELINGEN A. N.
Specialität: **Messwerkzeuge.**

1983



Maxµm, the world's first digital indicator, launched on the market by Federal Products Co. in 1983

1985



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

2004



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

2006



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

2010



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

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: In the automotive industry and mechanical engineering as well as in precision mechanics, plastics or medical technology. Metrology from Mahr solves the most 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.

150 YEARS

Mahr

EXACTLY

GÖTTINGEN



Germany
 Headquarters of the Mahr Group
 Production site for Metrology
 Systems

Mahr GmbH Göttingen
 Carl-Mahr-Str. 1
 D-37073 Göttingen

ESSLINGEN



Germany
 Precision Gages Division
 Sales Europe and Asia

Mahr GmbH Esslingen
 Reutlinger Straße 48
 D-73728 Esslingen

JENA



Germany
 Production and Sales
 Optical Coordinate Metrology

Mahr OKM GmbH
 Carl-Zeiss-Promenade 10
 D-07745 Jena

PROBOSTOV



Czech Republic
 Production and Sales
 Precision Gages

Mahr spol s.r.o.
 Kpt. Jarose 552
 CZ-41712 Probostov

MORE ABOUT MAHR: A GLOBAL PLAYER

► | **We're there wherever you need us.** As globalization advances, our customers rightly expect that we at Mahr are also represented worldwide. We have built a global network of production sites, branches and agencies with a view to ensuring

Perthometer M1

L_c
 5.50mm (0.80·S)

AUTO

5.50

测量开始

R_a

R_z

R_{max}

P_c

100

μm

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 21501, 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, Taiwan, Thailand, Tunisia, Turkey, UAE, United Kingdom, USA, Vietnam

the optimum level of quality service in every country throughout the world. 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!

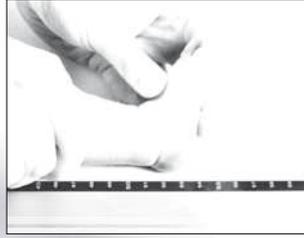


EXPERIENCE



*Mahr has been producing
measuring instruments
for over 140 years*

COMMITMENT



*The perfect solution
for every need*

TECHNOLOGY



*Top quality for
absolute precision*

RELIABILITY



Results you can rely on

MORE ABOUT MAHR: THE BRAND

► | **We let precision speak!** The brand stands for reliability. 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.

SIZE



*Continuous growth,
a global player*

COURAGE



*Going its own way
to new standards*

IMAGINATION



*Innovation leader
in industrial metrology*

VISION

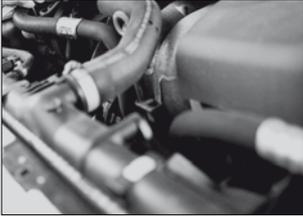


*Seeing things from
a new perspective*

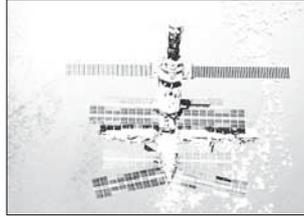
Supplemented with the right software, training and services such as calibration we ensure smooth operations, quality and the continual reduction of costs. The concepts we devise for the future of metrology are the direct result of dialog with your experts from the areas of production, research and development.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

EXACTLY

AUTOMOTIVE



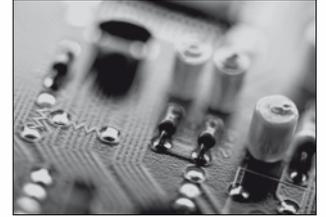
AEROSPACE



MEDICINE



ELECTRICAL
ENGINEERING



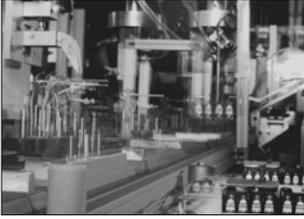
MORE ABOUT MAHR: THE EXPERTISE

► | **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 dialog with our most loyal customers





MECHANICAL
ENGINEERING



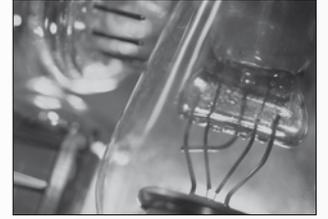
PLASTICS



OPTICS



PRECISION
ENGINEERING



across a whole range of industries. Mahr offers you a broad spectrum for hand-held metrology, surface metrology and form metrology, as well as for shafts, gears or tools. A comprehensive global service network provides services for everything from procurement of spare parts to calibrations compliant with international calibration standards as per DIN EN ISO 17025.



VISIONS



Measuring the future is a tricky business

INDICATIONS



Accurate predictions are something you shouldn't expect

PROGNOSES



People say there are many ways to reach a goal

PREDICTIONS



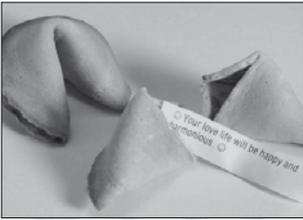
But none of them is entirely undisputed...

MORE ABOUT MAHR: THE FUTURE

► | **The challenges increase.** Climate change and environmental protection, renewable energies and the shortage of resources, mobility and electrical drive are all topics that pose new challenges and bring new products to production metrology. The trend towards sustainability means that industry needs to constantly reinforce its commitment to accuracy in the production process.



INTERPRETATIONS



...Results can be used only in rare cases

GOALS



Forecasts based on science also come with no guarantee

INSTRUCTIONS



When it comes to the future, only one thing is certain:

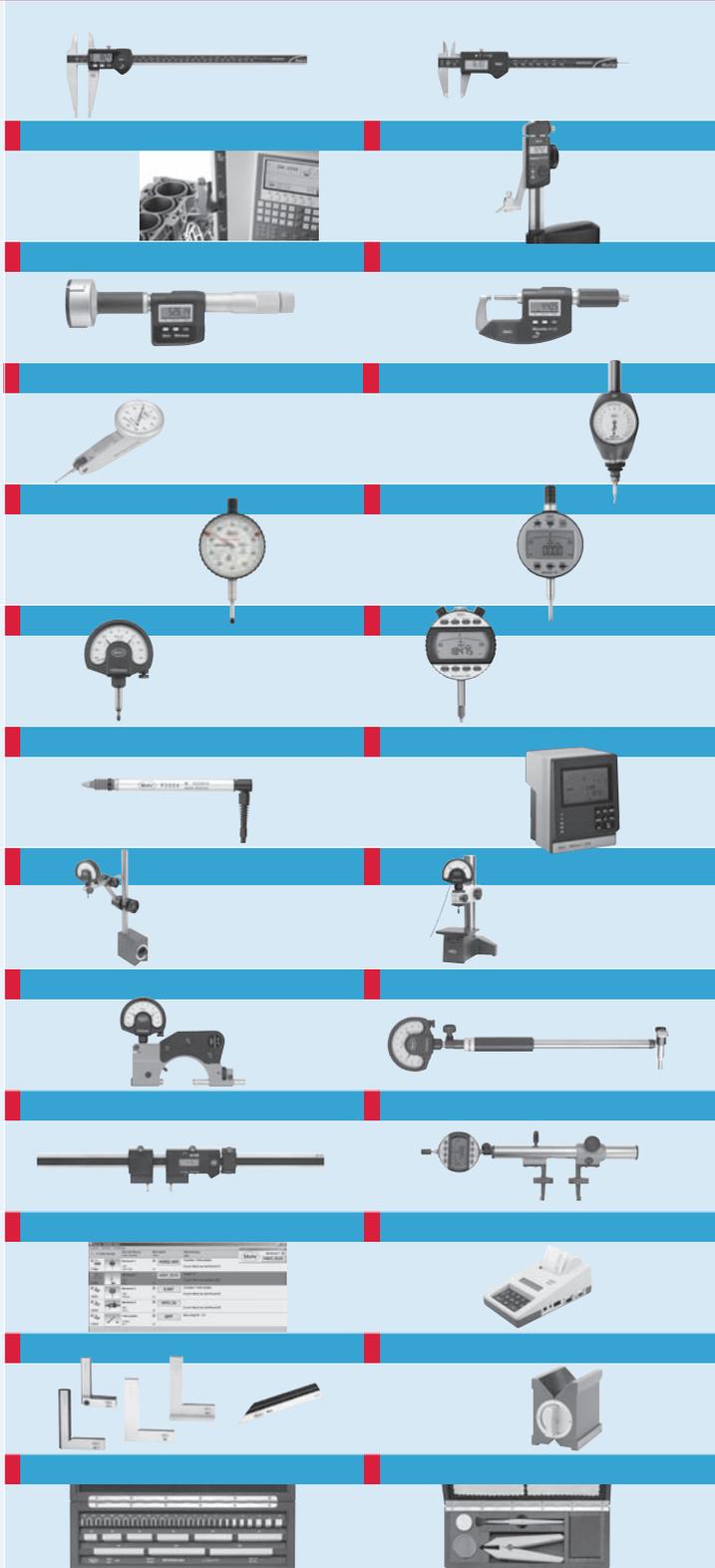
DIRECTIONS



It's on its way

All of this combines to make dimensional metrology a key player in this process. We are already busy contemplating the metrology of tomorrow. Let's use your requirements to face the future of metrology. Talk to us: we will find the solution to your measurement needs.

DIMENSIONAL METROLOGY



Contents

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Digimar	Height Measuring Instruments	2- 2
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Millimess	Digital / Dial Comparators	6- 2
Millimar	Electrical Length Measuring Instruments / Air Gaging	7- 2
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MarGage	Standards, Gages and Gage Blocks	13- 2

► | Contents

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MarShaft	Shaft 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.com, WebCode 203

► | 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 EWR a waterproof digital caliper, which enables 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 EWR

Waterproof Caliper with a Digital Display

1- 4

MarCal 16 ER

With a Digital Display

1- 8

MarCal 16 DN / 16 FN / 16 GN / 16 N

With a Line Scale (Vernier)

1-10

MarCal 16 U

With a Circular Scale

1-11

Universal Calipers

MarCal 16 EWW

With a Digital Display

1-12

Special Calipers

MarCal 16 EWR

Waterproof Caliper in special design

1-14

Workshop Calipers

MarCal 18 EWR / 18 ESA

With a Digital Display

1-20

MarCal 18 NA / 18 N / 18 DN

With a Line Scale (Vernier)

1-23

Depth Calipers

MarCal 30 EWR / 30 ER / 30 EWN

With a Digital Display

1-26

MarCal 30 N / 30 NH / 30 ND

With a Line Scale (Vernier)

1-30

Linear Machine Scales

MarCal 31 EW

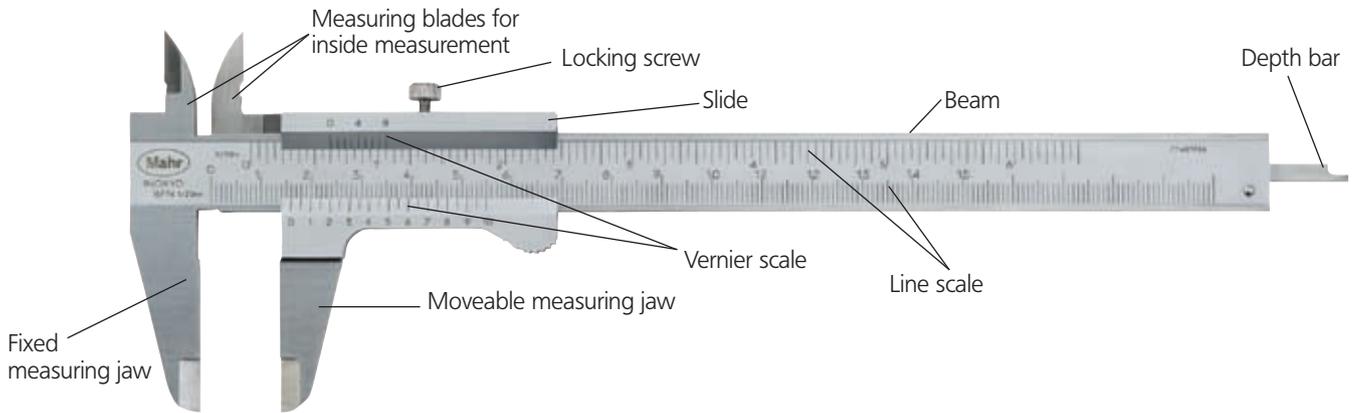
With a Digital Display

1-31

MarCal. Calipers

OVERVIEW

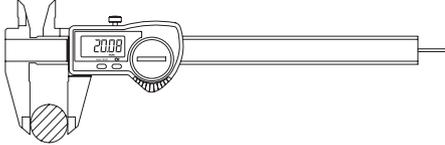
MarCal - Design Features



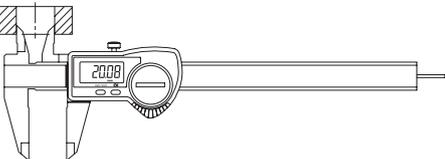
MarCal - Types on measurement

Calipers of the 16 series (e.g. 16 EWR, 16 U, 16 FN) can be used for 4 different measurements:

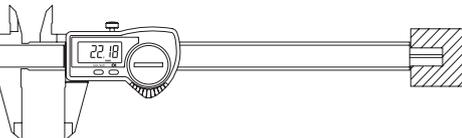
a) Outside measurement



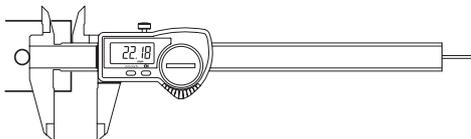
b) Inside measurement



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	
/	0.1 and 0.05	0.02	0.01
50	50	20	20
100			
200			
300	60	30	30
400			
500			
600			
700	90	40	40
800			
900			
1000			
1200			
1400	140	50	-
1600			
1800			
2000			
2200			
2400			

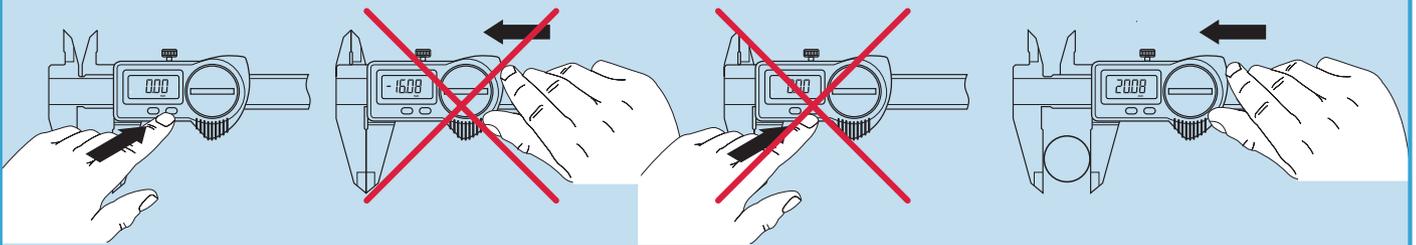
MarCal - The innovative Reference-System

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.

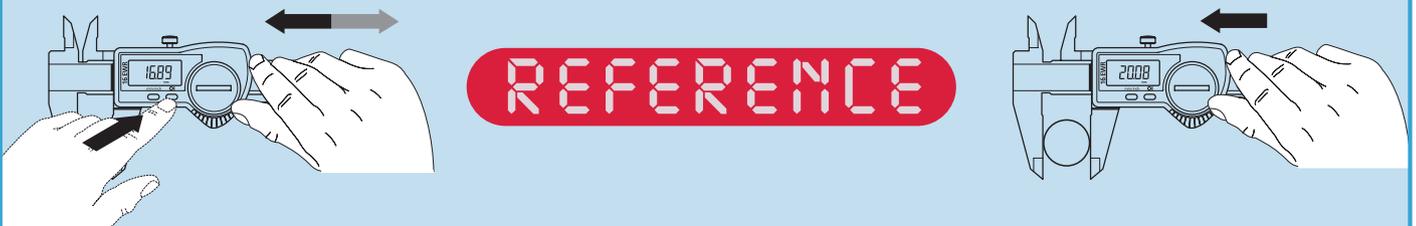
Conventional

- 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



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

MarCal. The new Generation with the Reference-System

WATERPROOF CALIPERS

▶ | The water-proof digital caliper **MarCal** 16 EWR, with protection class IP67 and the Reference Lock-Function, ensures both accurate and reliable results even in the most toughest workshop conditions. | ◀

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

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





USB



RS232C

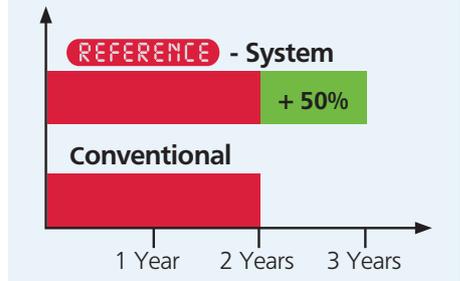


Digimatic

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



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%**.



Lapped measuring faces for accurate measurement.



MarCal calipers have **lapped guide way surfaces**, these guarantee an even and sensitive run of the slide.

Surface of the guide way



Mahr

Lapped guide way

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



Protection class **IP67** in accordance to IEC 60529, the water proof measuring system **FPS** (Fluid Protected measuring System) with a sealed housing.

Digital Caliper MarCal 16 EWR

DIN
862

REFERENCE

Features

Functions:

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

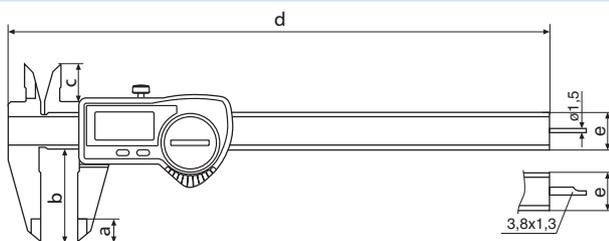
- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- Dirt wipers are integrated in the slide
- Life of the battery up to 3 years

- Max measuring speed 2.5 m/s (100"/s)
- High contrast Liquid Crystal Display with 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				
150	(6")	0.01/ .0005"	0.03	●			4103060
150	(6")	0.01/ .0005"	0.03		●		4103062
150	(6")	0.01/ .0005"	0.03	●		●	4103061
150	(6")	0.01/ .0005"	0.03		●	●	4103063



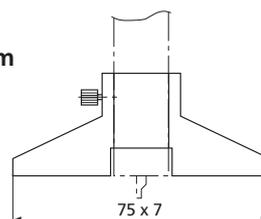
Dimensions

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	4102020
Battery 3V, Type CR 2032	4102520

16 Em



Digital Caliper MarCal 16 EWR with data output



REFERENCE

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

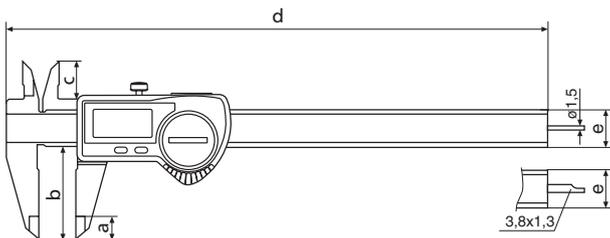
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide

- 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				
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 EXd 4102411

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 EWR special design



16 EWR-C



16 EWR-H



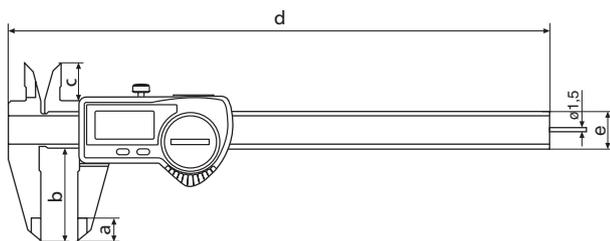
REFERENCE

Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-6, additional features can be found in the Technical Data.

Technical Data

	Measuring range		Resolution	Error limit G	Depth rod 	Order no.	Type
	mm	(inch)					
16 EWR-C	150	(6")	0.01/ .0005"	0.03	●	4103072	Ceramic outside measuring faces
16 EWR-H	150	(6")	0.01/ .0005"	0.03	●	4103073	Carbide outside measuring faces



Dimensions

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

Accessories

Battery, Data Connection Cables see Page 1 - 6

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 ER



REFERENCE

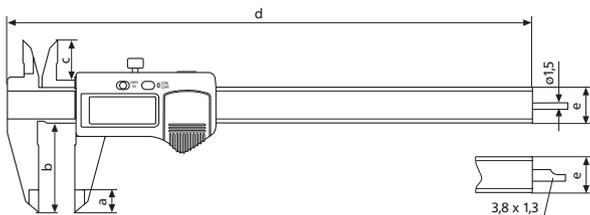
Features

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 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		Order no.
mm	(inch)	mm / inch	mm / inch			
150	(6")	0.01 / .0005"	0.03 / .001"	•	•	4103000
150	(6")	0.01 / .0005"	0.03 / .001"			4103001



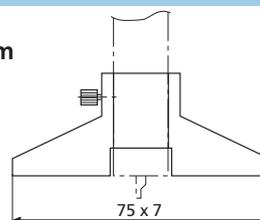
Dimensions

mm	a	b	c	d	e
150	10	40	16	233	16 x 3

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



REFERENCE

Features

Functions:

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

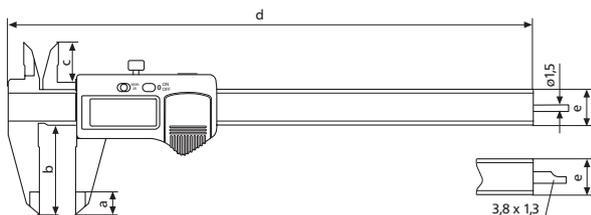
- Immediate measurement due to the Reference system
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic
- Dirt wipers are integrated in the slide

- Life of the battery up to 3 years
- Max measuring speed 2.5 m/s (100"/s)
- High contrast Liquid Crystal Display 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		Data output	Order no.
mm	(inch)	mm / inch	mm / inch	DIN 862				
150	(6")	0.01 / .0005"	0.03 / .001"	●	●		●	4103002
150	(6")	0.01 / .0005"	0.03 / .001"	●		●	●	4103003
200	(8")	0.01 / .0005"	0.03 / .001"	●		●	●	4103004
300	(12")	0.01 / .0005"	0.04 / .0015"				●	4103005



Dimensions

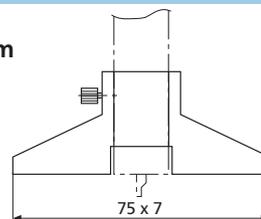
mm	a	b	c	d	e
150	10	40	16	235	16 x 3
200	10	40	16	285	16 x 3
300	14	64	18	388	16 x 4

Accessories

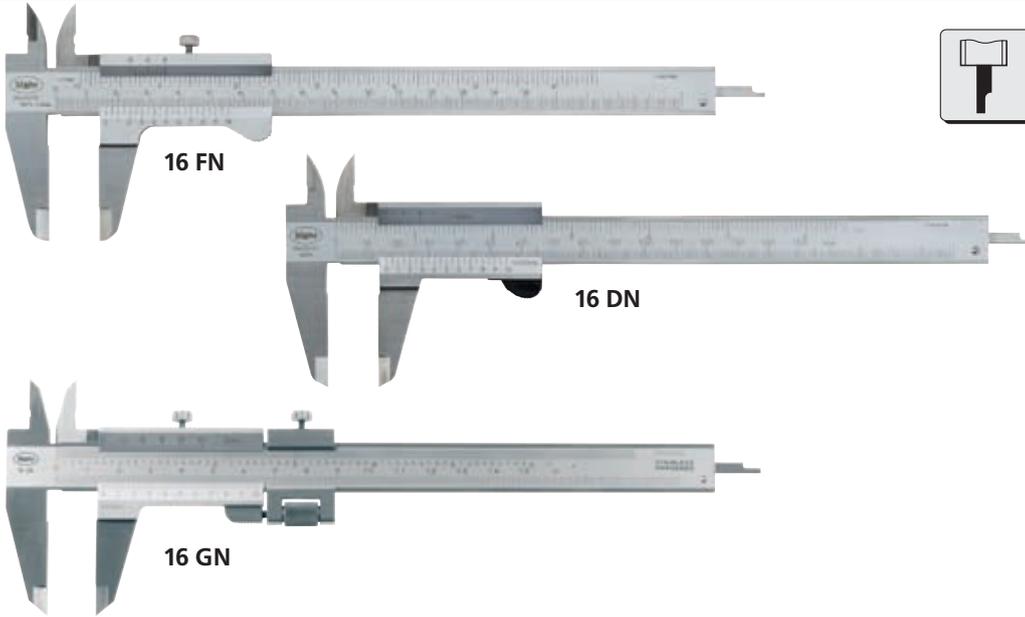
	Order no.
Depth Measuring Bridge	16 Em 4102020
Battery 3V, Type CR 2032	4102520
Data Connection Cable USB (2 m)	16 EXu 4102357
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	16 EXr 4102410
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	16 EXd 4102411

Accessories for Data Processing see Chapter 11

16 Em



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



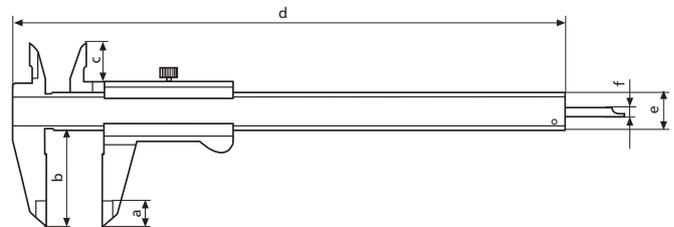
- ### Features
- Vernier and main scale have a satin chrome finish for glare free reading
 - Slide and beam made of hardened stainless steel
 - Raised guide ways for the protection of the scale
 - Measuring blades for inside measurement
 - Step measuring function
 - Depth bar
 - Locking screw or thumb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

Technical Data

	Measuring range		Readings		Error limit G	DIN 862	Order no. without fine adjustment	Order no. with fine adjustment	Remarks
	mm	(inch)	upper inch	lower mm					
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		Locking screw above
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*	
16 FN	300			0.05	0.05	●	4100422		Locking screw above
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*	

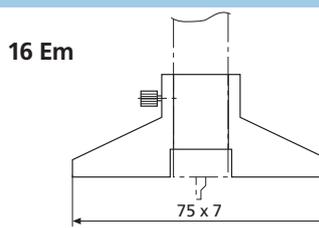
* Calipers with fine adjustment the measuring range is shortened by 20 mm / 1"

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

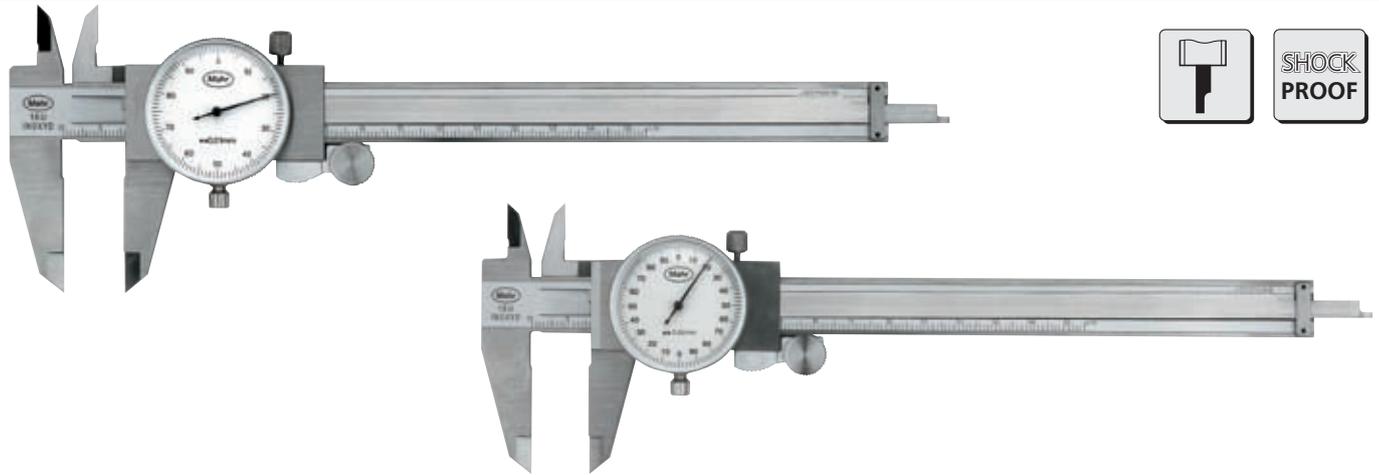


Accessories

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



Vernier Caliper MarCal 16 U with circular scale

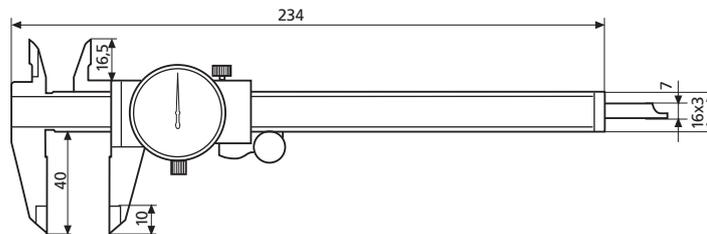


Features

- 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

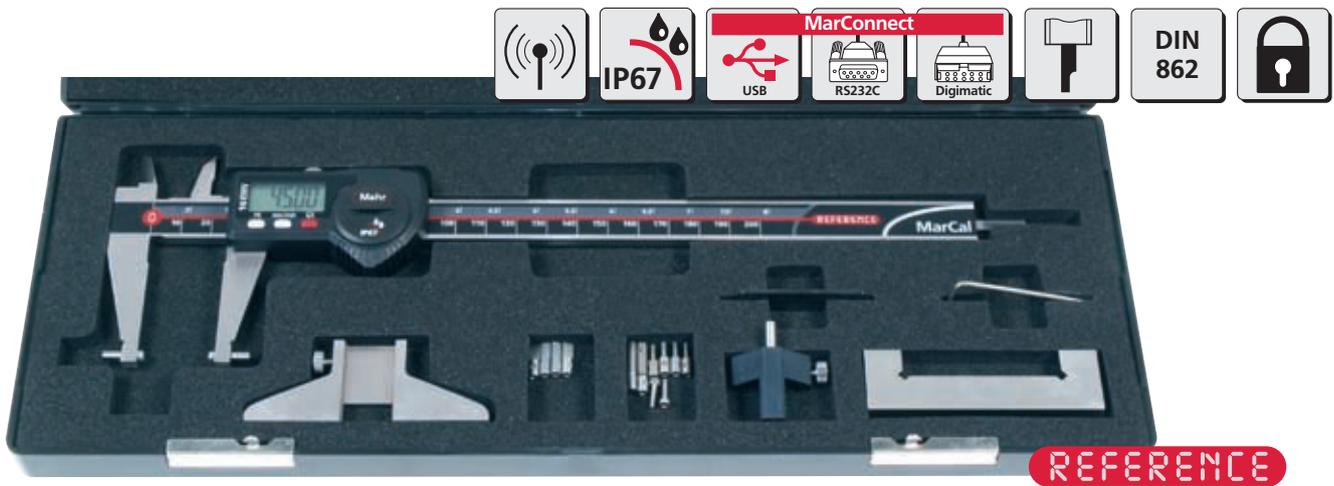
Measuring range	Readings	Diameter of circular scale	1 Pointer revolution	Dial face color	Error limit G	DIN 862	Order no.
150 mm	0.01 mm	34 mm	1 mm	white	0.03 mm	•	4107005
150 mm	0.02 mm	34 mm	2 mm	white	0.03 mm	•	4107107
6"	.001"	1.3"	.100"	black	.0012"		4107900



Accessories

	Order no.	16 Em
Depth Measuring Bridge	31 Em 4102020	
Leather case for meas. range 150 mm	4100302	

Universal Digital Caliper MarCal 16 EWW in set



Applications

- The 16 EWW 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

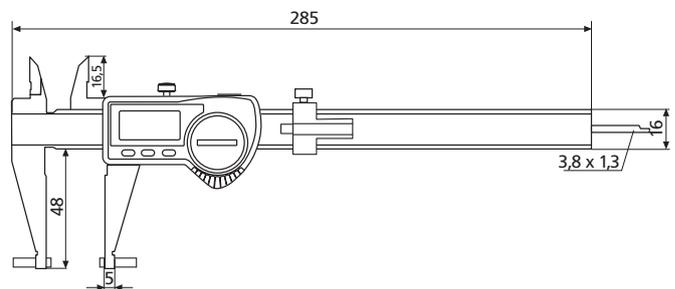
Measuring range*		Resolution	Error limit G	Order no.
mm	(inch)	mm / inch	mm	
200	(8")	0.01 / .0005"	0.03	4118807**
200	(8")	0.01 / .0005"	0.03	4118808***

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

Accessories

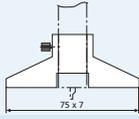
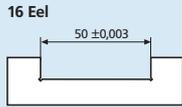
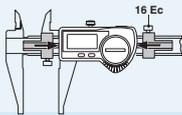
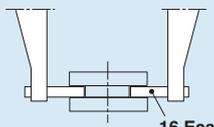
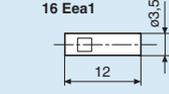
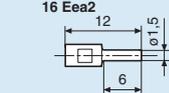
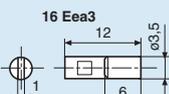
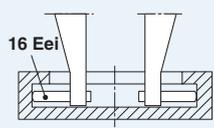
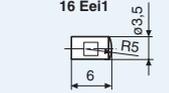
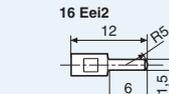
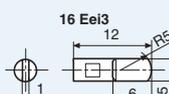
	Order no.
Battery 3V, Type CR 2032	4102520
Data Connection Cable USB (2 m)	16 EXu 4102357
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	16 EXr 4102410
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	16 EXd 4102411

Accessories for Data Processing see Chapter 11

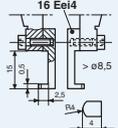
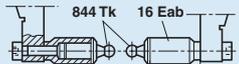


Universal Digital Caliper MarCal 16 EWW in set

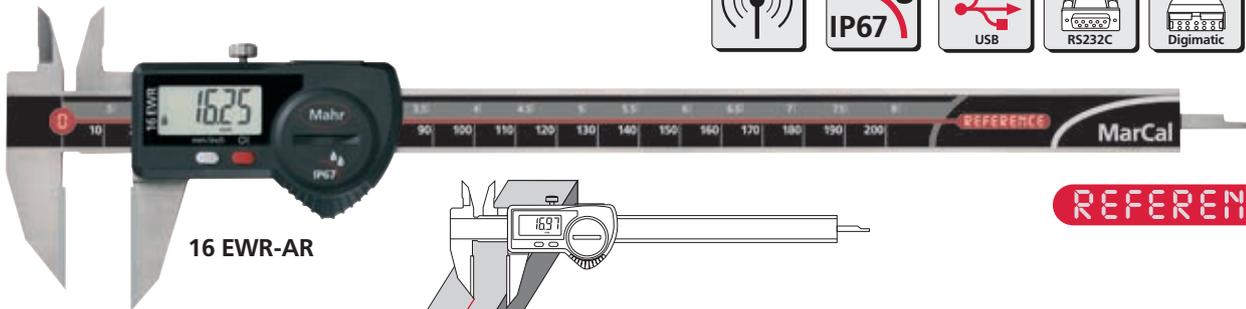
Standard Accessories are included in the set

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 measurements	4118810	2			up to dia. 175 mm
16 Eea 2	Anvils for outside measurements	4118811	2			up to dia. 175 mm
16 Eea 3	Anvils for outside measurements	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

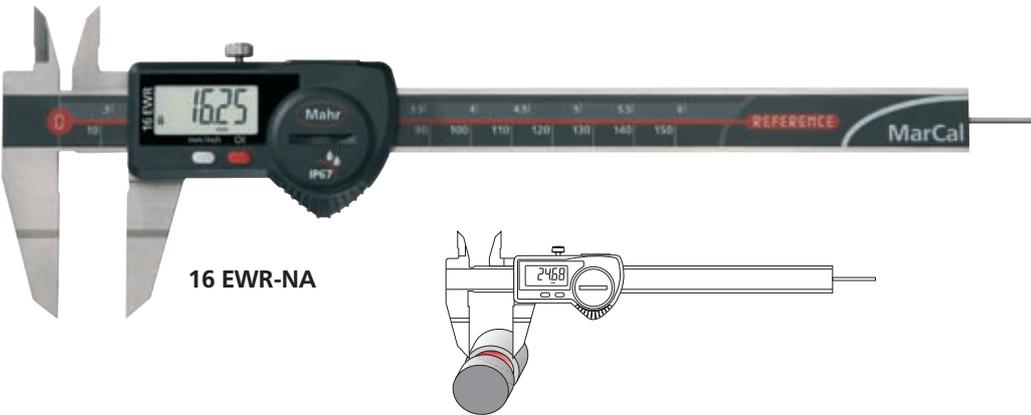
Catalog no.	Description	Order no.	Required quantity	Remarks	
16 Eei 4	Anvils for inside measurement	4118816	2		from dia. 8.5 mm
16 Eab	Mounting Attachment for 844Tg/Tr and 844 Tk	4118819	2		see Page 10-10
844 Tk	Ball Anvils		2		
844 Tg/Tr	Thread Anvils		1 + 1		see Pages 10-12/10-14

Digital Caliper MarCal 16 EWR special design



16 EWR-AR

REFERENCE



16 EWR-NA

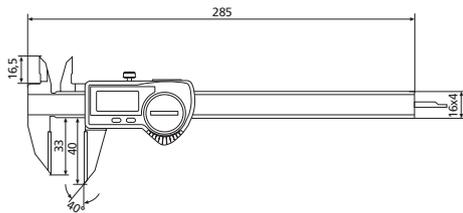
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-6, additional features can be found in the Technical Data.

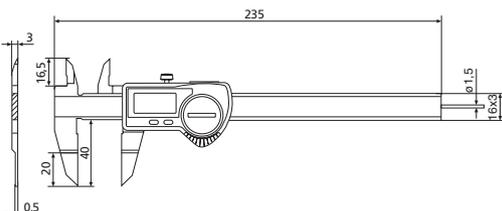
Technical Data

	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

16 EWR-AR



16 EWR-NA



Accessories

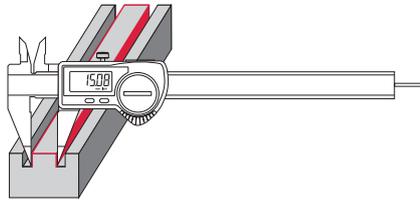
Battery, Data Connection Cables see Page 1 - 6

Accessories for Data Processing see Chapter 11

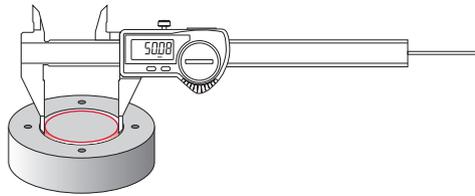
Digital Caliper MarCal 16 EWR special design



16 EWR-S



16 EWR-SM



REFERENCE

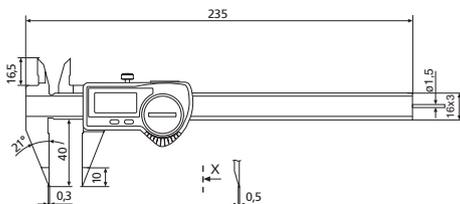
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-6, additional features can be found in the Technical Data.

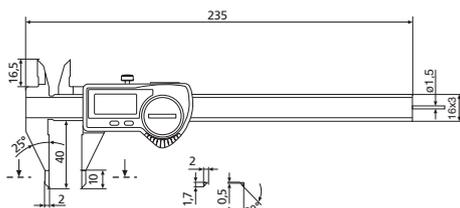
Technical Data

	Measuring range	Resolution	Error limit	Depth rod	Order no.	Type
	mm (inch)	mm / inch	G 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

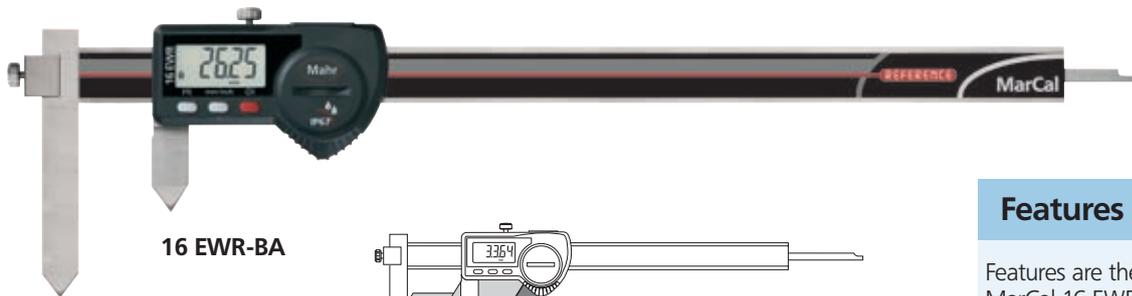
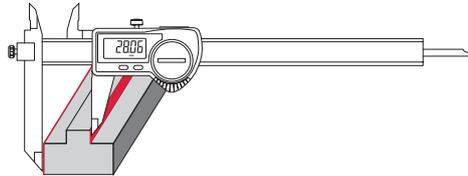
Battery, Data Connection Cables see Page 1 - 6

Accessories for Data Processing see Chapter 11

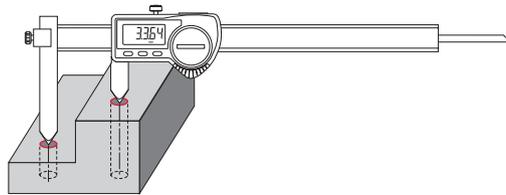
Digital Caliper MarCal 16 EWR special design



16 EWR-VS



16 EWR-BA



Features

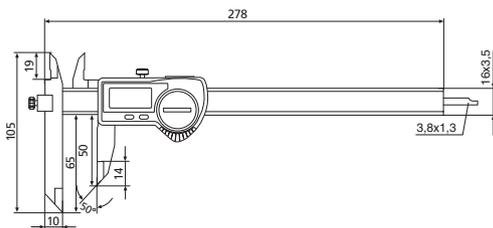
Features are the same as the MarCal 16 EWR, please refer to Page 1-6, additional features can be found in the Technical Data.

Technical Data

	Measuring range		Resolution	Error limit G	Depth rod 	Order no.	Type
	mm	(inch)					
16 EWR-VS	0 - 200	(0 - 8")	0.01/ .0005"	0.03	●	4103083	Adjustable measuring jaws
16 EWR-BA	10 - 210	(.4 - 8.3")	0.01/ .0005"	0.03	●	4103084	Adjustable measuring jaws*

* to measure the distance between bores

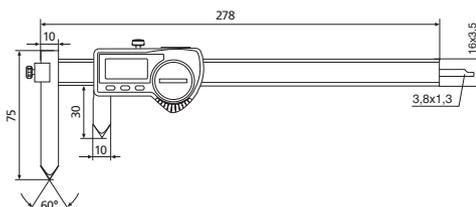
16 EWR-VS



Dimensions

mm	a	b	c	d	e
200	10	40	16	235	16 x 3

16 EWR-BA



Accessories

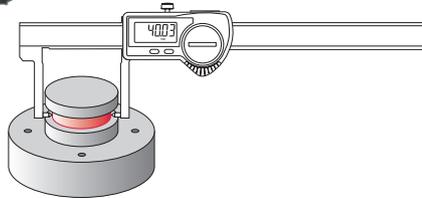
Battery, Data Connection Cables see Page 1 - 6

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 EWR special design



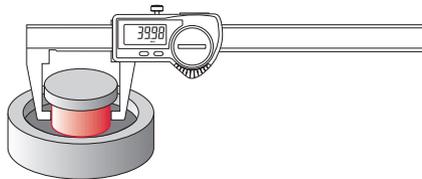
16 EWR-SA



REFERENCE



16 EWR-AA



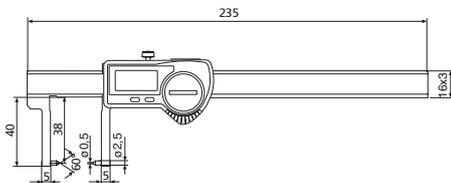
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-6, 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

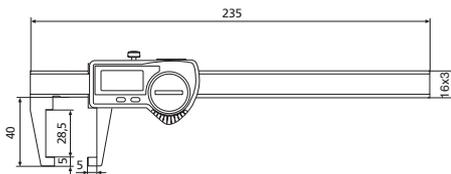
16 EWR-SA



Dimensions

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

16 EWR-AA



Accessories

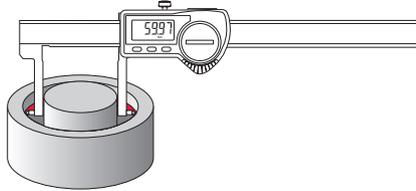
Battery, Data Connection Cables see Page 1 - 6

Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 EWR special design



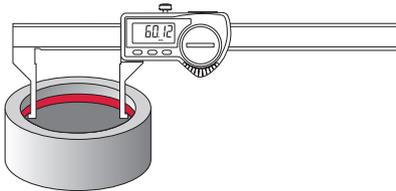
16 EWR-SI



REFERENCE



16 EWR-AI



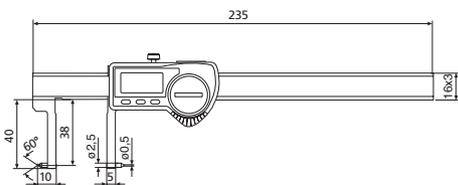
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-6, additional features can be found in the Technical Data.

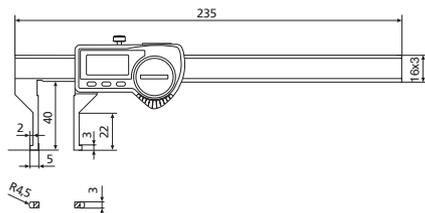
Technical Data

	Measuring range		Resolution	Error limit G	Order no.	Type
	mm	(inch)				
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

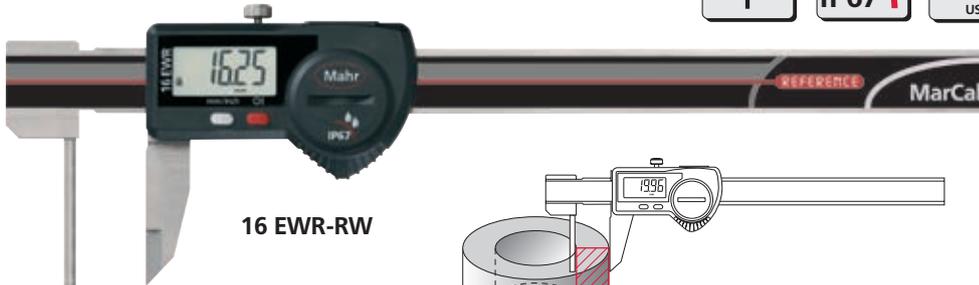


Accessories

Battery, Data Connection Cables see Page 1 - 6

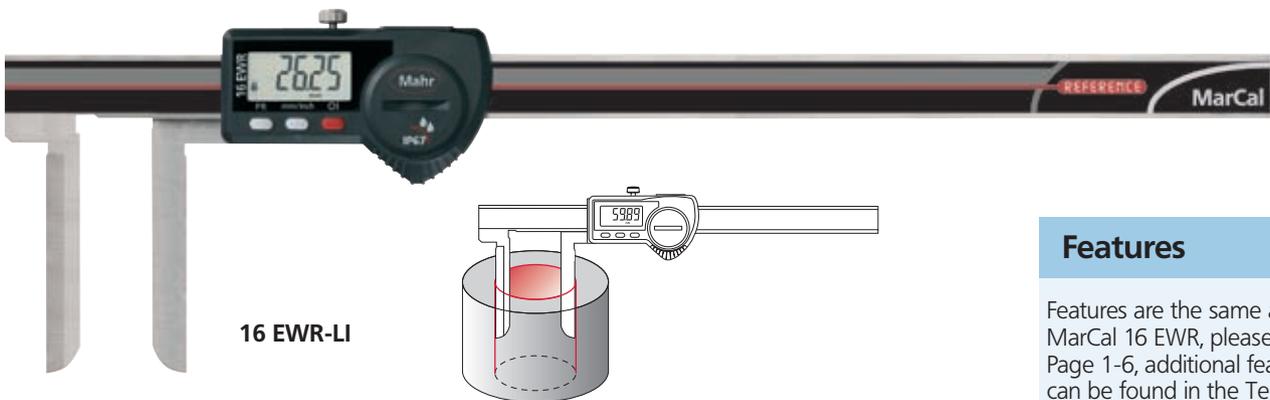
Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 16 EWR special design



16 EWR-RW

REFERENCE



16 EWR-LI

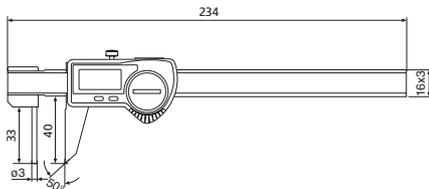
Features

Features are the same as the MarCal 16 EWR, please refer to Page 1-6, additional features can be found in the Technical Data.

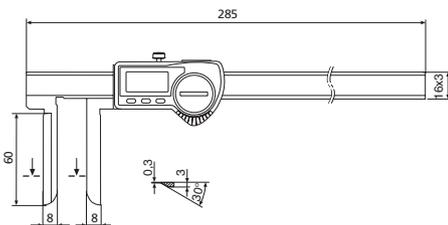
Technical Data

	Measuring range		Resolution	Error limit G	Order no.	Type
	mm	(inch)				
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 - 6

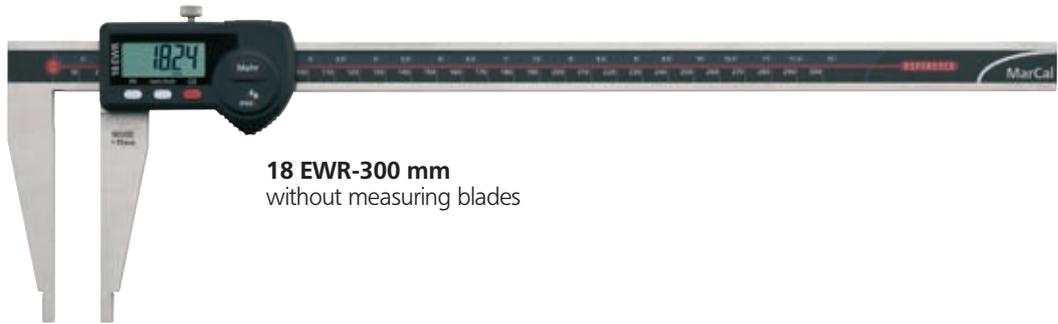
Accessories for Data Processing see Chapter 11

Digital Caliper MarCal 18 EWR

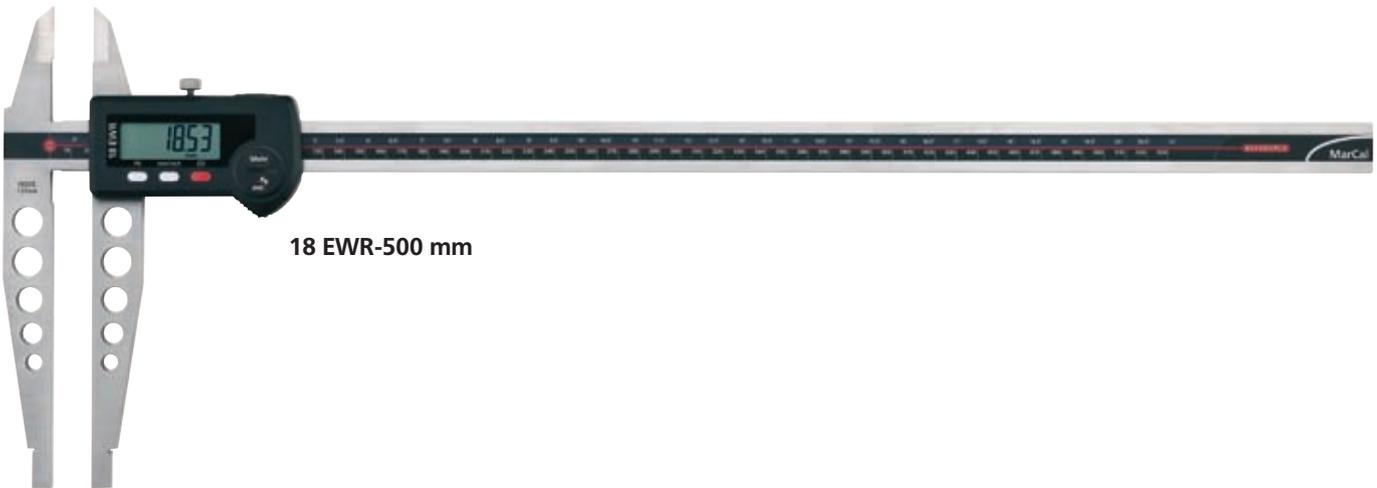
REFERENCE



18 EWR-300 mm



18 EWR-300 mm
without measuring blades



18 EWR-500 mm

Features

Functions:

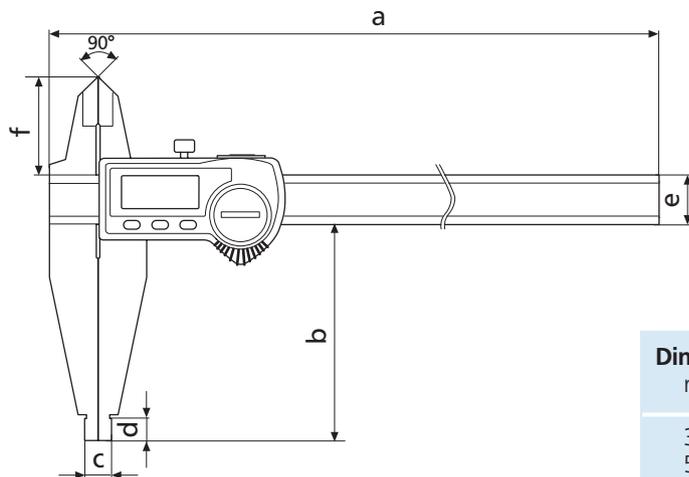
ON/OFF
 RESET (Set display to zero)
 mm/inch
 Reference-Lock/Unlock
 PRESET (for entering a numerical value)
 DATA (Data transmission via connection cable)
 Auto-ON/OFF

- 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

Digital Caliper MarCal 18 EWR with measuring blades for outside measurement



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.
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 EXd 4102411

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

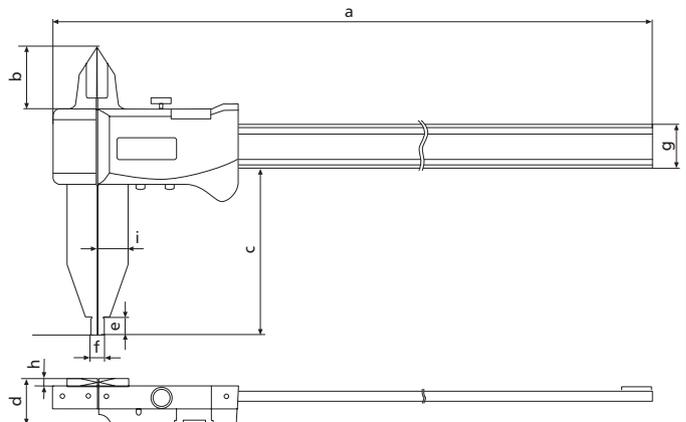
Measuring range		Resolution	Error limit G		Weight	Order no.
mm	(inch)	mm / inch	mm / inch		kg	
300	(12")	0.01 / .0005"	0.03 / .001"	•	0.50	4112620
500	(20")	0.01 / .0005"	0.03 / .001"	—	1.40	4112621
800	(32")	0.01 / .0005"	0.07 / .0025"	—	1.60	4112622
1000	(40")	0.01 / .0005"	0.08 / .0032"	—	1.80	4112623

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

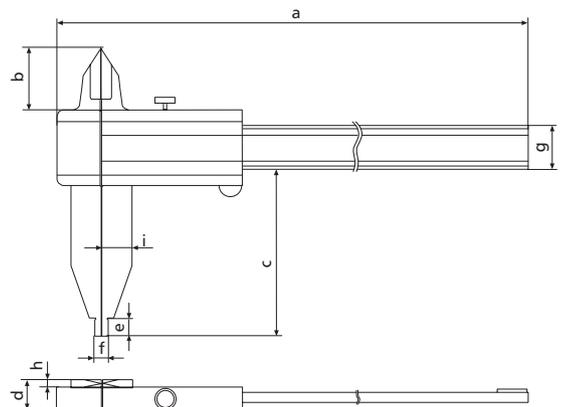
- To reduce the overall weight the slide and beam are made from aluminum and are coated with a hard anodized surface coating (1100HV)
- Measuring faces are made of hardened stainless steel
- Prisma guide ways for a more smooth and even movement
- Measuring blades for outside measurement
- Rounded measuring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

Technical Data

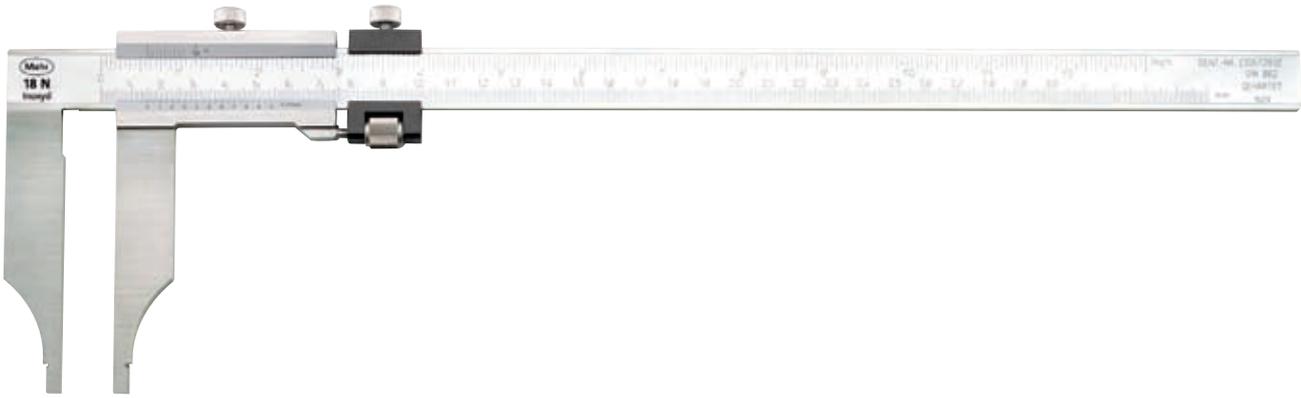
Measuring range mm	Readings		Error limit <i>G</i> mm	Weight kg	Order no.
	upper mm	lower mm			
300	0.02	0.02	0.03	0.50	4112300
500	0.02	0.02	0.03	1.40	4112301
1000	0.02	0.02	0.08	1.75	4112303
800	0.02	0.02	0.07	1.60	4112302
1500	0.05	0.05	0.16	2.10	4112304
2000	0.05	0.05	0.16	2.50	4112305

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

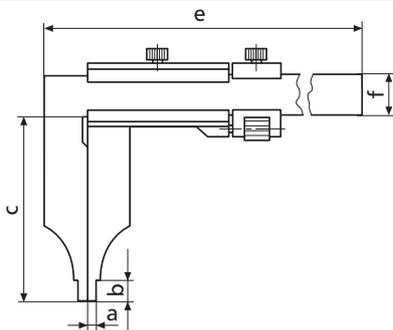


Features

- 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

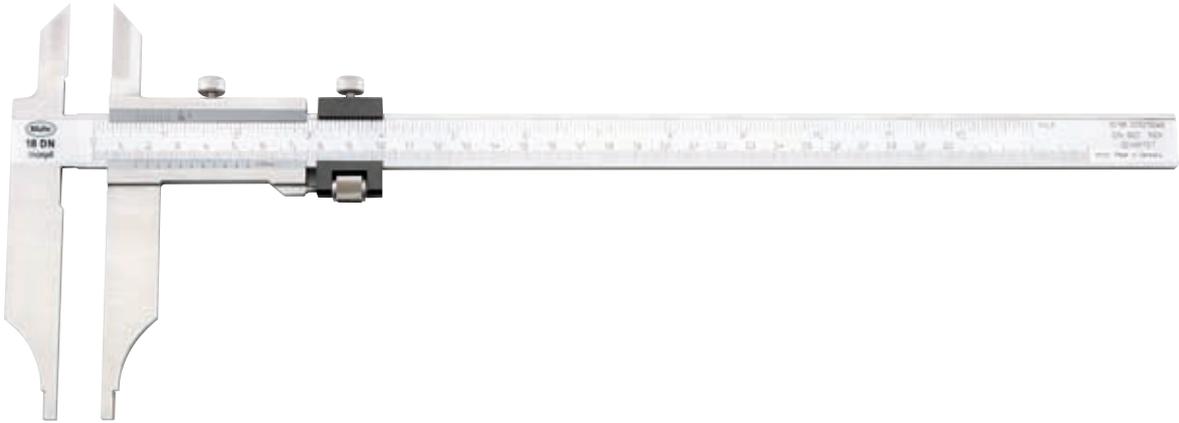
Measuring range		Resolution		Error limit G		Order no.	Order no.
mm	(inch)	upper	lower	mm		without fine adjustment	with fine adjustment
200		0.02 mm	0.02 mm	0.05		4112200	
300		0.02 mm	0.02 mm	0.05		4112201	4112220
300	(12")	.001"	0.02 mm	0.05			4112230
500		0.02 mm	0.02 mm	0.06			4112221
500	(20")	.001"	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

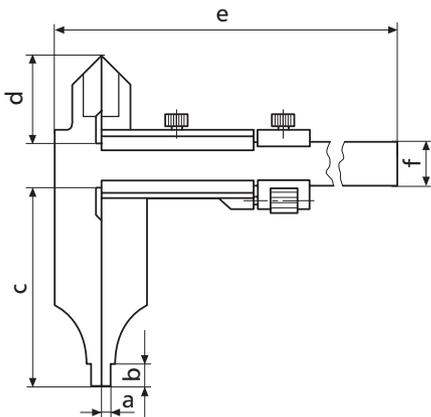


Features

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

Technical Data

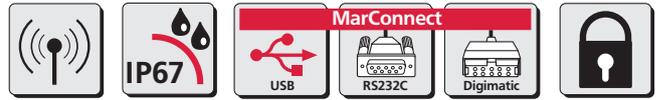
Measuring range mm	Resolution		Error limit G		Order no. without fine adjustment	Order no. with fine adjustment
	upper	lower	mm			
200	0.05 mm	0.05 mm	0.05	●	4113200	
200	0.02 mm	0.02 mm	0.05			4113300
300	0.05 mm	0.05 mm	0.05	●	4113201	
300	0.02 mm	0.02 mm	0.05			4113301
500	0.05 mm	0.05 mm	0.07	●	4113202	
500	0.02 mm	0.02 mm	0.06			4113302
800	0.05 mm	0.05 mm	0.10	●	4113203	
800	0.02 mm	0.02 mm	0.08			4113303
1000	0.05 mm	0.05 mm	0.12	●	4113204	
1000	0.02 mm	0.02 mm	0.08			4113304
1500	0.05 mm	0.05 mm	0.18	●	4113205	
2000	0.05 mm	0.05 mm	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	25	19	200	96	2270	45 x 10

Digital Depth Gage MarCal 30 EWR according to protection class IP67



REFERENCE

Merkmale

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

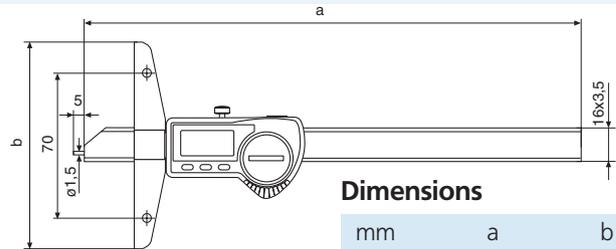
- Immediate measurement due to the Reference system
- Excellent resistance against dust, coolants and lubricants, protection class IP67
- MarConnect data output, choose alternatively: USB, OPTO RS232C or Digimatic

- 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

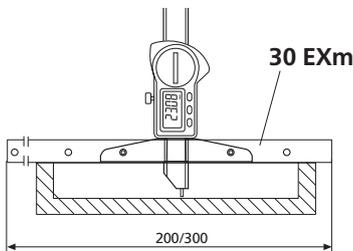
Measuring range		Resolution	Error limit	Order no.
mm	(inch)	mm / inch	G mm	
150	(6")	0.01 / .0005"	0.03	4126700
300	(12")	0.01 / .0005"	0.04	4126701
500	(20")	0.01 / .0005"	0.05	4126702



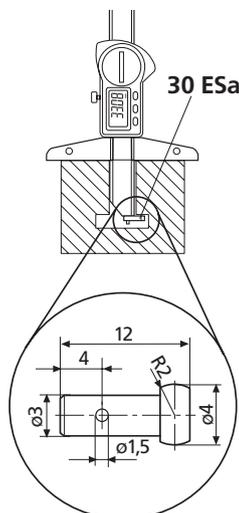
Dimensions

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 EXd 4102411
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 ER



REFERENCE

Features

Functions:

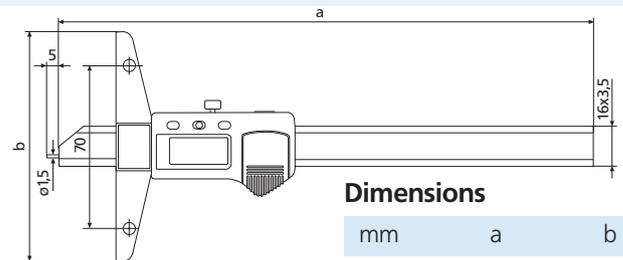
ON/OFF
 RESET (Set display to zero)
 mm/inch
 PRESET (enter a numerical value)
 Reference-Lock/Unlock
 DATA (Data transmission via connection cable)
 Auto-ON/OFF

- Immediate measurement due to the Reference system
- 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

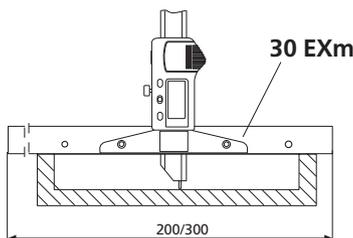
Measuring range		Resolution	Error limit	Order no.
mm	(inch)	mm / inch	G mm	
150	(6")	0.01 / .0005"	0.03	4126514
300	(12")	0.01 / .0005"	0.04	4126515
500	(20")	0.01 / .0005"	0.05	4126516



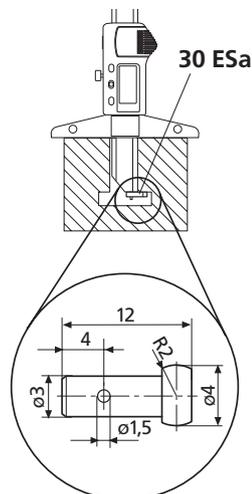
Dimensions

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

Depth measurement



Distance measurement



Accessories

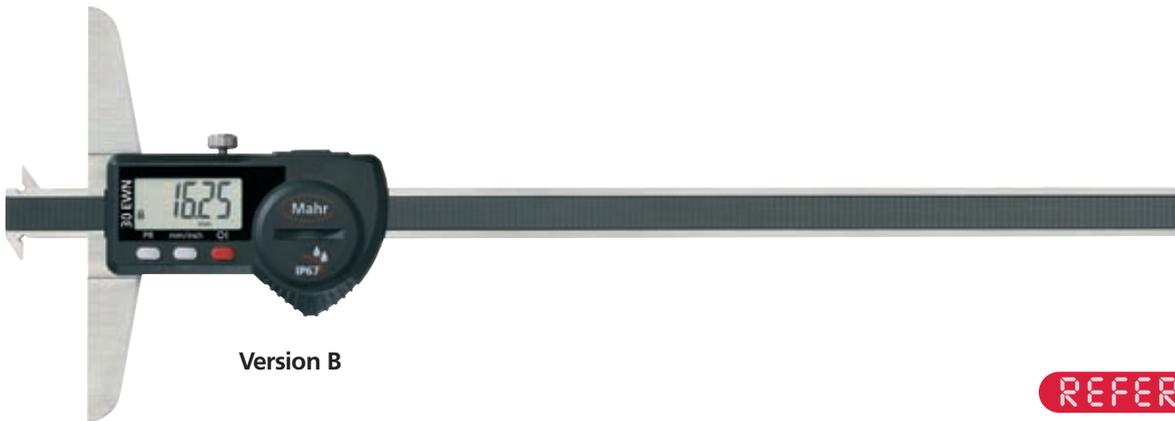
	Order no.
Battery 3V, Type CR 2032	4102520
Data Connection Cable USB (2 m)	16 EXu 4102357
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	16 EXr 4102410
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	16 EXd 4102411
Cross Beam Extension 200 mm	30 EXm 4126511
300 mm	30 EXm 4126510
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

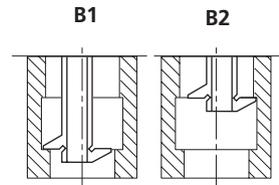
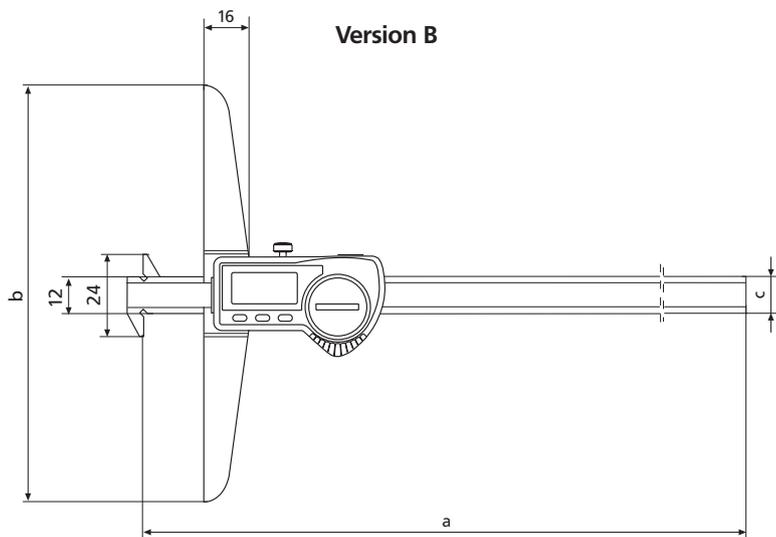
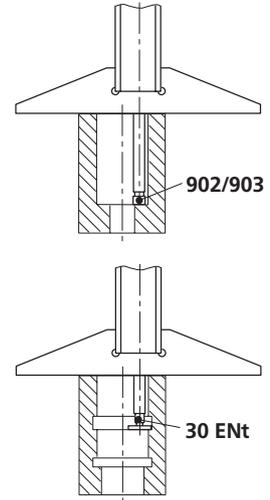
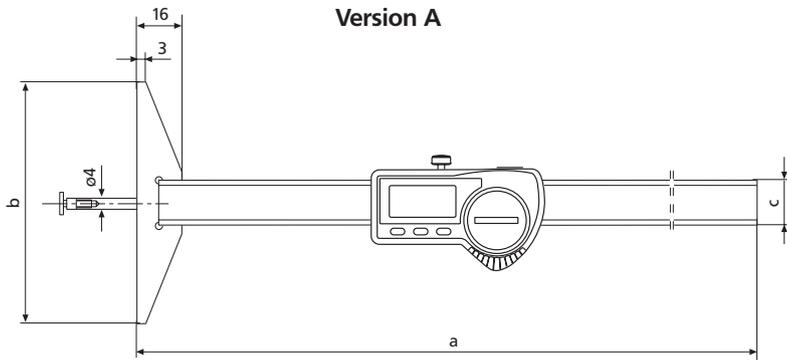
- Ideal for measuring the width of grooves and distances between grooves

Features

- | | | | |
|--|---|---|---|
| <p>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</p> | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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



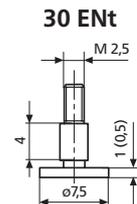
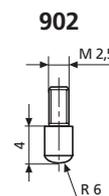
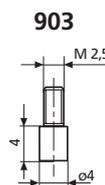
Dimensions

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

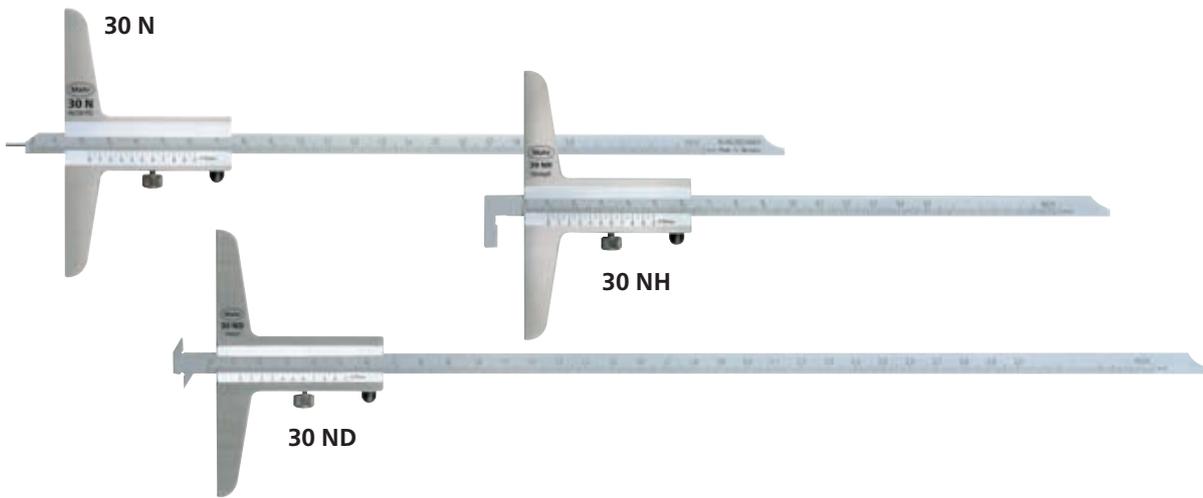
	Order no.
Battery 3V, Type CR 2032	4102520
Data Connection Cable USB (2 m)	16 EXu 4102357
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	16 EXr 4102410
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	16 EXd 4102411
Disc Type Anvil 0.5 mm thick, hardened	30 ENT 4126310
Disc Type Anvil 1 mm thick, hardened	30 ENT 4882022

Accessories for Data Processing see Chapter 11



Depth Gages MarCal 30 N / 30 NH / 30 ND

DIN
862

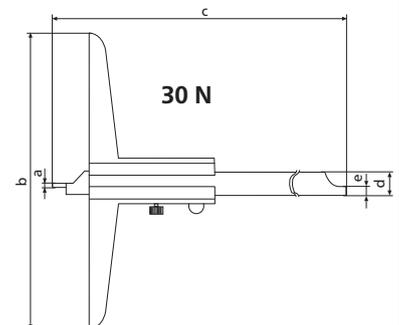
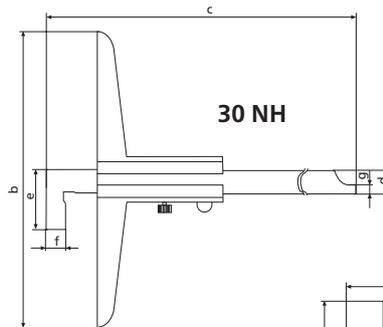
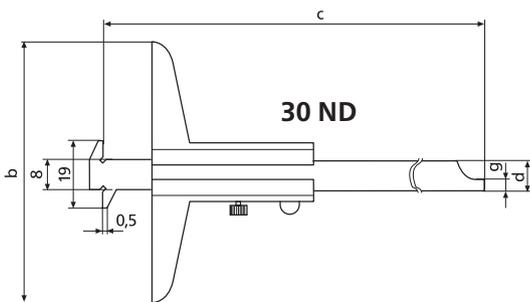


Features

- 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)

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 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		Resolution	Error limit G	Order no.
mm	(inch)			
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

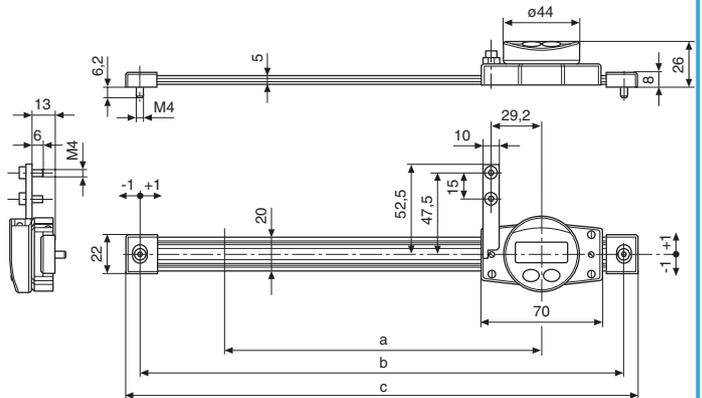
Dimensions

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



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► | 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 Instrument with 2D and Statistics function	
Digimar 816 CL	2- 8
Height Measuring Instrument for the workshop and test labs	
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“		
			
	2-4	2-4	2-4
Catalog page			
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	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



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



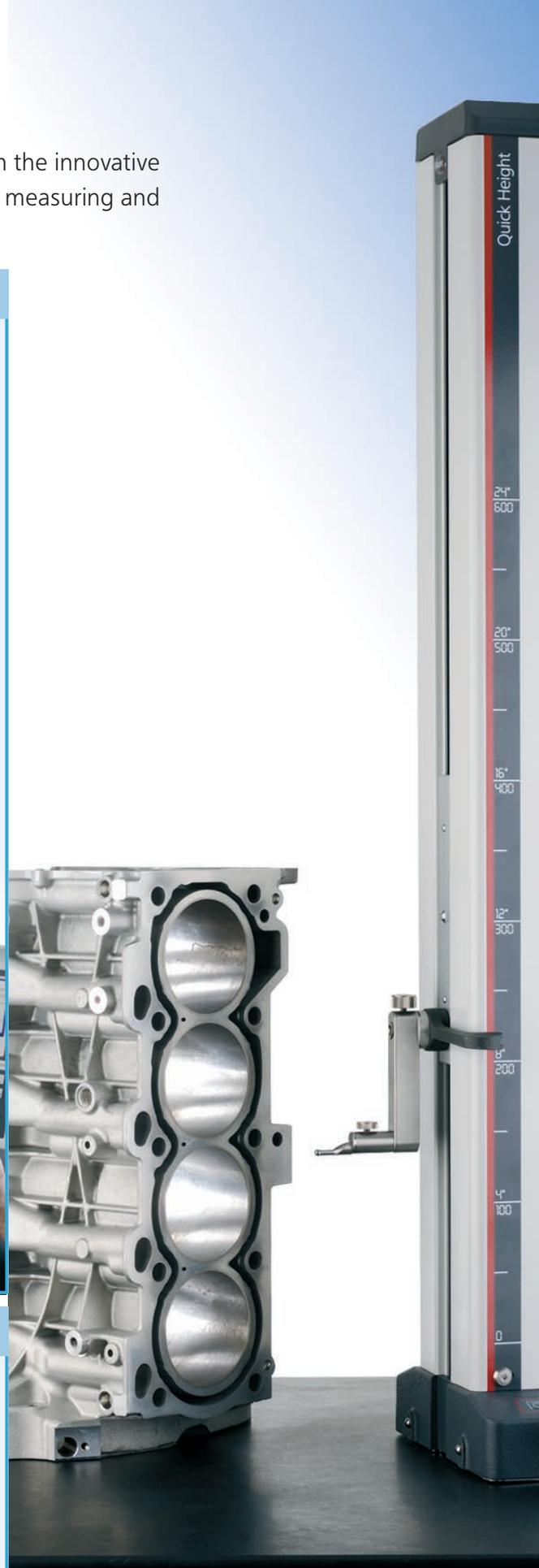
Ideal in conjunction with the air bearings for large workpieces.

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

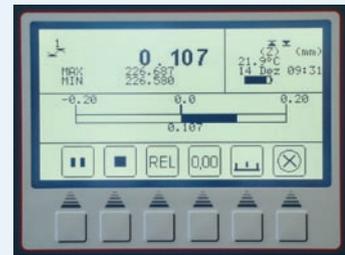
- Extremely accurate incremental measuring system with double reader head system, insensitive to the contamination of dirt
- Robust guide column, made from stainless steel
- Measuring head in precision ball bearings guide
- Temperature compensation with an integrated temperature sensor



Digimar 817 CLM



Ergonomic operating and display unit



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

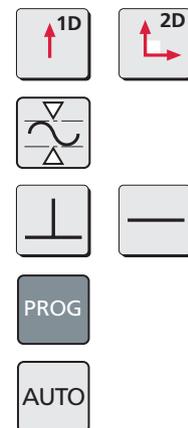


- The display unit can be positioned freely with the swivel arm

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

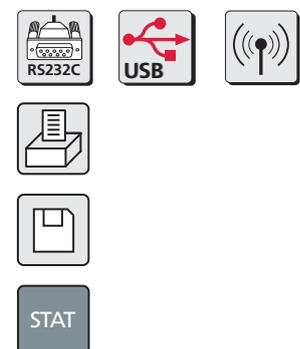
Universal measurement possibilities

- 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 measured 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 reliability 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 dongle
- 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

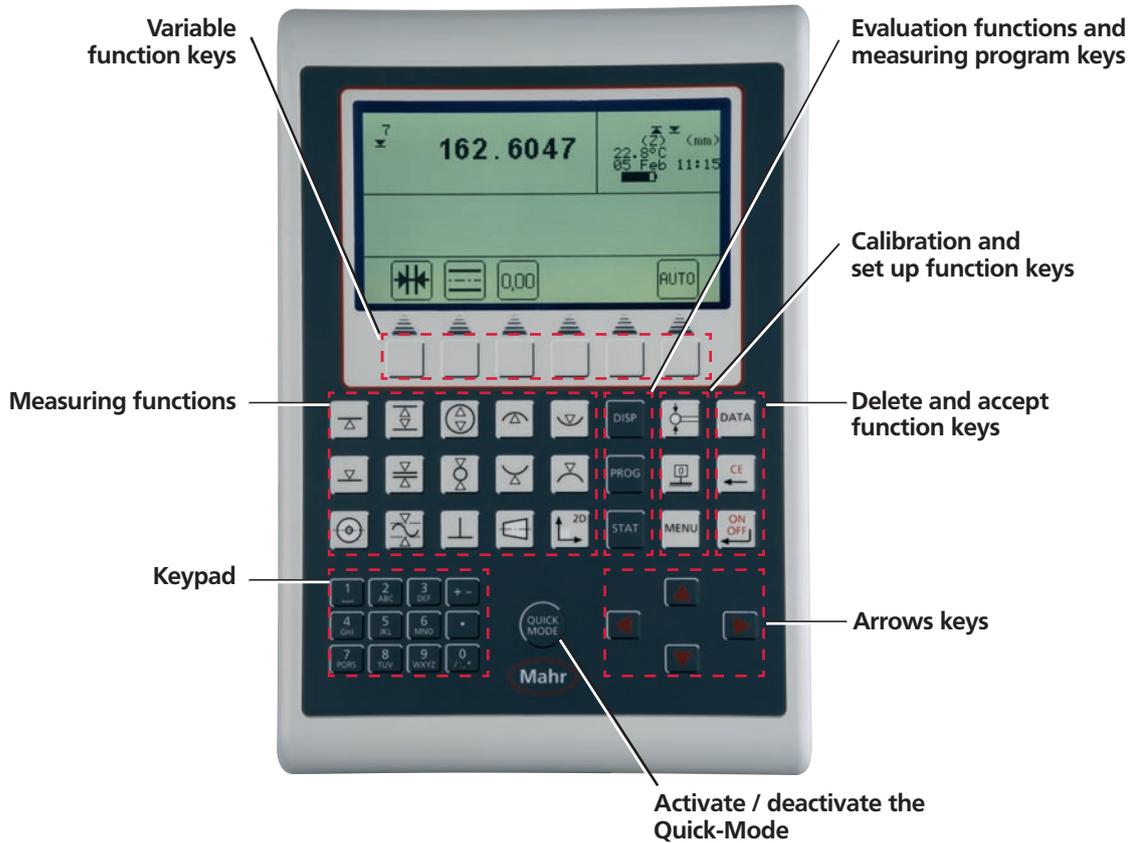
Technical Data

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 inch		0.01 / 0.005 / 0.001 / 0.0005 / 0.0001 .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

▶ | 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! ◀

User-friendly operation. . .

. . . due to the

- Clearly displayed measured values
- Self-explanatory operator guidance

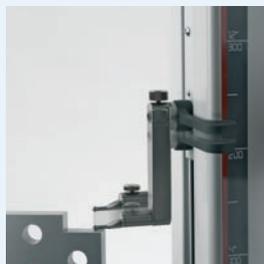


The operating and display unit has a background illuminated display.

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.



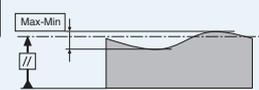
- Temperature compensation with an integrated temperature sensor



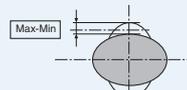
Versatile

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



The measuring program. . .

. . . is essential for repetitive part measurement



- 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 reliability 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

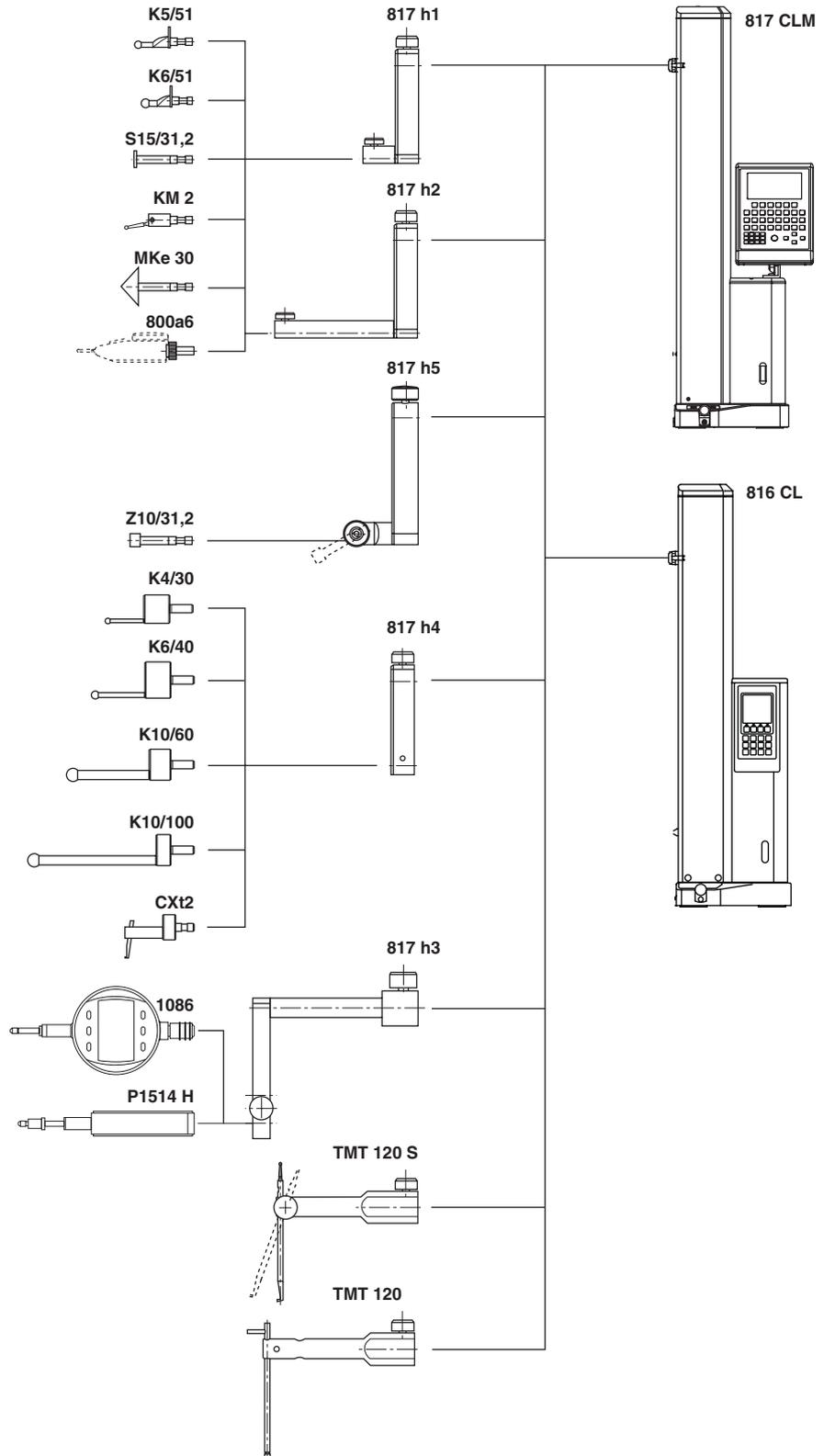
- Easy to read background lit graphic LCD display
- Large and clearly defined function keys
- Operator guidance with self-explanatory icons / pictograms
- Possible to set additional zero points on a work piece
- Memory can store up to 99 measured values
- MarConnect data output, select either:
 - USB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

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

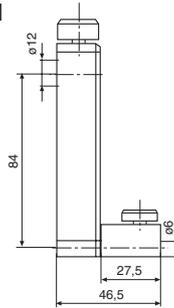
Accessories

Carrier for probes with mount dia. 6 mm

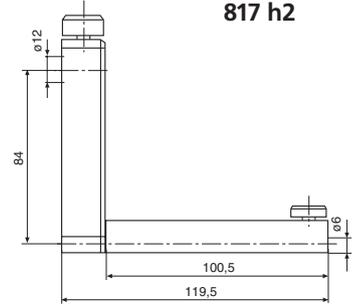
Catalog no.	Description	Shaft length mm	Order no.
817 h1	Carrier for a probe	27.5	4429154*
817 h2	Carrier for a probe	100	4429219
817 h5	Carrier with a joint for a probe	35	4429454

* Supplied with standard accessories

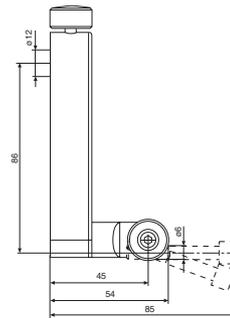
817 h1



817 h2



817 h5



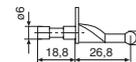
rotatable

Probes with mount dia. 6 mm

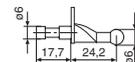
Catalog no.	Description	Order no.
K5/51	Spherical probe	4429158
K6/51	Spherical probe	4429254*
S15/31,2	Disc probe	4429226
Z10/31,2	Cylindrical probe	4429227
MKe 30	Taper probe	4429228
KM 2	Probe M2 incl. styli 800 ts, dia. 2 mm	4429256
800 a6	Mounting shaft 800 a6 for MarTest	4301865

* Supplied with standard accessories

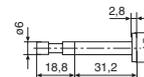
K 5/51



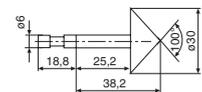
K 6/51



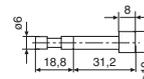
S 15/31,2



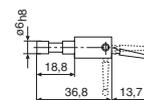
MKe 30



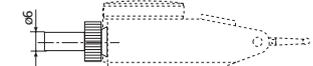
Z 10/31,2



KM 2



800 a6



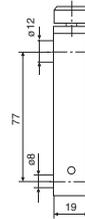
Height Measuring Instruments Digimar 817 CLM / 816 CL

Accessories

Carrier for probes with mount dia. 8 mm

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

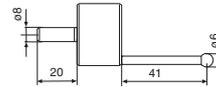
817 h4



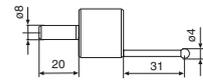
Probes with mount dia. 8 mm

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

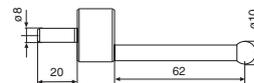
K 6/40



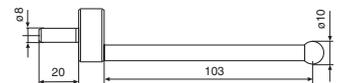
K 4/30



K 10/60



K 10/100

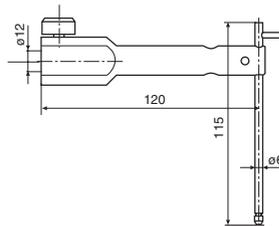


Universal probe CXt2 see page 2-14

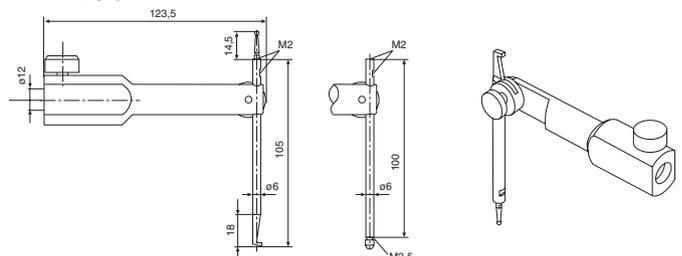
Depth probes

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

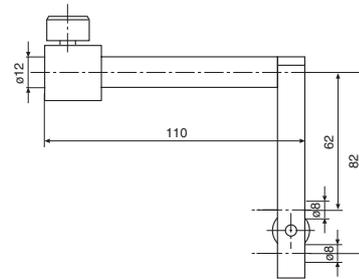


Height Measuring Instruments Digimar 817 CLM / 816 CL

Accessories for checking perpendicularity

Carrier for probes

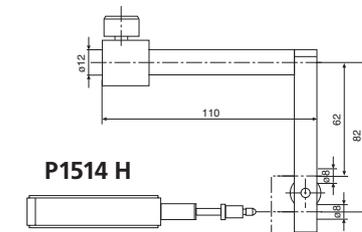
Catalog no.	Description	Order no.	817 h3
817 h3	Carrier for transducers	4429206	



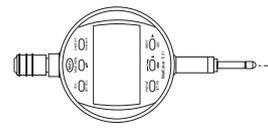
Transducers for checking perpendicularity

Catalog no.	Description	Order no.
P1514 H	Incremental probe, 12 mm incl. cable	4426810*
1086 R	Digital indicator, 12.5 mm Resolution 0.001 / .00005"	4337120
16 EXr	Data cable for digital indicator 1086 R	4102410*

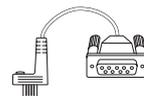
817 h3



P1514 H



1086 R



16 EXr

* Only for Digimar 817 CLM

Accessories

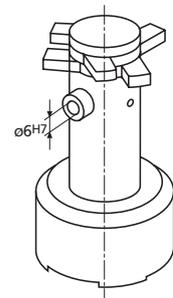
Setting blocks

Catalog no.	Description	Order no.	817 eb	EB I
817 eb	Setting block	4429168*		
EB I	Setting block for a taper probe, includes a calibration certificate	7023827		

* Supplied with standard accessories



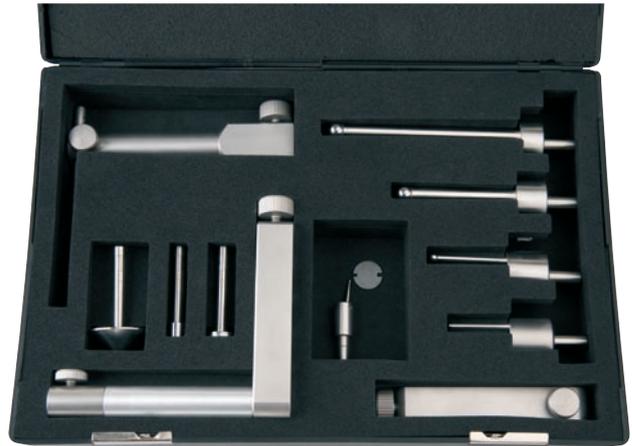
EB I



Height Measuring Instruments Digimar 817 CLM / 816 CL

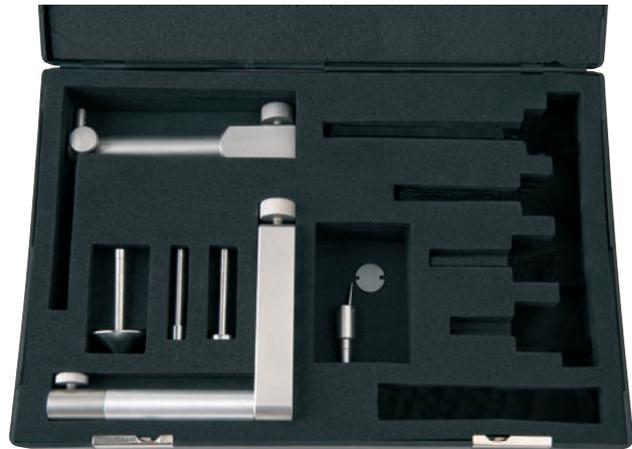
Accessory sets for probes

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



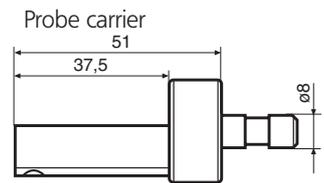
817 ts1

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



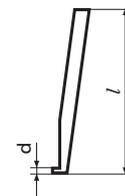
817 ts2

Universal probe set CXt2 consists of:	7034000
Case	3015925
Probe carrier	3015917
Measuring crook	3015918
Probe pin /tip:	3015919
Taper probe	3015920
Spherical probe	3022000
Spherical probe	3022001
Spherical probe	3022002
Extension M3 – M3	3015921
Extension M3 – M2.5	3015888

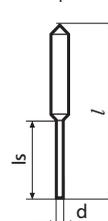


	Dimension	Shaft length	
Measuring crook	d = 0.5 mm	l = 78 mm	3015918
Probe pin /tip:	dia. d = 1.2 mm	l = 75 mm	3015919
		ls = 15.5 mm	
Taper probe	dia. d = 0–7.5 mm	l = 24 mm	3015920
Spherical probe	TC dia. dk = 3 mm	l = 24 mm	3022000
Spherical probe	TC dia. dk = 2 mm	l = 24 mm	3022001
Spherical probe	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

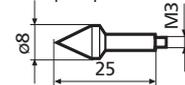
Measuring crook



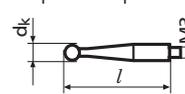
Pin probe



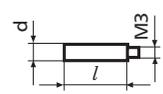
Taper probe



Spherical probe



Extension



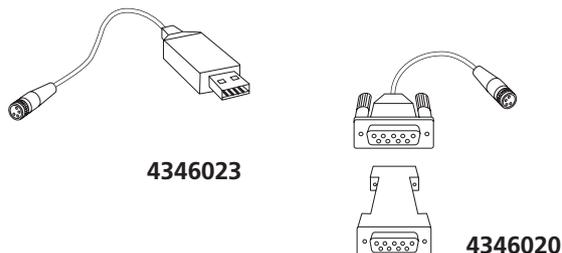
Height Measuring Instruments Digimar 817 CLM / 816 CL

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

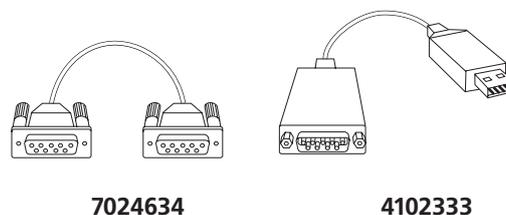


Accessories for data transmission for 817 CLM

Data connection cable

		Order no.
Data cable 817 CLM to MSP 2 / PC		7024634
Adapter cable RS232-USB for Digimar 817 CLM incl. MarCom Standard		4102333

Accessories for Data Processing see Chapter 11



Statistics printer MSP 2 for 816 CL and 817 CLM

- Can be connected via a RS232C interface
 - Two-line display for a simple dialog mode
 - 3 types of print protocols: statistics, statistics with a histogram and sample charts
 - Retrieve at any time from the memory a list of measured values
 - Individual values can be selected and deleted as required.
 - Alternative power sources include: mains adapter (100 - 240 V), batteries or NIMH-accumulator, type AA
 - Languages can be selected, German, English and French
- Supplied with:
Mains adapter, paper rolls



	Order no.
MSP2 Statistics printer	4102040

Printer for 817 CLM

HP Ink jet printer

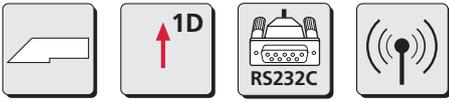
- Standard connectivity: USB - compatible with USB 2.0 specifications
- Compatible operating systems: Microsoft® Windows® 98 SE, Me, 2000, XP, 7
- Standard printer languages HP PCL 3

Similar to illustration



	Order no.
HP Ink jet 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 / 0.0008"	30 / 0.0012"
Repeatability	µm		5 / 0.0002"
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 / 0.0008"	30 / 0.0012"
Repeatability	µm		5 / 0.0002"
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

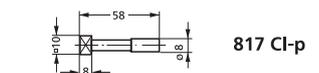
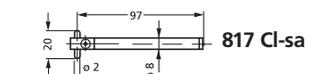
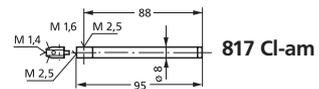
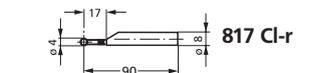
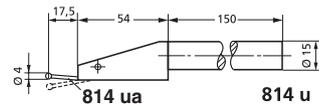
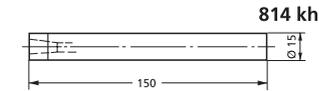
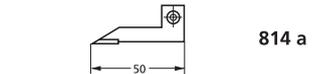
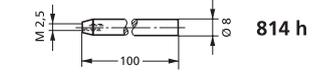
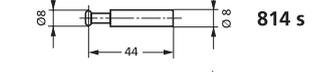
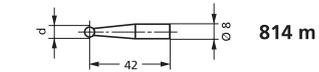
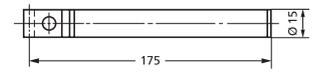
Order no.

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 To mount in probe arm 814 t	2 mm ball	(.0787")	4426525
		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 to mount the styli of dial indicators and dial comparators. For special applications.	M 2.5		4426514
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



* Scope of supply
** for upgrade

Height Measuring and Scribing Instrument Digimar 814 SR



REFERENCE

Application

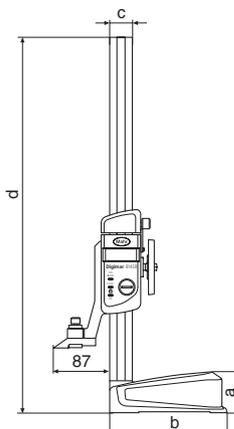
- Scribing and marking of work pieces
- Measuring heights and distances



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
- Interchangeable scriber point, carbide tipped
- Scope of supply: Scriber point, cardboard box, battery and operating instructions



Dimensions

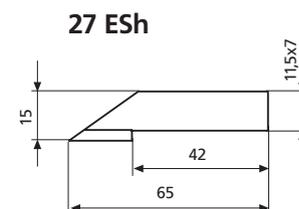
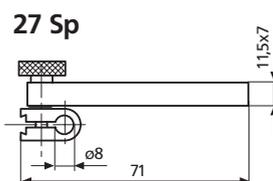
mm	a	b	c	d
350	62	180 x 98	35 x 15	580
600	62	180 x 98	35 x 15	835

Technical Data

Measuring range		Resolution	Error limit	Weight	Order no.
mm	(inch)	mm / inch	mm / inch	kg / lbs	
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	27 ESh 4123710
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 EXd 4102411



DOES EVERYTHING ROTATE AROUND PRECISION? NO PROBLEM WITH MICROMAR.



The latest information on MICROMAR products can be found on our website:

www.mahr.de, WebCode 205

► | 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 of the determined parameters 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 SH / 40 SD / 40 AG / 40 W

3-10

With Scales

Micromar 40 F / 40 T / 40 TS

3-14

With a Dial Comparator

Micromar 40 AB / 40 AS / 40 AR / 40 AW / 40 SM

3-17

With Special Measuring Faces

Micromar 40 Z

3-20

For Gear and Thread Measurement

Accessories for Micrometers

3-22

Inside Micrometers

Micromar 44 F / 44 Cms / 44 CB / 44 CZ

3-23Inside Micrometers with
2-Point Contact

Micromar 44 A / 44 EWR / 844 A

3-27

Self-Centering Inside Micrometers / Measuring Pistols

Depth Micrometers

Micromar 45 T

3-31

With a Line Scale (Vernier)

Micrometer Heads

Micromar 46 EWR / 46 / 46H

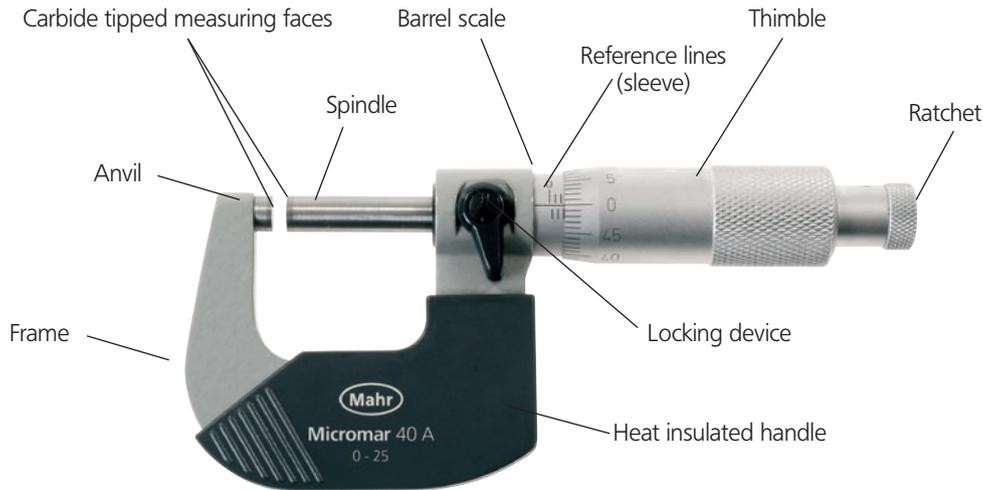
3-32

With Digital Display or Scales (Vernier)

Micromar. Micrometer

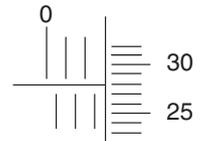
OVERVIEW

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 EWW 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)	●
DATA	Data transmission	●* ●* ●*



* For digital micrometers with a data output

Micromar. Digital Micrometer Micromar 40 EWR

WATERPROOF MICROMETERS

► | The digital waterproof Micrometer **Micromar** 40 EWR. Even in the most difficult conditions precise and reliable results are obtained. | ◀

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%**.

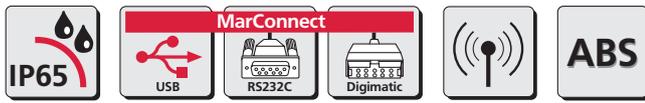


Code Initial	IP	International Protection
First Numeral	6	Dust-tight
Second Numeral	5	Protected against powerful water jets



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



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

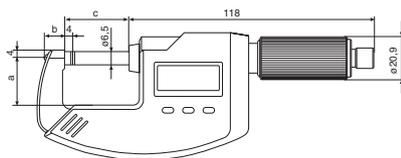
- High contrast Liquid Crystal Display with 8.5 mm high digits
- Hard lacquered steel frame, heat insulated
- Spindle and anvil are carbide tipped
- Spindle is made of stainless steel, hardened throughout and ground

- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with: Case, battery, operating instructions and setting standard (from measuring range 25-50 mm)

Technical Data

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

* 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

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 EXd 4102411

Accessories for Data Processing see Chapter 11

Digital Micrometer Set Micromar 40 EWR

Application range	Order no.	Remarks
0 - 100 mm	4151709	Includes: custom fitted plastic case, setting standards 25 mm, 50 mm and 75 mm



Digital Micrometer Micromar 40 ER



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

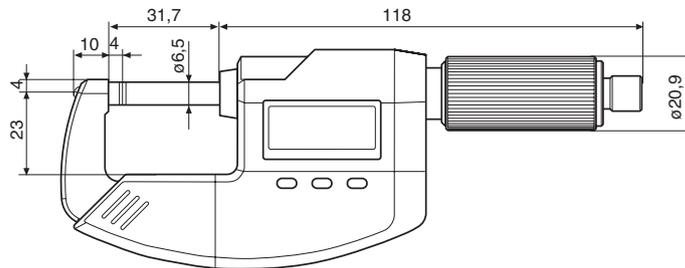
- Spindle is made of stainless steel, hardened throughout and ground
- Ratchet is integrated in the thimble
- Rapid drive

- Supplied with: Case, battery 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



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
- MarConnect data output, choose alternatively USB OPTO RS232C Digimatic

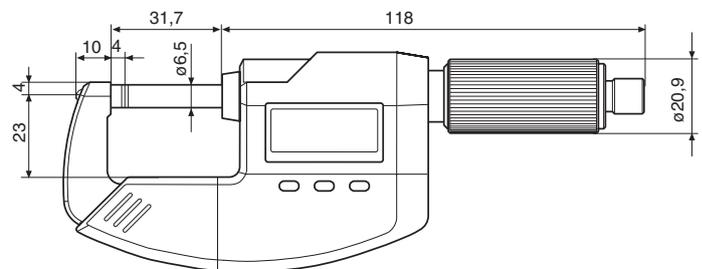
- High contrast Liquid Crystal Display with 8.5 mm high digits
- Hard lacquered steel frame, heat insulated
- Spindle and anvil are carbide tipped
- Spindle is made of stainless steel, hardened throughout and ground

- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with: Case, battery and operating instructions

Technical Data

	Measuring range		Resolution	Error limit G *	Spindle thread pitch	Order no.
	mm	(inch)	mm / inch	µm	mm	
40 EWS	0 - 25	(0-1")	0.001 / .00005"	2	0.635	4151724

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



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 EXd 4102411

Accessories for Data Processing see Chapter 11

Universal Digital Micrometer Micromar 40 EWW with sliding spindle



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
- 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 interchangeable anvils
- Spindle is made of stainless steel, hardened throughout and ground

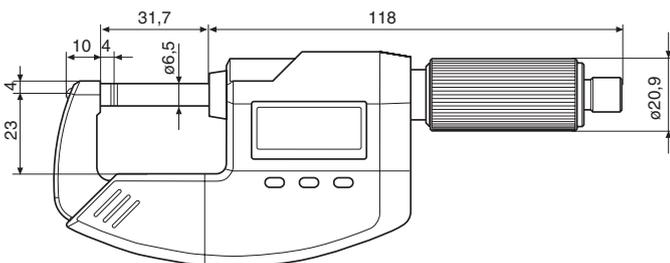
- Ratchet is integrated in the thimble
- Rapid drive
- Supplied with: Case, battery and operating instructions

Technical Data

Measuring range*	Resolution	Error limit**	Spindle thread pitch	Spindle dia.	Order no. without standard accessories	Order no. with standard accessories
mm	mm / inch	μm	mm	mm		
0 - 25	0.001 / .00005"	2	0.635	6.5	4151722	
0 - 25	0.001 / .00005"	2	0.635	6.5		4151723

* with thread anvils the measuring range is reduced

**with flat anvils over the full length of the anvils and at fixed zero point (better than DIN 863-3)



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 EXd 4102411

Accessories for Data Processing see Chapter 11

Universal Digital Micrometer Micromar 40 EWW with sliding spindle

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	

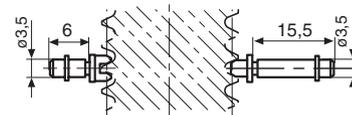
Special Accessories

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 by 20 mm



Metric thread (60°)					Whitworth thread (55°)					American UST thread (60°)				
Pitch			V-anvil	Blade	Pitch			V-anvil	Blade	Pitch			V-anvil	Blade
mm			Order no.	Order no.	range TPI			Order no.	Order no.	range TPI			Order no.	Order no.
0.5	-	0.7	4501000	4173700	40	-	32	4501007	4173743	40	-	32	4501018	4173815
0.7	-	1	4501001	4173701	32	-	24	4501008	4173744	32	-	24	4501019	4173816
1.25	-	2	4501002	4173702	24	-	18	4501009	4173745	24	-	18	4501020	4173817
2	-	3.5	4501003	4173703	18	-	14	4501010	4173746	18	-	14	4501021	4173818
					14	-	10	4501011	4173747	14	-	10	4501022	4173819
					10	-	7	4501012	4173748	10	-	7	4501023	4173820

Micrometer Micromar 40 A

DIN 863-1

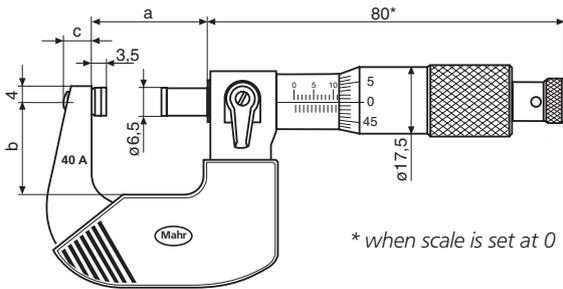


Features

- 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.
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
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



Dimensions

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

Accessories

Stand, setting standards, etc. please refer to page 3-22

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 SH / 40 SD with extra large thimble

DIN 863-1



40 SH



40 SD

Features

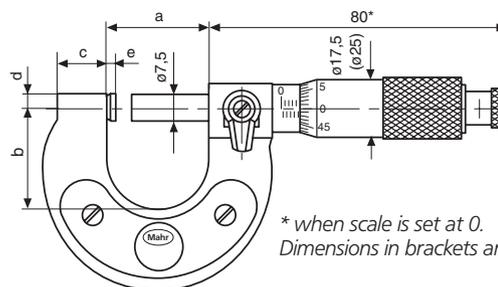
- Chrome plated steel frame
- Maximum stability
- Spindle and anvil made of hardened steel, carbide tipped measuring faces
- Spindle is made of stainless steel, hardened throughout and ground
- Scales with satin-chrome finish
- Heat insulators
- Rapid drive with integrated ratchet
- Locking device
- Supplied with: Case (measuring range 0 - 100 mm)

Only 40 SD:

- Reading error is reduced due to the 1 mm measuring span per rotation of the thimble

Technical Data

	Measuring range	Readings	Error limit G	Spindle thread pitch	Order no.
	mm	mm	µm	mm	
40 SH	0 - 25	0.01	4	0.5	4131000
	25 - 50	0.01	4	0.5	4131001
	50 - 75	0.01	5	0.5	4131002
	75 - 100	0.01	5	0.5	4131003
	100 - 125	0.01	6	0.5	4131004
	125 - 150	0.01	6	0.5	4131005
	150 - 175	0.01	7	0.5	4131006
175 - 200	0.01	7	0.5	4131007	
40 SD	0 - 25	0.01	4	1	4135000
	25 - 50	0.01	4	1	4135001
	50 - 75	0.01	5	1	4135002
	75 - 100	0.01	5	1	4135003



Dimensions

Measuring range	a	b	c	d	e
Dimensions in mm					
0 - 25	31	28	13	3.25	3
25 - 50	56	40	13	3.25	3
50 - 75	81	53	13	3.25	3
75 - 100	106	65	13	3.25	3
100 - 125	130	75.5	15	4	3.5
125 - 150	155	88	15	4	3.5
150 - 175	180	100.5	15	4	3.5
175 - 200	205	113	15	4	3.5

Accessories

Stand, setting standards, etc. please refer to page 3-22

Micrometer Sets Micromar 40 SSH

Application range	Order no.	Remarks
0-100 mm (4 Micrometers)	4133001	Incl. wooden case, setting standards 25 mm and 75 mm
100-200 mm (4 Micrometers)	4133005	Incl. wooden case, setting standards 125 mm and 175 mm



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:

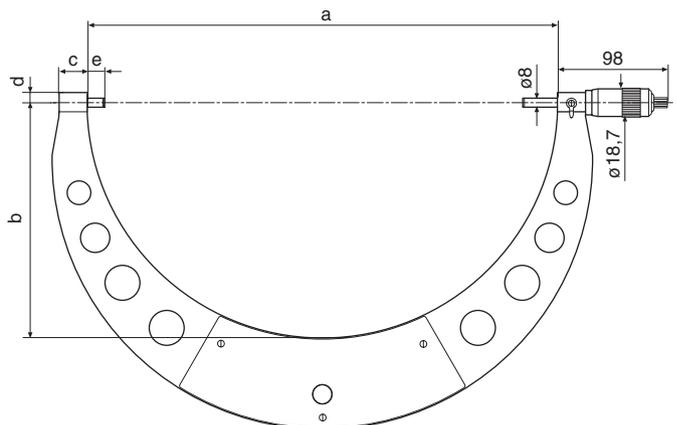
All Micrometers with measuring ranges between 400 mm to 500 mm, the frame is made from a steel tube

Technical Data

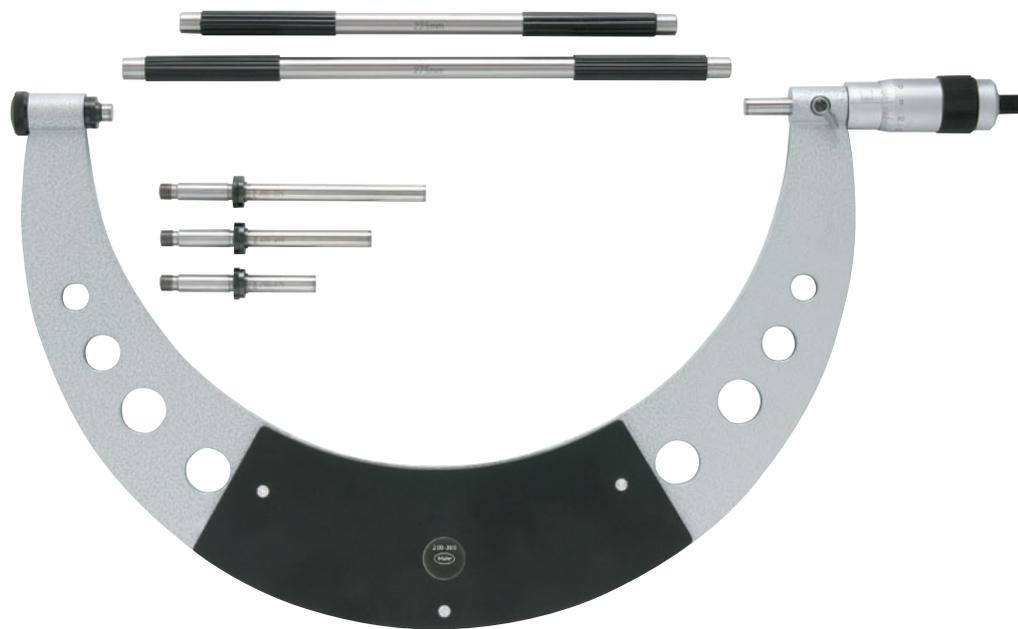
Measuring range	Readings	Error limit	Spindle thread pitch	Weight	Order no.
mm	mm	G μm	mm	kg	
200 - 225	0.01	8	0.5	2	4134500
225 - 250	0.01	8	0.5	2.2	4134501
250 - 275	0.01	9	0.5	2.3	4134502
275 - 300	0.01	9	0.5	2.7	4134503
300 - 325	0.01	10	0.5	3.2	4134504
325 - 350	0.01	10	0.5	3.4	4134505
350 - 375	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

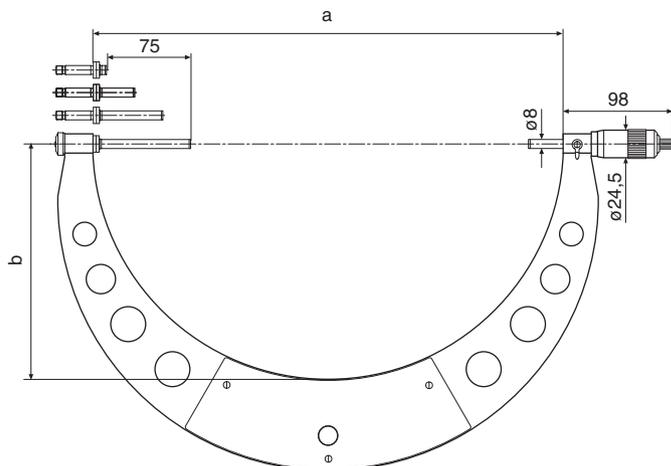
Note:
All Micrometers with measuring ranges from 400 mm up to 1000 mm, the frame is made from a steel tube

Technical Data

Measuring range	Readings	Error limit	Spindle thread pitch	Weight	Order no.
mm	mm	G μm	mm	kg	
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

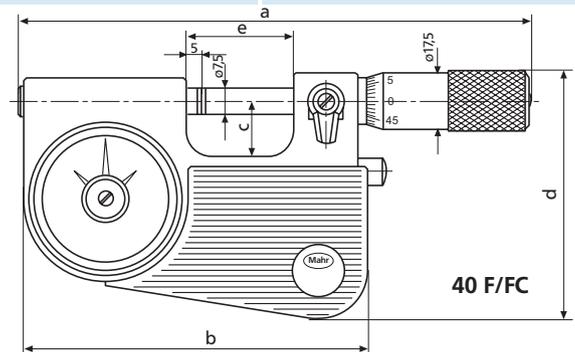
Features

- 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		Measuring force	Order no.	Remarks
			Flatness	Parallelism			
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 .0001"	≤2 μm ≤.00008"	0,5 mm .025"	1 μm .00005"	±65 μm ±.0025"	1 μm .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 3-22

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

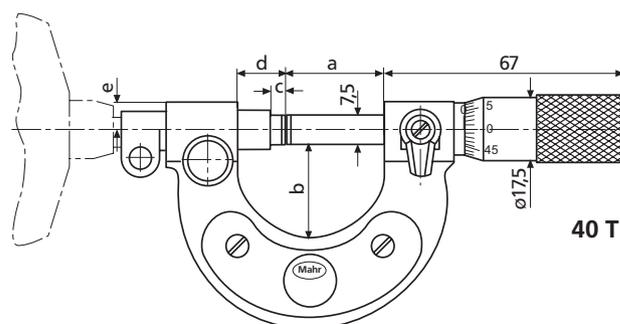
Technical Data

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



Indicating Snap Gage 840 F
see page 9-2



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

Accessories

Stand, setting standards, etc. please refer to page 3-22

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

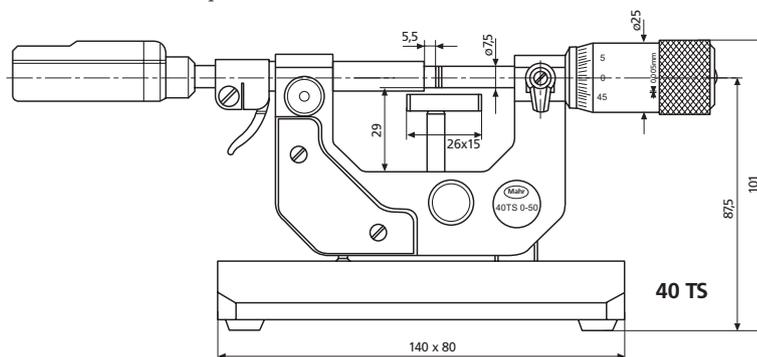
Features

- 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		Measuring force	Order no.*	Order no. wooden case
		Flatness	Parallelism			
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



Indicating Thread Snap Gage
852 TS see page 9-17



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	≤2 μm	0.5 mm	1 μm	±50 μm	1 μm
.0001"	≤.00008"	.025"	.00005"	±.002"	.00005"

Accessories

Stand, setting standards, etc. please refer to page 3-22

Micrometer Micromar 40 AB with reduced measuring faces



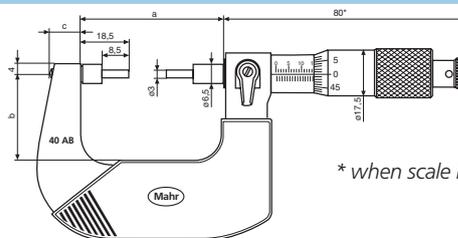
DIN 863-3

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



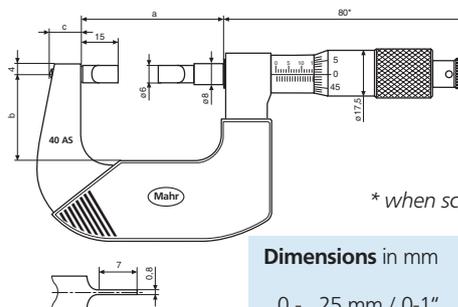
DIN 863-3

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 anvils



DIN
863-3

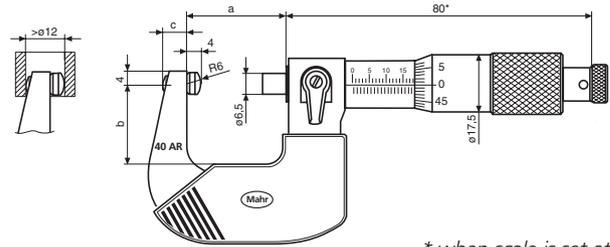
Features

- 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

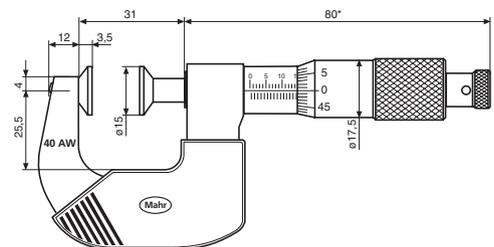


Features

- 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**

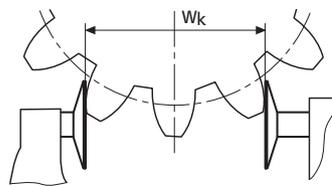


Features

- Chrome plated 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 (measuring range 0 - 95 mm)

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.

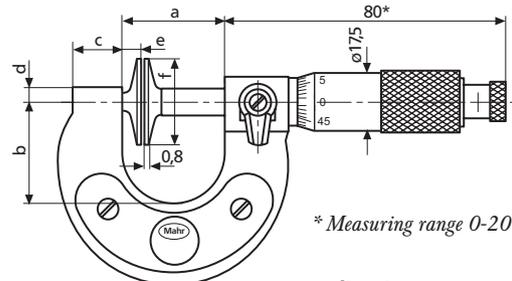


Technical Data

Measuring range mm	Readings mm	Error limit G μm	Spindle thread pitch mm	Measuring faces		Order no.
				Flatness μm	Parallelism μm	
0 - 20	0.01	4	0.5	≤ 0.6	≤ 4	4145000
20 - 45	0.01	4	0.5	≤ 0.6	≤ 4	4145001
45 - 70	0.01	5	0.5	≤ 0.6	≤ 4	4145002
70 - 95	0.01	5	0.5	≤ 0.6	≤ 4	4145003
95 - 120	0.01	6	0.5	≤ 0.6	≤ 5	4145004
120 - 145	0.01	6	0.5	≤ 0.6	≤ 5	4145005
145 - 170	0.01	7	0.5	≤ 0.6	≤ 5	4145006
170 - 195	0.01	7	0.5	≤ 0.6	≤ 5	4145007

Dimensions

Dimensions in mm	a	b	c	d	e	f
0 - 20	31	28	13	3.25	4.5	25
20 - 45	56	40	13	3.25	4.5	25
45 - 70	81	53	13	3.25	4.5	25
70 - 95	106	65	13	3.25	4.5	25
95 - 120	130	75.5	15	4	4.5	30
120 - 145	155	88	15	4	4.5	30
145 - 170	180	100.5	15	4	4.5	30
170 - 195	205	113	15	4	4.5	30



Indicating Snap Gage 840 FM
see page 9-10



Accessories

Stand, setting standards, etc. please refer to page 3-22

Thread Micrometer Micromar 40 Z

DIN 863-3



Features

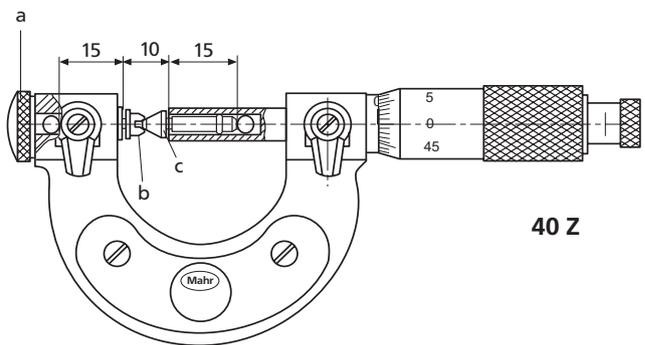
- For measuring pitch, root and outside diameters
- Rugged steel frame, heat insulated
- Spindle is hardened throughout, ground and is also provided with a locking device
- Adjustable anvil
- Spindle and anvil both have a mounting bore to accommodate interchangeable anvils
- Flat end surface of the anvil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

Technical Data

Readings	0.01 mm
Mounting bores for anvils	3.5 mm
Spindle thread pitch	0.5 mm
Thimble dia.	17.5 mm
Accuracy	DIN 863

Measuring range mm	Error limit G_{me}	Order no.	Order no. wooden case
0 - 25*	4 μ m	4170000	4170010
25 - 50	4 μ m	4170001	4170011
50 - 75	5 μ m	4170002	4170012
75 - 100	5 μ m	4170003	4170013
100 - 125	6 μ m	4170004	4170014
125 - 150	6 μ m	4170005	4170015
150 - 175	7 μ m	4170006	4170016
175 - 200	7 μ m	4170007	4170017

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



40 Z

a = Regulating range ± 0.5 mm
 b = V-anvil
 c = Tapered anvil

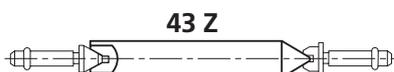
Indicating Thread Snap Gage 852 see page 9-16



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.



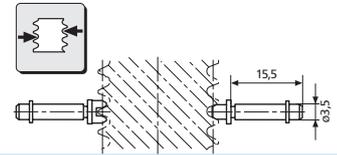
Length mm	Accuracy $\pm \mu$ m	Thread angle 60° Order no.	Thread angle 55° Order no.
25	4	4175000	4175100
50	4.5	4175001	4175101
75	4.5	4175002	4175102
100	4.5	4175003	4175103
125	5	4175004	4175104
150	5	4175005	4175105
175	5	4175006	4175106
200	5.5	4175630	4175636

Interchangeable Anvils for Thread Micrometer Micromar 40 Z

For pitch, root 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.



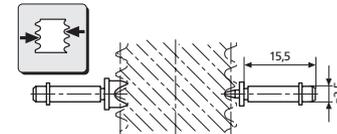
Pitch mm	Metric thread (60°)		Pitch range TPI	Whitworth thread (55°)		Pitch range TPI	American UST thread (60°)	
	V-anvil Order no.	Tapered anvil Order no.		V-anvil Order no.	Tapered anvil Order no.		V-anvil Order no.	Tapered anvil Order no.
0.2	4173007	4173407	40 - 32	4173043	4173443	60 - 48	4173113	4173513
0.25	4173008	4173408	32 - 24	4173044	4173444	48 - 40	4173114	4173514
0.3	4173009	4173409	24 - 18	4173045	4173445	40 - 32	4173115	4173515
0.35	4173010	4173410	18 - 14	4173046	4173446	32 - 24	4173116	4173516
0.4	4173011	4173411	14 - 10	4173047	4173447	24 - 18	4173117	4173517
0.45	4173012	4173412	10 - 7	4173048	4173448	18 - 14	4173118	4173518
0.5 - 0.7	4173000	4173400	7 - 4.5	4173049	4173449	14 - 10	4173119	4173519
0.7 - 1	4173001	4173401	4.5 - 3	4173050	4173450	10 - 7	4173120	4173520
1.25 - 2	4173002	4173402	3 - 2.5	4179408	4179409	7 - 4.5	4173121	4173521
2 - 3.5	4173003	4173403				4.5 - 3	4173122	4173522
3.5 - 5	4173004	4173404						
5 - 7	4173005	4173405						
7 - 9	4173006	4173406						

For pitch diameters

Pair consists of V-anvil and tapered anvil. Shank length 15,5 mm

For root diameters

Pair consists of V-anvil and pointed anvil. Each pitch requires a separate V-anvil. The pointed anvil can be used for several pitches.

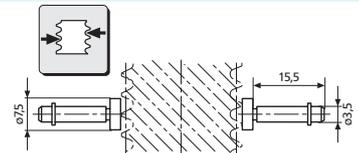


Trapezoid threads according to DIN 103			Metric thread (60°)			Whitworth thread (55°) American UST thread (60°)		
Pitch mm	V-anvil Order no.	Tapered anvil Order no.	Pitch mm	V-anvil Order no.	Pointed anvil Order no.	Pitch range TPI	V-anvil Order no.	Pointed anvil Order no.
1	4173250	4173650	0.5	4173213	4173220	40	4173331	4173334
1.5	4173251	4173651	0.6	4173214		36	4173321	
2	4173252	4173652	0.7	4173215		32	4173332	
3	4173253	4173653	0.75	4173216		28	4173333	
4	4173254	4173654	0.8	4173217		26	4173335	
5	4173255	4173655	0.9	4173218		24	4173336	
6	4173256	4173656	1	4173219		22	4173337	
7	4173257	4173657	1.25	4173221		20	4173338	
8	4173258	4173658	1.5	4173222		19	4173339	
9	4173259	4173659	1.75	4173223		18	4173340	
10	4173260	4173660	2	4173225	16	4173342	4173344	
12	4173261	4173661	2.5	4173226	14	4173343	4173348	
14	4173262	4173662	3	4173227	12	4173345		
16	4173263	4173663	3.5	4173229	11	4173346	4173452	
18	4173264	4173664	4	4173230	10	4173347		
20	4173265	4173665	4.5	4173231	9	4173349	4173456	
			5	4173233	8	4173350		
			5.5	4173234	7	4173451		
			6	4173235	6	4173453		
			7	4173237	5	4173454		
			8	4173238	4.5	4173455		
			9	4173239	4	4173457		
					3.5	4173458		
					3.25	4173459		
					3	4173460		

For outside diameter

Pair of Flat 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)

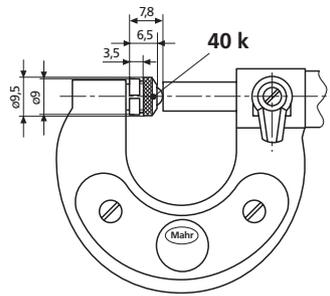
130 x 100 x 90 mm

Order no.

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.

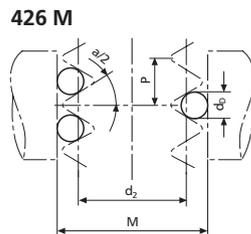
Length
inch

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

Wooden Cases for Micrometer

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

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

Pin gage dia.	Manufacturing tol.	Mounting hole
0.17 - 5.05 mm	$\pm 0.5 \mu\text{m}$	dia. 6.5 mm / 7.5 mm

Order no. and further details see page 13-15

Inside Micrometer Micromar 44 F

DIN 863-4

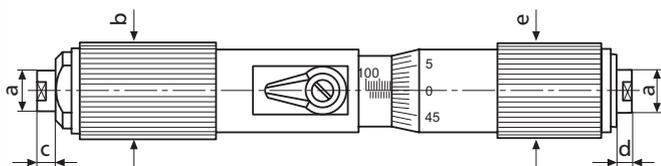


Features

- 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 <i>G</i> 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	∅7	∅12.5	2	4	∅12.6
40 - 50	∅7	∅12.5	2.5	4.5	∅12.6
50 - 70	∅7	∅13.5	2.5	4.5	∅13.6
70 - 100	∅7	∅13.5	4.5	4.5	∅14.0
100 - 125	∅8	∅20	4.5	4.5	∅20
125 - 150	∅8	∅20	8	8	∅20
150 - 175	∅8	∅20	8	8	∅20
175 - 200	∅8	∅20	8	8	∅20

Accessories

Ring Gage 355 E for testing the basic setting

Page

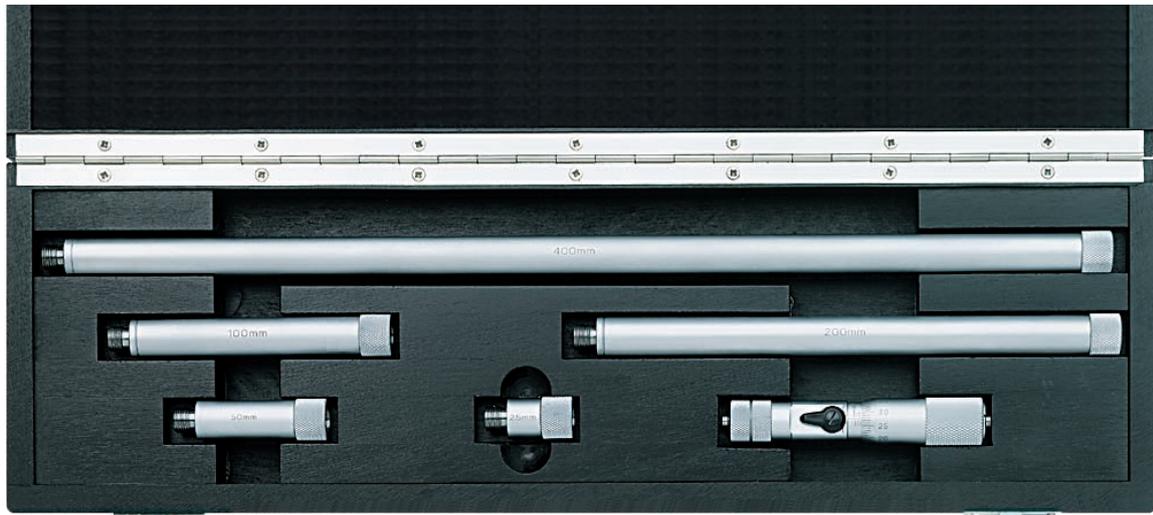
13-16

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

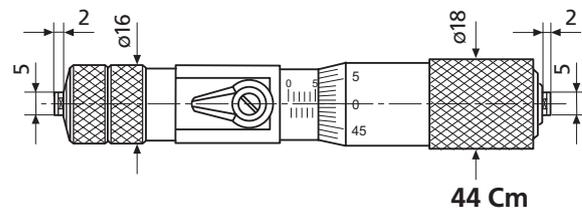
- Rigid, lightweight tubular construction
 - Spindle is hardened throughout and ground
 - Locking lever
 - Scales with satin-chrome finish
 - Carbide tipped spherical measuring faces
 - Interchangeable extensions 44 Cv with cylindrical gage rods that are spring-mounted in protective sleeves; for the 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
 $4 \mu\text{m} + 10 \times 10^{-6} \times l$
 (l = length of the combination in mm)
- Supplied with: Case

Technical Data

Catalog no.	Measuring range mm	Measuring head 44 Cm		Extensions 44 Cv length in mm	Order no.
		Readings mm	Spindle thread pitch mm		
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

Design 44 CZm for thread measuring on request.



Accessories

Inside Micrometers, ring gages, etc. please refer to page 3-26

Inside Micrometer Micromar 44 CB with reduced measuring faces

DIN
863-4

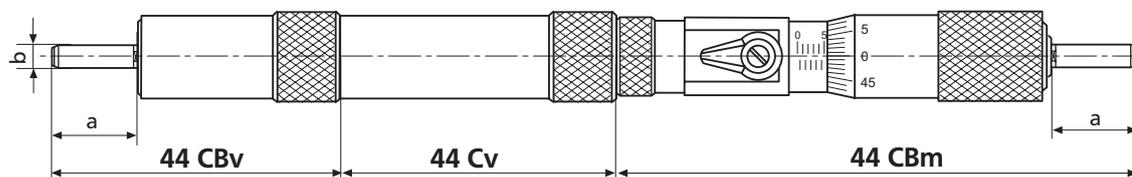


Features

- 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
 $4 \mu\text{m} + 10 \times 10^{-6} \times l$
(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		Order no.
	Readings	Spindle thread pitch	
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

Dimensions

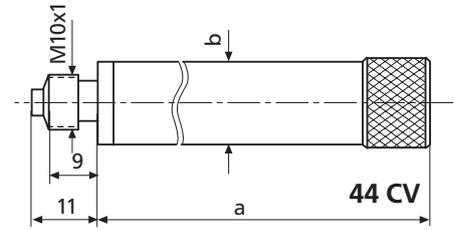
Meas. range in mm	a	b
150 - 175	10	dia. 5
175 - 200	20	dia. 5
250 - 275	40	dia. 5
275 - 300	50	dia. 5

Case, wooden boxes, etc. please refer to page 3-26

Accessories for Micromar 44 Cms / 44 CB

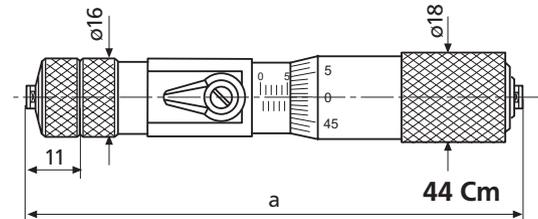
Individual Extensions 44 Cv

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 13-16
 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



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

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 12.5 mm are carbide tipped
- From 12.5 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

Technical Data

Measuring range mm	Measuring depth mm	Readings mm	Error limit G* µm	Order no.
6 - 8	64 / (139**)	0.005	4	4190000
8 - 10	64 / (139**)	0.005	4	4190001
10 - 12.5	64 / (139**)	0.005	4	4190002
12.5 - 16	65 / (140**)	0.005	4	4190003
16 - 20	65 / (140**)	0.005	4	4190004
20 - 25	70 / (220**)	0.005	4	4190005
25 - 30	70 / (220**)	0.005	4	4190006
30 - 35	71 / (221**)	0.005	4	4190007
35 - 40	71 / (221**)	0.005	4	4190008
40 - 50	79 / (229**)	0.005	4	4190009
50 - 60	79 / (229**)	0.005	5	4190010
60 - 70	79 / (229**)	0.005	5	4190011
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

Accessories

Measuring heads, ring gages, etc. please refer to page 3-30

Self-Centering Inside Micrometer Sets 44 AS

Measuring range mm	Number of Micrometers	Ring gages dia. mm	Order no.
6 - 12.5	3	8 / 10	4190050
12.5 - 25	3	16 / 20	4190051
25 - 50	4	30 / 40	4190052
50 - 100	4	60 / 85	4190053

- Supplied with: Case and ring gage



Digital Self-Centering Inside Micrometer Micromar 44 EX



Applications

- through holes
- blind holes
- centering shoulders

Features

- Functions:**
- 0 (Setting the display to zero for Relative measurement)
 - ABS (Switching between Relative and Absolute measurement)
 - mm/inch
 - PR (Reference setting)
- 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 12.5 mm are carbide tipped
 - From 12.5 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

Technical Data

Measuring range		Measuring depth mm	Readings mm / inch	Error limit G* µm	Order no.	
mm	(inch)					
6	- 8	(.25 - .3125")	64 / (139**)	0.001 / .00005"	4	4191020
8	- 10	(.3125 - .4")	64 / (139**)	0.001 / .00005"	4	4191021
10	- 12.5	(.4 - .5")	64 / (139**)	0.001 / .00005"	4	4191022
12.5	- 16	(.5 - .625")	65 / (140**)	0.001 / .00005"	4	4191023
16	- 20	(.625 - .775")	65 / (140**)	0.001 / .00005"	4	4191024
20	- 25	(.775 - 1")	70 / (220**)	0.001 / .00005"	4	4191025
25	- 30	(1" - 1.2")	70 / (220**)	0.001 / .00005"	4	4191026
30	- 35	(1.2 - 1.4")	71 / (221**)	0.001 / .00005"	4	4191027
35	- 40	(1.4 - 1.6")	71 / (221**)	0.001 / .00005"	4	4191028
40	- 50	(1.6" - 2")	79 / (229**)	0.001 / .00005"	4	4191029
50	- 60	(2" - 2.35")	79 / (229**)	0.001 / .00005"	5	4191030
60	- 70	(2.35 - 2.75")	79 / (229**)	0.001 / .00005"	5	4191031
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

Accessories

Measuring heads, ring gages, etc. please refer to page 3-30

Digital Self-Centering Inside Micrometer Sets Micromar 44 EXS

Measuring range		Number of measuring heads 44 Ak	Ring gages dia. mm	Order no.	
mm	(inch)				
6	- 12.5	(.25 - .5")	3	8 / 10	4191060
12.5	- 25	(.5 - 1")	3	16 / 20	4191061
25	- 50	(1 - 2")	4	30 / 40	4191062
50	- 100	(2 - 4")	4	60 / 85	4191063

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



Self-Centering Measuring Pistol Micromar 844 A



Applications

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

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 12.5 mm are carbide tipped
- From 12.5 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 R	4337121
MarCator 1087 R	4337161

Accessories

Measuring heads, ring gages, etc. please refer to page 3-30

Technical Data

Measuring range		Measuring depth mm	Error limit G* µm / inch	Order no.***	
mm	(inch)				
6	- 8	(.25 - .3125")	64 / (139**)	3 / .00015"	4487600
8	- 10	(.3125 - .4")	64 / (139**)	3 / .00015"	4487601
10	- 12.5	(.4 - .5")	64 / (139**)	3 / .00015"	4487602
12.5	- 16	(.5 - .625")	65 / (140**)	3 / .00015"	4487603
16	- 20	(.625 - .775")	65 / (140**)	3 / .00015"	4487604
20	- 25	(.775 - 1")	70 / (220**)	3 / .00015"	4487605
25	- 30	(1" - 1.2")	70 / (220**)	3 / .00015"	4487606
30	- 35	(1.2 - 1.4")	71 / (221**)	3 / .00015"	4487607
35	- 40	(1.4 - 1.6")	71 / (221**)	3 / .00015"	4487608
40	- 50	(1.6" - 2")	79 / (229**)	3 / .00015"	4487609
50	- 60	(2" - 2.35")	79 / (229**)	4 / .00016"	4487610
60	- 70	(2.35 - 2.75")	79 / (229**)	4 / .00016"	4487611
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

Self-Centering Measuring Pistol Set Micromar 844 AS

Measuring range		Number of measuring heads	Ring Gages dia. mm	Order no. with Digital Indicator 1086 R	Order no.***	
mm	(inch)					
6	- 12.5	(.25 - .5")	3	8 / 10	4487660	4487650
12.5	- 25	(.5 - 1")	3	16 / 20	4487661	4487651
25	- 50	(1 - 2")	4	30 / 40	4487662	4487652
50	- 100	(2 - 4")	4	60 / 85	4487663	4487653

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

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



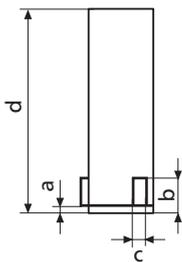
Accessories for Micromar 44 A, 44 EWR, 844 A

Measuring Heads 44 Ak for 44 EWR

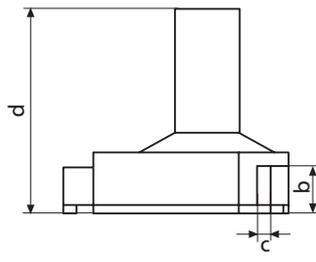
- Self-centering measuring head consists of 3 laterally positioned anvils, each are offset at intervals of 120°
- Anvils from 12.5 mm are carbide tipped
- From 12.5 mm, anvils can be used to measure to the base of a bore
- From 40 mm all measuring heads are made from aluminum to reduce weight

Measuring range		Order no.
mm	(inch)	
6 - 8	(.25 - .3125")	4190030
8 - 10	(.3125 - .4")	4190031
10 - 12.5	(.4 - .5")	4190032
12.5 - 16	(.5 - .625")	4190033
16 - 20	(.625 - .775")	4190034
20 - 25	(.775 - 1")	4190035
25 - 30	(1" - 1.2")	4190036
30 - 35	(1.2 - 1.4")	4190037
35 - 40	(1.4 - 1.6")	4190038
40 - 50	(1.6" - 2")	4190039
50 - 60	(2" - 2.35")	4190040
60 - 70	(2.35 - 2.75")	4190041
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 - 12.5 mm



Meas. range 12.5 - 200 mm



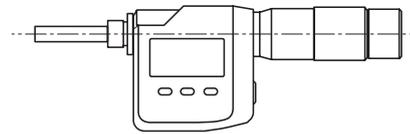
Measuring range	a	b	c	d
mm				
6 - 8	1.3	4.3	2	64
8 - 10	1.8	4.8	2	64
10 - 12.5	2	6	2.5	64
12.5 - 16	-	7	3	65
16 - 20	-	8.5	4	65
20 - 25	-	11	4	70
25 - 30	-	11	4	70
30 - 35	-	12	5	71
35 - 40	-	12	5	71
40 - 50	-	18	5	79
50 - 60	-	18	7	79
60 - 70	-	18	7	79
70 - 85	-	23	7	97
85 - 100	-	23	7	97
100 - 125	-	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
- Includes a traceable calibration certificate

dia. mm	Order no.	dia. mm	Order no.
8	4710026	40	4710060
10	4710030	60	4710080
16	4710036	85	4710105
20	4710040	125	4710121
30	4710050	175	4710122

Basic Unit 44 EWg

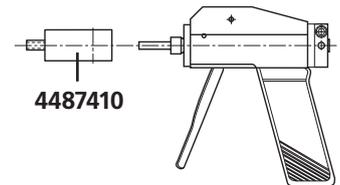


Threaded connection for changing the measuring heads

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

Basic Unit Measuring Pistol 844 Ag

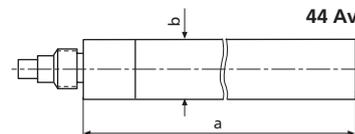
Threaded connection for changing the measuring heads. Any indicating instrument with an 8 mm mounting shank can be used.



Measuring range	Order no.
mm (inch)	
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	Length a	dia. b	Order no.
mm (inch)	mm	mm	
6 - 10 (.25 - .4")	75	5.8	4190090
10 - 20 (.4 - .775")	75	9.5	4190091
20 - 25 (.775 - 1")	150	19.0	4190092
25 - 200 (1 - 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	Range of micrometer	Readings	Spindle thread pitch	Error limit with a standard anvil	Measuring force	Length tolerance of extensions	Order no.
mm	mm	mm	mm	μm	N	μm	
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

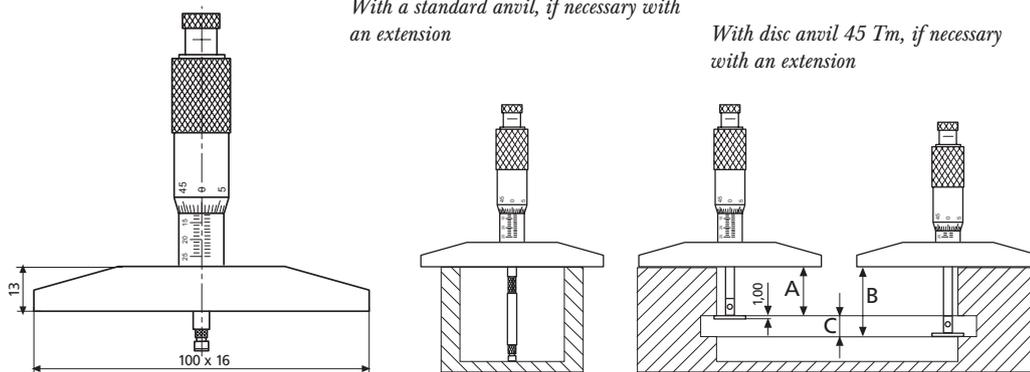
Measuring the space between grooves and the widths of a groove

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

Disc anvil 45 Tm
for groove spacing and groove widths

Order no.

4180011

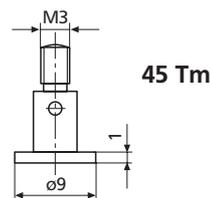
Extensions 45 Tv

Length L	Length tolerance
25 mm	$\pm 1.5 \mu\text{m}$
50 mm	$\pm 1.5 \mu\text{m}$
100 mm	$\pm 1.5 \mu\text{m}$

4180001

4180002

4180003



Digital Micrometer Head Micromar 46 EWR



Features

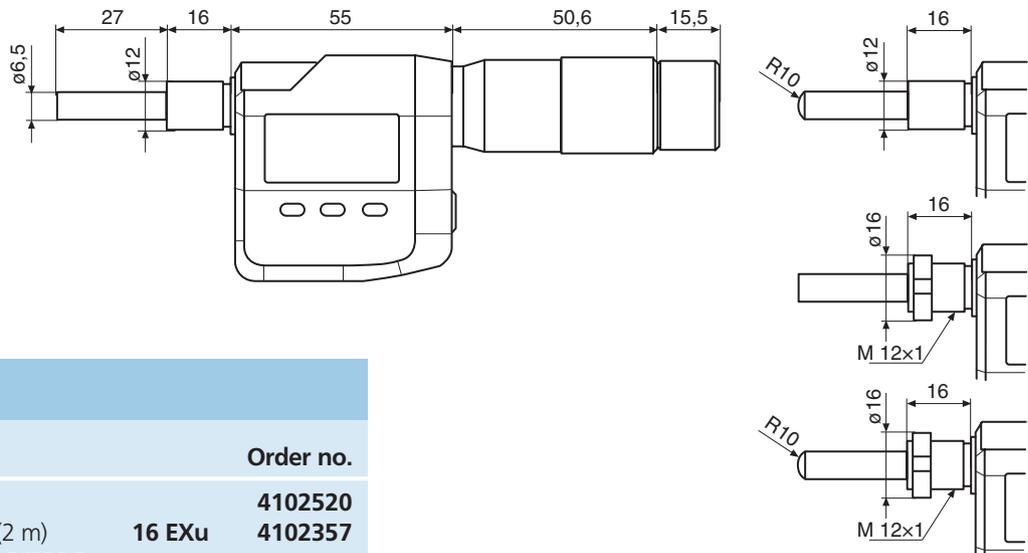
- Functions:**
- 0 (Zero setting)
 - ABS (Switch between Relative and Absolute measurement)
 - mm/inch
 - PRESET (enter a numerical value)
 - DATA (Data transmission via connection cable)
- Patented capacitive measuring system with an energy saving function, life of the battery approx. 2 years
 - Ratchet with integrated coupler
 - Supplied with: Case, end cap (in case the rapid drive is not required) and operating instructions

REFERENCE

Technical Data

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

* with locking nut



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 EXd 4102411

Accessories for Data Processing see Chapter 11

YOUR MEASURING TASKS ARE SENSITIVE. **MARTEST IS HIGHLY SENSITIVE.**



The latest information on MARTEST products can be found on our website:

www.mahr.com, WebCode 10407

▶ | Since 1936 Mahr is one of the leading global producers of test indicators, we have achieved this with the continuous advancement of our products and with unrelenting commitment to produce high quality products that not only meet customer requirements but also exceed them. We have also increased research and development in order to satisfy the demands and requirements of the market, however our core philosophy is to offer our customer a highly accurate and simple solution for various measuring tasks. With the MarTest series of test indicators there is not just a broad product range but also a wide variety of accessories at your disposal. The sensitive computer-optimized shockproof mechanism of the test indicator ensures maximum security and precision. MarTest is ideal for use in workshop conditions due to the dial being sealed thus impervious to the penetration of liquids. | ◀

▶ | MarTest. Test Indicators and Touch Probes

Mechanical Test Indicators with Dial 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

4-12

Water proof, with an Analog display

MarTest 802 EW

4-13

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	digital	0.001 mm / .00005" 0.01 mm / .0005"	●	13 µm	10 µm	3 µm	5 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	digital	0.001 mm / .00005" 0.01 mm / .0005"		13 µm	10 µm	5 µm	5 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"	

Length of styli	Order no.
14.5 mm	4305200
14.5 mm	4307200
14.5 mm	4301200
14.5 mm	4301250
14.5 mm	4305120
14.5 mm	4305960
14.5 mm	4305950
14.5 mm	4307950
14.5 mm	4307970

41.24 mm	4306200
41.24 mm	4306250
32.3 mm	4301300
41.24 mm	4306120
41.24 mm	4306950
41.24 mm	4306960

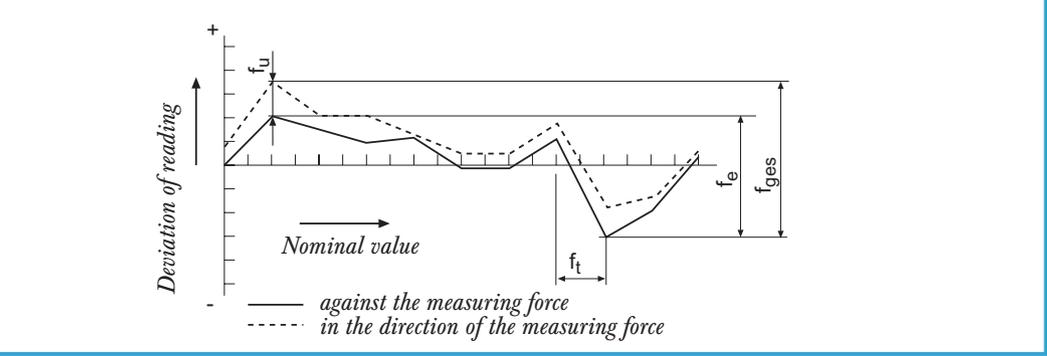
14.5 mm	4308150
14.5 mm	4308200
9.1 mm	4308220
14.5 mm	4308960
14.5 mm	4308970
14.5 mm	4308985

14.5 mm	4307250
14.5 mm	4308250
14.5 mm	4307960
14.5 mm	4308980

14.5 mm	4303200
14.5 mm	4303950

14.5 mm	4302200
14.5 mm	4302250
14.5 mm	4302950
14.5 mm	4302960

Metrological characteristics



MarTest - Design features

SHOCK PROOF

- 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

Mechanism

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

MarTest - Applications

Concentricity of a shaft

Concentricity of a sleeve

Centering of a bore

Aligning a surface

Testing parallelism

MarTest standard versions



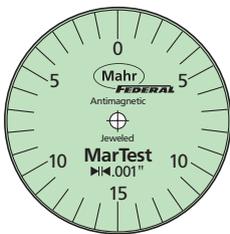
Technical Data

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

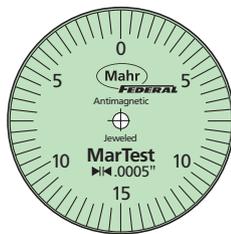
Supplied with:

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)

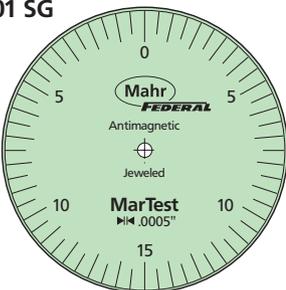
801 S1



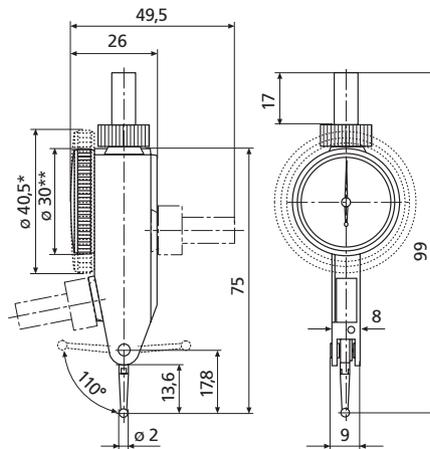
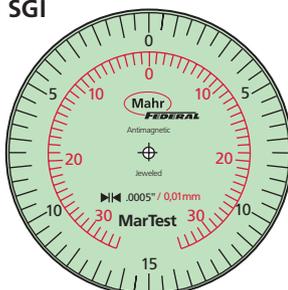
801 S



801 SG



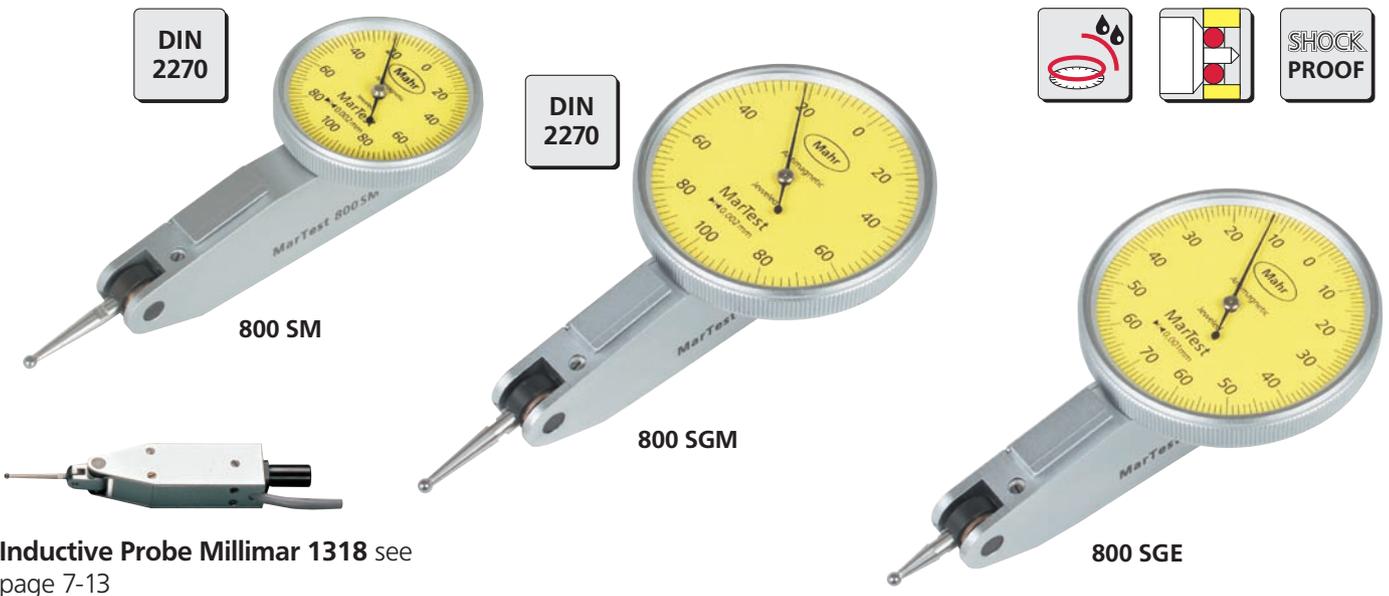
801 SGI



* 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



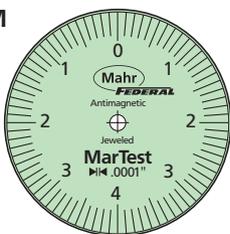
Inductive Probe Millimar 1318 see page 7-13

Technical Data

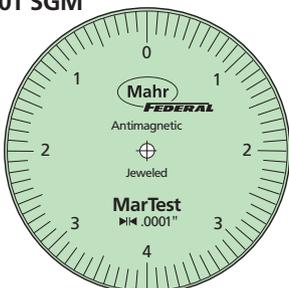
	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.
800 SM	± 0.1 mm	0.002 mm	27.5 mm	0.15 N	14.5 mm	4308150
800 SGM	± 0.1 mm	0.002 mm	38 mm	0.15 N	14.5 mm	4308200
800 SGE	± 0.07 mm	0.001 mm	38 mm	0.2 N	9.1 mm	4308220
801 SM	± .004"	.0001"	1.1"	0.15 N	14.5 mm	4308960
801 SGM	±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

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

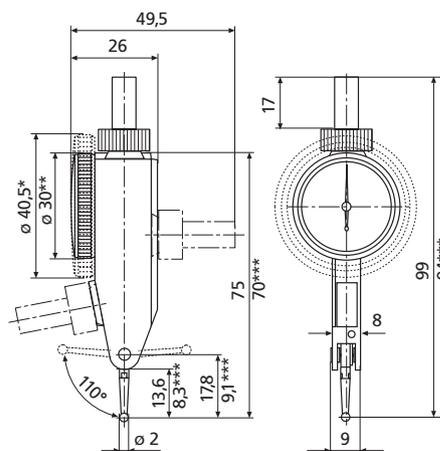
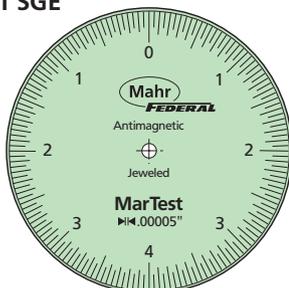
801 SM



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



Technical Data

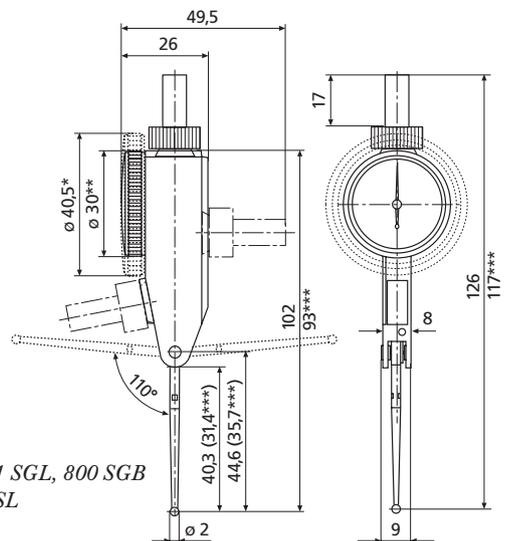
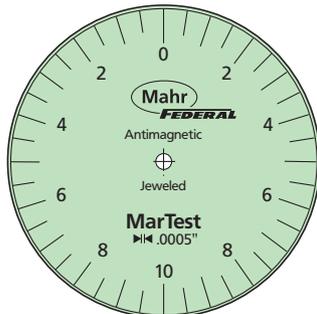
	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.
800 SL	± 0.25 mm	0.01 mm	27.5 mm	0.07 N	41.24 mm	4306200
800 SGL	± 0.25 mm	0.01 mm	38 mm	0.07 N	41.24 mm	4306250
800 SGB	± 0.5 mm	0.01 mm	38 mm	0.1 N	32.3 mm	4301300
801 SL	± .010"	.0005"	1.1"	0.07 N	41.24 mm	4306950
801 SGL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

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



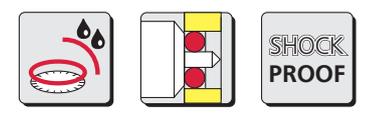
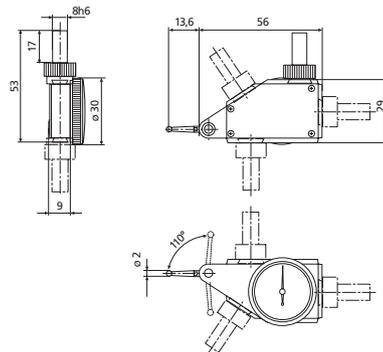
* 800 SGL, 801 SGL, 800 SGB
 ** 800 SL, 801 SL
 *** 800 SGB

MarTest styli can positioned horizontally to the dial face



DIN 2270

800 H



Technical Data

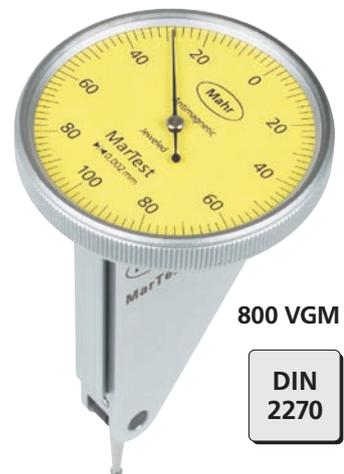
	Measuring range	Readings	Dial dia.	Measuring force	Length of styli	Order no.
800 H	± 0.4 mm	0.01 mm	27.5 mm	0.25 N	14.5 mm	4303200
801 H	± .015"	.0005"	1.1"	0.25 N	14.5 mm	4303950

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)

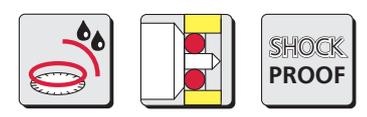
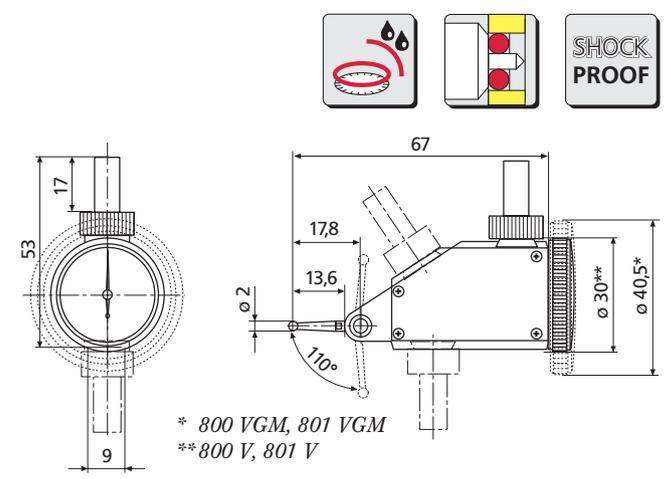
MarTest vertical model



800 V
DIN 2270



800 VGM
DIN 2270



Technical Data

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

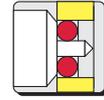
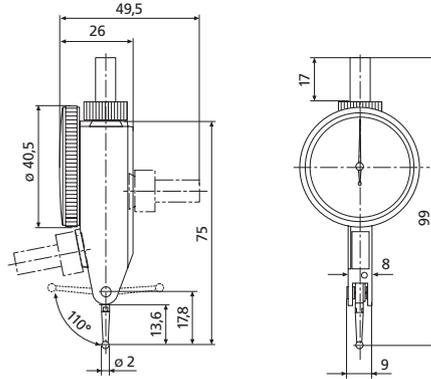
Supplied with:
 Plastic storage case, spanner for changing the styli, styli dia. 2 mm, mounting shaft 800 a8 (for metric versions), mounting shaft 800 a3/8 (for inch versions)

MarTest with larger measuring range



800 SRM

800 SR/SRM



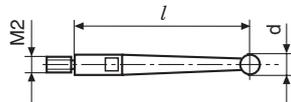
Technical Data

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

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 - Zubehör

Styluses
with ruby contact points



Styluses
with carbide contact points



Spanner for changing the styluses
4305868



Model	Stylus length <i>l</i>	Styluses					
		Carbide contact point			Ruby contact point		
		Cat. no.	dia. 1 mm	d	dia. 2 mm	dia. 3 mm	Cat. no.
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



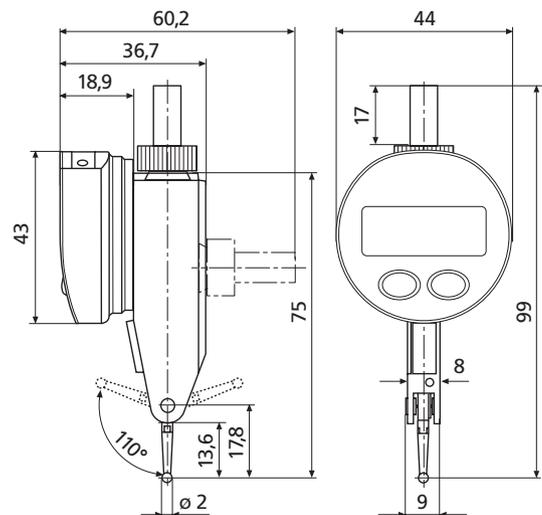
Features

Functions:

- ON/OFF
- RESET (Set display to zero)
- mm/inch
- MAX/MIN memory
- MAX-MIN ideal for testing concentricity and 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. 2mm, mounting shaft 800h8

Technical Data

	Measuring range mm	Resolution switchable mm/inch	Measuring force N	Length of styli mm	Order no.
800 EW	± 0.4	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



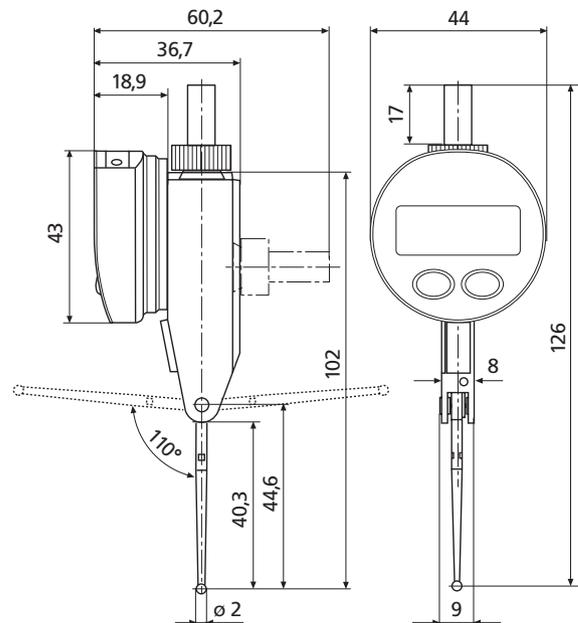
Features

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. 2mm, mounting shaft 800h8

Technical Data

	Measuring range mm	Resolution switchable mm/inch	Measuring force N	Length of styli mm	Order no.
800 EWL	± 0.25	0.001/0.0005" 0.01/0.005"	0.07	41.24	4306120



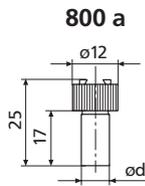
Zubehör

	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	4309853
Battery 3V, Type CR 2032	4102520
Data Connection Cable USB	800 EWu 4305121
Data Connection Cable Opto RS232	800 EWr 4305122

Martest - Accessories

Mounting shaft for dovetail

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



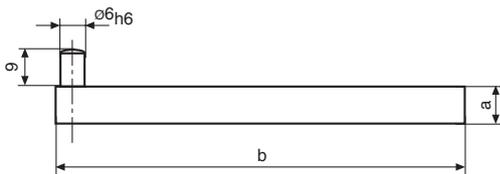
Stand 801 p

- 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

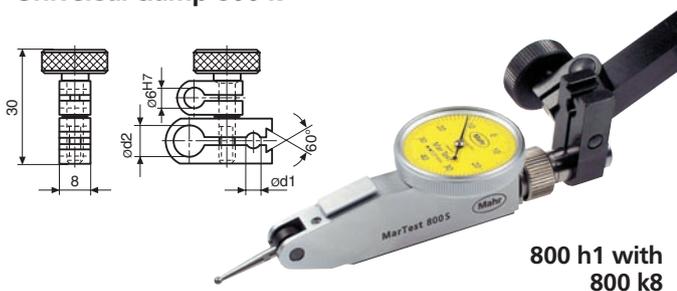


Holder 800 h



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

Universal clamp 800 k



800 h1 with 800 k8

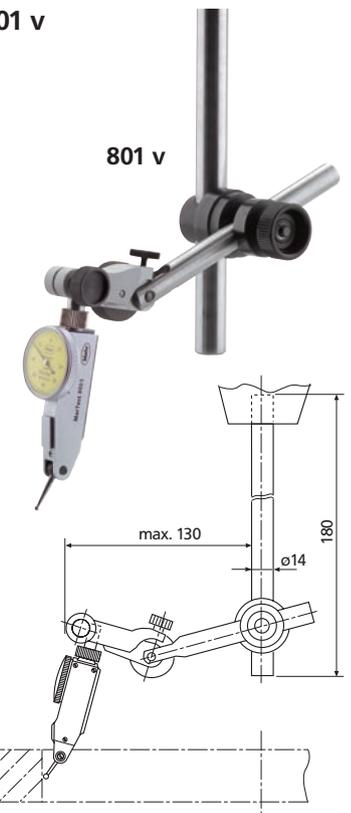
	Dimensions		Order no.
	dia. d1	dia. d2	
800 k8	4	8	4305891
800 k3/8	5/32"	3/8"	4305892

Centering support rods 801 v

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

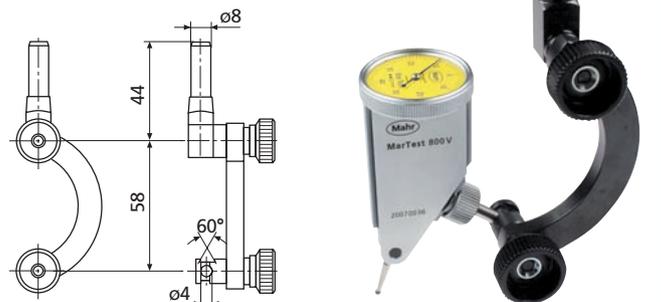
Mounting bore dia. 8 mm
Swivel range of mounting clamp 180°

Order no. 4309070

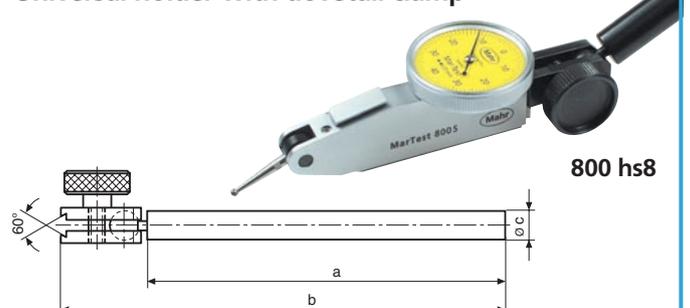


Universal centering support frame 800 b

Order no. 4305893



Universal holder with dovetail clamp



800 hs8

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

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

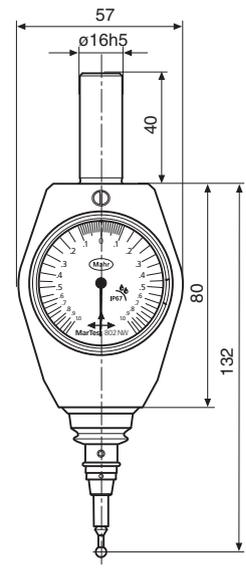
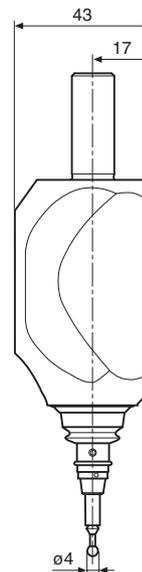
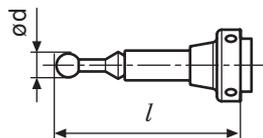
- High accuracy and linearity
 - suitable for measuring work pieces
 - measurement over the entire working range is possible
- Can be controlled independently of a machine tool
- Easy to read display
- Large working range in all axis (X, Y, Z) prevents damage to the stylus by contacting errors
- Shock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

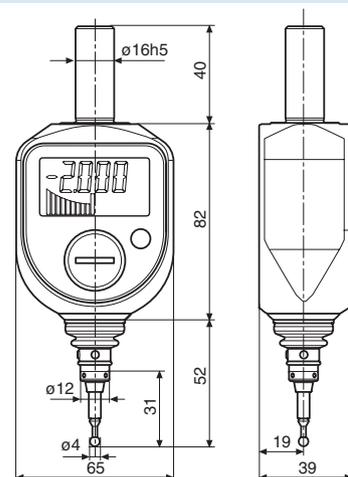
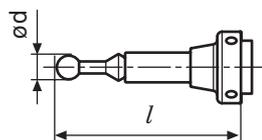
Technical Data

	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

* Further mounting shafts are available on request

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.com, WebCode 206

► | 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

Digital Indicators

Overview

5- 2

MarCator 1075 R

Standard versions with digital display

5- 4

MarCator 1086 R / 1086 WR

With tolerance function

5- 6

MarCator 1087 R

With combined digital and analog display

5-10

MarCator 1088 / 1088 W

With background lit display

5-12

MarCator 1087 BR

For 2-point inside measurement

5-14

Accessories for MarCator 1086 R / 1087 R / 1088

5-15

Dial Indicators

Overview

5-16

MarCator 803 A / 805 A / 803 S / 803 SW / 803 SB / 803 AZ

Small Dial Indicators

5-18

MarCator 810 A / 810 AT / 810 S / 810 SW / 810 SB / 810 SM / 810 SRM / 810 AZ

Standard versions

5-20

MarCator 810 AU / 810 AX / 810 SV / 810 AG

Special versions

5-22

Contact Points and Accessories for Dial / Digital Indicators, Mechanical / Digital Comparators & Probes

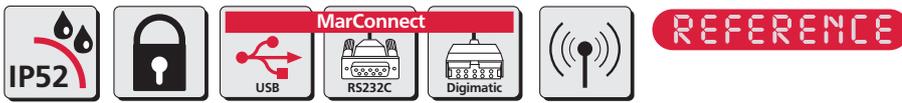
5-24

MarCator. Digital Indicators

OVERVIEW

Functions of Digital Indicators		1075 R	1075 R	1075 R	1086 R
					
Catalog page		5 - 4	5 - 4	5 - 4	5 - 6
Measuring ranges	mm / inch	12.5 / .5"	12.5 / .5"	12.5 / .5"	12.5 / .5" 25 / 1 50 / 2" 100 / 4"
Resolution	metric	0.01 mm	0.005 mm	0.001 mm	0.001 mm
	inch	.0005"	.0001"	.00005"	.00005"
	metric				0.01mm
	inch				.0005"
Mounting shank		8h6	8h6	8h6	8h6
Protection class	IP class acc. to IEC 60529				
Functions:					
ON/OFF		●	●	●	●
Set display to zero		●	●	●	●
Switch between mm/inch		●	●	●	●
Reversal of counting direction		●	●	●	●
Enter numerical value - PRESET		●	●	●	●
Data		●	●	●	●
ABS/REL-switchable					●
Tolerance display					●
Dynamic measuring functions	MIN. MAX MAX-MIN (TIR) 				
Search for reversal point	START/STOP				
Factor can be set / adjusted					●
Analog display					
Switch the analog value					
Key lock function LOC		●	●	●	●
Data output	USB 	●	●	●	●
	Digimatic 	●	●	●	●
	Opto RS232C 	●	●	●	●
Control output:					

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
 - Operating time approx. 3 years (2000 work. h/year)
 - Max measuring speed 1.5 m/sec (60"/sec)
 - MarConnect Data output: choose either
 USB
 OPTO RS232C
 Digimatic
 - High contrast Liquid Crystal Display with 12 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

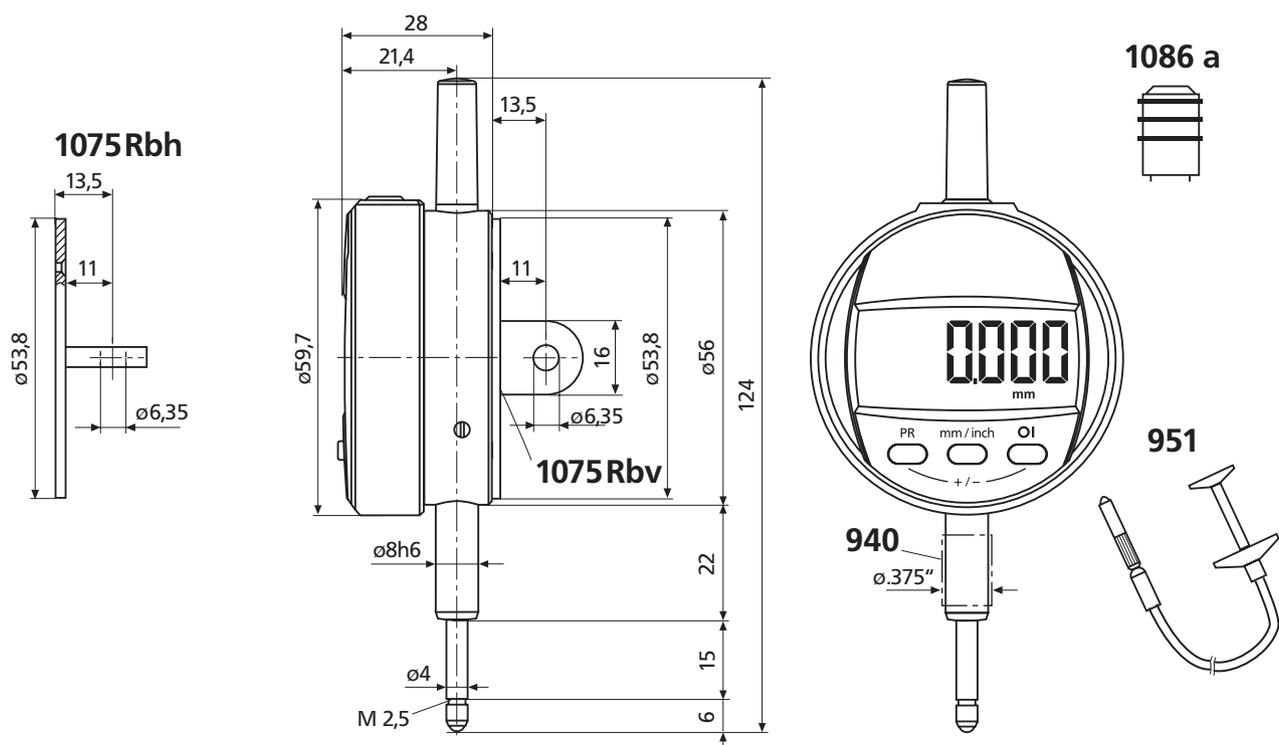
REFERENCE The new Digital Indicators 1075 R are equipped with the innovative Reference-System. The zero position only has to be set one time: once it is set, the zero remains stored for all further measurements. Therefore, when the indicator is switched ON or the measuring spindle is moved the indicator 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



Accessories

	Order no.	Additional Accessories	Page
Battery 3V , Type CR 2032	4102520	Contact Points 901-913	5-24
Data Connection Cable USB (2 m)	16 EXu 4102357	Special Holder 941	5-25
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	16 EXr 4102410	Sensor Lever 943	5-25
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	16 EXd 4102411	Accessories for Data Processing see Chapter 11	
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		

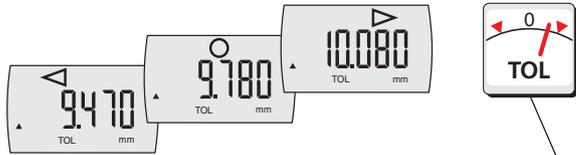
MarCator 1086 R

▶ | The new Digital Indicator **MarCator** 1086 R. With the large display and the integrated tolerance function, your measurement results are clearly visual. | ◀

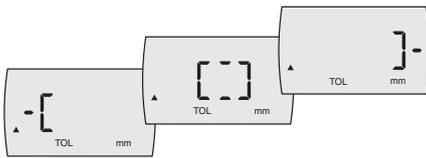
Clear display

Tolerance indication with the displayed value

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.



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

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.

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



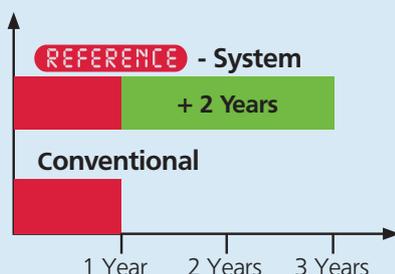
Absolute function:

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



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.**



Just set once to zero

REFERENCE

The new Digital Indicators 1086 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.

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



REFERENCE



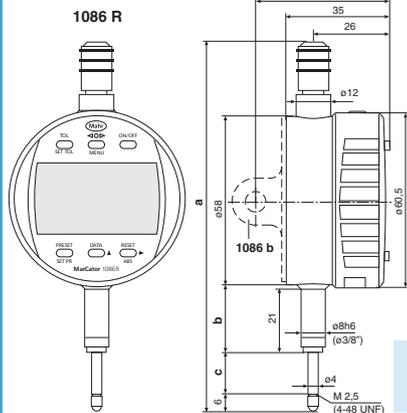
12,5 mm



25 mm



50 mm



Dimensions

Measuring 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
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
- Operating time approx. 3 years (2000 work. h/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
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range		Resolution	Span of error*	Repeatability	Measuring force	Weight	Mounting shank	Order no.
mm	(inch)	mm/inch	mm	mm	N	g	dia.	
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 R / 1086 ZR, Resolution 0.001 mm / .00005"



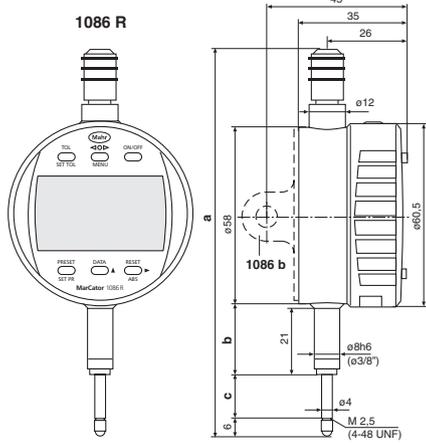
REFERENCE



25 mm



50 mm



Dimensions

Measuring 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
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
- Operating time approx. 3 years (2000 work. h/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
- Operating temperature 10 - 40°C
- Class of protection IP42 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range		Resolution	Span of error*	Repeatability	Measuring force	Weight	Mounting shank	Order no.
mm	(inch)	mm/inch	mm	mm	N	g	dia.	
12.5	(.5")	0.001/ .00005"	0.005	0.002	0.65 - 0.90	130	8h6	4337120
25	(1")	0.001/ .00005"	0.005	0.002	0.65 - 1.15	140	8h6	4337121
50	(2")	0.001/ .00005"	0.008	0.002	1.25 - 2.70	190	8h6	4337122
100	(4")	0.001/ .00005"	0.009	0.002	1.60 - 3.50	235	8h6	4337123
12.5	(.5")	0.001/ .00005"	0.005	0.002	0.65 - 0.90	150	3/8"	4337150
25	(1")	0.001/ .00005"	0.005	0.002	0.65 - 1.15	160	3/8"	4337151

* in any zero point

Digital Indicators MarCator 1086 W, Waterproof version



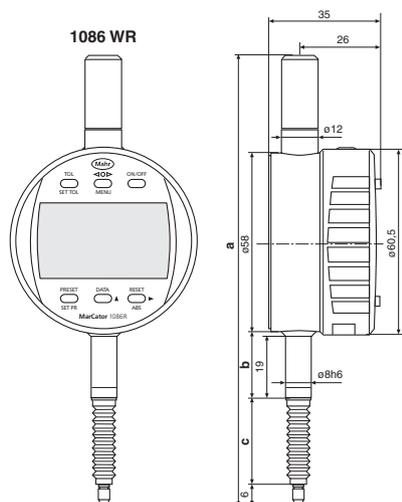
REFERENCE



12,5 mm



25 mm



Dimensions

Measuring range		a	b	c
mm	(inch)	mm	mm	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)
- 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. h/year)
- 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
- Operating temperature 10 - 40°C
- Class of protection IP54 in accordance to IEC 60529

Supplied with:
Battery, operating instructions

Technical Data

Measuring range		Resolution	Span of error*	Repeatability	Measuring force	Weight	Order no.
mm	(inch)	mm/inch	mm	mm	N	g	
12.5	(.5")	0.001/ .00005"	0.005	0.002	0.65 - 1.40	135	4337140
25	(1")	0.001/ .00005"	0.005	0.002	1.00 - 2.25	145	4337141
12.5	(.5")	0.01/ .0005"	0.02	0.01	0.65 - 1.40	135	4337145
25	(1")	0.01/ .0005"	0.02	0.01	1.00 - 2.25	145	4337146

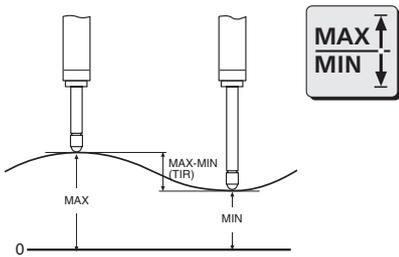
* in any zero point

MarCator 1087 R

► I The new Digital Indicator **MarCator** 1087 R. The multi-functional Digital Indicator with a combined analog and digital display as well as tolerance and dynamic measuring functions. I ◀

Dynamic measuring functions

- **MAX-MIN**-Function ideal for testing flatness and concentricity
- **MAX** and / or **MIN** for searching the reversal point

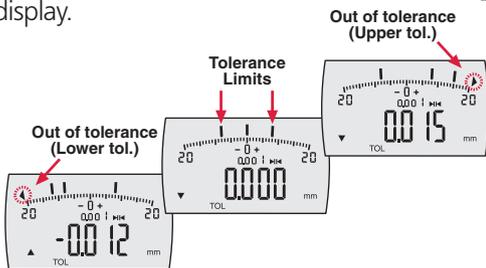


Universal Data-Interface

- 
• 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

Clear display Tolerance indication

The integrated bar graph visualizes the tolerance deviation. The out of tolerance; whether above the upper or below the lower tolerance limit is represented by arrows shown in the display.



- 
Absolute function:
 Digital Indicator can be set in any position to 0.000 without losing the reference to the preset value.

Just set once to zero

REFERENCE The new Digital Indicators 1087 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.

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.**

System	Battery Service Life
REFERENCE - System	3 Years (+ 2 Years extension)
Konventionell	1 Year

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.

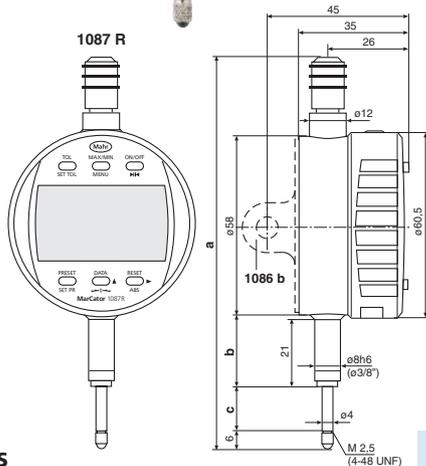
Digital Indicators MarCator 1087 R / 1087 ZR, with analog display



12,5 mm



25 mm



REFERENCE

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
- Operating time approx. 3 years (2000 work. h/year)
- 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

Dimensions

Measuring 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

Technical Data

Measuring range	Resolution	Span of error*	Repeatability	Measuring force	Weight	Mounting shank	Order no.
mm (inch)	mm/inch	mm	mm	N	g	dia.	
12.5 (.5")	0.001/ .00005"	0.005	0.002	0.65 - 0.90	140	8h6	4337160
25 (1")	0.001/ .00005"	0.005	0.002	0.65 - 1.15	150	8h6	4337161
12.5 (.5")	0.001/ .00005"	0.005	0.002	0.65 - 0.90	150	3/8"	4337170
25 (1")	0.001/ .00005"	0.005	0.002	0.65 - 1.15	160	3/8"	4337171

* in any zero point

MarCator 1088

► | The new Digital Indicator **MarCator 1088**. Tolerance monitoring is simplified with the changing of the color in the background lit display. | ◀

Dynamic measuring functions

- MAX-MIN memory: ideal for testing flatness and concentricity
- MAX-MIN memory: for searching the reversal point



Tolerance function:
clearly visual tolerance excess due to the change of color in the background lit display.



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



- **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) mm / inch	Display range 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



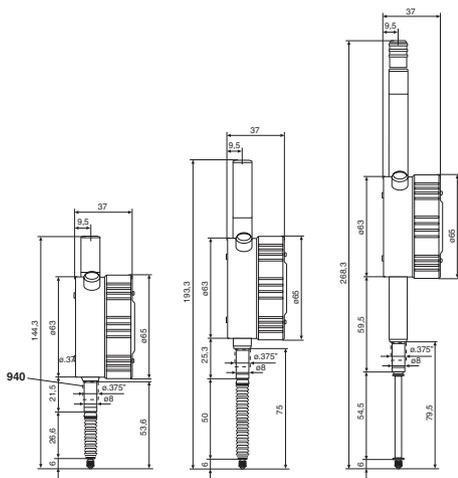
12,5 mm



25 mm



50 mm



Features

Functions:

- ON/OFF
- RESET (set digital and analog displays to zero)
- 0 - (set the analog display to zero)
- PRESET (enter any numerical values)
- DATA (data transmission)
- mm/inch-switchable
- 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		Resolution	Measuring force	Span of error*	Protection class	Order no. 230 V	Order no. 115 V
mm	(inch)	mm/inch	N	mm			
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

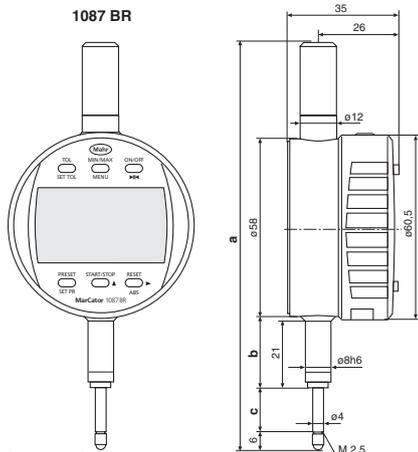
Digital Indicator MarCator 1087 BR for 2 point inside measurement



REFERENCE



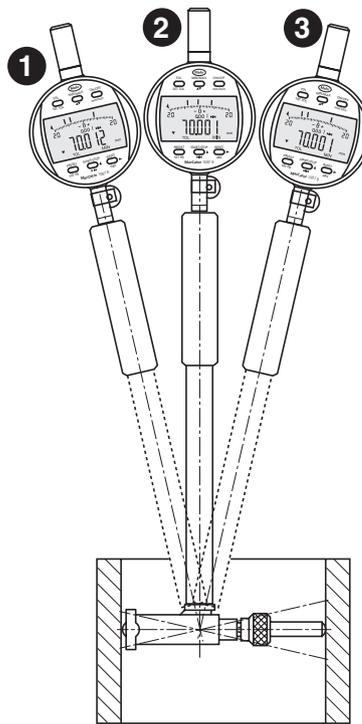
12,5 mm



Dimensions

Measuring range	a	b	c
mm (inch)	mm	mm	mm
12.5 (5")	131	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).

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. h/year)
- Maximum measuring 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

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

Technical Data

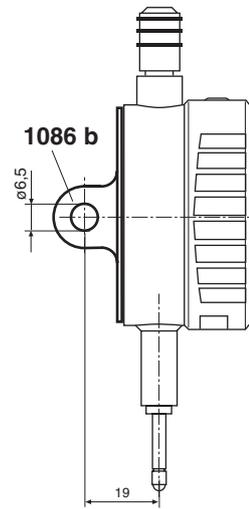
Measuring range	Resolution	Span of error*	Repeatability	Measuring force	Weight	Mounting shank	Order no.
mm (inch)	mm/inch	mm	mm	N	g	dia.	
12.5 (5")	0.001/ .00005"	0.005	0.002	0.65 - 0.90	140	8h6	4337162

* in any zero point

Accessories for MarCator 1086 R, 1087 R und 1088

Accessories for MarCator 1086 R and 1087 R

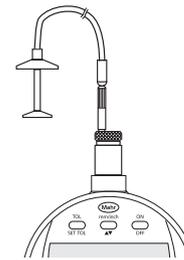
	Order no.
Battery 3V , Type CR 2450	4884464
Data Connection Cable USB (2 m)	16 EXu 4102357
Data Connection Cable Opto RS232C (2 m), with SUB-D jack 9-pin	16 EXr 4102410
Data Connection Cable Digimatic (2 m), Flat plug 10-pin	16 EXd 4102411
Mounting Lug	1086 b 4337421
Rubber bellows for 1086 W - 12.5 mm	4337472
Rubber bellows for 1086 W - 25 mm	4337474



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

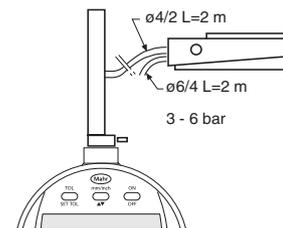
1085 a



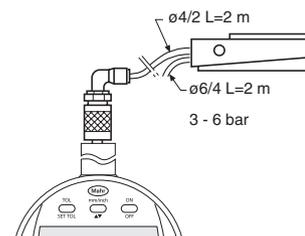
Accessories for MarCator 1086 R, 1087 R and 1088

	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	5-24
Special Holder	941	5-25
Sensor Lever	943	5-25

1082 p (12,5/25)



1082 p (50/100)



Accessories for Data Processing see Chapter 11

MarCator Dial Indicators (DIN Style)

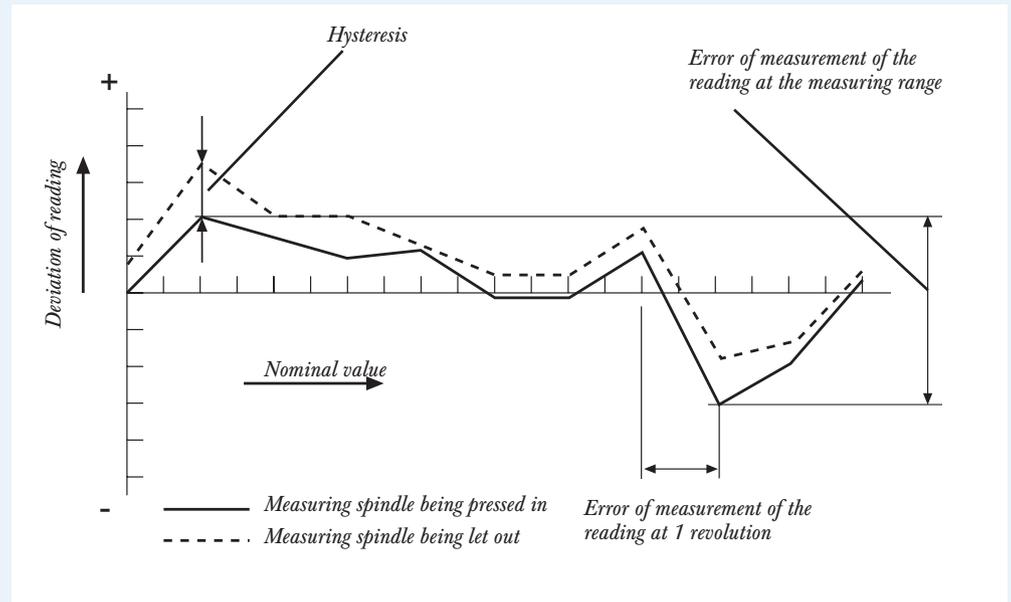
OVERVIEW

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	
<i>DIN EN ISO 463</i>					
Limit value for measurement error at the reading	<ul style="list-style-type: none"> Measuring range 1 revolution 1/2 revolution 1/10 revolution 	10 µm	12 µm	10 µm	10 µm
		9 µm	9 µm	9 µm	9 µm
		8 µm	8 µm	8 µm	8 µm
		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			●	●	
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	
<i>DIN EN ISO 463</i>					
Limit value for measurement error at the reading	<ul style="list-style-type: none"> Measuring range 1 revolution 1/2 revolution 1/10 revolution 	15 µm	15 µm	15 µm	15 µm
		10 µm	10 µm	10 µm	10 µm
		9 µm	9 µm	9 µm	9 µm
		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			●	●	
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	

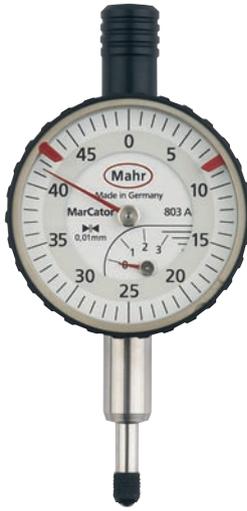
803 SB	803 AZ
	
0.4 mm (±0.2)	.120"
0.01 mm	.0005"
0-20-0	0-20
DIN 878	Factory standard
9 μm	.0004"
8 μm	
5 μm	.0002"
3 μm	.00012"
3 μm	.00012"
●	
0.9 - 1.1 N	0.7 - 1.1 N
4324250	4324900

Metrological characteristics



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				
7 μm	4 μm	10 μm	.0005"	15 μm	50 μm	17 μm	25 μm
6 μm	3 μm	7 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



803 A



805 A



SHOCK
PROOF

803 S

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	Readings	Dial face dia.	Overtravel	Mounting shank dia.	Measuring force	Accuracy	Order no.
	mm	mm	mm	mm	mm	N	DIN 878	
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



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:

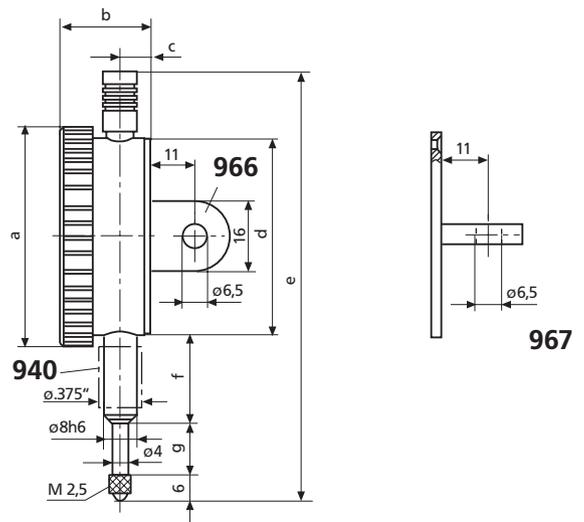
- The scope of supply includes an Adapter Bush 940 for adapting mounting shank 8h6 mm to inch bore .375"

Dimensions according to DIN EN ISO 463

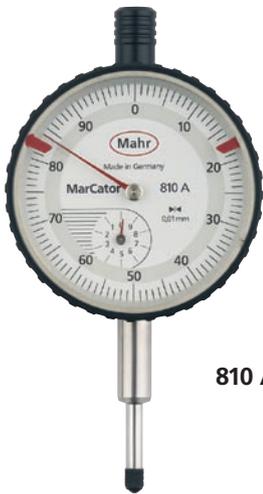
mm	a	b	c	d	e	f	g
803 A	ø 40	20.6	6.8	ø 37	83	15.5	8
805 A	ø 40	20.6	6.8	ø 37	83	15.5	8
803 S	ø 40	20.6	6.8	ø 37	80	15	5.5
803 SW	ø 44	21.6	7.1	ø 37	86	15	11
803 SB	ø 40	20.6	6.8	ø 37	83	15.5	8
803 AZ	ø 40	20.6	6.8	ø 37	83	15.5	8

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



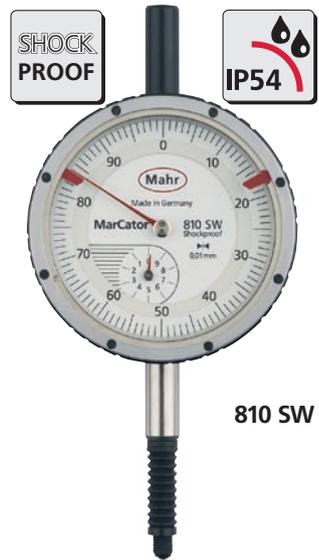
810 A



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

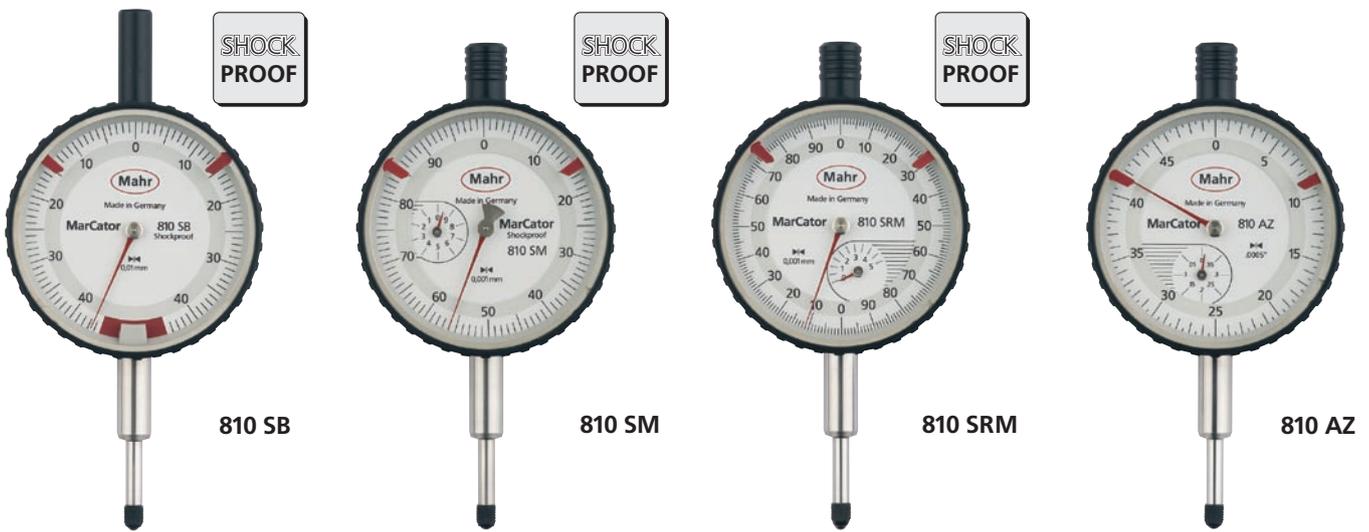
Technical Data

	Range	Readings	Dial face dia.	Overtravel	Mounting shank dia.	Measuring force	Accuracy	Order no.
	mm	mm	mm	mm	mm	N	DIN 878	
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.		Order no.
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	940	Mounting Lug	
Splash Guard Cover for bezel dia. 58 mm	955	Bore perpendicular to mounting shank	961
	4310103	Bore parallel to mounting shank	962
	4373020		4375010
			4375011

Precision Dial Indicators 810



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

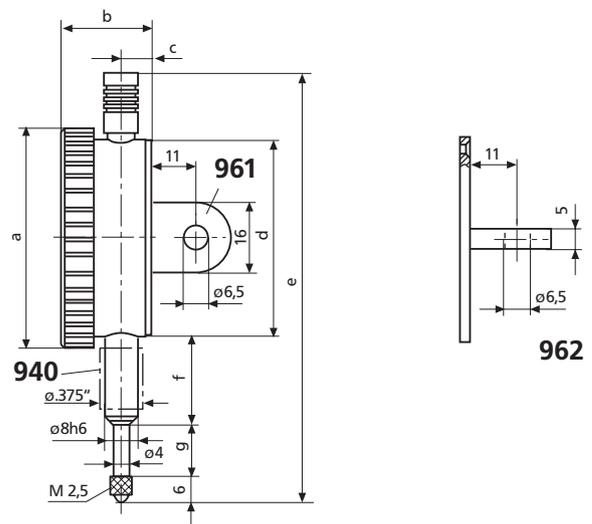
Inch version

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

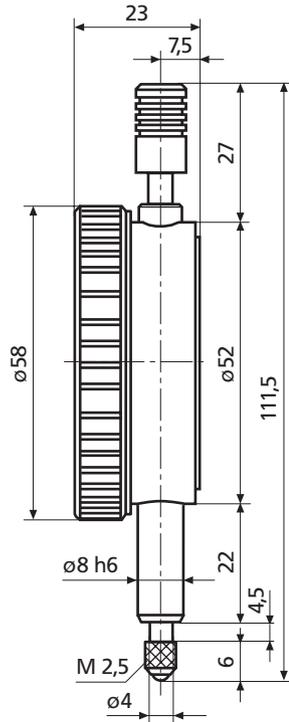
mm	a	b	c	d	e	f	g
810 A/AT	∅ 58	23	7.5	52	112	21	16
810 S	∅ 58	23	7.5	52	111.5	22	15
810 SW	∅ 61	24.15	7.9	52	127.6	22	22.1
810 SB	∅ 58	23	7.5	52	120	22	15
810 SM	∅ 58	25	8.5	52	111.5	22	15
810 SRM	∅ 58	23	7.5	52	111.5	22	15
810 AZ	∅ 58	23	7.5	52	111.5	22	15



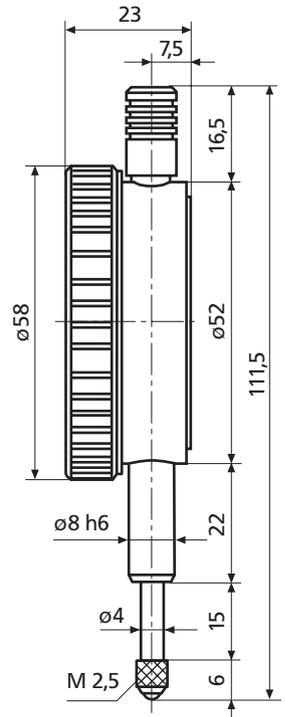
Precision Dial Indicators 810



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

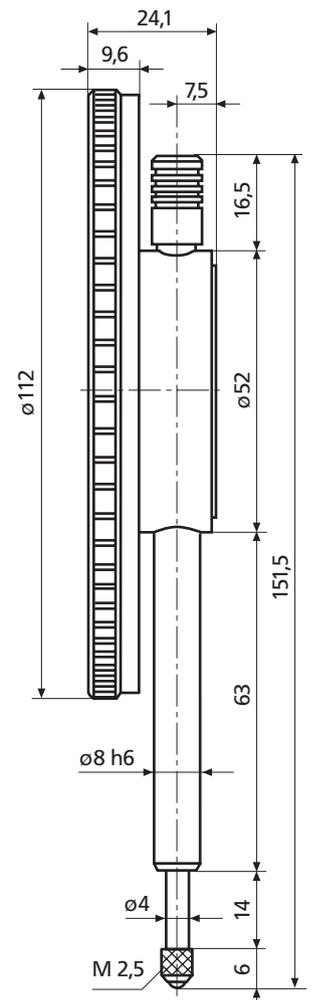
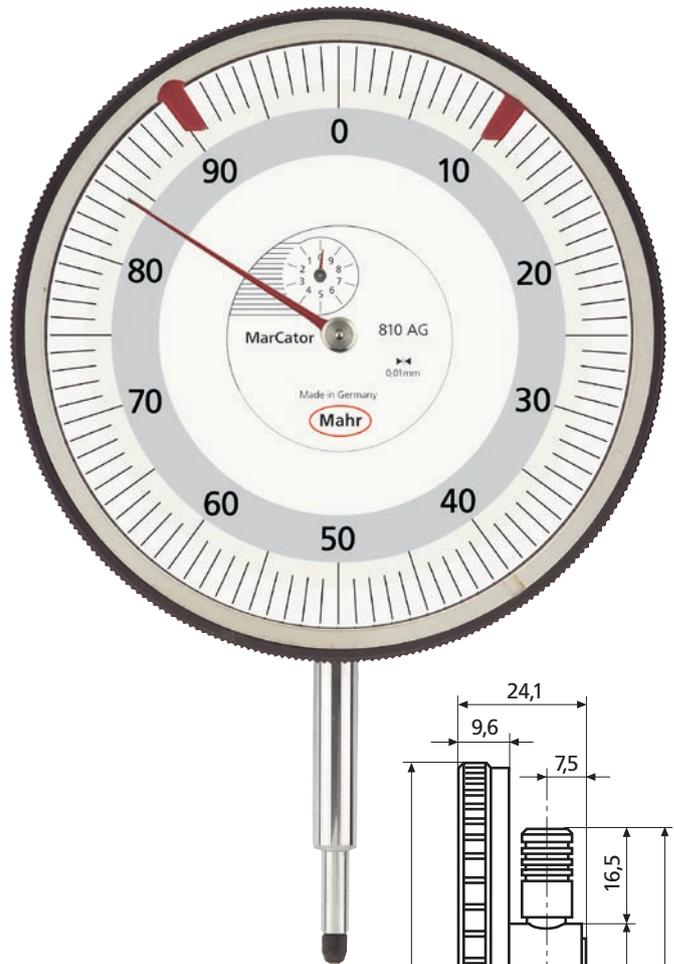
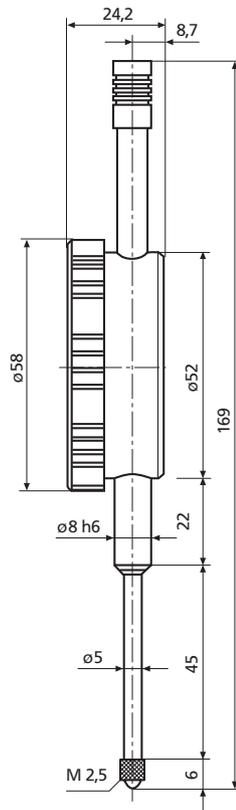
with reading 0.1 mm

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

Technical Data

	Range	Readings	Dial face	Overtravel	Mounting	Measuring	Order no.
	mm	mm	dia.	mm	shank	force	
			mm		dia.	N	
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



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

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

Order no.

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

902	902 H	903	903 H
Steel	Carbide contact face	Steel	Carbide tipped
Length mm	Order no.	Order no.	Order no.
4	4360007	—	4360070
6	4360009	—	4360071
8	4360010	4360040	4360072
10	4360011	4360041	4360073
12	4360012	4360042	4360074
15	4360013	4360043	4360075
20	4360014	4360044	4360076
25	4360015	4360045	4360077
30	4360016	4360046	4360300
35	4360017	4360047	4360078
40	4360019	4360049	4360310
45	4360026	4360050	4360303
50	4360018	4360048	4360079
55	4360031		
65	4360035		
75	4360020		
85	4360036		
95	4360029		

Ball Contact Point 906 H

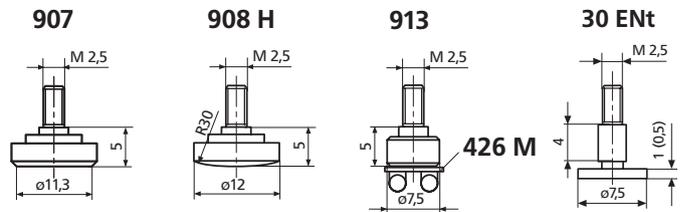
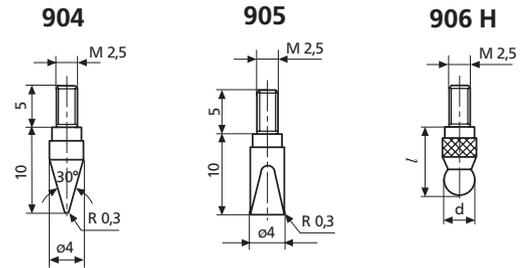
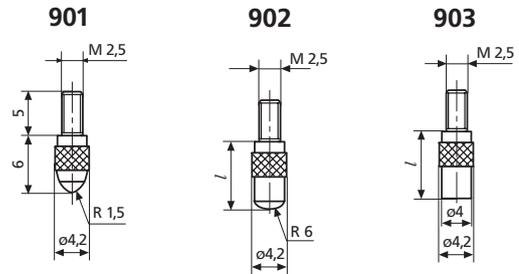
with carbide ball. accuracy ball dia. 0/-6µm

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

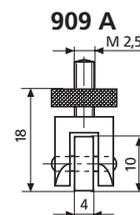
Concentricity error 3 µm

	Order no.
Cylindrical Roller	909 A 4360220
Radiused Roller, R = 5 mm	909 B 4360221



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



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

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		

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

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)

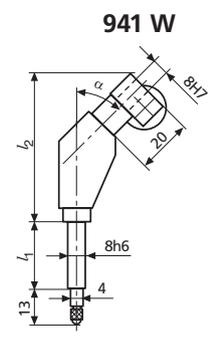
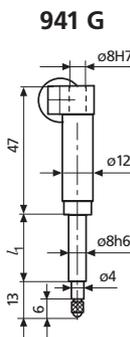
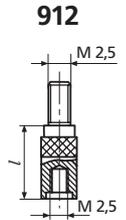
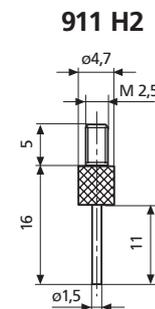
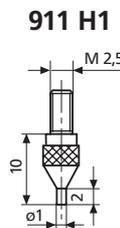
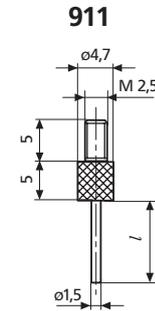
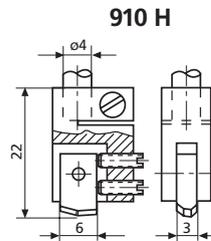
Straight Holder 941 G
 Mounting shank length l_1

Angular Holder 941 W

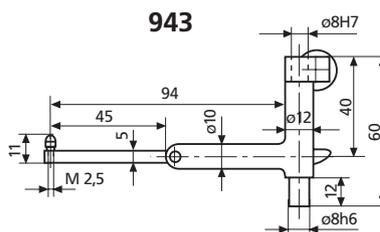
Order no.	Order no.	l_2	Order no.	l_2	Order no.	l_2
25	4365000	53.7	Angle $\alpha=45^\circ$	mm	Angle $\alpha=60^\circ$	mm
50	4365001		Angle $\alpha=60^\circ$	mm	Angle $\alpha=90^\circ$	mm
75	4365002		Angle $\alpha=90^\circ$	mm	Angle $\alpha=90^\circ$	mm

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



Transmission error with the 941 W
 max. 1%;
 for travel 3 mm = 0.03 mm



SIMPLE, ACCURATE AND INEXPENSIVE MEASUREMENT. MILLIMESS DIAL COMPARATORS.



The latest information on MILLIMESS products can be found on our website:

www.mahr.com, WebCode 207

▶ | Millimes is the "classic" amongst all measuring instrument. For over 60 years the Millimes 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. Millimes 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 Millimes 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 $0.2 \mu\text{m}$ / $10 \mu\text{inch}$ 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 Millimes spectrum. | ◀

▶ | Millimes. Digital and Dial Comparators

Inductive Digital Comparators

Overview 6- 2

Millimes 2100 6- 4

With background lit digital and analog display

Millimes 2000 / 2001 6- 5

With digital and analog display

μMaxμm // 6- 7

With digital display

Mechanical Dial Comparators

Overview 6- 8

Millimes 1000 A / 1000 B 6-11

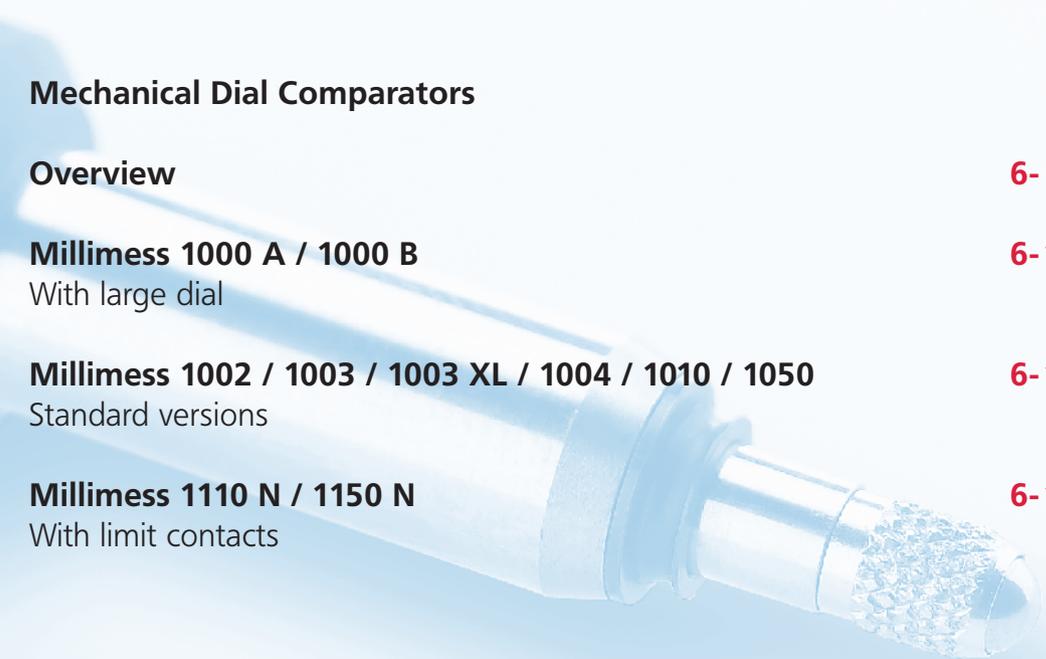
With large dial

Millimes 1002 / 1003 / 1003 XL / 1004 / 1010 / 1050 6-12

Standard versions

Millimes 1110 N / 1150 N 6-14

With limit contacts



Millimes. Digital Comparators

OVERVIEW

Inductive Digital Comparators				
	2100	2000	2001	μMaxμm //
				
Catalog page	6 - 3	6 - 5	6 - 5	6 - 7
Measuring range	2.8 mm	1.8 mm	1.8 mm	2 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"	mm / inch 0.0002 / .00001" 0.0005 / .00002" 0.001 / .00005"	mm / inch 0.0005 / .00002" 0.001 / .00005" 0.001 / .0001" 0.005 / .0005"
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	●	●	●	
Switch between ABS/REL	●	●	●	●
Tolerance display	●		●	●
Dynamic meas. functions	●		●	
Min. Max. Max-Min (Tir)				
Resolution switchable	●	●	●	●
Analog display	●	●	●	●
Analog value switchable	●	●	●	●
Lock key function	●		●	
Data output				
USB	●	●	●	
Digimatic	●	●	●	●
Opto RS232C	●	●	●	
Control output	●		●	
Protection class	IP class acc. IEC 60529	IP54	IP54	IP54

Millimess 2100

► | The new 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



Tolerance function:

clearly visual tolerance excess due to the change of color in the background lit display.



Universal SPS Interface

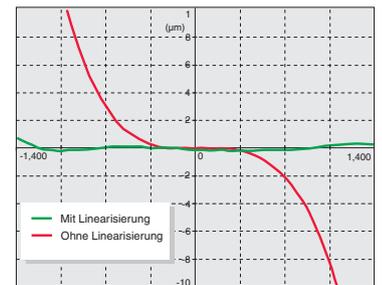
The choice is yours:
MarConnect Data output, choose between USB, Digimatic or RS232C



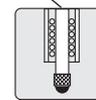
Control output can be connected to a SPS



Linearized, inductive **absolute measuring system**. Reference point is not lost when the instrument is switched off



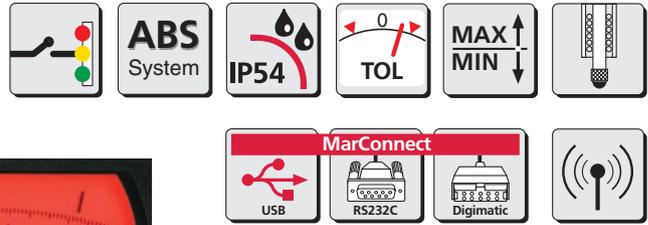
Especially suited for use in a manufacturing environment. Waterproof: **protection class IP54** in accordance to IEC 60529



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 Millimes 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.	
						230 V	115 V
±1.0 (inch) mm	0.0005 / .00002"	±0.015 (.0006")	1 μm 2 μm	1.8 mm	0.7 - 0.9 N	4346200	4346201**
±1.4 (.055") mm	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 Extrames 2000 / 2001



2000



2001



Features

Extrames 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

Extrames 2001

Features are identical to Extrames 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

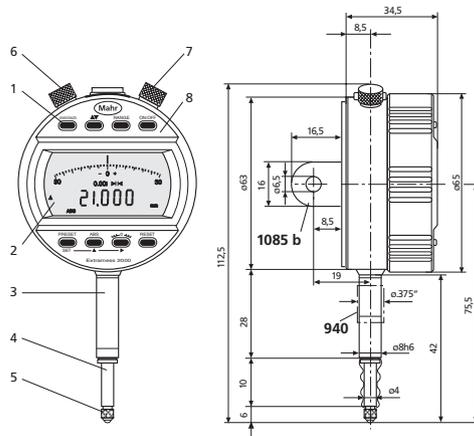
	Measuring ranges switchable		Resolution and readings	Display range of analog display		Span of error* G	Over-travel	Meas.-force	Order no.	
	mm	(inch)		mm	(inch)				µm	mm
2000	1.8	(.07")	0.001 / .00005"	± 0.030	(.0015")	0.6	2.4	0.7 - 0.9	4346000	4346900**
	1.8	(.07")	0.0005 / .00002"	± 0.015	(.0006")	0.6	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.		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 mounting shaft dia. 8h6 mm	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	

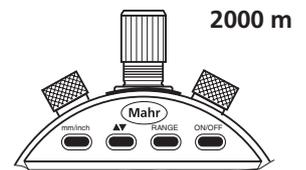
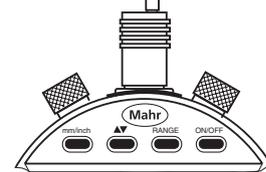
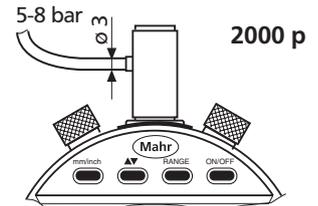
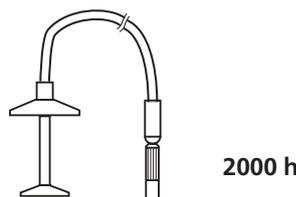
Measuring Force Springs

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

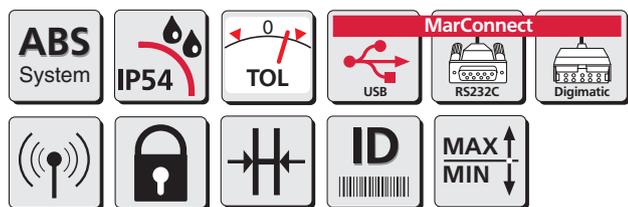
Additional Accessories

	Page
Contact Points 901-913	5-24
Special Holder 941	5-25

Accessories for Data Processing see Chapter 11



Inductive Digital Comparator μ Max μ m® II



Mode A:
Actual value + bargraph
Display of tolerance



Mode B:
GO/NOGO display



- Calculate the distance between 2 measured values
- Data output with serial number identification capability

Features

- Functions:**
- ON/OFF
 - ZERO (set the analog display to zero)
 - mm/inch
 - PRESET (enter any numerical values)
 - Reversal of counting direction
 - Switch to the analog display
 - ABS (Display can be set to zero, without losing the reference to the Preset value)
 - Inductive absolute measuring system, life of the battery ca. 6000 hours
 - High contrast analog and digital LCD, with 8 mm high digits
 - Operating and display unit (bezel) can be rotated 270°
 - Zero point is not lost even when power is off
 - MarConnect data output: USB, OPTO RS232C, Digimatic
- Operating temperature**
5-54°C
- Supplied with:**
Batteries
- Go/NoGo display feature:**
- Advanced Functions:**
- Dynamic mode operation: Max, Min, TIR
 - Two point difference measurement – provides comparison of two readings or measuring locations
 - Multiplier factor for ratio measurements
 - Hold function – holds reading on display until ready to resume measuring

Technical Data

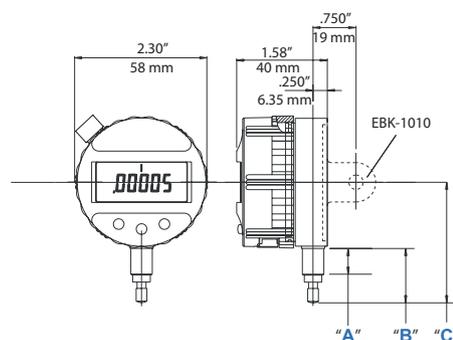
Range	Resolution	Accuracy	Measuring force	Weight	Mounting shank Length	Order no.
mm / inch	mm / inch	% of digital range		g	mm dia.	
±1.00 / ±0.040"	0.0002 / 0.00001"	±0.25% over ±0.50 mm ±0.50% from ±0.50 mm to ±1.00 mm	0.8 - 1.1	170	11.7 8h6	2034205
	0.0005 / 0.00002"					
	0.001 / 0.00005"					
	0.002 / 0.00001"					
	0.005 / 0.0002"					
	0.01 / 0.0005"					
	0.02 / 0.001"					

Further versions are available upon request

Accessories

	Order no.
Lug Back (Horizontal / Vertical)	EBK-1010
Data Connection Cable USB (2m)	4346023
Data Connection Cable RS232 (9 pin, 2 m)	4346020
Data Connection Cable Digimatic (10 pin, 2 m)	4346021
Splash Cover	ECV-1307-W2
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	940 4310103

For further mounting accessories refer to page 6-13



Dimensions	A	B	C
mm / inch			
	11.7 / 0.46"	24.1 / 0.95"	53.6 / 2.11"
	38.0 / 1.50"	57.2 / 2.25"	86.6 / 3.41"

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	DIN 879-1	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	4338000	4339000	4335000	4334000
Order no. Waterproof			4335005	4334005

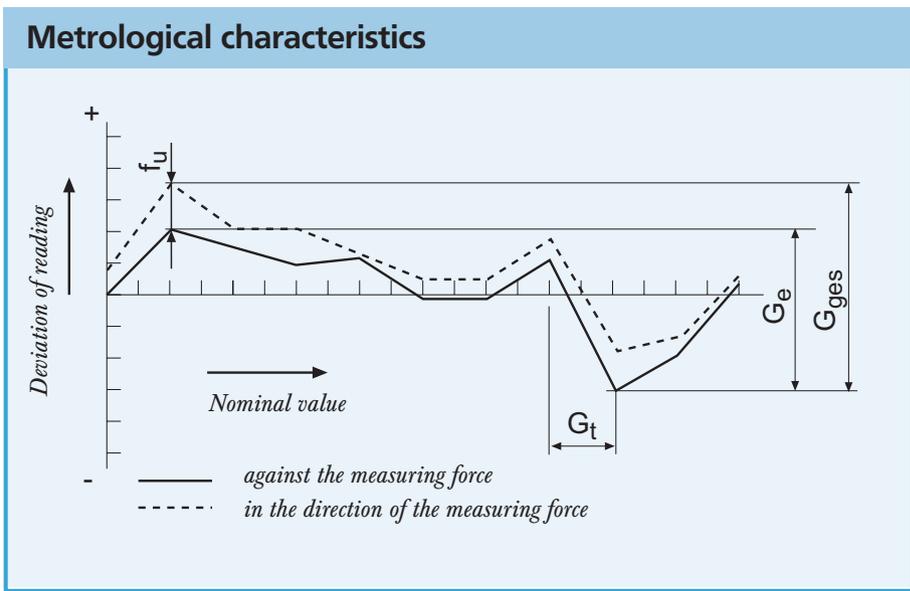
Inch		1002 Z	1003 Z
Measuring range		± .0010"	± .0020"
Readings		.00002"	.00005"
Dial style		.001-0-.001	.002-0-.002
Accuracy*		Factory standard	Factory standard
G _{ges}		.000025"	.00006"
G ^e		.00002"	.00005"
f _u		.00001"	.000025"
G ^t		.000014"	.000035"
r		.00001"	.000025"
Order no. Standard		4335900	4334900
Order no. Waterproof		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

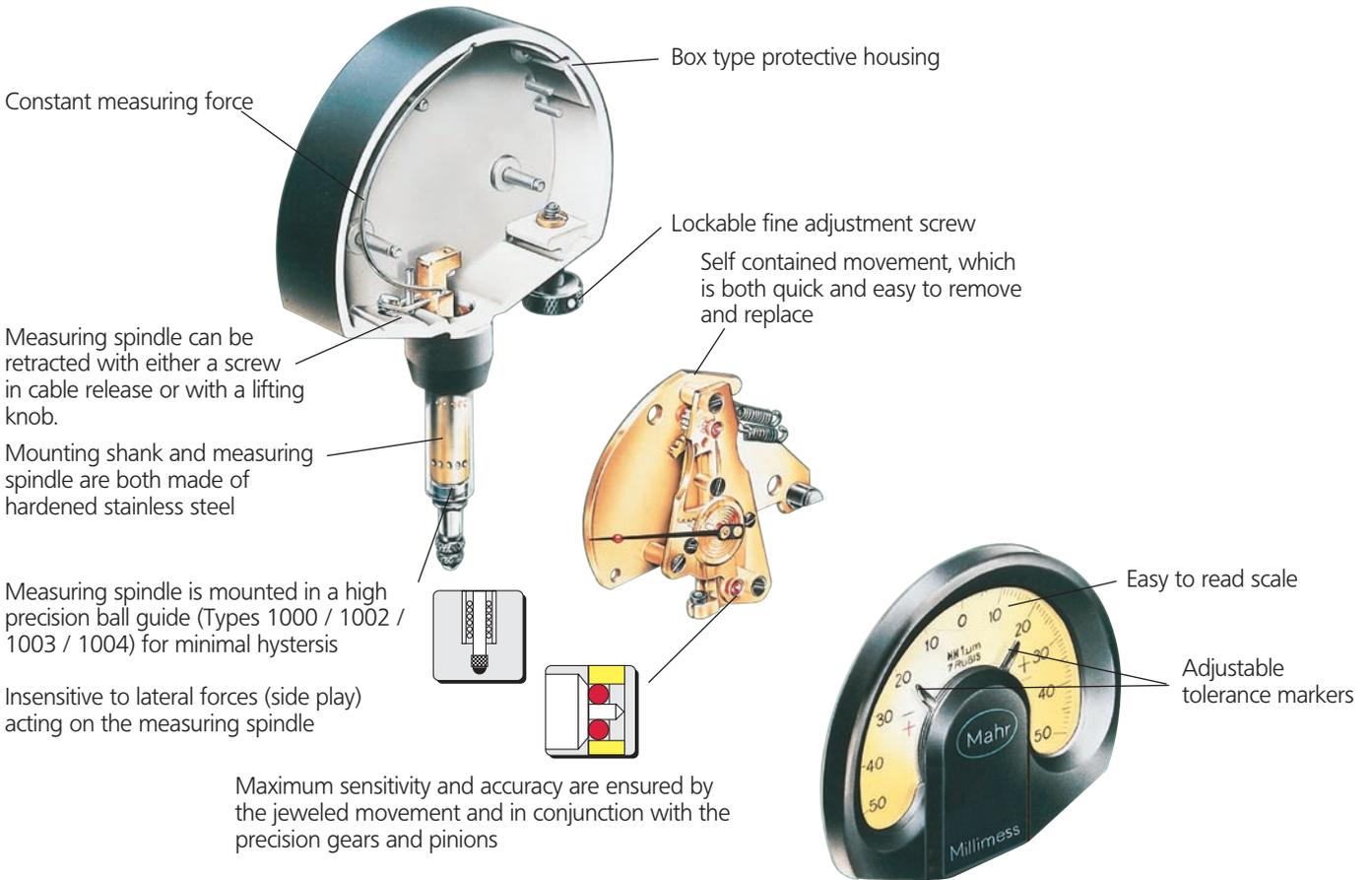
1004 Z	1010 Z
± .0050"	± .0100"
.0001"	.0005"
.005-0-.005	.01-0-.01
Factory standard	Factory standard
.00012"	.0004"
.0001"	.00035"
.00003"	.0001"
.00005"	.00025"
.00003"	.0001"
4333900	4332900
4333905	4332905



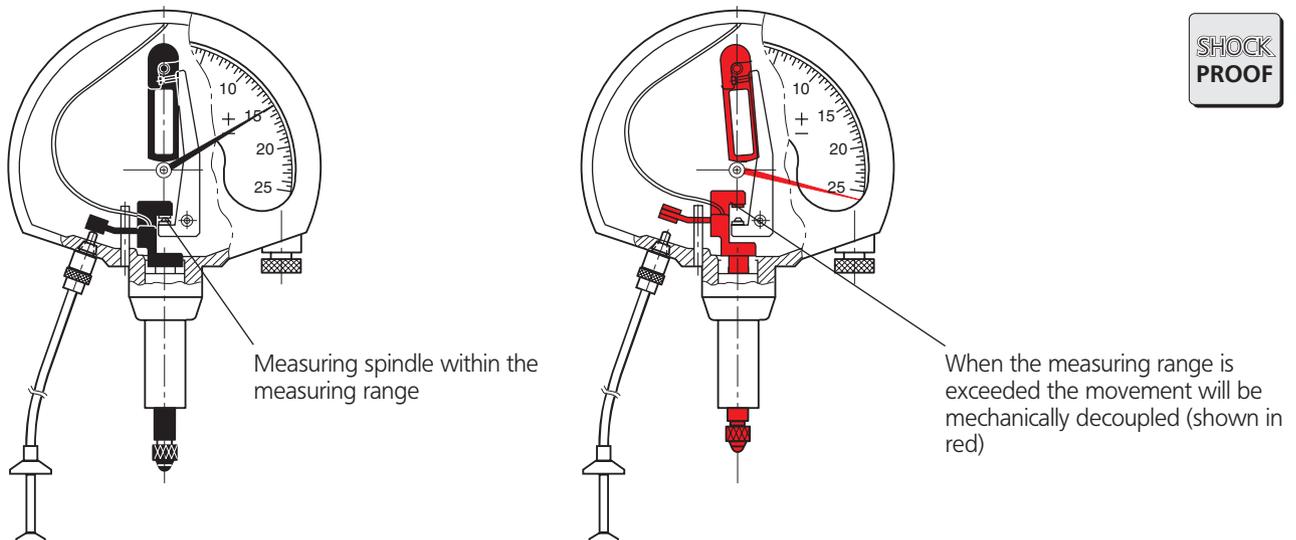
Millimess. Dial Comparators

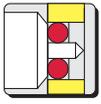
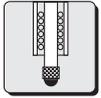
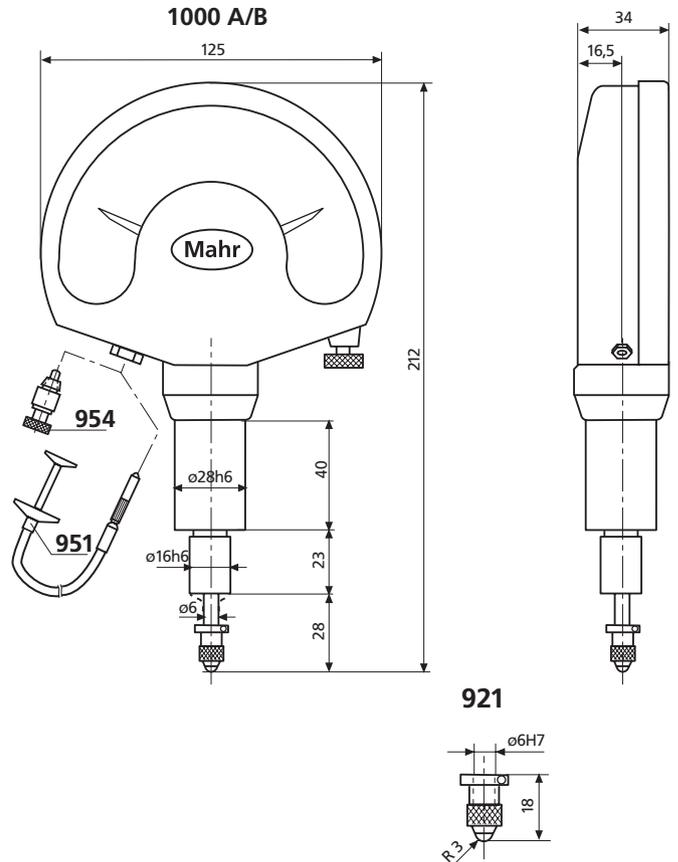
OVERVIEW

Design Features



Shockproof Mechanism



Mechanical Dial Comparator Large Type Millimess

**SHOCK
PROOF**

1000 A

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	921 4362001
with Ruby ball	921 R 4362002
Cable Release to raise the measuring spindle	951 4372000
Lifting Knob for lifting the measuring spindle	954 4372030
Rubber Bellows to seal the open end of the measuring spindle	4338008
Additional Accessories	Page
Precision Stand	824 GT 8-11

Technical Data

	Measuring force	Reading	Scale division	Over-travel	Measuring force	Order no.
Metric						
1000 A	$\pm 100 \mu\text{m}$	$1 \mu\text{m}$	1 mm	4 mm	3.5 N	4338000
1000 B	$\pm 50 \mu\text{m}$	$1 \mu\text{m}$	2 mm	4 mm	3.5 N	4339000

Mechanical Dial Comparators



1002



1003



1004



1003XL



1003T**



Technical Data

Metric		Measuring range	Readings	Overtravel	Measuring force 	Order no. Standard*	Order no. Waterproof**
1002	Supramess	± 25 µm	0.5 µm	2.8 mm	1 N	4335000	4335005
1003	Millimess	± 50 µm	1 µm	2.8 mm	1 N	4334000	4334005
1003	Millimess	± 50 µm	1 µm	2.8 mm	0.3 N	4334075	
1003	Millimess	± 50 µm	1 µm	2.8 mm	0.5 N	4334050	
1003	Millimess	± 50 µm	1 µm	2.8 mm	0.7 N	4334071	
1003	Millimess	± 50 µm	1 µm	2.8 mm	2 N	4334010	
1003	Millimess	± 50 µm	1 µm	2.8 mm	3 N	4334011	
1003 XL	Millimess XL	± 130 µm	2 µm	2.5 mm	1 N	4334001	
1004	Compramess	± 0.13 mm	5 µm	2.5 mm	1 N	4333000	4333005
1010	Zentimess	± 0.25 mm	0.01 mm	2.5 mm	1 N	4332000	4332005
1050	Dezimess	± 1.5 mm	0.05 mm	0.3 mm	1 N	4330000	4330005
Inch							
1002 Z	Supramess	± .0010"	.00002"	.11"	1 N	4335900	4335905
1003 Z	Millimess	± .0020"	.00005"	.11"	1 N	4334900	4334905
1004 Z	Compramess	± .0050"	.0001"	.10"	1 N	4333900	4333905
1010 Z	Zentimess	± .0100"	.0005"	.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 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	Over travel	Measuring force	Order no. Standard*	Order no. Water-proof**
Metric							
1110 N	Elzetimes	± 0.25 mm	0.01 mm	2.3 mm	2 N	4343100	4343105
1150 N	Eldezimes	± 1.5 mm	0.05 mm	0.3 mm	1.5 N	4342100	4342105

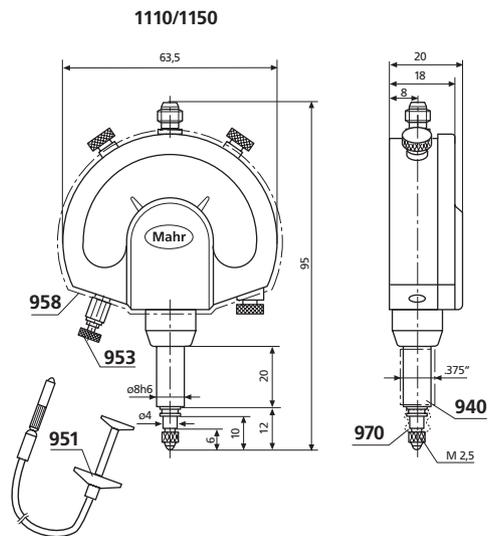
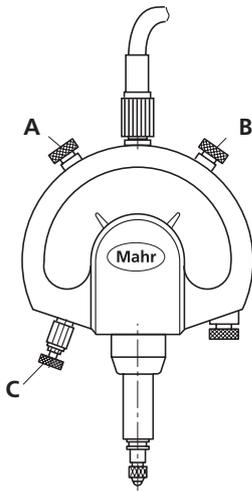
* Incl. Plastic Case, Setting Knob 953, Cable (1.2m)

** IP54, Incl. Plastic Case, Splash Guard Cover 958, Rubber Bellows (only for 1110)

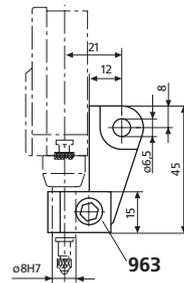
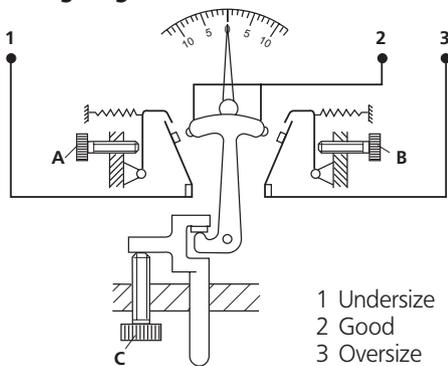
Mechanical Dial Comparators with limit contacts

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			



Wiring diagram



Zubehör

	Order no.		Order no.
Connection Cable (1.2 m), axial	4345695	Splash Guard Cover	958 4373031
Connection Cable (5 m), axial	4345694	Rubber Bellows to seal the open end of the measuring spindle	970 4334786
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	940 4310103	Mounting Lug to mount on mounting shank 8h6 mm	963 4375002
Cable Release to raise the measuring spindle	951 4372000		
Setting Knob for setting the limit contacts without an additional setting standard	953 4372020	Additional Accessories	Page
Lifting Knob for lifting the measuring spindle	954 4372030	Contact Points	901-913 5-24
		Special Holder	941 5-24
		Sensor Lever	943 5-25

COMPLEX MEASURING TASKS BROUGHT STRAIGHT TO THE POINT. **MILLIMAR**



The latest information on MILLIMAR products can be found on our website:

www.mahr.com, WebCode 153

▶ | 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. | ◀

▶ | Millimar. Electrical Length Measuring Instruments, Air Gaging and Engineered Solutions

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Millimar. Electrical Length Measuring Instruments

OVERVIEW

Evaluation Instruments



C 1216



C 1245



S 1840

- 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
- 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)

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 hysteresis
- 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

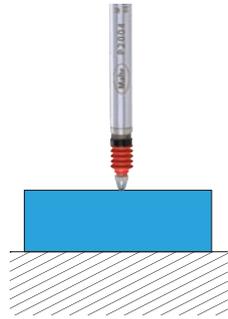
APPLICATIONS WITH INDUCTIVE PROBES

Single measurement with one probe

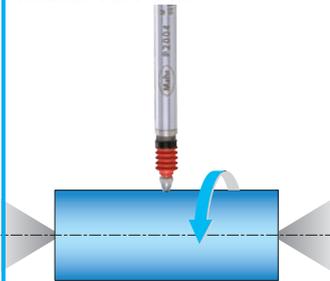
Indicating instrument instantly displays the measured value.

- 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

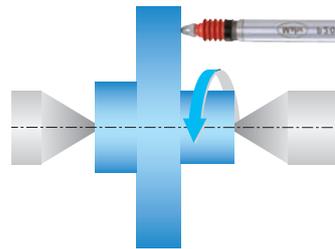
Thickness measurement



Radial run-out



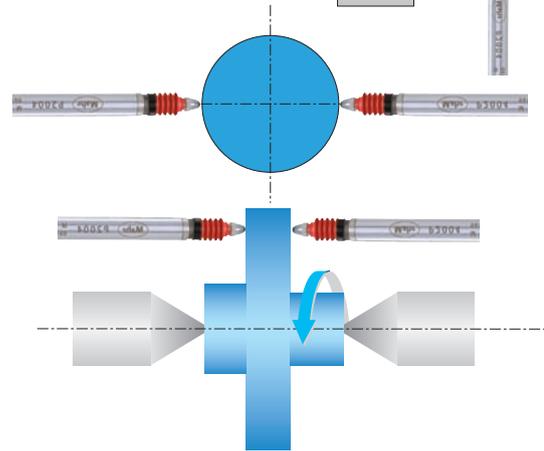
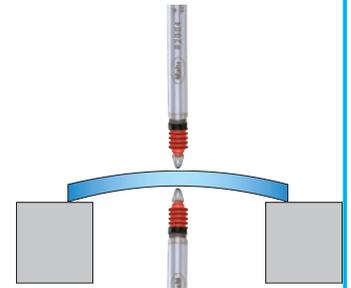
Axial run-out



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.

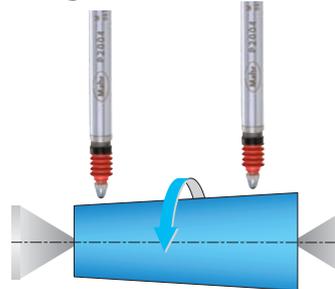
Thickness measurement



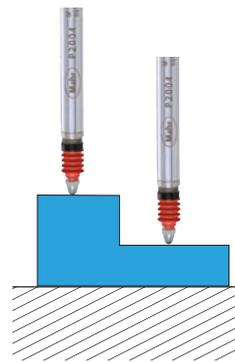
Difference measurement with 2 probes

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.

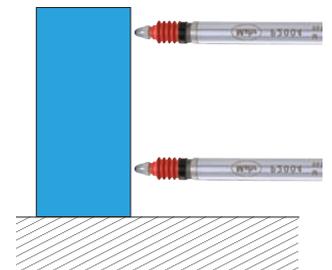
Form measurement of wedges or cones



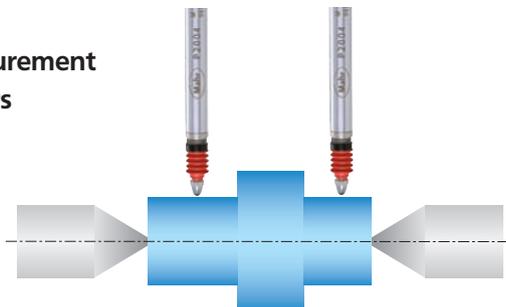
Height difference between 2 steps



Perpendicularity measurement



Concentricity measurement on 2 shaft diameters



Millimar. Electrical Length Measuring Instruments

INDUCTIVE PROBE PROGRAM

P1300-Serie (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 separated 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



P2101 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 7-8

1301 / 1303 / 1304 K / 1318 (Mahr-LVDT)



1301



1303



1304 K



1318

- 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)

Page 7-12

1340 Mahr High Precision Probe



1340

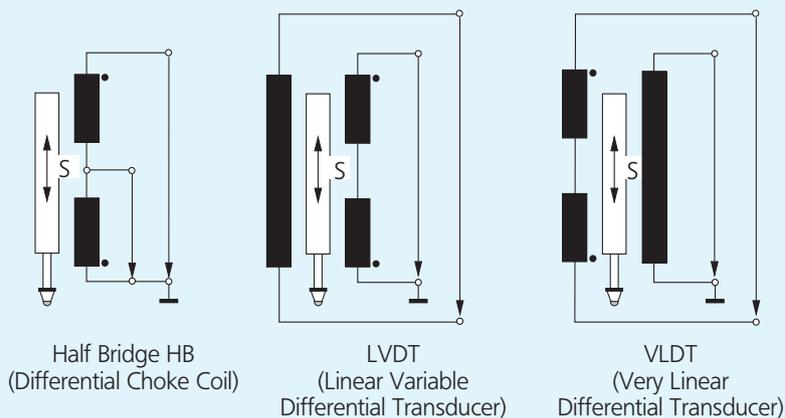
- To obtain the best results use in conjunction with Millitron 1240
- Unprecedented measuring accuracy and minimum linearity error < 0.01 %, i.e. 0.4 μm over the total measuring range

Page 7-12

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.

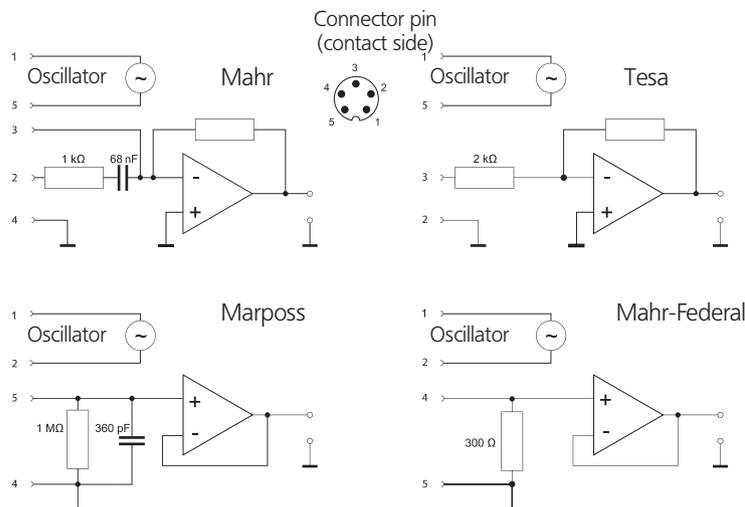
The Mahr P2000 series of probes applies a high linear, patented VLDT transducer which is similar to an LVDT transducer. This also operates according to a differential transformer principle.



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

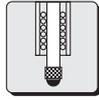
Schematic drawings of Mahr input amplifiers according to the various compatibilities



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 separated with the plug-in connector.



Technical Data

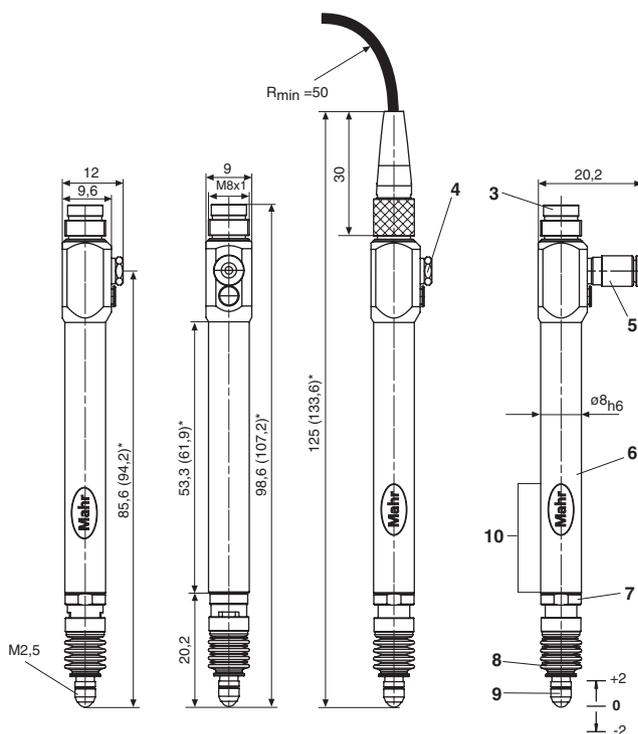
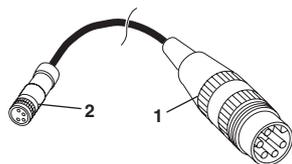
Probe type	P1300 MA	P1300 TA	P1300 MB	P1300 TB
Measuring range		± 2.0 mm		
Distance of lower stop ¹⁾		- 2.2 ... 0 mm		
Distance of upper stop ¹⁾		+ 2.2 ... 4.4 mm		
Lifter/Retraction	Vacuum Lifter (Standard option)		Compressed Air Retraction (max. 1 bar)	
Measuring force at electrical zero point	0.75 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			
Hysteresis f _u	0.5 µm			
Linearity deviation with revised sensitivity				
within range ± 0.5 mm	0.4 µm	1.0 µm	0.4 µm	1.0 µm
within range ± 1.0 mm	1.5 µm	3.0 µm	1.5 µm	3.0 µm
within range ± 2.0 mm	3.0 µm	not specified	3.0 µm	not specified
Protection class according to IEC 60529	IP64			
Length of cable	2.5 m (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°)



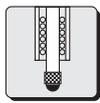
Connection cable 2.5 m

	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	4885334
Cable for P1300 - 90° 5 m	4885335
Cable for P1300 - 90° 10 m	4885336
Cable for P1300 2.5 m	4885220
Cable for P1300 5 m	4885259
Cable for P1300 10 m	4885260

	Order no.
Sealing bellows for P1300 .. A	7021546
P1300 .. B	7028220
Measuring force springs¹⁾ 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

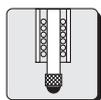
Probe type	P2001	P2004	P2004 A	P2004 B
Measuring range	± 0.5 mm		± 2.0 mm	
Distance of lower stop ¹⁾	–		- 2.2 ... 0 mm	
Distance of upper stop ¹⁾	–		+2.2 ... 4.4 mm	
Lifter/Retraction	–	–	Vacuum lifter	Compressed air (max. 1 bar) depending on air pressure
Measuring force at the electrical zero point	0.75 N ± 0.15 N	0.75 N ± 0.15 N ²⁾	0.75 N ± 0.15 N ²⁾	
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		0.1 µm	
Hysteresis f _u	0.2 µm		0.5 µm	
Linearity deviation with corrected sensitivity				
within range ± 0.1 mm	0.6 µm		–	
within range ± 0.5 mm	1.5 µm		0.4 µm	
within range ± 1.0 mm	–		1.5 µm	
within range ± 2.0 mm	–		3.0 µm	
Protection class according to DIN VDE 0470, Part 1 / EN 60529	IP40		IP64	
Cable length	2.5 m ³⁾		2.5 m 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 interchangeable, 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		± 2.0 mm	
Distance of lower stop		- 5.3 mm		- 2.2 ... 0 mm ¹⁾	
Distance of upper stop		+ 5.3		8.4 ... 10.4 mm 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		
Hysteresis f _u		1 μm		0.5 μm	
Linearity deviation with corrected sensitivity					
within range ± 0.5 mm		-		0.5 μm	
within range ± 1.0 mm		-		2.0 μm	
within range ± 2.0 mm		4.0 μm		4.0 μm	
within range ± 5.0 mm		20.0 μm		-	
Protection class according to DIN VDE 0470 Part 1 / IEC 60529		IP64		IP64	
Cable length		2.5 m ³⁾		2.5 m 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

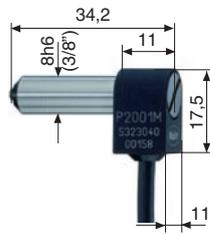
¹⁾ Relative to the electrical zero point. Adjustable; lower and upper stops are simultaneously adjusted

²⁾ Measuring force springs are interchangeable, additional measuring force springs are available (0.25; 0.5; 1; 1.25; 1.5 N)

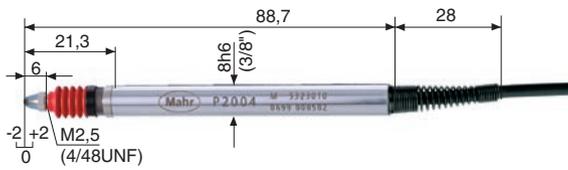
³⁾ Extension cables are available, see accessories

Inductive Probe Millimar P2000-Series

P2001

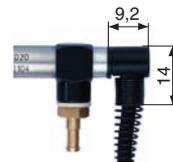
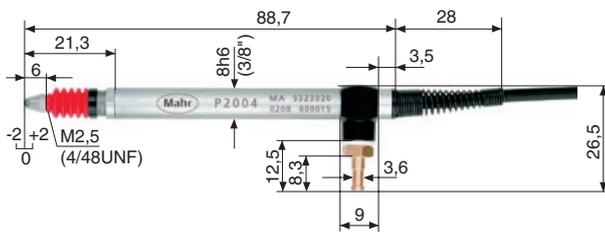


P2004



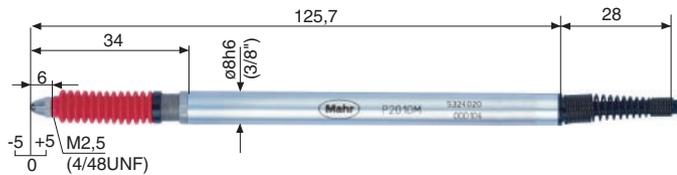
With the supplied slip-on cap, the cable can be flexed to 90° (vertical to horizontal)

P2004 A / P2004 B



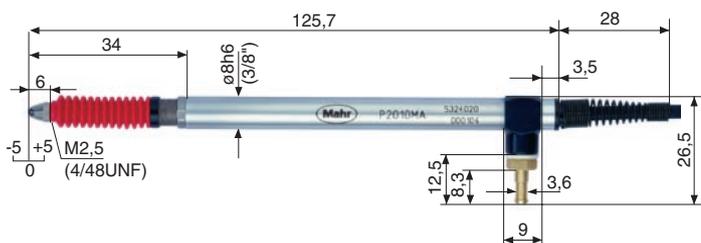
With the supplied slip-on cap, the cable can be flexed to 90° (vertical to horizontal)

P2010



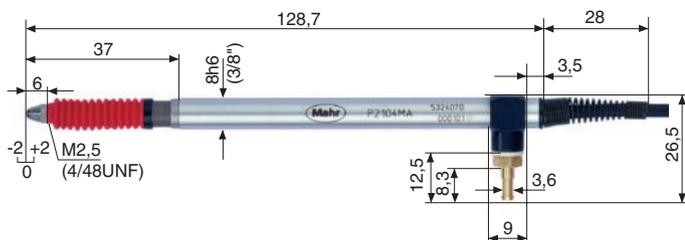
With the supplied slip-on cap, the cable can be flexed to 90° (vertical to horizontal)

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		Mahr M	Tesa T	Marposs U	Mahr Federal F
Length	Description	Order no.	Order no.	Order no.	Order no.
2.5 m	C 2025	5323130	5323131	5323133	5323134
5 m	C 2050	5323140	5323141	5323143	5323144
7.5 m	C 2075	5323150	5323151	5323153	5323154
10 m	C 2100	5323160	5323161	5323163	5323164

	Order no.		Order no.
Measuring force springs¹⁾ for P2004 and 2004 A		Measuring force springs¹⁾ for 2010 and P2010 A	
0.25 N	7026827	0.25 N	7028212
0.50 N	7026827	0.50 N	7028212
0.75 N	7026828	0.75 N	7027764
1.00 N	7026849	1.00 N	7028213
1.25 N	7025579	1.25 N	7028214
1.50 N	7025505	1.50 N	7028215
<i>¹⁾ All measuring forces (except 0.25 N) include the sealing bellows have a measuring spring force of ca. 0.25 N in zero position.</i>		<i>¹⁾ All measuring forces (except 0.25 N) include the sealing bellows have a measuring spring force of ca. 0.25 N in zero position.</i>	

	Order no.		Order no.
Measuring force springs¹⁾ for P2104 A		Sealing bellows for	
0.25 N	7028212	2004, 2004 A	7021546
0.50 N	7027764	2004 B	7028220
0.75 N	7028213	2010, 2010 A, 2104 A	7027758
1.00 N	7028214	2010 B, 2104 B	7028221
1.25 N	7028215		
<i>¹⁾ All measuring forces include the sealing bellows</i>			

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
Operating temperature range	- 10 ... + 80° C
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



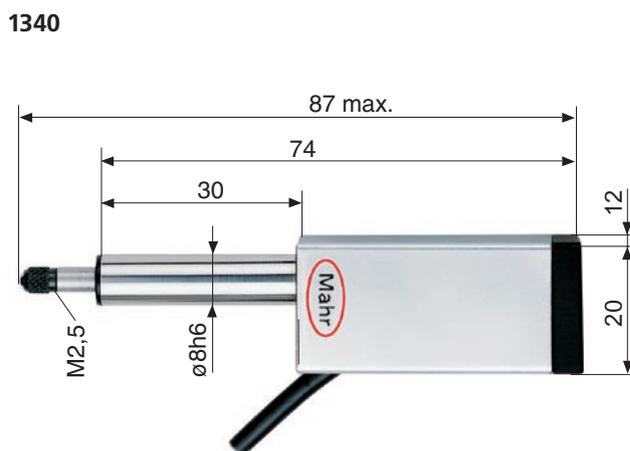
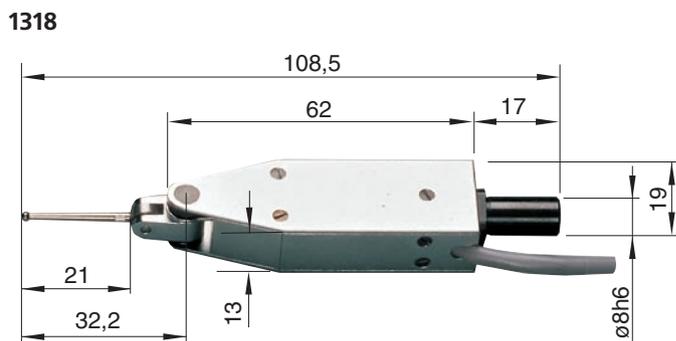
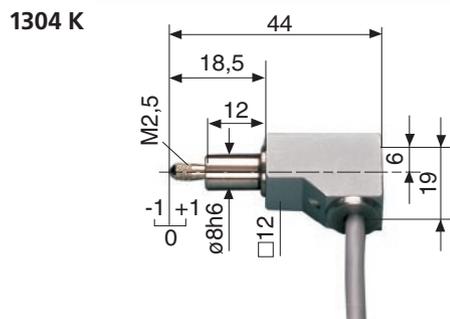
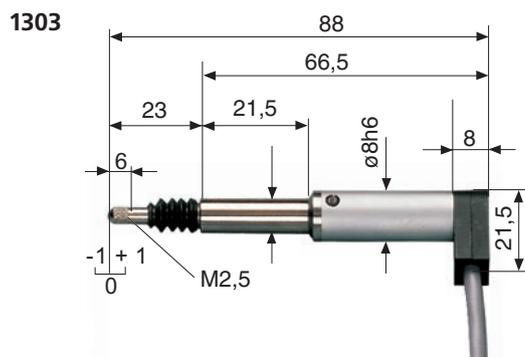
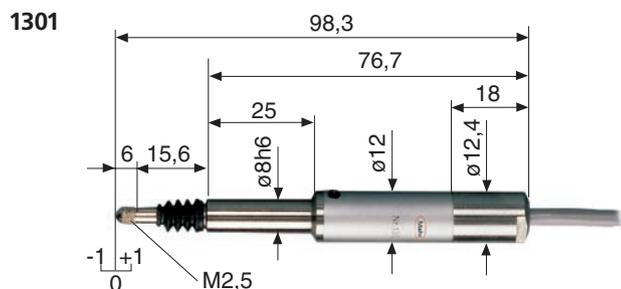
Technical Data

Probe type	1301	1303	1304 K	1318	1340
Measuring range	± 1.0 mm		± 1.0 mm	- 0.3 ... +1.0 mm	± 2 mm
Distance of lower stop ¹⁾	-1.1 ... 0 mm		- 1.1 mm	- 0.37 mm	- 2.2 mm (adjustable)
Distance of upper stop ¹⁾	2.7 mm		+1.1 mm	+ 1.6 mm	+ 3.0 mm
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_u	0.2 µm		0.2 µm	0.5 µm	0.08 µm
Hysteresis f_w	0.1 µm		0.15 µm	0.03 µm	0.08 µm
Linearity deviation with corrected sensitivity					
within range ± 0,3 mm	–		–	0.9 µm	–
within range ± 0,5 mm	0.5 µm		1.0 µm	–	–
within range ± 1,0 mm	2.0 µm		4.0 µm	–	0.15 µm
within range ± 2,0 mm	–		–	–	0.4 µm
Protect. class acc. to IEC 60529	IP64		IP62	IP50	IP64
Cable length	1.5 m ²⁾				
Compatibility - Mahr	LVDT				only with Millimar 1240
Order no.	5313010	5313030	5313049	5313180	5313400

¹⁾ Relative to the electrical zero point

²⁾ Extension cables are available, see accessories

Inductive Probe Millimar 1301 / 1303 / 1304 K / 1318



Accessories

	Description	Order no.
Extension Cables for 1301 / 1303 / 1304 K / 1318	1288/1 1 m	5312881
	1288/2,5 2.5 m	5312882
	1288/5 5 m	5312885
	1288/7,5 7.5 m	5312887
	1288/10 10 m	5312889
	Cable Release for 1301 / 1303	1399
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	1340/1
Pneumatic hand pump with a plug-in hose ca. 1 m		
Pneumatic Foot Switch for 1340 to connect up to max. 4 probes, type 1340	1340/1F	5313419

* Included in the scope of supply

Millimar. Evaluation Instruments

OVERVIEW

	C 1200 IC	C 1208 / C 1216	C 1245	1240
				
Catalog page	7 - 16	7 - 17	7 - 18	7 - 19
Display	Large analog scale with 2 tolerance markers	Background lit LCD with an analog display and a two line digital display	Analog scale with a two line digital display	Evaluation instrument with 2 adjustable tolerance markers
Measuring channels	1 Inductive Probe (A)	2 Inductive Probes (A, B) 1 Pneumatic Measuring Instrument	According to type, up to: <ul style="list-style-type: none"> • 8 Inductive Probes • 4 Incremental Probes • 2 pneumatic measuring tool • 8 Analog Signals or a combination of the above 	2 Inductive Probes (A, B)
Compatible Inductive Probe (carrier frequency)	Mahr	Mahr / Mahr Federal	Mahr / TESA / Mahr Federal	Mahr
Max. Resolution	0.1 μm	0.1 μm / 0.01 μm^*	0.1 μm	0.01 μm
Input Combinations	+A, -A	+A, -A, +B, -B, A+B, A-B, B-A, -A-B	Formula editor for 80 characters Functions: + / - / * / +/ () / Factor	+A, -A, +B, -B A+B, +A-B, -A+B, -A-B
Features / Programs	1	2 / 2	16 / 6	2 / 2
Test steps	1	1	6	1
Dynamic measurements 	—	MAX, MIN, MAX-MIN, (MAX+MIN)/2, mean	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	n, xn, x, s, R
Classification	—	—	max. 998, max. 62 on I/O	max. 30
Control inputs and outputs / SPS connections 	—	3 Opto-coupler inputs, 3 Opto-coupler outputs	3 Opto-coupler inputs, 6 Opto-coupler outputs	3 Opto-coupler inputs, 3 TTL outputs
Analog output	—	1*	1	1
Data interfaces / ports 	—	RS232, 9 pin, plug	RS232, 9 pin, plug	RS232, 9 pin, plug
Configuration	Turn switch	PC, Keypad	PC, Keypad	Keypad
Battery operated	Yes	—	—	—
Dimensions in mm (H x W x D)	137 x 157 x 80	205 x 160 x 165	210 x 160 x 155	195 x 156 x 120

* Only C1216

S 1840	X 1715	X 1741	1901 TA	G 1275 incl. D1200 X
				
7 - 20	7 - 23	7 - 24	7 - 25	7 - 21
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) 1 Pneumatic Measuring Instrument	According to type, up to: <ul style="list-style-type: none"> • 8 Inductive Probes • 4 Incremental Probes • 8 Analog Signals • 2 Temperature Sensors or a combination of the above	According to type, up to: <ul style="list-style-type: none"> • 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 / TESA / Mahr Federal	Mahr / TESA / Mahr Federal	Mahr	Mahr / TESA / Mahr Federal
0.01 µm	0.1 µm	0.1 µm	—	0.1 µm or 0.01 µm
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	16 / 6	16 / 6	1	99 / 1000
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, Freely programmable
—	N, x-bar, S, Xmax, Xmin, Range	N, x-bar, S, Xmax, Xmin, Range	—	Freely programmable
—	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, 6 Opto-coupler outputs	6 Opto-coupler inputs, 12 Opto-coupler outputs	—	16 Digital inputs (Optional) 16 Digital outputs (Optional)
1	1	2	1 Output voltage 1 Current output	—
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	PC	—	PC, Touchscreen
—	—	—	—	—
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 1200 IC Compact amplifier



1200 IC

Features

- Compact housing
- Battery powered for portable usage in the workshop
- Large analog display with 2 tolerance markers
- Quick and reliable display of the measured value
- Switchable measuring direction
- One inductive probe can be connected
- Fine adjustment due to the large range zero setter
- Battery operation with the commercially available round R14 batteries
- Test button for batteries
- Supplied with: Mains adapter and operating instructions

Technical Data

	1200 IC	1200 IC/MZ
Measuring range / Resolution	± 3 µm / 0.1 µm ± 10 µm / 0.2 µm ± 30 µm / 1 µm ± 100 µm / 2 µm ± 300 µm / 10 µm	± .0001" / .000002" ± .0003" / .00001" ± .001" / .00002" ± .003" / .0001" ± .01" / .0002"
Scale length		120 mm
Response time		350 ms
Single meas. combinations		+A, -A
Range of zero adjustment: 5 and 100 µm		1 Large range setter
Deviation spread referring to measuring range		≤ 2.5%
Protection class acc. to DIN		IP40
Working temperature range		+ 10... + 40° C / + 50... + 104° F
Power supply		mains adapter, 9V = ~5 VA
Power consumption		ca. 0.1 W
Dimensions		137 x 157 x 80 mm
Weight		1 kg
Order no.	5312000	5312009

Accessories

	Order-no.
Battery , R 14 battery 1.5 V, (6 are required)	3004424
For appropriate Inductive probes please refer to pages 7-6 to 7-12	

Millimar C 1208 / C 1216 Compact amplifiers with background lit display



C 1208

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 / 1 μin at measuring ranges from (**only C1216**)

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 output (**only C1216**)
- Programable analog output voltage (max. ±5V) (**only C1216**)
- 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 0.1 μm 400 (±200) μm, resolution 0.01 μm*

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 x 160 x 165 mm
Weight	ca. 2.1 kg

* only with C1216

Order no.

	Order-no.
C 1208 M Mahr compatible	5312080
C 1208 F Mahr-Federal compatible	5312082
C 1216 M Mahr compatible	5312160
C 1216 F Mahr-Federal compatible	5312162

For appropriate Inductive probes please refer to pages 7-6 to 7-12

Accessories

	Order-no.
Extension cable (9 pin D-Sub-jack to a D-Sub-socket), length 3 m	7024634
Control Unit with 3 push buttons	5318430
Foot switch for	
for Input 1	5330955
for Input 2	5330956
for Input 3	5330957
Adapter 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 compatibility)
- 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
Measuring range inductive probe	±.0003; .001; .003; .01; .03; .1; .3 inch 4000 (±2000) µm, resolution 0.1 µm (measured value display)

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

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 T)	ca. 210 x 160 x 155 mm
Weight	ca. 2 kg

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 T Tesa compatible for 4 inductive probes	5331251
C 1245 F Mahr-Federal compatible for 4 inductive probes	5331253

For appropriate Inductive probes please refer to pages 7-6 to 7-12

Accessories

	Order-no.
Extension cable (9 pin D-Sub-jack to a D-Sub-socket), length 3 m	7024634
Control Unit with 3 push buttons	5318430
Foot switch for Millimar for Input 1	5330955
for Input 2	5330956
for Input 3	5330957
Adapter non wired for I/O port	7032401
Keypad dust cover	3025712

Millimar 1240 Compact amplifier



Features

- Highly accurate processing of measured values
- Zero setting is possible at any point within the measuring range
- Actual value of a standard can be acquired at the touch of a button
- Statistical functions \bar{x} , s , r and n for 1 parameter
- Tolerance monitoring (with adjustable hysteresis)
- Tolerance field can be set along the total width
- Universal classification possibilities
- Extreme value memories of long stability
- 2 inputs for Mahr compatible inductive probes for single, sum or difference measurements
- Use the RS232C interface to connect a printer / computer / data logger
- Connect a recorder with analog output
- Use the RS232C interface to remotely control all functions
- Supplied with: Operating instructions and a mains power supply plug

Technical Data

Display	analog/digital	Deviation spread referring to measuring range	
Analog display: Measuring range/resolution		Analog display	≤ 1.5 %
± 1 μm/0.02 μm (± .003" / .0001")		Digital display	≤ 0.01%
± 3 μm/0.1 μm (± .01" / .0002")		Analog output	≤ 1 %
± 10 μm/0.2 μm (± .03" / .01")		Output voltage	± 5 V
± 30 μm/1 μm (± .1" / .002")		Data output	RS 232 C
± 100 μm/2 μm (± .3" / .01")		Limit switches	2
± 300 μm/10 μm (± .00003" / .000001")		Signal lamps	3
± 1000 μm/20 μm (± .0001" / .000002")		Response time	15 ms
± 3000 μm/100 μm (± .0003" / .00001")		Control outputs	3
± 10000 μm/200 μm (± .001" / .00002")		Type of output	TTL
Digital display: Measuring range/resolution		Control inputs	3
± 200 μm/0.01 μm (± .08" / .00001")		Protection class acc. to DIN	IP40
± 2000 μm/0.1 μm (± .008" / .000001")		Working temperature range	+10 ... +40°C / + 50 ... + 104° F
Single meas./ combinations	+A, -A, +B, -B, A+B, +A-B, -A+B, -A-B	Power supply	230 V~/115 V~ ± 10%, 50-60 Hz (switchable)
Dynamic Functions	Max, Min, Max-Min, (Max+Min)/2, mean	Power consumption	ca. 30 VA
Static Functions	n , x_n , \bar{x} , s , R	Dimensions (W x H x D)	156 x 195 x 120 mm
Zero adjuster	Zero setting at any point	yWeight	2.3 kg

Order no.

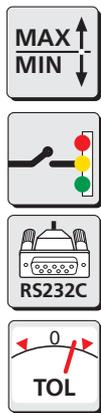
	Order no.
1240 Front Panel English	5312401

For appropriate inductive probes please refer to pages 7-6 to 7-12
Recommended **Probe 1340** see page 7-12

Accessories

	Order no.
Push buttons 1240/3D for activating 3 different functions e.g., Start, zero setting etc., connection cable 1.5 m	5312430
Foot Switch 1240/1F , connection cable length 2 m	5312431
Control Unit 1240/SG with 3 push buttons and 5 relay outputs	5312439
Classifying Instrument 1240/KG with 20 opto-coupler outputs	5312438
Data Cable to any. PC (9 pin D-jack)/MSP2	7024634
Statistics Printer MSP2 , 230V / 110V	4102040

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
- Extensive calculation of input signals: $\pm A$, $\pm B$ 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
- Interfaces: 2 inputs for inductive probes, chose either wahlweise Mahr or Mahr-Federal compatibility
- Programmable analog output voltaeg (max. $\pm 5V$)
- 3 digital inputs (e.g. start of measurement, master measurement)
- 3 digital outputs for GO – NO GO – rework, measuring time
- 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 $\pm .0003$; .001; .003; .01; .03; .1; .3 inch or tolerance related
Meas. range inductive probe	4000 (± 2000) μm , resolution 0.1 μm 400 (± 200) μm , resolution 0.01 μm
Resolution	0.1 μm / .000005"
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	$\pm 0.005\%$ / $^{\circ}C$
Operating temp. range	0 ... 45 $^{\circ}C$ / 32 $^{\circ}F$... 113 $^{\circ}F$

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 $\pm 5V$ programmable
Power supply via	
Mains power pack	100V ... 240V, 47Hz ... 63Hz
Power consumption	12 VA
Protection class	IP53
	IP43 with conductive dust
Dimensions (H x W x D)	ca. 487 x 47 x 144 mm
Weight	ca. 1.4 kg

Order no.

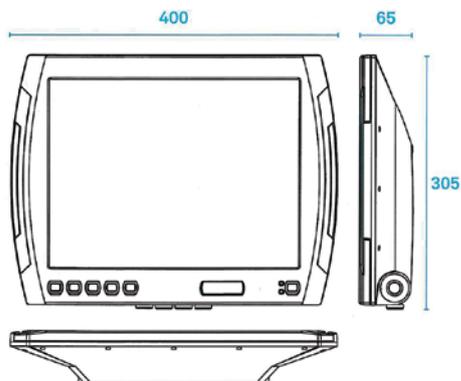
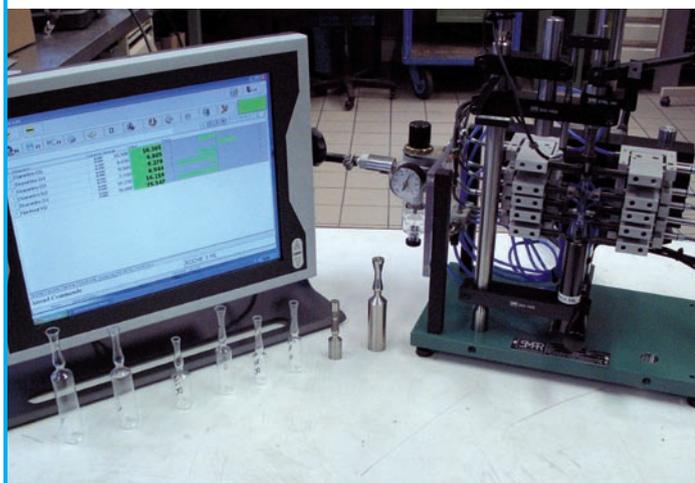
	Order no.
S 1840 M Mahr compatible	5318400
S 1840 F Mahr-Federal compatible	5318402

For appropriate Inductive probes please refer to pages 7-6 to 7-12

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	7024634
Control Unit with 3 push buttons	5318430
Foot Switch for Millimar	Input 1 5330955
	Input 2 5330956
	Input 3 5330957
Adapter non wired for I/O port	7032401

Millimar G1275



VMT 6015

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 reliably 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 Millimar G1275.

Technical Data

Dimensions (LxDxH)	305 x 400 x 65 mm
Weight	4,3 kg
Material	Aluminum pressure die-cast powder-coated
Operating temperature	0 °C . . . 55 °C
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

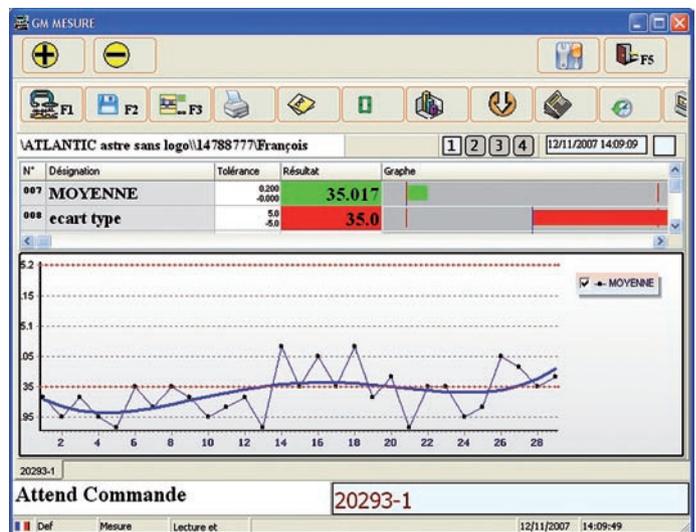
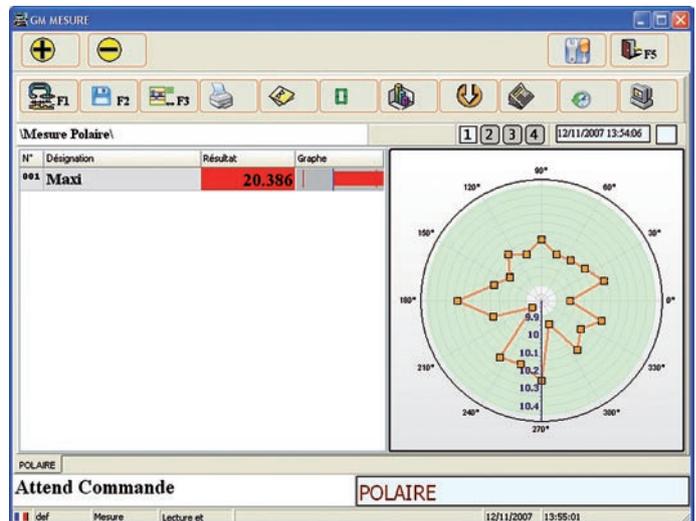
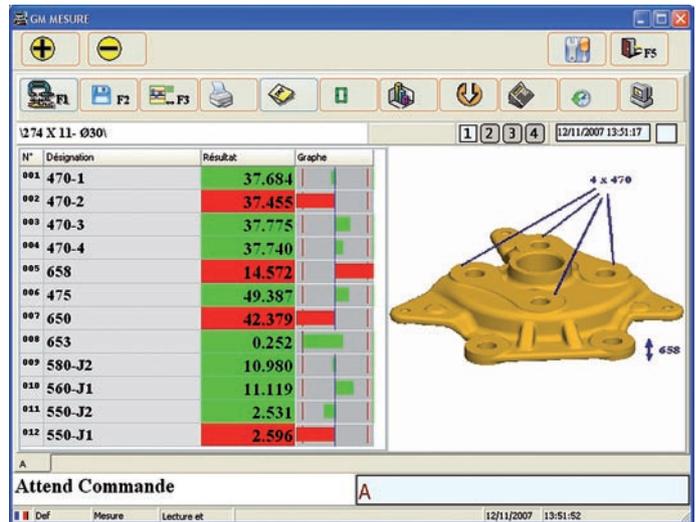
Numero	Référence	Nom de la gamme	Date de création	Date de modification	Date Utilisation
10	AS2		24/09/2007 12:05:14	09/11/2007 11:40:38	09/11/2007 11:40:38
26	ATTRIBUT		15/10/2007 09:37:47	09/11/2007 11:43:44	09/11/2007 11:41:54
29	ATTRIBUT 2		23/10/2007 16:37:49	09/11/2007 08:38:24	09/11/2007 08:38:24
12	PLA_UTILISER		09/03/2007 15:37:04	26/10/2007 10:50:22	26/10/2007 10:50:22
1	DESMESS_VMI	Desmes VMI	12/12/2002	26/10/2007 11:23:42	26/10/2007 11:23:42
22	M		05/09/2007 16:08:26	21/09/2007 16:07:24	21/09/2007 16:07:24
13	MANUEL		12/03/2007 08:58:14	05/11/2007 15:32:35	05/11/2007 15:32:35
18	MOTEUR_VSK		15/06/2007 10:47:16	24/09/2007 11:39:30	24/09/2007 11:39:30

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 histogram and SPC control card.
- Automatic calibration demand after hours and n measurements
- Inaccurate measuring values can be commented on with the reasons
- Statistical 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 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 processing.

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: D1000X Software, operating instructions and a mains power supply plug null modem cable, 9-pin

Technical Data

Measuring range inductive probe 4000 (+/- 2000) μm , Resolution 0.1 μm

Response time

- Meas. value memory 0.005s
- Outputs 0.020s

Error limits

- 0.3% (min. 0.2 μm)

Temperature coefficient $\pm 0,005\%/^{\circ}\text{C}$
Oper. temperature range $0^{\circ} \dots 50^{\circ}\text{C}$

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 T)

ca. 160 x 205 x 165 mm

Weight

ca. 2 kg

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
X 1715	Tesa compatible for 8 Inductive probes	5331062

For appropriate Inductive probes please refer to pages 7-6 to 7-12

Accessories

	Order no.
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
for input 1	5330956
for input 2	5330957
for input 3	7032401
Adapter non wired for I/O port	

* 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 processing.

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: D1000X Software, operating instructions and a mains power supply plug null modem cable, 9-pin

Technical Data

Measuring range inductive probe 4000 (+/- 2000) μm ,
Resolution 0.1 μm

Response time

- Meas. value memory 0.005s
- Outputs 0.020s

Error limits

- 0.3% (min. 0.2 μm)

Temperature coefficient $\pm 0.005\%/^{\circ}\text{C}$
Oper. temperature range $0^{\circ} \dots 50^{\circ}\text{C}$

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

Weight

ca. 2 kg

Order no.

		Order no.
X 1741	Mahr compatible for 2 Inductive probes	9037840
X 1741	Mahr compatible for 4 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 7-12

Accessories

	Order no.
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
Input 1	5330956
Input 2	5330957
Input 3	7032401
Adapter non wired for I/O port	7032401

* Included in the scope of supply

Millimar Measuring Amplifier 1901 TA with analog output



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 frequency 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)	$\pm 125 \mu\text{m}$	Connections	Input	5 pin socket
	$\pm 250 \mu\text{m}$		Output	3 pin socket
	$\pm 500 \mu\text{m}$		Supply	3- pin plug
	$\pm 1000 \mu\text{m}$		Response time	5-10 ms
	$\pm 2000 \mu\text{m}$		Cut-off frequency	90 Hz
Output voltage at end of measuring range	± 10 V	Protection class	IP 54	
Option:	± 5 V / 0 -5 V / 0 -10 V	Dimensions: (L x D x H)	43 x 100 x 170 mm	
Current output at end of measuring range	± 5 mA			
Linearity	$\pm 0,3\%$			
Supply voltage	24 V =			

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 7-12

Millimar. Pneumatic Length Metrology

PRECISION BEGINS AT THE START OF THE MEASURING PROCESS

► | Millipneu 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. Pneumatic 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 pneumatic measuring value recorders are displayed by the Millimar evaluation units according to the principle of determination of changes in air pressure. | ◀



Millimar. Pneumatic Length 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 a pneumatic 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.



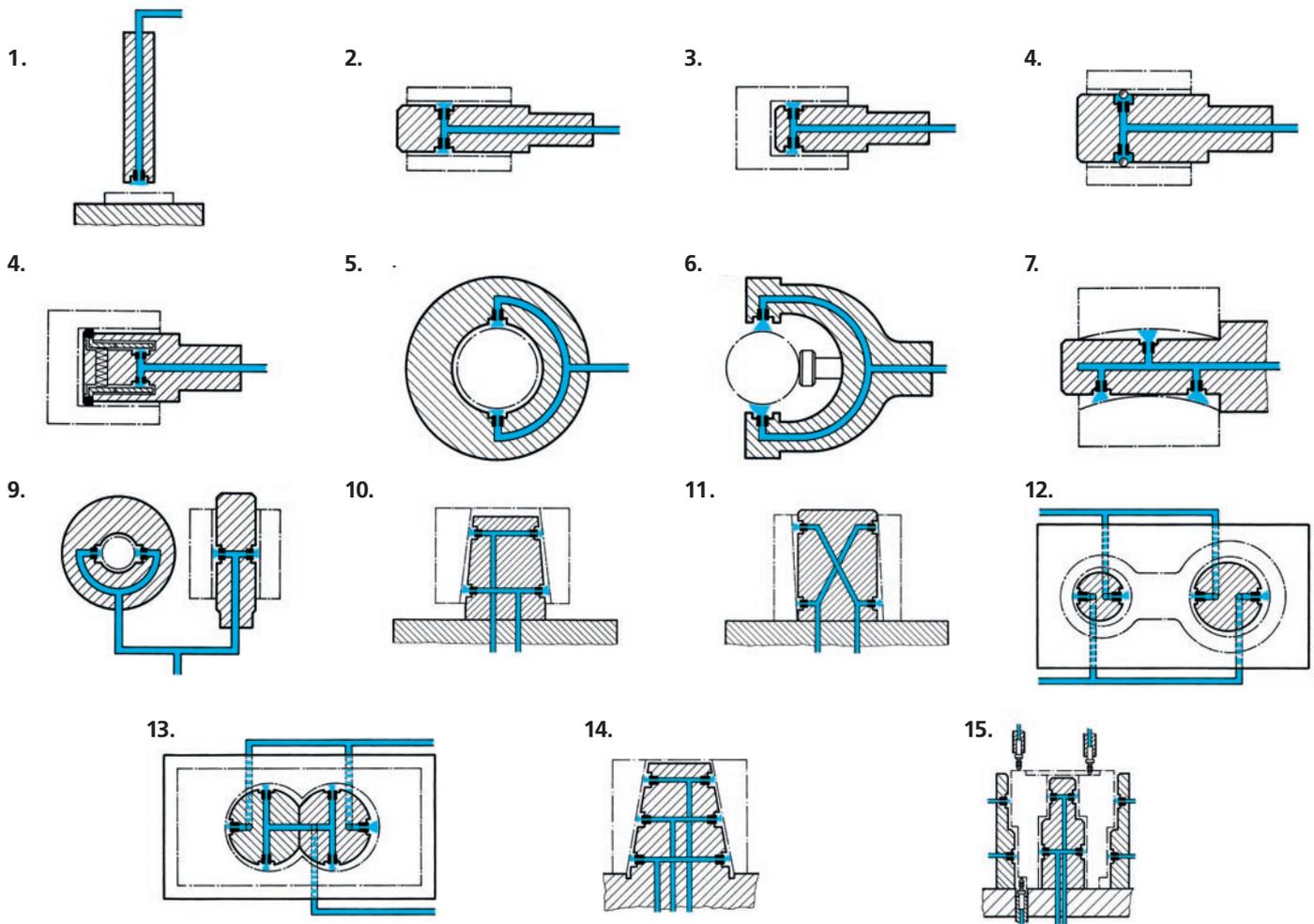
Metrological features

- Universal, reliable, 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: depending 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, eccentricities, alignment of bores, mating measurements etc.
- Various measuring possibilities due to the corresponding adaption to existing measuring problems
- **Millipneu** 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
- **Millipneu** 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 columns and long scales
- Versatile **Millipneu** 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 pneumatic measuring elements
- Robust model for the shop floor. Models for all applications.
- Special models for special tasks

Millimar. Air Gages

PRECISION BEGINS AT THE START OF THE MEASURING PROCESS

► | 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 pneumatic measuring procedure has a relatively close linear measuring range. The limit of the measuring procedure is reached when the described generated surface A which arises due to the gap distance becomes larger than the cross-sectional area of the measuring jet with the diameter d . | ◀



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 and thickness measurement with adjustable jet air caliper gage
7. Straightness measurement of a cylindrical bore with special jet air plug gage
8. Mating measurement between bore and shaft with jet air plug gage and jet air ring gage
9. Taper-pitch measurement of an inside taper with taper jet air plug gage - measurement as per the differential measuring method
10. 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
11. Measurement of hole distances of separated cylindrical bores with jet air plug gage - measurement as per the differential measuring method
12. Measurement of hole distances of truncated cylindrical bores with jet air plug gages - measurement as per the differential measuring method
13. Taper-pitch measurement as well as form and diameter measurement of an inside taper with taper jet air plug gage.
14. Multiple inside and outside measurements with measuring jet air gages and contact probes in connection with a seven-column unit.

Jet Air Gage Plugs for Bores

Description

Millimar jet air plug gages are used for checking cylindrical through bores or blind bores.

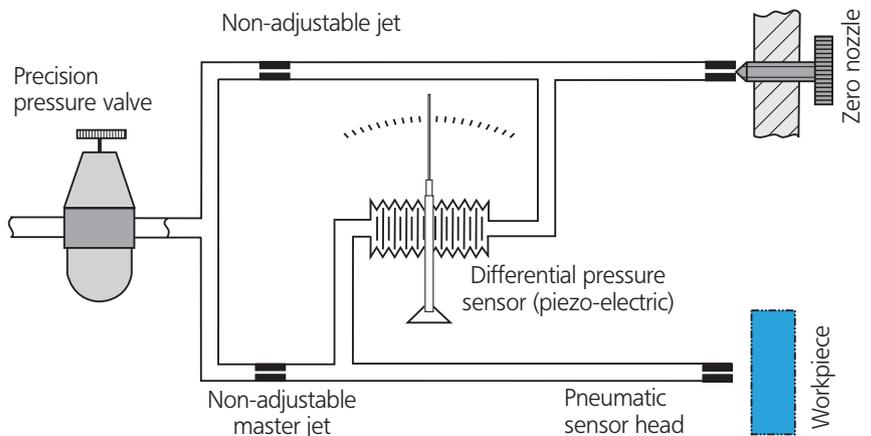
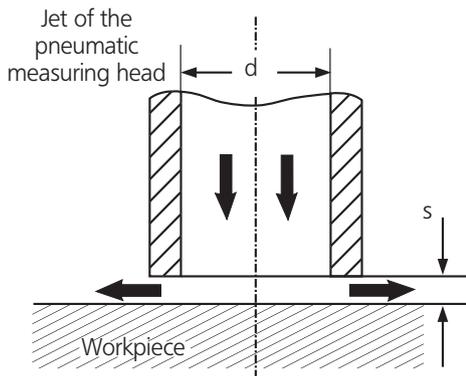
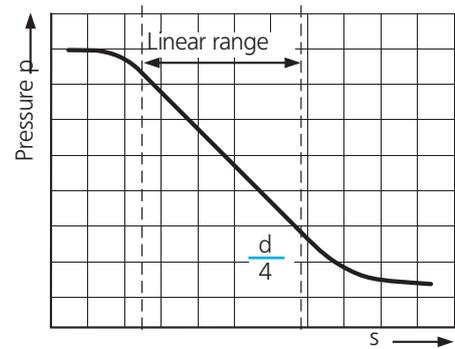
The plug gage bodies are equipped with two opposing measuring jets which record the measured value without contact. This arrangement allows the diameter, the diametric roundness and the cylindricity of bores to be calculated using a single jet air plug gage.

The diameter is measured immediately after the air plug gage is introduced, which the diametric roundness deviation can be tested by rotation around 180° and the cylindricity by movement in a longitudinal direction.

The measuring range of the **Millimar** air plug gage is 80 µm to max. 100 µm.

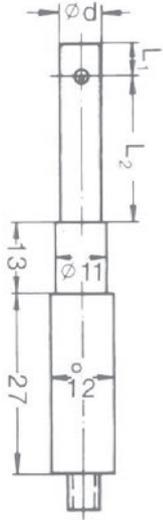
Millimar jet air plug gages are furnished in high chrome stainless steel or chrome plated versions and, if required, with a shut-off valve to conserve air consumption.

The long service life of especially the air tooling adjusted on the **Millimar** display units is due in part to hardened measuring jets which are recessed relative to the generated surface of the measuring body and are therefore protected against damage.



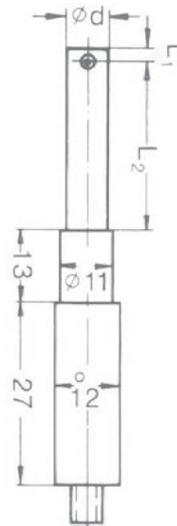
Jet Air Gage Plugs for Bores

Jet Air Gage Plugs for Through Bores

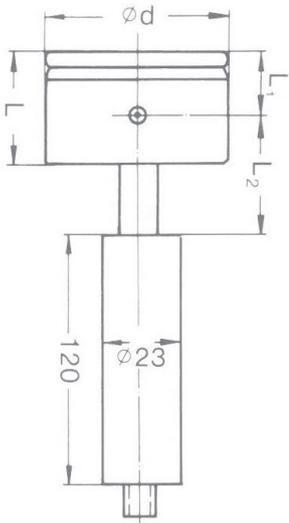


6002 Z hardened,
for indicator instruments
(dia. 3 - 5 mm)

Jet Air Gage Plugs for Blind Bores

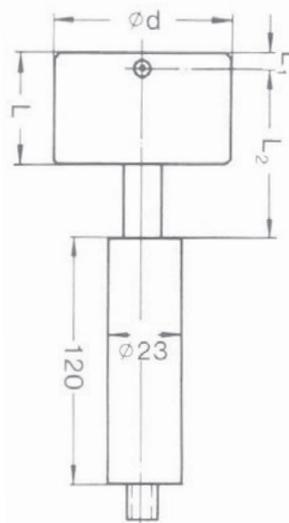


6012 Z hardened,
for indicator instruments
(dia. 3 - 5 mm)



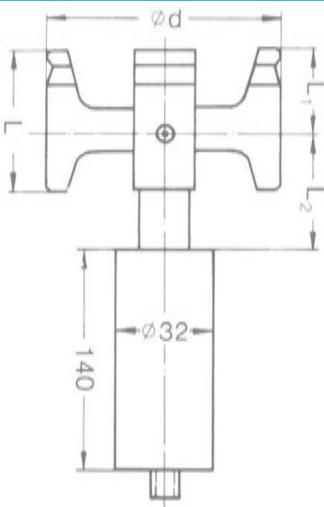
6001 Z hard-chrome plated
for indicator instruments
(dia. 5 - 80 mm)

6002 Z hardened,
for indicator instruments
(dia. 5 - 80 mm)



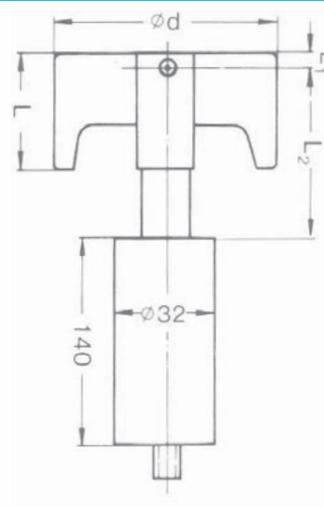
6011 Z hard-chrome plated,
for indicator instruments
(dia. 5 - 80 mm)

6012 Z hardened,
for indicator instruments
(dia. 5 - 80 mm)



6001 Z hard-chrome plated,
for indicator instruments
(dia. 80 - 100 mm)

6002 Z hardened,
for indicator instruments
(dia. 80 - 100 mm)



6011 Z hard-chrome plated,
for indicator instruments
(dia. 80 - 100 mm)

6012 Z hardened,
for indicator instruments
(dia. 80 - 100 mm)

Jet Air Gage Plugs for Bores

Jet Air Gage Plugs for Through Bores¹

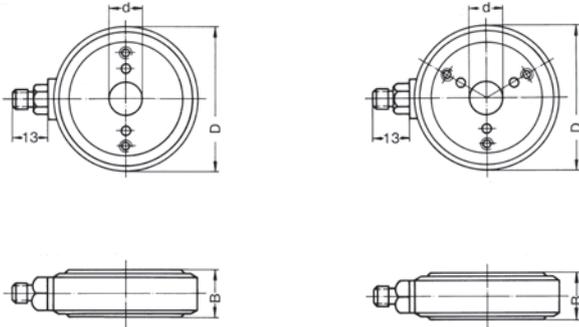
Type	dia. d	L1	L2 (mm)	Order no.
6001	5 to 8	10	35	5260102*
	8 to 10	10	40**, 70, 100, 150	5260103*
	10 to 13	10		5260104*
	13 to 15	20		5260105*
	15 to 20	20	5260106*	
	20 to 25	20	5260107*	
	25 to 30	20	60**, 110, 160, 210, 260, 310	5260108*
	30 to 35	20		5260109*
	35 to 40	20		5260110*
	40 to 45	20	5260111*	
	45 to 50	20	5260112*	
	50 to 55	20	5260113*	
	55 to 60	20	5260114*	
	60 to 65	20	50**, 100, 150, 200, 250, 300	5260115*
	65 to 70	20		5260116*
	70 to 75	20		5260117*
	75 to 80	20	5260118*	
	80 to 85	30	55**, 105, 155, 205, 255, 305	5260119*
85 to 90	30	5260120*		
90 to 100	30	5260121*		
100 to . . .	on Request			
6002	3 to 4	10	20	5260200*
	4 to 5	10	22	5260201*
	5 to 8	10	35	5260202*
	8 to 10	10	40**, 70, 100, 150	5260203*
	10 to 13	10		5260204*
	13 to 15	20		5260205*
	15 to 20	20	5260206*	
	20 to 25	20	5260207*	
	25 to 30	20	60**, 110, 160, 210, 260, 310	5260208*
	30 to 35	20		5260209*
	35 to 40	20		5260210*
	40 to 45	20	5260211*	
	45 to 50	20	5260212*	
	50 to 55	20	5260213*	
	55 to 60	20	5260214*	
	60 to 65	20	50**, 100, 150, 200, 250, 300	5260215*
	65 to 70	20		5260216*
	70 to 75	20		5260217*
75 to 80	20	5260218*		
80 to 85	30	55**, 105, 155, 205, 255, 305	5260219*	
85 to 90	30		5260220*	
90 to 100	30		5260221*	
100 to . . .	on Request			

Jet Air Gage Plugs for Blind Bores¹

Type	dia. d	L1	L2 (mm)	Order no.
6011	5 to 8	10	35	5261102*
	8 to 10	10	40**, 70, 100, 150	5261103*
	10 to 13	10		5261104*
	13 to 15	20		5261105*
	15 to 20	20	5261106*	
	20 to 25	20	5261107*	
	25 to 30	20	60**, 110, 160, 210, 260, 310	5261108*
	30 to 35	20		5261109*
	35 to 40	20		5261110*
	40 to 45	20	5261111*	
	45 to 50	20	5261112*	
	50 to 55	20	5261113*	
	55 to 60	20	5261114*	
	60 to 65	20	65**, 115, 165, 215, 265, 315	5261115*
	65 to 70	20		5261116*
	70 to 75	20		5261117*
	75 to 80	20	5261118*	
	80 to 85	30	70**, 120, 170, 220, 270, 320	5261119*
85 to 90	30	5261120*		
90 to 100	30	5261121*		
100 to . . .	on Request			
6012	3 to 4	10	20	5261200*
	4 to 5	10	22	5261201*
	5 to 8	10	35	5261202*
	8 to 10	10	40**, 70, 100, 150	5261203*
	10 to 13	10		5261204*
	13 to 15	20		5261205*
	15 to 20	20	5261206*	
	20 to 25	20	5261207*	
	25 to 30	20	60**, 110, 160, 210, 260, 320	5261208*
	30 to 35	20		5261209*
	35 to 40	20		5261210*
	40 to 45	20	5261211*	
	45 to 50	20	5261212*	
	50 to 55	20	5261213*	
	55 to 60	20	5261214*	
	60 to 65	20	65**, 115, 165, 215, 265, 315	5261215*
	65 to 70	20		5261216*
	70 to 75	20		5261217*
75 to 80	20	5261218*		
80 to 85	30	70**, 120, 170, 220, 270, 320	5261219*	
85 to 90	30		5261220*	
90 to 100	30		5261221*	
100 to . . .	on Request			

¹ Please state unit magnification and workpiece tolerances when ordering
 * Metrology Systems Division ** Standard version

Air Rings for Cylindrical Shafts



Millimar 6300
Jet air ring gages with 2 measuring jets

Millimar 6303
Jet air ring gages with 3 measuring jets

Technical Data

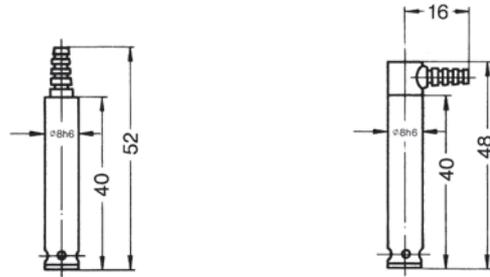
Jet air ring gages with 2 measuring jets¹

Type	dia. d mm	dia. D mm	B mm	Order no.
6300	3 to 8	66	18	5263017*
	8 to 14	66	18	5263018*
	14 to 20	66	18	5263019*
	20 to 26	80	22	5263020*
	26 to 32	80	22	5263020*
	32 to 38	66	24	5263022*
	38 to 45	74	26	5263023*
	45 to 52	80	28	5263024*
	52 to 60	88	30	5263025*
	60 to 68	96	32	5263026*
	68 to 76	104	34	5263027*
	76 to 84	112	36	5263028*
	84 to 92	120	38	5263029*
	92 to 100	128	40	5263030*
	100 to	on Request		

Jet air ring gages with 3 measuring jets¹

Type	dia. d mm	dia. D mm	B mm	Order no.
6303	3 to 8	66	18	5263301*
	8 to 14	66	18	5263302*
	14 to 20	66	18	5263303*
	20 to 26	80	22	5263304*
	26 to 32	80	22	5263305*
	32 to 38	66	24	5263306*
	38 to 45	74	26	5263307*
	45 to 52	80	28	5263308*
	52 to 60	88	30	5263309*
	60 to 68	96	32	5263310*
	68 to 76	104	34	5263311*
	76 to 84	112	36	5263312*
	84 to 92	120	38	5263313*
	92 to 100	128	40	5263314*
	100 to	on Request		

Pneumatic Jet Air Gages 6900-6918



Millimar 6900 to 6903
Millimar 6910 to 6913
Jet air gages, straight

Millimar 6905 to 6908
Millimar 6915 to 6918
Jet air gages, cranked

Description

Millimar jet air gages have all the advantages of contact-free, pneumatic length measurement.

Measuring values are recorded by a hardened jet that is recessed and protected from damage by a hardened-metal ring.

Millimar jet air gages are especially suited to test workpieces with a sensitive surface that would be damaged by mechanical contact.

When used in the manufacturing environment, there is an additional advantage to the measuring jets: Due to the outflowing air, the workpiece surfaces are freed from filth, such as oil, water and dust.

To adjust jet air gages with **Millipneu** measuring units, setting gages are needed whose outer form matches that of the test specimen.

¹ Please state unit magnification and workpiece tolerances when ordering
* Metrology Systems Division

Accessories



Millimar 6105 Setting Rings for jet air gage plugs and contact gage plugs.
Millimar setting rings have been carefully hardened, aged, ground and lapped.

Quality	N
Manufacturing tolerance	JS3
Cylinder form tolerance	0.4 x numerical value of IT4

Millimar 6107 Setting Rings for jet air gage plugs.

Millimar setting rings have been carefully hardened, aged, ground and lapped.

Quality	S
Manufacturing tolerance	JS3
Cylinder form tolerance	0.1 x numerical value of IT4
Measuring uncertainty of the labeled nominal value	0.5 x numerical value of IT1



Millimar 6400 Setting Plugs for Jet Air Measuring Rings.

Millimar setting gage plugs have been carefully hardened, aged, ground and lapped.

Manufacturing tolerance	JS3
Cylinder form tolerance	0.1 x numerical value of IT3

Measuring uncertainty of the labeled nominal value	0.5 x numerical value of IT1
--	------------------------------



Air Treatment Unit 7052

Filter 5 μ m
 pressure manometer,
 pressure 0.5 - 12 bar
Order no. 7027929*

Air Treatment Unit 7046

To supply the **Millimar** units with filtered air and treated measuring air.
 The air filter cleans dirt, water and oil out of the supply air.

Order no. 5270460*



Handle with manual slide valve for jet air gage plug 5 - 80 mm
Order no. 7007838*

Handle with manual slide valve for jet air gage plug 80 - 150 mm
Order no. 7007836*



Note

All settings rings and setting plugs are delivered with a test certificate as per DIN 55350-18-4.2.2.



Millimar Hose

to connect a pneumatic measuring element with a **Millimar** C1208, C1245, S184x, X17xx, X1941. Connection M10/plug sleeve NW6, length 2m

Order no. 5330913*

Millimar 7110/2 Hose

to connect a **Millimar** C1208, C1245, S184x, X17xx, X1941 with an air treatment unit. 10x1.5 incl. reduction to 8, length 2 m

Order no. 5271109*

Millimar Connecting Hose

to connect a **Millimar** C1208, C1245, S184x, X17xx, X1941 with an air treatment unit. 10x1.5 incl. reduction to 8, length 2 m

Order no. 5330917*

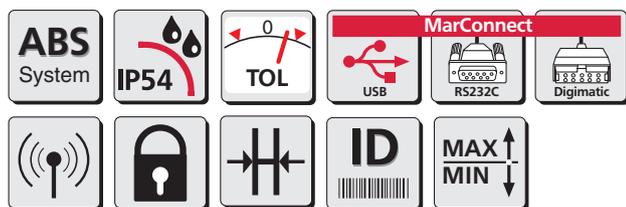
Millimar. Air Evaluation Units

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. | ◀



μDimensionair® II Universal, pneumatic hand measuring tool



Features

- Non-contact diameter measurements in bores or on shafts
- Measuring plugs, measuring rings or measuring jaws can be easily interchanged
- Power supplied by batteries enables very flexible use of μDimensionair, regardless of location
- Display, P/E converter, handle and measuring element form a handy unit
- An ideal alternative to classical measuring chains (measuring element and evaluation unit)
- Flexible used due to different combination possibilities of the individual components
- Easy to handle, like a dial gage
- Large display, with large digits and easy to read analog bar for optimal reading of the measuring values
- The display can be rotated 270°, enabling it to be optimally set up for the most different applications
- The robust design of the μDimensionair makes it ideal for the workshop environment and the production site.
- Protection class IP54. Dirt and liquids cannot damage it.
- With a printer or computer, the measuring results can be protocolled via a data interface.

All standard measuring elements (jet air gage plugs, jet air measuring jaws) can be easily fastened on the μDimensionair using the supplied adapter.

Technical Data

μDimensionair II



	Meas. plug magnification
Measuring Range	
± 0.080 mm	2500:1
± 0.040 mm	5000:1
± 0.020 mm	10000:1
Data Output	USB / ASCII / Digimatic
Battery Life	6000 hours
Operating Temperature	5 - 35° C
Storage Temperature	0 - 60° C
Repeatability	± 1 digit (LSD)
Linear Error	± 1% of full scale (LSD)
Response Time	ca. 1 s
Thermal Stability	0.1% of full scale/°C
Tolerance Indicators	Two — over/under (3 classes)
Weight	25 kg
Dimensions	ca. 100 x 60 x 70 mm
Auto OFF	15 minutes of non-use
Power Requirements	3 volt lithium battery, 2 per unit - Type CR-2450
Air Supply	2.10 ± 0.01 bar
Display	Rotates through 270°
Order no.	2103200^{1*}

Accessories

	Order no.
Pressure regulator with filter	2238020*
Universal bench kit	2239307*
Battery 3V Type CR-2450	4102520*
μDimensionair Data Cable Opto RS232 (2m)	SCB-4*
Data Cable Digimatic (2m), flat plug, 10-pin	2001025*
μDimensionair II Data Cable USB (2m) MarCom or PC	4346023*
Data Cable Opto RS232 (2m)	4346020*
Data Cable Digimatic (2m), flat plug, 10-pin	4346021*

¹ Includes handle, adapter and connection hose

* Metrology Systems Division

Millimar 1020 / 1040 Display units for single and sum measurements



Description

Millimar dial gages determine the changes in air pressure, the pressure differential being measured between two pressure chambers. While one of the two chambers delivers a constant reference pressure, the pressure in the other chamber (measuring chamber) is determined by the distance between the measuring jets of a pneumatic probe and the testpiece.

The pressure differential is displayed by means of a highly precise, ruby-bearing air/mechanical converter which ensures fast display of measured values and complete measuring accuracy over the long term.

Since the measuring jet has an overpressure of 2 bar, constant measuring conditions exist which are essentially unaffected by the location of the measuring jets relative to the testpiece or by other external circumstances.

Features

Millimar 1020

Dial gage with fixed magnification and zero setting. Instrument adjustment using a setting gage.

Millimar 1040

Dial gage with precisely adjustable magnification and zero setting; instrument adjustment using two setting gages (minimum and maximum).

Millimar dial gages can be converted to other measuring ranges by simply changing the instrument jet and scale.

Applications

- Length and mating measurements of all kinds
- In conjunction with jet air plugs: measurement of bores of dia. 3 mm (.1181") and above, with display of diameter and calculation of conicity and roundness deviation (without additional input)
- In conjunction with jet air ring gages: Shaft measurements
- With **Millimar** jet air gages: Thickness measurements
- In conjunction with contact gages: Measurement of angularity straightness, or bores, etc.

Technical Data

Millimar 1020

Graduation	0.5 μm	1 μm	2 μm
Measuring ranges ¹	25 μm	50 μm	100 μm
Magnification	10000	5000	2500
Scale length	182 mm		
Tolerance index	2		
Max. measuring error	2 % of measuring range		
Zero setter	1 pneumatic large range setter over the entire scale range		
Zero setting range	1, via hose 7110 oder 7120 (connecting thread M 10 x 0.75)		
Probe connection	1, via high pressure hose 7100 (connecting thread M 14 x 1.5)		
Compressed air connection	3.5 to 10 bar overpressure		
Operating air pressure	150 x 195 x 250 mm (with pressure reducer and quick-action closing valve)		
Dimensions			

Order no.

5210200*

Millimar 1040

Magnification adjuster	
Max. measuring error	1.5 % of measuring range
Other data as per Millimar 1020	

Order no.

5210400*

¹ Measuring ranges are determined by the choice of magnification. Instrument jets and scales can be exchanged.

* Metrology Systems Division

Millimar C 1208 PE Compact, user-friendly length measuring unit



Model types and Accessories

			Order no.
C1208 PE	10000 M	Mahr compatible	5312090*
C1208 PE	5000 M	Mahr compatible	5312091*
C1208 PE	2500 M	Mahr compatible	5312092*
C1208 PE	10000 F	Mahr Federal compatible	5312093*
C1208 PE	5000 F	Mahr Federal compatible	5312094*
C1208 PE	2500 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*
Foot Switch for Millimar for	
Input 1	5330955*
Input 2	5330956*
Input 3	5330957*

* *Metrology Systems Division*

Features

Functions

- Favorites, using the SELECT button, frequently required settings can be directly called up
- Static measurements $\pm A$, $\pm B$ 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 D10005

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 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 ± 0.001 , .0003; .001; .003; .01; .03; .1; .3 inch or tolerance related

Measuring range / resolution

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



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

The following modules are available:

- 4 inputs for inductive probes (alternatively compatible with probes from Mahr, Tesa, Mahr Federal)
- 2 inputs for incremental probes
- 1 input for pneumatic measuring devices
- 4 inputs for D.C. voltage signal

Model types

Model	Resolution	Accessories	Order no.
C1245 PE/M	2500	with pressure reducer	5331261*
C1245 PE/M	5000	with pressure reducer	5331262*
C1245 PE/M	10000	with pressure reducer	5331263*

For 2 pneumatic probes

C1245 PE/M 2	2500	with pressure reducer	5331285*
C1245 PE/M 2	5000	with pressure reducer	5331286*
C1245 PE/M 2	10000	with pressure reducer	5331287*

* Metrology Systems Division

Technical Data

Display	Analog indicator instrument, LCD 53 x 40 mm
Analog scale	145 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 ± .0003; .001; .003; .01; .03; .1; .3 inch

Measuring range / resolution

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
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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, 47 Hz to 63 Hz
Mains unit	
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



Features

- Easy to read 3-color analog display
 - For measurements with pneumatic measuring devices
 - One input for pneumatic measuring devices (alternatively compatible to PE systems from Mahr or Mahr Federal)
 - Extensive calculation of input signals: $\pm A$
 - Dynamic measurements: Max, Min, Max-Min, Mean
 - Programmable either via the integrated membrane keyboard or RS232 interface via MS-Window configuration software
 - Programmable warning and tolerance limits, segment colors change from green to yellow or red when tolerances are exceeded
 - Backlit, two-line LCD for the display of measuring values, help tests and units of measurement
 - Three digital inputs (e.g. measuring start, master measurement)
 - Three digital outputs for GO - NO GO - rework, measuring time
- Supplied with: Mains power supply plug

Model types and Accessories

Millimar S 1840 PE to connect pneumatic measuring devices

		Order no.
S 1840 PE	2500:1 Z	5318450*
S 1840 PE	5000:1 Z	5318451*
S 1840 PE	10000:1 Z	5318452*

Accessories

Base foot with pressure reducer 1 x		5330910*
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*

* Metrology Systems Division

Technical Data

Analog display	101 LED elements, 3-color
Range and text display	7 characters LCD, 14 segment, alphanumerical
Measured value display	7 characters, 7 Segment
Tolerance display	via color range of the analog display
Display ranges	$\pm 1, 10, 30, 100, 300, 1000, 3000, 10000 \mu\text{m}$ $\pm .0001; .0003; .001; .003; .01; .03; .1; .3$ inch or tolerance related
Error limits	
10 x analog display	1 % (101 LEDs)
Digital display	± 1 digit
Temperature coefficient	$\pm 0.005 \text{ } \%/^{\circ}\text{C}$
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 to 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
Weight	ca. 1.6 kg

Millimar S 1841 PE Intelligent recording and clear display of complex measuring tasks



Description

The **Millimar S 1841 V** signal sharing column amplifier is the ideal evaluation and display instrument for multi-gaging stations on the shop floor.

It is the first instrument to combine the power of a cutting-edge measuring computer with the unrivalled clarity of a column amplifier. The result is a highly innovative instrument that can open entirely new dimensions for implementing your measuring tasks.

You increase the reliability of your production processes since the measured values are extremely easy to read.

You make a considerable contribution to the cost-effectiveness of your measuring equipment - the modular design of the concept means that the **Millimar S 1841 V** can also be adapted easily to the measuring tasks of the future.

This measuring instrument features intuitive parameterization and will therefore be well received by your quality assurance personnel.

Features

Display

Up to 4 indicating strips and operating columns can be mounted on a base unit

- Three-color illuminated bar graph with warning and tolerance limits as an analog display
- Two-line backlit LCD display to show the measuring values, help texts and measuring units
- Up to 2 features can be simultaneously displayed per column

Functions

- 16 characteristics may be defined
- A formula editor (80 characters) serves for the mathematical combination of input channels C1 to C16, using the 4 basic arithmetic operations including functions and parentheses
- Static measurements: instantaneous value, square root, ARC tangent
- Dynamic measurements: Max, Min, Max - Min, Max + Min, mean value
- Statistical functions: n, x-bar, S, Xmax, Xmin, R
- Memory for 5000 measured values

- Measurement is started / stopped via keyboard, digital input, RS232.

Connections

- 4 input modules can be fitted in the base unit, the following modules are available:
 - 4 inputs for inductive probes (compatible with either Mahr, Tesa, Marposs or Federal probes)
 - 2 inputs for incremental probes
 - 1 input for pneumatic measuring equipment
 - 4 inputs for D.C. voltage signals
- RS232 interface
- Analog output
- 6 digital inputs for start of measurement, master measurement/zero setting, sending data
- 12 digital outputs for up to 4 characteristics: GO - NO-GO - Rework classification, collective GO / NO-GO, measuring time, 10 classes, BCD interface, Go - out of warning limits - out of tolerance

Model types and Accessories

Input module for air gages

1 input channel for air gages
 Measuring value recorder Piezo
 Supply pressure 2 bar \pm 5 %
 > 4 bar before pressure reducer!
 Each module requires 1 pressure reducer

Magnification	Resolution	Order no.
2500:1	\pm 50 μ m	5331020*
5000:1	\pm 25 μ m	5331021*
10000:1	\pm 12.5 μ m	5331022*

Millimar S 1841

- | Order no. |
|---|
| 1 Indicating and operating column with base unit |
| 2 Indicating and operating columns with base unit |
| 3 Indicating and operating columns with base unit |
| 4 Indicating and operating columns with base unit |

Order no.

- | |
|-----------------|
| 5331001* |
| 5331002* |
| 5331003* |
| 5331004* |

* Metrology Systems Division

Technical Data

Bar graph	101 LEDs per indicator unit, 3-color
Range and text display	7-digit LCD, 14 segments, alphanumeric
Measured value display	7-digit LCD, 7 segments
Tolerance display	Via color change of bar graph
Display range	± 10, 30, 100, 300, 1000, 3000, 10000 μm ± .0003; .001; .003; .01; .03; .1; .3 inch or tolerance related
Measuring range, inductive probe	4000 (± 2000) μm or 400 (± 200) μm
Resolution	0.1 μm or 0.01 μm (digital display)
Units	mm / μm / inch
Carrier frequency	19.4 kHz (Mahr)/13 kHz (Tesa)
Cutoff frequency	40 Hz (-3 dB)
Hold time of numerical display	≤ 0.250 s
Error limits	
– Scale division 10	≤ 1 % (101 LEDs)
– Numerical display	±1 digit
– Analog output	5% fullscale
– Digital output (RS232 and digital IO)	±1 digit
Repetition limit of display	1 digit
Switch repetition limit	≤ 0,1 mm
Hysteresis	Zero
Hysteresis of scale display	Zero
Temperature coefficient	± 0.005 %/°C
Maximum number of connectable pick-ups	Maximum 4 input modules of the following types: 4x inductive probes of type Mahr, Tesa 2x incremental probes of type Heidenhain 1Vp-p 1x pneumatic input of type Mahr or Federal 4x voltage signals ± 10 V, ± 5 V 2 x temperature measurement
Working temperature	0 °C to 45 °C
Operating temperature	0 °C to 55 °C
Storage temperature	-15 °C to +55 °C
Maximum relative humidity	80 %, non-condensing
Control inputs	6 opto-coupler inputs, 24 V / 10 mA
Control outputs	12 opto-coupler outputs, 24 V / 100 mA
Analog output	
– Voltage	± 4 V
– Sensitivity	adjustable
– Maximum load resistor	≥ 2 k
– Residual ripple	Mahr < 0,5 %
– Reference potential	0 V
– Cutoff frequency	≥ 250 Hz
Serial interface	RS232C; 9-pin Sub-D for PC or printer
Size of LCD field	ca. 38 x 35 mm per display unit
Dimensions (L x W x H)	Max. 245 x 225 x 487 mm
Weight	Max. ca. 8.5 kg
Power supply	90 VAC to 264 VAC
Power supply frequency	47 Hz to 63 Hz
Power consumption	max. 30 VA
Sicherung	2 A, time-lag fuse
Conformity	EN61010-1, EN55011, EN50082-2 EMV- regulation 89/336/EWG
Protection class	IP53, IEC 60529

Millimar Air / Electronic Converter

Description

The use of air / electronic converters which convert the measuring signal (air pressure) into an electrical signal has made it possible to connect this robust metrology with modern electronic measuring data processing in measuring computers and the connection to QS systems.

Main characteristics are:

- Compact construction form
- Robust housing made from one massive aluminum block
- Splash-proof
- Simple integration – can be set up side by side
- Pressure regulator is separate from converter
- Can be used together with all Mahr length measuring units
- Can be set to all common magnifications (measuring range)
- High stability from zero point and magnification
- Low noise
- Special measuring amplifier 1901 IC with direct current output available for measuring control

Configuration and Mode of Operation

Measuring nozzle, comparative nozzle (with pneumatic zero setter) and 2 pre-nozzles form a pneumatic bridge which contains a membrane. The shifting of the membrane due to the measuring pressure is recorded by an inductive measuring system. The output of the measuring system delivers a signal that is compatible with the carrier frequency systems of the Millimar units from Mahr.

	Converter X 1941	Converter 1940
Sensor principle	Piezo-electrical	Inductive
Output signal	D. C. voltage	Carrier frequency
Meas. range in μm	100 / 50 / 25	100 / 50 / 25
Combinable with	SPS inputs	Millimar units

Millimar 1940. Air / Electronic Converter



Air-controlled probes are becoming more and more widespread in dimensional metrology. Air / electronic converters convert the measuring signal (air pressure) into an electronic signal.

Millimar 1940 is particularly well-suited to measurements with narrow tolerances. Its cutting-edge carrier frequency measuring system means it can be connected to the evaluation instruments in the same way as an inductive probe.

Millimar X 1941 Air / Electronic Converter



Air/electronic converters convert the signals from pneumatic measuring equipment (air pressure) into electrical signals. The piezo-electrical measuring system means that the **Millimar X 1941** air / electronic converter can be finely aligned with most of the pneumatic systems on the market. The **Millimar X 1941** has an analog signal output. It can therefore be very easily connected to the measuring computer and control system.

Precision Pressure Reducers



These devices create the normal pressure of 2 bar needed to operate the air/electronic converter from the overpressure of approx. 5 bar. Since this pressure must be precisely constant, the precision pressure reducers from Mahr are prescribed for the operation of the converter **Millimar 1940**.

The pressure reducers are delivered in 3 different versions:

- Precision pressure reducers without the possibility to block off the measuring air (standard version)
- Precision pressure reducers with the possibility to block off the measuring air due to a pneumatic signal
- Precision pressure reducers that block the measuring air can be conducted with an electrical signal (e.g. 24 V = from an SPC).

Millimar. Engineered Solutions

MEASURING INSTRUMENTS FOR DIMENSIONAL METROLOGY

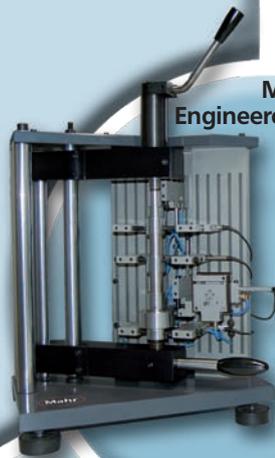
► | The design and manufacture of high-precision, reliable part-specific gages requires extensive metrological experience and expertise. Cutting-edge **Millimar** length measurement components provide reliable measuring instruments for a wide range of different workpiece geometries with different levels 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. | ◀

Millimar Probes

- Inductive probes
- Incremental probes
- Electronic indicating plug gages
- Pneumatic measuring devices
- Air / electronic converters



Mahr Engineered Solutions



Millimar Evaluation instruments

- Compact devices
- Column amplifiers
- Measuring computers



Millimar Measuring instruments

- Measuring tables, see Chapter 8
- Universal measuring instruments
- Gages from standard elements



Millimar. Engineered Solutions

The ever growing precision and productivity of machine tools is increasingly shaping the development of production technology. This is leading to improved stability and reliability in production processes. It also means full testing is no longer needed within the manufacturing chain. Nonetheless, the need for test equipment for use outside the production process is increasing accordingly.

The requirements for these — generally — single-purpose measuring instruments are:

- Appropriate precision in the mechanical sector which represents the core of the measuring instrument
- Reliability, robust design and ergonomic handling for use in demanding production environments
- Probes with appropriate resolutions and linearities for representing narrower and narrower manufacturing tolerances
- Evaluation systems that take into account the increased speed of IT development and are able to condense measured values into statistical data and transfer this data to control consoles for process monitoring

Project planning

Workpiece drawings are used in close cooperation with the customer to define the requirements of the gage in terms of: Measurement task, test quantity, test scope, test cycle, recording and processing of measured values, loading and unload, level of automation, classification, evaluation, calibration, documentation, system environment, system interfaces, special acceptance testing regulations and much more.

Design

Experienced designers develop the ideal technical solution for your measuring task, taking into account all the special requirements that the measuring instrument needs to satisfy. A part-specific gage is produced based on the high-precision, reliable components in the Mahr Length Metrology product range. This includes an extensive amount of data relating to modules and assemblies for existing gages.

Manufacture and assembly

Individual parts are manufactured and assembled by skilled experts in our DIN EN ISO 9001 and VDA 6.4 certified plant in Göttingen.

Putting into service

Instruments can be put into service, including integration into the production line, and acceptance testing can be performed either at the Mahr plant or at the installation location. If required, this can also be done in accordance with the customer's own procedures and/or internal standards (i.e. measuring instrument compatibility certificate).



Electronic multi-gage measuring device to test 6x diameter and perpendicularity



Taper jet air ring gage with 2 measuring paths on 2 planes each to test 4x diameter, 2x taper angle, 2x taper pitch



Jet air plug gage mounted on a floating bearing with position query to diameter and determination of position

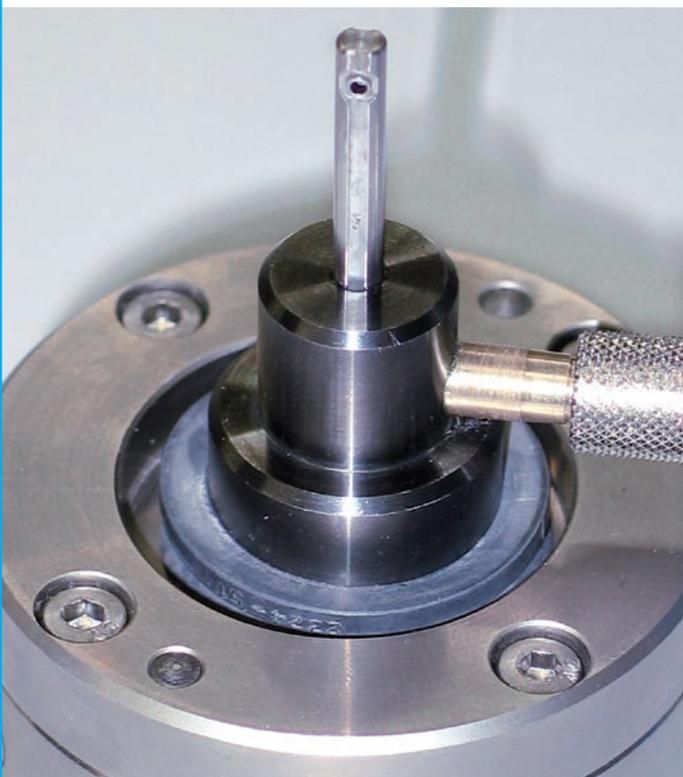
Pneumatic Measuring Devices for Inside and Outside Diameter Measurement



Valve seat plug



Pneumatic combination measuring device



Jet air plug gage with floating bearing

Pneumatic measurements with jet air gages is a non-contact measurement with high resolution and low workspace requirement. An extremely small distance between different measurement planes can be selected.

The corresponding arrangement of jet air gages enables not only diameter to be measured, but also form tolerances such as cylinder form, taper angle, straightness etc.

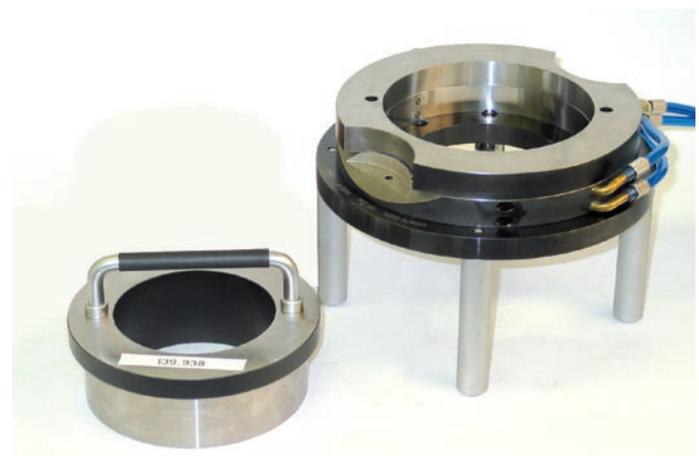
Due to the smallest size possible, they are suitable for small inside and outside diameters (valve guide bores) and do not require a great amount of maintenance.

They can be used for low workpiece tolerances (mainly used for ground workpieces or workpieces with precision bores $Rz \leq 6.3$). For large roughness depths, a contact measurement must be used.

The jet air gages do not touch the workpiece. Also for minimum size workpieces there is always a minimum gap. The measuring forces are insignificantly small. The opposing surface which the jet air gage blows upon must be at least as wide as the outside diameter of the gage.

Jet air plug gages and rings are very robust and insensitive to filth (self-cleaning effect). Filth generally directly influences every measurement, however, pneumatic metrology offers a considerable advantage over normal tactile measurement. Residue from coolants or bore emulsions and small dirt particles are removed by the exiting air thus assuring a correct measurement, even without exaggerated cleanliness.

The design of the jet air gage form as well as their arrangement to the measuring organs makes it possible to measure the narrowest bars, polygonal parts, spherical parts as well as very thin-walled parts.



Pneumatic jet air ring gage

Air ring and plug gages are adjusted to fit the customer's specific measuring task, just like the tactile versions are. This makes all plug gages, but also ring gages, purely special models.

Product range:

- Plug gages for through bores
- Blind bore plug gages
- Special multi-gaging plugs gages
- Ring / plug gages with 2 or more jet air nozzles on the periphery
- Ring / plug gages with several measuring planes
- Ring / plug gages in incremental models
- Special measuring devices
- Straightness plugs
- Mating measuring devices
- Taper plug (SK, HSK, MK among others) and ring gages

Measuring devices for taper measurement

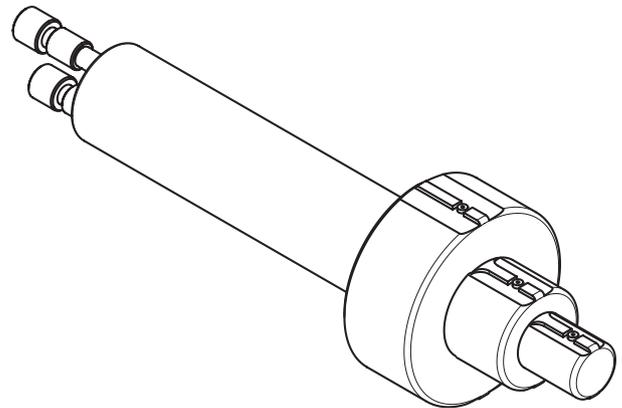
Millipneu taper jet air plug gages and taper jet air ring gages as well as tactile taper plug gages are used for the rational testing of Morse, steep, metrical and special tapers.

With taper plug gages, inside tapers are measured and outside tapers with taper ring gages.

The taper measuring devices with 2 measuring planes can determine the characteristics diameter and taper pitch/taper angle.

Taper measuring devices with 3 or more measuring planes enable the evaluation of the features diameter, taper angle/taper pitch and a statement as to the convexity.

By additionally attaching an inductive probe to taper measuring devices, the insertion depth can be determined.



Three-step air plug gage

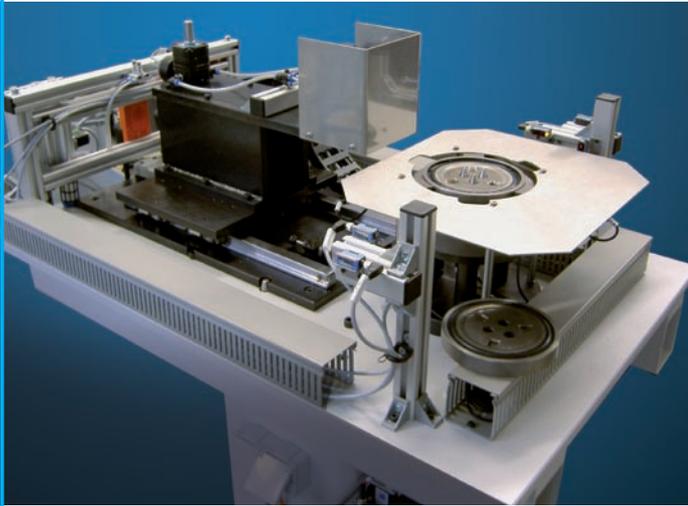


Taper air plug gage with taper attachment



Taper air plug gage with fixed attachment

Multi-Gaging Unit for Radial Run-Out / Axial Run-Out Relative to Reference Planes



Measuring unit for radial run-out/axial run-out using the example of pulleys

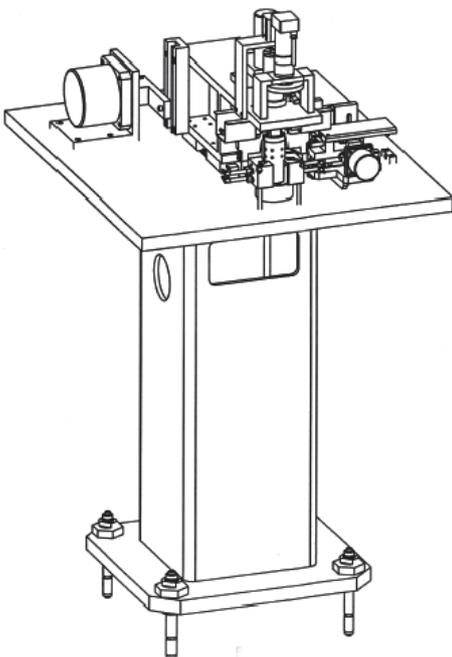
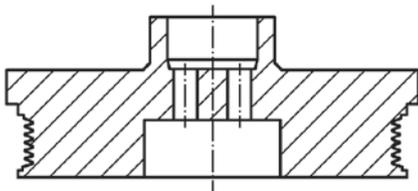
The measuring unit can be designed as a manual or semi-automatic version. The measuring unit can be loaded manually or automatically. After positioning the workpiece and leaving the work area of the measuring machine, the procedure is started via SPC. The vertical measuring unit for diameter and flatness then advances.

The swivel movement is motorized. Measuring value acquisition takes place dynamically for all measuring values. When the measurement ends, signals are passed on to the SPC. Scrap parts can be selected via a discarding process.

The measuring process is conducted via a control (e.g. Siemens S7). The procedure itself requires customer-specific adaptations.

The features are evaluated via a computer-controlled evaluation program (e.g. D 1200X), which takes the incoming measuring values, processes them according to customer specifications and puts them into the desired form of evaluation.

Features to be measured: diameter, distance, axial run-out, radial run-out, height.



Multi-Gage Measuring System for Connecting Rods

Measuring system for cylinders shown with the example of connecting rods

A semi-automatic measurement of cylindrical workpieces (e.g. connecting rods) can take place with a pneumatic or tactile method. Both methods may also be combined.

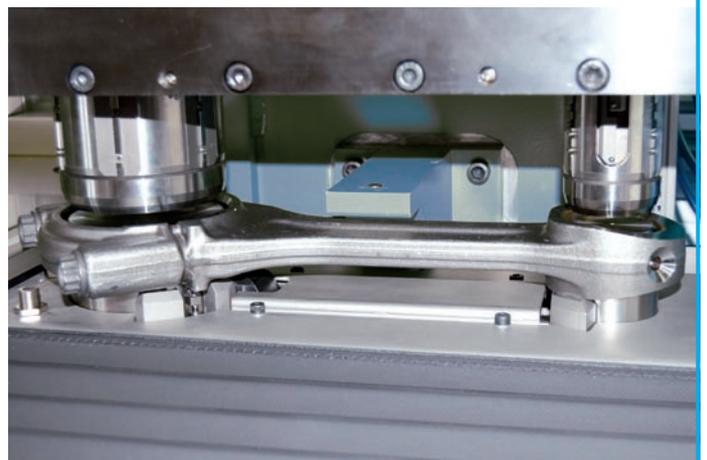
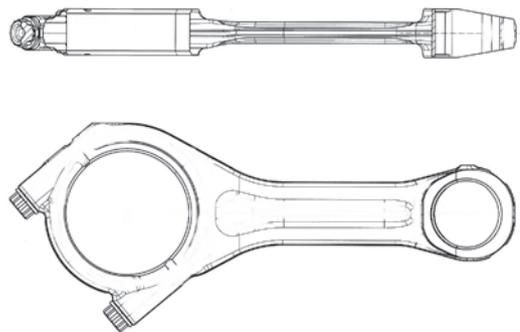
The diameter of a connecting rod eye can e.g. be measured pneumatically, however, the thickness of the connecting rod eye must be measured with a probe. Both evaluations are then used to calculate the perpendicularity of the connecting rod eye to the supporting surface.

After the precision positioning via a preceding tray which moves the workpiece into measuring position, the measuring head is automatically lowered into the measuring position (into the workpiece). The measurement is independent of the location. After the measuring values have been acquired, the measuring head and the preceding tray move back into their respective starting positions.

The measuring process is conducted via a control (e.g. Siemens S7) and the movements are conducted pneumatically. The procedure itself requires customer-specific adaptations.

The features are evaluated via a computer-controlled evaluation program (e.g. D1200X), which takes the incoming measuring values, processes them according to customer specifications and puts them into the desired form of evaluation.

Features to be measured: diameter, ovality, rods, offset, parallelism, thickness, perpendicularity, etc.



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.

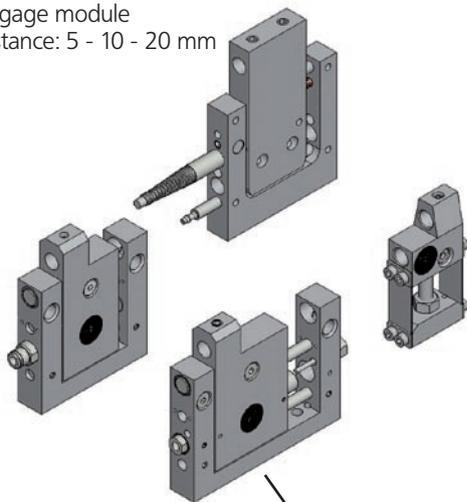
Economical

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.

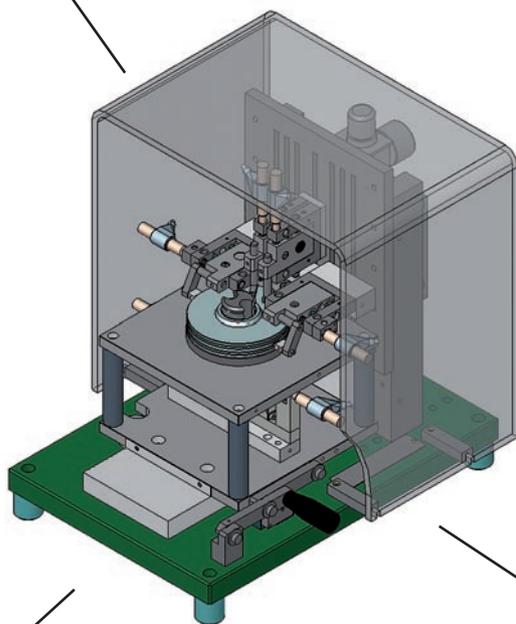
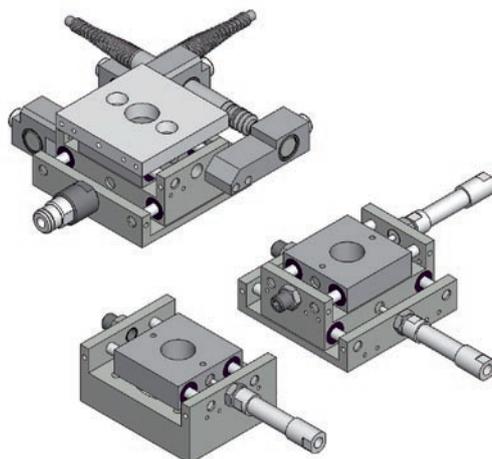
Below are just a few examples of the many factors that contribute to the cost effectiveness of the Millimar standard elements:

- 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.

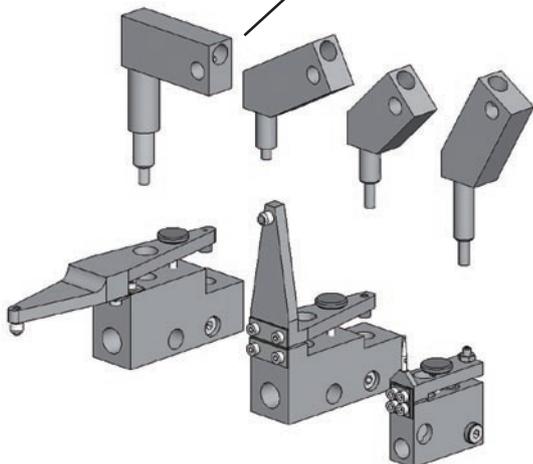
FP 1500 gage module
Travel distance: 5 - 10 - 20 mm



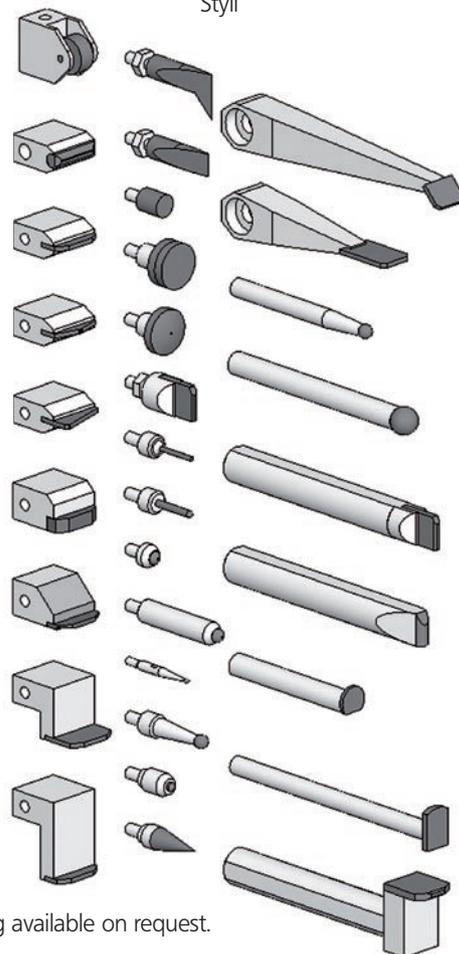
XY tables
Travel distance: 2.5 - 5 - 7 mm



Angular adjustment
0 - 30 - 45 - 60 - 90°



Styli



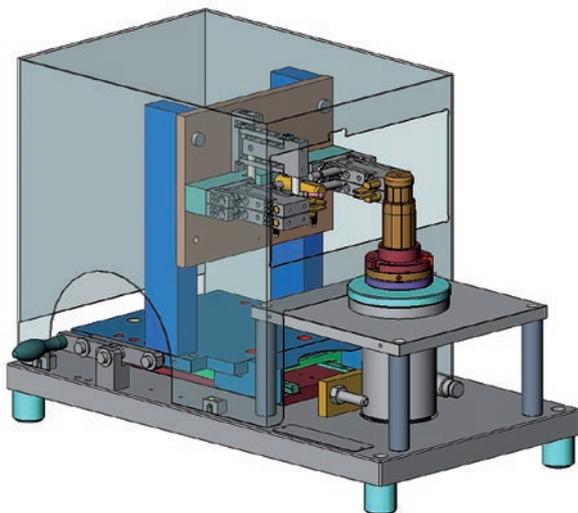
Specialized catalog available on request.

Standardized Measuring Devices



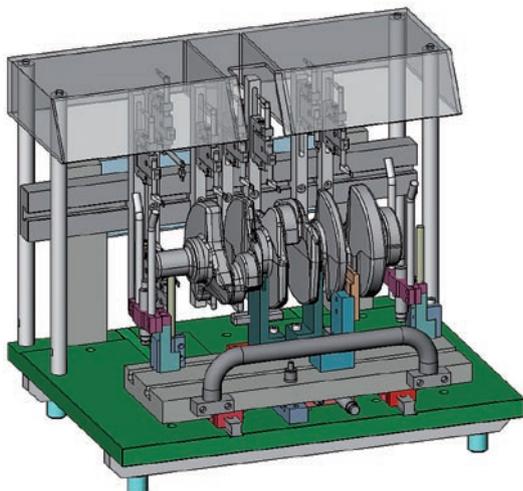
Vertical measuring device with pivoting clamping of workpiece between centers

These measuring devices allow inspection of diameter, length, and radial and axial run-out for rotationally symmetrical parts.



Measuring device with rotary table

Measuring devices with rotary table allow combined external and internal measurements and automatic radial and axial run-out testing.



Horizontal measuring device with clamping of workpiece on prisms or between centers, including workpiece loading table

The horizontal measuring device allows workpieces to be held on prismatic supports or between centers. This system is particularly suitable for heavy workpieces.

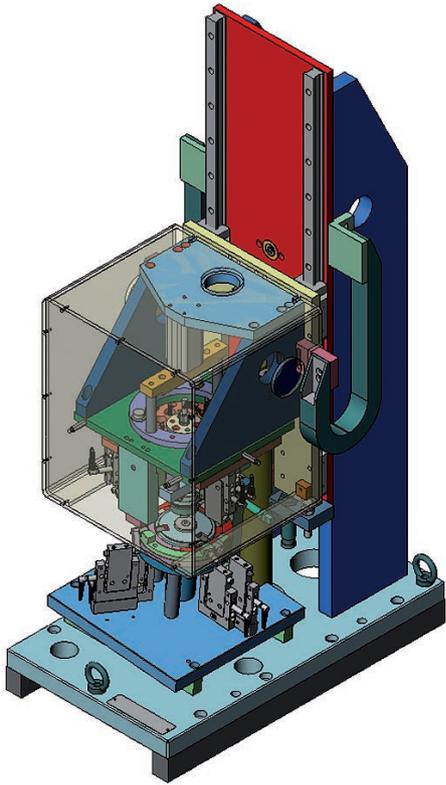
The workpiece can be loaded into the workpiece holder away from the actual measuring station.

Customized Measuring Devices

Customized measuring devices

Complete design and build service for automatic machines for integration into production lines.

Measurement results can be evaluated online to allow tool adjustments, statistical analysis, etc.



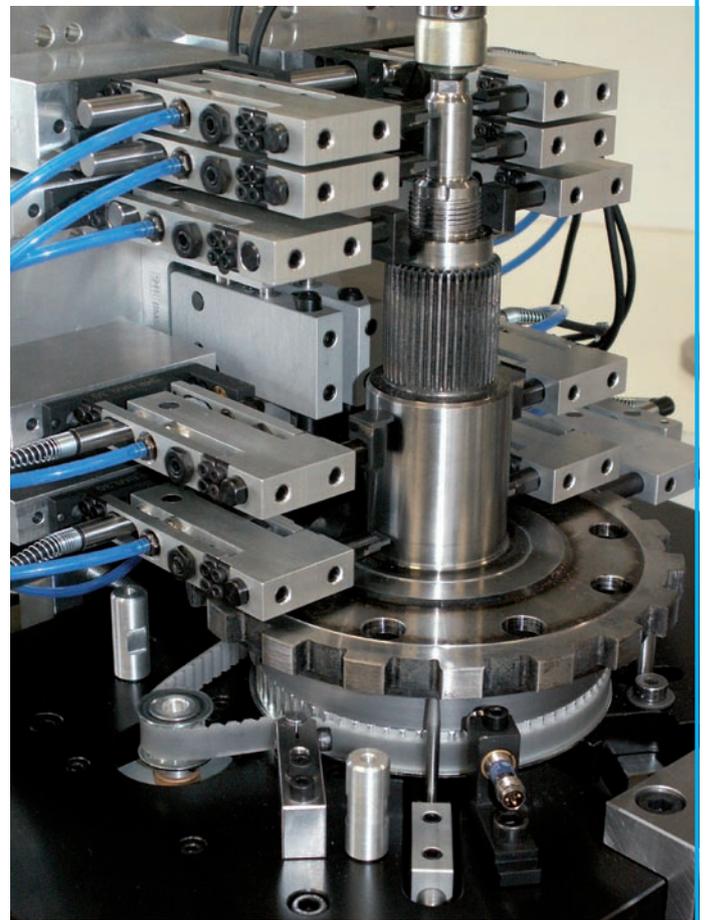
Automated measuring machines

Workpieces can be placed by robots, for example.

Loading and lifting is then carried out automatically.

The various gage modules are connected to our industrial measuring computer.

The **Millimar D1200X** software provides display and analysis of static and dynamic measurements and form deviations.



YOUR STABLE PARTNER FOR MANUFACTURING. **MARSTAND.**



The latest information on MARSTAND products can be found on our website:
www.mahr.com, WebCode 210

▶ | MarStand Indicator Stands, Comparator Stands and Run out Testing Instruments offer high stability 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

With Cast Iron Base

8- 2

MarStand 815 MA / 815 MB / 815MG / 815 P

With Magnetic Base

8- 3

Post & Support Arm Assemblies

MarStand 815 XN / 815 XMA / 815 XMB / 815 XMS / 815 XMG / 815 XP

With Mounting Thread and / or T-slot

8- 5

Magnetic Bases

MarStand 815 Y / 815 YP

8- 5

Center Bench

MarStand 818

With moveable Tail Stocks and Support Arms

8- 6

Comparator Stands

MarStand 820 N / 820 NC / 820 FC / 820 NG / 820 FG

Small Version

8- 8

MarStand 821 NG / 821 FG

Large Version

8-10

MarStand 824 NT / 824 FT / 824 GT

Heavy Version

8-11

Modular Units

MarStand 827 b

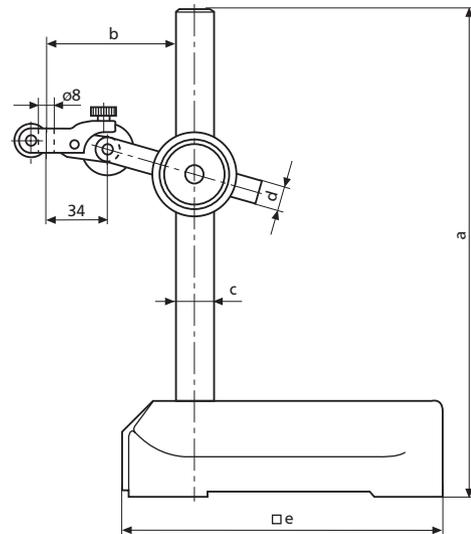
8-12

Indicator Stand 815 GN



Features

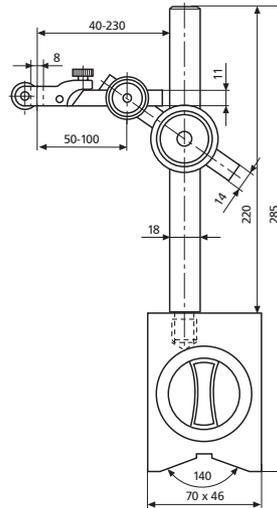
- Rugged base ensures both maximum stability and sturdiness
- The upper side of the base has a convenient hand grip
- Moves easily over surfaces without vibration
- Front of the base is ground to allow movement of the stand along edges and rules
- Stable due to the three point support
- Support arm can be finely adjusted
- Post and support arm are made from stainless steel
- Indicator can be rotated through $\pm 90^\circ$



Technical Data

Total height with base	Max. projection of support arm	Post dia.		Base surface	Fine adjustment range	Mounting hole	Weight	Order no. (excludes indicating instrument)
		c	d					
a	b	c	d	e	mm	mm	kg	
300	185	18	14	150 x 150	2	8H7	4.2	4413000
500	200	25	18	190 x 180	2	8H7	9	4413001
750	230	35	25	190 x 180	2	8H7	10	4413005

Indicator Stand 815 MA with magnetic base



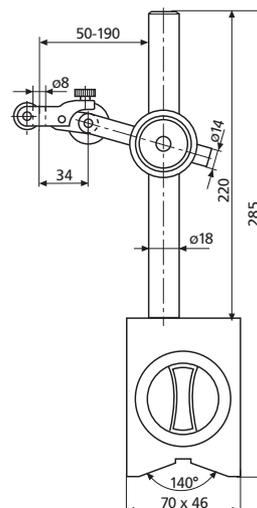
Features

- 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 mm	V-way for shaft dia. mm	Magnetic force N	Fine adjustment range mm	Mounting hole mm	Weight kg	Order no. (excludes indicating instrument)	Order no. wooden case
285	20 - 100	450	2	8H7	2.5	4416000	4416001

Indicator Stand 815 MB with magnetic base



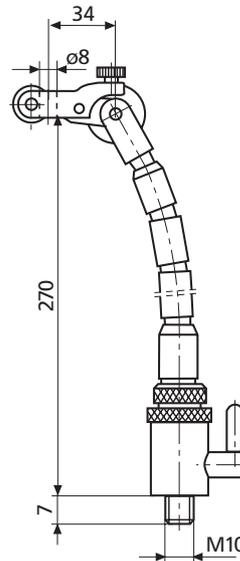
Features

- 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 $\pm 90^\circ$

Technical Data

Total height with base mm	V-way for shaft dia. mm	Magnetic force N	Fine adjustment range mm	Mounting hole mm	Weight kg	Order no. (excludes indicating instrument)	Order no. wooden case
285	20 - 100	450	2	8H7	2.2	4417000	4416001

Indicator Stand 815 MG with flexible stem



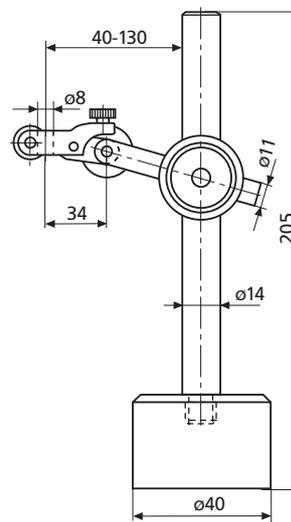
Features

- Flexible in any direction, arm can be locked in position
- The sleeves and grounded steel balls of the stem are compressed with a strong steel cable
- Clamping force is adjustable
- 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
- Support arm can be finely adjusted
- Indicating instrument can be rotated through $\pm 90^\circ$

Technical Data

Total height with base mm	V-way for shaft dia. mm	Magnetic force N	Fine adjustment range mm	Mounting bore mm	Weight kg	Order no. (excludes indicating instrument)	Order no. wooden case
350	20 - 100	450	1.5	8H7	1.9	4420000	4416001

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 $\pm 90^\circ$

Technical Data

Total height with base mm	Magnetic force N	Fine adjustment range mm	Mounting bore mm	Weight kg	Order no. (excludes indicating instrument)
205	250	1,5	8H7	0,7	4422000

Post and Support Assemblies 815 X

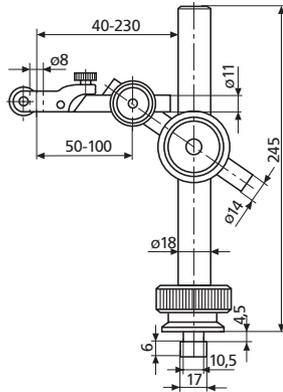
For application in inspection equipment for conducting length and concentricity (run-out) tests

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

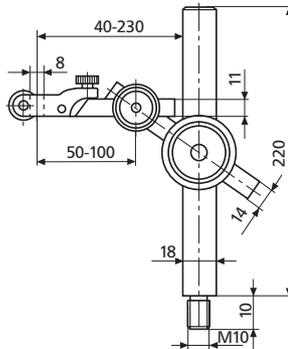


815 XMA

with mounting thread

- Two joints
- Post and support arm are made from stainless steel
- With fine adjustment

Order no. 4424005

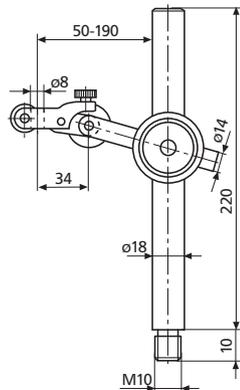


815 XMB

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.

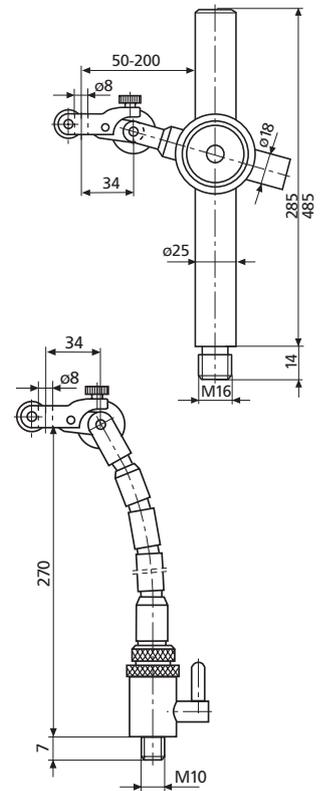
285 mm **4435011**
485 mm **4435015**

815 XMG

with mounting thread

- Flexible in any direction, arm can be locked in position
- With fine adjustment

Order no. 4424010

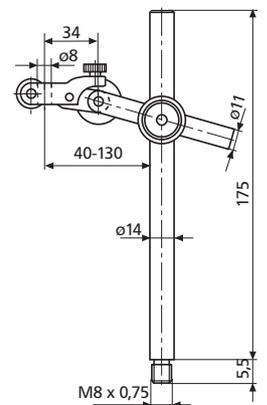


815 XP

with mounting thread

- One joint
- Post and support arm are made from stainless steel
- With fine adjustment

Order no. 4424015



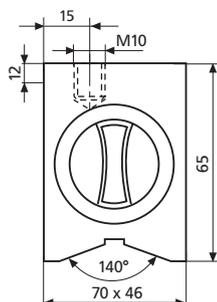
Magnetic Bases 815 Y

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

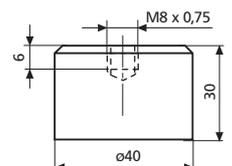
Order no. 4425000



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 (0.79")

Support Arm 818 XNB:

- Support arm with one joint
- with fine adjustment

Technical Data

Height of centers mm	Distance between centers mm	Base size (L x W) mm	Lateral and/or height difference of Tailstocks mm	T-slot width mm	Weight kg	Order no. (excludes indicating instrument)
50	0 - 200	350 x 110	0,01	10H7	8	4622200
75	0 - 350	500 x 110	0,01	10H7	12	4622201
100	0 - 450	700 x 180	0,01	12H7	35	4622202
150	0 - 450	700 x 180	0,01	12H7	38	4622203

Center Bench 818 with V-support

V-support height mm	Base size (L x W) mm	T-slot width mm	Weight kg	Order n. (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	Bestell-Nr. (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

818 pe V-support anvils in pairs

Center height mm	Dia. range mm	Order no.
50 / 75	3 - 15	4622210
100	8 - 45	4622211

818 pb V-support in pairs

Height mm	Dia. range mm	T-slot width mm	Order no.
70	5 - 20	10	4622215
120	5 - 45	12	4622216

818 ab Roller support in pairs

Height mm	Dia. range mm	T-slot width mm	Order no.
70	3 - 20	10	4622220
120	3 - 45	12	4622221

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

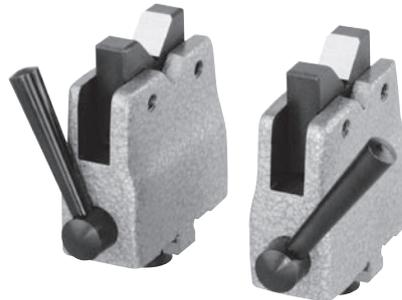
818 pe



818 ab



818 pb



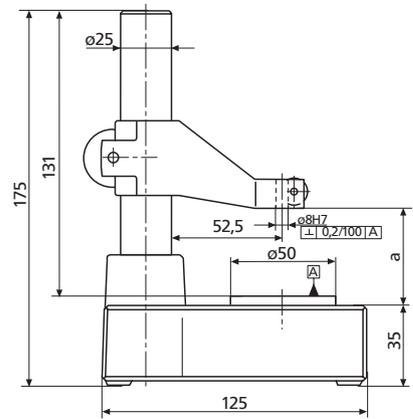
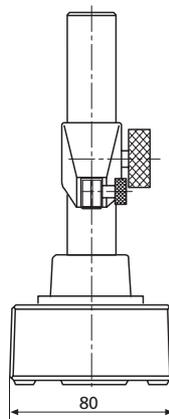
Small Comparator Stands 820

820 N



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 of a indicating instrument



820 N

Technical Data

	Working range a mm		Flatness tolerance (DIN 876) Grade	Mounting hole mm	Fine adjustment range mm	Weight kg	Order no.*	Remarks
820 N	0 - 110	steel	00	8H7		2.6	4430000	
820 NG	0 - 130	granite	0	8H7		3.2	4430100	
820 FG	0 - 130	granite	0	8H7	± 0.2	3.2	4431100	fine adjustment
820 NC	0 - 110	ceramic	00	8H7		4.0	4432100	
820 FC	0 - 110	ceramic	00	8H7	± 0.2	4.0	4433100	fine adjustment

* excludes indicating instrument

Small Comparator Stands 820

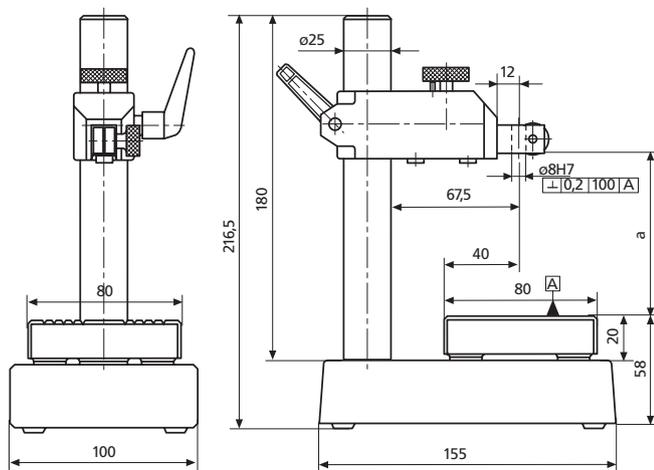
820 FC



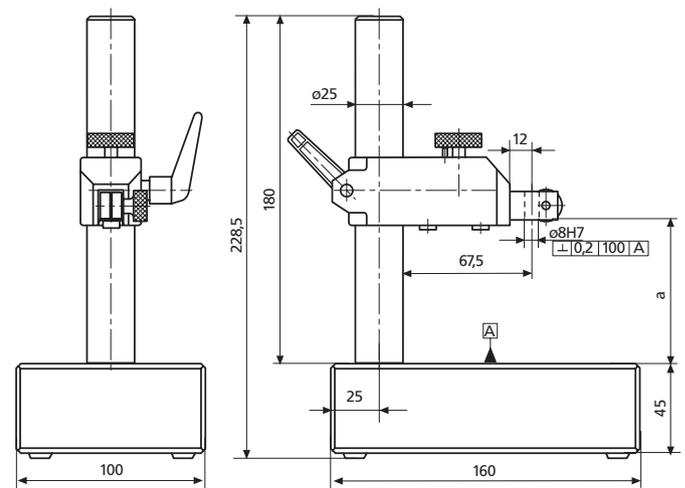
820 FG



820 FC



820 FG



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)

107 V

(Single)
(Pair)

Order no.

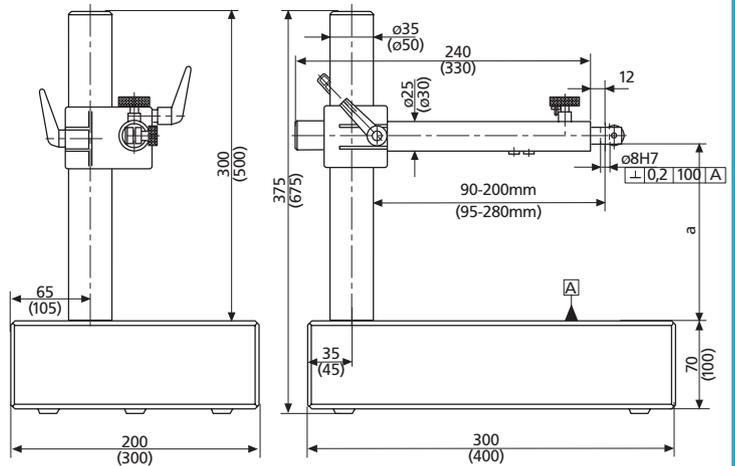
4229000
4229001

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 mm	Flatness tolerance (DIN 876) Grade	Mounting hole mm	Fine adjustment range mm	Weight kg	Order no.*	Remarks
821 NG	0 - 250	0	8H7	-	15.8	4435100	
	0 - 430	0	8H7	-	48	4435110	
821 FG	0 - 250	0	8H7	± 0.2	15.8	4435101	Fine adjustment
	0 - 430	0	8H7	± 0.2	48	4435111	

* 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 mm	Mounting hole mm	Fine adjustment range mm	Weight kg	Order no.*
824 NT	0 - 210	8H7	-	17	4442100
824 FT	0 - 210	8H7	± 0.2	19	4443100
824 GT	0 - 200	28H7	± 1.5	18	4444200

* excludes indicating instrument, excludes plate

Plates

	Plate size mm	Flatness tolerance µm	Mounting hole mm	Weight kg	Order no.	Remarks
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.

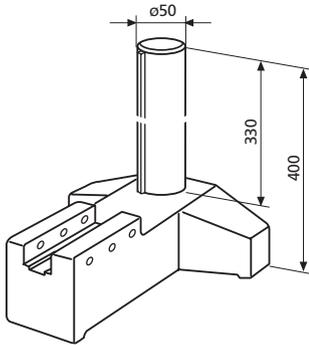
107 V	(Single)	4229000
	(Pair)	4229001

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

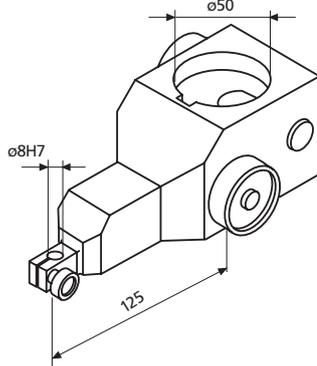


- T-shaped base which is made from a special cast iron
- Post has a chrome finish

Order no. 4082705

Support Arms

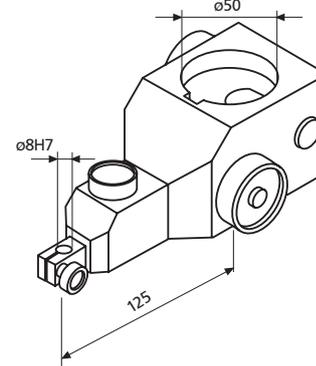
827 b 16



- Mounting hole 8 mm
- Without fine adjustment

Order no. 4082716

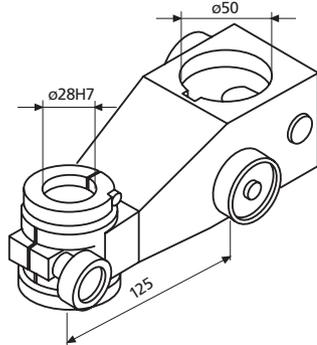
827 b 17



- Mounting hole 8 mm
- Fine adjustment, consisting of a strong, rigid parallel spring assembly

Order no. 4082717

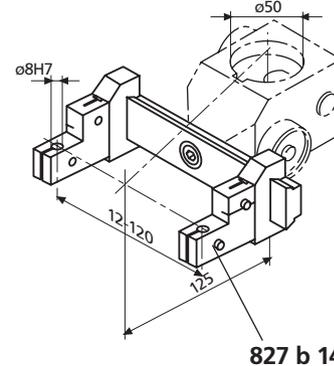
827 b 18



- Mounting hole 28 mm
- With fine adjustment

Order no. 4082718

827 b 19



- Support arm with dovetail guide

Order no. 4082719

- With probe holder, mounting hole 8 mm

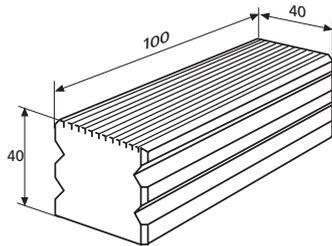
Order no. 4082714

827 b 14

Modular Units 827 for individual comparator stands

Plates

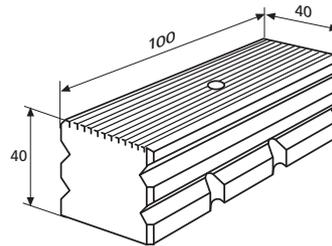
827 b 31



- For single measurement
- Hardened and lapped
- Reversible
- Measuring surface has longitudinal grooves
- Flatness deviation 1 μm

Order no. 4082731

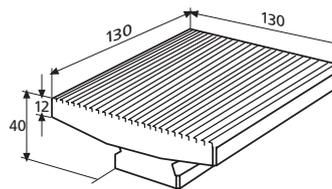
827 b 32



- 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

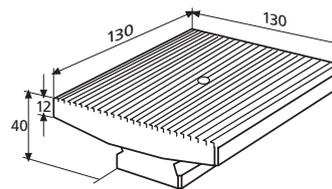
827 b 33



- For single measurement
- Large measuring surfaces which has longitudinal grooves, hardened and lapped
- Flatness deviation 1 μm

Order no. 4082733

827 b 34

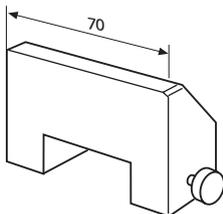


- For sum measurement
- Large measuring surfaces which have longitudinal grooves, hardened and lapped
- With mounting hole 8H7 mm/ .375" and a clamp for inductive probes
- Flatness deviation 1 μm

Order no. 4082734

Adjustable Stop

827 b 35

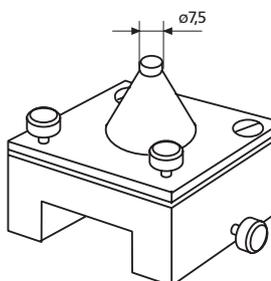


- Ensures that a work piece is correctly positioned
- To be attached to plates 827 b 31 and 827 b 32

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 . 4082736

THE BENCHMARK OF INDICATING MEASURING INSTRUMENTS. **MARAMETER.**



The latest information on MARAMETER products can be found on our website:

www.mahr.com, WebCode 211

► | 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 840 F / 840 FC / 840 FH / 840 FG / 840 FM With fixed or interchangeable measuring faces	9- 2
MaraMeter 840 FS For direct measurement on the machine tool	9-12
MaraMeter 840 E For extremely high precision	9-14
MaraMeter 852 / 852 TS / 853 For threads, pitches, roots, serrations	9-15

Portable Thickness Gages

MaraMeter 838 A / 838 B / 838 AB With digital or analog display	9-20
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Caliper Gages

MaraMeter 838 TA / 838 EA / 838 TI / 838 EI With digital or analog display	9-22
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Depth Gages

MaraMeter 837	9-27
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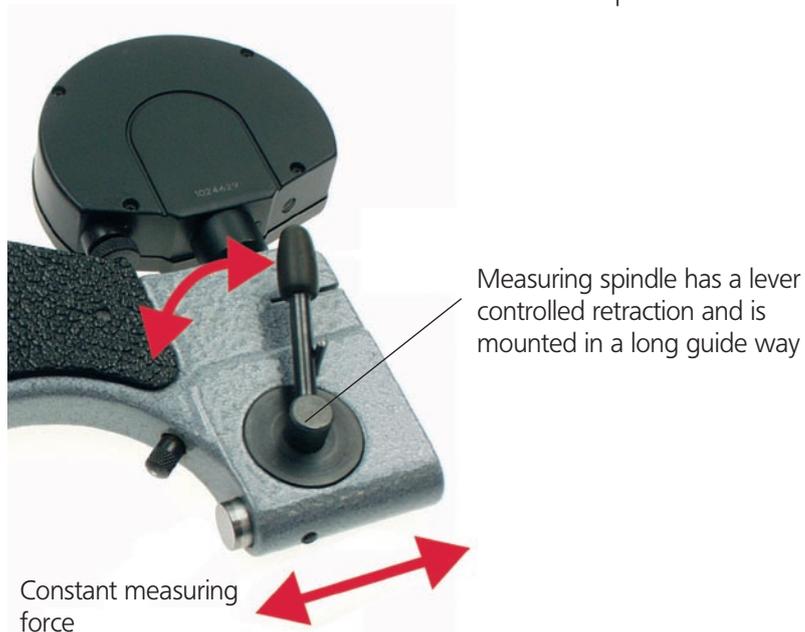
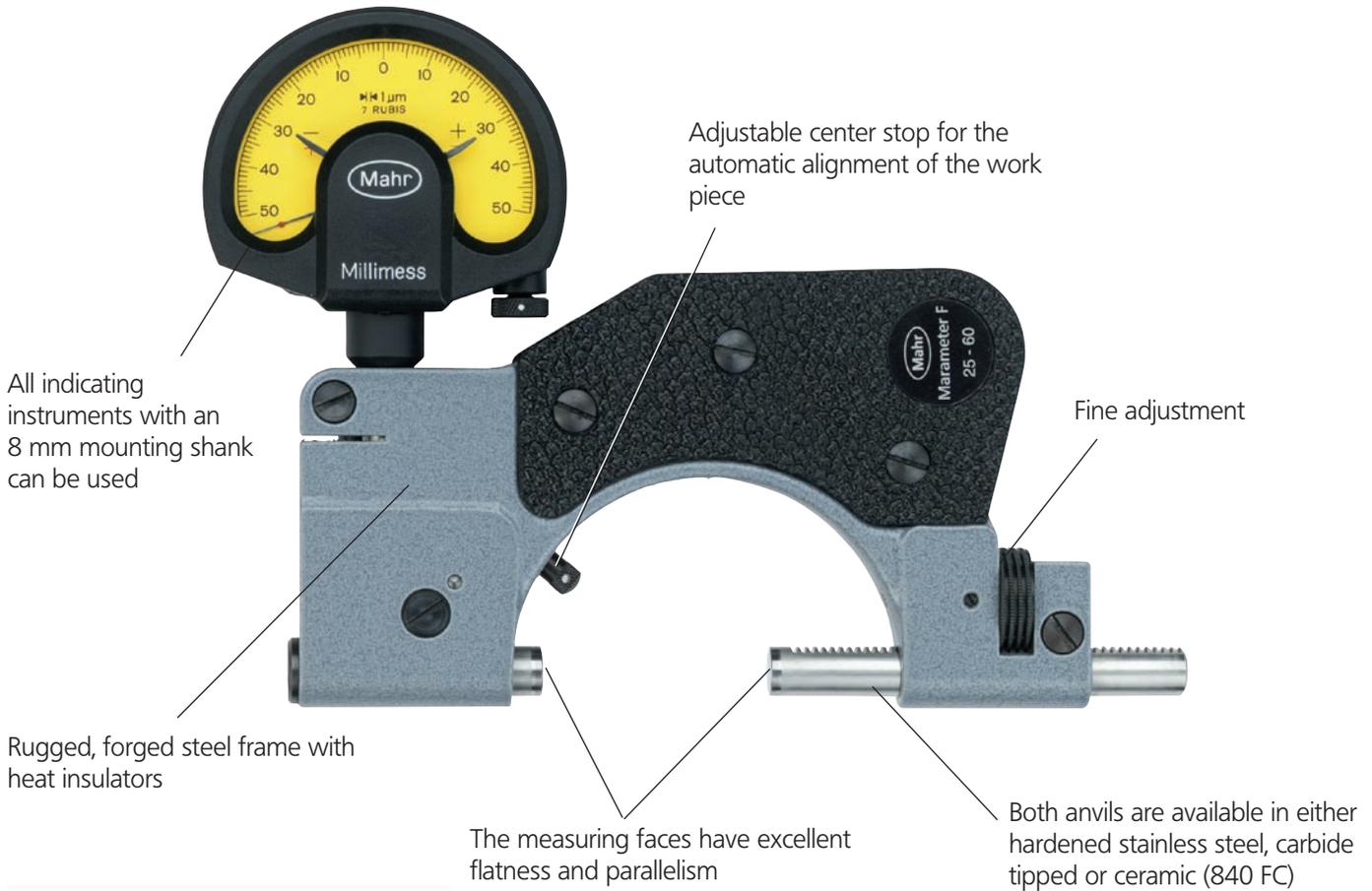
Indicating Measuring Instruments for Inside Dimensions

MaraMeter 844 D Indicating Plug Gage for rapid testing of serial components	9-28
MaraMeter 844 K / 844 N / 844 NH Self-centering Dial Bore Gage	9-35
MaraMeter 844 Z Dial Bore Gage for internal serrations	9-44

MaraMeter. Indicating Snap Gages 840 F / 840 FC

OVERVIEW

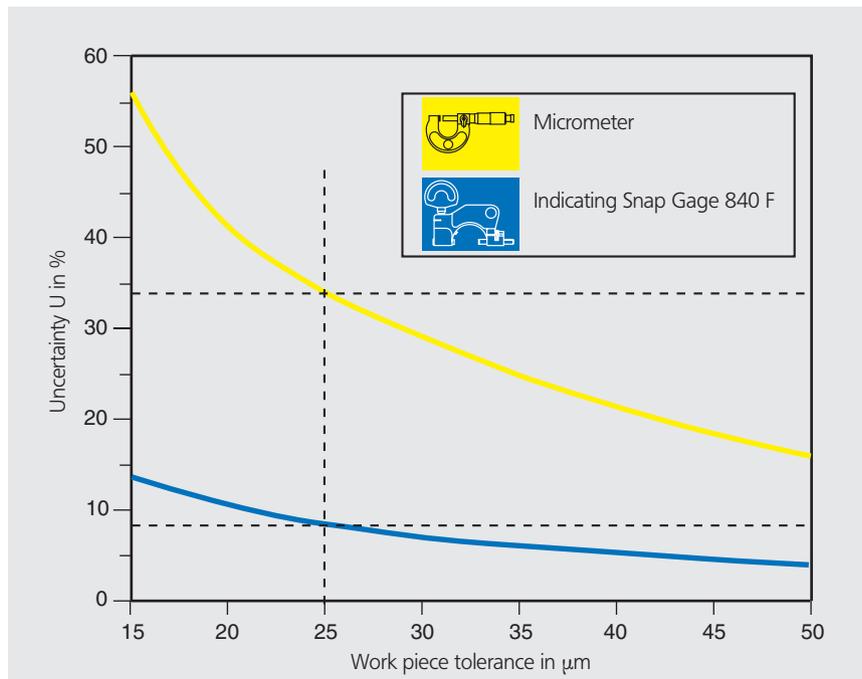
▶ | The Indicating Snap Gages **MaraMeter** 840 F / 840 FC are ideal for highly accurate and reliable results on cylindrical work pieces with a narrow tolerance. | ◀



Advantages of the Snap Gage 840 F compared to a Micrometer

• Reduced Measuring Uncertainty

The MaraMeter Indicating Snap Gages have a notably reduced measuring uncertainty in comparison to a Micrometer.



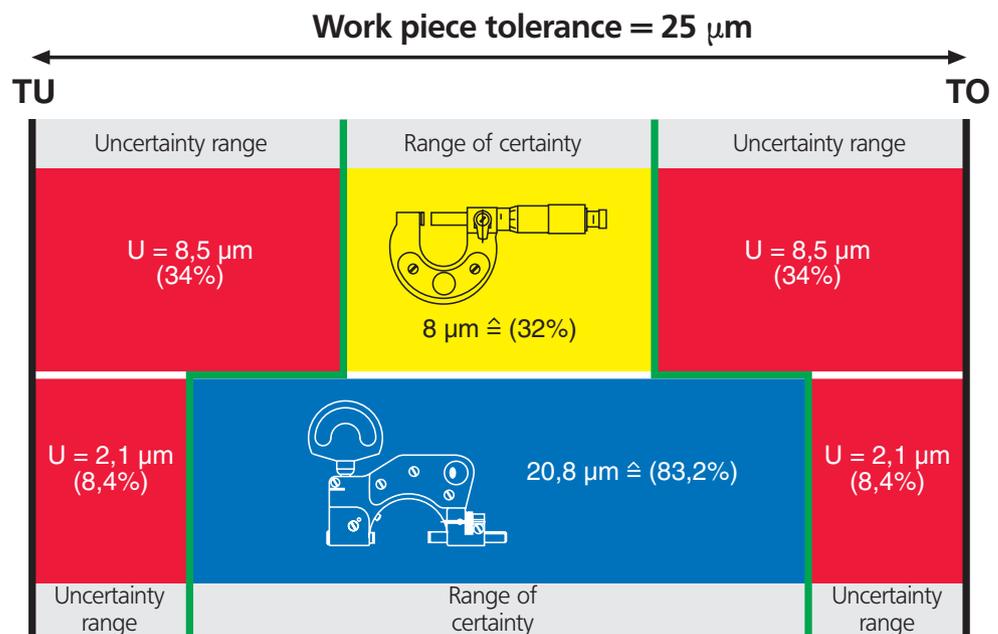
Measuring Uncertainty U is dependent upon the tolerance of the work piece

• 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.

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 contact points 903

Technical Data

	Measuring range		Repeatability f_w μm	Distance of moveable anvil mm	Measuring** force N	Measuring face		Order no.*
	mm	mm				Flatness μm	Parallelism μm	
840 F	0	- 25	≤ 0.5	2	7.5	≤ 0.2	≤ 1	4450000
	25	- 60	≤ 0.5	2	7.5	≤ 0.2	≤ 2	4450001
	50	- 100	≤ 1	2.5	7.5	≤ 0.2	≤ 2	4450002
	100	- 150	≤ 1	2.5	7.5	≤ 0.2	≤ 2	4450003
	150	- 200	≤ 1	2.5	7.5	≤ 0.2	≤ 2	4450004
840 FC	0	- 25	≤ 1	2	7.5	≤ 0.2	≤ 1	4450100
	25	- 60	≤ 1	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	Order no.
Compramess 1004	5 μm	4333000
Millimess 1003	1 μm	4334000
Millimess 1003XL	2 μm	4334001
Supramess 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

Digital Indicators see Chapter 5

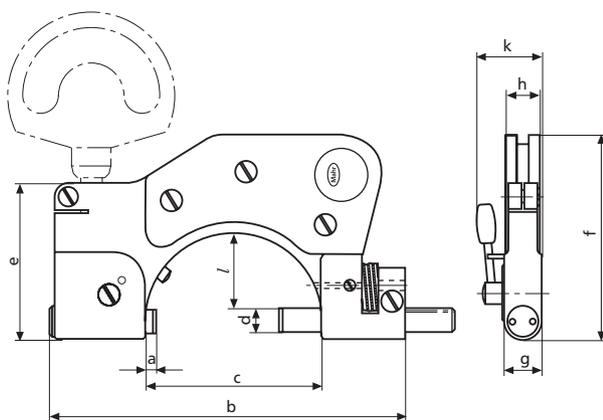
Electrical Indicating Instruments see Chapter 7



2000



1003



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

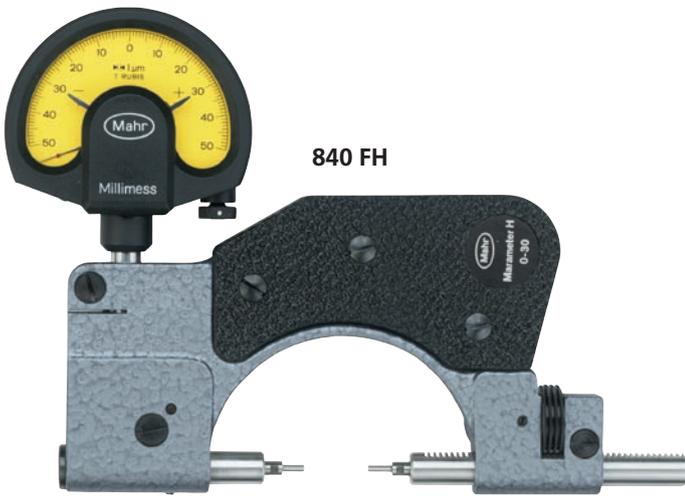
Accessories

Reference Discs 390 see Chapter 13

Gage Blocks see Chapter 13

Holder 840 Fk and Stand 840 Ff see Page 9-11

Indicating Snap Gage 840 FH with interchangeable anvils



Features

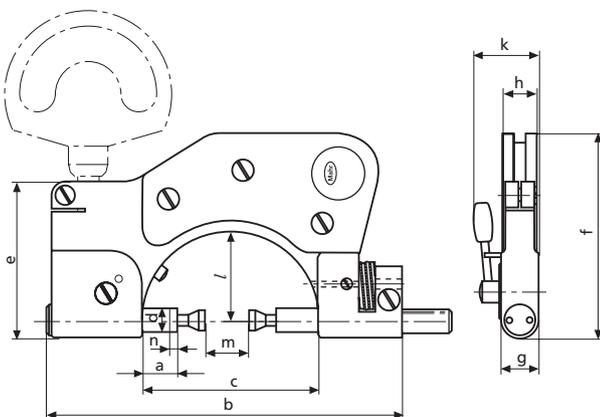
- Measuring spindle and anvil spindle have precision tapered bores for mounting interchangeable anvils 40 He
- For cylindrical parts such as shafts, bolts and spindles
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- 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 contact points 903, spanner DIN 902-3.5

Technical Data

	Measuring range* mm	Repeatability f_w μm	Distance of moveable anvil mm	Measuring force N	Order no.**
840 FH	0 - 30	≤ 1	2	7.5	4451000
	30 - 80	≤ 1	2.5	7.5	4451005

* Measuring is dependent upon the length of the anvils being used

** Excludes indicating instrument



Meas. range	840 FH	
m (mm)	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

Indicating Snap Gage 840 FH with interchangeable anvils

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

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Dial Comparator	Readings	Order no.
Compramess 1004	5 μm	4333000
Millimess 1003	1 μm	4334000
Millimess 1003XL	2 μm	4334001
Supramess 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

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

Accessories

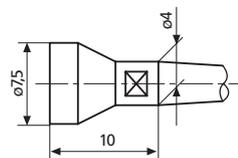
Spanner (Included in scope of supply)
for 840 FH, to loosen anvils

Order no. 4880210

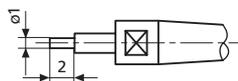
Reference Discs 390 see Chapter 13

Gage Blocks see Chapter 13

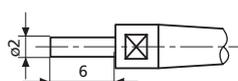
Holder 840 Fk and **Stand 840 Ff** see Page 9-11



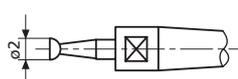
40 He 0H



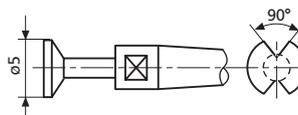
40 He 1



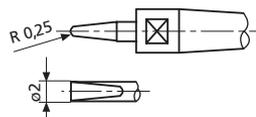
40 He 2



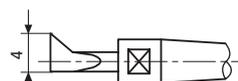
40 He 3



40 He 4



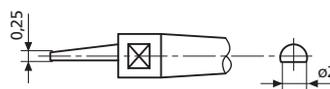
40 He 5



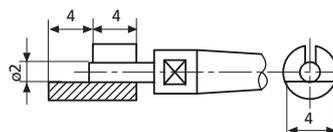
40 He 6



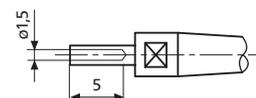
40 He 7



40 He 8



40 He 9



40 He 10



40 He 11

Indicating Snap Gages 840 FG with interchangeable anvils



Features

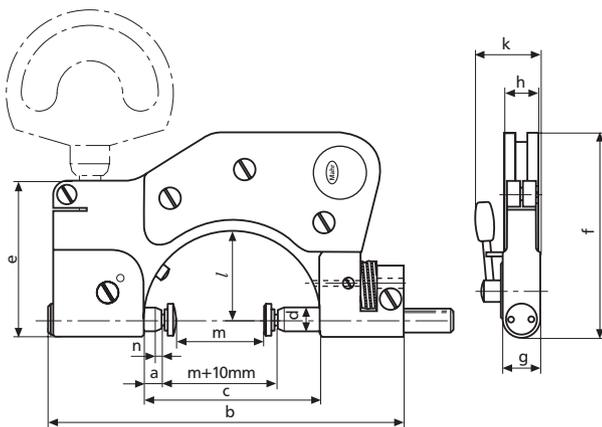
- Measuring spindle and anvil spindle have a M 2.5 connection thread, thus enabling the use of interchangeable anvils that are also used in dial indicators and dial comparators
- For cylindrical parts such as shafts, bolts and spindles
- Rugged, forged steel frame with heat insulators
- Measuring spindle 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 contact points 903

Technische Daten

	Measuring range* mm	Repeatability f_w μm	Distance of moveable anvil mm	Measuring force N	Order no.**
840 FG	0 - 50*	≤ 0.5	2	7.5	4454000
	40 - 90*	≤ 0.5	2.5	7.5	4454001

* Measuring is dependent upon the length of the anvils being used

** Excludes indicating instrument



Meas. range	840 FG	
m (mm)	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

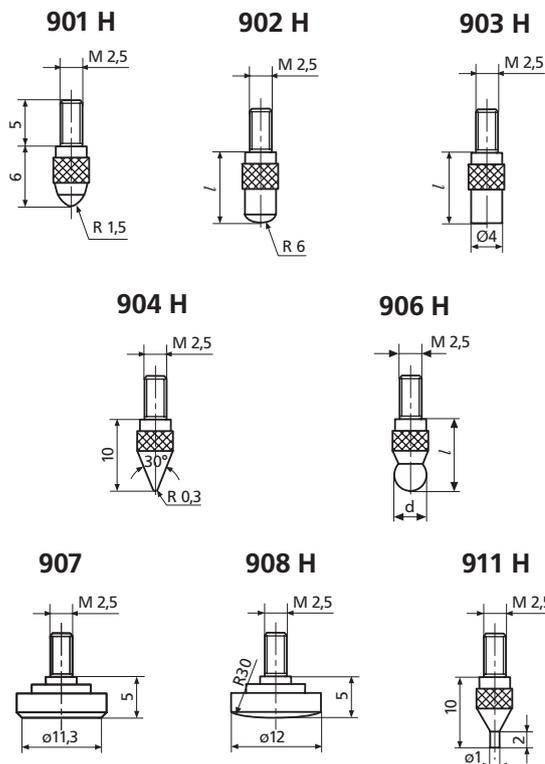
** Distance of moveable anvil

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 <i>l</i> in mm	
	10	4360041
	15	4360043
	20	4360044
903 H*	Flat contact point, carbide tipped	4360101
	Length <i>l</i> in mm	
	6	
	10	
	15	4360103
	20	4360105
		4360106
904 H	Conical contact point, carbide tipped	4360131

906 H Ball Contact Points
with carbide ball,
manufacturing tolerance ball dia. 0/-6 µm

Ball dia. d mm	<i>l</i> mm	Order no.	Ball dia. d mm	<i>l</i> 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			



Catalog no.	Features	Order no.
907	Flat contact plates* steel, dia. 11.3 mm, A = 1 cm ²	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.

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Dial Comparator	Readings	Order no.
Compramess 1004	5 µm	4333000
Millimess 1003	1 µm	4334000
Millimess 1003XL	2 µm	4334001
Supramess 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

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

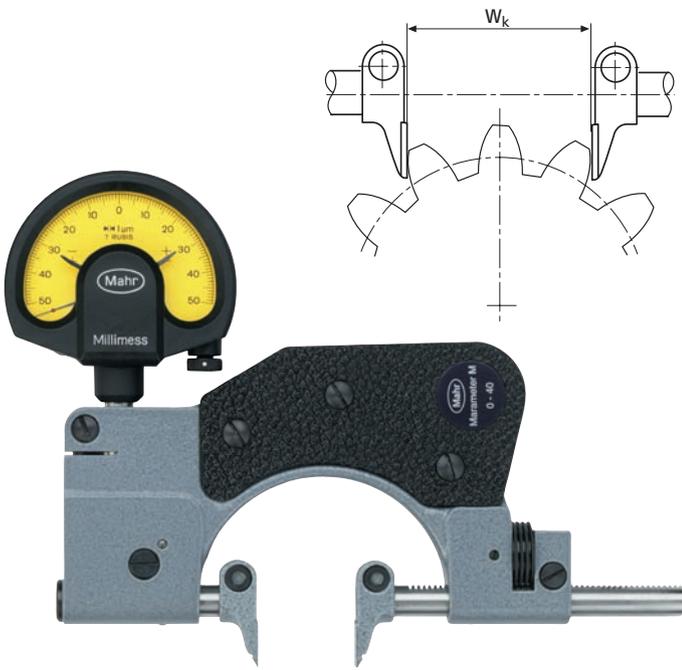
Accessories

Reference Discs 390 see Chapter 13

Gage Blocks see Chapter 13

Holder 840 Fk and **Stand 840 Ff** see Page 9-11

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 W_k 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 contact points 903

Technical Data

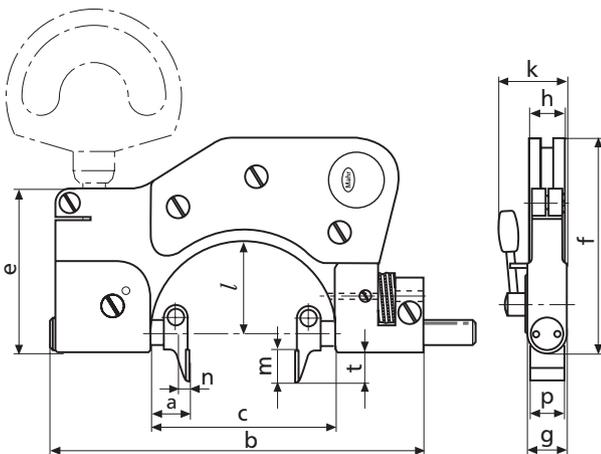
	Measuring range mm	Repeatability f_w μm	Measuring force N	Measuring face			Tooth span measurements as per module m	Order no.*
				Area mm	Flatness μm	Parallelism μm		
840 FM	0 - 40	1	7.5	12 x 12	≤ 0.5	≤ 2	0.5	4452000
	40 - 80	1	7.5	12 x 12	≤ 0.5	≤ 3	0.5	4452001
	80 - 130	1	9	15 x 17	≤ 0.5	≤ 3	1.0	4452002
	130 - 180	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 (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 9-7
 Reference Discs 390 see Chapter 13
 Gage Blocks see Chapter 13
 Holder 840 Fk and Stand 840 Ff see Page 9-11

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	840 E	852	
840 Ff	{ 0 - 25 25 - 60	0 - 30	0 - 50	0 - 40	0 - 25	0 - 45	4450020

Indicating Snap Gages 840 FS MaraMeter S



Merkmale

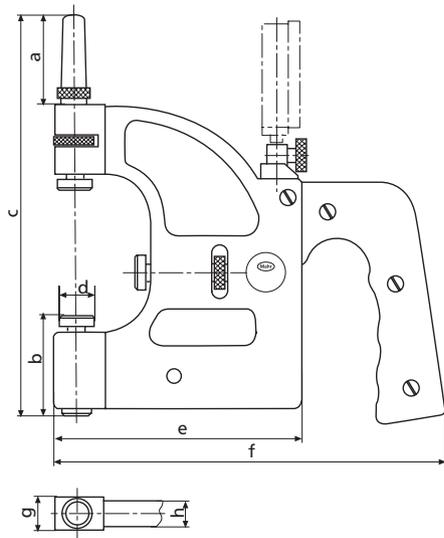
- For all kinds of cylindrical work pieces, whether directly on a machine tool or in the production control
- Rigid frame; convenient handle with heat insulators open on one end to eliminate heat transfer from user's hand
- Both spindles are made of hardened stainless steel and mounted in long guide 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 μm	Measuring force N	Distance of moveable anvil mm	Measuring faces		Weight kg	Order no.*
	mm					Flatness μm	Parallelism μm		
840 FS	10	- 30	1	13.5	0.7	≤ 0.5	≤ 3	0.6	4455000
840 FS	30	- 60	1	13.5	0.7	≤ 0.5	≤ 3	0.9	4455001
840 FS	60	- 100	1	13.5	0.7	≤ 0.5	≤ 3	1.3	4455002
840 FS	100	- 150	1	15	0.7	≤ 0.5	≤ 3	1.7	4455003
840 FS	150	- 200	1	15	0.7	≤ 0.5	≤ 3	2.0	4455004
840 FS	200	- 250	1	15	0.7	≤ 0.5	≤ 3	2.2	4455005
840 FS	250	- 300	1	15	0.7	≤ 0.5	≤ 3	2.5	4455006
840 FS	300	- 350	1	15	0.7	≤ 0.5	≤ 4	3.3	4455007
840 FS	350	- 400	1	15	0.7	≤ 0.5	≤ 4	3.3	4455008
840 FS	400	- 450	1	15	0.7	≤ 0.5	≤ 4	4.3	4455009
840 FS	450	- 500	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	Order no.
Compramess 1004	5 μm	4333000
Millimess 1003	1 μm	4334000
Millimess 1003 XL	2 μm	4334001
Supramess 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

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7



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	Readings / Resolution adjustable to*	Measuring force	Measuring faces dia.	Repeatability f_w	Measuring faces Parallelism	Order no.**
	mm	μm	N	mm	μm	μm	
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 9-11

Recommended indicating instruments:

Electrical indicating instruments; recommended are C 1216M, C 1208M and 1240; please refer to Chapter 7



C 1208M



1240

Indicating Bench Snap Gage 852 TS



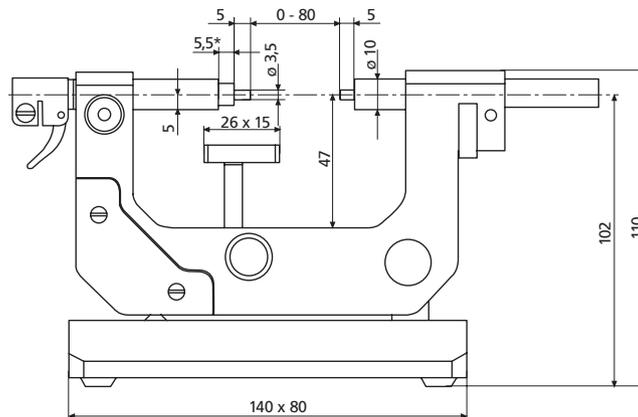
Applications

- 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**	Repeatability f_w μm	Retraction	Measuring force	Measuring face Parallelism μm	Order no.
0 - 80 mm	1 μm	1.2 mm	6.5 N	≤ 2 μm	4510030***

* In initial position

** Depending upon which anvils are being used

*** Delivery with a different indicating instrument is available upon request

Accessories

Order no.

Standard TC-tipped anvils,
Pair dia. D= 3.5 mm

4510840

Interchangeable Anvils please refer to Pages 9-18
Thread Setting Plug Gages see Page 13-17

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 contact points 903

Technical Data

	Measuring range*		Repeatability f_w μm	Measuring force		Order no.**
	mm			N		
852	0	- 45	1	7.5		4510000
852	45	- 85	1	7.5		4510001
852	85	- 140	1	9		4510002
852	140	- 190	1	9		4510003

* Depending upon which anvils are being used, purchase separately

** Excludes indicating instrument and anvils

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

Dial Comparator	Readings	Order no.
Compress 1004	5 μm	4333000
Millimess 1003	1 μm	4334000
Millimess 1003 XL	2 μm	4334001
Supramess 1002	0.5 μm	4335000
Extrames 2000	0.2 μm , 0.5 μm , 1 μm	4346000
Extrames 2001	0.2 μm , 0.5 μm , 1 μm	4346100

Digital Indicators see Chapter 5

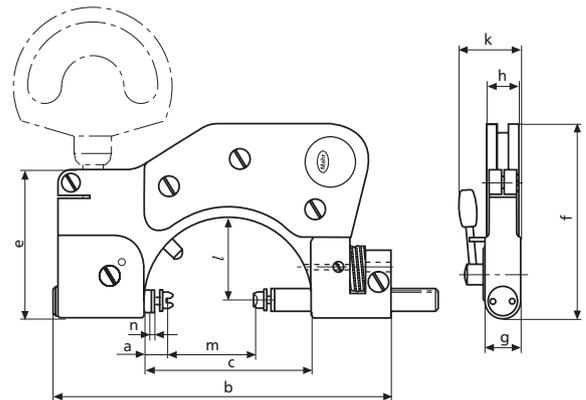
Electrical Indicating Instruments see Chapter 7

Accessories

Interchangeable Anvils please refer to Pages 9-18

Thread Setting Plug Gages see Page 13-17

Holder 840 Fk and **Stand 840 Ff** (for 0-45 mm) see Page 9-11



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

Indicating Thread Snap Gage 853 for taps



Features

- For pitch, root and outside diameters on taps in conjunction with interchangeable anvils
- Measuring spindle mounted in long guideway, lever-controlled retraction with mounting bore for interchangeable anvils
- Anvil spindle adjustable with thumbscrew via worm and rack, for mounting interchangeable 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 9-16
- Supplied with: Wooden case, steel flat contact points 903

Technische Daten

	Measuring range	Repeatability	Measuring force	Order no.*
	mm	f_w μm	N	
853	1.2 - 35	2	7.5	4511000
853	35 - 75	2	7.5	4511001

* Excludes indicating instrument and the support yokes 853 q

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:

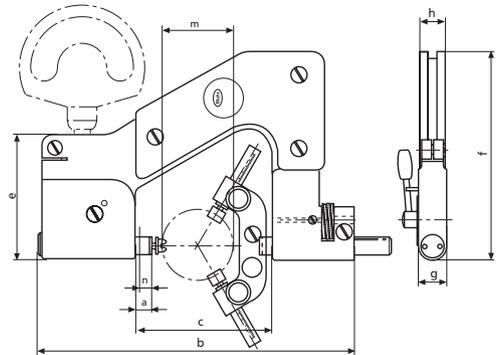
Cat. no.	No. of flutes of taps	For meas. range mm	Compens. factor**	Order no.
853 qk 3	3	1.2 - 35	x 1	4511024
853 qk 5	5	1.2 - 35	x 1.34	4511026
853 qk 7	7	1.2 - 35	x 1.42	4511028
853 qg 3	3	35 - 75	x 1	4511025
853 qg 5	5	35 - 75	x 1.34	4511027
853 qg 7	7	35 - 75	x 1.42	4511029

** 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:

Indicator	Readings	Order no.
MarCator 810 S	0.001 mm	4311000
Compramess 1004	5 μm	4333000
Zentimess 1010	0.01 mm	4332000
MarCator 1087 R	1 μm	4337160



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

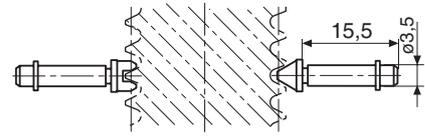
a* = In initial position

Accessories

Interchangeable Anvils see from Pages 9-18
Thread Setting Plug Gages see Page 13-17

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

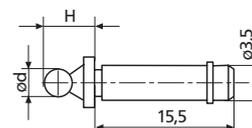
* V-anvil covers 3 pitches

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. $\pm 2 \mu\text{m}$



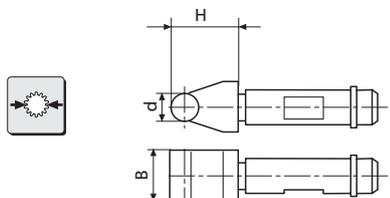
dia. d mm	H mm	Order no.	dia. d mm	H mm	Order no.	dia. d mm	H mm	Order no.
0.5	5.0	4179150	1.65	6.2	4179168	3.048	7.5	4179182
0.551	5.1	4179151	1.7	6.2	4179169	3.2	7.7	4170570
0.62	5.1	4179152	1.75	6.3	4170553	3.25	7.8	4170566
0.623	5.1	4179153	1.782	6.3	4179170	3.4	7.9	4179183
0.63	5.1	4179154	1.8	6.3	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)

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. $\pm 2 \mu\text{m}$



Further sizes are available upon request (material: steel)

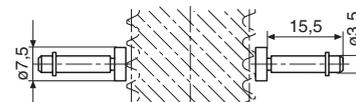
dia. d mm	Dimension H mm	Dimension B dia. mm	Order no.
1	5.5	5	4510200
1.25	5.8	5	4510201
1.5	6.0	5	4510202
1.75	6.3	5	4510203
2	6.5	5.5	4510204
2.5	7.0	5.5	4510206
3	7.5	5.5	4510207
3.5	8.0	5.5	4510208
4	8.5	5.5	4510209
4.5	9.0	5.5	4510210
5	9.5	6	4510211
5.5	10.0	6	4510212
6	10.5	6	4510213

For outside diameters

Anvil 40 Za, flat

Measuring face dia. 7.5 mm
with 853 smallest measurable O.D. dia. 5 mm

Hardened steel **Order no. 4173210**
Carbide tipped **Order no. 4511190**



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

Catalog no.	Throat depth		Measuring range		Measuring face dia. mm	Measuring face radius mm	Order no. with Indicator 810	Order no. with Indicator 1075 R 5μm	Order no. Wooden case
	mm	(inch)	mm	(inch)					
838 A	50	(2")	0 - 20	(0 - .750")	11.3 = 1 cm ²	-	4495000	4495120	4495050
	100	(4")	0 - 20	(0 - .750")	11.3 = 1 cm ²	-	4495001	4495121	4495051
	200	(8")	0 - 20	(0 - .750")	11.3 = 1 cm ²	-	4495002	4495122	4495052
	50	(2")	0 - 20	(0 - .750")	20 = 3.14 cm ²	-	4495103	4495125	4495050
	100	(4")	0 - 20	(0 - .750")	20 = 3.14 cm ²	-	4495104	4495126	4495051
	200	(8")	0 - 20	(0 - .750")	20 = 3.14 cm ²	-	4495105	4495127	4495052
	50	(2")	0 - 20	(0 - .750")	30 = 7.06 cm ²	-	4495109	4495130	4495050
	100	(4")	0 - 20	(0 - .750")	30 = 7.06 cm ²	-	4495110	4495131	4495051
	200	(8")	0 - 20	(0 - .750")	30 = 7.06 cm ²	-	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

Catalog no.	Throat depth		Measuring range		Measuring face dia. mm lower	Measuring face radius mm upper	Order no. with Indicator 810	Order no. with Indicator 1075 R 5μm	Order no. Wooden case
	mm	(inch)	mm	(inch)					
838 AB flat / spherical	50	(2")	0 - 20	(0 - .750")	11.3 = 1 cm ²	30	4495504	4495140	4495050
	100	(4")	0 - 20	(0 - .750")	11.3 = 1 cm ²	30			

Catalog no.	Throat depth		Measuring range		Measuring face dia. mm lower	Measuring face radius mm upper	Order no. with Indicator 1075 R 1μm	Order no. with Comparator 1003	Order no. Wooden case
	mm	(inch)	mm	(inch)					
838 AB flat / spherical	50	(2")	0 - 20	(0 - .750")	11.3 = 1 cm ²	30	4495145	4495519	4495050
	100	(4")	0 - 20	(0 - .750")	11.3 = 1 cm ²	30			

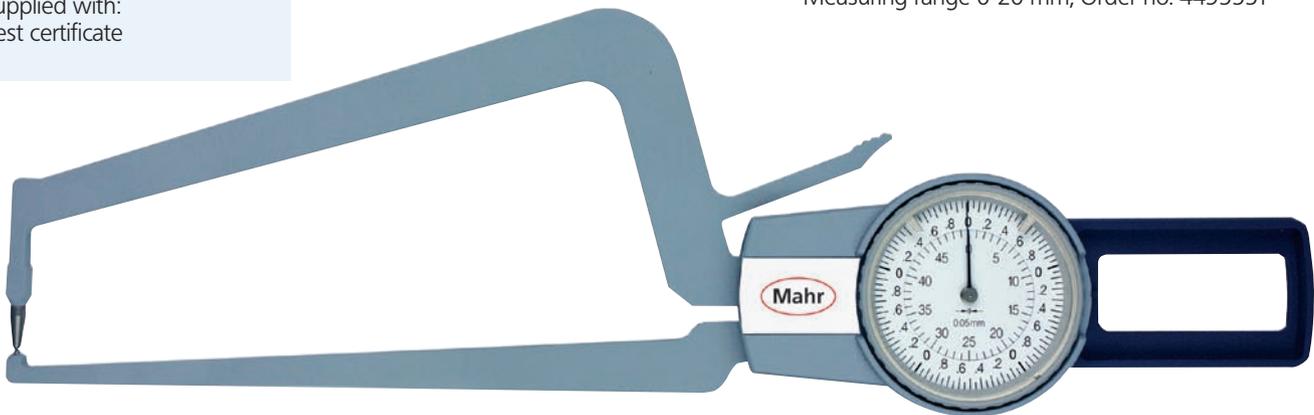
Gages for External Measurement 838 TA to measure thickness and wall thicknesses

Features

- For measuring thicknesses and wall thicknesses
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- Dust and splash waterproof
- Contact points are made from carbide
- Absolute measuring instrument
- Supplied with: Test certificate



Type A
Measuring range 0-20 mm, Order no. 4495551



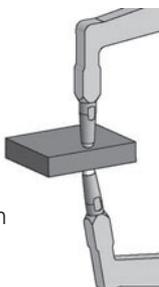
Type B with handle
Measuring range 0-50 mm, Order no. 4495554

Technical Data and Dimensions

			Type A			Type B	
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	170	170
Contact point - length (move.)	Hb	mm	19.1	24.6	24.6	32	32
Contact point - length (fixed)	Hf	mm	18.6	24.6	2.5	32	1
Contact point - ball dia.	D	mm	1.5 ¹⁾	1.5 ¹⁾	1.5 ²⁾	2 ¹⁾	2 ²⁾
Measuring force	F	N	0.8 - 1.2	1.1 - 1.6	1.1 - 1.6	1.2 - 1.8	1.2 - 1.8
Protection class			IP65	IP65	IP65	-	-
Order no.			4495550	4495551	4495552	4495553	4495554

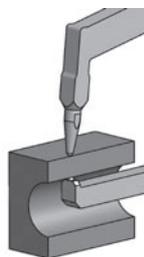
Applications

1)

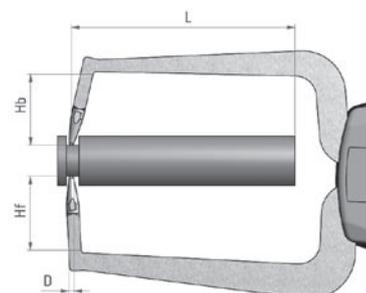


Ball dia. 1.5 mm
Ball dia. 2 mm
Ball dia. 3 mm

2)



Ball dia. 1.5 mm
Ball dia. 2 mm
Ball dia. 3 mm



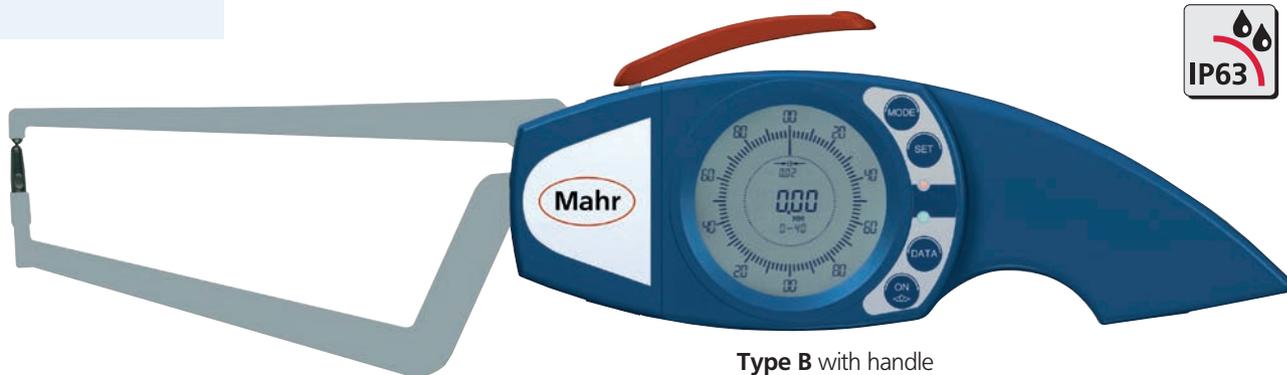
Electronic Gages for External Measurement 838 EA to measure thickness and wall thicknesses

Features

- High contrast analog and digital LCD
- Specified measuring programs according to application
- Absolute/Relative measuring program
- Tolerance is displayed with 2 LEDs
- mm/inch switchable
- Protection class IP67 or IP63 according to EN 60529
- Supplied with:
Test certificate
Battery



Type A
Measuring range 0-20 mm, Order no. 4495561



Type B with handle
Measuring range 0-40 mm, Order no. 4495167

Technical Data and Dimensions

			Type A			Type B	
Measuring range	Meb	mm	0 - 10	0 - 20	0 - 20	0 - 40	0 - 40
Resolution	Skw	mm	0.005	0.01	0.01	0.02	0.02
Error limit	G	mm	0.015	0.03	0.03	0.04	0.04
Repeatability limit	r	mm	0.005	0.01	0.01	0.02	0.02
Measuring depth	L	mm	35	85	85	115	115
Contact point - length (move.)	Hb	mm	19.1	24.6	24.6	25	25
Contact point - length (fixed)	Hf	mm	18.6	24.6	2.5	25	1
Contact point - ball dia.	D	mm	1.5 ¹⁾	1.5 ¹⁾	1.5 ²⁾	3 ¹⁾	3 ²⁾
Measuring force	F	N	0.8 - 1.2	1.1 - 1.6	1.1 - 1.6	1 - 1.5	1 - 1.5
Protection class			IP67	IP67	IP67	IP63	IP63
Order no.			4495560	4495561	4495562	4495059	4495167

Accessories

	Order no.
Digimatic interface incl. data connection cable for Type A	838 di 4495083
Digimatic interface incl. data connection cable for Type B	838 di 4495084
USB data cable incl. Software for Type A	838 usb 4495079
Battery Alkaline AAA 1.5 V for Type A*	4243073
Battery Alkaline AA 1.5 V for Type B	4243072

* 2 batteries are required

Gages for Internal Measurement 838 TI for measuring bores and internal grooves

Features

- For measuring bores and internal grooves
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- Dust and splash waterproof
- Contact points are made from carbide
- Absolute measuring instrument
- Supplied with: Test certificate



Type A
Measuring range 10-30 mm, Order no. 4495581

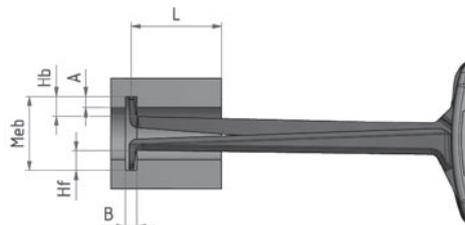


Type B with handle
Measuring range 15-65 mm, Order no. 4495076

Technical Data and Dimensions

			Type A						Type B	
			5 - 15	10 - 30	20 - 40	30 - 50	40 - 60	50 - 70	15 - 65	40 - 90
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	175	175
Groove depth	A	mm	2.3	5.2	7.0	7.0	8.3	8.3	4.5	8
Groove width	B	mm	0.8	1.2	1.2	1.2	1.2	1.2	2.5	2.5
Contact point - length (move.)	Hb	mm	2.5	5.4	7.3	7.3	12.2	12.2	5.3	8.5
Contact point - length (fixed)	Hf	mm	2.5	5.4	7.3	7.3	12.2	12.2	5.3	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	1.2 - 2	1.2 - 2
Protection class			IP65	IP65	IP65	IP65	IP65	IP65	-	-
Order no.			4495580	4495581	4495582	4495583	4495584	4495585	4495076	4495077

Application



Electronic Gages for Internal Measurement 838 EI for measuring bores and internal grooves

Features

- High contrast analog and digital LCD
- Specified measuring programs according to application
- Absolute/Relative measuring program
- Tolerance is displayed with 2 LEDs
- mm/inch switchable
- Protection class IP67 or IP63 according to EN 60529
- Supplied with:
Test certificate
Battery



Type A

Measuring range 10-30 mm, Order no. 4495591



Type B with handle

Measuring range 15-55 mm, Order no. 4495596

Technical Data and Dimensions

			Type A						Type B	
			5 - 15	10 - 30	20 - 40	30 - 50	40 - 60	50 - 70	15 - 55	35 - 75
Measuring range	Meb	mm	5 - 15	10 - 30	20 - 40	30 - 50	40 - 60	50 - 70	15 - 55	35 - 75
Resolution	Skw	mm	0.005	0.01	0.01	0.01	0.01	0.01	0.02	0.02
Error limit	G	mm	0.015	0.03	0.03	0.03	0.03	0.03	0.04	0.04
Repeatability limit	r	mm	0.005	0.01	0.01	0.01	0.01	0.01	0.02	0.02
Measuring depth	L	mm	35	85	85	85	85	85	114	114
Groove depth	A	mm	2.3	5.2	7.0	7.0	8.3	8.3	4.5	8
Groove width	B	mm	0.8	1.2	1.2	1.2	1.2	1.2	2.5	3
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	1.2 - 1.7	1.3 - 1.8
Protection class			IP67	IP67	IP67	IP67	IP67	IP67	IP63	IP63
Order no.			4495590	4495591	4495592	4495593	4495594	4495595	4495596	4495597

Accessories

	Order no.	Order no.
Digimatic interface incl. data connection cable for Type A	838 di	4495083
Digimatic interface incl. data connection cable for Type B	838 di	4495084
USB data cable incl. Software for Type A	838 usb	4495079
Battery Alkaline AAA 1.5 V for Type A*		4243073
Battery Alkaline AA 1.5 V for Type B		4243072
* 2 batteries are required		

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

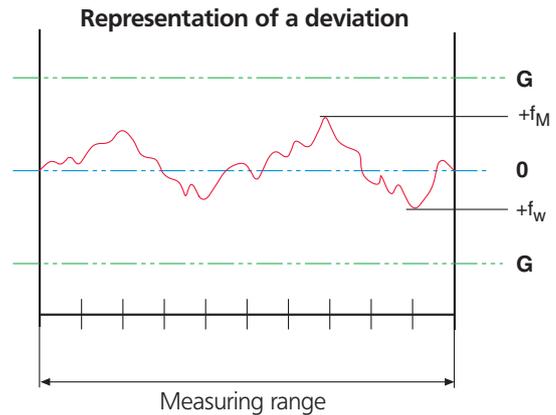
The deviation within the measuring range (range of deviation) f_M represents the distance of ordinates between the highest and the lowest position in the deviation diagram when the movable caliper arm closes. The **error limits G** for f_M is symmetrically positioned to the zero line and is indicated as ± f_{Mzul.}

The deviation in the partial measuring range f_w 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 referred to with **repeatability limit r**.



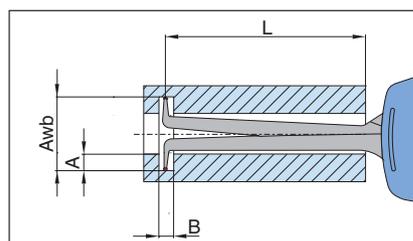
Measuring Capacity of Internal Measuring Instruments

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 connection 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 B/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
120	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 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

Accuracy

Hysteresis
 Repeatability
 Linearity
 Linearity 844 Dks >16 mm

$f_U \leq 0.4 \mu\text{m}$
 $f_W \leq 1 \mu\text{m}$
 $\leq 1 \%$
 $\leq 2 \%$

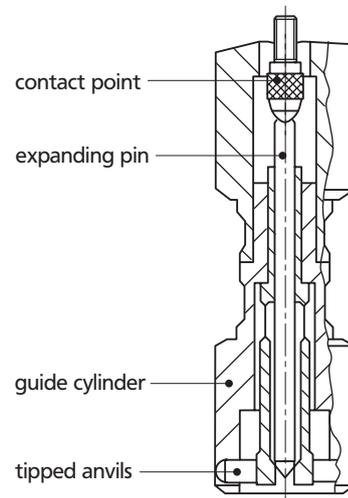
When placing an order please quote the nominal diameter and tolerances, for example:

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



Plug Gages

Measuring Head 844 Dk, Standard version

	Nominal ^① diameter mm	Manufacturing ^② tolerance mm	Meas. range ^③ dia. d mm	Order no.	
over	2.98 - 3.99 3.99 - 8	-0.02/-0.04 -0.02/-0.04	0.1 0.1	4480184* 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

	Nominal ^① diameter mm	Manufacturing ^② tolerance mm	Meas. range ^③ 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	16 - 25	-0.02/-0.05	0.15	4478230	
over	25 - 32	-0.02/-0.05	0.15	4478232	
over	32 - 44	-0.02/-0.06	0.15	4478233	
over	44 - 50	-0.03/-0.06	0.15	4478234	
over	50 - 60	-0.03/-0.06	0.15	4478235	
over	60 - 70	-0.03/-0.06	0.15	4478236	
over	70 - 80	-0.04/-0.07	0.15	4478237	
over	80 - 90	-0.04/-0.07	0.15	4478238	
over	90 - 100	-0.04/-0.07	0.15	4478239	
over	100 - 110	-0.04/-0.07	0.15	4478240	
over	110 - 120	-0.04/-0.07	0.15	4478241	
over	120 - 130	-0.04/-0.07	0.15	4478242	
over	130 - 140	-0.04/-0.07	0.15	4478243	
over	140 - 150	-0.04/-0.07	0.15	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

	Nominal ^① diameter mm	Manufacturing ^② tolerance mm	Meas. range ^③ dia. d mm	Order no.	
over	2.98 - 3.99 3.99 - 8	-0.02/-0.04 -0.02/-0.04	0.1 0.1	4478272* 4478250*	
over	8 - 16	-0.02/-0.04	0.15	4478251	
over over over	16 - 25 25 - 32 32 - 44	-0.02/-0.05 -0.02/-0.05 -0.02/-0.06	0.2 0.2 0.2	4478252 4478254 4478255	
over over over	44 - 50 50 - 60 60 - 70	-0.03/-0.06 -0.03/-0.06 -0.03/-0.06	0.2 0.2 0.2	4478256 4478257 4478258	
over over over over over over over over over over over over over over over over over over over over	70 - 80 80 - 90 90 - 100 100 - 110 110 - 120 120 - 130 130 - 140 140 - 150 150 - 160 160 - 170 170 - 180 180 - 190 190 - 200	-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 -0.04/-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 -0.04/-0.07 -0.04/-0.07 -0.04/-0.07	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	4478259 4478260 4478261 4478262 4478263 4478264 4478265 4478266 4478267 4478268 4478269 4478270 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

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	26	4478050

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.

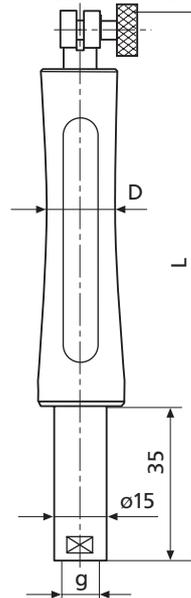
Cat. no.	Connecting thread g	Length L mm	Handle dia. D mm	Order no.
844 Dge	M6 x 0.75	195	33	4478020
	M10 x 1	195	33	4478021

Right Angle (Elbow) Attachment

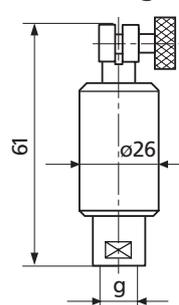
For measuring difficult to reach bores, e.g. in tight spaces, on a machine tool or when work piece bores are inconveniently located. For screwing in between holder and measuring head.

Cat. no.	Connecting thread g mm	Elbow		Order no.
		Length L mm	Height H mm	
844 Kw	M6 x 0.75	26.5	22.5	4470110
844 Dw	M10 x 1	36.7	17	4478110

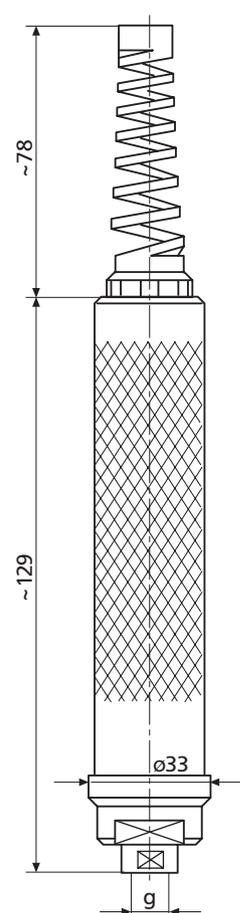
844 Kg / 844 Dg



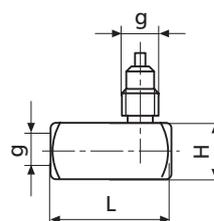
844 Dgk



844 Dge



844 Kw / 844 Dw



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	dia. D mm	Order no.
844 Dvk	M6x0.75/M3,5x0.35	64	3.8	4478080
844 Kv	M6 x 0.75	64	8	4470070
844 Dv	M10 x 1	64	15	4478070
844 Dv	M10 x 1	80	15	4478071
844 Dv	M10 x 1	100	15	4478072
844 Dv	M10 x 1	125	15	4478073
844 Dv	M10 x 1	250	15	4478074
844 Dv	M10 x 1	500	15	4478075

Depth Stops

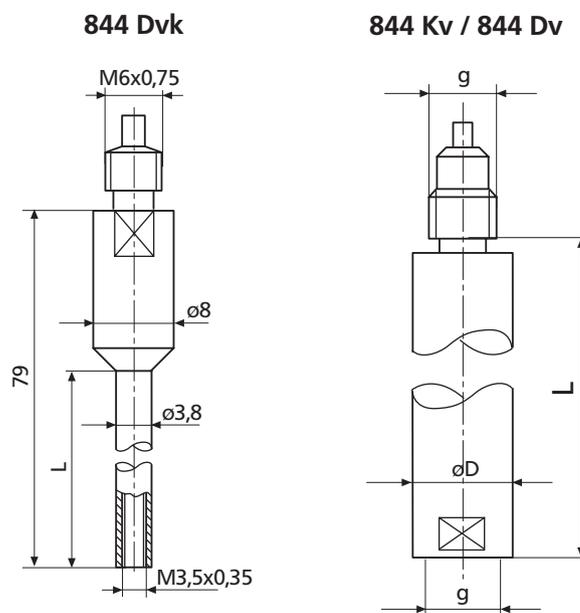
For limiting depth of insertion of measuring head in bore. Can be attached to Extensions 844 Kv or 844 Dv. With clamping screw.

Cat. no.	Mounting hole dia. d mm	Stop surface dia. A mm	Height h mm	Order no.
844 Kt	8	25	60	4470115
844 Dt	15	45	30	4478115
844 Dt	15	75	30	4478116
844 Dt	15	110	30	4478117
844 Dt	15	160	30	4478118
844 Dt	15	220	30	4478119

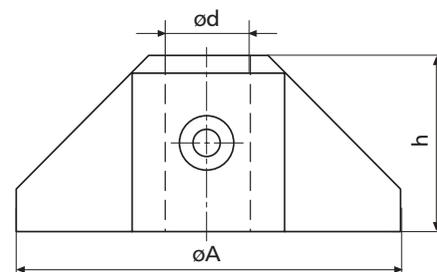
Depth Stop Rings

For limiting depth of insertion of measuring head in bore. Clamped onto the measuring head.

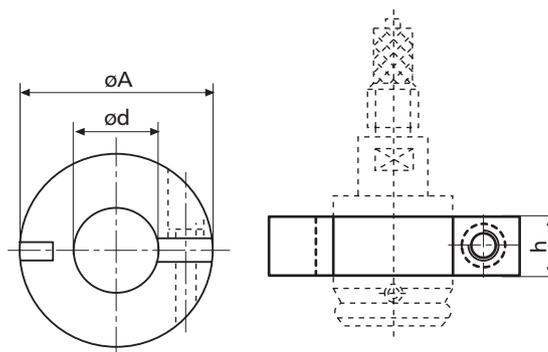
Cat. no.	Mounting hole dia. d mm	Stop surface dia. A mm	Height h mm	Order no.
844 Dtr	3 - 5	27	10	4478130
	> 5 - 8	30	10	4478130
	> 8 - 11	33	10	4478130
	> 11 - 15	37	10	4478130
	> 15 - 20	42	10	4478130
	> 20 - 25	50	12	4478131
	> 25 - 30	55	12	4478131
	> 30 - 35	60	12	4478131
	> 35 - 40	65	12	4478131
	> 40 - 45	70	12	4478131
	> 45 - 50	75	12	4478132
	> 50 - 60	85	12	4478132
	> 60 - 70	95	12	4478132
	> 70 - 80	105	12	4478132
	> 80 - 90	115	12	4478133
	> 90 - 100	125	12	4478133



844 Kt / 844 Dt



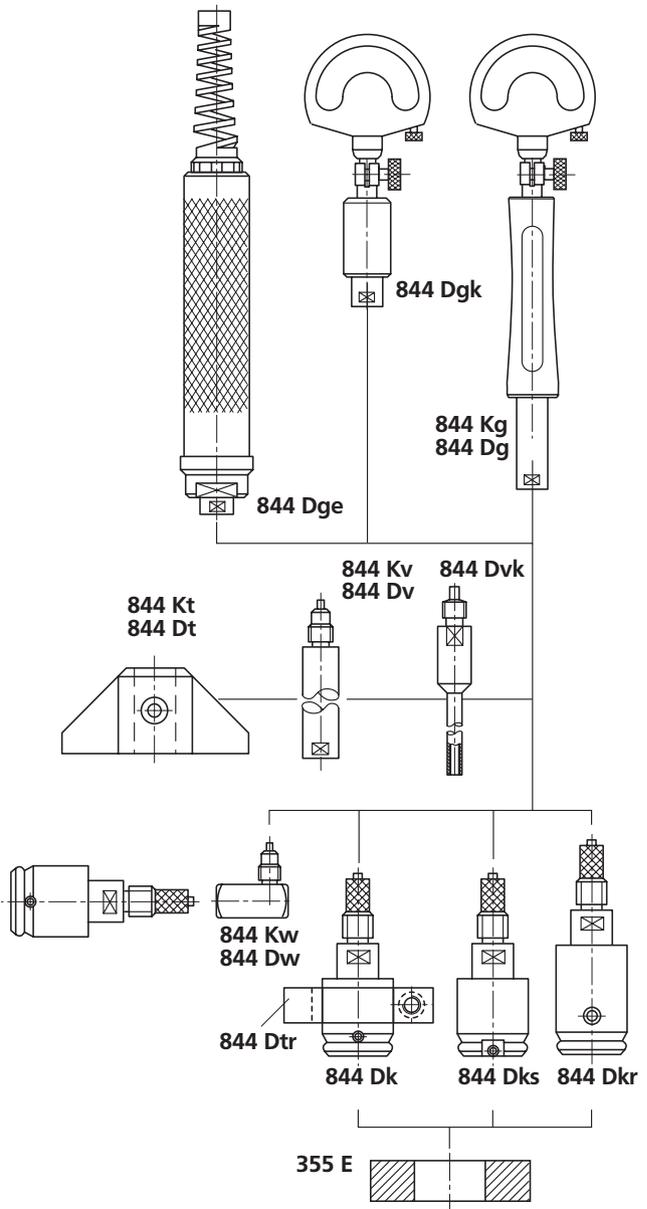
844 Dtr



Modular Unit System 844 D

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 9-42		

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.
Compramess 1004	5 μm	4333000
Millimes 1003	1 μm	4334000
Supramess 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
Millimar C 1208	± 3 , 10, 30, 100, 300, 1000 μm 3000 μm , 10000 μm	5312080
Millimar P 2004 M		5323010
Millimar S 1840	± 10 , 30, 100, 300, 1000 μm 3000 μm , 10000 μm	5318400
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: 0.5-200 mm

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.
Compramess 1004	5 μm	4333000
Millimess 1003	1 μm	4334000
Millimess 1003 XL	2 μm	4334001
Supramess 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	1 μm, 2 μm, 4 μm, 10 μm	4337162

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.

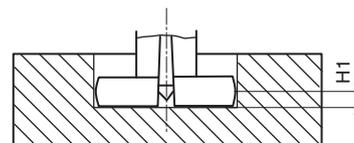
Measuring Probe 844 Kk, Expander Pin, individual Ring Gage for 844 Ke

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	4470802			4482302		
0.70	0.65 - 0.77	2.2	4470589				4482303		
0.80	0.75 - 0.87	2.55	4470590				4482304		
0.90	0.85 - 0.97	2.65	4470591	4470803			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				4482308		
1.30	1.27 - 1.45	10.5	4470595				4482309		
1.40	1.37 - 1.55	10.5	4470596	4470804	4471234 4471206 4471812 4471813 4471814 4471208 4471815 4471816 4471817 4471204	4471207	4482310		
1.75	1.50 - 1.90	16	4470597				4482311		
2.00	1.80 - 2.20	16	4470598				4482312		
2.25	2.05 - 2.45	16	4470599				4482313		
2.50	2.30 - 2.70	21	4470600				4482314		
2.75	2.55 - 2.95	21	4470601				4482315		
3.00	2.80 - 3.20	21	4470602				4482316		
3.25	3.05 - 3.45	21	4470603				4470805	4471819	4482317
3.50	3.30 - 3.70	21	4470604						4482318
3.75	3.55 - 3.95	21	4470605						4482319
4.00	3.80 - 4.20	21	4470606	4482320					
4.00	3.70 - 4.30	38	4470607	4470806	4471607 4471608 4471609 4471610 4471611 4471612 4471613 4471615 4471616 4471617 4471618 4471619 4471620	4471200	4482320		
4.50	4.20 - 4.80	38	4470608				4482321		
5.00	4.70 - 5.30	38	4470609				4482322		
5.50	5.20 - 5.80	38	4470610				4482323		
6.00	5.70 - 6.30	38	4470611				4482324		
6.50	6.20 - 6.80	38	4470612				4482325		
7.00	6.70 - 7.30	38	4470613				4482326		
7.50	7.20 - 7.80	38	4470615				4482327		
8.00	7.70 - 8.30	38	4470616				4482328		
8.50	8.20 - 8.80	45	4470617				4482329		
9.00	8.70 - 9.30	45	4470618	4482330					
9.50	9.20 - 9.80	45	4470619	4482331					
10.00	9.70 - 10.30	45	4470620	4470808	4471620 4471621 4471622 4471623 4471624 4471625 4471626 4471627 4471628 4471629	4471202	4482332		
10.00	9.40 - 10.60	45	4470621				4482332		
11.00	10.40 - 11.60	45	4470622				4482333		
12.00	11.40 - 12.60	45	4470623				4482334		
13.00	12.40 - 13.60	45	4470624				4482335		
14.00	13.40 - 14.60	45	4470625				4482336		
15.00	14.40 - 15.60	45	4470626				4482337		
16.00	15.40 - 16.60	80	4470627				4482338		
17.00	16.40 - 17.60	80	4470628				4482339		
18.00	17.40 - 18.60	80	4470629				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	19.50	0.60
1.75	25.30	0.90
2.50	30.60	1.20
4.00	47.30	2.00
10.00	48.50	3.30

Minimum measurement height



Modular Unit System for 844 KS Blind Hole Measuring Probes

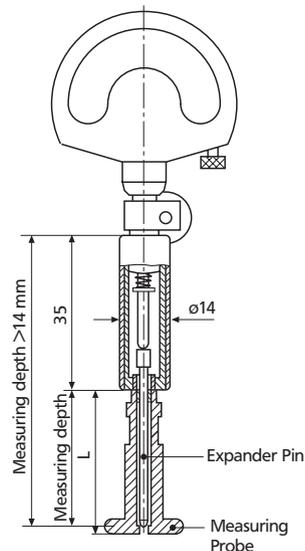
In addition to complete Dial Bore Gages 844 KS, modular units are available for assembly as required to suit a individual measuring task and or application.

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		
2.75	2.55 - 2.95	21	4482227	4482177	
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	4482192	
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		
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		

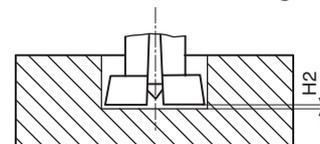


for further technical data (e.g. nominal dimensions up to 40 mm) see **WebCode 11070**



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 $\pm 1 \mu\text{m}$

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, dia. 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

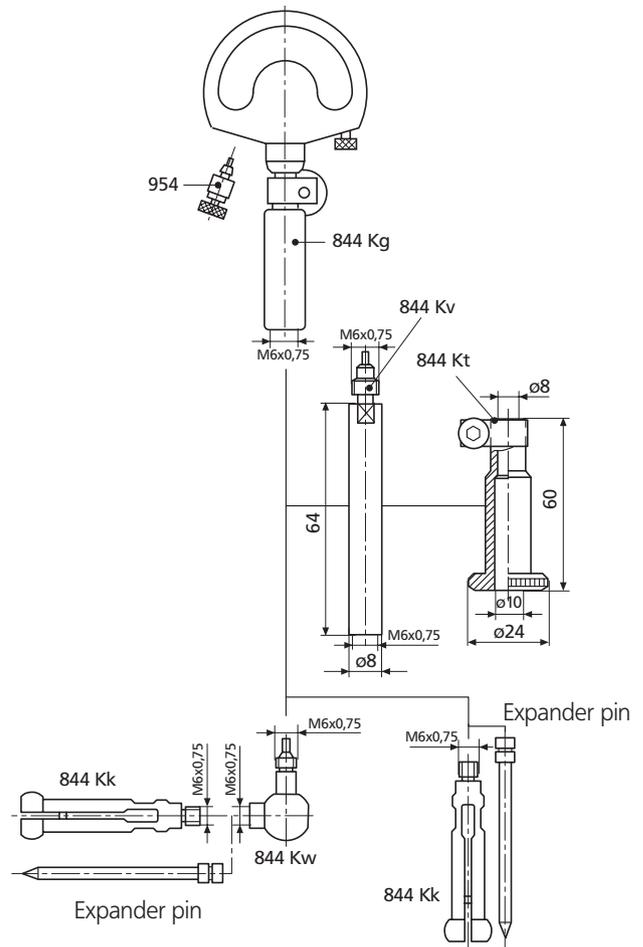
Facilitates insertion of measuring probe in bore by lifting measuring spindle of Dial Comparator.

Order no. 4372030

Depth Stop 844 Kt

For checking diameter of bores at prescribed depth. Only to be used with Extension 844 Kv.

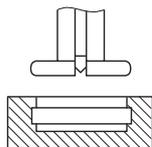
Order no. 4470115



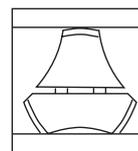
Measuring Probes for Special Applications

For measurement of blind holes, diameters of recesses, distances between plane-parallel surfaces, etc. special models of measuring probes are available on request.

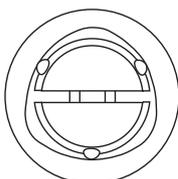
1. Measurement of the diameter of recesses



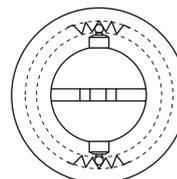
2. Measurement of plane-parallel surfaces



3. Measurement of polygon bores



4. Measurement of inside serrations, see 844 Z Page 9-44



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

Angle Stop 844 Ka

Facilitates positioning of cylindrical work pieces under measuring instrument. For clamping to Stand 844 Kst.

Order no. 4470120

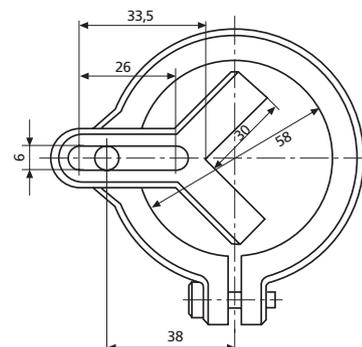
Floating Holder 844 Ksts



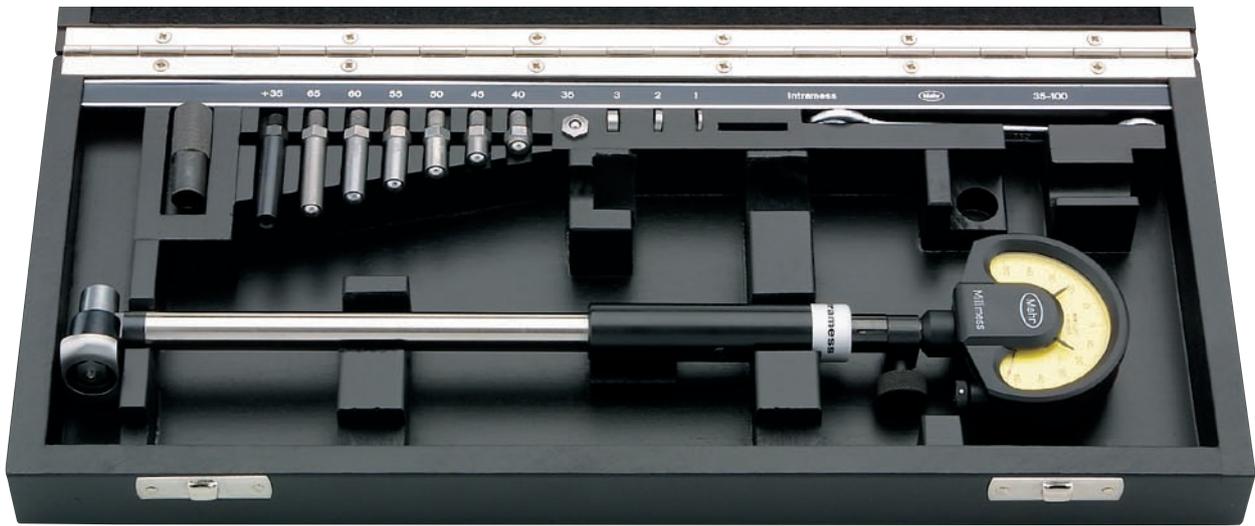
Features

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



Self-Centering Dial Bore Gages 844 N / 844 NH Intramess



Features

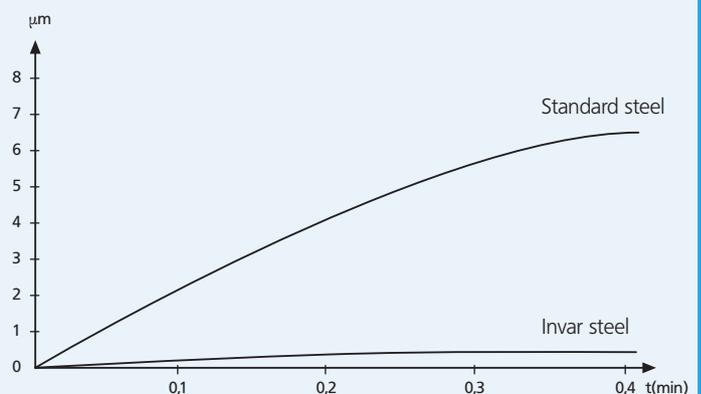
- Measuring the diameter, roundness and conical form of a bore as well as the distances of plane-parallel surfaces
- Measuring head consists of a carbide-tipped moving anvil and an interchangeable stationary anvil which has a hardened steel ball; alternatively a carbide ball is available
- Transmission 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 comparison 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 Dat

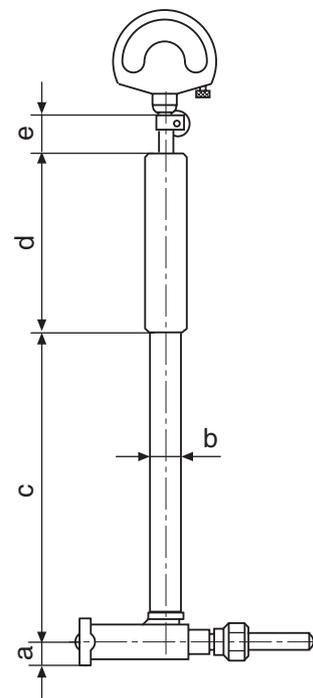
Measuring range	Error limit	Repeatability	Hysteresis	Order no*	Order no*
mm	G_e μm	f_w μm	f_u μm	844 N	844 NH
18 - 50	2	0.5	2.5	4474000	4475000
35 - 100	2	0.5	2.5	4474001	4475001
100 - 250	2	0.5	2.5	4474002	4475002
250 - 400	3	1.5	3.5	4474003	4475003
400 - 800	3	1.5	3.5	4474004	4475004
250 - 800	3	1.5	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	a	b	c	d	e
18 - 50	5.35	8	115	63	22
35 - 100	8.5	12	148	80	22
100 - 250	11.5	18	230	100	25
250 - 400	16	24	366	110	28
400 - 800	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	Order no.
Compramess 1004	5 μm	4333000
Millimess 1003	1 μm	4334000
Supramess 1002	0.5 μm	4335000
Extramess 2001	0.2 μm , 0.5 μm , 1 μm	4346100
MarCator 1087 BR	1 μm , 2 μm , 4 μm , 10 μm	4337162



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: 0.5 - 200 mm



355 E

Components

Measuring Jaw 844 em

Measuring range	Dimensions	Order no.
18 - 800 mm	60 x 9.5 x 9 mm	4470095

Setting Bridge 844 Neb

Measuring range	Width	Height	Order no.
18 - 250 mm	70 mm	12 mm	4474080
18 - 400 mm	165 mm	17 mm	4474081
18 - 800 mm	320 mm	20 mm	4474082

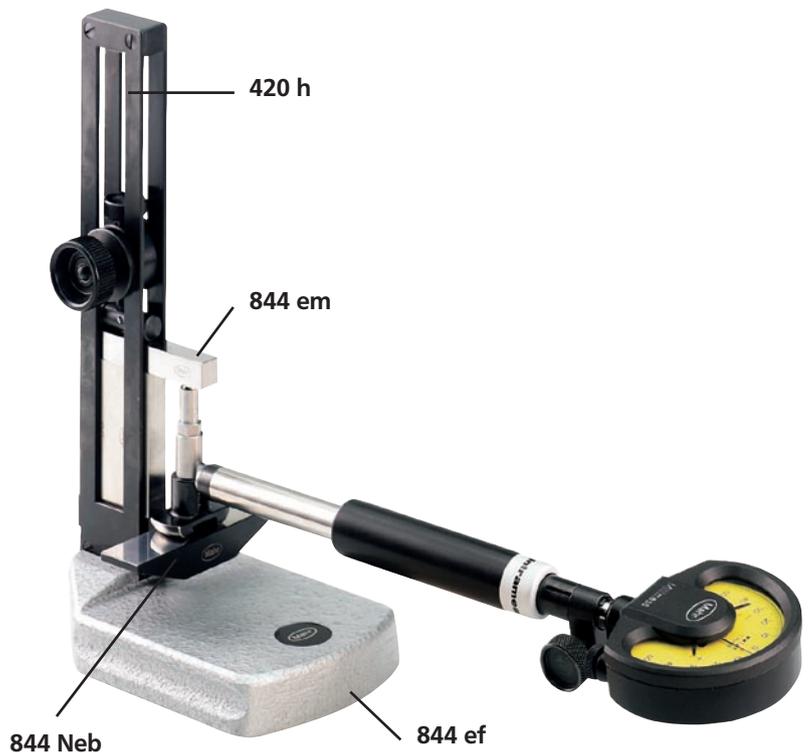
Gage Block Holder 420 h

Clamping range	Order no.
0 - 70 mm	4800120
0 - 120 mm	4800121
100 - 220 mm	4800122
100 - 420 mm	4800123
400 - 820 mm	4800124

Stand 844 ef

For mounting setting device up to 420 mm

Order no. 4470098



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	Order no. 844 Nk	Order no. 844 NHk
18 - 50	4474151	4474156
35 - 100	4474152	4474157
100 - 250	4474153	4474158
250 - 400	4474154	4474159
400 - 800	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	L (mm)	d1 (mm)	d2 (mm)	Order no.
18 - 50	200	14	8	4474040
35 - 100	250	18	12	4474041
100 - 250	350	26	18	4474042
250 - 800	500	30	24	4474043

Short Holder 844 Ngk

Shank and transfer rod made of heat-resistant Invar steel. With a locking clamp for indicator.

For meas. range mm	L (mm)	d1 (mm)	d2 (mm)	Order no.
18 - 50	120	14	8	4474050
35 - 100	120	18	12	4474051
100 - 250	150	26	18	4474052
250 - 800	250	30	24	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.

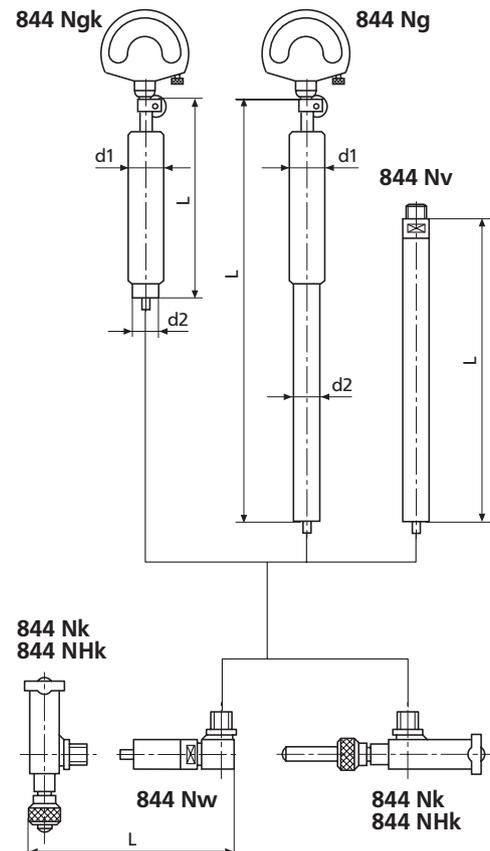
For meas. ranges mm	Length* L (mm)	Bore depth mm	Order no.
18 - 50	66	45	4474070
35 - 100	80	55	4474071
100 - 250	105	70	4474072

* 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	Length L (mm)	Order no.
18 - 50	250	4474066
35 - 100	250	4474060
100 - 250	250	4474061
	500	4474062
250 - 800	250	4474063
	500	4474064



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)

Modular Unit Parts:

Diametrical two ball measurement „M_{dk}“ from **3.5 - 26.1 mm**

Ball dimen. 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	

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

Merkmale

- 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

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

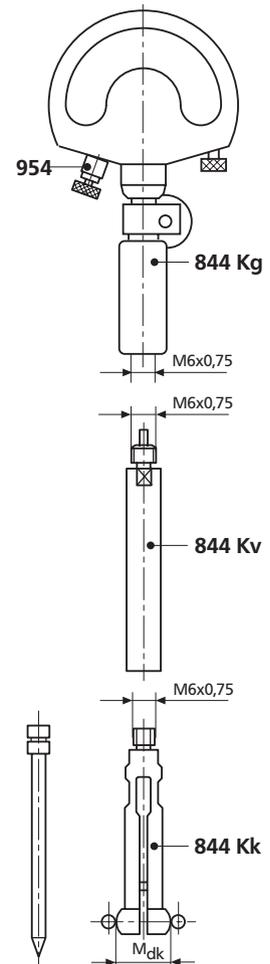
for measuring in depth bores; length 64 mm

Order no. 4470070

844 Kk Anvil

for internal serrations. ball dimension „M_{dk}“ from

3.5 - 26.1 mm



Modular Unit Parts

Diametrical two ball measurement from M_{dk} 26-333 mm

Measuring Heads

844 z1, for M_{dk} 26 - 130,5 mm

844 z2, for M_{dk} 48.5 - 333 mm

Order no.

4485000

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

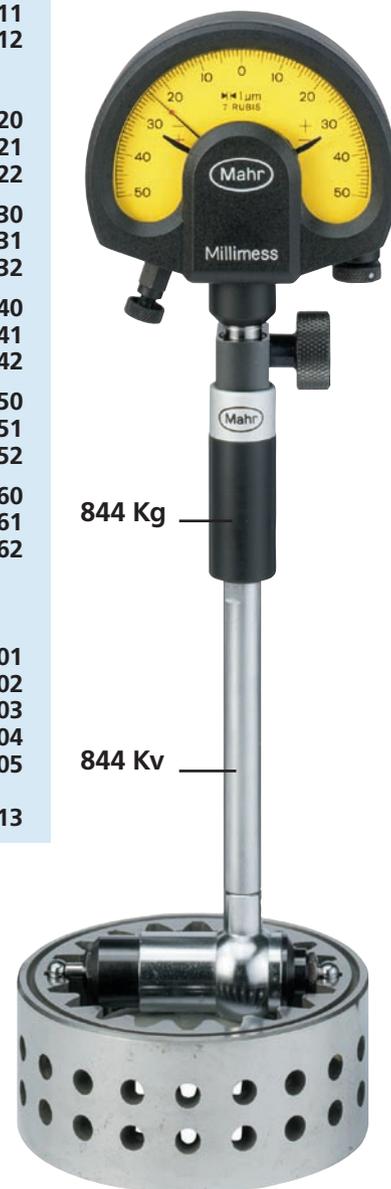
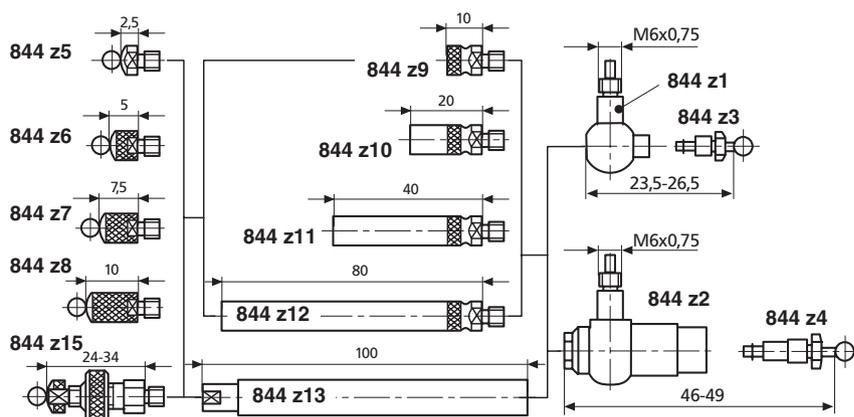
Spacer (intermediate piece)

	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		

Example:

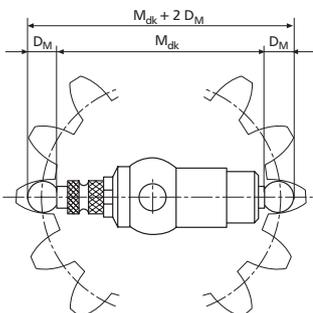
Diametrical two ball meas. M _{dk}	73.0 mm
Ball dia.	5.486 mm

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 specified 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 9-43.

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	Measuring 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	Measuring 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	Measuring 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	Measuring 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	Order no.
Compramess 1004	5 μ m	4333000
Millimess 1003	1 μ m	4334000

Digital Indicators see Chapter 5
Electrical Indicating Instruments see Chapter 7

DO YOU HAVE DIVERSE MEASURING TASKS? MULTIMAR MASTERS THEM WITH FLYING COLORS.



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www.mahr.com, WebCode 10281

▶ | 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 ES

Digital Universal Caliper

10- 2

Multimar 844 T

Universal Measuring Instrument for Comparison Measurements

10- 4

Accessories for Multimar 25 ES / 844 T

10- 6

Multimar 36 B

Indicator Gage for Internal (I.D.) and External (O.D.) Measurements

10-21

Digital Universal Caliper 25 ES Varimeter



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

Illustration is shown with accessories, these are sold separately

Features

Functions:

- ON/OFF
- RESET (zero setting) mm/inch
- HOLD (Storage of measuring values)
- DATA (Data transmission)
- PRESET (for entering a numerical value)
- TOL (Tolerance display)

- Capacitive measuring system, life of the battery ca. 2 years
- Max measuring speed: 1.5 m/s (60"/s)
- Data output: Opto RS232C via data connection cable
- High contrast 6 mm Liquid Crystal Display
- Interchangeable measuring arms

- Due to the patented mounting fixture of the measuring arms and or 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
- Supplied with: Battery

Technical Data

Measuring range*		Resolution	Error limit (DIN 862)	Weight	Order no.	Order no. wooden case
outside mm	inside mm					
0 - 300	25 - 325	0.01 / .0005"	0.03	770	4118700	4118750
0 - 300	25 - 325	0.01 / .0005"	0.03	750	4118701**	4118750
0 - 600	25 - 625	0.01 / .0005"	0.03	1050	4118702	4118751
0 - 1000	25 - 1025	0.01 / .0005"	0.04	1470	4118703	4118752

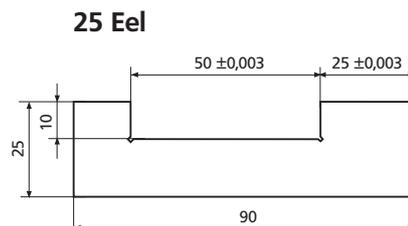
* Dependent upon which accessories are being used the measuring range can be extended by a further 75 mm (2.95") by reversing the measuring arms 844 Te/Tx

** Without fine adjustment

Accessories

	Order no.
Setting Gage , hardened steel, screwed in to wooden case	25 Eel
Battery 3V, Type CR 2032	4102520
Data Connection Cable RS232C (2 m), SUB-D-jack 9-pin	16 ESv
	4102510

Accessories for Data Processing see Chapter 11



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

- 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

All indicating instruments with an 8 mm mounting shank can be used



Constant measuring force due to the built-in measuring force spring



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

Technical Data

Application range*	Extended range of application	Measuring force	Distance of movable anvil	Weight	Order no.**	Order no. Wooden case
mm	mm	N	mm	g		
25 - 110	25 - 185	5	10	775	4500001***	4500010
100 - 260	100 - 335	5	10	1010	4500002***	4500011
250 - 610	250 - 685	5	10	1580	4500003***	4500012
600 - 1010	600 - 1085	5	10	2225	4500004***	4500013
1000 - 1500	1000 - 1575	5	10	2460	4500005***	—
1500 - 2000	1500 - 2075	5	10	2620	4500006***	—
2000 - 2500	2000 - 2575	5	10	2800	4500007***	—

* These application ranges only apply to internal measurements. For external measurements the range of application is reduced by 25 mm (1"). The extension of the application range takes place when the measuring elements are rotated through 180°.

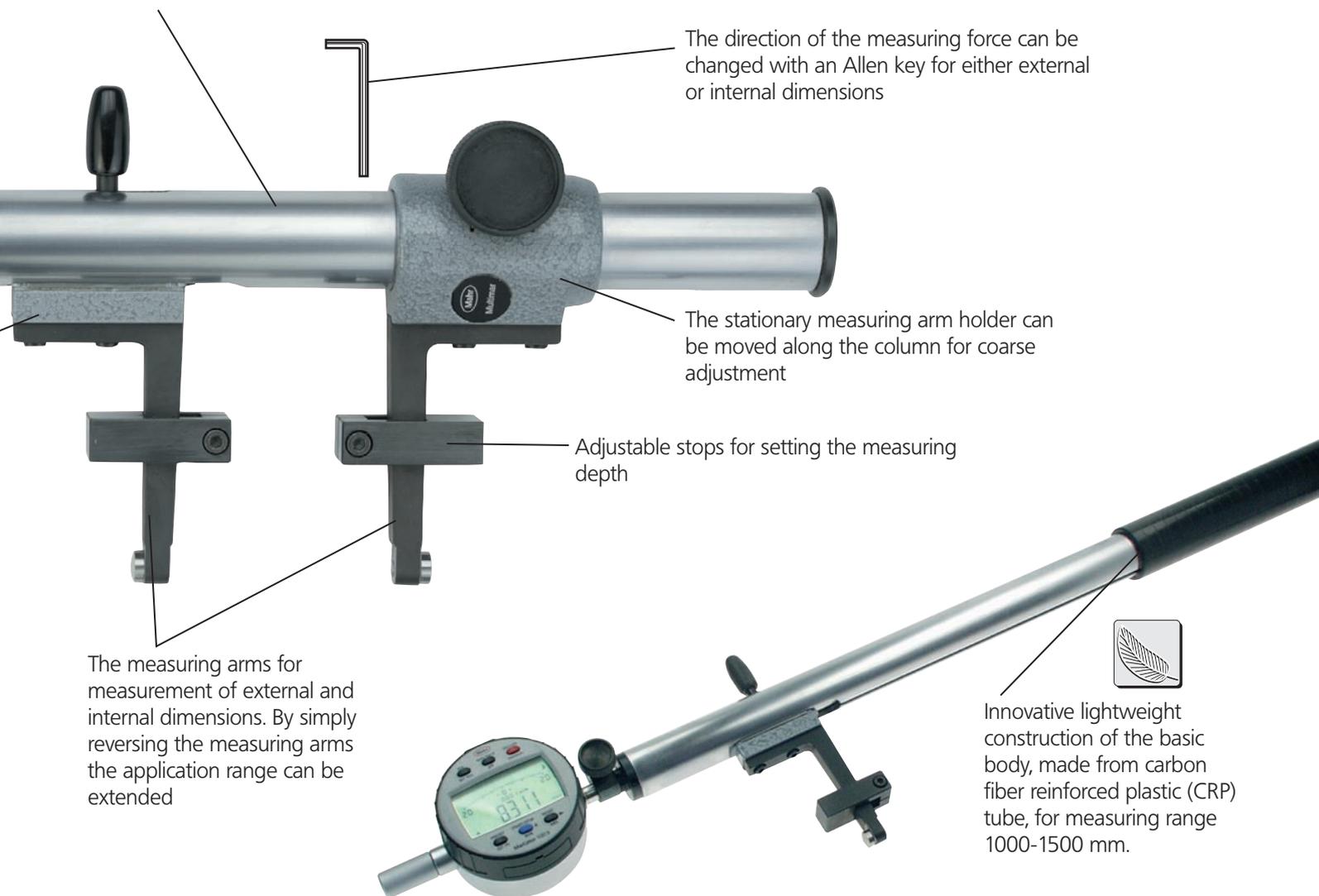
All application ranges depend upon which anvil is being used.

From 1000 mm (range of application) a lightweight CRP tube is used.

** Excludes indicating instrument

*** Includes a transport and storage 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

The stationary measuring arm holder can be moved along the column for coarse adjustment

Adjustable stops for setting the measuring depth

The measuring arms for measurement of external and internal dimensions. By simply reversing the measuring arms the application range can be extended

Innovative lightweight construction of the basic body, made from carbon fiber reinforced plastic (CRP) tube, for measuring range 1000-1500 mm.

Indicating Instruments

All indicating instruments with a 8 mm mounting shank can be used.
Recommended are:

Indicating Instrument	Readings	Order no.
MarCator 810 S	0.01 mm	4311000
Zentimes 1010	0.01 mm	4332000
Compramess 1004	5 μ m	4333000
Digitale Messuhr MarCator 1087 BR	0.001 mm*	4337162

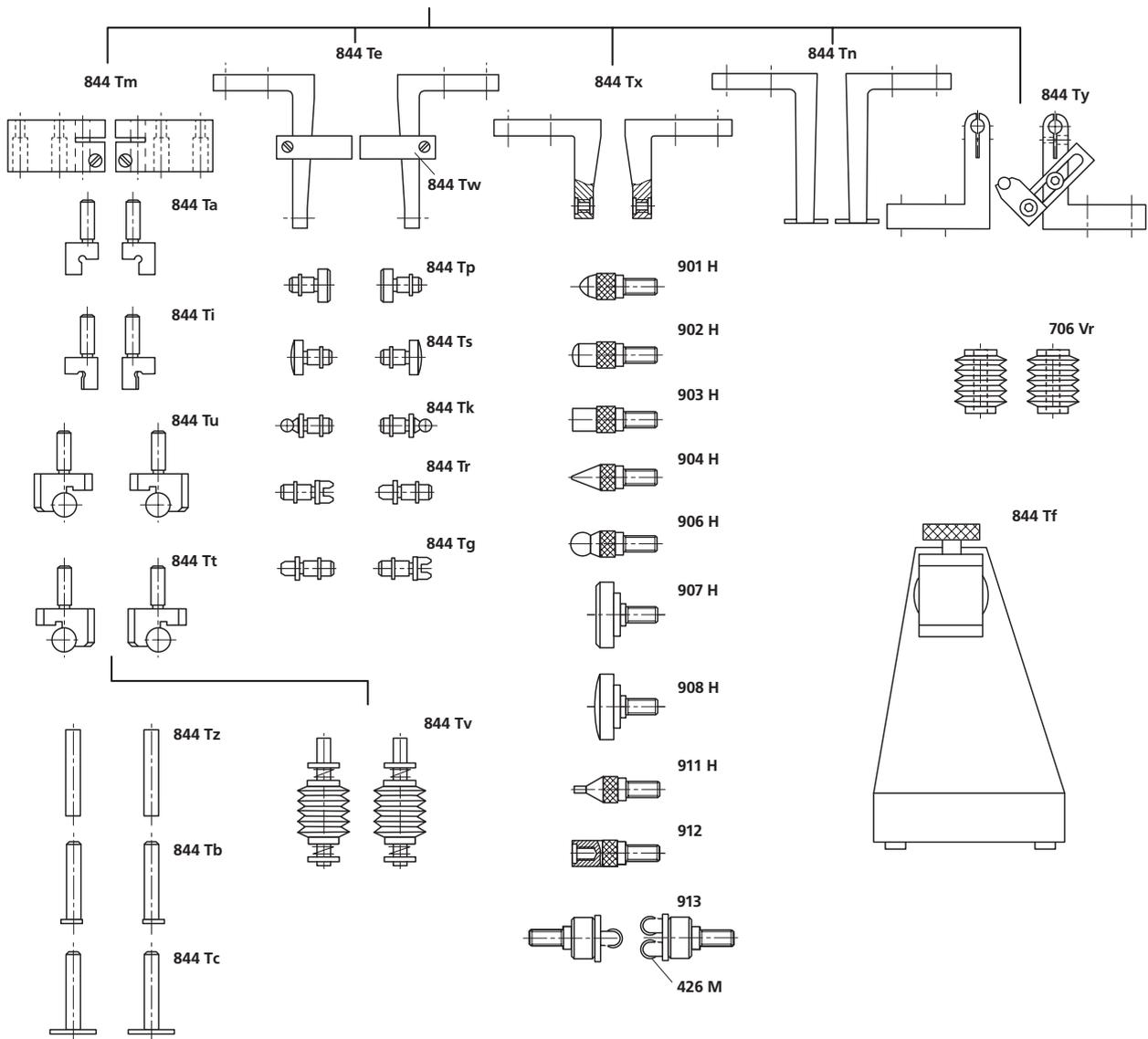
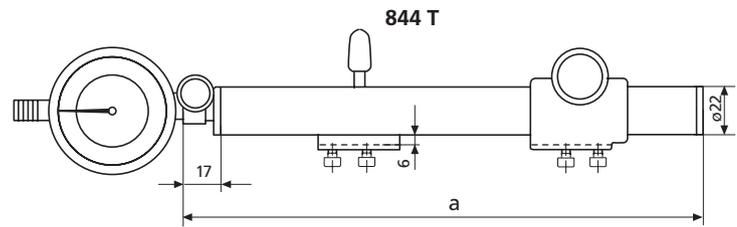
* Resolution

For further digital indicators please refer to Chapter 5

Overview. Measuring Arms, Stops, Mounting Attachments and Anvils

Dimensions

Range of application mm	a mm
25 - 110	245
100 - 260	395
250 - 610	745
600 - 1010	1145
1000 - 1500	1675
1500 - 2000	2175
2000 - 2500	2675

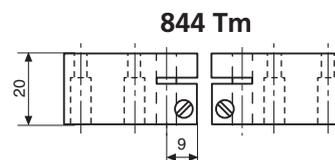


Overview. Measuring Arms, Stops and Mounting Attachments

Mounting Attachments 844 Tm

- Accommodates the following anvils 844 Ta, 844 Ti, 844 Tu, 844 Tt, 844 Tz, 844 Tb and 844 Tc
- Faces can also be used as stops
- Reversible arm holders for extending measuring range

Order no. 4500030

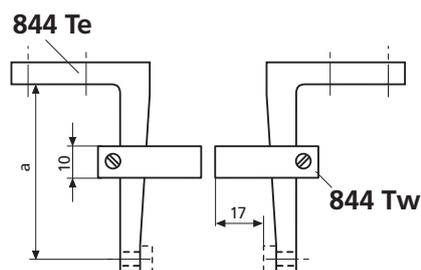


Measuring Arms 844 Te

- For external and internal diameters
- With a 3.5 mm (0.138") diameter mount, accommodates the interchangeable anvils 844 Tp, 844 Ts, 844 Tk, 844 Tr and 844 Tg
- Reversible arm holders for extending measuring range

Throat depth a in mm	25	50	100
Order no.	4500020	4500021	4500022*

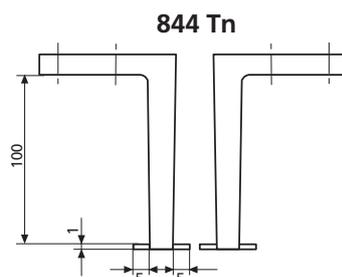
* Not suitable for Digital Caliper 25 ES



Stops 844 Tw

- To set the measuring depth limit. Can be attached and relocated on the following measuring arms 844 Te, 844 Tn, 844 Tx. Reversible for external and internal measurements

Order no. 4500109



Measuring Arms 844 Tn

- Hardened steel
- To measure external and internal diameters on recesses and grooves at a greater measuring depth

Throat depth a in mm	100
Order no.	4500036*

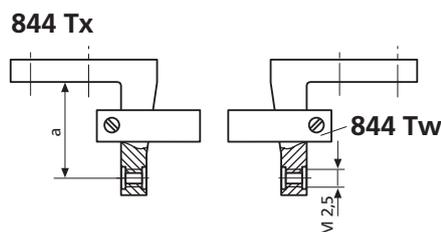
* Not suitable for Digital Caliper 25 ES

Measuring Arms 844 Tx

- With an M 2.5 connection thread to screw in interchangeable anvils
- For internal and external dimensions on specially formed work pieces
- Measuring arms in conjunction with the measuring arms holder is reversible thus extending the range of measurement / application

Throat depth a in mm	25	50	100
Order no.	4500080	4500081	4500082*

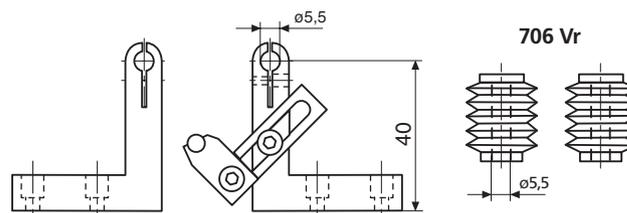
* Not suitable for Digital Caliper 25 ES



Holder for Measuring Rollers 844 Ty

- With location bolts for the Measuring Rollers 706 Vr, plus a stop and stop pin

Order no. 4502463



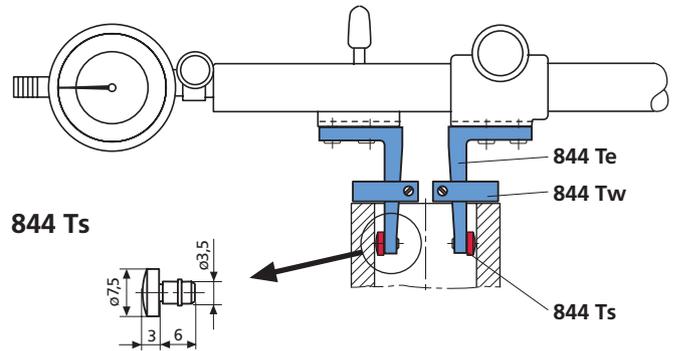
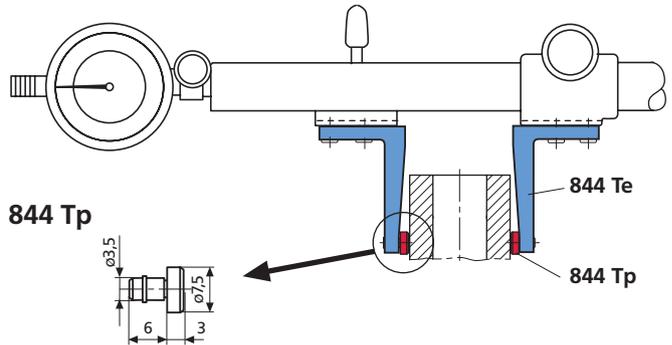
Measuring external and internal dimensions

Anvils for Measuring Arms 844 Te

- Hardened steel
- With a cylindrical mounting shank and retainer ring that allows free rotation in the bore of measuring arms 844 Te

Cat. no.	Order no.
844 Tp Flat; for external diameters, distance and widths	4500040*
844 Ts Spherical; for internal diameters	4500045*

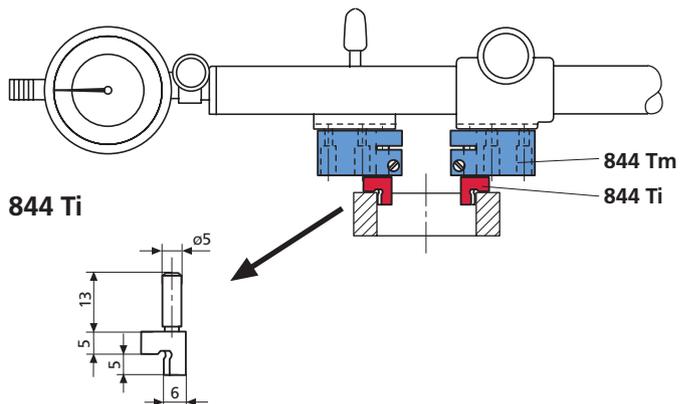
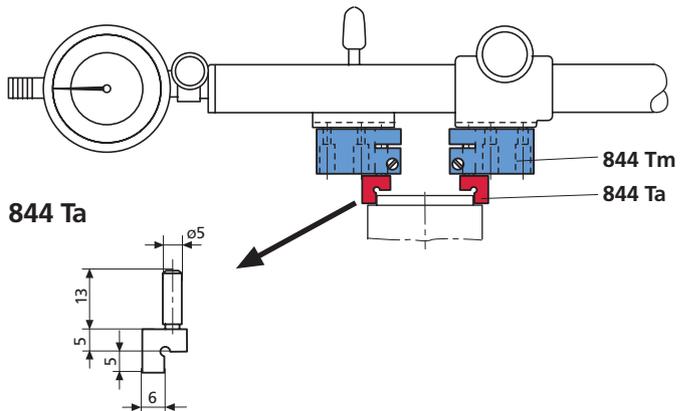
* 2 pieces are required



Shoulder anvils for mounting attachments 844 Tm

- Made from hardened steel
- For measuring narrow collars such as centering shoulders and other similar measuring tasks
- With cylindrical mounting shaft to attach into the mounting attachments 844 Tm

Cat. no.	Order no.
844 Ta Flat; for external diameters	4500050
844 Ti Semi-cylindrical, for internal diameters	4500055



Measuring tapers and distances

Roller Anvils 844 Tu* for Mounting Attachments 844 Tm

- To measure the diameter of **outside tapers and dovetail guides**
- Roller is made of hardened steel

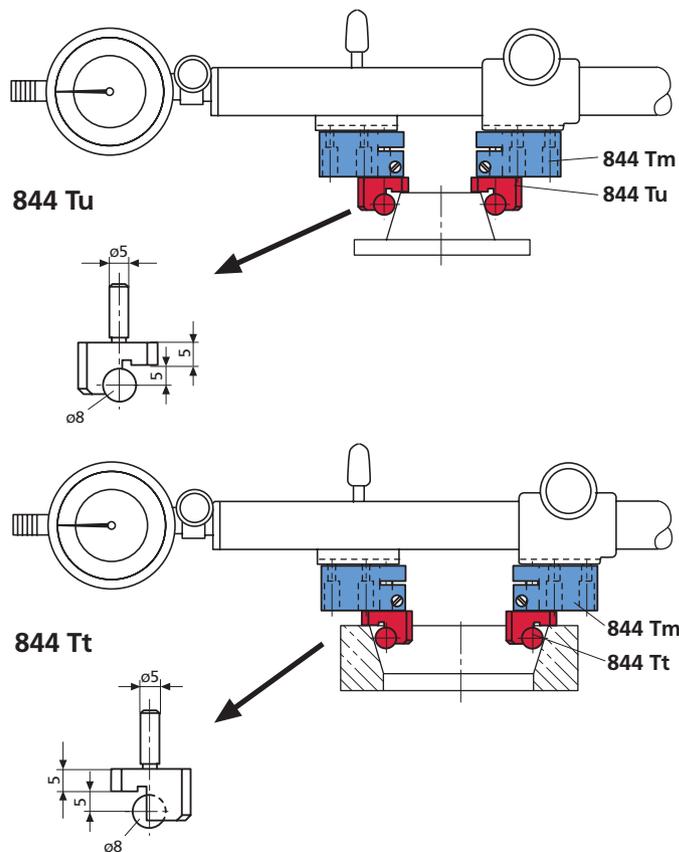
Cat. no.		Order no.
844 Tu*	Roller dia. 8 mm Roller length 14 mm Distance of the roller to the stop face 5 mm ± 3 μm	4500047

Ball Anvils 844 Tt* for Mounting Attachments 844 Tm

- To measure the diameter of **inside tapers** with a distance of 5 mm from the taper face
- Ball is made of hardened steel

Cat. no.		Order no.
844 Tt*	Ball dia. 8 mm Distance of the ball to the stop face 5 mm ± 3 μm	4500046

* Outer and inner surfaces that are parallel to one another a combination sets (pair) consisting of a Roller Anvil 844 Tu and a Ball Anvil 844 Tt, are recommended.



Measuring recesses

Anvils with Measuring Blades for Mounting Attachments 844 Tm

- For measuring centering shoulders and recesses on internal and external diameters; consists of a pin type holder, which is be moved to set the measuring depth in Mounting Attachment 844 Tm and a mounted measuring blade
- The face of the Mounting Attachment 844 Tm serves as stop

844 Tb

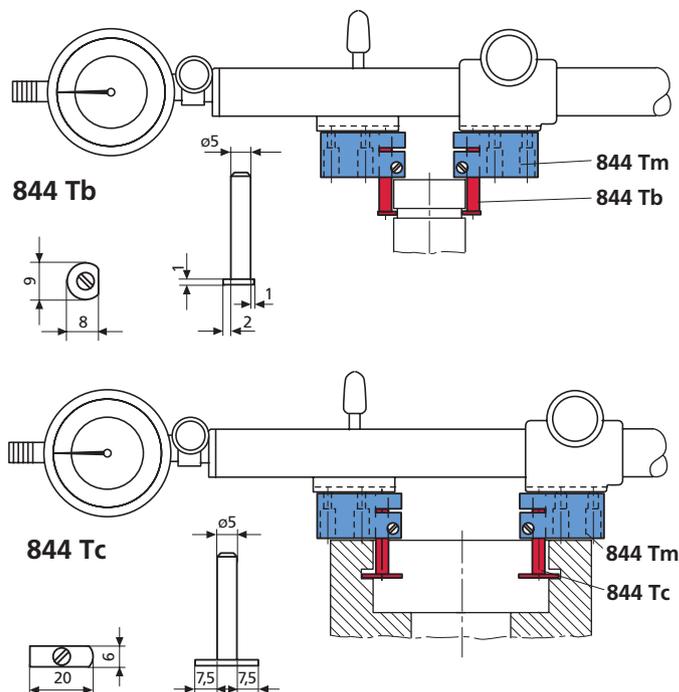
- With round measuring blades
- Ideal for workpieces that have a recess up to 2 mm in depth

844 Tc

- With long measuring blades
- Ideal for workpieces that have a recess up to 7.5 mm in depth

Cat. no.	Blade Length	Blade dia.	Range of adjustment	Order no.
mm	mm	mm		
844 Tb	–	9	0 – 10	4500015*
844 Tc	20	–	0 – 10	4500114*
	20	–	40 – 50	4500115*

* 2 pieces are required



Measuring external and internal tooth profiles

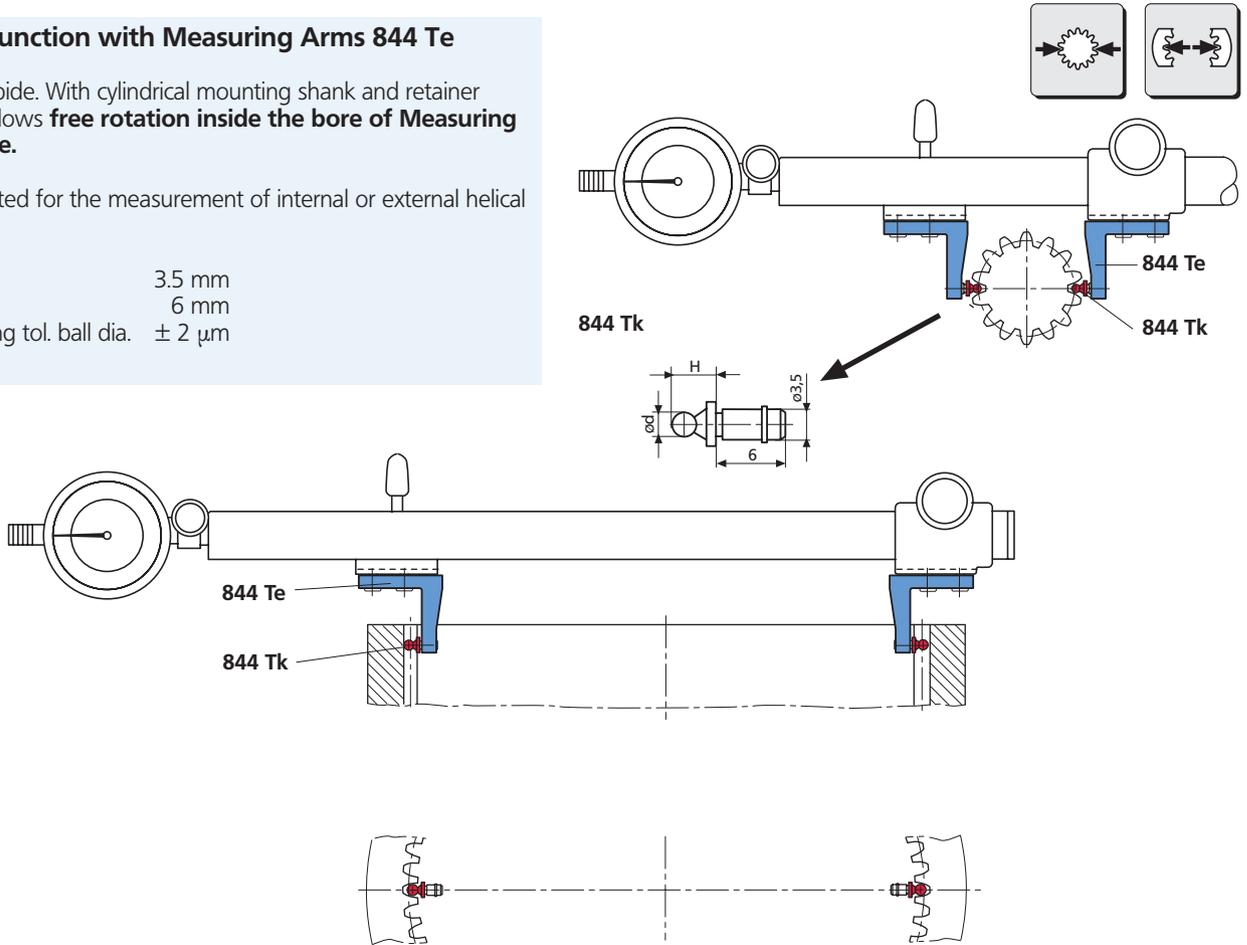
Ball Anvils 844 Tk

Use in conjunction with Measuring Arms 844 Te

- Made of carbide. With cylindrical mounting shank and retainer ring which allows **free rotation inside the bore of Measuring Arms 844 Te**.

Especially suited for the measurement of internal or external helical gear wheels.

Shank dia. 3.5 mm
 Shank length 6 mm
 Manufacturing tol. ball dia. $\pm 2 \mu\text{m}$



dia. d mm	H mm	Order no.*									
0.5	3.0	4502620	1.5	4.0	4500352	2.438	4.9	4502646	4.5	7.0	4500360
0.551	3.1	4502621	1.524	4.0	4502635	2.5	5.0	4500356	4.835	7.3	4502655
0.62	3.1	4502622	1.54	4.0	4502636	2.667	5.2	4502647	5	7.5	4500361
0.623	3.1	4502623	1.6	4.1	4502637	2.704	5.2	4502648	5.25	7.8	4502656
0.63	3.1	4502624	1.65	4.2	4502638	2.713	5.2	4502649	5.486	8.0	4502657
0.722	3.2	4502625	1.7	4.2	4502639	2.721	5.2	4502650	5.5	8.0	4500362
0.862	3.4	4502626	1.75	4.3	4500353	2.743	5.2	4502651	6	8.5	4500363
0.895	3.4	4502627	1.782	4.3	4502640	2.75	5.3	4500618	6.096	8.6	4502658
0.965	3.5	4502628	1.8	4.3	4502641	3	5.5	4500357	6.35	8.9	4502545
1	3.5	4500350	1.829	4.3	4502642	3.048	5.5	4502652	6.5	9.0	4502542
1.1	3.6	4502629	1.9	4.4	4502643	3.25	5.8	4502541	7	9.5	4502547
1.118	3.6	4502630	2	4.5	4500354	3.4	5.9	4502653	8	10.5	4502548
1.125	3.6	4502631	2.032	4.5	4502543	3.5	6.0	4500358	9	11.5	4502549
1.25	3.8	4500351	2.25	4.8	4502540	3.658	6.2	4502654	10	12.5	4502550
1.35	3.9	4502632	2.284	4.8	4502644	4	6.5	4500359			
1.372	3.9	4502633	2.3	4.8	4502544						
1.385	3.9	4502634	2.386	4.9	4502645						

* 2 pieces are required

Further sizes are available upon request (material: Steel)

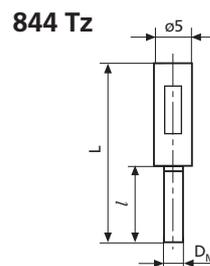
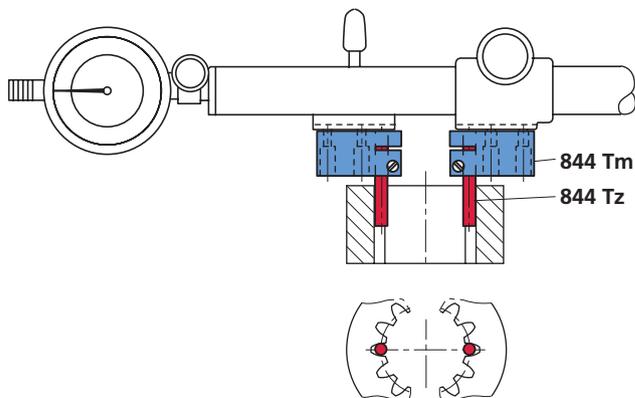
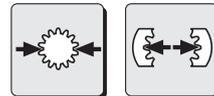
Measuring external and internal tooth profiles

Cylindrical Measuring Pins 844 Tz

Use in conjunction with Mounting Attachments 844 Tm

- Made from steel, with shank for mounting into the Mounting Attachment 844 Tm.

Manufacturing tol. $\pm 2 \mu\text{m}$



dia. D_M mm	Length l mm	Length L mm	Order no.
1	6	19.5	4500500
1.25	6	19.5	4500501
1.5	6	19.5	4500502
1.75	10	23.5	4500503
2	10	23.5	4500504
2.5	10	23.5	4500506
3	15	28.5	4500507
3.5	15	28.5	4500508
4	15	28.5	4500509
4.5	20	33.5	4500510
5	20	33.5	4500511
5.5	20	33.5	4500512
6	20	33.5	4500513

Further sizes are available upon request (material: Steel)

Measuring external threads

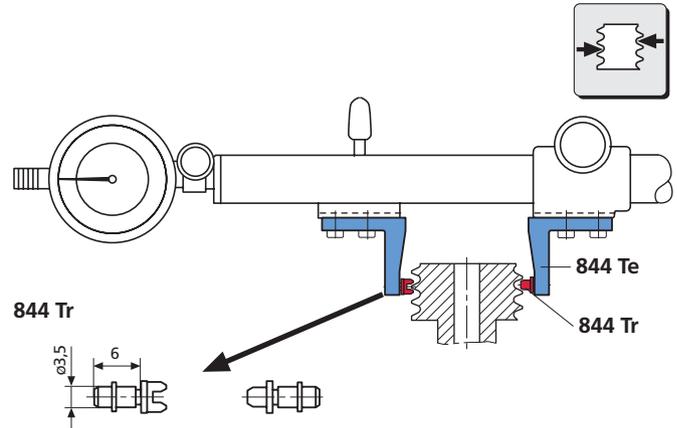
Interchangeable Anvils 844 Tr

Used in conjunction with Measuring Arms 844 Te

- Pair consists of V-anvil and blade

For pitch diameters

Shank dia. 3.5 mm
Shank length 6 mm



Metric external thread (60°)			Whitworth external thread (55°)			American UST external 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.
0.5 - 0.7	4501000	4501200	40 - 32	4501007	4501207	40 - 32	4501018	4501418
0.7 - 1	4501001	4501201	32 - 24	4501008	4501208	32 - 24	4501019	4501419
1.25 - 2	4501002	4501202	24 - 18	4501009	4501209	24 - 18	4501020	4501420
2 - 3.5	4501003	4501203	18 - 14	4501010	4501210	18 - 14	4501021	4501421
3.5 - 5	4501004	4501204	14 - 10	4501011	4501211	14 - 10	4501022	4501422
5 - 7	4501005	4501205	10 - 7	4501012	4501212	10 - 7	4501023	4501423
7 - 9	4501006	4501206	7 - 4.5	4501013	4501213	7 - 4.5	4501024	4501424
			4.5 - 3	4501014	4501214	4.5 - 3	4501025	4501425
			3 - 2.5	4501015	4501215			

For pitch diameters

Trapezoid external thread acc. to DIN 103

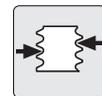
Pitch	V-anvil	Blade
mm	Order no.	Order no.
1	4501150	4501350
1.5	4501151	4501351
2	4501152	4501352
3	4501153	4501353
4	4501154	4501354
5	4501155	4501355
6	4501156	4501356
7	4501157	4501357
8	4501158	4501358
9	4501159	4501359
10	4501160	4501360
12	4501161	4501361
14	4501162	4501362
16	4501163	4501363
18	4501164	4501364
20	4501165	4501365

Measuring external threads

Interchangeable Anvils 844 Tr

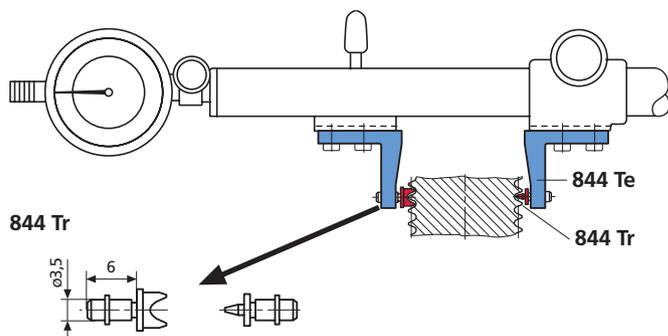
Used in conjunction with Measuring Arms 844 Te

- Pair consists of V-anvil and blade
- Each pitch requires a separate V-anvil
- Blade can be used for several pitches



For root diameters

Shank dia. 3.5 mm
Shank length 6 mm



Metric external thread (60°)			Whitworth external thread (55°) American UST external thread (60°)		
Pitch	V-anvil	Blade	Pitch	V-anvil	Blade
mm	Order no.	Order no.	range tpi	Order no.	Order no.
0.5	4501026		40	4501083	
0.6	4501027		36	4501108	4501284
0.7	4501028		32	4501084	
0.75	4501029	4501232	28	4501085	
0.8	4501030		26	4501086	
0.9	4501031		24	4501087	
1	4501032		22	4501088	4501290
1.25	4501033		20	4501089	
1.5	4501034	4501235	19	4501090	
1.75	4501035		18	4501091	
2	4501036		16	4501092	4501293
2.5	4501037	4501238	14	4501093	
3	4501038		12	4501094	4501296
3.5	4501039		11	4501095	
4	4501040	4501241	10	4501096	
4.5	4501041		9	4501097	4501299
5	4501042		8	4501098	
5.5	4501043	4501244	7	4501099	
6	4501044		6	4501100	
7	4501045		5	4501101	4501302
8	4501046	4501247	4.5	4501102	
9	4501047		4	4501103	
			3.5	4501104	4501306
			3.25	4501105	
			3	4501106	

Measuring internal threads

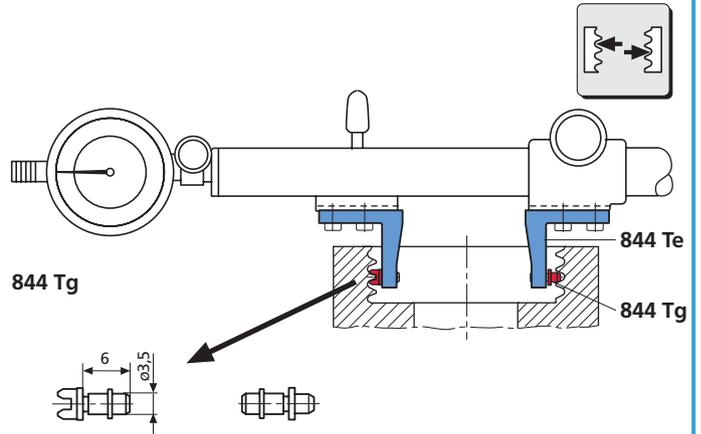
Interchangeable Anvils 844 Tg

Used in conjunction with Measuring Arms 844 Te

- Pair consists of V-anvil and tapered anvil.

For pitch diameter

Shank dia. 3.5 mm
Shank length 6 mm



Metric internal thread (60°)			Whitworth internal thread (55°)			American UST internal thread (60°)		
Pitch	V-anvil	Tapered anvil	Pitch range	V-anvil	Tapered anvil	Pitch range	V-anvil	Tapered anvil
mm	Order no.	Order no.	tpi	Order no.	Order no.	tpi	Order no.	Order no.
0.5 - 0.7	4174300	4174600	40 - 32	4174343	4174643	40 - 32	4174415	4174615
0.7 - 1	4174301	4174601	32 - 24	4174344	4174644	32 - 24	4174416	4174616
1.25 - 2	4174302	4174602	24 - 18	4174345	4174645	24 - 18	4174417	4174617
2 - 3.5	4174303	4174603	18 - 14	4174346	4174646	18 - 14	4174418	4174618
3.5 - 5	4174304	4174604	14 - 10	4174347	4174647	14 - 10	4174419	4174919
5 - 7	4174305	4174605	10 - 7	4174348	4174648	10 - 7	4174420	4174620
7 - 9	4174306	4174606	7 - 4.5	4174349	4174649	7 - 4.5	4174421	4174621
			4.5 - 3	4174350	4174650	4.5 - 3	4174422	4174622
			3 - 2.5	4174351	4174651			

Trapezoid external thread acc. to DIN 103

Pitch	V-anvil	Tapered anvil
mm	Order no.	Order no.
1	4501830	4501831
1.5	4501832	4501833
2	4501834	4501835
3	4501836	4501837
4	4501838	4501839
5	4501840	4501841
6	4501842	4501843
7	4501844	4501845
8	4501846	4501847
9	4501848	4501849
10	4501850	4501851
12	4174961	4174981
14	4174962	4174982
16	4174963	4174983
18	4174964	4174984
20	4174965	4174985

Measuring internal threads

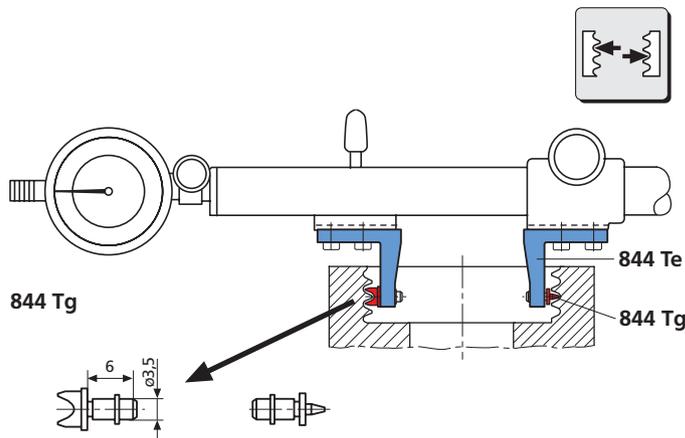
Interchangeable Anvils 844 Tg

Used in conjunction with Measuring Arms 844 Te

- Pair consists of V-anvil and pointed anvil
- Each pitch requires a separate V-anvil
- Pointed anvil can be used for several pitches.

For external diameters

Shank dia. 3.5 mm
 Shank length 6 mm



Metric internal thread (60°)			Whitworth internal thread (55°) American UST internal thread (60°)		
Pitch mm	V-anvil Order no.	Pointed anvil Order no.	Pitch range tpi	V-anvil Order no.	Pointed anvil Order no.
0.5	4174313		40	4174431	
0.6	4174314		36	4174427	4174632
0.7	4174315		32	4174432	
0.75	4174316	4174619	28	4174433	
0.8	4174317		26	4174435	
0.9	4174318		24	4174436	
1	4174319		22	4174437	4174939
1.25	4174321		20	4174438	
1.5	4174322	4174623	19	4174439	
1.75	4174323		18	4174440	
2	4174325		16	4174442	4174943
2.5	4174326	4174627	14	4174443	
3	4174327		12	4174445	4174947
3.5	4174329		11	4174446	
4	4174330	4174631	10	4174447	
4.5	4174331		9	4174449	4174949
5	4174333		8	4174450	
5.5	4174334	4174635	7	4174451	
6	4174335		6	4174453	
7	4174337		5	4174454	4174655
8	4174338	4174639	4.5	4174455	
9	4174339		4	4174457	
			3.5	4174458	4174660
			3.25	4174459	
			3	4174460	

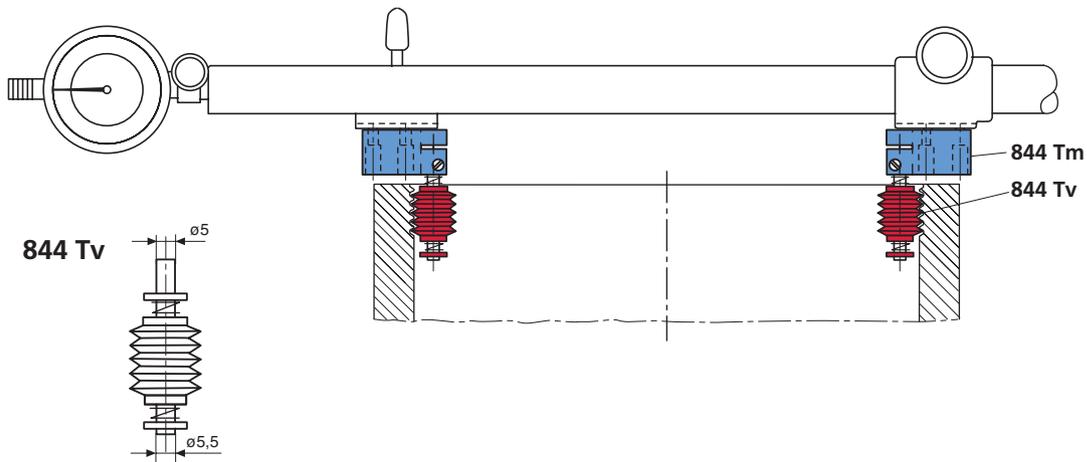
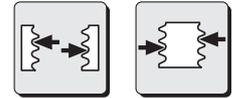
Measuring external and internal threads

Interchangeable Measuring Rollers 844 Tv

Used in conjunction with Mounting Attachment 844 Tm

- Mounting shank fits into Mounting Attachment 844 Tm
- Each has two springs to alleviate the positioning on the correct pitch thread

Mounting Shank dia.: 5 mm



Metric Thread (60°)		Whitworth Thread (55°)		American UST Thread (60°)	
Pitch mm	Order no.	Range tpi	Order no.	Range tpi	Order no.
0.5	4501705	40	4501769	40	4501819
0.6	4501706	36	4501768	36	4501818
0.7	4501707	32	4501767	32	4501817
0.75	4501708	30	4501766	30	4501816
0.8	4501709	28	4501765	28	4501815
0.9	4501710	24	4501764	24	4501814
1	4501711	22	4501763	22	4501813
1.25	4501712	20	4501762	20	4501812
1.5	4501713	19	4501761	19	4501811
1.75	4501714	18	4501760	18	4501810
2	4501715	16	4501759	16	4501809
2.5	4501716	14	4501758	14	4501808
3	4501717	13	4501757	13	4501807
3.5	4501718	12	4501756	12	4501806
4	4501719	11	4501755	11	4501805
4.5	4501720	10	4501754	10	4501804
5	4501721	9	4501753	9	4501803
5.5	4501722	8	4501752	8	4501802
6	4501723	7	4501751	7	4501801
		6	4501750	6	4501800

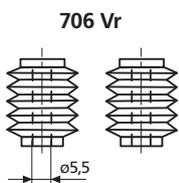
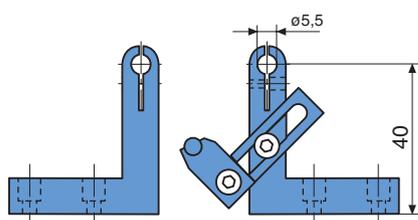
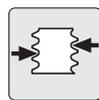
Special Threads. Interchangeable Measuring Rollers for special threads are also available on request.

Measuring external threads

Measuring Roller Holder 844 Ty

- With location bolts for the Measuring Rollers 706 Vr
- With stop and stop pin

Order no. 4502463



Thread Measuring Rollers 706 Vr

Used in conjunction with Measuring roller holder 844 Ty

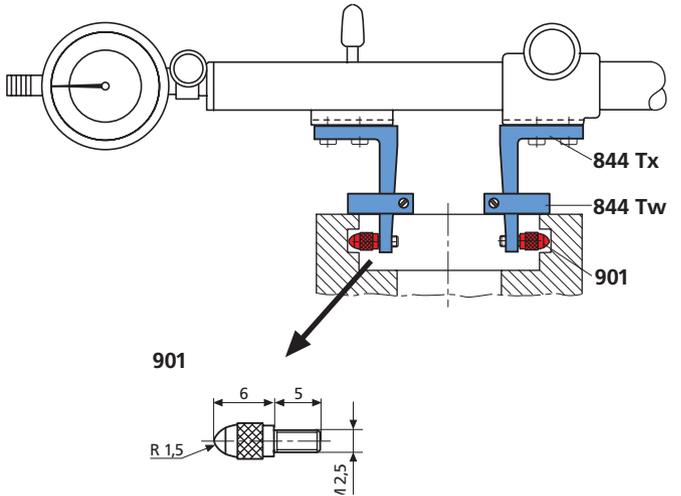
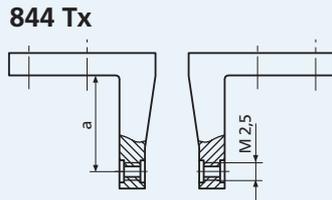
Metric Thread (60°)		Whitworth Thread (55°)		American UST Thread (60°)	
Pitch mm	Order no.	Range tpi	Order no.	Range tpi	Order no.
0.5	4521105	40	4521219	40	4521319
0.6	4521106	36	4521218	36	4521318
0.7	4521107	32	4521217	32	4521317
0.75	4521108	30	4521216	30	4521316
0.8	4521109	28	4521215	28	4521315
0.9	4521110	24	4521214	24	4521314
1	4521111	22	4521213	22	4521313
1.25	4521112	20	4521212	20	4521312
1.5	4521113	19	4521211	19	4521311
1.75	4521114	18	4521210	18	4521310
2	4521115	16	4521209	16	4521309
2.5	4521116	14	4521208	14	4521308
3	4521117	13	4521207	13	4521307
3.5	4521118	12	4521206	12	4521306
4	4521119	11	4521205	11	4521305
4.5	4521120	10	4521204	10	4521304
5	4521121	9	4521203	9	4521303
5.5	4521122	8	4521202	8	4521302
6	4521123	7	4521201	7	4521301
		6	4521200	6	4521300

Special Threads. Interchangeable Measuring Rollers for special threads are also available on request.

Measuring external and internal dimensions

Measuring Arms 844 Tx and associated Anvils

- With an M 2.5 connection thread to screw in the interchangeable anvils
- For internal and external dimensions on specially formed work pieces
- Measuring arms on the measuring arm holder are reversible, therefore extending the range of measurement / application



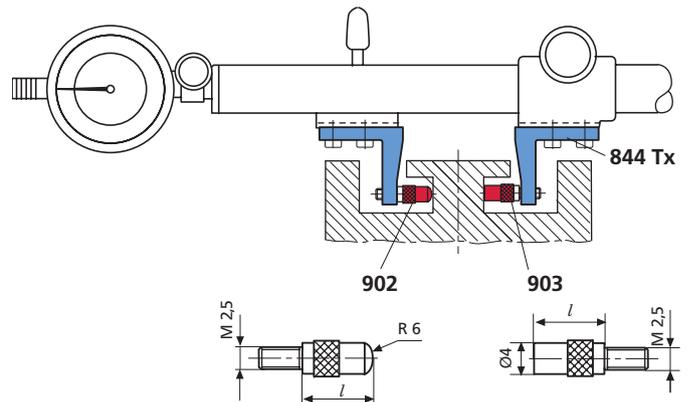
Throat depth a mm	25	50	100
Order no.	4500080	4500081	4500082

Standard Contact Points / Anvils 901, Ball dia. 3 mm

Cat. 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 l mm	902	902 H	903	903 H
	Steel	Carbide meas. face	Steel	Carbide-tipped
	Order no.	Order no.	Order no.	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			



Measuring external and internal dimensions

Measuring Arms 844 Tx and associated Anvils

Ball Contact Points 906 H

With carbide ball. manufacturing 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			

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

Special Contact Points / Anvils

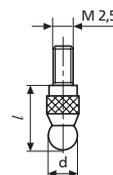
	Order no.
Conical Contact Points , carbide tipped	904 H 4360131
Flat Contact Points* , steel, A = 1 cm ² carbide tipped, dia. 7 mm	907 4360200 907 H 4360201
Spherical Contact Points , steel carbide tipped	908 4360210 908 H 4360211
Pin Contact Point , carbide tipped, dia. 1 mm, flat	911 H 4360240
Flat Contact Point , for mounting a pin gage holder 426 M for measuring threads using the 3 wire method	913 4360400

* When using an anvil with a flat contact face the opposite anvil must have an spherical contact face.

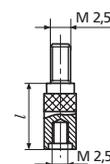
Note:

The Order no's on pages 10-18 and 10-19 only related to one piece.

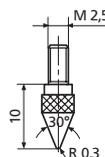
906 H



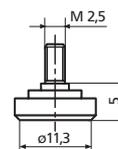
912



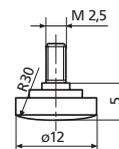
904 H



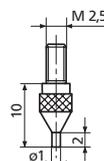
907



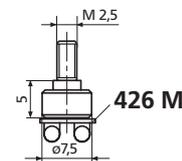
908 H



911 H



913



Scribing with Digital Universal Caliper 25 ES

Scriber Point 25 Es

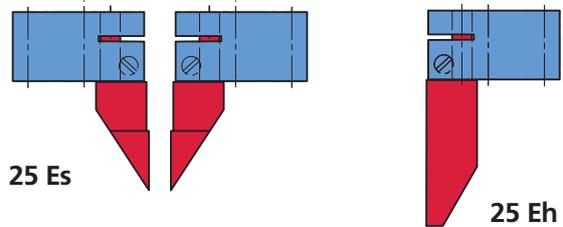
- For straight lines and circles
- Made of hardened steel

Order no. 4118530

Counter Holder 25 Eh

- In conjunction with 25 Es to scribe straight lines, for example; along an edge
- Made of hardened steel

Order no. 4118535



25 Es

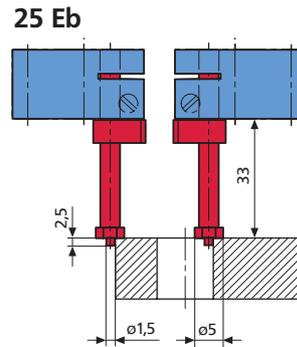
25 Eh

Anvils for Distances for Digital Universal Caliper 25 ES

Mounting Inserts 25 Eb

- For distances between the center of bores and between the center of a bore and an edge
- Carbide tipped
- Longest distance between hole centers corresponds with half the measuring range

Order no. 4118525



25 Eb

Stand 844 Tf for Universal Measuring Instrument 844 T

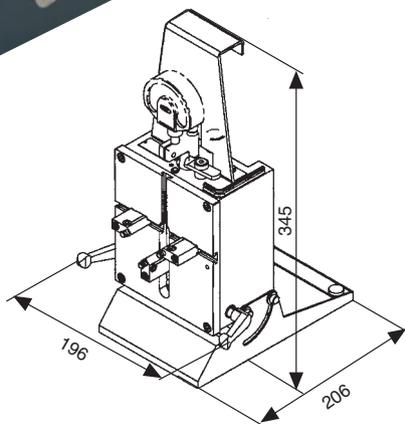
- For stationary use of the Universal Measuring Instrument 844 T
Measuring range 25 - 110 mm
- User has both hands free for insertion of work piece
- The indicating instrument is always in the operator's line of vision
- Strong, stable cast base with clamping device for Universal Measuring Instrument

Order no. 4450512



844 Tf

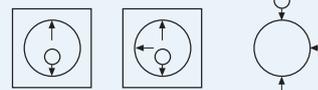
I.D./O.D. Indicator Gage 36 B for Internal and External Dimensions



Features

- For checking of inside and outside diameters, reference flanges, small shoulders and grooves.
- Adjustable retraction (6 mm to 10 mm) of the moveable anvil
- Adjustable measuring force
- 2-point T-plate, gives a diameter reading directly across the diameter. A third contact may be used as a side-step of centralizer

Inside meas. Outside meas.



without stop with stop

- High measuring accuracy ensured by measuring probe supported in friction free parallel spring system
- User friendly, table area can be tilted in relation to the base from 0° to 90°

Indicating Instruments

All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

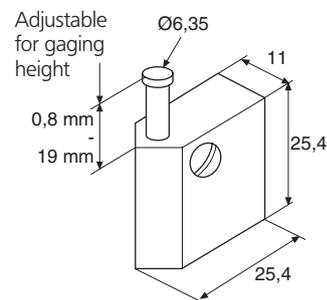
Catalog no.	Resolution	Order no.
MarCator 1087	1 μm	4337060
μMaxμm II	1 μm	2032405

Technical Data

Model	Measuring range		Meas. force adjustable N	Distance of mov. anvil adjustable mm	Order no.
	Int. dimensions mm	Ext. dimensions mm			
M36-B10	19 - 140	6 - 127	0 - 35	6 - 10	2003200
M36-B20	19 - 197	6 - 222	0 - 35	6 - 10	2003201

Jaw Sets

Type	Description	Material (contact pins and rest surfaces)	Order no.
JW-9	Jaw Set (3 pieces)	Steel	2003210*
PS-55	Contact Pins for JW-9	Steel	2003215
JW-58	Jaw Set (3 pieces)	Carbide	2003211
PS-226	Contact Pins for JW-58	Carbide	2003216



Jaw JW-9

* Supplied with.
For special jaw configurations are available upon request

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.com, WebCode 213

Programm	Messgeräte	Einstellungen	?
4 USB-Geräte	Beschreibung Gerät, Anschlusskabel	Messwert Status	Anforderung Ziel
USB1	Fußschalter Schalter MC1	--,-- OK	Messung Nr.: 0/1
USB2	Durchmesser 1 1087 16EXu	+015.17 OK	Schalter: Fußschalter Excel: Default.xlt/Tabelle1/1
USB3	Durchmesser 2 1087 16EXu	+025.35 OK	Schalter: Fußschalter Excel: Default.xlt/Tabelle1/2
USB4	Durchmesser 3 1087 16EXu	+014.99 OK	Schalter: Fußschalter Excel: Default.xlt/Tabelle1/3

► | Our new digital hand held measuring instruments are equipped with MarConnect interface capability. Regardless of which interface standard you use, whether USB, Opto RS232 or Digimatic; MarConnect will always provide you with the optimal connection.

▶ | MarConnect. Data Processing

USB Ready / MarCom Software

Overview

MarConnect USB Ready

11- 2

Simple data transmission to a PC as well as enables quick and universal assembly of a multiple measuring station

MarCom Software

11- 3

Clear and flexible data acquisition

Statistics Printer

MarConnect MSP2

11- 5

Statistics printer with integrated Data Logger

Interfaces

MarConnect T-Box

11- 6

Interface to connect to a PC keyboard input

Radio Transmission

MarConnect Radio System FM 2

11- 7

Secure and wireless data transmission

Overview

MarConnect Data Connection Cables

11- 8

To connect Measuring Instruments to Data Printers, Interfaces and PC's

MarConnect. USB ready

► | The new flexible **MarConnect** interface from Mahr. Simplifies both data transmission to a PC and enables quick and universal assembly of a multiple measuring station. ◀ |



- **Choose alternative methods of data transmission** either with a foot switch or a PC keyboard, direct on the measuring instrument or with the Timer function



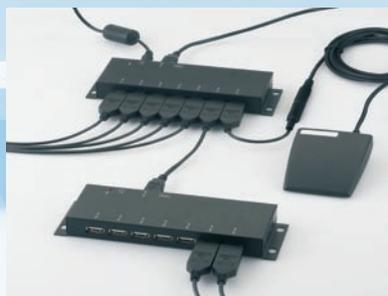
- **Compatible with all MarConnect USB ready measuring instruments**

- **Clear and flexible data acquisition** with the easy to use **MarCom Professional Software**

4 USB-Geräte	Beschreibung	Messwert	Anforderung
USB1	Schalter Messstation	OK	Messung Nr.: 0/1
USB2	Welle 1	+015.17	Excel: Default.xls/Tabelle1/1
USB3	Breite	+025.35	Excel: Default.xls/Tabelle1/2
USB4	Messstation 3	+014.99	Timer 00:00:10 Excel: Default.xls/Tabelle1/1

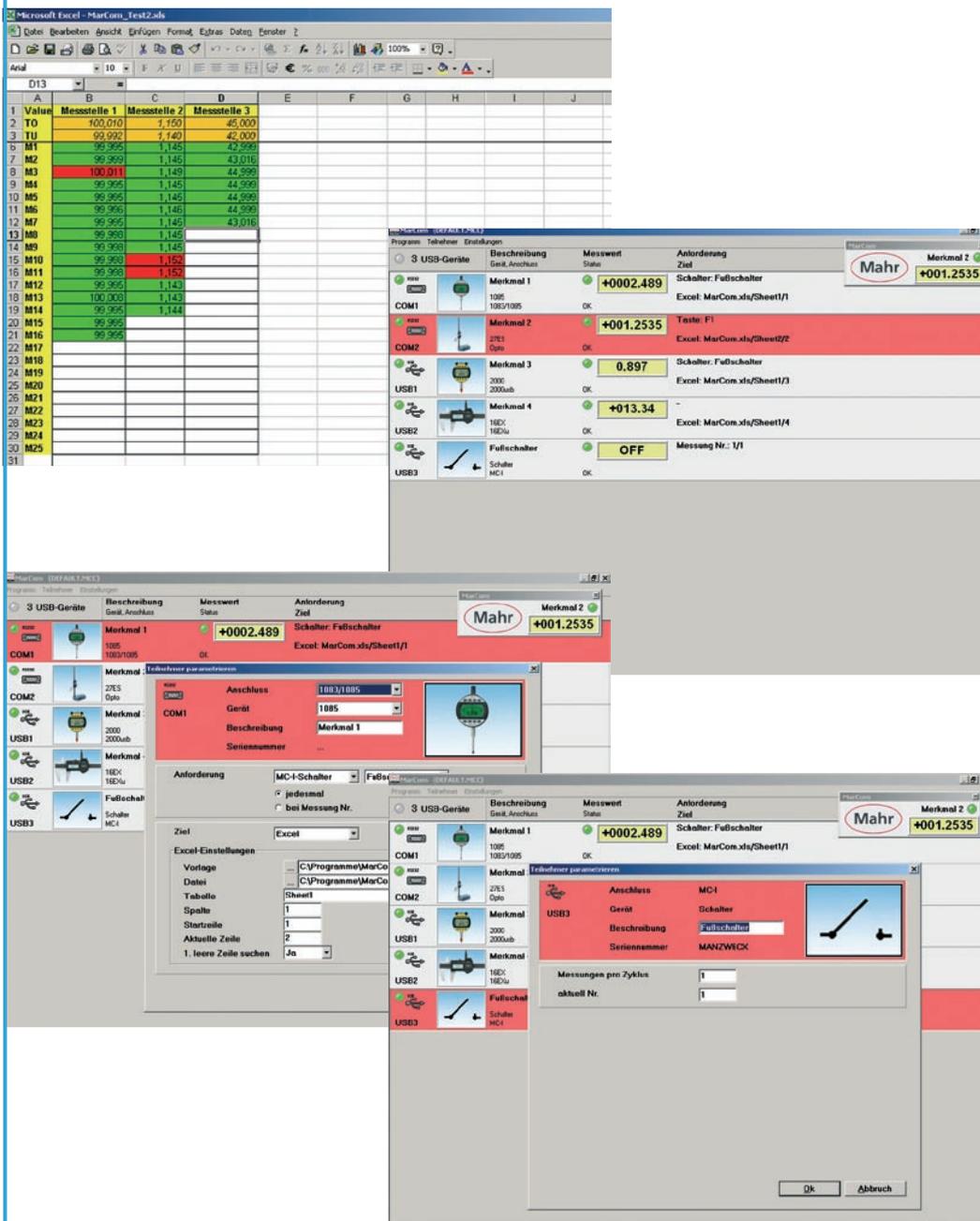


- **Multiple measuring station** is easily set up with a USB hub, up to 100 measuring devices can be simultaneously connected



- **Easily extendable** with additional USB hubs

MarCom Software



Features

Software MarCom Professional

- Measured values can be directly transferred into either 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 is possible via USB and 2 serial COM interfaces
- USB hub is also suitable as a measuring instrument interface
- Up to 100 measuring instruments can be connected with USB data cable
- Clear portrayal of the chosen measuring instruments with the aid of icons
- Several foot switches can be connected up via USB. Measuring instruments can be freely assigned
- Freely definable and configurable measurement cycles
- There are a variety of ways to transmit data, you can either press the "Data" button on the measuring instrument or on the data cable; via a computer, timer, keyboard; or by activating a foot switch connected to a USB interface
- Text file can be edited thus translated in diverse languages

Software MarCom Standard

(USB cable is not included in the scope of supply)

Features and system requirements are identical to MarCom Professional, except that it only has one USB and one serial COM interface

System Requirements

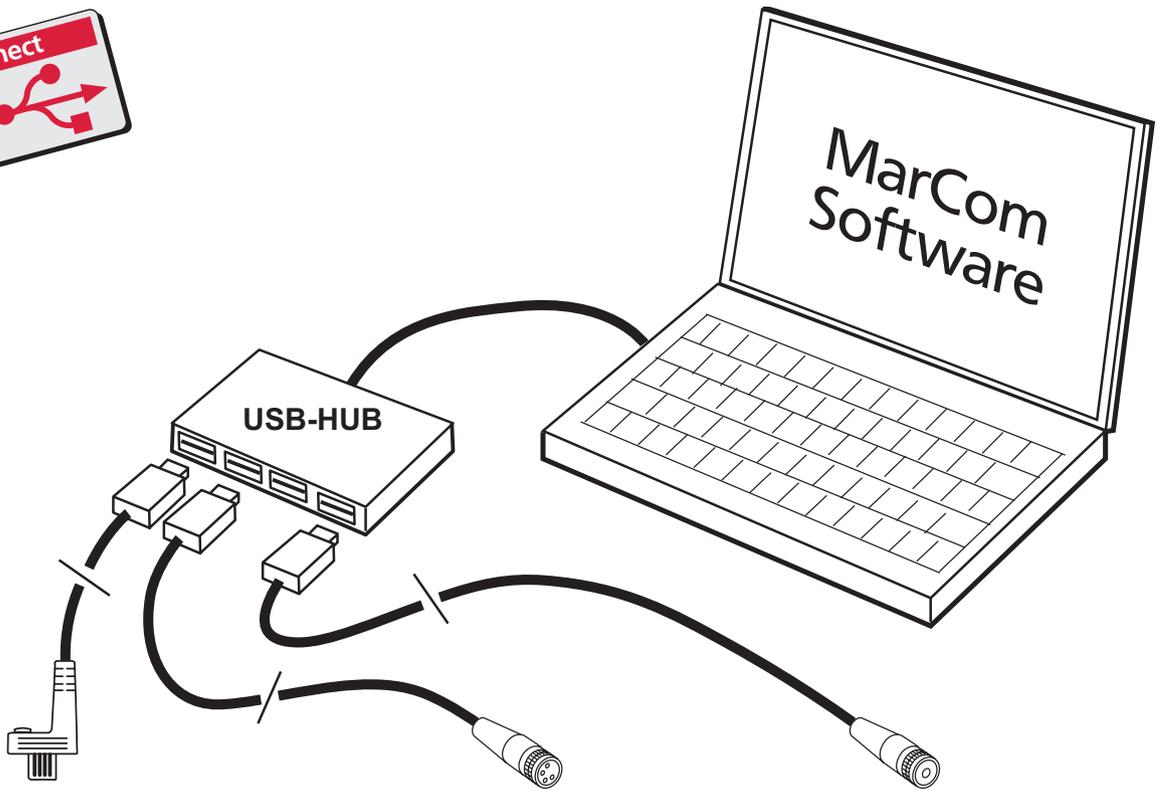
- IBM AT compatible PC
- MS Windows® 2000, XP, Vista, 7
- USB interface, higher than 1.1
- up to 10 MB
- CD / DVD drive
- Recommended: MS Excel from Version 97 onwards

Order no.

Software MarCom Professional
Software MarCom Standard

4102552
4102551

USB ready measuring instruments



Data Connection Cable **16 EXu**
Order no. 4102357
 incl. MarCom Standard

for **MarCal.** Calipers
 16 ER / 16 EWR
 16 EWW
 18 EWR
 30 ER /
 30 EWR / 30 EWN



for **Digimar.** Height Gages
 814 SR



for **Micromar.** Micrometers
 40 EWR, 40 EWS, 40 EWW,
 46 EWR, 44 EWR



for **MarCator.** Digital Indicators
 1075 R, 1086 R,
 1087 R



for **MarSurf.** PS1



Data Connection Cable **2000 usb**
Order no. 4346023
 incl. MarCom Standard

for **MarCator.** Digital Indicators
 1088



for **Millimes.** Digital
 Comparators
 2000
 2001
 2100
µMaxµm II



für **Digimar.** 816 CL



Data Connection Cable **MC-I**
Order no. 4102782
 incl. MarCom Standard

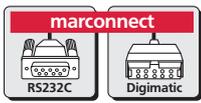
for **Foot switch**
Order no. 4102058



USB-HUB 7-fold industrial model incl. USB cable for
 connection to a PC and power adapter
Order no. 4102553



Statistics Printer MSP 2 with integrated Data Logger



Above shows the Statistics Printer MSP2 being used in conjunction with the Transport Bag MSP 2t

Features

- Areas of application include; incoming goods department, on the production floor, in quality assurance department and in dispatch
- Can be connected to any of the following: Mahr Hand Measuring Instruments, Mahr Millimetre Instruments, Digimatic compatible instruments and measuring instruments with a RS232C interface
- Two-line display for a simple dialog mode
- Real-time clock with date
- Measured values can easily be stored and transferred to a PC
- The following statistical parameters can be determined: process mean \bar{x} , range R, standard deviation σ_n and σ_{n-1} , Min and Max of the measured values, $> UTol$, $< LTol$, machine capability C_m and C_{mk} , process capability C_p and C_{pk} for sampling sizes 2-25
- 3 types of print protocols: statistics, statistics with a histogram, sample charts
- List of measured values can be printed from the memory at any time
- Individual values can be chosen and deleted as desired
- Quiet and fast Thermo-printer (5 lines/sec.)
- Automatic data transfer with adjustable time interval parameter from between 1 sec. to 99 hrs.
- Alternative power sources include: mains adapter (100 - 240 V, batteries or NIMH-accumulator, type AA)
- Can be deployed as an interface to the PC
- Languages can be selected, German, English and French
- Supplied with: Mains adapter, paper roll

Technical Data

Max. measured values	999
Characters per line	24
Paper width	58 mm
Paper length	25 m
LxWxH	215 x 116 x 85 mm
Battery operation at 1100 mAh	> 7000 printed lines
Data logger powered by accu.	ca. 24 Hrs.
Protection class	IP40
Total weight incl. accu.	600 g

Order no. 4102040

Accessories

	Order no.
Foot Switch to trigger data transmission	4102058
Paper Rolls 1 Pack = 5 rolls	4102041
Transport Bag MSP 2t	4102042
Data Cable to connect MSP 2 to a PC (Data transfer / Interface mode)	4102711
Data Cable for connecting measuring instruments See cable overview on Page 11-8	
MarCom Software see Page 11-3	

T-Box keyboard interface to connect to measuring instruments to USB interface



T-Box 205 USB

Features

- Measuring data is converted into **keyboard codes**, therefore suitable for any software with a manual input (e.g. MS-Excel®)
- No special driver software required
- Independent of operating system (Windows, Linux, DOS)
- Measuring values can be processed individually or as a group
- The measured values can be directly triggered on the measuring instrument or with the optional foot switch
- Every Multi-RS232C port is individually adjustable via the interface
- Termination character (e.g. Enter) and language can be selected via the interface
- The power is supplied by the USB interface
- Supplied with: USB cable

Note:
Further T-Boxes with a Timer function and can be cascaded are available upon request.

Technical Data

	Inputs	Dimensions mm (L x W x H)	Order no.	Remarks
T-Box 205 USB	2 x Multi-RS232C inputs 3 x Digimatic inputs	175 x 125 x 55	4102579	When connecting Digimatic measuring instruments the standard cable of the manufacturer can be used

Accessories

	Order no.
Foot Switch for connection to T-Box	4102556
Data Cable for connecting measuring instruments. See cable overview on Page 11-8	

Digi-USB-1 Interface USB Interface with one Digimatic input port



Features

- Power supplied by the USB interface
- No driver required for the USB interface
- The USB interface is recognized as a keyboard
- Termination character such as Enter or TAB can be set up on the USB interface
- The measured values can be directly triggered on the measuring instrument, timer funktion or with the optional foot switch
- Supplied with: USB-Interface

Technical Data

Input	Dimensions mm (L x W x H)	Order no.
1 x Digimatic - measuring instrument - input	20 x 57 x 33	4102523

Accessories

	Order no.
Foot Switch	4102058

Radio transmission radio system FM 2



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*
- 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

* Further frequencies are available upon request

Transmitter

For Measuring Instruments		Order no.
MarCal	16 ER, 16 EWR, 16 EWW, 18 EWR, 30 ER, 30 EWN, 30 EWR	16 EXf 4102306
Digimar	814 SR	
Micromar	40 EW, 44 EX, 46 EX, 40 EWS, 40 EWW	
MarCator	1075, 1080, 1081, 1086, 1087	
MarCal	25 ES, 30 EWD, 31 ES, 32 ES	1082 f 4102307
Digimar	27 ES, M 814	
MarTool	106 ES	
Millimess	2000, 2001, 2100	2000 f 4102309
MarCator	1088	
Digimar	816 CL	
Digimar	817 CLM	817 f 4102310
Millimar	C1208, C1216, C1245, S1840	RS232 f 4102311

Further transmitters are available, see page 11-9

Receiver

	Order no.
TWIN Receiver for USB and RS232 interfaces incl. driver and basic software. Basic software consists of a software keyboard interface and software to store measured values in an MS-Excel® column	FM 2 4102305



Accessories

	Order no.
Hand switch for remote control*	HTF 1 4102314

* only in conjunction with Software Pack Plus

Software

	Order no.
Software Pack Plus to store measured data from several transmitters in separate MS-Excel® columns. Remote control with the hand switch.	4102315

MarConnect. Interfaces

OVERVIEW

Connect to ... Instrument	PC			
	 direct via USB and MarCom Software	 direct via RS232C and MarCom Software	 via Digi-USB 1	via T-Box
Fußschalter	4102058+4102782 ③	4102058+4102782 ②③	4102058	4102556
16 ER / EWR 16 EWV 18 EWR 30 ER / EWR / EWN 40 EWR, 40 EWS, 40 EWV, 46 EWR, 44 EWR 1075 R, 1086 R, 1087 R 814 SR, PS1	4102357	4102410	4102411	4102411
2000, 2001, 2100 1088, 816 CL <i>µMaxµm II</i>	4346023	4346020	4346021	4346021
838 EA, 838 EI (Ausf. A) 838 EA, 838 EI (Ausf. B)	4495079 -----	----- -----	4495083 4495084 ⑥	4495083 4495084 ⑥
<i>Maxµm III</i>	-----	-----	2239037	2239037
31 EW, 800 EW, 800 EWL	4305121	4305122	-----	-----
25 ES 106 ES M 814	4102510+4102330	4102510	-----	4102510
MSP 2	4102711+4102334 ④	4102711 ④	-----	-----
1240, S1840, C1245, C1208, C1216, X1715, X1741	7024634+4102331 ⑤	7024634 ⑤	-----	4102715
Digimar 817 CLM	7024634+4102333 ④	7024634 ④	-----	-----

② Foot switch; only with an additional USB Port

③ Cable length 18 cm / 7"

④ Data transmission only with the "Data" key or "automatic transmission" on the measuring instrument

⑤ Foot switch to transfer data on the measuring instrument

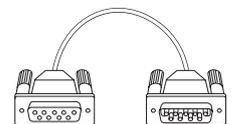
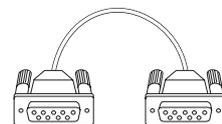
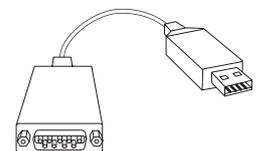
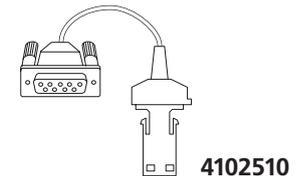
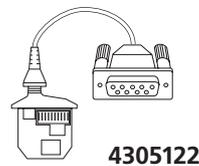
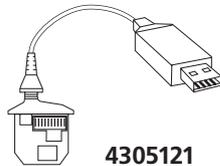
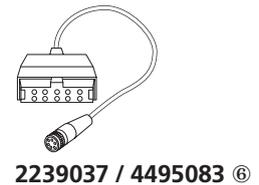
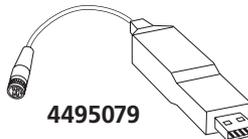
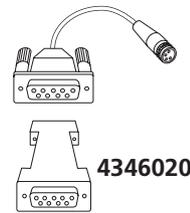
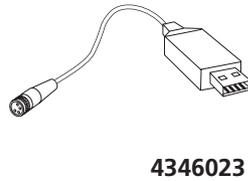
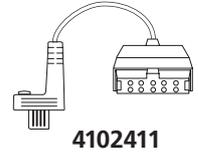
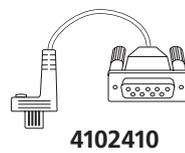
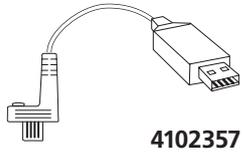
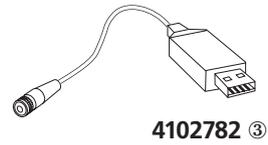
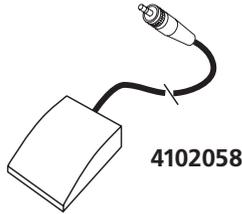
Millimar - Order no. 5330956 / Millimar 1240 - Order no. 5312431

⑥ Data cable is included in the handle of the measuring instrument, cable length 1.5 m / 5 ft

► | **MarConnect.** Regardless of which interface standard you use, whether; USB, Opto RS232 oder Digimatic, MarConnect always provides you with the optimum connection. ◀◀

	
Transmitter FM 2 via USB or RS232	Data printer MSP 2
4102314 ⑦	4102058
4102306	4102411
4102309	4346021
----- 4102313+4495084	4495083 4495084 ⑥
-----	2239037
-----	-----
4102307	4102510
-----	-----
4102311 ⑧	7024634
4102310	7024634

Standard cable length 2 m



⑦ Hand switch only in conjunction with Software pack Plus
 ⑧ Not available for Millimar 1240

THE COMPLETE SUPPORT FOR YOUR INSPECTION. **MARTOOL**



The latest information on MARTOOL products can be found on our website:

www.mahr.com, WebCode 10436-5062

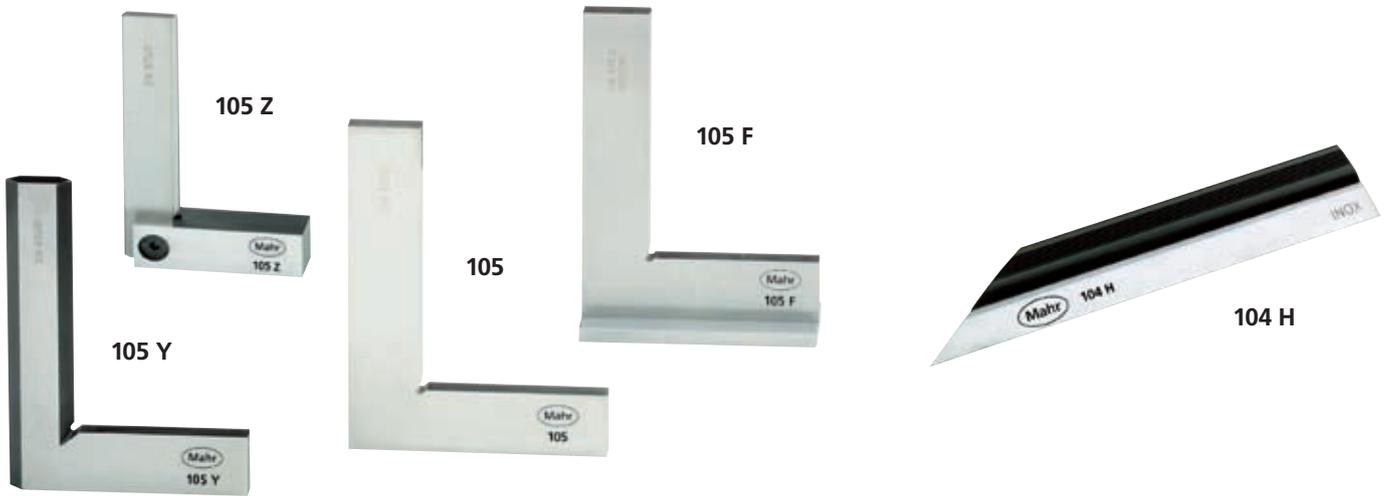
▶ | MarTool measuring and inspection equipment are indispensable aids for dimensional metrology. Their simple handling make them the most versatile instruments for daily use in either the inspection room or the workshop, whether measuring an angle on a work piece or inspecting the surface plate for a height measuring instrument with the outstanding quality from MarTool you cannot go wrong.

▶ | MarTool. Measuring and Inspection Equipment

MarTool 104 Knife-edge Straight Edges	12- 2
MarTool 105 / 105 F /105 Y /105 Z Set Squares	12- 2
MarTool 106 UF / 106 ES Universal Bevel Protractor	12- 4
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:

$$t = 2 + \frac{l}{250} \mu\text{m}$$

Length l in mm

Technical Data

Length		Cross section mm	Weight kg	Order no.
mm	(inch)			
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		Cross section mm	Weight kg	Order no.
mm	(inch)			
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:

$$t = 5 + \frac{l}{50} \mu\text{m}$$

(Length l is the longer beam in mm)

Technical Data

Length of beams		Cross section	Weight	Order no.
mm	(inch)	mm	kg	
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		Cross section	Weight	Order no.
mm	(inch)	mm	kg	
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
500 x 330	(20 x 13")	45 x 10	2.20	4210006

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:

$$t = 5 + \frac{l}{50} \mu\text{m}$$

(Length l is the longer beam in mm)

Technical Data

Length of beams		Cross section		Weight	Order no.
mm	(inch)	narrow beam mm	wide beam mm	kg	
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

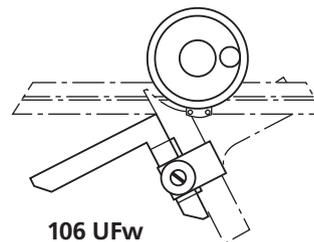
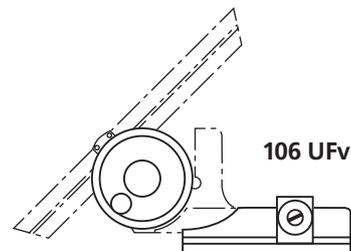
- With fine adjustment
- Stainless steel
- Vernier scale and main scale both have a satin chrome finish to prevent glare and to enable parallax free reading on the same plane
- Knurled screw for clamping the interchangeable beam into position
- Supplied with:
Magnifying reading lens,
interchangeable 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) beam length	106 Us 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



Digital Universal Bevel Protractor 106 ES



Features

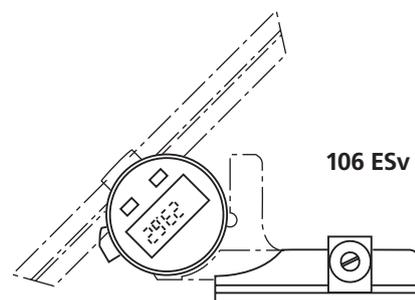
- Easy to read high contrast 8,5 mm high LCD
- Displays the angular degrees and angular minutes or decimal degrees
- Zero setting at any position of the measuring range
- Beam can be clamped with a push button
- Fine adjustment for easy setting of a desired angle
- Locking lever to prevent accidental 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 beam length	106 ESs
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	106 ESv
Featuring flat and V-surface for dia. 5 – 30 mm, length 90 mm, width 25 mm	4214630
Acute Angle Attachment	106 UFw
for particularly small acute angles, screws onto the beam	4214062



Surface Plate 107 G made from granite



Technical Data

- 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

Technische Daten

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

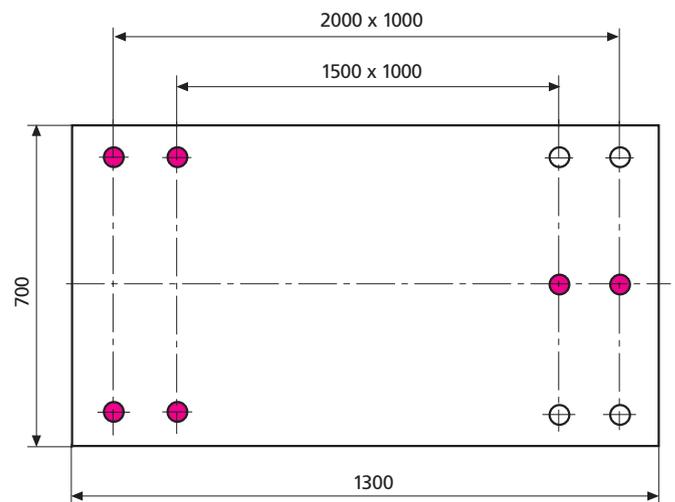
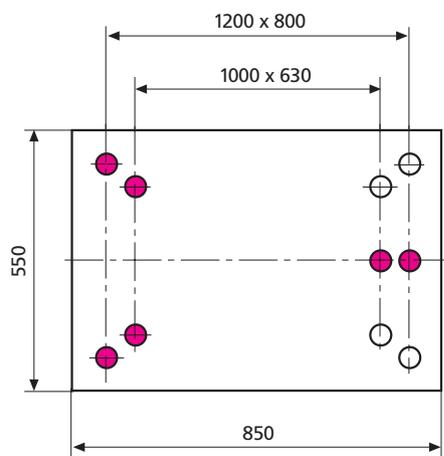
* Excludes stand with cabinet

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, $0.22 \times l$ 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 are for support and two 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.com, WebCode 10397

▶ | 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

Gage Blocks	13- 2
MarGage 402 / 404 / 406 / 408 / 409 Gage Blocks made of steel	13- 4
MarGage 411 / 415 Test Sets for Calipers	13- 4
MarGage 417 Individual Gage Blocks made of steel	13- 5
MarGage 402 C / 404 C / 406 C / 408 C / 409 C Gage Blocks made of ceramic	13- 6
MarGage 417 C Individual Gage Blocks made of ceramic	13- 8
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Pin Gages / Plug Gages	13-12
MarGage 426 / 426 G / 426 S Pin Gages made of steel	13-12
MarGage 426 D / 426 DS Plug Gages made of steel	13-14
MarGage 426 A / 426 M Thread Pin Gages	13-15
Settings Standards / Thread Gages	13-16
MarGage 355 E / 390 / 708 E / 715 E Setting Standards	13-16
MarGage 705 / 708 G / 708 N Thread Gages	13-17

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 dimension 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

Tolerance Class K	XX=35
Tolerance Class 0	XX=11
Tolerance Class 1	XX=13
Tolerance Class 2	XX=15

Nominal dim.	Order no.						
0.50	480XX09	1.31	480XX59	10.5	480XX00	175	480XX41
1	480XX19	1.32	480XX60	11	480XX01	200	480XX42
1.001	480XX20	1.33	480XX61	11.5	480XX02	250	480XX43
1.002	480XX21	1.34	480XX62	12	480XX03	300	480XX44
1.003	480XX22	1.35	480XX63	12.5	480XX04	400	480XX46
1.004	480XX23	1.36	480XX64	13	480XX05	500	480XX48
1.005	480XX24	1.37	480XX65	13.5	480XX06	600	480XX49
1.006	480XX25	1.38	480XX66	14	480XX07	700	480XX50
1.007	480XX26	1.39	480XX67	14.5	480XX08	800	480XX51
1.008	480XX27	1.40	480XX68	15	480XX09	900	480XX52
1.009	480XX28	1.41	480XX69	15.5	480XX10	1000	480XX53
1.01	480XX29	1.42	480XX70	16	480XX11		
1.02	480XX30	1.43	480XX71	16.5	480XX12		
1.03	480XX31	1.44	480XX72	17	480XX13		
1.04	480XX32	1.45	480XX73	17.5	480XX14		
1.05	480XX33	1.46	480XX74	18	480XX15		
1.06	480XX34	1.47	480XX75	18.5	480XX16		
1.07	480XX35	1.48	480XX76	19	480XX17		
1.08	480XX36	1.49	480XX77	19.5	480XX18		
1.09	480XX37	1.5	480XX78	20	480XX19		
1.10	480XX38	1.6	480XX79	20.5	480XX20		
1.11	480XX39	1.7	480XX80	21	480XX21		
1.12	480XX40	1.8	480XX81	21.5	480XX22		
1.13	480XX41	1.9	480XX82	22	480XX23		
1.14	480XX42	2	480XX83	22.5	480XX24		
1.15	480XX43	2.5	480XX84	23	480XX25		
1.16	480XX44	3	480XX85	23.5	480XX26		
1.17	480XX45	3.5	480XX86	24	480XX27		
1.18	480XX46	4	480XX87	24.5	480XX28		
1.19	480XX47	4.5	480XX88	25	480XX29		
1.20	480XX48	5	480XX89	30	480XX30		
1.21	480XX49	5.5	480XX90	40	480XX31		
1.22	480XX50	6	480XX91	50	480XX32		
1.23	480XX51	6.5	480XX92	60	480XX33		
1.24	480XX52	7	480XX93	70	480XX34		
1.25	480XX53	7.5	480XX94	75	480XX35		
1.26	480XX54	8	480XX95	80	480XX36		
1.27	480XX55	8.5	480XX96	90	480XX37		
1.28	480XX56	9	480XX97	100	480XX38		
1.29	480XX57	9.5	480XX98	125	480XX39		
1.30	480XX58	10	480XX99	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; Circonimar 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.	Quantity per set	Nominal sizes mm	Increments mm	Gage blocks
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

Tol. Class K XX=47
 Tol. Class 0 XX=41
 Tol. Class 1 XX=43
 Tol. Class 2 XX=45

Nominal dim.	Order no.						
0.50	480XX00	1.21	480XX40	1.7	480XX71	15	480XX00
1	480XX10	1.22	480XX41	1.8	480XX72	15.5	480XX01
1.001	480XX11	1.23	480XX42	1.9	480XX73	16	480XX02
1.002	480XX12	1.24	480XX43	2	480XX74	16.5	480XX03
1.003	480XX13	1.25	480XX44	2.5	480XX75	17	480XX04
1.004	480XX14	1.26	480XX45	3	480XX76	17.5	480XX05
1.005	480XX15	1.27	480XX46	3.5	480XX77	18	480XX06
1.006	480XX16	1.28	480XX47	4	480XX78	18.5	480XX07
1.007	480XX17	1.29	480XX48	4.5	480XX79	19	480XX08
1.008	480XX18	1.30	480XX49	5	480XX80	19.5	480XX09
1.009	480XX19	1.31	480XX50	5.5	480XX81	20	480XX10
1.01	480XX20	1.32	480XX51	6	480XX82	20.5	480XX11
1.02	480XX21	1.33	480XX52	6.5	480XX83	21	480XX12
1.03	480XX22	1.34	480XX53	7	480XX84	21.5	480XX13
1.04	480XX23	1.35	480XX54	7.5	480XX85	22	480XX14
1.05	480XX24	1.36	480XX55	8	480XX86	22.5	480XX15
1.06	480XX25	1.37	480XX56	8.5	480XX87	23	480XX16
1.07	480XX26	1.38	480XX57	9	480XX88	23.5	480XX17
1.08	480XX27	1.39	480XX58	9.5	480XX89	24	480XX18
1.09	480XX28	1.40	480XX59	10	480XX90	24.5	480XX19
1.10	480XX29	1.41	480XX60	10.5	480XX91	25	480XX20
1.11	480XX30	1.42	480XX61	11	480XX92	30	480XX21
1.12	480XX31	1.43	480XX62	11.5	480XX93	40	480XX22
1.13	480XX32	1.44	480XX63	12	480XX94	50	480XX23
1.14	480XX33	1.45	480XX64	12.5	480XX95	60	480XX24
1.15	480XX34	1.46	480XX65	13	480XX96	70	480XX25
1.16	480XX35	1.47	480XX66	13.5	480XX97	75	480XX26
1.17	480XX36	1.48	480XX67	14	480XX98	80	480XX27
1.18	480XX37	1.49	480XX68	14.5	480XX99	90	480XX28
1.19	480XX38	1.5	480XX69			100	480XX29
1.20	480XX39	1.6	480XX70				

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 $\pm 2 \mu\text{m}$

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

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

		Wear-resistant gage steel, hardened, multi-aged, ground and lapped Grade 0, DIN 2269 Manufacturing tolerance $\pm 0.5 \mu\text{m}$ 426/0			Wear-resistant gage steel, hardened multi-aged, ground and lapped Grade 1, DIN 2269 Manufacturing tolerance $\pm 1.0 \mu\text{m}$ 426/1			Wear-resistant gage steel, hardened multi-aged and precision ground Better than Grade 2, DIN 2269 Manufacturing tolerance $\pm 1.5 \mu\text{m}$ 426/2		
		Increments		Increments		Increments		Increments		
Ø mm	Length mm	Order no.	Order no.	Length mm	Order no.	Order no.	Length mm	Order no.	Order no.	
		0.01 mm	0.001 mm		0.01 mm	0.001 mm		0.01 mm	0.001 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

		Wear-resistant gage steel, hardened, multi-aged, ground and lapped Grade 0, DIN 2269 Manufacturing tolerance $\pm 0.5 \mu\text{m}$ 426 G/0			Wear-resistant gage steel, hardened, multi-aged, ground and lapped Grade 1, DIN 2269 Manufacturing tolerance $\pm 1.0 \mu\text{m}$ 426 G/1			Wear-resistant gage steel, hardened multi-aged and precision ground Better than Grade 2, DIN 2269 Manufacturing tolerance $\pm 1.5 \mu\text{m}$ 426 G/2		
		Increments		Increments		Increments		Increments		
Ø mm	Effective Length mm	Order no.	Order no.	Effective Length mm	Order no.	Order no.	Effective Length mm	Order no.	Order no.	
		0.01 mm	0.001 mm		0.01 mm	0.001 mm		0.01 mm	0.001 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 13-14 (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

Wear-resistant gage steel, hardened, multi-aged, ground and **lapped**
Grade 0, DIN 2269

Manufacturing tolerance $\pm 0.5 \mu\text{m}$

Wear-resistant gage steel, hardened, multi-aged, ground and **lapped**
Grade 1, DIN 2269

Manufacturing tolerance $\pm 1.0 \mu\text{m}$

Wear-resistant gage steel, hardened multi-aged and precision ground
Better than Grade 2, DIN 2269

Manufacturing tolerance $\pm 1.5 \mu\text{m}$

dia. mm		Increments	Quantity	Order no.	Increments	Anzahl	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

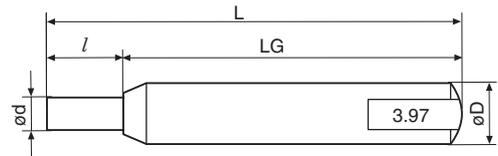


Features

- 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
- Supplied with:
Wooden case with plastic inlay

Technical Data

Wear-resistant gage steel, hardened, multi-aged, ground and **lapped**
 plastic handle inscribed with the diameter
 Manufacturing tolerance $\pm 0.5 \mu\text{m}$
 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	5	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 pedestal

Technical Data

Wear-resistant gage steel, hardened, multi-aged, ground and **lapped**
 Plastic handle inscribed with the diameter

Manufacturing tolerance $\pm 0.5 \mu\text{m}$
 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

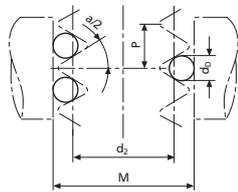
Thread Pin Gages 426 M in holders 426 A with an eyelet



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 $\pm 0.5 \mu\text{m}$
 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.

4820000
4820003

Mounting hole 7.5 mm
 Mounting hole 6.5 mm

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. $\pm 0.5 \mu\text{m}$
 Pin gage length 32 mm

Technical Data

Pin Gage	Order no.			for thread pitch							
	426 M Pair dia. 7.5 mm	426 M Pair dia. 6.5 mm	426 A Set	Metric mm		Whitworth range tpi		American UST range tpi		Trapezoid 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		
1.1	4820022	4820142	4821012	1.75			14		13	2	
1.35	4820023	4820143	4821013	2			12	11	12	11	
1.65	4820024	4820144	4821014	2.5			10	9	10	9	
2.05	4820025	4820145	4821015	3	3.5		8	7	8	7	
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	
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.

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 1mm

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	>120-125	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	>170-175	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*

* When placing an order please inform us of the diameter

Diameter increments 0,001 mm

ø mm	Order no.*	ø mm	Order no.*	ø mm	Order no.*	ø mm	Order no.*	ø mm	Order no.*
1-1,8	4732600	>35-40	4732607	>80-85	4732616	>125-130	4732638	>170-175	4732629
>1,8-3	4732641	>40-45	4732608	>85-90	4732617	>130-135	4732623	>175-180	4732630
>3-5	4732642	>45-50	4732609	>90-95	4732618	>135-140	4732639	>180-185	4732631
>5-10	4732635	>50-55	4732610	>95-100	4732619	>140-145	4732624	>185-190	4732632
>10-15	4732602	>55-60	4732611	>100-105	4732620	>145-150	4732640	>190-195	4732633
>15-20	4732603	>60-65	4732612	>105-110	4732636	>150-155	4732625	>195-200	4732634
>20-25	4732604	>65-70	4732613	>110-115	4732621	>155-160	4732626		
>25-32	4732605	>70-75	4732614	>115-120	4732637	>160-165	4732627		
>32-35	4732606	>75-80	4732615	>120-125	4732622	>165-170	4732628		

* When placing an order please inform us of the diameter

Setting Standards for indicating measuring instruments

Reference Discs 390



Features

- Special wear-resistant gage steel. Hardened and lapped.

Manufacturing tolerance	± 1/2 IT 2
Uncertainty of actual deviation	1/2 IT 0
Nominal diameter over	10 - 100 mm

Setting standards with a DKD calibration certificate from the Mahr Calibration Laboratory are available on request (threads are excluded)

Pin Gages from dia.	3 mm
Ring Gages dia.	10 - 100 mm
Reference Discs dia.	10 - 100 mm

Thread Setting Ring Gage 708 E

Features

- With full thread profile
- Actual deviation is engraved on the gage
- For setting indicating thread measuring instruments
- For metric threads for tolerance class "H" according to DIN 2241
- For other thread types please state tolerance requirements

Thread Setting Plug Gage 715 E



Features

- With full thread profile
- Actual deviation is engraved on the gage
- For setting indicating thread measuring instruments
- Metric threads in accordance with DIN 2241: Tolerance class h applies to standard threads dia. 1 - 1.4 mm and for pitches 0.2 and 0.25, for all other sizes the tolerance class g is applicable
- For other thread types please state tolerance requirements

Thread Gages



705



708 N



708 G

Thread Limit Plug Gage 705

- Special wear-resistant gage steel. Hardened and ground
- GO end with full thread profile, pitch diameter corresponds to minimum permissible dimension of internal thread
- NO-GO end has only 3 threads and a shortened flank profile, pitch diameter corresponds to maximum permissible dimension of internal thread
- Accuracy for metric ISO threads according to DIN ISO 1502 (up to 40 mm the GO end and NO-GO end are on a common handle. Over 40 mm the GO / NO-GO end are on separate handles for easier handling)
- Nominal diameter 1 - 100 mm. For all standard and special threads

Thread Ring Gages

- Special wear-resistant gage steel. Hardened and ground. Accuracy of metric ISO threads according to DIN ISO 1502
- Nominal diameter 1 - 200 mm
- For all standard and special threads

GO Thread Ring Gage 708 G

- With full thread profile. Pitch diameter corresponds to the maximum permissible dimension of an external thread. The external diameter is relieved

NO-GO Thread Ring Gage 708 N

- With reduced thread profile. For checking minimum permissible dimension of pitch diameter on external thread

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 154



► | 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

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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. | ◀



Optimar 100

Universal dial indicator testing machine

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: $MPE = (0.2 + L/100) \mu m$, L in mm at $T = 20 \text{ }^\circ\text{C} \pm 0.5 \text{ }^\circ\text{C}$, permissible temperature gradient 0.1 K/h
- **Mahr software** or **QMSOFT software**

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.



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 (testing as per VDI/VDE/DGQ 2618, sheet 13.2., 2005)
- Device for force sensor on request
- **OPTIMAR** recalibrated on site by Mahr Service Center
- 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)	$(0.2 + L/100) \mu m$, (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)



Request catalog or see WebCode 2421

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 μm (0.001 μm)
- Reproducibility of 0.2 μm (0.005 μm) ($6\sigma < 1 \mu\text{m}/0.025 \mu\text{m}$)
- 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 plate 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)	3 oz (0.8 N)
(lower contact)	1 oz (0.3 N)
Contact tip material	Hard metal (diamond - optional)
Contact tip radius	0.125 in (3.175 mm)
Sensor range	± 0.015 in (± 0.38 mm)
Measuring range	$\pm 500 \mu\text{m}$ ($\pm 10.0 \mu\text{m}$)
Reproducibility	$6\sigma < 1 \mu\text{m}$ (25 nm) measured on a 1 in gage block without removing the gage block
Linearity	Deviation $< 1 \mu\text{m}$ over the central $\pm 50 \mu\text{m}$ and $< 1 \mu\text{m}$ in any 50 μm within the $\pm 500 \mu\text{m}$ measuring range < 20 nm over the central $\pm 1.0 \mu\text{m}$ and < 20 nm in any $\pm 1.0 \mu\text{m}$ over a measuring range of $\pm 10.0 \mu\text{m}$

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.

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
- Two measuring and evaluation programs: Calibration and data management or additionally with customer management, gage-block storage management and multi-test-unit management

Accessories

- **QM-Block** calibration software for calibration and data management of gage blocks and sets of gage blocks
- The evaluation software runs under Windows® NT/2000/XP

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.



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	$\pm 0.01 \mu\text{m}$ (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 1m) we recommend the **ULM**, **828 CiM** or **PLM** universal measuring machines.

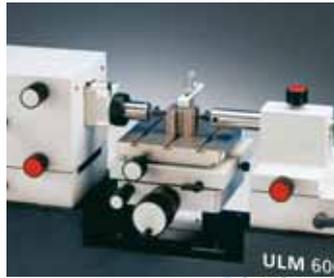
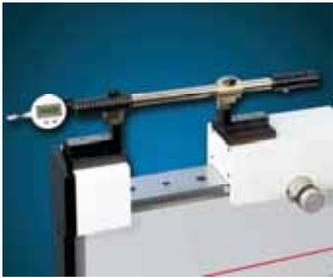


Request catalog or see WebCode 2335



Precimar. Length Measuring Machines for Every Area of Use

▶ | 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 ultra-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. | ◀



Precimar LINEAR 100 for Workshop Length Metrology

Description

Linear 100 is a universal, user-friendly 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 12282-8080

Precimar LINEAR 800 / 1200 / 2000

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

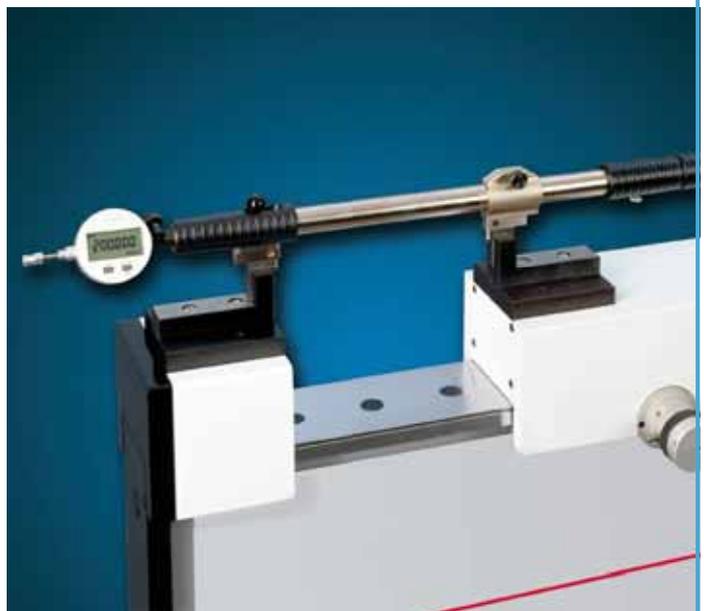
Applications

- Setting measuring instruments with displays such as the Multimar 844T
- Setting two-point internal measuring instruments such as the 844 N
- Setting indicator snap gages such as MaraMaeter 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

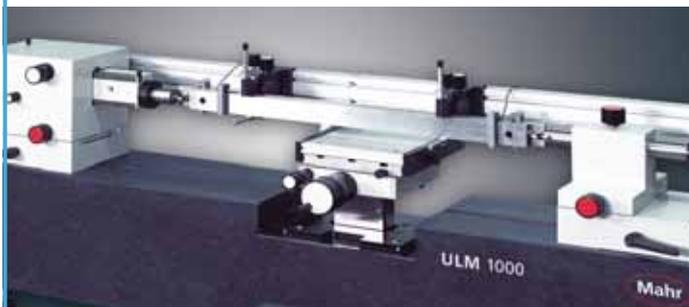
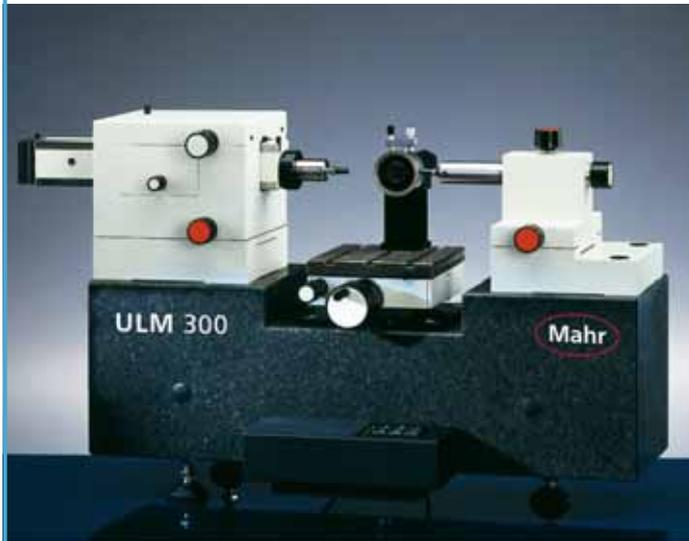
Universal single-axis length measuring and setting instruments



Request brochure or see WebCode 12283

Precimar ULM 300 / 600 / 1000 / 1500 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 Heidenhain reflected light 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 3 speeds

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)
- Height of object table can be adjusted using buttons

Features

- Excellent measuring accuracy
 - 100% compliance with Abbe comparator principle
 - Online temperature measurement with 2 to 4 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
 - 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 runs under MS Windows
- Mahr 828 WIN**

Details on metrological accessories are available on request.

Versions

ULM 300
ULM 600
ULM 1000
ULM 1500



Request brochure or see
WebCode 10454

Precimar ULM 520 S / 1000 S 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 Heidenhain reflected light 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 3 speeds

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

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 under MS-Windows **Mahr 828 WIN**

Large universal length measuring instruments with large direct measuring range



Versions

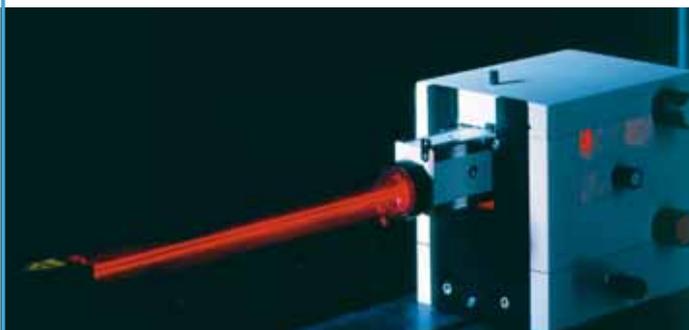
ULM 520 S
ULM 1000 S



Request brochure or see WebCode 10455

Precimar ULM 800 L / 1500 L 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 Heidenhain reflected light 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 3 speeds

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

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 runs under MS Windows
Mahr 828 WIN

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
ULM 1500 L



Request brochure or see WebCode 10456

Precimar PLM 600-2 for Precision Length Metrology

Description

Model type

Comparator according to the Abbe principle with horizontal basic bed (highly homogeneous and rigid granite)

Measuring system

X-axis: Incremental, high-precision Heidenhain length measuring system, 200 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

- The **Precimar PLM 600-2** features a universal measuring table with 5 finely adjustable axes and 25 kg (55 lbs) load capacity, a state-of-the-art PC-based multiple-axis machine control system with PC workstation, the **828 WIN** "Free Measurement" basic software and a calibration certificate
- Straightforward operation using measuring force-controlled, joystick-operated measuring slide, with progressive deflection characteristic and automatic contact detection
- Automatic detection of internal and external measurements and computer-aided reversing point detection
- A motorized measuring slide allows high travel speeds
- The CNC-controlled motorized vertical movement of the support table (optional) results in excellent measuring efficiency
- State-of-the-art machine control, data recording, processing, logging and transfer with powerful software and menu-driven operation
- Software compensates for thermal dimensional deviations
- Software enables very straightforward setting and changing of measuring force
- Low measuring uncertainty due to aerostatic slide ways for all measuring carriages on the machine bed
- Electronic regulation of the measuring forces and automatic contacting; therefore almost all subjective influences are eliminated and unintentional corrections with the workpiece is avoided.
- Semi-automatic bore and inside thread measurement



Request brochure or see WebCode 2380

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 measuring 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 under MS-Windows, **828 WIN**
- 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 testpiece prevented

Details of metrological accessories are available on request.



Request brochure or see WebCode 2092.

Precimar Dial Gage Tester



Optimar 100

Measuring range (mm)	100
Length measuring deviation MPE _{E1} (μm)	(0.2 + L/100)
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 - 820	0 - 1220	0 - 2020
Internal measuring range Length measuring deviation 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 600-2



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
Length measuring deviation MPE _{E1} (μm)	(0.1 + L/2000) or (0.3 + L/1500)	(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	250	250
Operation type	manual, motorized	motorized, CNC-controlled	motorized, CNC-controlled

* depending upon unit type

FROM THE THUMBNAIL TEST... ...TO 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.

► I MarSurf. Surface Metrology

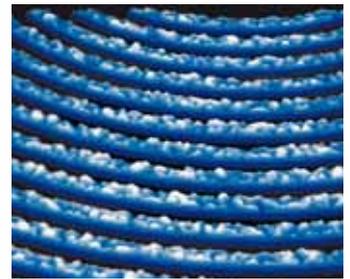
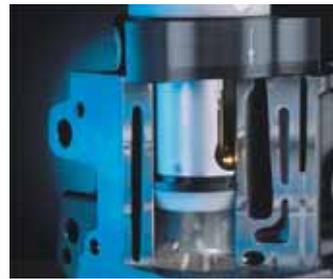
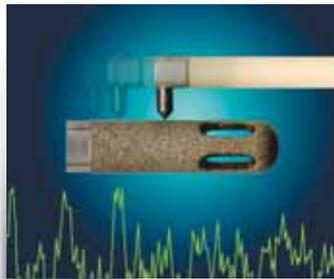
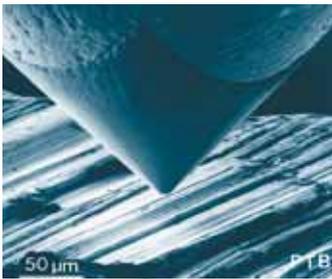
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MarSurf. The Surface Metrology System for all Your Industry's Needs

THE RIGHT SOLUTION FOR EVERY TASK

▶ | MarSurf has a universal range of applications. Key industries include:

- Automotive industry
- Electronics industry
- Mechanical engineering industry
- Medical industry
- Optics industry



Automotive Industry



Measurements on synchronous 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 331

Electronics Industry

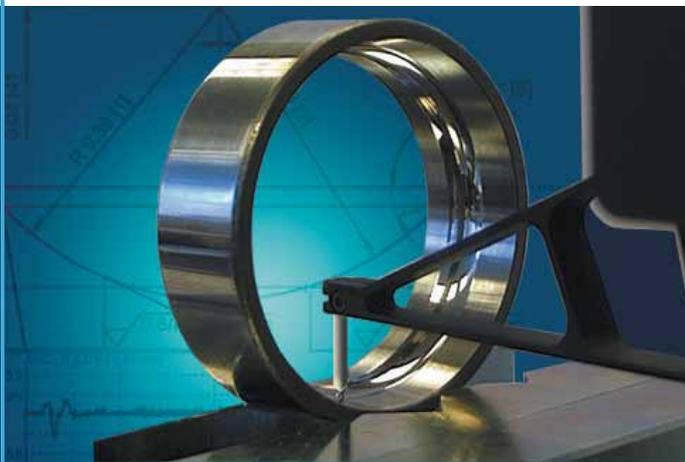


Measurements on wafer surfaces

Measurements can be performed in no time at all using optical sensors such as the **MarSurf WS1** system in this example, which uses the principle of white light interferometry. The vertical resolution of 0.1 nm (0.004 μin) ensures maximum precision. The powerful MarWin software platform with the **MarSurf XT 20** allows quick and easy topography evaluation.

 WebCode 333

Mechanical Engineering Industry

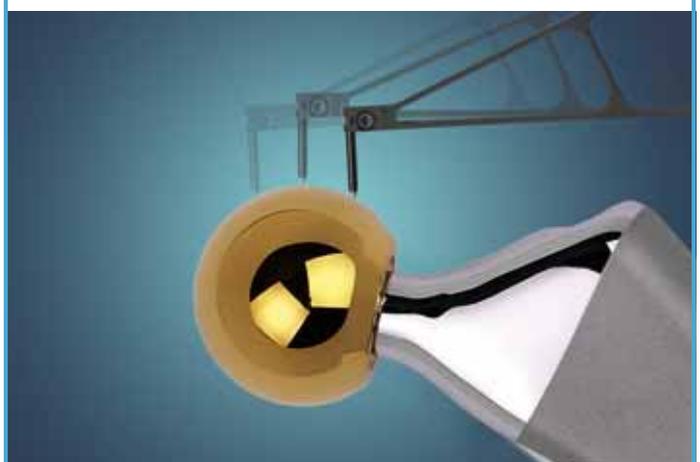


Measurements on ball races

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 9773

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 334

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 PS1. Absolute Mobility in Surface Metrology

Entry-level roughness measurement

Description

The **MarSurf PS1** lives up to its claim of "**Absolute mobility**" in all manner of ways, providing:

- **Mains-independent operation**
Over 500 measurements without having to recharge the instrument
- **An all-in-one solution** that is no larger than a digital camera. Small and lightweight (400 g / 0.88 lbs)
- **Instrument flexibility**
The standard range of functions is sufficient for this all-purpose smart little instrument to perform your measuring tasks
- **All the measuring positions you need**
Can be used horizontally, vertically, upside down or in any other position required by the component
- **25 parameters**
Offer the same range of functions as a laboratory instrument
- **Error-free operation** thanks to an integrated roughness standard
- **Automatic cutoff selection** (patented) so that even non-specialists are ensured correct measuring results
- **Simple operation**
The brief guide in pocket diary format reflects how simple the PS1 is to use. You quickly get to grips with the essential features, enabling you to complete your measuring tasks with excellent results



MarSurf PS1. The Set

The **MarSurf PS1** comes in a complete set. Thanks to the carrying case, you always have your surface roughness measuring instrument with you as you pass through the production floor. Quick and reliable on-the-spot measurements ensure your quality requirements are met during the production process or incoming goods inspection.

The set contains:

- MarSurf PS1 base unit
- Drive unit
- 1 standard probe conforming to standards
- Built-in battery
- Roughness standard integrated into casing
- Height adjustment accessory
- Probe protection
- AC adapter
- Operating instructions
- Carrying case with shoulder strap and belt loop
- USB cable
- Mahr calibration certificate.

Order No. 6910210



WebCode 10778

MarSurf PS1. Technical Data

Unit of measurement	Metric, inch
Measuring principle	Stylus method
Probe	Inductive skidded probe, 2 μm (80 μin) stylus tip, measuring force approx 0.7 mN
Parameters (25, with tolerance limits)	Ra, Rq, Rz (Ry (JIS) corr. to Rz), Rz (JIS), Rmax, Rp, Rp (ASME), Rpm (ASME), Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Vo, Rt, R3z, RPc, Rmr (tp (JIS, ASME) corr. to Rmr), RSm, R, Ar, Rx
Languages	14 including 3 Asian languages
Measuring range	350 μm , 180 μm , 90 μm (0.014 in, 0.007 in, 0.004 in)
Profile resolution	32 nm, 16 nm, 8 nm (1.3 μin , 0.6 μin , 0.3 μin)
Filter*	Phase-correct profile filter (Gaussian filter) as per DIN EN ISO 11562, special filter as per DIN EN ISO 13565-1, ls filter as per DIN EN ISO 3274 (can be disabled)
Cutoff lc*	0.25 mm, 0.8 mm, 2.5 mm; automatic (0.010 in, 0.030 in, 0.100 in)
Traversing length Lt*	1.75 mm, 5.6 mm, 17.5 mm; automatic (0.069 in, 0.22 in, 0.69 in)
Traversing length (MOTIF)	1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm (0.04 in, 0.08 in, 0.16 in, 0.32 in, 0.48 in, 0.64 in)
Short cutoff*	Selectable
Evaluation length ln*	1.25 mm, 4.0 mm, 12.50 mm (0.050 in, 0.15 in, 0.50 in)
Sampling lengths*	Selectable: 1 to 5
Calibration function	Dynamic
Memory capacity	Max. 15 profiles, max. 20,000 results
Other functions	Blocking of settings (code-protected), date/time
Dimensions	140 mm \times 50 mm \times 70 mm (5.51 in \times 1.97 in \times 2.76 in)
Weight	400 g (0.88 lbs)
Battery	Li-ion battery
Interfaces	USB, MarConnect (RS232)
Long-range power supply	100 V to 264 V

* in accordance with ISO/JIS

MarSurf PS1 / M 300. Accessories

80 mm (3.15 in) probe extension **Order No. 6850540**

for example, for measuring points located deep within cylinders.

PHT 3-350 probe **Order No. 6111521**

for measurements in bores from dia. 3 mm (0.12 in).

PHT 11-100 probe **Order No. 6111524**

for measurements at recessed measuring points, e.g. in grooves from 2.5 mm (0.10 in) wide and up to 7.5 mm (0.30 in) deep.

PHTR 100 probe **Order No. 6111525**

for measurements on concave and convex surfaces.

PHTF 0.5-100 probe **Order No. 6111522**

for measurements on tooth flanks.

PT 150 probe **Order No. 6111523**

Dual-skid probe for measurements on metal sheets and roller surfaces according to DIN EN 10049 (SEP).



MarSurf M 300. A step ahead!

High mobility, high-performance unit

Description

MarSurf 300, the first mobile roughness measuring unit with the possibility to use a cable-free connection (*Bluetooth*) to the drive unit.

More comfort and performance at a good price, an investment that pays off!

- Cable-free *Bluetooth* connection
- Simple use due to high-resolution color display and proven user guidance in the "automatic teller machine" style
- Integrated standard in the drive unit
- Large measuring range of 350 μm (0.14 in)
- Automatic selection of filter and traversing length conforming to standards
- Integrated memory for up to 40,000 results and 30 profiles
- 15 languages (incl. 3 Asian languages)



More possibilities with MarSurf M 300

- Integrated thermal printer with highest printing quality
- Output of the R-profile via thermal printer
- Record can be output with the push of a button or automatically
- Data transfer of the results to the PC via USB interface
- Evaluation of the most commonly used parameters as well as characteristic curves, parameter lists (e.g. material ratio)
- Integrated memory for results and profiles
- Tolerance monitoring
- Printing of R-profile (ISO/ASME/JIS), P-profile (MOTIF), material ratio curve, measuring record
- Setting of asymmetric intersection lines for peak count calculation
- Measuring units ($\mu\text{m}/\mu\text{inch}$) and standards (ISO/JIS/ASME/MOTIF) selectable
- Individual traversing lengths as well as short cutoff selectable
- Locking and/or password protection for instrument settings
- Built-in battery with power management
- AC adapter with exchangeable adapters for worldwide use
- Output of date and/or time of the measurements

Further advantages

- Can be extended to a stationary measuring station
- Use of the PHT probe series
- Software „MarSurf PS1/M 300 Explorer“ for the creation of measuring records

MarSurf M 300. Application Examples



Roughness measurements on flap tracks (for landing flaps) (Airbus)



Roughness measurement on wings (Airbus)



Roughness measurement on ship propellers (Mecklenburger Metallguss)



Scope of Delivery

MarSurf M 300 Set

Order no. 6910401

- Evaluation unit MarSurf M 300
- Drive unit MarSurf RD 18
- Standard probe PHT 6-350
- Standard (integrated in MarSurf RD 18)
- Mahr calibration certificate
- 1 roll of thermal paper
- Probe protection
- End face vee-block
- Height adjustment
- Wide-range AC adapter with 3 adapters
- 2 x USB cable (for connection to PC and use with cable)
- Allen key
- Operating instructions

The set is delivered in a practical carrying case.
For accessories, please see page 15-6: Accessories PS1

MarSurf M 300 C



Drive Unit RD 18 C

Cylindrical drive unit with hand-held support and probe from the PHT series

As a sequel to the proven mobile roughness depth measuring units, the M 300 C set contains the cylindrical drive unit RD 18 C. With this unit set you reach all measuring points on your work-piece.

Possibilities MarSurf M 300 C

- Automatic selection of filter and traversing length conforming to standards
- Integrated thermal graphics printer of high print quality
- Printing of R-profile (ISO/ASME/JIS), P-profile (MOTIF), material ratio curve, measuring record
- Data transfer of results and profiles via USB-interface to your PC
- Cutoffs - 0.25/0.8/2.5 mm (0.010/0.032/0.100 in)
- Integrated memory for the results of up to 40,000 measurements and 30 profiles
- Tolerance monitoring in display and measuring record
- Vertical scale: automatic/selectable
- Dynamic calibration function
- 15 languages
- Standards: ISO/ASME/JIS and MOTIF selectable
- Number of sampling lengths selectable from 1 to 5
- Locking and/or password protection for instrument settings
- Units $\mu\text{m}/\mu\text{inch}$ selectable
- AC adapter with three mains adapters, for input voltages from 90 V to 264 V
- Output of date and/or time of the measurements

Further advantages

- Expandable to a stationary measuring station
- Usable with the PHT series probes
- Software "MarSurf PS1/M 300 Explorer" to create measuring records

MarSurf M 300 C on measuring stand ST-D



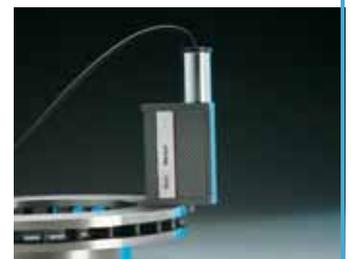
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Drive unit set with probe system



Example: upside down measurement



Example: measurement on end face vee



Example: Measurement with height adjustment

MarSurf M 300 C



Scope of delivery

- Evaluation unit MarSurf M 300C
- Cylindrical drive unit MarSurf RD 18 C
- Hand-held support with vee-block faces
- Standard probe PHT 6-350
- 1 chart paper roll
- Probe protection
- Mount for drive unit with clamping shaft diameter 8 mm
- Power pack with 3 mains plugs
- 1 x USB cable (connectable on PC)
- Allen key
- Operating instructions

All items come in a carrying case.

MarSurf M 300 C set:

Order no. 6910431

Efficient Application Aids for Manufacturing

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 TF-1



MarSurf BF-1



MarSurf DR-1



MarSurf CB-2



MarSurf M 400. Mobile and Stationary Surface Metrology for the Production Area

The best of the "mobiles".
Easy. Fast. Innovative. With skidless tracing and automatic zero setting.



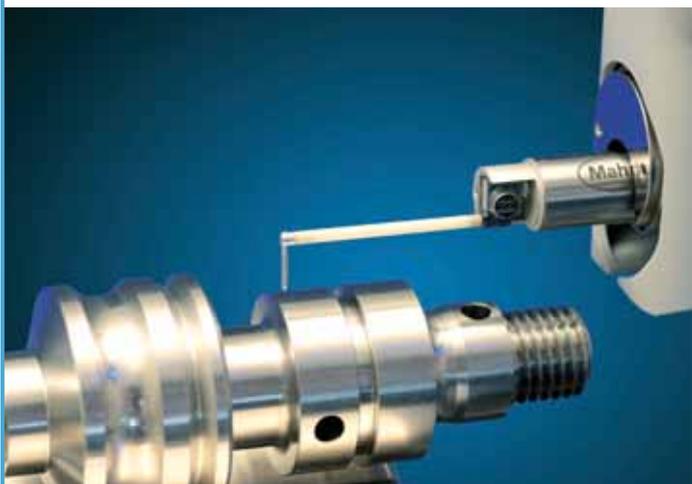
Description

The need for high quality surface metrology already in the mobile area 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.

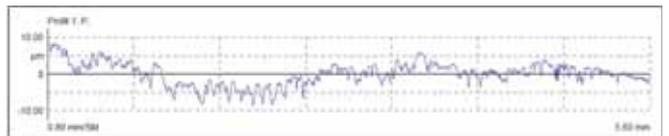
The automatic zero setting option spares the user complicated manual zero setting. After pressing the start button, zero setting and subsequent measurement are started right away.



Measuring in production



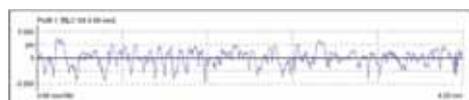
P profiles



W profiles

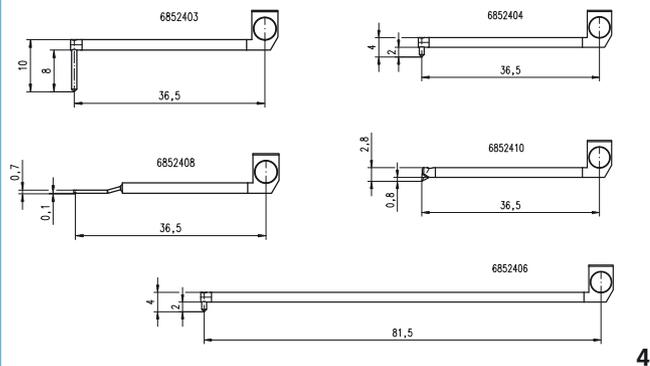


R profiles



MarSurf M 400. The Best of the "Mobiles"

High performance with high mobility



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"

MarSurf M 400 Set. Scope of Delivery



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

Technical Data

MarSurf M 400 set

Profile determination	Primary, waviness and roughness profile
Probes	inductive skidless probe system with exchangeable probe inserts, 2 μm probe tips, measuring force approx. 0.7 mN (standard)
Filters (as per DIN/JIS)	Gaussian filter, Ls filter
Standards	DIN/ISO/JIS/ASME/MOTIF
Parameters	DIN/ISO: Ra, Rq, Rz, Rmax, Rp, Rv, Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, Vo, Rt, R3z, R _{Pc} , Rmr (3x), HSC, RSm, Rsk, Rdc, Rdq, Rku, Pa, Pt, Pmr (3x), Pdc, Wa, Wq, Wt, WSm, Wsk, JIS: Ra, Rz, RzJIS94, Sm, S, ASME: RpA, Rpm, MOTIF: R, AR, W, AW, Rx, Wx, Wte, CR, CL, CF, NR, NCRX, NW, CPM
Cutoff l_c (as per ISO/JIS):	0.25 mm, 0.8 mm, 2.5 mm, automatic,
Traversing lengths L_t (as per ISO/JIS)	1.75 mm, 5.6 mm, 17.5 mm, automatic, free entry
Traversing lengths (as per MOTIF)	1 mm, 4 mm, 8 mm, 12 mm, 16 mm
Evaluation lengths l_m (as per ISO/JIS)	1.25 mm, 4.0 mm, 12.5 mm
Number n of sampling lengths (as per ISO/JIS):	selectable: 1 to 5
Shortened cutoff (as per ISO/JIS)	selectable
Tracing speed	0.2 mm/s, 1 mm/s
Profile resolution	Measuring speed: $\pm 250 \mu\text{m} = 8 \text{ nm}$, $\pm 25 \mu\text{m} = 0.8 \text{ nm}$, (standard probe arm length) $\pm 500 \mu\text{m} = 16 \text{ nm}$ (double probe arm length)
Languages	15, 3 of them Asian
Memory	Max. 30 profiles, max. 40,000 results
Other	lock/code word protection, date/time, integrated printer, dynamic calibration function

Drive Unit SD 26

Traversing length	26 mm
Measuring speed	0.2 mm/s; 1 mm/s
Positioning speed in X	5 mm/s
Height adjustment Z	7.5 mm, motorized
Positioning speed in Z	2 mm/s
Zero setting of probe system	Automatically to zero or to specified value in the probe measuring range
Inclination adjustment	$\pm 1.5^\circ$ (alignment function with user guidance in the evaluation unit)
Temperature (storage)	-15°C to $+55^\circ \text{C}$
Temperature (operation)	$+5^\circ \text{C}$ to $+40^\circ \text{C}$
Rel. humidity	30% to 85%, non-condensing
Weight	M 400: approx. 1.0 kg SD 26: approx. 0.9 kg
Interfaces	USB Slave, MarConnect (RS232)
Wide-range AC adapter	90 – 264 V



MarSurf. PC-based Stationary Surface Measuring Stations VERSATILE, HIGH-PERFORMANCE UNITS FOR INSPECTION ROOM AND LABORATORY

▶ | 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. | ◀



 Request a brochure or see WebCode 2564.



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

- Connection options for Mahr **PZK, GD 25, PGK 20, PGK 120** and **PRK** drive units
- Dominant Waviness option available
- Software can also be used as evaluation software for **M** and **S** units
- Optional **qs-STAT**-based data transfer



MarSurf XC 2

For entry-level, high-precision contour measurement



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

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.

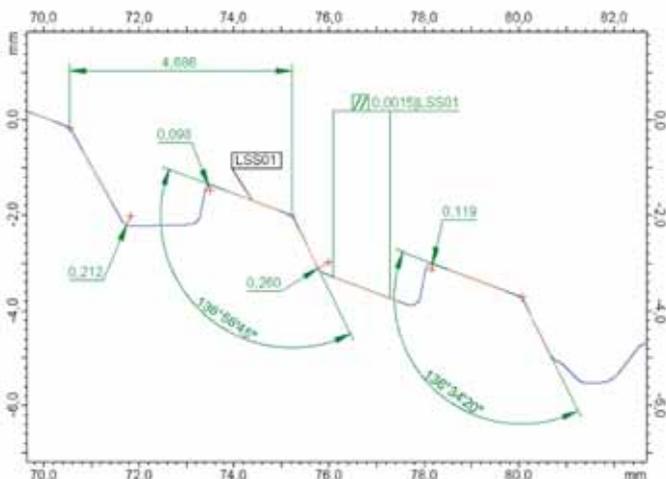
CD 120 Drive Unit

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**.



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 today 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 and export of DXF files for nominal/actual comparison
- **PCV 200** drive unit with patented probe arm mount allows tool-free, reproducible changeover of probe arms
- Flexibility 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



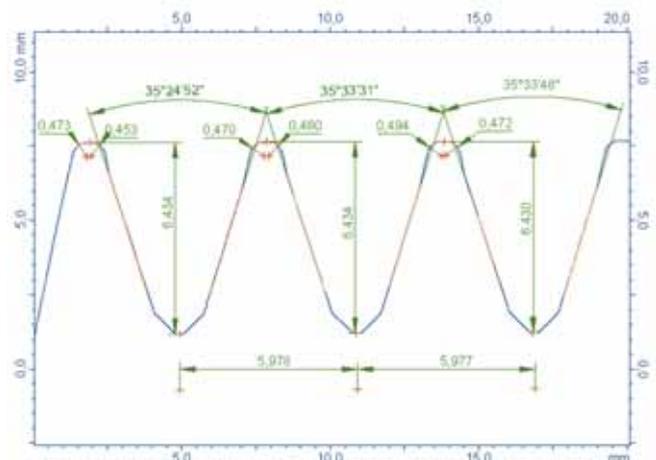
Versions

By combining the **MarSurf XC 20** software with the high-precision **LD 120** drive and probe system and the **ST 500** or **ST 750** measuring stand, resolutions in the nm range can be achieved, thereby allowing contour and roughness depth to be determined in a single measuring run.

Additional functions such as **qs-STAT**-based data export or evaluation of dominant waviness are further optional extras.



WebCode 2736



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.

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 LD 120** 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.

Versions

- Combi-measuring station with one measuring stand and two drive units (**PCV 200** and **MarSurf GD 25**)
- Combi-measuring station with quick-change mounts (**PGK 120**, **PCV 200**)
- **MarSurf UD 120 / LD 120** enables high-precision contour and roughness evaluation on components

 WebCode 3152



MarSurf UD 120 / LD 120

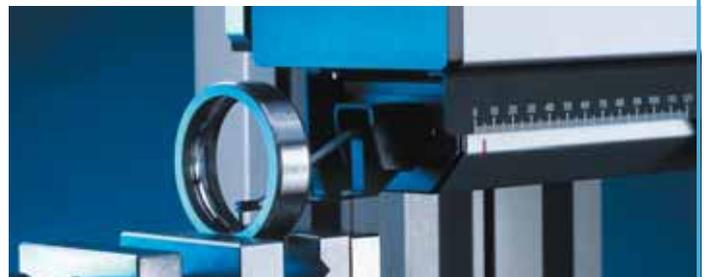
Two in one. Contour and roughness depth measurement in a single stroke

Description

MarSurf UD 120/ LD 120 is the new high-quality, high-precision **contour and roughness measuring station** with integrated laser measuring system. It performs roughness and contour evaluations in a single stroke. To complete both these measurement tasks with a single measurement, you need a high-precision measuring system that supports both the relatively large measuring stroke for the contour in radii, on slopes or in freeform areas and the resolution in the nm range for the roughness depth measurement.

Features

- The magnetic probe mount ensures flexibility by supporting a wide range of probes that can be easily exchanged, while maintaining a high level of reliability
- Positioning accuracy in the μm range when exchanging probes, and collision protection, rigidity and stability with resolutions in the nm range
- Reliable results thanks to a calibration procedure specially geared to high accuracy
- Software can be used to set measuring forces which remain constant over the entire measuring stroke, ensuring flexibility and reliability. You can select the optimum measuring force to match the material characteristics of the workpiece and the probe of your choice
- Increase accuracy due to morphological filtering in the **MarSurf X series**
- Probe arm change does not call for recalibration. Calibration is saved for every arm as well as for the magnetic probe mounting, ensuring high reproducibility.



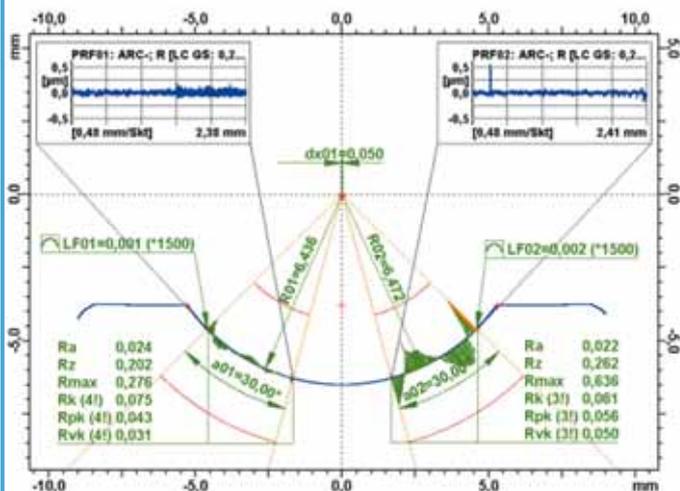
Versions

MarSurf UD 120 with measuring stand

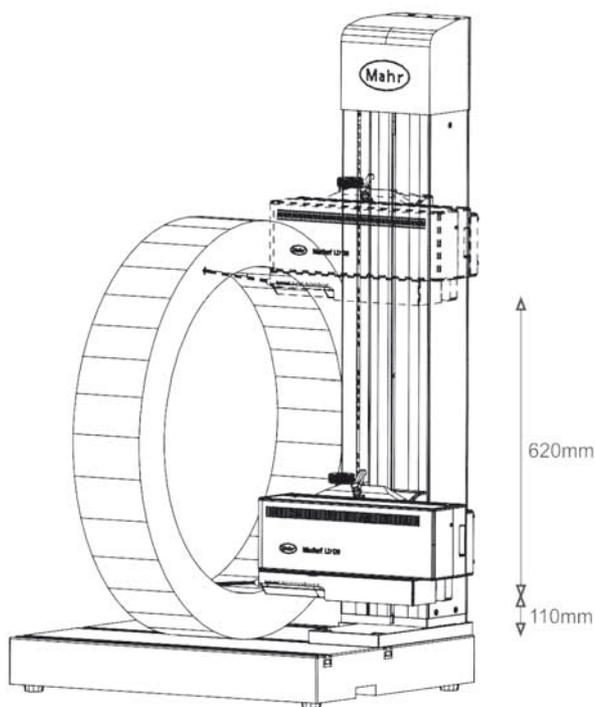
Entry into the world of high-precision roughness and contour metrology by means of an integrated optical tracing system.

MarSurf LD 120 with measuring stand

This combination including measuring stand makes for a highly flexible measuring station.



MarSurf Measuring Stand ST 750 D. Measuring Contours in New Dimensions

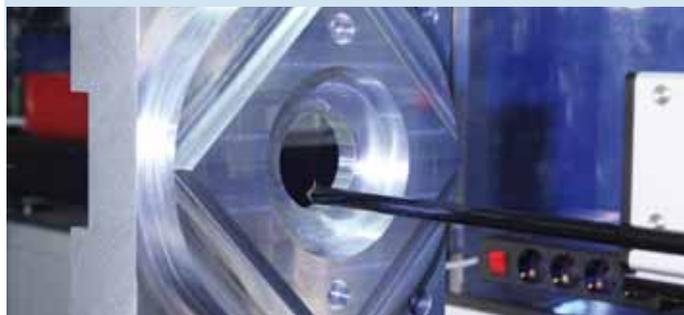


Sketch: LD 120 with ST 750 D

By using a twin-stylus probe arm and the UD 120 / LD 120 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.



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 120 / LD 120 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.

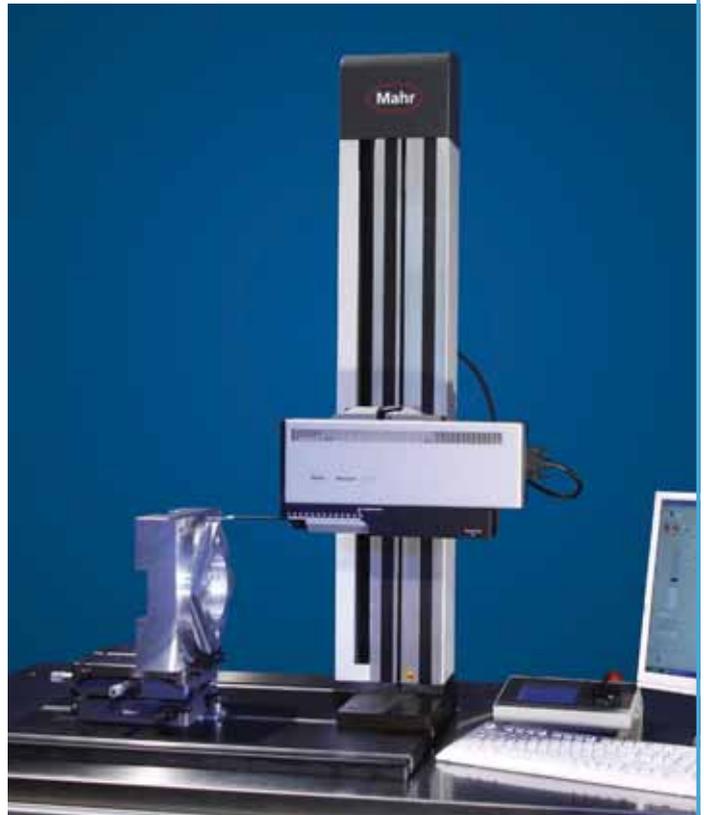
1. Measurement of the lower contour range "measuring force below"
2. Moving the slide on the measuring stand in the upper position.
3. Measuring the upper contour range "measuring force above"
4. Evaluation (distance, diameter) of the two profiles related to each other

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 LD 120/UD 120	MPE ±(1.4 + L/100) μm
with PCV	L = measuring length in mm 2) 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 Measuring Stand ST 750 D. Measuring Contours in New Dimensions



Scope of Delivery MarSurf XC 20 with ST 750 D

Measuring Station MarSurf XC 20 with ST 750 D	
MarSurf XC 20 CNC	6268361
consisting of: Control unit MidRange CNC,	
Software MarSurf XC 20 MarWin, PC	
Countries package WIN XP Professional	62682XX
TFT monitor 19"	5460043
Manual control panel MCP 21 advanced	7033935
Drive unit PCV 200	6720810
Calibration set contour (standard)	6820124
XY table CT 200*	6710530
Measuring stand MarSurf ST 750 D	
with granite plate 700 mm x 550 mm	6710255
Stand axis module ST 750 D	6851389
Printer	5460030
USB cable	3018232
Support for PCV 200/CD 120	6851362
Protection concept PCV	7033957
Probe arm 350 M	6851529
Stylus PCV ± 9 mm	6851530
Probe arm CP 175M/10/3. 5	9045820*

*not shown in picture



WebCode 13832

Scope of Delivery MarSurf LD 120 with ST 750 D

Measuring Station MarSurf LD 120 with ST 750 D	
MarSurf XCR 20 LD 120	6268382
consisting of: Control unit MidRange LD 120,	
Software MarSurf XCR 20 MarWin, PC	
Countries package WIN XP Professional	62682xx
TFT monitor 19"	5460043
Manual control panel MCP 21 advanced	7033935
Drive unit MarSurf LD 120	6720814
incl. 2 probe arms	
Calibration standard for MarSurf LD 120	
Accuracy class 1	6820121
XY table CT 200	6710530
Measuring stand ST 750 D	
with granite plate 700 mm x 550 mm	6710255
Stand axis module ST 750 D	6851389
Printer	5460030
USB cable	3018232
Set of damping elements	6851368
Support for UD 120 / LD 120	6851360
Protection concept UD 120 /LD 120	7033457
Probe arm LDT 3-10-2/90*	6852008 ¹⁾

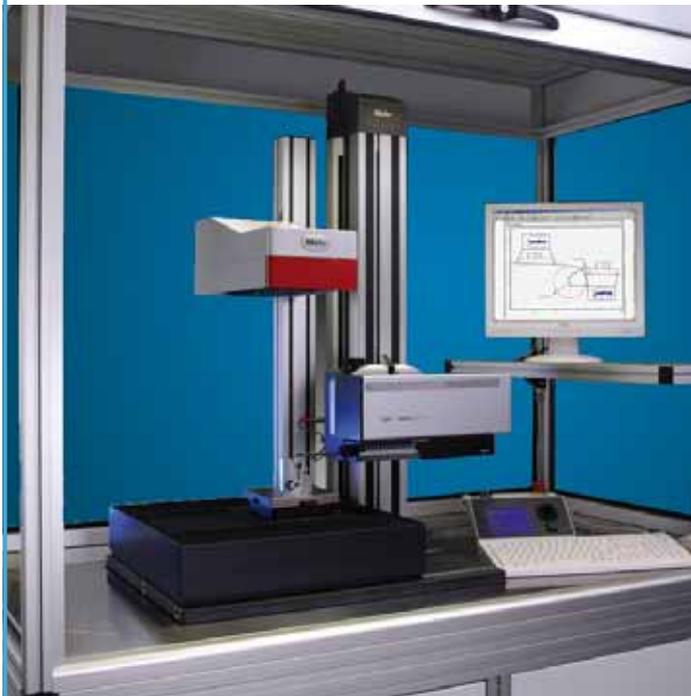
Measuring station MarSurf UD 120

Components such as LD 120 however	
Drive unit UD 120	6720817

¹⁾ additional probe arms and tips upon request

MarSurf XP 20

A measuring station for all occasions



- Depending on the measurement task, the measuring station can be set up using modules with automatic linear/rotation axes
- Modular system affords flexibility
- One software language for all systems

Versions

Manual measuring stations:

- Roughness measuring station
- Contour measuring station
- Combined roughness and contour measuring station

Automatic measuring stations:

- Roughness measuring station
- Contour measuring station
- Combined roughness and contour measuring station

Aspheric measuring station

See picture below

Description

The new Mahr software platform **MarWin** is a modular control and evaluation system with significant advantages.

This multi-product software platform provides users with a uniform basis, thereby ensuring the operational and functional reliability particularly required in automated processes.

Quick and easy configuration is achieved through the use of standardized mechanical and electronic measuring station components.

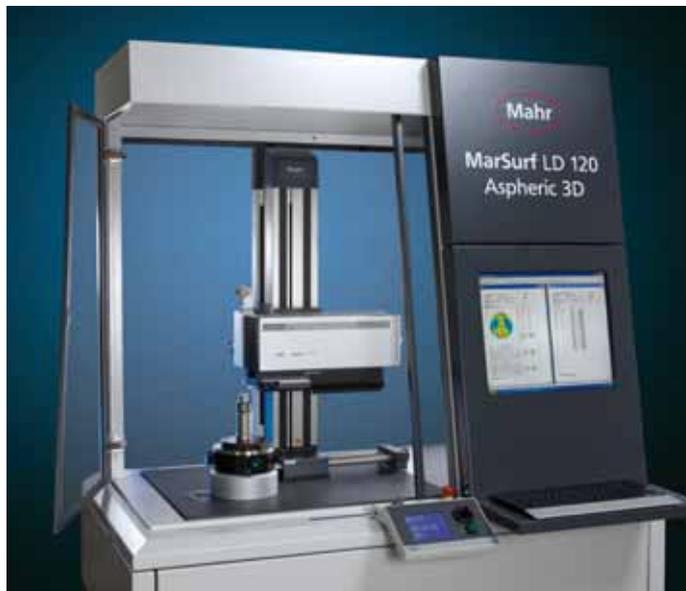
Features

- **MarTalk** coordinates the interface between the software and the machine
- **MarScript** handles the measuring language and control systems
- Tried-and-tested **Mahr quality** components and software together with a straightforward user interface provide reliable measuring results
- Safety for your system and operators through compliance with all relevant guidelines
- Modularity, i.e. depending on the measurement task, additional axes and workpiece supports can be used in addition to the standard components
- Time saved through significant reduction in setup times for the automatic measuring station



WebCode 3202

MarSurf LD 120 Aspheric 3D measuring station



MarSurf. Mobile Instruments Data Overview



	MarSurf PS1	MarSurf M 300	MarSurf M 300 C
Parameters	Ra, Rq, Rz (Ry (JIS) equiv. to Rz), Rz (JIS), Rmax, Rp, Rp (ASME), Rpm, Rsk (ASME), Rpk, Rk, Rvk, Mr1, Mr2, A1, A2, (24 roughness parameters, with tolerance limits), Vo, Rt, R3z, R _{Pc} , Rmr (tp (JIS, ASME) equiv. to Rmr), RSm, R, Ar, Rx	Over 35 roughness parameters	Over 35 roughness parameters
Probe	inductive skidded probe, 2 μm probe tip, measuring force ca. 0.7 mN	PHT probe series (skid probe system)	PHT 6-350
Drive unit		RD 18 (standard drive unit)	RD 18 C
Traversing lengths	Lt* 1.75 mm, 5.6 mm, 17.5 mm as per MOTIF 1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm	1.75 / 5.6 / 17.5 mm with RD 18 drive unit	1.75 / 5.6 / 17.5 mm
Profile resolution	8 nm / 16 nm / 32 nm (automatic switching)	8 nm / 16 nm / 32 nm (automatic switching)	8 nm / 16 nm / 32 nm
Languages	14 languages 3 Asian languages	15 languages 3 Asian languages	15 languages 3 Asian languages
Dimensions (L x W x H)	140 x 50 x 70 mm	Approx. 190 x 170 x 75 mm	Approx. 190 x 170 x 75 mm
Weight	400 g	1.3 kg	1.3 kg
Power supply	Primary: 90 V to 264 V Secondary: 9 V	Primary: 90 V to 264 V Secondary: 9 V	Primary 90 V to 264 V Secondary: 9 V

MarSurf. MarSurf M 400 Data Overview



	MarSurf M 400
Parameters	Roughness, waviness, and P profile parameters
Probe	Probe system BFW 250
Drive Unit	SD 26
Traversing length	1.75 mm, 5.6 mm, 17.5 mm, automatic, free entry as per MOTIF: 1 mm, 4 mm, 8 mm, 12 mm, 16 mm
Measuring range	±250 μm (±500 μm with double length probe arm)
Resolution (Z)	Measuring range: ±250 μm = 8 nm, ±25 μm = 0,8 nm
Measuring force (in Z)	0.7 mN
Dimensions (L x B x H)	approx. 190 x 170 x 75 mm
Weight	1.9 kg
Power supply	Primary: 90 V to 264 V; Secondary: 9 V

MarSurf. Data Overview XR 20, XC 2 / XC 20



	MarSurf XR 20	MarSurf XC 2 / XC 20
Parameters	Over 100 roughness, waviness, P-profile and motif 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	MFW 250, R probe	350 mm probe arms, 175 mm probe arms complete with probe stylus tips
Drive unit	Usable PZK, GD 25, GD 120, PGK 20, PRK via PAV 62	MarSurf CD 120 / MarSurf PCV 200 (only XC 20)
Traversing length	Depending upon drive unit 0.56 / 1.75 / 5.6 / 17.5 / 56; Lt var 0.56 to 120.0	1 mm to 120 mm, 1 mm to 200 mm (only XC 20)
Measuring range		± 25 mm with 350 mm probe arm
Profile resolution	± 25 µm = 0.5 nm; ± 250 µm = 5 nm	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) of compl.meas. stand ST 500	Approx. 700 mm x 550 mm x 720 mm	Approx. 700 mm x 550 mm x 720 mm
Weight of measuring station with ST 500 meas. stand	Approx. 160 kg	Approx. 140 kg
Power supply	230 V (or 115 V possible)	230 V (or 115 V possible)

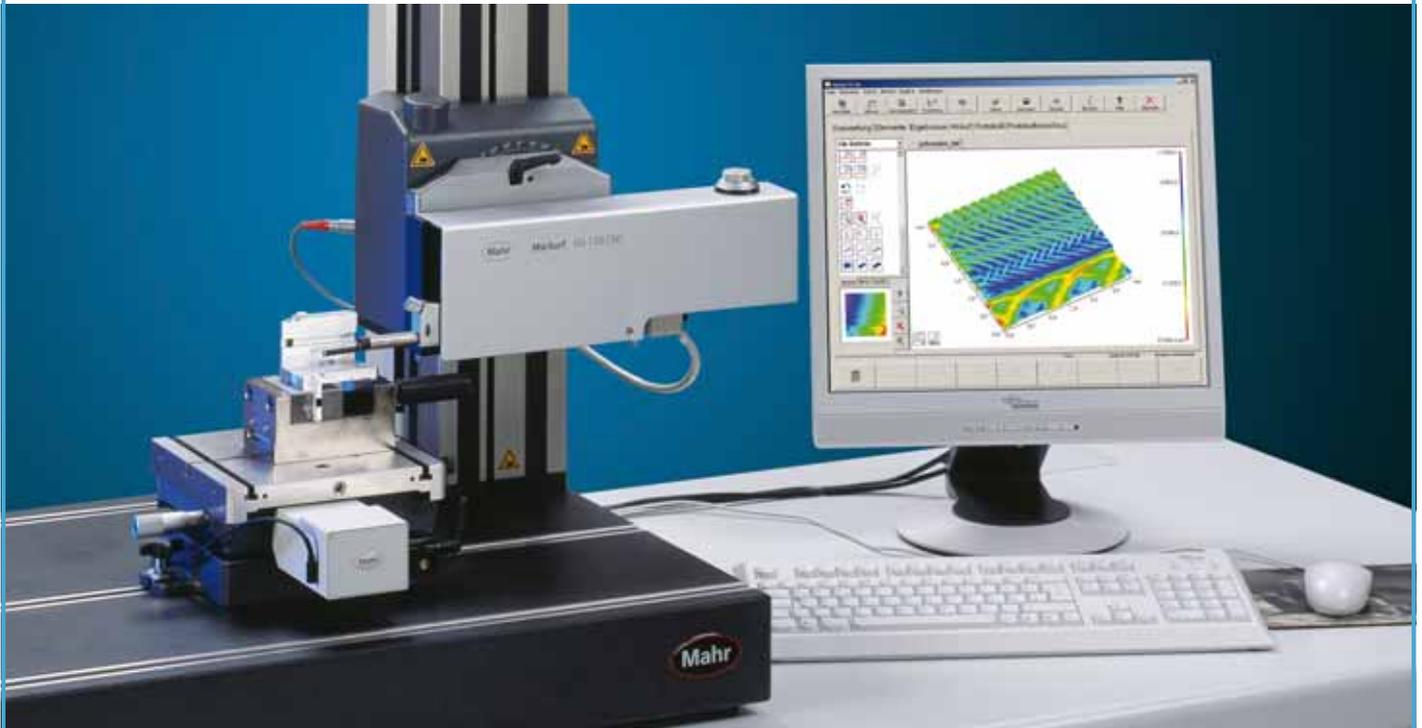
MarSurf. Data Overview UD 120 / LD 120 and XT



	MarSurf UD 120 / LD 120	MarSurf XT 20
Parameters	Roughness parameters, waviness parameters, P-parameters, see MarSurf XR 20	Color-coded height presentation, grid models, photo simulation, 2D top view, any profile sections, zoom function, distances, angles, radii, extreme points, comprehensive filter functions such as Gaussian filter, median filter, polynomial filter, interpolation of invalid sections, remove spherical form, remove cylindrical form, alignment functions across sections, 3D surface roughness parameters, export and evaluation of any profile sections in MarSurf XR 20 roughness software or MarSurf XC 2/XC 20 contour software. Measuring data can be recorded using stylus instruments with Y-drive or MarSurf WS1 optical surface sensor.
Contour elements	Radii, distances, angles, see MarSurf XC 20	
Probes	LD A14-10-2 with diamond tip 2 µm 60° (UD 120), LD A14-10-2 with diamond tip 2 µm 90° and LD A14-10-500 (LD 120)	
Drive unit	MarSurf LD 120 / UD 120	
Traversing length	0.1 mm to 120 mm	
Profile resolution	2 nm	
Measuring range	10 mm	
Measuring force (in Z)	LD 120: 0.5 mN to 30 mN / UD 120: 1 mN to 30 mN	
Dimensions (L x W x H) of the compl. measuring stand ST 500	Approx. 700 mm x 550 mm x 720 mm	
Weight	Approx. 160 kg (incl. ST 500)	
Power supply	230 V (or 115 V possible)	

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.

CT 200-MOT Technical Data

CT 200-MOT technical data as for CT 200 but with motorized Y-drive.

Adjustment path in Y	175 mm (0.7 in)
Resolution	0.375 μm (15 μin)

Measuring Station Components

As described on pages 15-17 to 15-21, plus:

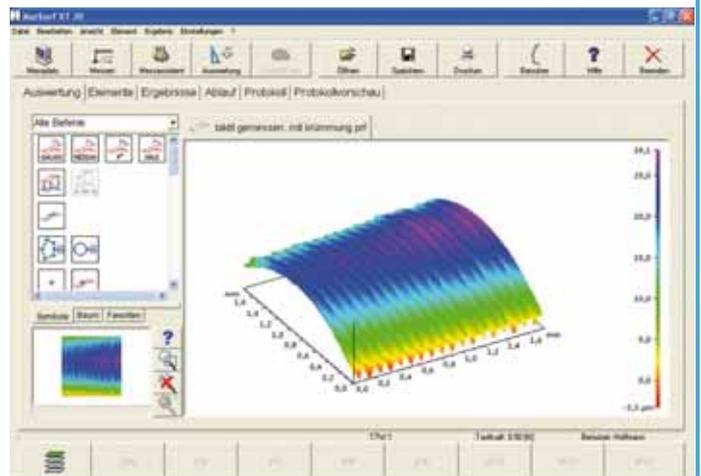
Topography measuring station extension

MarSurf XT 20 software

CT 200-MOT Y-drive

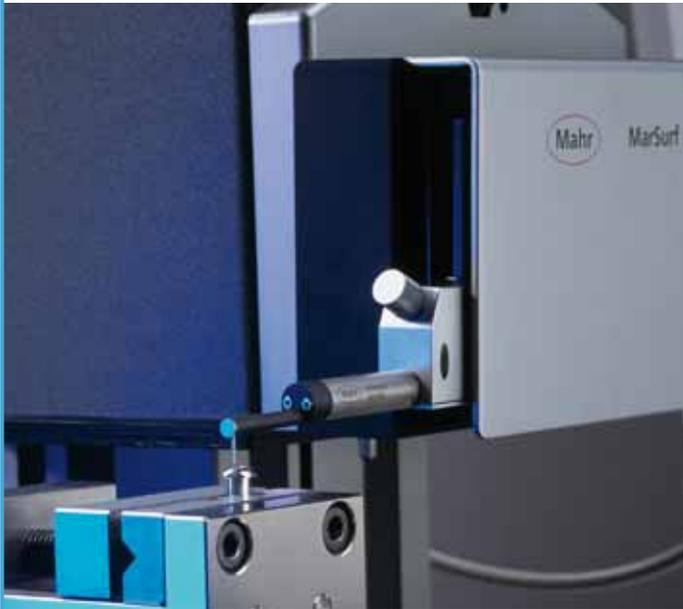
Order No. 6299034

Order No. 6710543



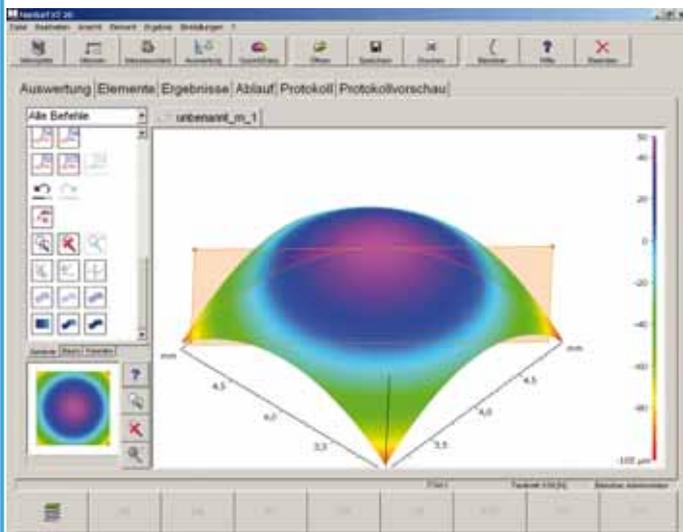
MarSurf XR 20 with XT 20 Topography

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. WS1 White Light Sensor Measuring Station

Non-contact measurement of surface structures



Description

Ever higher surface qualities are being produced thanks to new processing methods and materials. This places much greater demands on a measuring system in terms of resolution and measuring accuracy.

The **MarSurf WS1** is an optical surface sensor which operates according to the principle of white light interferometry. This technology enables rapid, high-precision recording of surface topographies on a wide range of materials.

Features

- The impressive vertical resolution of 0.1 nm (0.004 μm) enables the finest of structure to be recorded
- Can be used in inspection rooms and the manufacturing environment
- The compact design saves space
- The optical design is specifically geared to the demands of industrial processing methods
- Illuminated using LED technology with a long service life
- Evaluation with the **MarSurf XT 20** topography software enables a comprehensive, user-friendly topography analysis
- Can be incorporated as an OEM component

MarSurf PCV 200 Drive Unit

Contour drive unit



Description

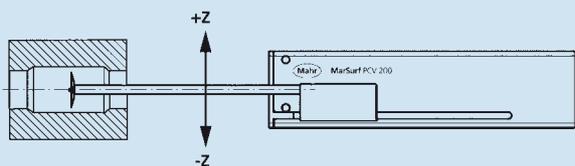
The **PCV 200** contour drive unit supports measuring paths of up to 200 mm (7.87 in).

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

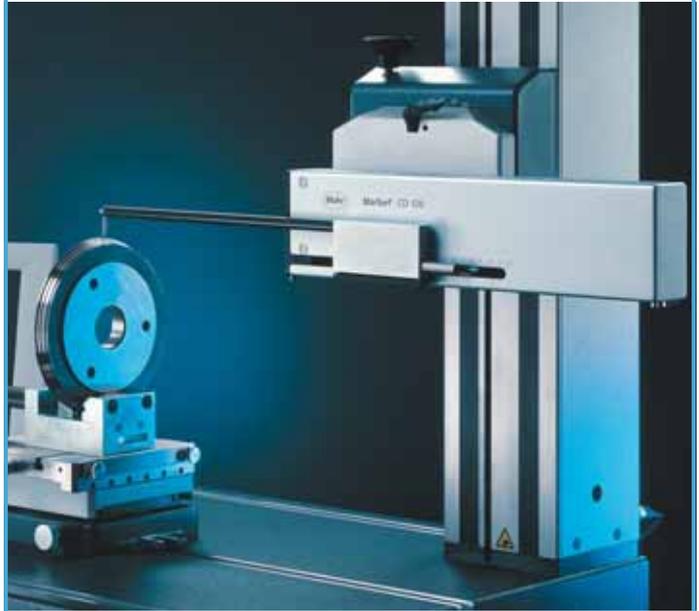
The drive unit supports a large number of probe arms of different shapes and sizes.



 WebCode 2736

MarSurf CD 120 Drive Unit

Contour drive unit



Description

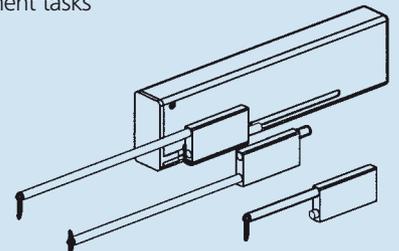
The **CD 120** contour drive unit is based on the technology of the **PCV 200** drive unit. It measures contour elements such as radii, distances, angles, etc. simply and precisely.

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.



 WebCode 2698

MarSurf. PZK Drive Unit

Small and handy



Description

This set consists of the small, handy PZK drive unit and the integrated, inductive MFW 250 probe. The probe arms can be changed very quickly. The built-in datum plane allows both skidless and skidless measurements. The PZK set also includes a hand-held mount. The bottom of the hand-held mount takes the form of a vee-block, enabling flat and cylindrical workpiece contours to be measured. This makes the PZK a universal system.

 WebCode 2997



MarSurf. 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 skidless probe can be used, along with all probes of the R series.

 WebCode 2997



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.

Precise positioning on the horizontal axis is very important for automatic operating sequences. The **GD 120** allows precise positioning on the X-axis.

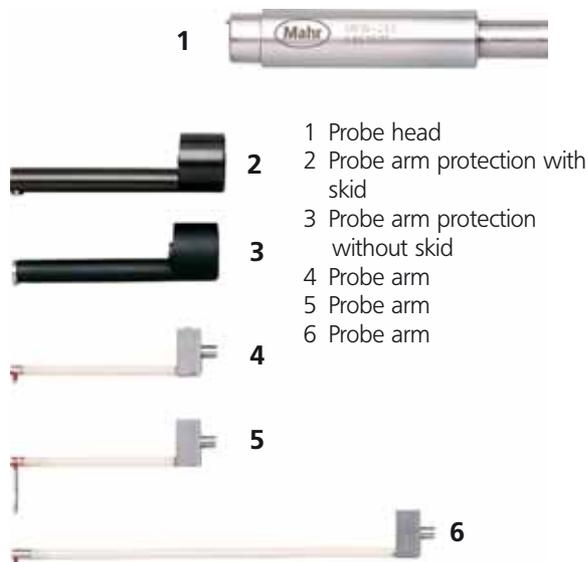
In addition to very quiet running (residual value $R_z < 30 \text{ nm}/0.1 \text{ mm/s}$), this unit offers fast probe clamping and also protects the unit by means of a collision protection device on the probe mount.

 WebCode 2997



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

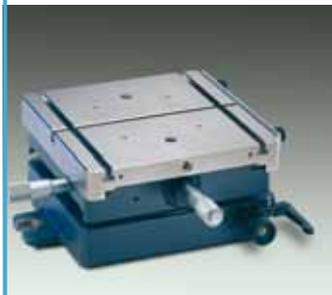
The MFW probe system can be used as a skidless or skidded probe. It is distinguished by the following characteristics:

- low linearity deviation (< 1 %),
- high resolution (100,000-/200,000: 1),
- large measuring range ($\pm 250 \mu\text{m}$).

Double length tracing arms enlarge the measuring range to $\pm 500 \mu\text{m}$.

The simple tracing arm interchange ensures a particularly wide field of application. The rugged, rigid design avoids natural vibration.

 WebCode 2997



Accessories

Depending upon the measuring task, different accessory components, parallel vices or prisms can be ordered.

XY table CT 200 Order No. 6710530

Table surface 200 mm x 200 mm (optionally expandable to 400 mm x 400 mm with an adapter plate)
 XY-adjustment by 25 mm each using micrometer caliper.
 C- axis adjustable by $\pm 2.5^\circ$ 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 Order No. 6710633
 axis can swiveled by $\pm 45^\circ$

PGN Geometric Standard

DIN EN ISO 5436 type C1 sinusoidal groove profile



Surface roughness standard with a sinusoidal groove profile. Profile depth approx. $3\ \mu\text{m}$ ($120\ \mu\text{in}$), groove spacing approx. $0.12\ \text{mm}$ ($.00472\ \text{in}$). For checking the roughness measuring station. The following types are available:

- PGN 1** Profile depth approx. $1.5\ \mu\text{m}$, groove spacing approx. $0.10\ \text{mm}$
- PGN 3** Profile depth approx. $3\ \mu\text{m}$, groove spacing approx. $0.12\ \text{mm}$
- PGN 10** Profile depth approx. $10\ \mu\text{m}$, groove spacing approx. $0.20\ \text{mm}$

DKD and Mahr calibration certificate upon request

PEN 10-1 Setting Standard

DIN EN ISO 5436 type A1 depth setting standard



Depth setting standard for the static calibration of the vertical stroke of all skidless, single-skid and dual-skid probes. Groove depth approx. $10\ \mu\text{m}$, $\varnothing 44\ \text{mm}$.

- 2 calibration grooves
- Optical flat surface

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. $10\ \mu\text{m}$ ($.394\ \mu\text{in}$). For checking the roughness measuring station. R_a , R_z , R_{max} .

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.

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 155

► | 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.

▶ I MarForm. Form Measuring Instruments

Formtesters

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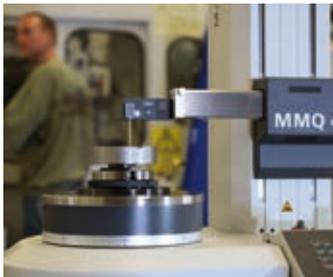
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MarForm. Formtesters for a Wide Range of Applications

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



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.

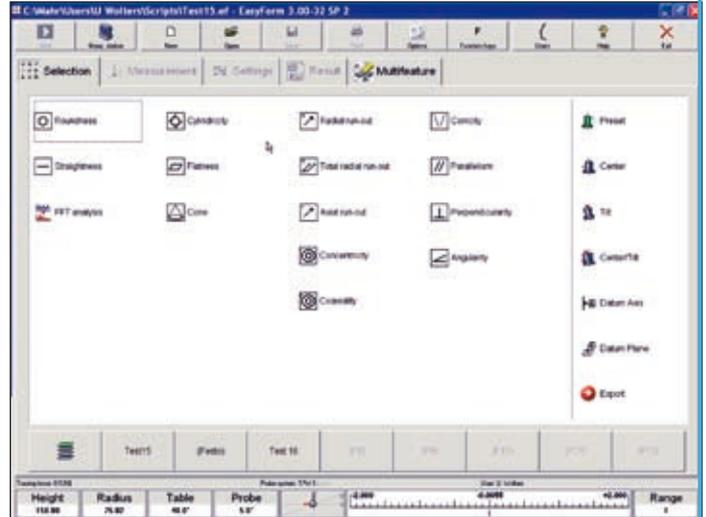
- Precise and fast measurement results
- Reliable thanks to mechanical bearings
- Large measuring volume
- Mobile due to its low weight and convenient size
- Fast computer-assisted workpiece alignment
- Centering and tilting screws for rough and fine adjustment
- Universal and reliable
- Suitable for 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

(1) from either a single or several polar traces



EasyForm 3.0

Versions

MMQ 100 with EasyForm as a powerful, PC-based evaluation system running on Windows® XP 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⁾, straight-ness⁽¹⁾, parallelism⁽¹⁾ and perpendicularity⁽¹⁾.

The **MMQ 100 EasyForm measuring station** comes complete:

Form Measuring Station MMQ 100 Plus Order no. 9999116 consisting of:

- MarForm MMQ 100 Plus with digital encoders in X/Z and with T20W probe
- EasyForm PC
- WIN XP Country Package
- 19" TFT monitor

Options for MMQ 100:

Advanced Form for comprehensive evaluations, based on EasyForm.

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 1412/10146.

MarForm MMQ 200

The MMQ 200 is the standard form measuring instrument for both your shop floor and precision inspection rooms



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

Characteristics of MarForm MMQ 200

- High-precision roundness measuring axis (C)
- Motorized measuring axis vertical (Z)
- Motorized positioning axis horizontal (X)
- Manual or automatic 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 4.0**. Operation takes place with touchscreen technology and is thus also for the mouse operation unique and easy.

Form measuring station with T20W 9999485

- Formtester MarForm MMQ 200
- Length measuring probe T20W, manual, with probe arm
- Measuring and operating software EasyForm 4.0
- PC Intel class, Windows XP Professional
- 19" TFT monitor
- Deskjet printer with cable
- Rim chuck with diameter of Ø 100 mm

Form measuring station with T7W 9999486

- Formtester MarForm MMQ 200
- Motorized length measuring probe T7W with probe arm
- Measuring and operating software EasyForm 4.0
- PC Intel class, Windows XP Professional
- 19" TFT monitor
- Deskjet printer with cable
- Rim chuck with diameter of Ø 100 mm

Options:

- 17" touchscreen TFT monitor instead of 19" 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

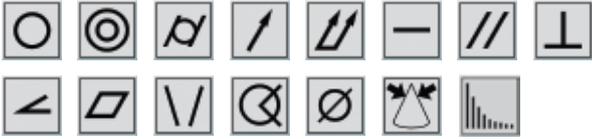


Request a brochure or see WebCode 13148.

⁽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



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.

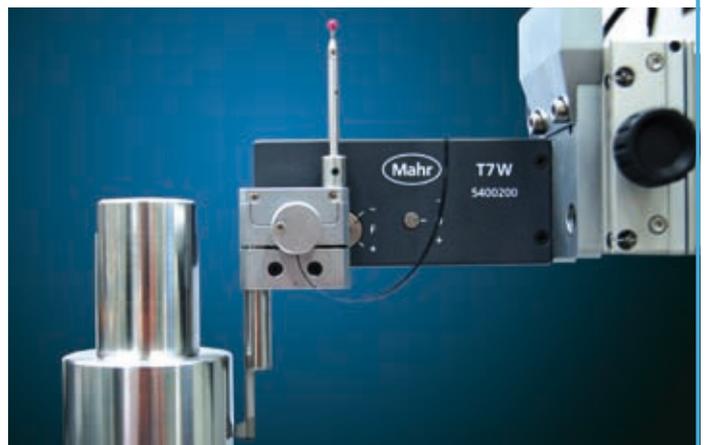
- Motorized or manual centering and tilting table
- Vertical axis (Z) with measuring length of either 500 mm (19.67 in) or 900 mm (35.4 in) and horizontal axis (X) with measuring length of 280 mm (11.02 in) or
- Vertical axis (Z) with measuring length of 350 mm (13.78 in) and horizontal axis (X) with measuring length of 180 mm (7.09 in)
- With digital position decoders in the linear axes X and Z for best reproducibility 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.



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° .



Request a brochure or see WebCode 11321.

MarForm Overview of Standard Form Measuring Machines



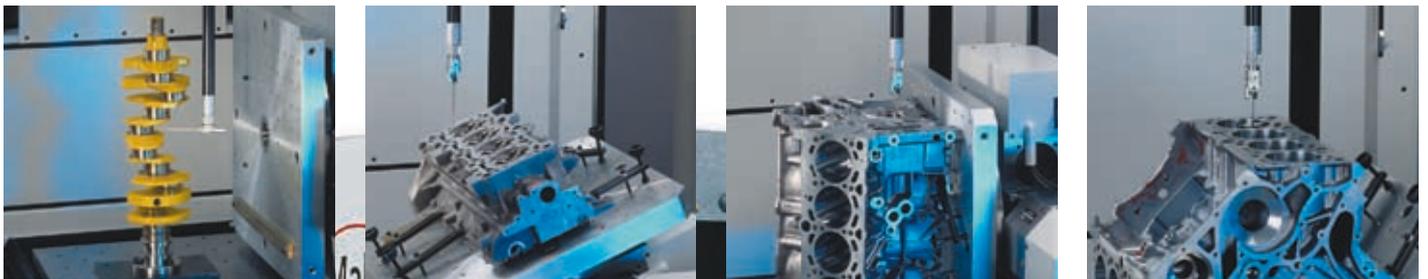
Formtester	MMQ 100	MMQ 200 Z= 250 mm	MMQ 400-2 Z = 350 mm/ X = 180 mm Z = 500 mm/ X = 280 mm	MMQ 400-2 Z = 900 mm X = 280 mm
Roundness measuring unit, C-axis				
Roundness deviation ($\mu\text{m}+\mu\text{m}/\text{mm}$ meas. height)**	0.05 + 0.0006	0.03 + 0.0006	0.02 + 0.0005	0.02 + 0.0005
Roundness deviation ($\mu\text{m}+\mu\text{m}/\text{mm}$ meas. height)*	0.025 + 0.0003	0.015 + 0.0003	0.01 + 0.00025	0.01 + 0.00025
Axial run-out ($\mu\text{m}+\mu\text{m}/\text{mm}$ meas. radius)**	0.04 + 0.0006	0.04 + 0.0006	0.04 + 0.0002	0.04 + 0.0002
Axial run-out ($\mu\text{m}+\mu\text{m}/\text{mm}$ meas. radius)*	0.02 + 0.0003	0.02 + 0.0001	0.02 + 0.0001	0.02 + 0.0001
Centering and tilting table				
Table diameter (mm)	160	160	285	285
Table load, centric (N)	200	200	600	400***
Revolutions per minute (rpm) 50 Hz / 60 Hz	5 / 6	1 to 15	1 to 10	1 to 10
Vertical straightness measuring unit, Z-axis				
Positioning path (mm)	300 manual	-	-	-
Measuring path motorized (mm)	-	250	350 /500	900
Straightness deviation /100 mm meas. path (μm)**	-	0.15	0.15	0.15
Straightness deviation /total meas. path (μm)**	-	0.3	0.3/0.4	0.4
Parallelism deviation Z-/C-axis in tracing direction ($\mu\text{m}/\text{mm}$)	-	-	0.5/350 0.8/500	2/900
Measuring speed (mm/s)	-	0.5 to 5	<0.1 to 10	<0.1 to 10
Positioning speed (mm/s)	-	0.5 to 100	<0.5 to 100	<0.5 to 100
Positioning path (mm)	man. 180.	mot. 150		
Horizontal straightness measuring unit, X-axis				
Measuring path, motorized (mm)	-	-	180/280	280
Straightness deviation/100 mm meas. path (μm)**	-	-	0.4	0.5
Straightness deviation /total meas. path (μm)**	-	-	0.8/180 1.5/280	1.5
Perpendicularity X-/C-axis (μm)	-	-	1/180 2/280	2
Measuring speed (mm/s)	-	-	<0.5 to 10	<0.5 to 10
Positioning speed (mm/s)	-	0.5 to 30	<0.5 to 30	<0.5 to 30

* Values as max. deviation from reference circle LSC, filter 15 upr.

** All values acc. to DIN ISO 1101 at 20 °C \pm 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 \varnothing 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.

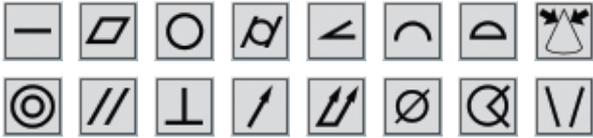
MarForm. The Reference Machines for Form and Positional Tolerances OUR MOST ACCURATE FORM MEASURING INSTRUMENTS EVER

▶ | **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 WebCode1336.

MarForm Overview Reference and Large Formtesters

Formtester	MFU 800	MFU 100
Roundness measuring device, C-axis		
Roundness deviation ($\mu\text{m}+\mu\text{m}/\text{mm}$ meas. height)**	0.02 + 0.0004	0.02 + 0.0004
Roundness deviation ($\mu\text{m}+\mu\text{m}/\text{mm}$ meas. height)*	0.01 + 0.0002	0.01 + 0.0002
Axial run-out deviation ($\mu\text{m}+\mu\text{m}/\text{mm}$ meas. radius)**	0.04 + 0.0002	0.04 + 0.0004
Axial run-out deviation ($\mu\text{m}+\mu\text{m}/\text{mm}$ meas. radius)*	0.02 + 0.0001	0.02 + 0.0002
Resolution (interpolated)	0.0005°	0.0001°
Centering and tilting table		
Table diameter (mm)	300	180
Table load capacity, centric (N)	1,000	200
Speed (rpm) 50 Hz/60 Hz	0.1 to 15	0.1 to 15
Vertical straightness measuring unit, Z-axis		
Measuring path (mm)	480	320
Straightness deviation /100 mm (μm)**	0.1	0.1
Straightness deviation /200 mm (μm)**	-	0.2
Straightness deviation / measuring path (μm)**	0.3	0.3
Parallelism deviation of Z-/C-axis in tracing direction (μm)	0.6	0.6
Measuring speed (mm/s)	0.1 to 50	0.1 to 50
Positioning speed (mm/s)	0.1 to 50	0.1 to 50
Positioning uncertainty (μm) with probe return positioning	-	1
Positioning uncertainty (μm) (total positioning P to VDI 3441)	10	2
Resolution (interpolated) (μm)	0.001	0.001
Horizontal straightness measuring unit, X-axis		
Measuring path (mm)	180	190
Straightness deviation /100 mm (μm)**	0.15	0.15
Straightness deviation /meas. path (μm)**	0.3	0.3
Perpendicularity of X/C-axis (μm)	0.3	0.3
Measuring speed (mm/s)	0.1 to 50	0.1 to 50
Positioning speed (mm/s)	0.1 to 50	0.1 to 50
Positioning uncertainty (μm) with probe return positioning	-	1
Positioning uncertainty (μm) (total positioning P to VDI 3441)	4	2
Diameter measuring accuracy (μm)	2	0.2
Resolution (interpolated) (μm)	0.001	0.001
Horizontal straightness measuring unit, Y-axis		
Measuring path (mm)	6	6
Straightness deviation ($\mu\text{m}/5$ mm, filter 0.25 mm)	0.5	0.5
Perpendicularity Y-/X-axis (μm)	1	1
Resolution (interpolated) (μm)	0.005	0.005

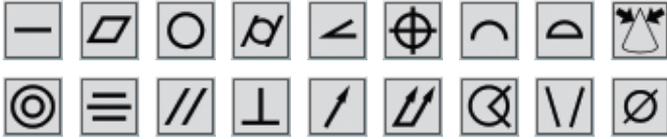
* Values as maximum deviation from reference circle LSC, filter 15 μm .

** All values in accordance with DIN ISO 1101 at 20 °C \pm 1 °C in vibration-free environment, filter 15 μm 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 if 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 1307.

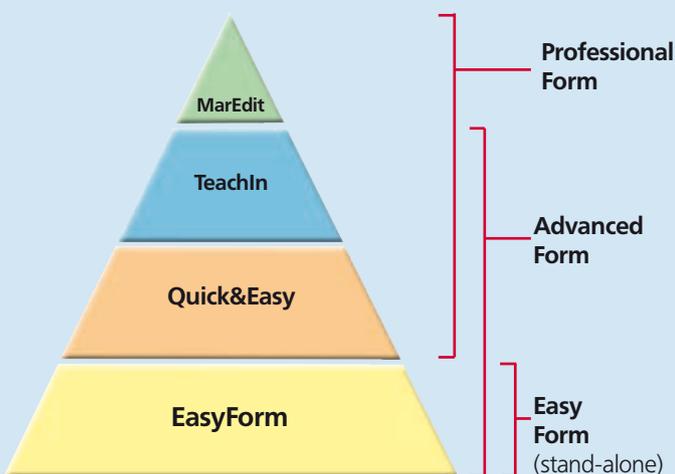
MarWin. Software Modules for MarForm

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 $\mu\text{m}/\mu\text{in}$ 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**.

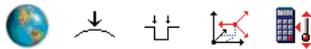
This sequence merely has to be saved and the measuring program is then ready.

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

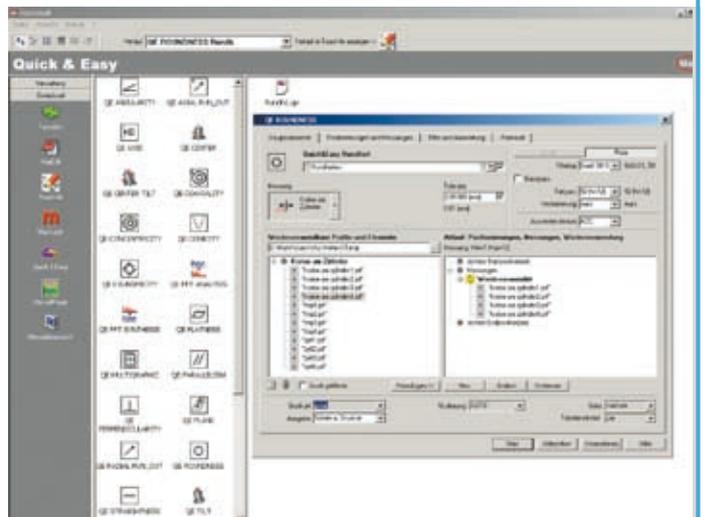
2. PROFILE RECORDING



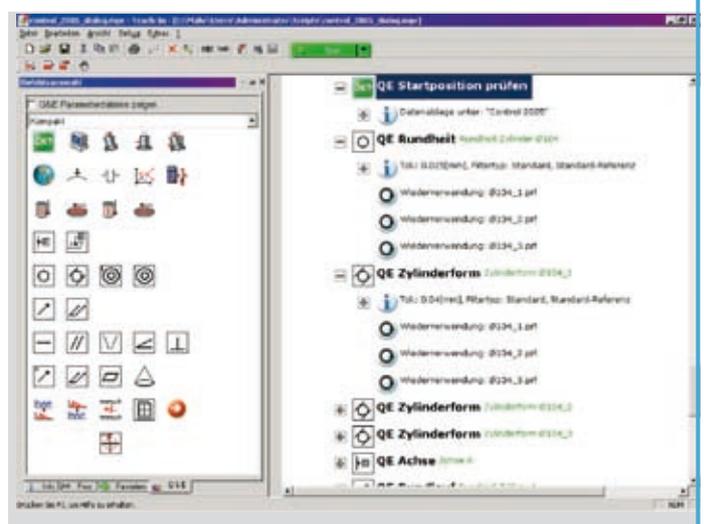
- QE Circles on cylinder
- QE Circles on plane/end face
- QE Lines on cylinder
- QE Lines on plane/end face



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

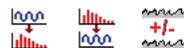


- QE Straightness
- QE Parallelism
- QE Conicity
- QE Angularity
- QE Perpendicularity



- QE Axial run-out
- QE Total axial run-out
- QE Flatness
- QE Taper

4. SPECIAL EVALUATION

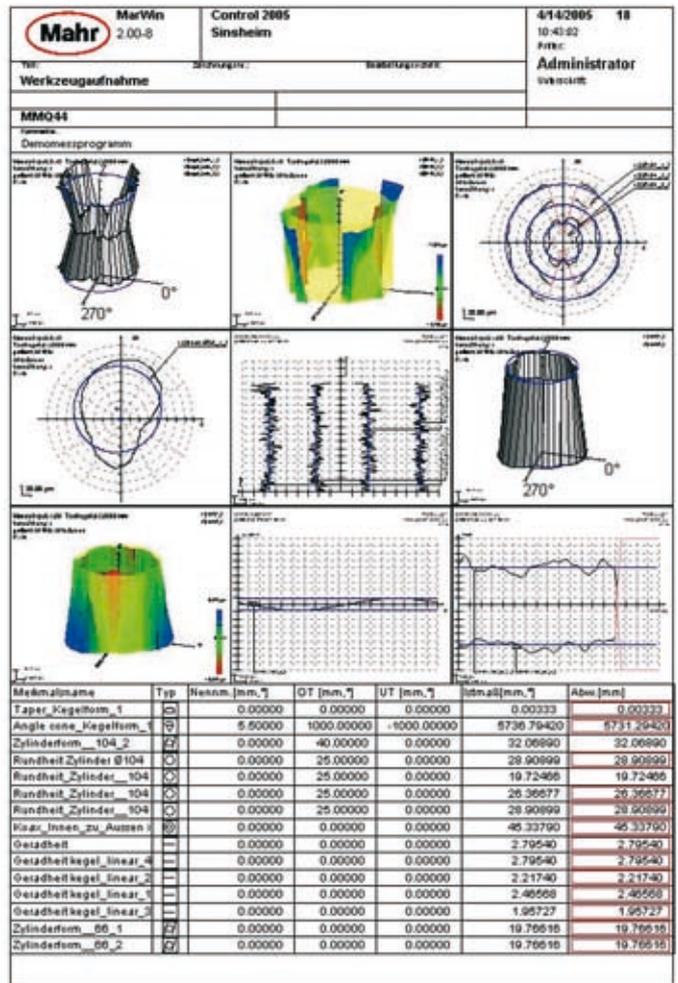


- QE Fourier analysis
- QE Fourier synthesis (optional)
- QE Profile arithmetics

5. RECORD



- QE Multigraphics



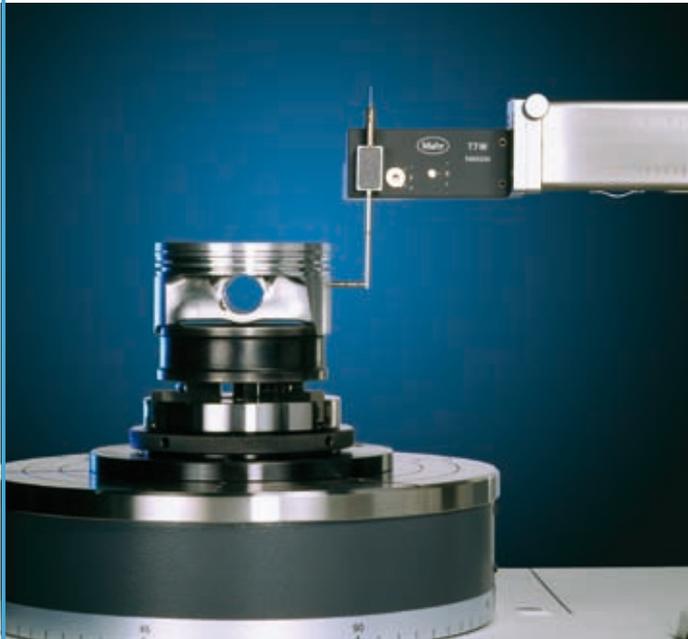
Multigraphic record

6. DATA EXPORT



- QE Result export (Option)
- QE QS-STAT (Option)

Software Packages for Special Applications



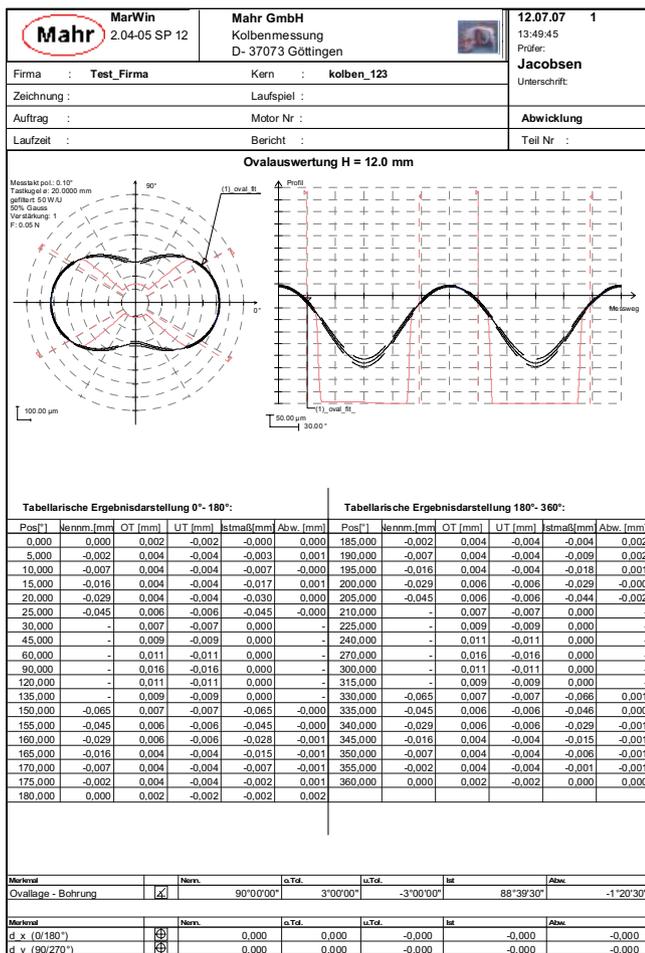
Expansion package for piston measurement and evaluation

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)



Request a brochure or see WebCode 1292.

MarWin. Lead Measurement and Analysis with MarForm Formtesters

Expansion package for MarForm Formtesters as per Mercedes Benz Standard MBN31007-7, version 2

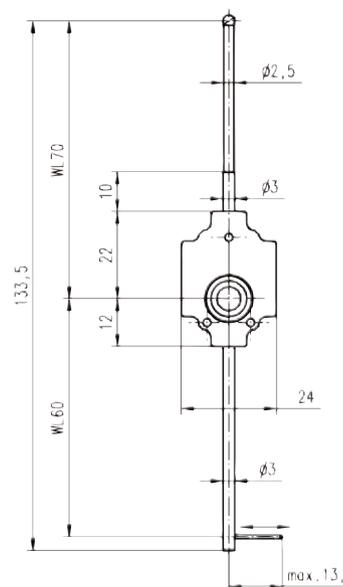
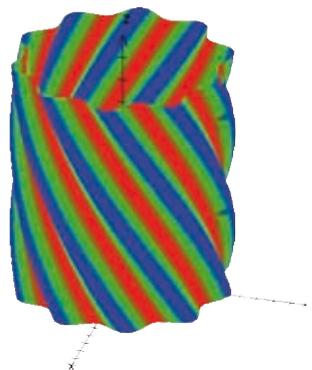


Expansion package: Lead measurement and analysis

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 measurement 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



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.

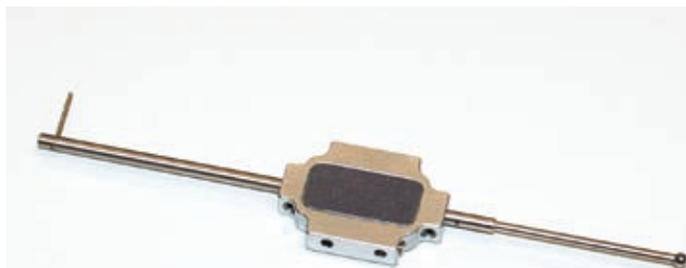
Measurement of n generating lines (72 as per MB Standard, MBN 31007-7)

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



Request a brochure or see WebCode 1292.

Expansion Package for MarForm Formtesters. Lead Measurement and Analysis

Form and lead evaluation

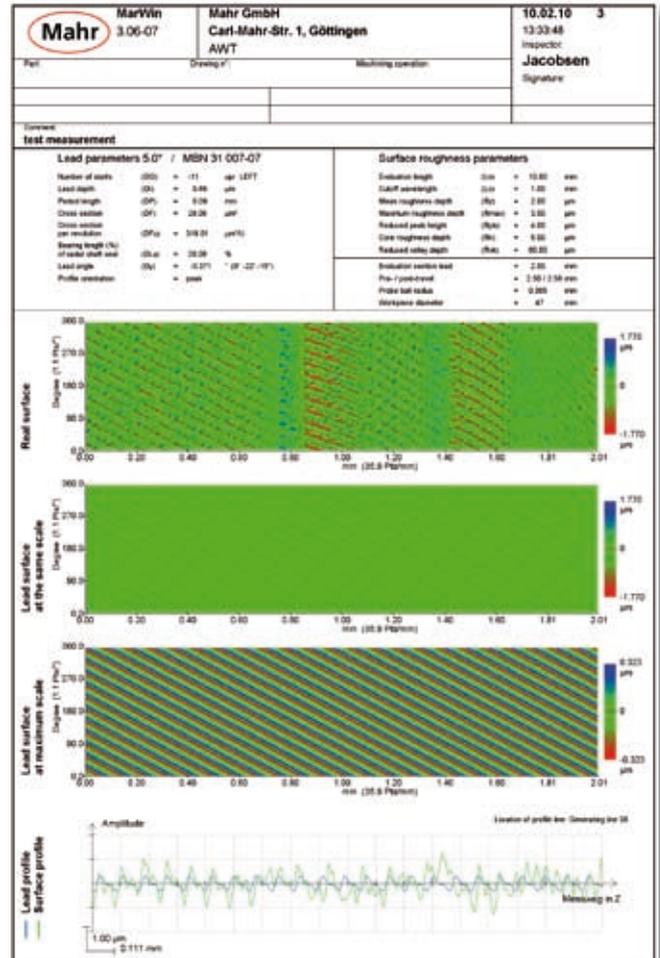
- Form/positional evaluation for conicity / parallelism / parallel to lead evaluation
- Form/positional/lead evaluation of several upr values

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 $D\gamma$ (degrees)
- Lead direction
- Lead depth Dt (μm)
- Theoretical supply cross section DF (μm^2)
- Theoretical supply cross section per turn DFu ($\mu\text{m}/\text{U}$)
- Contact length of radial seal DLu (%)



Record lead measurement

Graphic output:

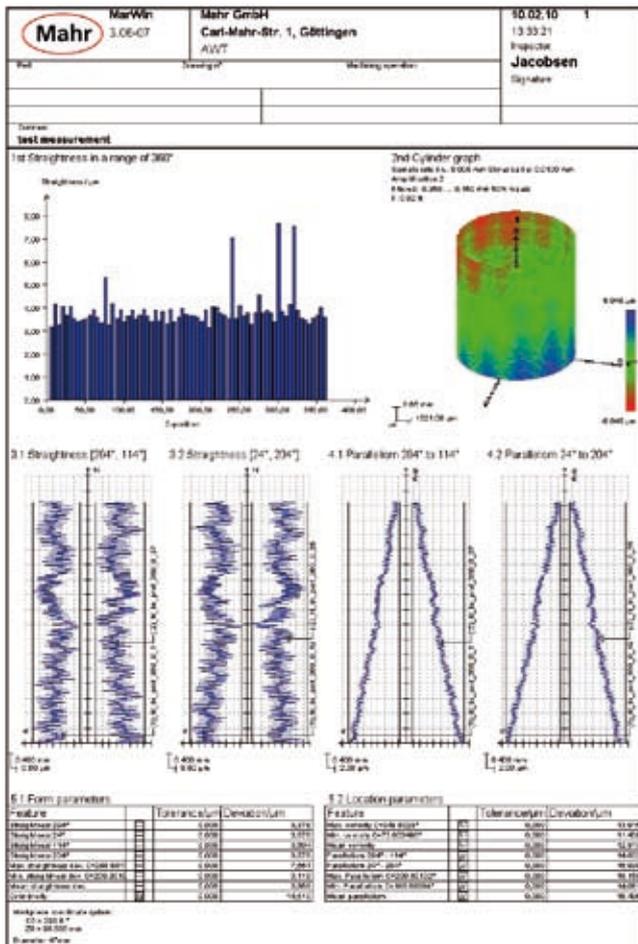
The measured profiles are output in the record as graphs.

Various diagram types are available:

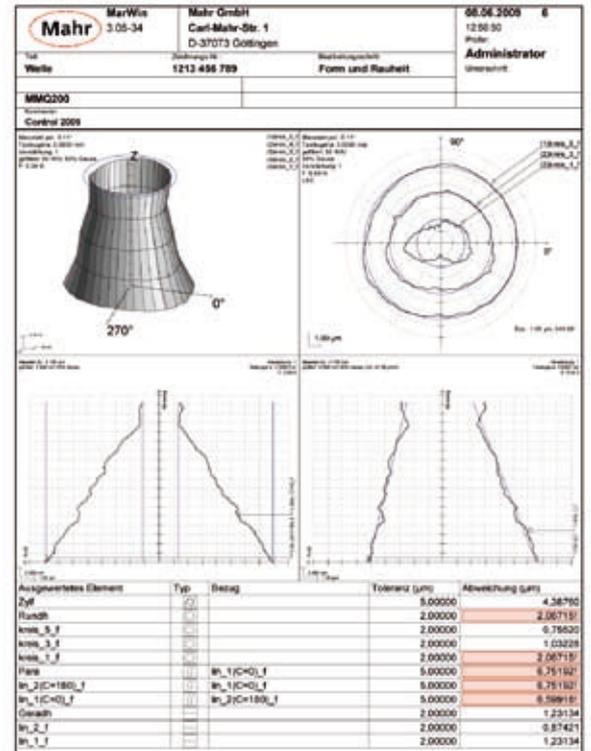
- 3D cylinder (in color, traditional and unwound)
- Every assessed generating line profile is shown in a linear graph to judge the form and the positional parameters.
- Amplitude spectra of the linear profiles in a bar graph

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?

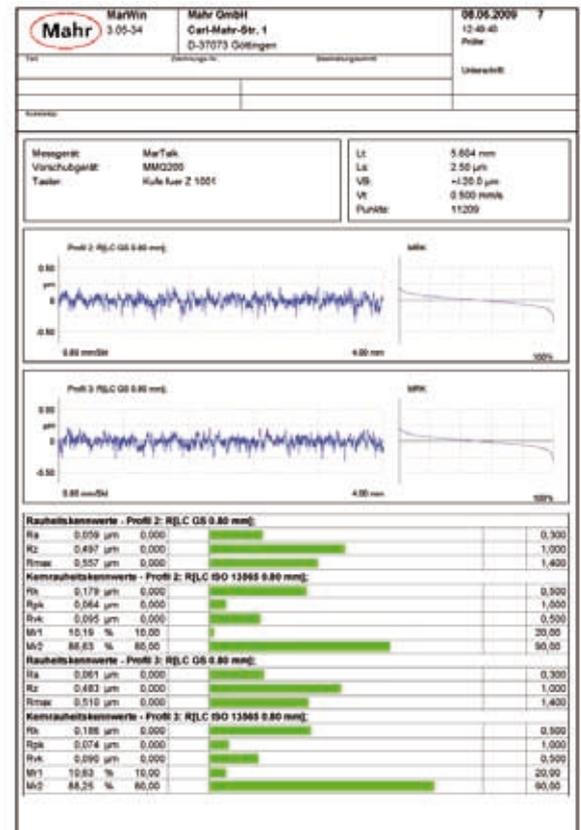
Why not assess e.g. the Ra and Rz values with a MarForm form measuring instrument?

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

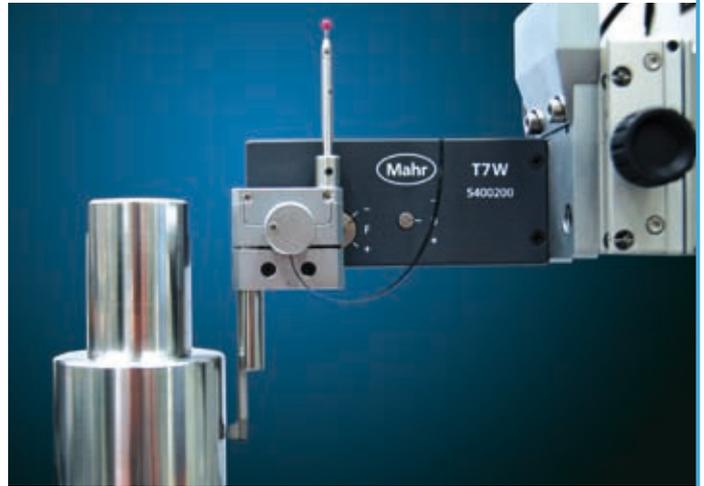
Mahr as the market leader in the field of form metrology offers form measuring machines of utmost precision and for many customers Mahr measuring machines are the standard in mechanical form metrology. And the very well proven stylus method has been perfected at Mahr

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!

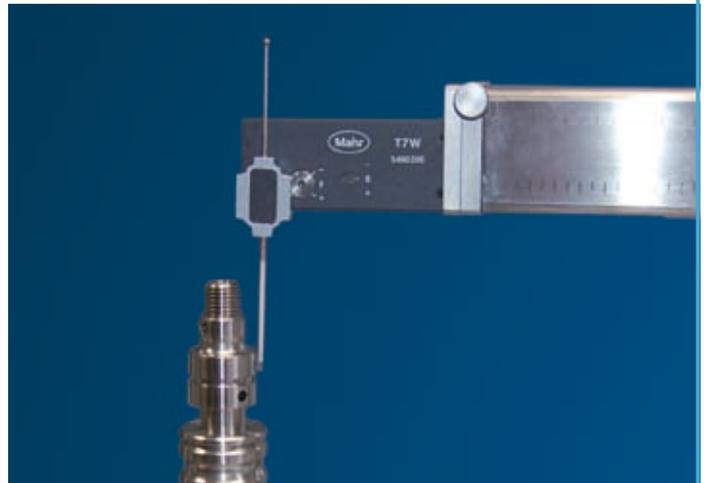
This is possible as the change between the form probe with ruby ball and the **PHT 6-350** pick-up with diamond tip is fully-automatic and program-controlled. Changing from vertical to horizontal measuring positions is also fully automatic. Owing to the rotary axis of the **T7W** probe which positions 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 parameters. 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 possibility 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 $> 2 \mu\text{m}$. 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

System
Skid radius
laterally 2.9 mm
Contact point
Measuring range
Specification

Order No. 6111520

One-skidded probe
In tracing direction 25 mm,
0.8 mm in front of the probe tip
350 μm
For level surfaces, for bores from
6 mm \varnothing to 17 mm depth,
grooves from 3 mm width,
min. workpiece length =
tracing length + 1 mm
2 $\mu\text{m}/90^\circ$ diamond

Probe tip geometry

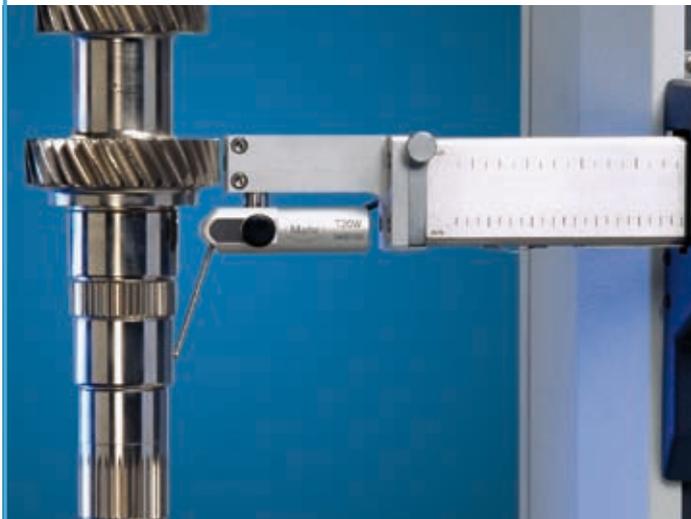
Motorized probe T7W

Technical data on pg. 16-22

Order no. 5400200

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 damping 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 $\pm 1,000 \mu\text{m}$
- 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 $2,000 \mu\text{m}$ (0.079 in)
- Zero probe working range $\pm 500 \mu\text{m}$ (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 probe signal and the filters in form testing.

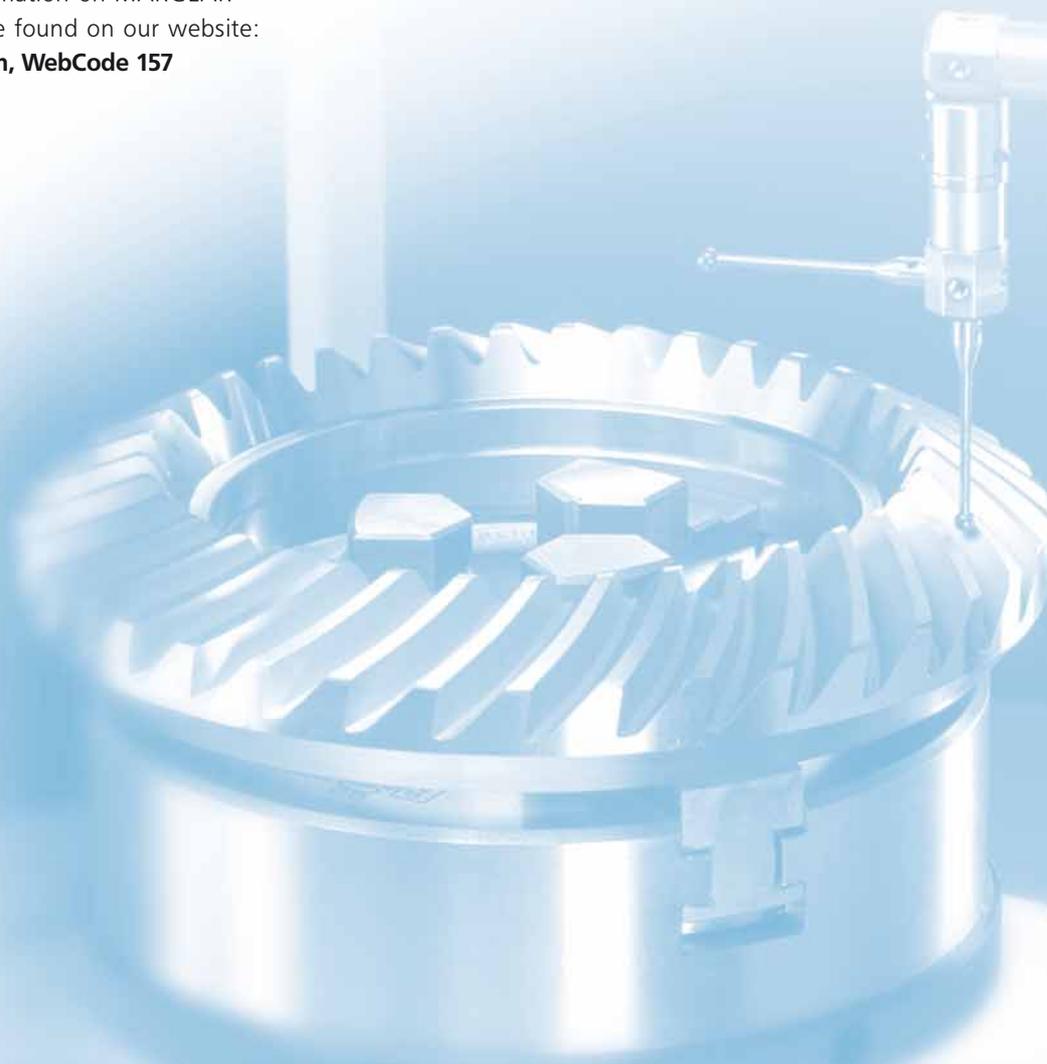


Request a brochure or see WebCode 1292.

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 157



▶ | 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, GMX 400, GMX 600

17- 3

MarGear. Industry Solutions

17- 4

MarGear. Software Solutions

MarLib, Gear CuT, Closed Loop

17- 6



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 275/400

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
- Shaving cutters
- Hobs
- Pinion-shaped cutters
- Synchronous gears
- Beveloid gears
- 3D geometry, form and positional measurements, diameters and distances

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 13582.

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
- Hobs
- Synchronous gears
- Beveloid gears
- 3D geometry
- Form measurements with centering and tilting table
- Camshafts, crankshafts & pistons *

(* optional)

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 2441.

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 15 x 15 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

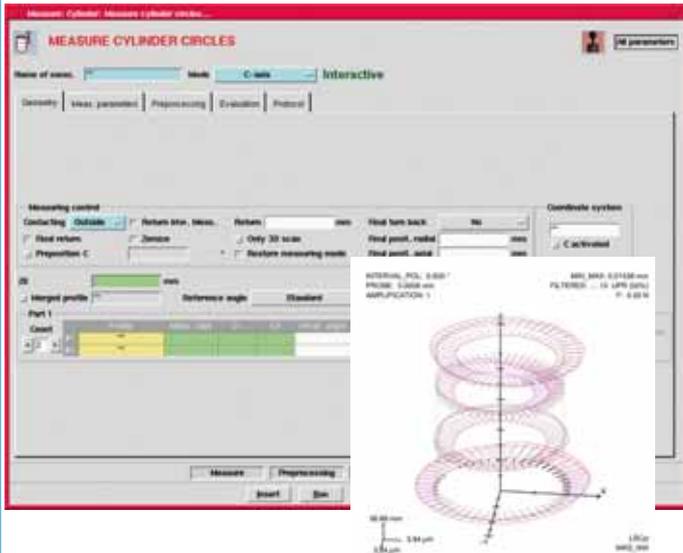


Measurement of camshafts (GMX 600 only)

- 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

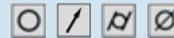


Measurement philosophy

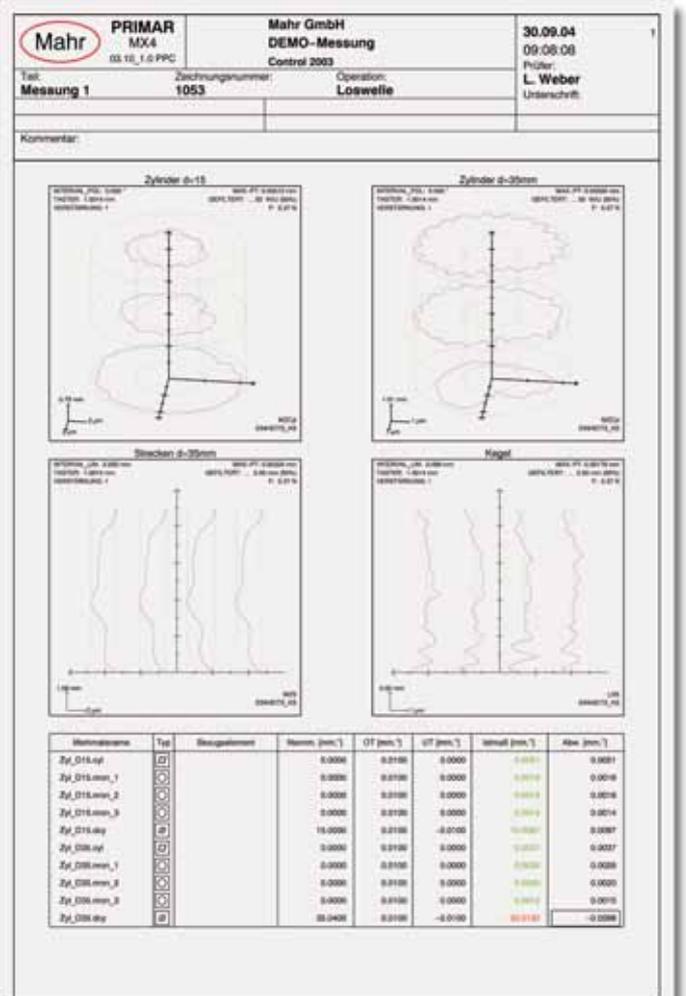
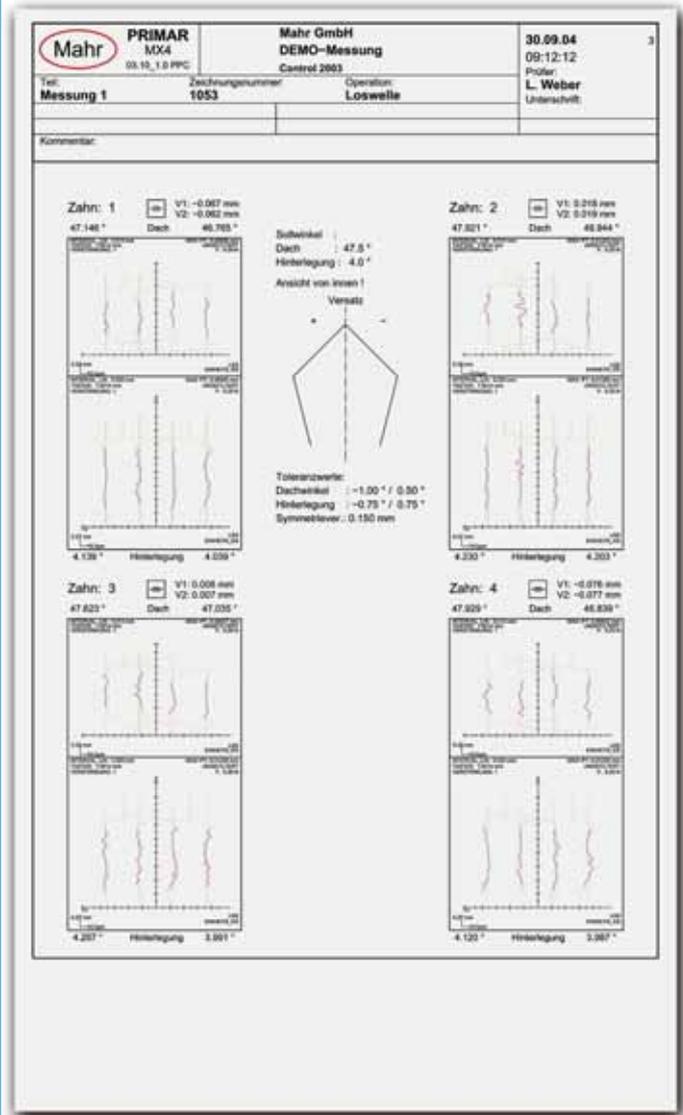
- Includes approx. 30 complex functions defined using parameter masks
- Geometry-oriented programming
- Each module is split into measurement, analysis and recording

Advantages

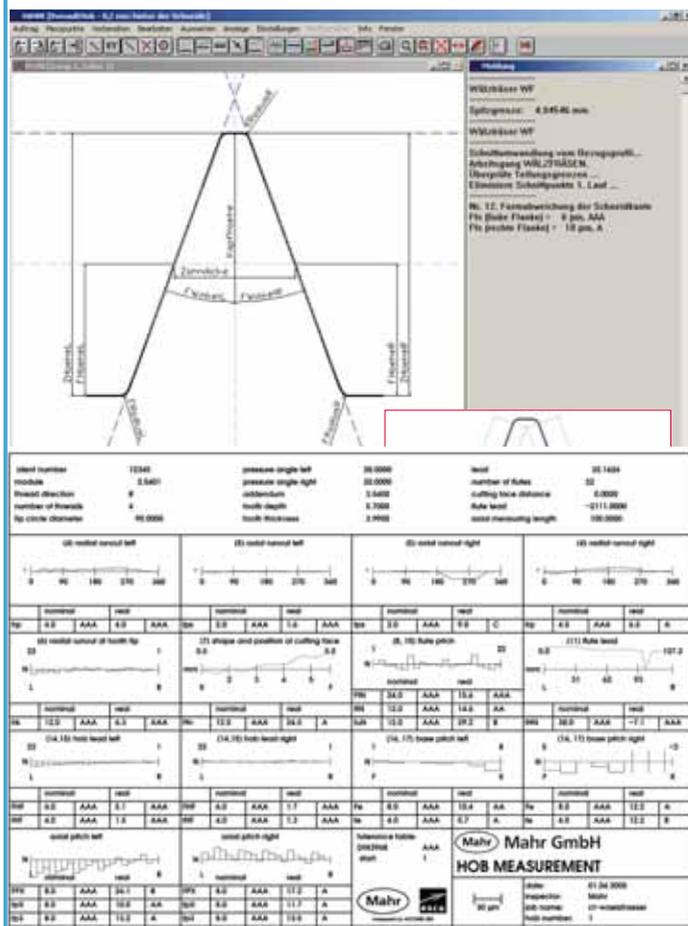
- Short, clear and structured programs
- Quick and easy programming
- **MarLib** modules can be saved as a program
- Analysis of specific parameters such as roundness, cylindricity, diameter, etc.
- Analysis of various parameters from a single geometric element



Below: Sample record for form and position analysis, taking the example of a synchronous gear and camshaft.



MarGear. Software Solutions – Gear CuT



Gear CuT – software for manufacturers of gearing tools for standard and special profiles

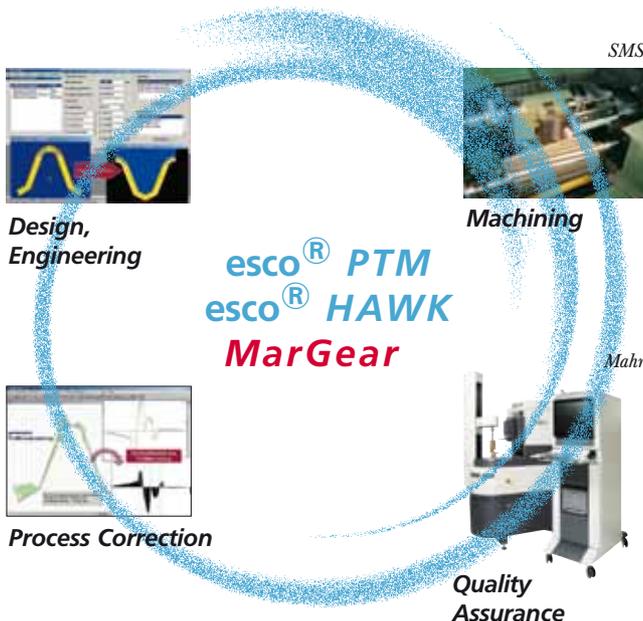
Measurement philosophy

- 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

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

THE SECOND DIMENSION IN METROLOGY OPTICAL METROLOGY FROM MAHR



The latest Information on MARVISON multisensor technology can be found on our website:
www.mahr.de, WebCode 11125

► | 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 microscopes 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 facilities and training centers also use Mahr microscopes in order to attain precise measuring results at an interesting price.

▶ | MarVision. Optical and Coordinate Measuring Machines

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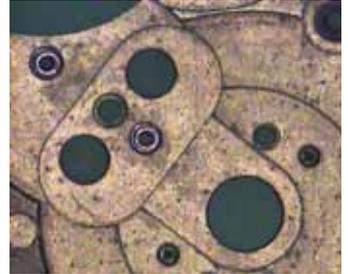
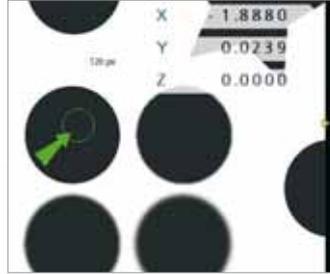
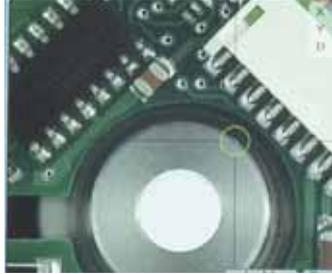
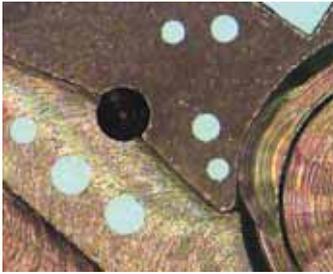


Request brochures

MarVision. Universal Microscopes for Shop Floor and Laboratory

MOBILE AND FAST QUALITY CONTROL

▶ | The product group MarVision offers you the right measuring unit for every application imaginable. Starting from the simple measuring microscope up to the high-precision optical measurement of tools. | ◀



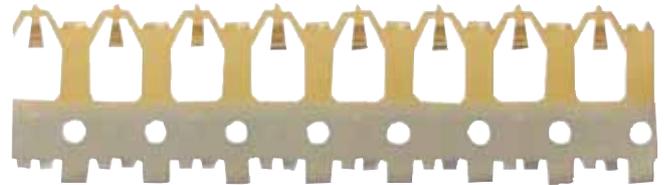
Plastics Industry



In the synthetics industry there are numerous thin-walled components that cannot be measured using tactile measuring units.

The MM 320 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



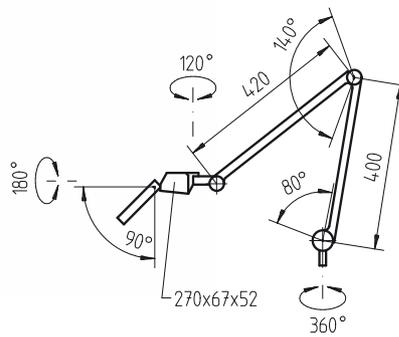
The measuring microscopes are excellently suited to test the distances of small bores and PCB tracks as well as for optical inspection. The MM 320 with QC 300 offers the possibility to take pictures for documentation purposes and to enter comments and marks on them, without having to work at a PC. An 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 units offer a high accuracy with short measuring time. The measuring microscopes from the MarVision product line are the economical solution for entry into optical metrology. The extensive selection of accessories allows the units to be used flexibly. Turned parts, for example, can thus be sharply depicted with transmitted light.

Illuminated Magnifiers MarVision 130 W*



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: Fluorescent tube and operating instructions

* Not for Sale in North America (230 Volts only)

Illuminated Magnifier 130 W with compact fluorescent tube

For inspecting flat parts and for assembly work

Attention:

Table base 130 t or Table clamp 130 kl are required!

Technical Data

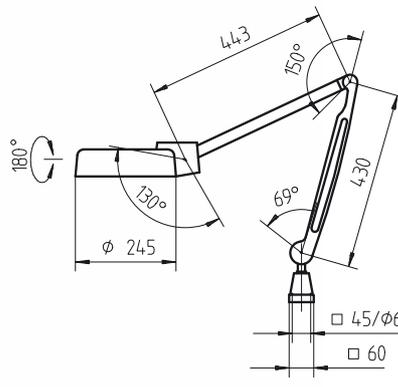
	Type of lamp	Power supply	Dioptric power	Magnification	Order no.
130 W*	Compact fluorescent tubes	230 V~ / 50 Hz	4	2	4298300

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
Compact fluorescent tube for 130 W with integrated starter	4298325



Illuminated Magnifier MarVision 130 WR*



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: Fluorescent tube and operating instructions

* 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!

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	

Digital Stereo-Zoom Microscope MarVision SM 150 / SM 160



SM 150



SM 160

Application

- For the inspection of workpieces either on the production line and in the quality assurance

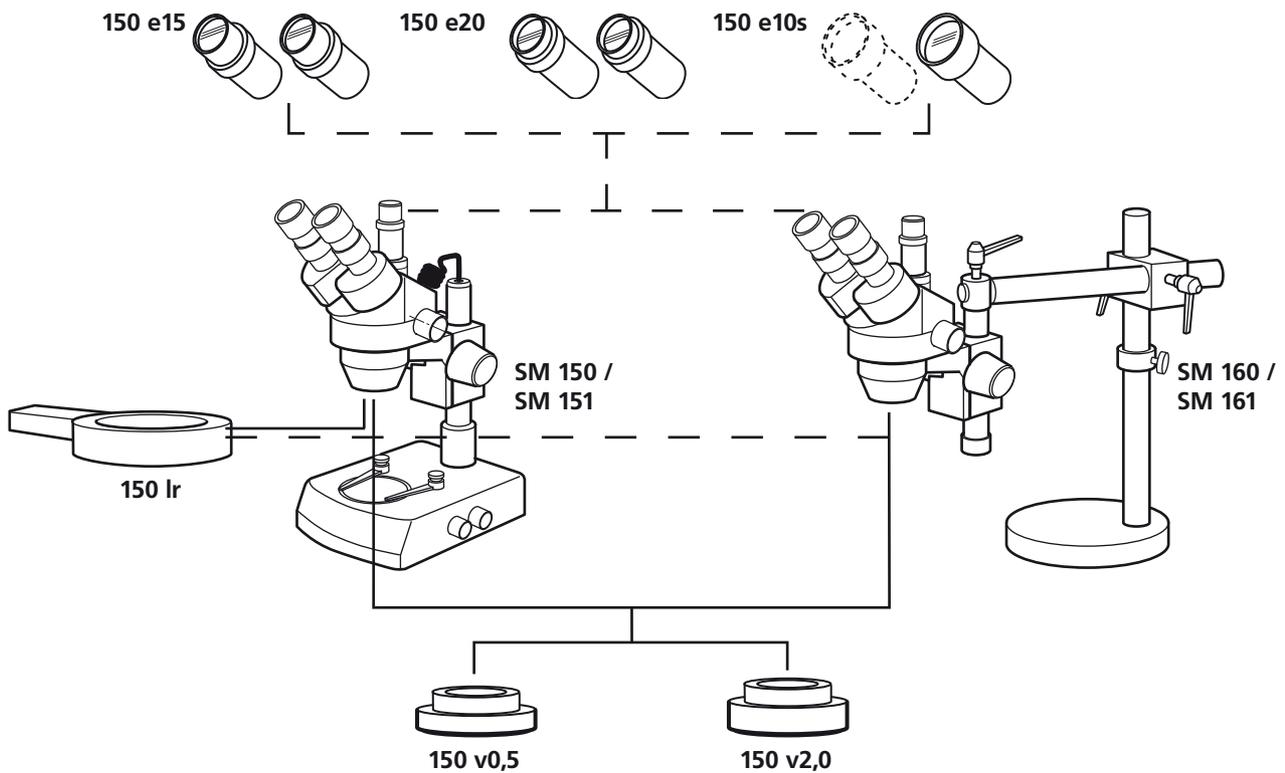
Features

- High-quality optics for light-intensive and sharp three-dimensional images
- Continuously variable magnification due to the adjustable zoom lenses
- Focusing via ergonomic hand wheel, located on both sides for left and right-handed persons
- Prism head tilted to 45° and rotatable through 360°; with the dioptic 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)

Technical Data

		SM 150	SM 151	SM 160	SM 161
Magnification				variable 7x - 45x	
Field of view	mm			28 - 5	
Observation tube angle				45°	
Optical tube		Binocular	Trinocular	Binocular	Trinocular
Camera connector			●		●
Working distance	mm			105	
Max. height of test piece	mm	75	75	—	—
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.		4245001	4245002	4245003	4245004

Accessories for MarVision SM 150 / SM 160



Illumination

	Order no.
LED ring light, adjustable D= 75 mm, incl. mains adapter	150 lr 4245030
Cold light source luminance / brightness 8 mlx, Output 30 W, Power input 50VA / 240V	200 fs 4245043
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 adapter	150 cam* 4245026

* Only for SM 151 and SM 161

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 back light, dimmable
- Robust cast stand
- Stable XY table precision mounted
- Supplied with: Microscope, ocular 10x with cross line reticules, 2 digital micrometer heads, 50 mm, 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°

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
Field of view	mm	6
Working distance	mm	70
Max. height of test piece	mm	130
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.

4246000

4246001

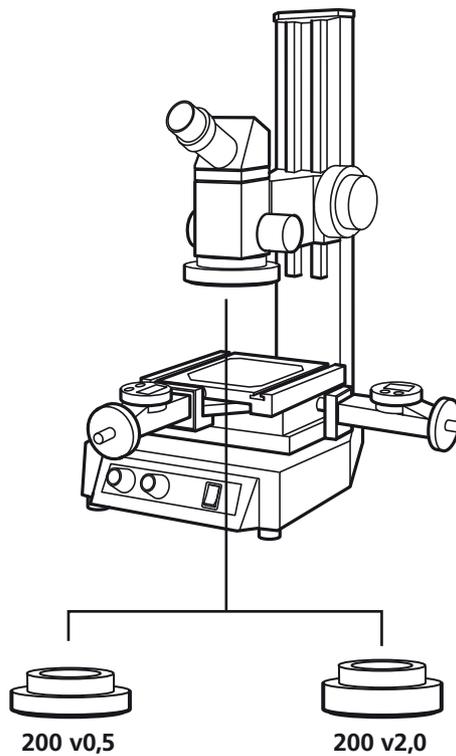
* Measuring table is centered

Optics Option

		Order no.
Ocular head, with angular measuring device, rotatable through 360°	200 w	4246010



Accessories for MarVision MM 200



Ancillary Lenses

		Order no.
Magnification 0.5x	200 v0,5	4246020
Magnification 2.0x	200 v2,0	4246021

Illumination

		Order no.
Cold light source luminance / brightness 8 mlx, Output 30 W, Power input 50VA / 240V	200 fs	4245043
Flexible fiber-optic light guide 2-Arm, L=500 mm, D=4 mm	200 fl	4245042

Dust Cover

	Order no.
Dust cover for MM 200	4246070

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	
- MPE 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	
Field of view	mm		23 - 4	
Working distance	mm		70	
Max. height of test piece	mm		130 / 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	4246100	4246101	—
	with QC 200	4246200	4246201	4246202

* Measuring table is centered

** Option extension

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 dioptic adjustment
- LED ring light, dimmable
- LED back light, dimmable
- Robust cast stand
- 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 operating and display unit QC 200
- Instruction manual
- Inspection certificate

Operating and Display Unit QC 100

- Large, high-contrast backlight graphic LCD display
- Displays for X and Y-Axis

Functions:

- 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 backlight 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 points



Operating and display unit QC 200

Optics Option

		Order no.
Ocular head , with angular measuring device, rotatable through 360°	200 w	4246010



Illumination Option

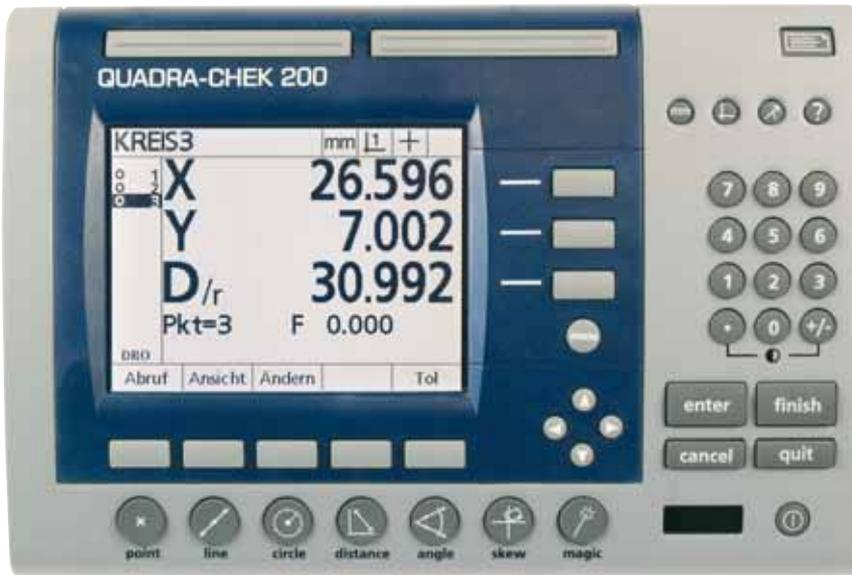
		Order no.
Telecentric LED back light illumination for measuring rotationally symmetric parts	200 ld	4247050

Z-Axis Option

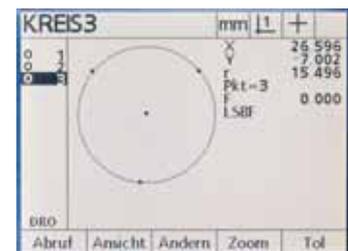
		Order no.
Z-Axis extension 200 mm	320 zv	4246051

Workshop Measuring Microscope MarVision MM 220

Operating and Display Unit QC 200



Digital display



Graphic mode

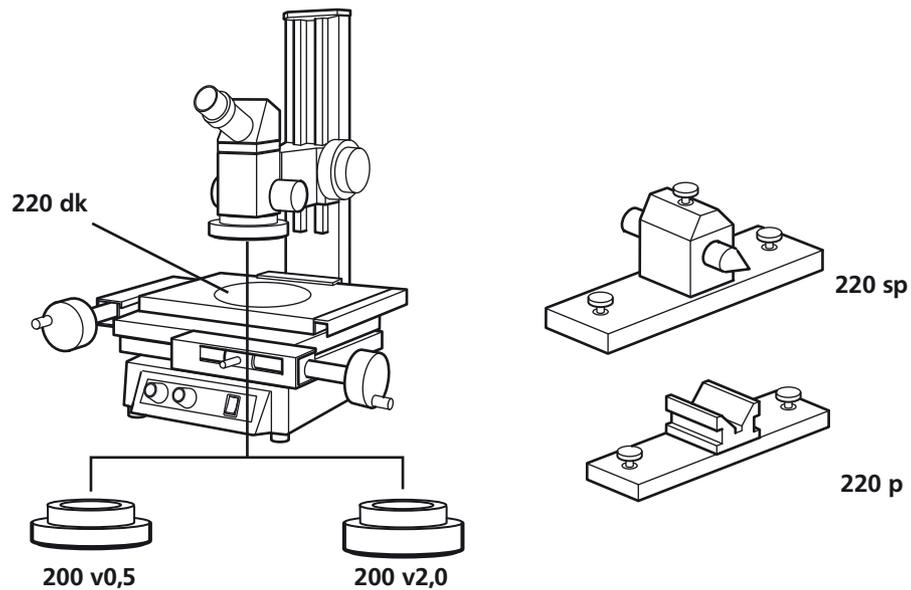
Measurement and Evaluation Functions

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

For Operating and Display Units QC 100 / QC 200

		Order no.
Foot-operated switch for capturing measuring points	200 qcs	4246111
Software OptoFace for transmitting measured data into MS-Excel	320 of	4246112

Accessories for MarVision MM 220



Ancillary Lenses

		Order no.
Magnification 0.5x	200 v0,5	4246020
Magnification 2.0x	200 v2,0	4246021

For the Measuring Tables

		Order no.
Pair of vee-blocks for diameters 5-55 mm to be mounted on the measuring table	220 p	4246801
Pair of center supports height 40 mm to be mounted on the measuring table	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

Illumination

		Order no.
Cold light source luminance / brightness 8 mlx, Output 30 W, Power input 50VA / 240V	200 fs	4245043
Flexible fiber-optic light guide 2-Arm, L=500 mm, D=4 mm	200 fl	4245042

Dust Covers

	Order no.
Dust cover for measuring ranges 100 / 100 and 200 / 100	4246071
Dust cover for measuring ranges 250 / 170	4246072

Workshop Measuring Microscope MarVision MM 320 with image processing



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 18-18			
Working distance	mm		85		
Max. height of test piece	mm		120 / 320**		90 / 290**
Illumination		LED Incident and transmitted light, individually adjustable			
Interfaces		USB / RS232			
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 (on screen)			
Order no.	Zoom 25-160x	4247200	4247201	4247202	4247203

* Measuring table is centered

** Optional extension

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

Features

Measuring Microscope

- Integrated CCD color camera
- Zoom lens
- LED ring light: 1 ring and 4 segments, each can be individually switched on/off or dimmed
- LED back light: dimmable
- Robust base made of hardened granite
- 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 assistance
- Supplied with: Microscope, standard stop bar, operating and display unit QC 300
- Instruction manual
- Inspection certificate

Operating and Display Unit QC 300

- Large, high-contrast backlight color LCD display
- 4 Display modes: real time video image, digital display, element and tolerance display
- Automatic edge detection
- Measurement and evaluation functions for points, lines, circles, angles and 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
- Lighting controls
- Operator prompts are available in several languages
- RS232 interface for processing measured data
- USB printer port
- USB-Port
- Updates can be obtained via an USB stick, thus future is secured
- Update possibility via USB-stick

Options

Optics Option

		Order no.
TV-Adapter 0.67x for zoom lenses	320 tv0,67	4247027

Optional Illumination

		Order no.
Telecentric LED back light illumination for measuring rotationally symmetric parts from zoom magnification 1.0x	200 ld	4247050
Coaxial LED top light for zoom lens	320 kaz	4245300

Z-Axis Option

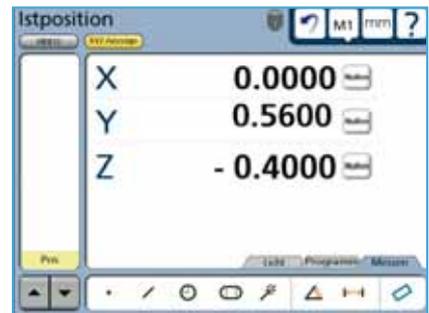
		Order no.
Z-Axis extended by 200 mm	320 zv	4246051
Z-Axis with measuring system	320 zm	4246050
Z-Axis extended by 200 mm with measuring system	320 zvm	4246052

Workshop Measuring Microscope MarVision MM 320 with image processing

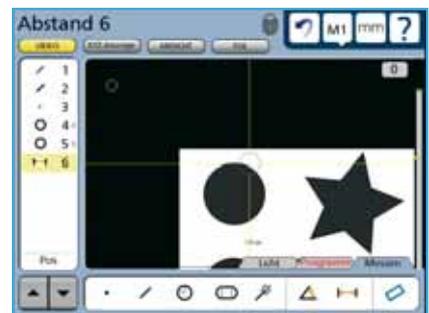
Operating and Display Unit QC 300



Operating and display unit



Positioning indicator



Video image

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

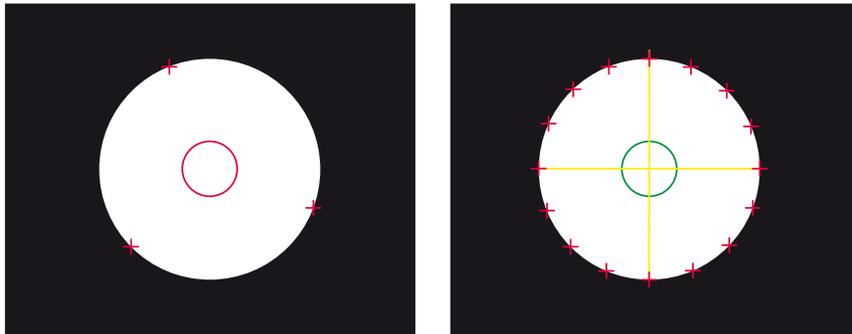
Automatic Video Edge Detection

The automatic video edge recognition simplifies the measuring procedure. If the circle in the reticule approaches an edge, this is automatically recognized by the image processing. The color of the circle changes from red to green.



Multi-edge Function

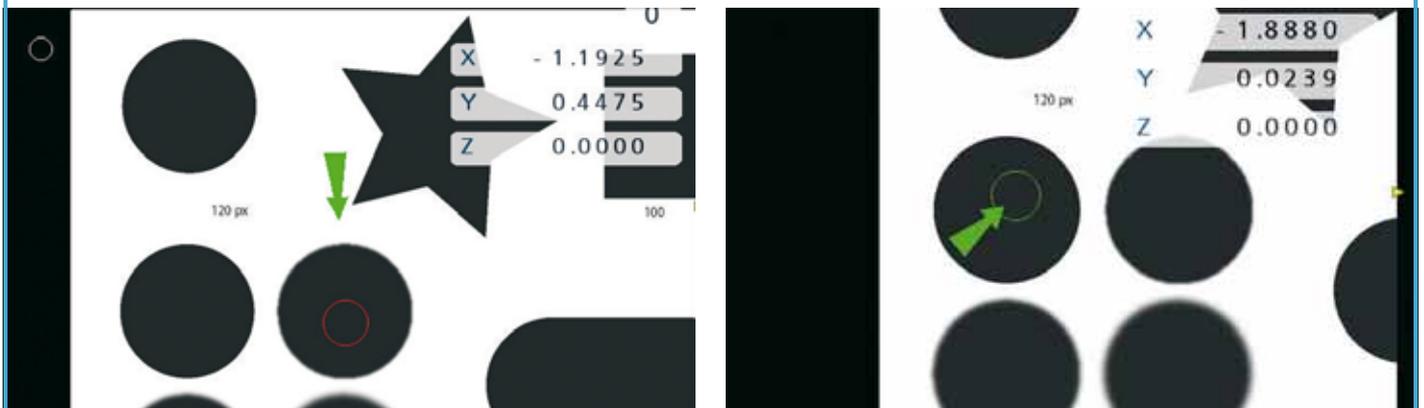
After measuring a minimum number of points (3 for circle measurement) a pre-defined number from measuring points are recognized automatically to calculate a circle.



Automatic circle calculation

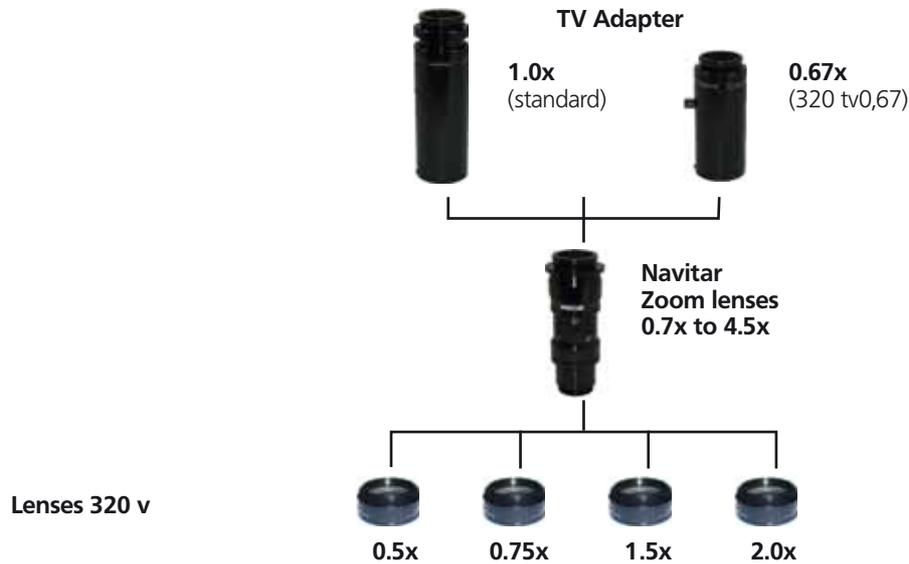
Measuring Program

- Simple creation of measuring programs with the Teach-In mode
- Smooth program sequence due to on screen graphic guidance



Workshop Measuring Microscope MarVision MM 320 with image processing

Configuration of Optics for MarVision MM 320



Ancilliary Lenses

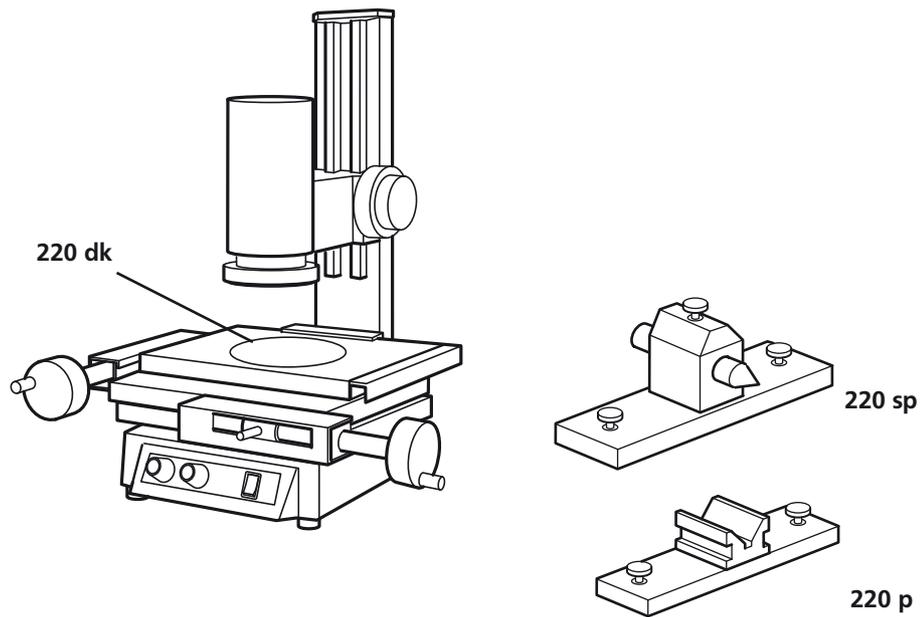
	Order no.
Magnification 0.5x	320 v0,5 4247020
Magnification 0.75x	320 v0,75 4247021
Magnification 1.5x	320 v1,5 4247022
Magnification 2.0x	320 v2,0 4247023

Zoom Lenses

TV adapter	Lenses	Zoom-Magnification					
		0.7x 👁 / ○	1.0x 👁 / ○	2.0x 👁 / ○	3.0x 👁 / ○	4.0x 👁 / ○	4.5x 👁 / ○
0.67	—	16 / 13.5	23 / 9.7	46 / 5.2	68 / 3.4	91 / 2.4	103 / 2.1
0.67	0.5	8 / 27	11 / 19.4	23 / 10.4	34 / 6.7	46 / 4.9	51 / 4.2
0.67	0.75	12 / 18	17 / 13	35 / 7	52 / 4.5	70 / 3.2	78 / 2.8
0.67	1.5	24 / 8.8	35 / 6.4	70 / 3.4	105 / 2.2	139 / 1.6	157 / 1.3
0.67	2.0	32 / 6.7	46 / 4.9	92 / 2.5	139 / 1.6	185 / 1.2	208 / 1
1.0	—	25 / 9.0	35 / 6.5	65 / 3.5	100 / 2.3	139 / 1.6	160 / 1.4
1.0	0.5	12 / 18	17 / 13	34 / 7.0	51 / 4.5	68 / 3.3	77 / 2.8
1.0	0.75	18 / 12	26 / 9	52 / 4.6	78 / 3.0	104 / 2.2	117 / 1.9
1.0	1.5	36 / 5.9	52 / 4.3	104 / 2.3	156 / 1.5	208 / 1.1	234 / 0.9
1.0	2.0	48 / 4.5	68 / 3.3	138 / 1.7	207 / 1.1	276 / 0.8	311 / 0.7

👁 Magnification on screen ○ filed of view in mm

Accessories for MarVision MM 320



For Measuring Tables

		Order no.
Pair of V-blocks for diameters 5-55 mm to be mounted on the measuring table	220 p	4246801
Pair of center supports height 40 mm to be mounted on the measuring table	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 as 90	4246821

Calibration Standards

		Order no.
Calibration standard with circles	320 nk	4246900
Calibration standard with circles incl. calibration certificate	320 nkz	4246901

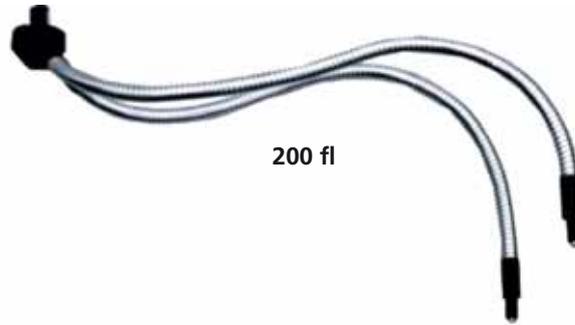
Dust Covers

		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

Accessories for Operating and Display Unit QC 300

		Order no.
Foot-operated switch for capturing measuring points	200 qcs	4246111
MarCom USB , incl. USB adapter cable and RS232 data cable	320 mcu	4246113

Cold Light Sources for MarVision Measuring Microscopes



Features

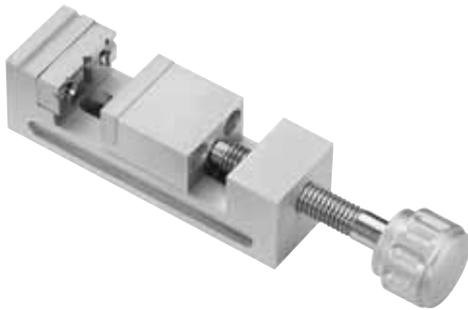
Cold light source 200 fs

- 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

	Type	For Microscope				Order no.
		SM 150 / 160	MM 200	MM 220	MM 320	
Cold light source Luminance / brightness 8 mx Output 30 W Power input 50VA / 240V	200 fs	●	●	●	●	4245043
Flexible fiber-optic light guide 2-Arm, L=500 mm, D=4 mm	200 fl	●	●	●	●	4245042

Mini Precision Vise MarTool 109 P



Features

- For clamping small parts on a measuring microscope as well as various other applications
- With a threaded spindle
- With horizontal and vertical grounded prism
- Parallelism 0.01 mm
- Angular accuracy 0.01 mm

Technical Data

Width of jaws mm	Dimensions L x W x H mm	Width of vise mm	Depth of vise mm	Order no.
15	50 x 15 x 15	14.5	6	4246810
25	75 x 25 x 25	24.5	10	4246811
35	100 x 35 x 35	34.5	14	4246812

Mini Precision Vise MarTool 109 PS as set



Features

- With 2 mini precision vises
- In additional are a pair of plastic jaws, a pair of step jaws and a pair of prism jaws with a positioning pin
- Supplied with: Plastic case

Technical Data

Width of jaws mm	Order no.
15 / 25	4246816
25 / 35	4246817
15 / 25 / 35 incl. stand and adapter plates	4246818

Stand for Mini Precision Vise MarTool 109 Pst



Features

- Can be rotated and swivelled in all directions
- Includes stop plates

Technical Data

Width of jaws mm	Order no.
15	4246813
25	4246814
35	4246815

MarVision. Tool Measurements HIGHEST PRECISION FOR YOUR CUTTING TOOLS

▶ | Maximum manufacturing and quality control precision is key to your company's success. With optical coordinate measuring machines from the MarVision product line, Mahr offers you the perfect solution to many different measurement tasks – from cutting tools and rotation-symmetrical parts for the manufacturing industry and medical technology to miniaturized electronic components. Ultra-precise measuring machines, powerful image processing algorithms, part-specific evaluation software and decades of experience in optical metrology lay the foundation for meeting your high demands. From cutting contours to complete measurements, we deliver a solution to you. The realization of tool measurement and the closed loop is a service coming from the cooperation between Mahr OKM and esco GmbH, Aachen.

Thanks to their modular design, optical coordinate measuring machines provide excellent configuration flexibility based on the many hardware and software modules and can be tailored to meet specific user requirements. The applications for this coordinate metrology range from comprehensive measurement of precision/cutting tools and rotationally symmetrical parts to diamond-tipped grinding tools. | ◀



WebCode 11718.

MarVision UNI-VIS 250

Precision measurements of complex tools and rotationally symmetrical parts using tried-and-tested system solutions.

Fully automatic measurement of:

- Shafts, pistons, jet needles, precision cylindrical components
- Grinding wheels and bright-finished bodies of revolution
- Stepped tools
- Ball-track milling cutters and ball-end milling cutters
- Cutting plates

UNI-VIS 250 AR/ARZ

$$MPE_{E1} = (1.3 + L/450) \mu\text{m}$$

$$MPE_{E2} = (1.8 + L/360) \mu\text{m}$$

UNI-VIS 250 HR/HRZ

$$MPE_{E1} = (0.7 + L/500) \mu\text{m}$$

$$MPE_{E2} = (1.1 + L/300) \mu\text{m}$$



WebCode 11136.

MarVision TM 500

The optical tool measuring machine TM 500 is used for complete measurement of standard tools.

Exact measurement

of all features on standard tools.

Tip measurement

on drills and milling cutters.

Automatic measurement

of unknown contours of cutting tools:

- Standard drills
- Standard milling cutters
- Ball-end milling cutters and ball-edge milling cutters
- Stepped tools
- Form milling cutters (option)

Length measuring deviation

$$MPE_{E1} = (2,0 + L/200) \mu\text{m}$$

$$MPE_{E2} = (2,8 + L/160) \mu\text{m}$$



WebCode.

MarVision ACCURE 250



Precision measurements of helical cutting tools thanks to setting the pivoted measuring head to the lead angle.

Fully automatic measurement of

- Hobs
- Bandsaw milling cutters
- Taps and thread milling cutters
- Grinding worms
- Stepped and form-cutting tools
- Profile grinding wheels
- Ball track milling cutters
- Ball-end milling cutters
- Standard and special tools

ACCURE 250

$$MPE_{E1} = (1.1 + L/450) \mu\text{m}$$

$$MPE_{E2} = (1.6 + L/360) \mu\text{m}$$

ACCURE 250 H

$$MPE_{E1} = (0.7 + L/500) \mu\text{m}$$

$$MPE_{E2} = (1.1 + L/300) \mu\text{m}$$



WebCode 11139.

MarVision TAURUS 650 S



Precision measurements on long, heavy rotary cutting tools.

Full integration into production environments.

Fully automatic measurement of:

- Stepped tools
- Ball-end milling cutters
- Ball-track milling cutters
- Reamers
- Pine-tree milling cutters

Length measuring deviation:

$$MPE_{E1} = (1.8 + L/200) \mu\text{m}$$

$$MPE_{E2} = (2.5 + L/100) \mu\text{m}$$



WebCode 11138-5829.

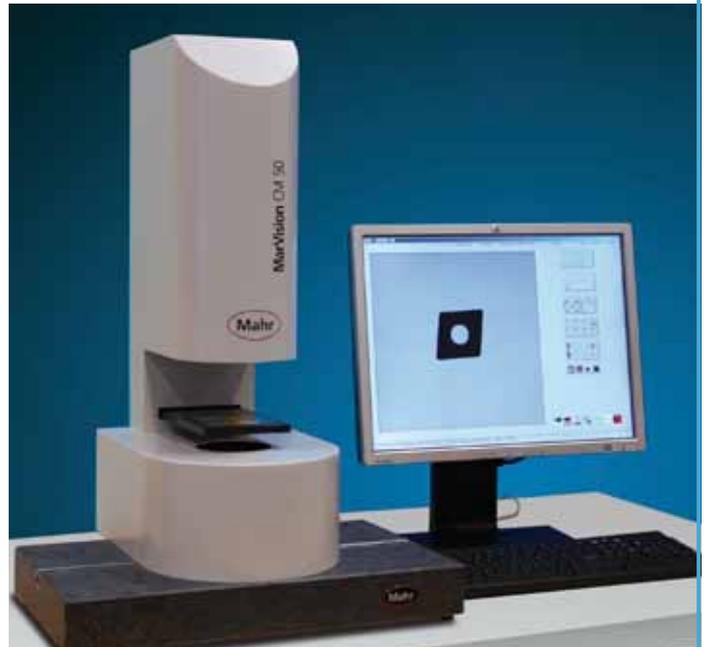
MarVision CM 50

The measuring station **MarVision CM 50** – the optimal solution for manufacturers of indexable inserts. Fast measurement of all geometrical characteristics on the outside contour of cutting plates or other 2D parts.

- Fast measurement by scanning the entire contour in the picture field
- Independent of operator due to automatic edge detection
- Constant and reproducible evaluation of small radii segments and complex composite geometries using best fit algorithms
- Direct comparison of the actual values to the nominal contour
- Clear documentation of the results with all relevant testing characteristics

Technical data:

Size of measuring field	53 mm x 45 mm
Telecentric range	± 6 mm
Work distance	77 mm
Length measuring deviation	E = 2.5 µm

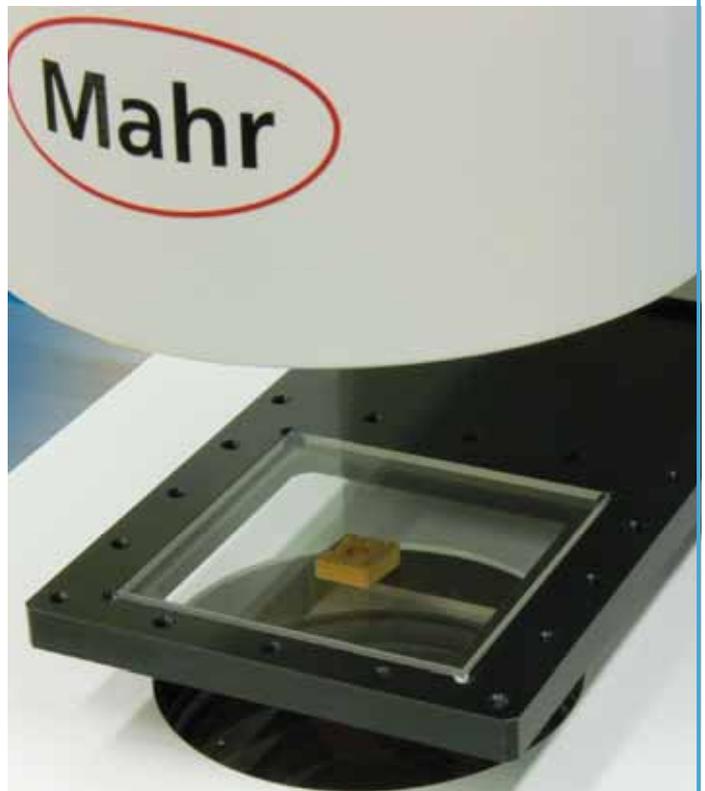


WebCode 13567.

MarVision. Branch Solutions

Measurement of indexable inserts (CM 50)

- Fast measurement of all complex 2D geometries
- Even cutting edges with different heights can be easily measured
- The high-resolution CCD camera in connection with large-scale display optics assures precise and reproducible measuring results
- Measuring field size: 53 mm x 45 mm
- Camera: 2/3" CCD camera; 5 megapixels
- Work distance: 77 mm
- Length measuring deviation: E = 2.5 µm
- Dimensions (WxDxH) in mm: 500 x 500 x 730 (dimensions without PC and monitor)



MarVision. Branch Solutions



Measurement of hobs (only ACCURE 250)

- Comprehensive hob measurement for standard and special profiles
- Maximum tool weights up to 15 kg
- Diameters up to 200 mm
- Lead angle $\pm 15^\circ$
- Free contour scanning up to a measuring point density of $1 \mu\text{m}$
- Measurements and analysis conforming to DIN 3968
 - profile form, pitch, base pitch, radial run-out of tip, form and position of cutting faces, radial run-out (optical measurements)
 - flute direction, flute pitch, axial run-out, cutting edges (tactile measurements)



Measurement of taps (ACCURE 250 only)

- Comprehensive measurement of right-hand and left-hand cutting taps
- Diameters from 1.4 mm to 70 mm
- Lead angle $\pm 15^\circ$
- Free contour scanning up to a measuring point density of $1 \mu\text{m}$
- Axial section profile including starting taper, calculation of outer and core diameters, half-angle of thread, lead, taper and other dimensions are measured in transmitted light
- Rake angle, flute pitch and web diameter are measured in incident light



Measurement of ball-track milling cutters (UNI-VIS 250 / TAURUS)

- Comprehensive measurement of ball-track milling cutters in axial and axis-parallel sections
- Automatic tool wobble correction
- Free contour scanning up to a measuring point density of $1 \mu\text{m}$
- Diameters up to 150 mm
- Import of CAD data for programming the measuring machine
- Optical measurements of profile forms, lengths, angles, radii, rake angles, relief angles and radial run-out

MarVision. Branch Solutions

Measurement of cutting plates (UNI-VIS 250 / TAURUS)

- Comprehensive measurement of the cutting edge contour
- Free contour scanning up to a measuring point density of $1\ \mu\text{m}$
- Import of CAD data for programming the measuring machine
- Automatic contour scanning in X, Y and Z according to CAD data
- Optical measurements of profile forms, lengths, radii, angles and rake angles



Measurement of stepped tools (TAURUS 650s)

- Comprehensive measurement of the cutting edge contour
- Optical measurement of profile form, lengths, radii and angles
- Optional: Optical or tactile measurement of rake angles and relief angles
- Pneumatic chucks



Measurement of PCD milling tools (TAURUS 650s)

- Comprehensive measurement of the cutting edge contour
- Optical measurement of profile form, lengths, radii and angles
- Optional: Optical or tactile measurement of rake angles and relief angles
- Tactile measurement of bit seat
- Determination of overall geometry resulting from individual cutting edges
- Pneumatic chucks
- Cutting edge parameterization for flat tool bits (inserts)
- Measurement of cutting edge run-out



MarVision. Branch Solutions



Measurement of ball-end milling cutters (UNI-VIS 250 / TAURUS)

- Comprehensive axial-section measurement of ball-end milling cutters
- Analysis in freely selectable angular divisions of the nominal or actual circle
- Automatic tool wobble correction
- Free contour scanning up to a measuring point density of $1 \mu\text{m}$
- Optical measurement of profile forms, position errors relative to the nominal profile, position errors relative to the shaft, radial run-out, rake angles and relief angles



Measurement of rotationally symmetrical parts (UNI-VIS 250 / TAURUS)

- Comprehensive axial-section measurement of rotationally symmetrical parts in freely selectable angle positions
- Automatic tool wobble correction
- Free contour scanning up to a measuring point density of $1 \mu\text{m}$
- High repeatability for small radii and angles thanks to intelligent correlation of measuring points with the nominal contour
- Import of CAD data for programming the measuring machine
- Optical measurement of profile forms, axial and radial lengths and distances, radii, angles and diameters

MarVision. Branch Solutions

Measurement of standard drills, step drills, (only TM 500)

Contour measurement:

- Selection of tool holders
- Measurement with Dynamic Contour Scan (DCS)
- Automatic dimensioning of contour (diameters, radii, distances, angles)
- Evaluation of individual edges or overlapping edges (active contour)
- Evaluation of the flute (pitch angle, division)
- Measurement and evaluation of rake angles and relief angles
- Dimension record with nominal and actual values
- Graphic evaluation of the edge profile

Tip measurement:

- Selection of the cuts (e.g envelope of cone cut, surface cut)
- Definition of reference
- Adjusting the measuring window
- Evaluation of the tip parameters
- Measurement of rake angles and relief angles
- Width of land
- Chisel edge angle
- Fully automatic tip measurement for repeatability measurements



Measurement of standard end mill cutters (only TM 500)

Contour measurement:

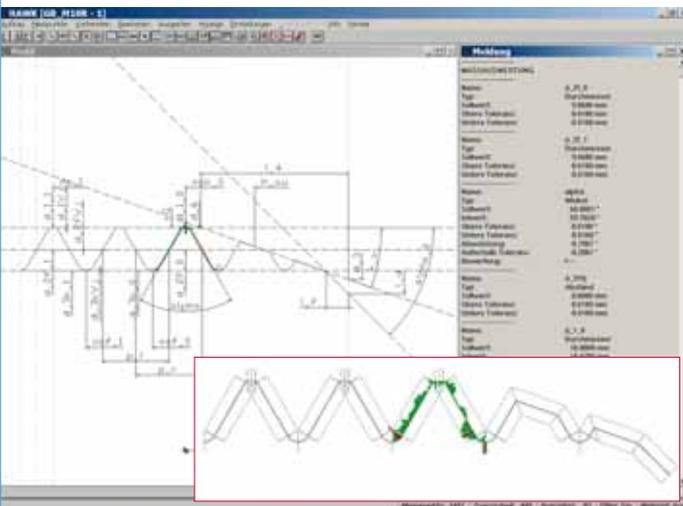
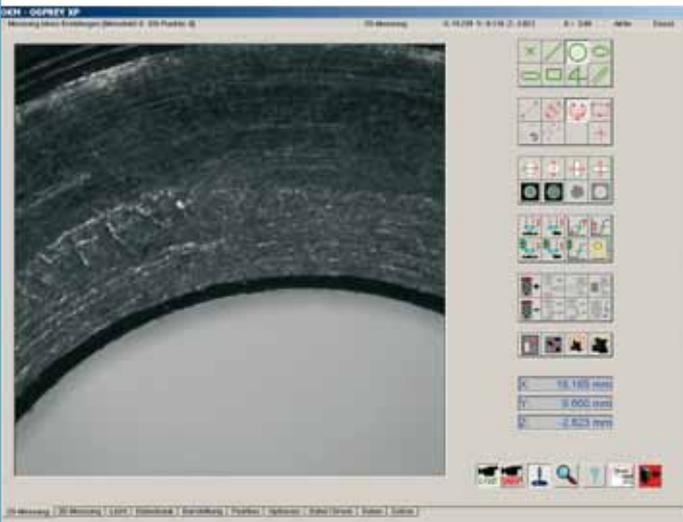
- Selection of tool holders
- Measurement with Dynamic Contour Scan (DCS)
- Automatic dimensioning of contour (diameters, radii, distances, angles)
- Evaluation of individual edges or overlapping edges (active contour)
- Evaluation of the flute (pitch angle, division)
- Measurement and evaluation of rake angles and relief angles
- Dimension record with nominal and actual values
- Graphic evaluation of the edge profile

Tip measurements:

- Selection of the cuts (e.g envelope of cone cut, drill cut)
- Definition of reference
- Adjusting the measuring window
- Evaluation of the tip parameters
- Measurement of rake angles and relief angles
- Width of land
- Chisel edge angle
- Fully automatic tip measurement for repeatability measurements



MarVision. Software Solutions



OSPREY Measurement Software

- Very simple operation thanks to a clearly structured user interface
- Single-monitor solution
- Very simple creation of CNC programs
- Separate settings for illumination, edge criteria, focus, measurement and data analysis functions
- Image processing – gray level analysis using a subpixel technique
- Open communication platform between optical coordinate measuring machines and data analysis modules such as **HAWK**

HAWK Programming, Data Analysis and Documentation Tool

Measurement philosophy

- Complete optical contour scanning
- Actual contour assigned to nominal contour
- Measured points assigned to geometric elements using adjustable best-fit ranges
- High repeatability even with small angular and radius segments
- Data import formats: DXF, ASCII, IGES
- Data export formats: ASCII (CSV), qs-STAT

Advantages

- Very simple program creation by setting dimensions at the nominal contour
- Customized parameter programs for the automatic creation of measuring jobs
- Offline programming of measuring jobs at separate workstations
- Full functionality for the system owner – „single-button“ control for staff

MarVision. Software solutions – Closed Loop

Precision Tool Grinding

Philosophy

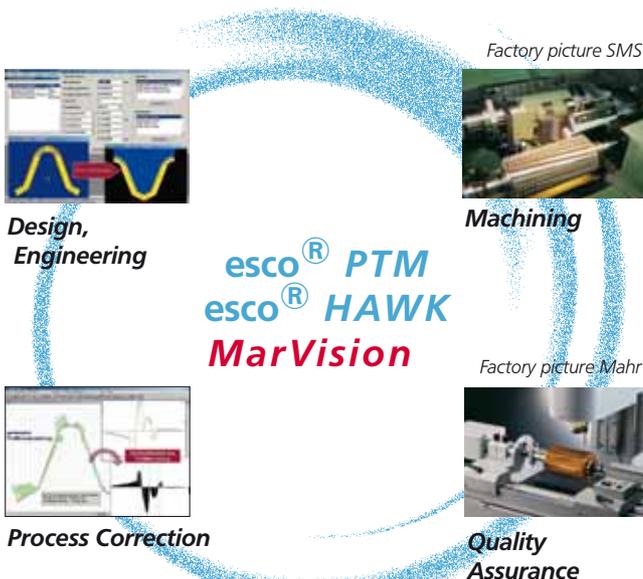
- Influencing the manufacturing process
- Measuring machine becomes part of production

Principle

- Production data available for input via CAx interfaces
- Measurement programs created automatically control the measuring machine, and the scanned geometries are directly available in HAWK 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

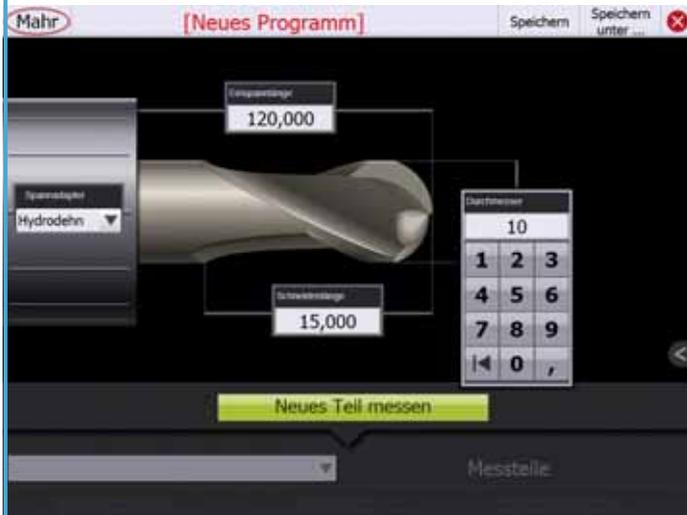
Advantages

- Time saving of up to 80%
- Higher manufacturing accuracies
- Operator influence is minimized



MarVision. Software Solutions

PROTOS - Measuring without Programming

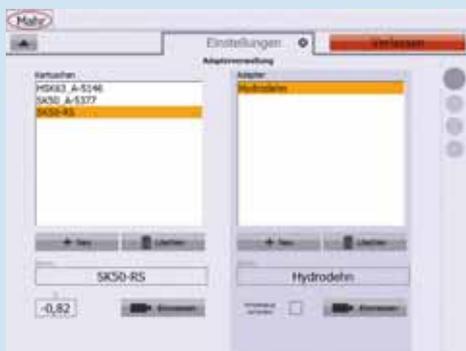


Easy operation

- Absolutely no programming knowledge required
 - Graphic surface with a clear structure
 - Intuitive operation via icons
 - Easier call-up of functions on the touchscreen
- Measurement of standard tools without drawing data, no calibration of a coordinate system required!
- Management of different adapters with zero point
 - > **Simply clamp and start the measurement!**

Dynamic measurements

- Complete measurement of a standard tool in less than a minute
 - Newest camera technology with very high picture frequency
 - Optical dynamic scan of the edge
- PROTOS recognizes the course of the edge and follows it independently
- Recognition of different edge contours
- Highest information density due to low measuring point distance
- PROTOS independently recognizes the end of the contour
- Edge evaluation takes place simultaneously along with the dynamic measurement
 - > **You save measuring time**



Adapter management

Complete evaluation

- Sum evaluation (over all edges)
- NEW! Single evaluation of the edges can be conducted for a dynamic measurement, independent of the number of edges.
- NEW! PROTOS automatically generates the tool geometries from the measuring points; nominal geometries that can be parameterized are derived.
- Automatic dimensioning for standard tools (diameters, radii, angles, distances)
- Additional dimensioning simply via mouse click
- Free tolerance entry
- Graphic evaluation with range of tolerances (profile form deviation)
- Measurement evaluation with drawing (measuring record)
- Possible to transfer correction values to the grinding machine as a path correction --> **closed loop**

Fast change - inserts

• Clamping adapter

PROTOS offers an integrated zero point management for your adapters. In addition to the zero points in X (length), angle offset values can also be managed. Once the adapter has been connected, it can be quickly called up from a selection list.

• Wobble correction

PROTOS offers an integrated wobble correction for one-sidedly clamped tools. Three possibilities are provided:

- Automatic: PROTOS can calculate the position of the tool shaft using the specifications of the clamping length, edge length and adapter and moves independently to the positions to measure wobble.
- Manual: The operator uses the joystick to the positions at which the wobble should be measured.
- Coordinates: The operator can enter the corresponding coordinate values with reference to the selected adapter into a template. PROTOS measures the wobble at these points.

FAST AND PRECISE MEASUREMENT OF YOUR TOOLS.

MarPreset. Tool Presetters



For current information on MARPRESET tool presetters, please visit our website: www.mahr.de, WebCode 12548

▶ | At Mahr, the expression „Measurably Better“ is not just a slogan. It is a sign of our dedication. Our philosophy is to deliver „measurably better“ products, support and service to our customers, guaranteeing you that you can comply with all of your quality, cost and delivery commitments. MarPreset systems can increase efficiency and help you to persist as a successful competitor on the market – today and in the future. Excellent services in design, engineering and production enable the manufacture of the most precise and reliable tool presetters in the world.

▶ | MarPreset. Tool Presetters

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MarPreset. Increase Your Efficiency.

► | You are wasting valuable time if you are using your processing centers to preset your tools. The arguments for Mahr tool presetters are convincing: You measure your tools faster and more precisely than expensive processing centers do, since they were developed only for this purpose. Regardless of whether you are setting drilling tools, measuring chamfers, testing tools for damage or wear – MarPreset tool presetters carry out these tasks better and faster than your processing center does. This avoids unnecessary idle time and you increase your productivity and profitability. | ◀



MarPreset 1500

Description

The **MarPreset 1500** is the most robust and reliable unit of its class. It is designed for use on the shop floor and offers presetting, inspection and tool management with excellent reproducibility under almost all conditions.

The consistently symmetrical construction of the cast-iron basic body minimizes environmental influences through temperature and mechanical strain.

The ergonomic fast positioning system with practically frictionless travel allows for fast and easy operation. The measuring range and equipment of the **MarPreset 1500** can be configured for almost all workshop tools.

Technical Data

Measuring range

- Tool diameters: 320 mm, 420 mm
- Length 400 mm, 500 mm, 600 mm
- Extra 50 mm to the right of the spindle for turning tools

Positioning

- Ergonomic quick positioning due to frictionless travel path and smooth movement
- Fine adjustment/axis brake system

Linear encoders

- Heidenhain precision linear encoders for both axes
- Resolution 0.0005 mm

Base

- Cast iron
- Alignment elements and vibration damping ensure stability

Horizontal and vertical guides

- Precision basis and column made of cast iron with hardened and polished guides
- Pre-spanned linear precision bearings ensure accuracy
- Bellows protect bearings and guides from environmental influences

Spindle

- ISO 50 or 40 taper for SK, CAT, BT, NMTB as well as Big Plus tools
- Adapter for most clamping systems
- Customized spindles and adapters are available
- Option: HSK and Capto with mechanical clamping

Dimensions and weight

- Width: 748 mm (30")
- Depth: 527 mm (21")
- Height: 890 mm (35") with 400 mm Z-travel
1.115 mm (44") with 600 mm Z-travel
- Average shipping weight 234 kg

Accurate. Robust. Great value



Connections

- Electrical supply: 110 V 60 Hz to 220 V 50 Hz
- Compressed air: Normal compressed air in the workshop 4.5 to 6.2 bar (60 to 90 PSI), only for the options vacuum-clamping or axis brake.

Features

• Tool management and communication

ParleVision PGC PLUS offers comprehensive tool management and enables communication.

• Integration of tool shrink

The 1500 platform is the perfect component for an integrated tool shrink system.

• Turning tools

MarPreset 1500 is perfectly suited for turning tools. The combination of the travel path over the center of the spindle with a configured digital display makes the MarPreset presetters the most economic setting methods for turning tools.



MarPreset 1800

High-performance. Easy. Complete.



Description

The tool presetter **MarPreset 1800** offers the complete solution for tool measurement and inspection.

The most modern camera technology combined with a solid construction and the easiest operation make **MarPreset 1800** one of the leading products of its class.

Features

High-performance

- Solid cast iron construction of base and column
- Consistently symmetrical construction prevents deformation through temperature fluctuations
- Precision spindle with roller bearing, vacuum clamping and locking
- LED ring light for inspection of edge surfaces

Easy

- Clear user interface - clear icons
- One-button operation
- 17" touchscreen monitor for large and clear display of the camera image
- Operator training in 20 minutes

Complete

- Included in the basic unit:
 - Storage shelf for tools and adapter
 - Robust base frame with vibration dampers and fold-out wheels
 - Precision adjustment of X and Z axis
 - Label printer
 - 17" touchscreen monitor
 - Diameter up to 420 mm
- Complete functionality - one price!



Tool adapter for all tool holders



MarPreset 1800 - Shrink Set

Tool Presetting and Measurement with Integrated Induction Warmth Shrink System



Features

Complete system solution

- MarPreset 1800 with all measuring and evaluation functions of the PGC Plus Software
- Integrated holder for cooling liquid
- Integrated drain to dry tools
- Tool holder
- Label printer

Shrink system

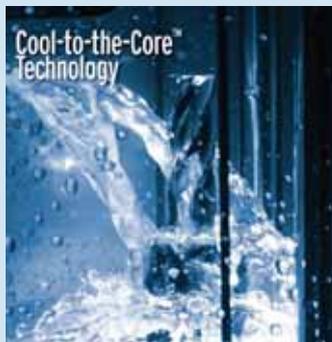
- Reliable and easy operation
- Fully automatic procedure
- Diameter from 4 to 32 mm
- Optional: Diameter from 32 to 50 mm

Operation

- Operation via large LCD touchscreen
- Shrink process is started with one click
- Shrink factor compensation

Cool-to-the-Core technology

- No need to touch hot tools – the entire spindle and tool are cooled
- Tools are completely cooled off and dried in two minutes
- Tools can be used again directly after shrinking



Technical Data

Measuring range

- Diameter: 420 mm
- Extra 50 mm to the right of the spindle for turning tools
- Length: 600 mm

Positioning

- Ergonomic quick positioning
- Fine adjustment

Linear encoder

- Heidenhain precision linear encoders for both axes
- Resolution 0.0005 mm

Basis

- Cast iron base and column
- Alignment element and vibration damping ensure stability
- Integrated lower base frame with fold-out wheels for mobility
- Lockable closet for storing tools and accessories
- Monitor holder

Horizontal and vertical guides

- Precision basis and column with hardened and polished guides
- Pre-spanned linear precision bearings
- Bellows protect bearings and guides from environmental influences

Dimension W x D x H (in mm)

- 1,552 x 700 x 1,947 (z = 400 mm)
- 1,552 x 700 x 2,150 (z = 500 / 600 mm)

Connections

- Electrical supply: 110 to 230 VAC
- Compressed air: 6 bar

Spindle

- Precision spindle, roller bearings
- SK 50 (standard), SK 40, HSK 63, Capto C5
- Adapter available for all clamping systems

Options

- Software PGC Plus for data coupling, tool management and extended measuring functions
- Tool length setting
- RFID chip reading and writing head



MarPreset 2500

Highly Precise Measuring Platform



Description

The mechanical design of the **MarPreset 2500** offers an excellent foundation for exact and reproducible results of measurements and presetting of tools.

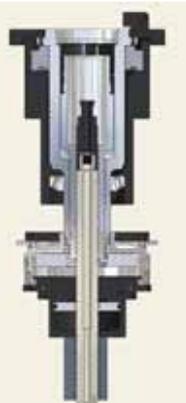
Especially for precision demands in the μm range for manual or automatic measurements, MarPreset is flexible and easy to implement.

The maximal measuring ranges of 950 mm x 1,000 mm and the consistently symmetrical design of the completely cast iron base body create the basis for the highest performance in measuring and inspection.

MarPreset presetting tools are well known to be robust, reliable and have a long life.

Spindle

- ISO 50 or 40 taper for SK, CAT, BT, NMTB as well as Big Plus tools. Adapters for most clamping systems
- The precision spindle for fast changing systems is optional. Inserts are available for all common tool supports with vacuum clamping or mechanical clamping



Features

The **MarPreset 2500** can be equipped with a precision spindle changing system.

This enables a fast change of the inserts, highest run-out accuracy and an automatic clamping for the most various clamping systems.

Technical Data

Measuring range

- Tool diameters: 300 mm, 400 mm, 500 mm
Upon request: 600 mm, 700 mm, 800 mm, 950 mm
- Tool lengths: 450 mm, 550 mm, 650 mm, 750 mm, 850 mm, 1,000 mm
- Extra 50 mm to the right of the spindle for turning tools

Positioning

- Axis movement for X and Y via joystick (2 speeds)
- Manual fine adjustment
- Swivel axis can be either manually or CNC controlled

Linear encoder

- Heidenhain precision linear encoders for both axes
- Resolution 0.001 mm

Base

- Cast iron base and column
- Alignment element and vibration damping ensure stability

Horizontal and vertical guides

- Precision base and column made of cast iron with hardened and polished guides
- Pre-spanned linear precision bearings ensure accuracy
- Bellows protect bearings and guides from environmental influences

Dimensions and weight

- Total width: 1.838 mm (72.4")
- Depth 701 mm (27.6")
- Height: 1.948 mm (76.7") for 450 to 650 mm stand, 2.342 mm (93.2") for 750 to 1,000 mm stand
- Average shipping weight 1,000 kg



The Suitable Configuration for Your Application

1500 Platform Series



Tool diameters up to 420 mm
Tool lengths up to 600 mm



Parlevision PSC



- For applications requiring precision measurements and tool inspections



Parlevision PGC PLUS



- For applications requiring comprehensive tool data management and communication

- Expandable measuring range
- Software upgrades
- Record editor
- Tool supports

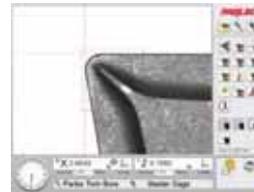
2500 Platform Series



Tool diameters up to 500 mm (900 mm)
Tool lengths up to 1,000 mm



Parlevision PSC



- For applications requiring precision measurements and tool inspections



Parlevision PGC PLUS



- For applications requiring comprehensive tool data management and communication



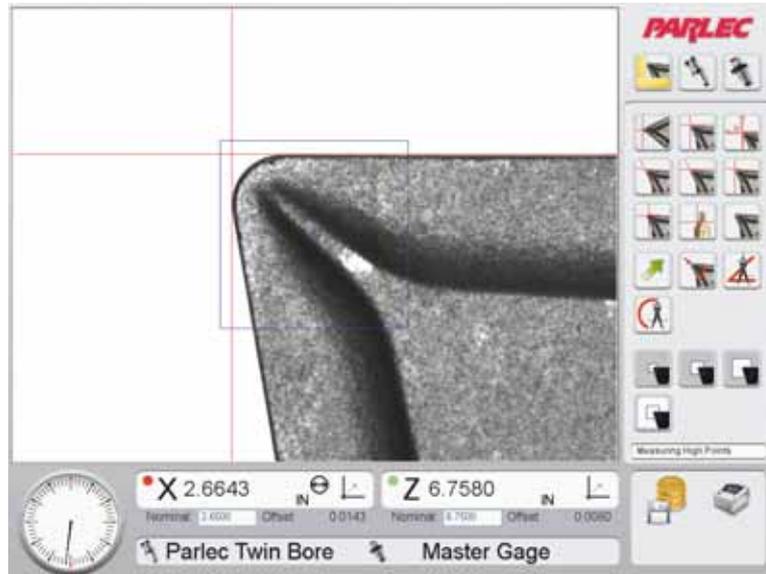
Parlevision CNC



- To fulfill the demands of 3-axis automation during measuring and inspection procedures.

MarPreset Software PSC

Measuring and Inspection System



Description

The PSC system offers you the most modern video metrology at a favorable price.

The ParleVision camera system uses a high-resolution camera. The images are displayed on a TFT monitor, optionally available as a touchscreen. The tool edge is automatically recognized in real time as soon as it enters into the camera's image field.

All functions can quickly be called up via icons; no previous programming knowledge is required.

20 minutes of instruction suffice to train your employees.

Features

- All measuring functions and connections are conducted via clear icons on the monitor; no previous programming knowledge is necessary.
- Resolution for X and Z axes 0.001 mm
- Tolerance display red/green for fast evaluation
- Possibility to connect label printer to print various types of label formats
- Display options
 - radius / diameter
 - millimeter / inch
 - relative / absolute measurement
- Easy camera calibration by the user
- Touchscreen compatible

Image processing

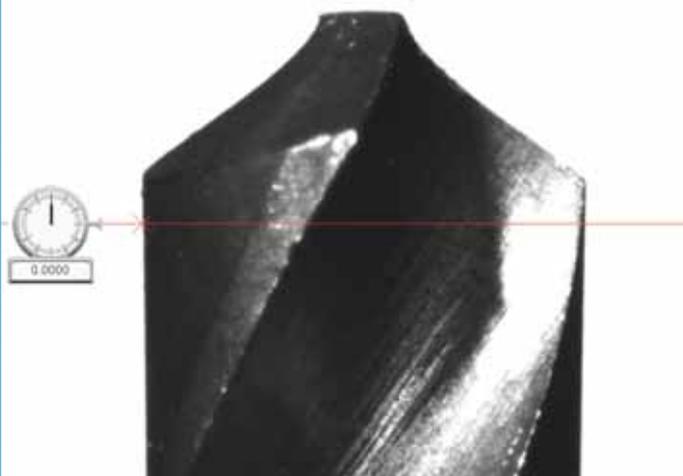
- Video camera with Smart Camera technology, camera chip with modern 1/2" CMOS chip
- High-resolution picture processing
- LED ring light with adjustable intensity for surface inspection of the tool edge (wear, nicks)

Measurement

- High-performance software algorithms ensure high accuracy and reproducibility, regardless which side of the image area the tool edge is located on
- Automatic edge detection in the live picture in real time

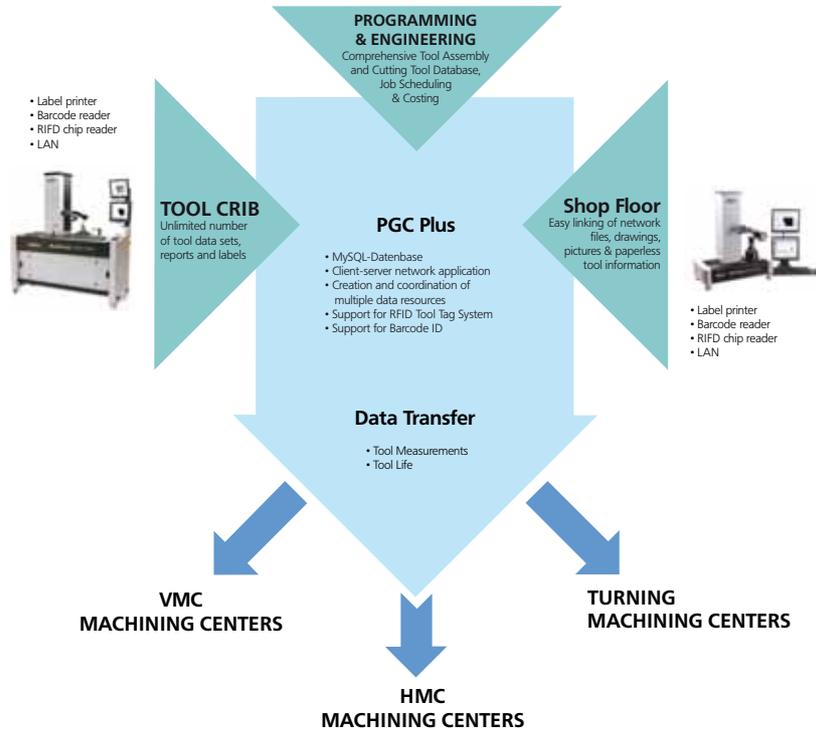
Simple management of tools and adapters

- Save a max. of 500 tools with nominal values (length, diameter) and tolerances
- Save a max. of 99 adapters with zero point management
- Possibility to connect label printer



MarPreset Software PGC Plus

Tool Management and Data Connection



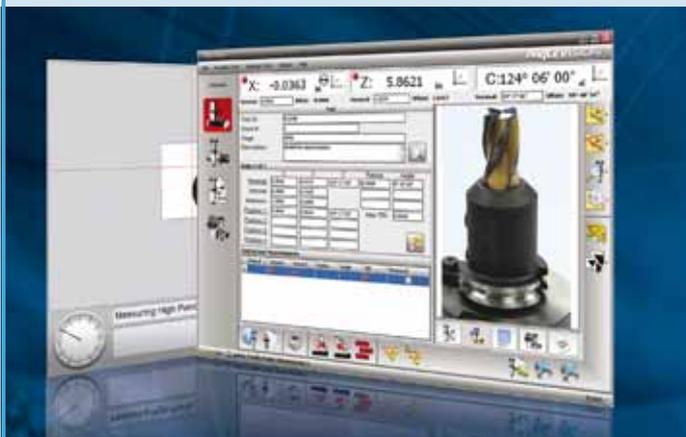
Description

For high demands on reproducibility, tool management and data transfer

As easy as a single system but as powerful as a networked solution for many users.

Complete your production network with PGC Plus to attain comprehensive tool management and communication functions.

This user-friendly Plug & Play solution can be run as a single application on the tool presetter or as a client-server network installation.



Features

All features and functions of the PSC software as well as:

- PGC Plus tool management and data communication software on one PC
- Operating system Windows XP
- Network-compatible
- User management
- Measuring record

Image processing

- Video camera with Smart Camera Technology, camera chip with modern 1/2" CMOS chip
- High-resolution picture processing
- LED ring light with adjustable intensity for surface inspection of the tool edge (wear, nicks)

Measurement

- High-performance software algorithms ensure high accuracy and reproducibility, regardless which side of the image area the tool edge is located on
- Automatic edge detection in live picture in real time



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 11935

▶ | 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 **20- 2**

MarShaft MAN **20- 3**
Manual Tactile Shaft Measuring Machine

MarShaft SCOPE **20- 3**
Optical Shaft Measuring Machine

MarShaft CNC **20- 4**
Automatic Tactile Shaft Measuring Center

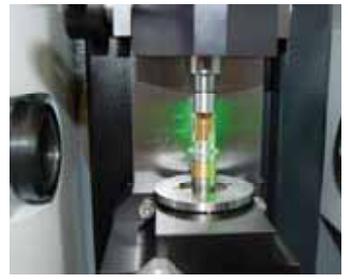
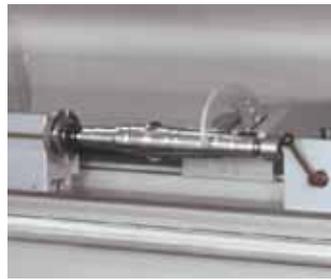
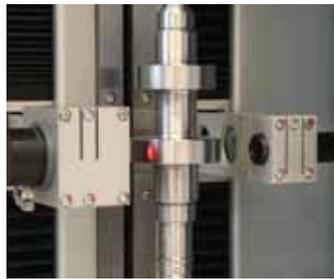
MarShaft Data Overview **20- 5**



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 12098.

MarShaft SCOPE

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 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 12106.

MarShaft CNC

Automatic shaft measuring system



Request brochure or see WebCode 12107.

Description

The flexible **MarShaft CNC** shaft measuring system automatically inspects shaft-shaped parts with maximum precision during production.

- Automatic measuring process
- Maximum flexibility as virtually no changeover time required
- Simple operation

Features

- No operator influence on the measuring results
- Short measuring times
- Ideal for use on the shop floor

Application

Measurement of shaft-shaped parts with all kinds of different geometries

- Gear shafts
- Drive shafts
- Toothed racks
- Hollow shafts
- Camshafts

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
- Workpieces are measured two-dimensionally by two sensors at 75 ° angles (diode cells).

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 CNC
Measuring Range			
Length (Z) (mm)	400 / 800 / 1600/ 2000 / 2400	350. 750. 1000	700 / 1100 / 1600
Diameter (X) (mm)	120 or 220	80 or 120	120 or 220
Workpiece			
Weight (max.) (kg)	20/60	30	30 or 80
Resolution (settable)			
Lengths/Diameter (mm)	0.0001	0.01 to 0.0001	0.001 / 0.0001
Angle (Degree)	0.001	0.01 to 0.0001	0.01
Error Limits*			
Lengths (μm), L (length) in mm	(3+L/100)	(2+L/125)	(2+L/100)
Diameter (μm) L (lengths) in mm	(0.5+L/100)	(1.5+L/125)	(0.5+L/100)
Drive	Manual	Servo motors	Servo motors
Optics	Camera or measuring microscope possible	Telecentric precision lens system, high-resolution CCD array	-

* (2 σ at 20 °C ± 1 °C relative to reference standard)

MarCheck. Technical Data

Dimensions	L 260mm / W 180mm / H 50mm
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	0.0001mm; 0.001mm; 0.01mm 0.00001inch; 0.0001inch; 0.001inch 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. 3GB USB stick; connection to USB printer, preferably Mahr no. 4429015 Only the print record HP PCL5 is supported
Unit of measure	mm / inch can be set in the MENU

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 9628

► | 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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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))

Product training and advanced training seminars for designers on request.

Contact:

Mahr GmbH, Göttingen
Tel.: +49 (0) 551 7073-800
E-Mail: mahr-akademie@mahr.de



WebCode 8711.

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 13459.

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 13455.

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 9664.

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:

- Setting rings* / ring gages*
- Setting plug gages* / plug gages*
- Setting disks*
- Setting masters
- Setting standards for inside micrometers
- Setting standards for outside micrometers*
- Dial comparators*
- Lever-type test indicators*
- Geometry and roughness standards*
- Thread plug gages, thread ring gages
- Internal and external measuring instruments
- Inductive measuring instruments and probes*
- Calibration spheres
- Tall cylinder squares*
- Rulers
- Micrometers*
- Calipers*
- Measuring inserts
- Dial gages*
- Measuring anvils
- Dial gages and dial indicator testing devices*
- Measuring tables and V-blocks
- Angularity measuring instruments
- Roughness measuring instruments
- Roughness standards*
- Snap gages
- Radius, thread-form and sensor gages
- Standard cylinder squares*
- Parallel gage blocks* made of steel, ceramic and hardened metal
- Parallel pieces
- Optical flats
- Pin gages*

- Flats
- Roundness standards*
- Depth setting standards*
- Magnification standards* (flicks)
- Spline gages
- Angle standards
- Bevel protractors
- Customized objects on request

* Calibrations with officially recognized calibration certificates that comply with national and international standards, e.g. **NIST** (National Institute of Standards and Technology), and **DKD** (German Calibration Service).

NIST is the national standards institute in the United State

The **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/.



WebCode 13457.

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

checklist 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

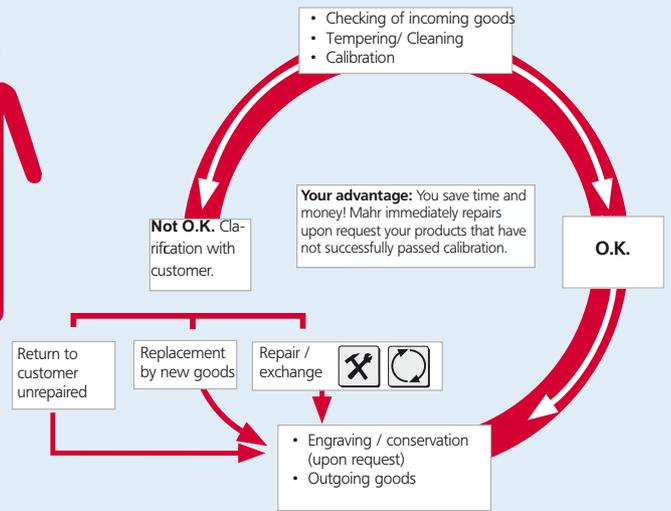
- Request Mahr System Box: by e-mail: **systembox@mahr.de** oder telefonisch unter 0711 6312-653
- Fill out check list
- Send to:
Mahr GmbH
Kalibrierzentrum
Reutlinger Straße 48
73728 Esslingen a. N.



System box including insulating material



2. Incoming goods Mahr



4. Outgoing goods customer

- Receipt of calibration measuring devices
- Entry of calibration data



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



WebCode 13487.

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
- Specifying 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

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: With this modular system, Mahr offers a network and software solution suited for multi-users that provides expandable functions in different expansion stages. For transferring and saving testing device data, there are different automatization possibilities. Data from existing testing device monitoring systems can generally be transferred into MarSoftCal.

So that your software stays up-to-date and you can profit from new functions, we suggest a maintenance contract. Maintenance includes at least four updates per year, support by phone or email during regular working hours as well as recording and integrating your wishes.

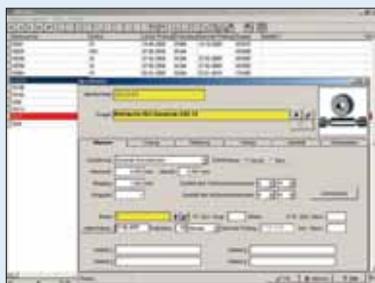
And this is how the data transfer with Mahr works:

When the goods leave our lab, you will receive a calibration data removal which you can transfer to your system with just a few mouse clicks. All management data and records are then available to you in the current version.

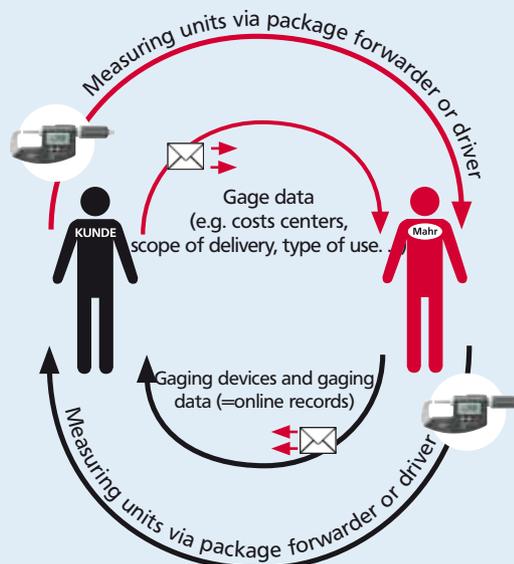
You save the work of entering data and reduce the time required for the management of your testing devices by up to 70%!



WebCode 13485.



**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, maintained and newly reassembled. A professionally 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.

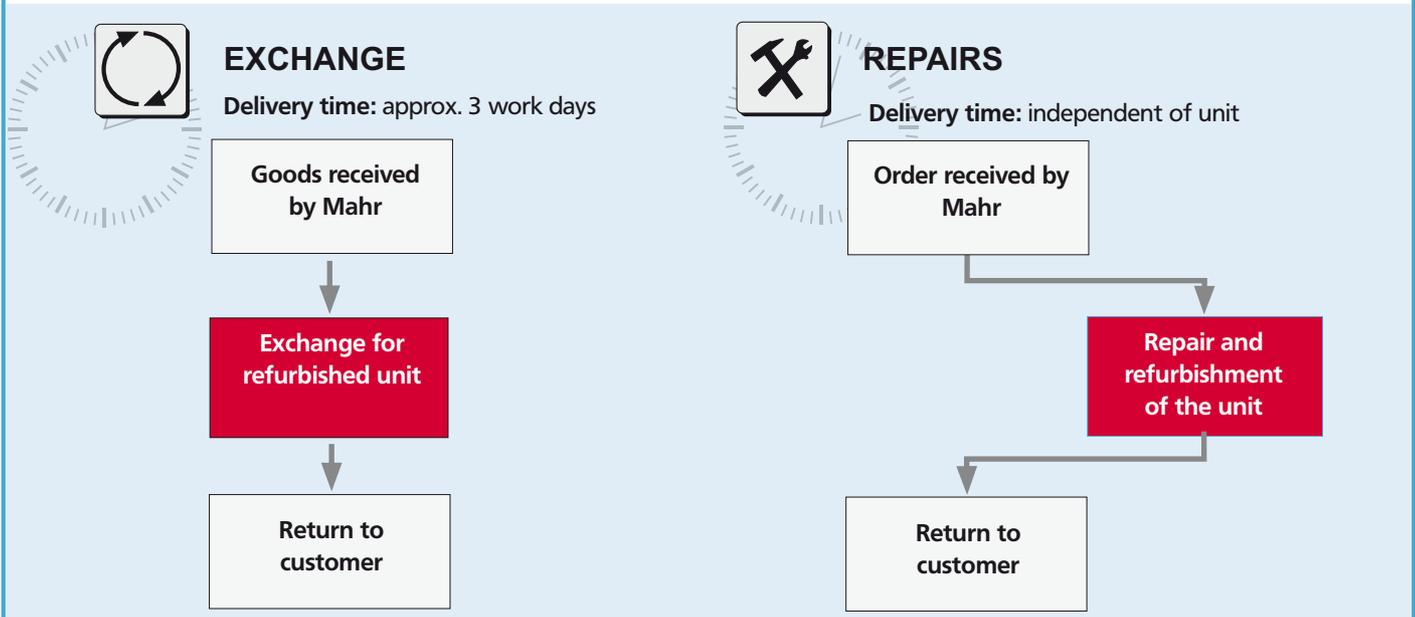
Our exchange pool contains measuring unit such as indicating snap gages, all sorts of electrical and mechanical precision indicators as well as inductive measuring probes. As long as you do not exclude the option "exchange" in your order, we will opt for an exchange instead of a repair in every case. This is our way of guaranteeing that you receive units as quickly as possible that can be used again.



WebCode 13486.

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 engrave 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 damages. 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.



Subcontract Measurements 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.

Mahr conducts the following subcontract measurements:

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 digitization 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.

Akunder Mahr GmbH Esslingen Reutlinger Straße 48 73728 Esslingen		Deckblatt Erstmusterprüfbericht VDA <input type="checkbox"/> Bericht Produktionsprozess- und Produktfreigabe <input type="checkbox"/> Dm3A Vorlagestufe: _____ <input type="checkbox"/> Bemusterung <input checked="" type="checkbox"/> Neuteil <input type="checkbox"/> Produktänderung (Spezifikationsänderung) <input type="checkbox"/> Produktionsverlagerung <input type="checkbox"/> Änderung von Produktionsprozessen <input type="checkbox"/> Aussetzen der Fertigung länger als 12 Monate <input type="checkbox"/> Werkzeugänderung / -korrektur <input type="checkbox"/> Änderung von Zusatztteilen <input type="checkbox"/> Änderung von Lieferanten <input type="checkbox"/> Sonstige <input type="checkbox"/> Nachbemusterung <input type="checkbox"/> Neubemusterung <input type="checkbox"/> Bericht sonstige Muster																									
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Lieferant / Produktionsstandort: Kennnummer / IMI-NS-Code: Berichte-Nr. / Index: Bemessung: Mustermaß Sachnummer: 1111 Zeichnungsnummer: 2222 Stempel / Datum: 29.04.2007		Kunde: Kennnummer: Berichte-Nr. / Index: Bemessung: Sachnummer: Zeichnungsnummer: Stempel / Datum:																									
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Bestätigung Lieferant: Hiermit wird bestätigt, dass die Bemusterungen entsprechend dem VDA Band 2 Kapitel 4 durchgeführt worden sind. <input type="checkbox"/> Der IMDS-Datensatz wurde erstellt oder der IMDS-ID-Nr.																											
Name: Abteilung: Telefon/ Fax/ E-Mail: Datum:		Bemerkung: Unterschrift:																									
Entscheidung Kunde Freigabe mit Auflagen: Nachbemusterung erforderlich: abgelehnt: Nachbemusterung erforderlich:		Einzelangaben Abweis-Geschäftszug-Nr.: Bei Rückmeldung Lieferchein-Nr. / -datum: Name: Abteilung: Telefon/ Fax/ E-Mail: Datum:																									

Initial sampling inspection record as per VDA



Request brochure or see WebCode 13483.

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 capabilities. 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:

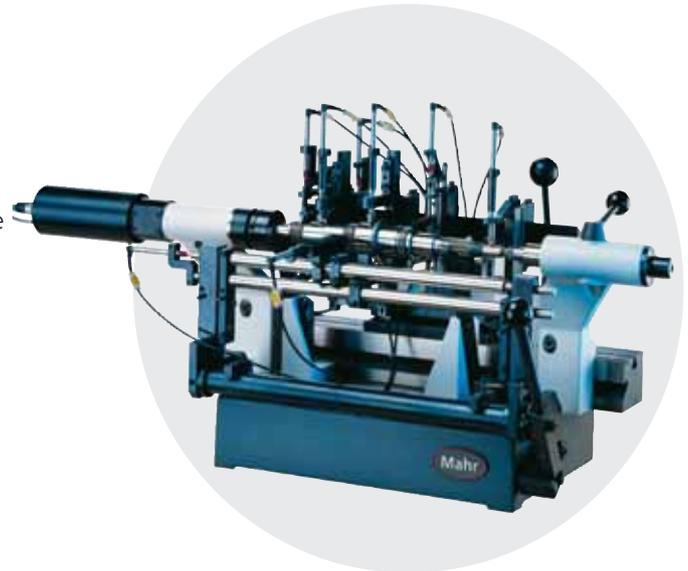
This procedure determines the influence of the operator on the measuring results. For this purpose, we test the units at your site under the normal operating conditions. We also involve the staff that will be working with the devices later on.

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).

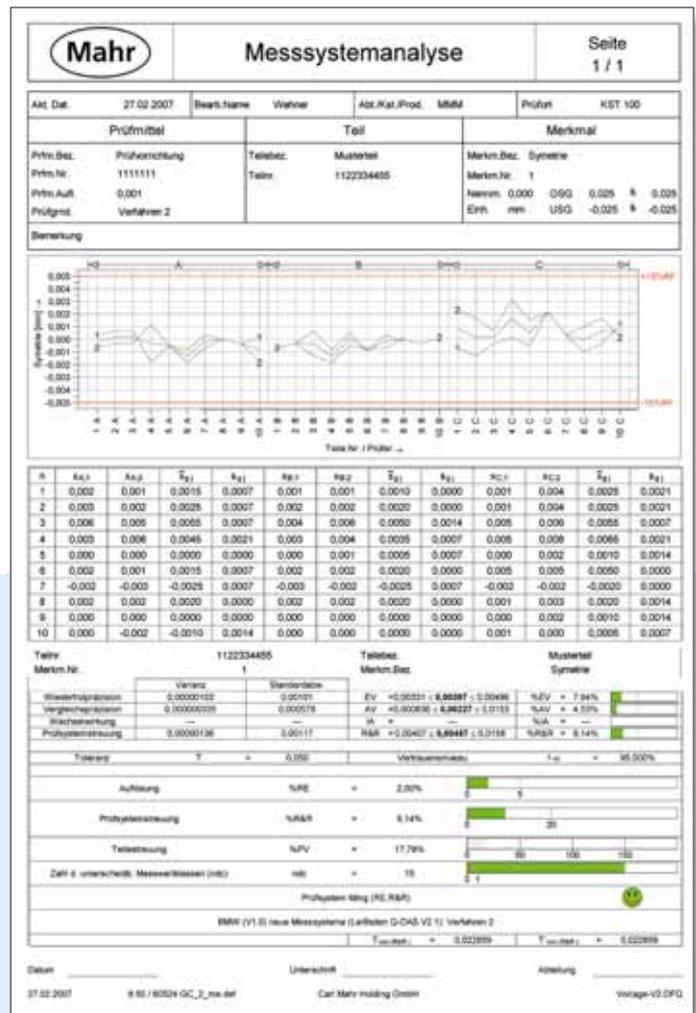
Procedure 3:

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



Record of a capability test according to Procedure 2

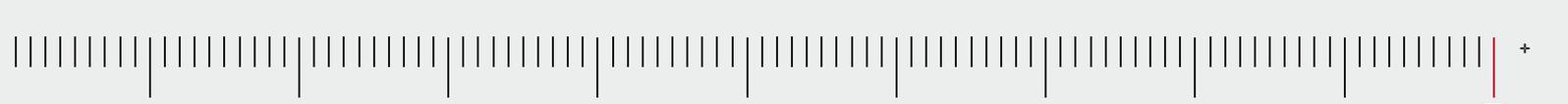


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