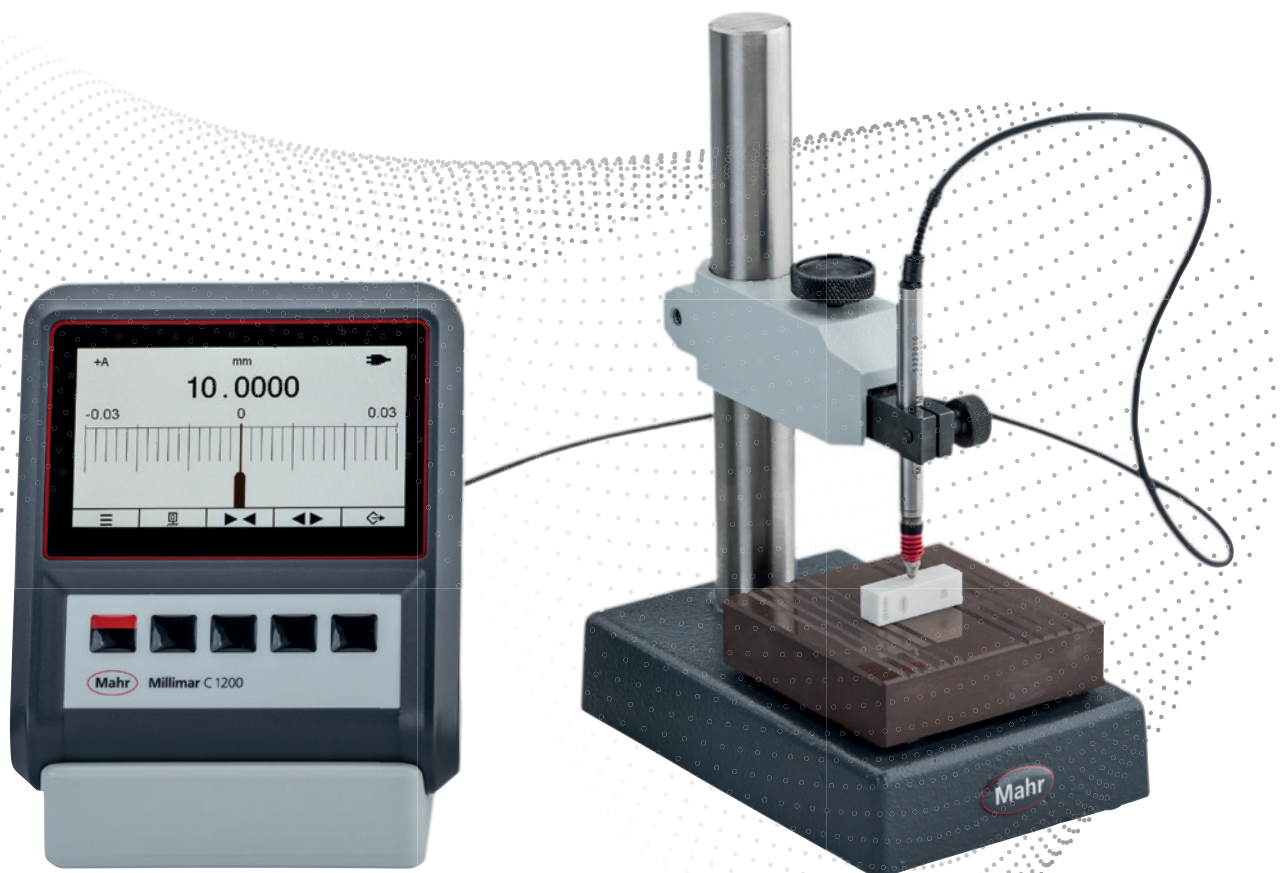


Millimar | Electrical and Pneumatic Length Measuring Instruments

The requirements for electrical length measuring instruments are just as varied as their applications. Excellent reliability, precision and simple operation are called for. Millimar measuring instruments fulfill all these requirements. These products are rugged, versatile and attractively priced.



Millimar | Electrical Length Measuring Instruments

Millimar | Evaluation units



C 1200



N1700 Modules



Cockpit Software

Millimar | Inductive probes



P1300 M



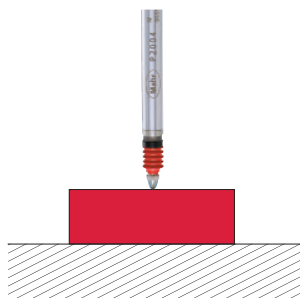
P2004 M

Millimar | Electrical Length Measuring Instruments 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 workpieces
- Applied in the same way as with digital / dial indicators, digital / dial comparators or test indicators

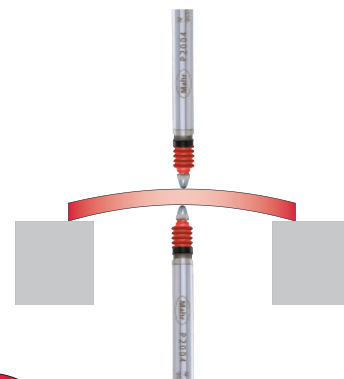
Thickness measurement



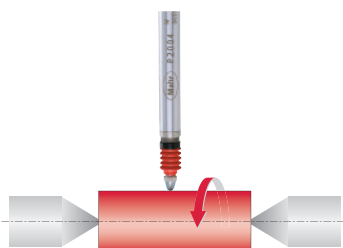
Sum measurement with 2 probes

Indicates the sum of deviation (total composite error) acquired from 2 probes irrespective of the form, support and concentricity deviation.

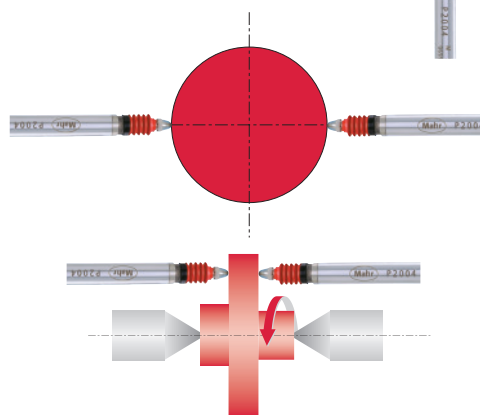
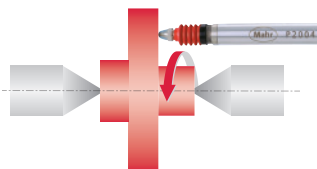
Thickness measurement



Radial run-out



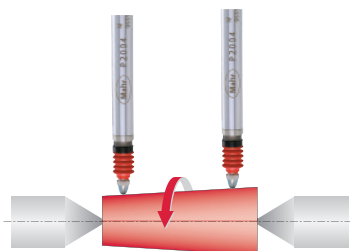
Axial run-out



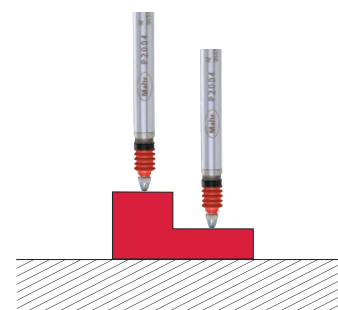
Difference measurement with 2 probes

Shows the difference between the measured values acquired by 2 probes irrespective of the absolute dimension of the test piece. This is particularly suitable for dimensional comparison of two test points.

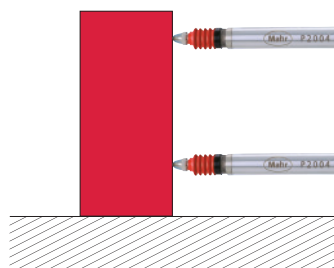
Form measurement of wedges, cones



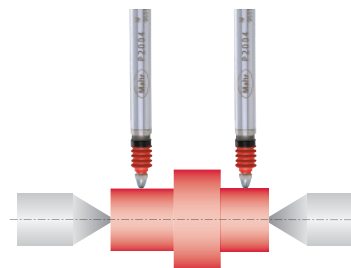
Height difference between 2 steps



Perpendicularity measurement

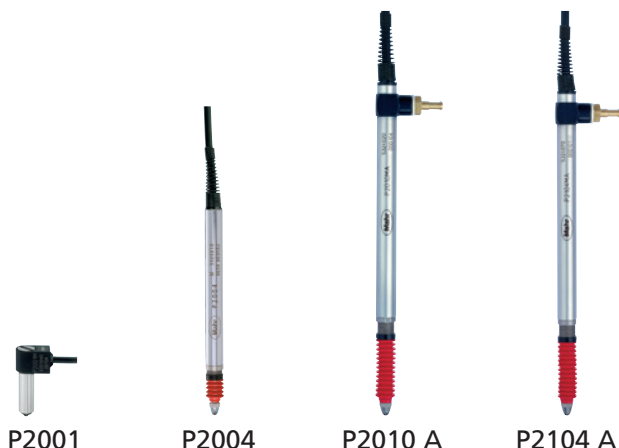


Concentricity measurement on 2 shaft diameters



Millimar | Electrical Length Measuring Instruments Inductive Probe Program

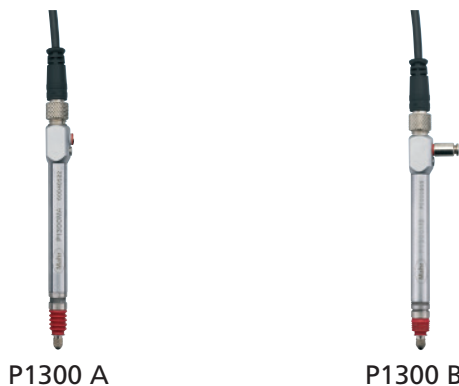
Millimar – P2000 Series



- Available in all prominent compatibilities (Available in various type compatibilities)
- Wide product spectrum measuring ranges from 1 to 10 mm plus models with a compressed air (pneumatic) lifter or 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 258-267

Millimar – P1300 Series (Mahr half-bridge)



- 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 268-271

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



- Extremely robust in all operating conditions; measuring system is offset to guide and mounting shank
- Excellent clamping characteristics
- Measuring spindle runs in rotary stroke bearings (except 1318)
- Measuring spindle can be lifted with a cable release (1301/1303)
- Gaging pressure is less than 4g / .14 oz in either direction, with a change of less than 0.1 g per 25 μm / .0001" of contact travel and linearity of 0.1% over the full range $\pm 0.250 \text{ mm} \pm .010$ ", also clutch-mounted contact swivels through 280° arc for easy positioning (EHE-Series)

Page 272-274

Millimar – 1340 Mahr High Precision Probe



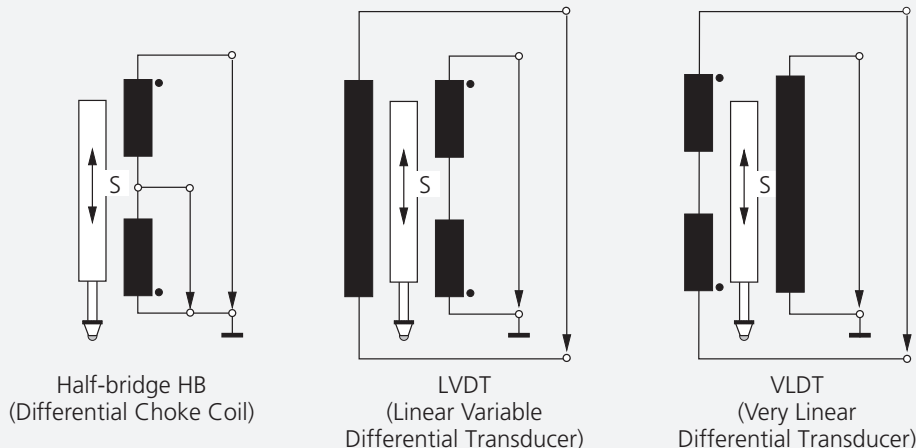
- To obtain the best results, use in conjunction with Millitron C1240M
- Unprecedented measuring accuracy and minimum linearity error < 0.01 %, i.e. 0.4 μm over the total measuring range

Page 275

General Technical Data of Inductive Probes

The measuring principle of inductive probes is based on the change of position of the magnet's conductive core moving within a coil system. Generally, this is distinguished between a half-bridge and LVDT's.

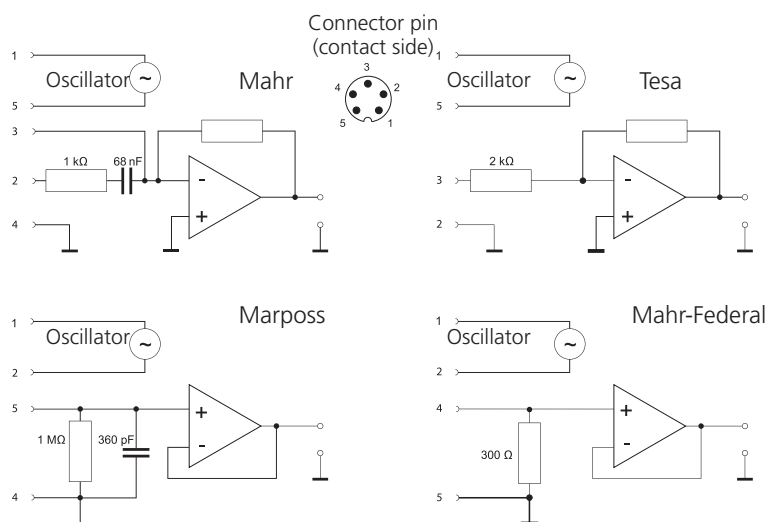
The Mahr P2000 series of probes applies a high linear, patented VLDT transducer which is similar to an LVDT transducer. This also operates according to a differential transformer principle.



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	192	73.75	115	78.74
		P2004				
		P2104				
		P1300	192	73.75	—	—
		1301	192	—	—	—
1303						
1304 K						
1318						
Amplitude	V_{eff}	P2010	19.2	29.5	11.5	7.874
			5	3	3.5	2

Schematic drawings of Mahr input amplifiers according to the various compatibilities



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, regardless of 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 stylus.

Flexible

The modular concept using Millimar standard elements is continued throughout the construction of the whole system. A generous amount of travel in the stylus (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 catalog, or alternatively we can provide ready-built devices as turn-key solutions. Whichever option you choose, you can be sure that you are purchasing a system that is tailored to your specific requirements on the most favorable of terms.

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

- Reusability of standard elements: Once manufacture of a particular type of workpiece has ceased, all standard elements used in the test equipment can be reused for a different type of workpiece.
- A choice of different mechanisms for guiding the moving part of the stylus, according to the accuracy requirements of the measuring task (optimal price-performance ratio).
- Reduction in development and implementation time.
- Availability of the equipment: Our standard elements are manufactured under standard production conditions and are always available off the shelf and ready to use.



Detailed information can be found in the catalog –
Components for Length Metrology

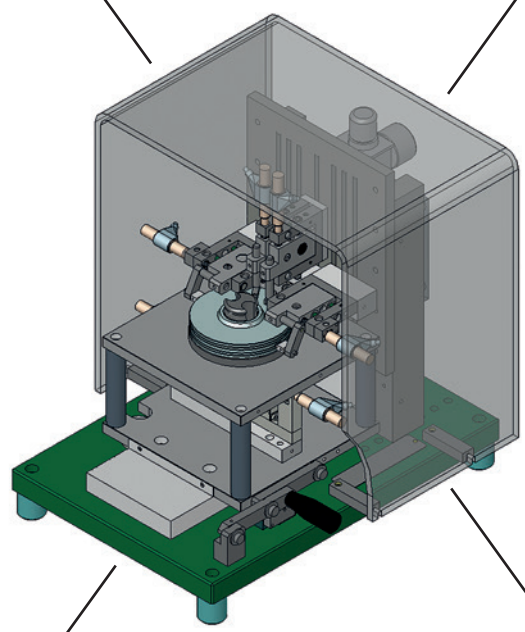
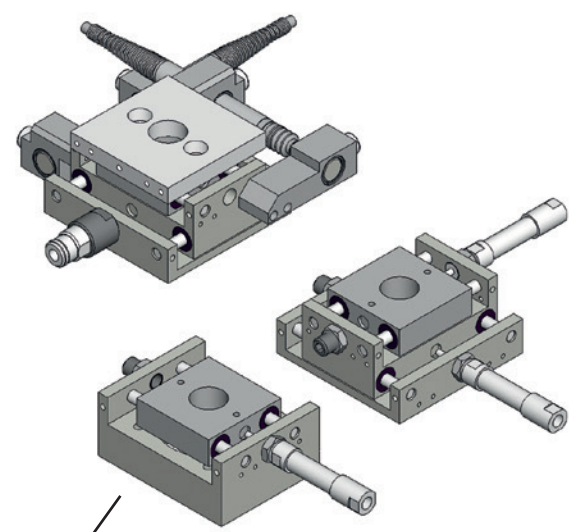
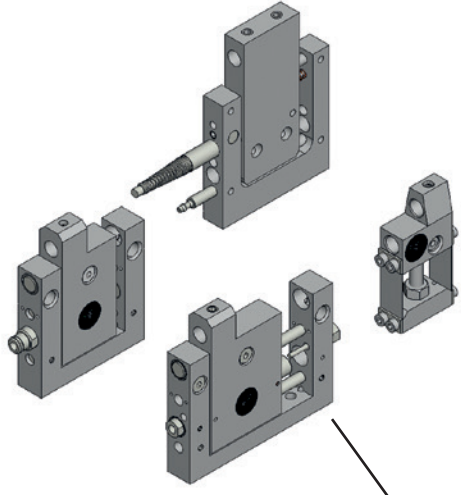
or visit our online shop at
<https://eshop.mahr.com>



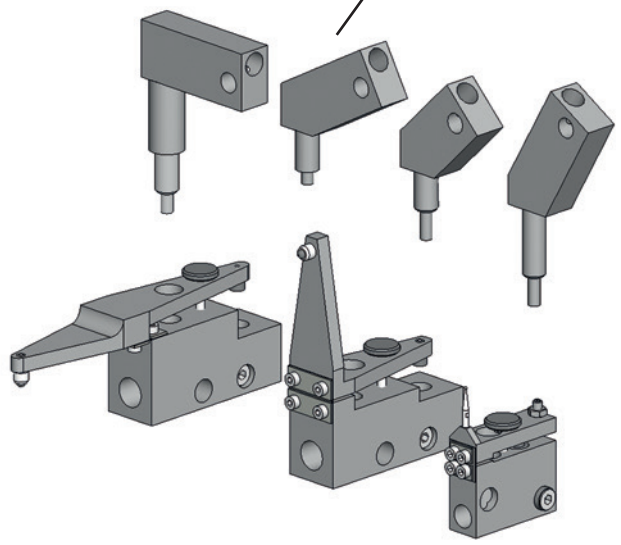
Millimar | Standard Elements

Gage module
Travel distance: 5 - 10 - 20 mm

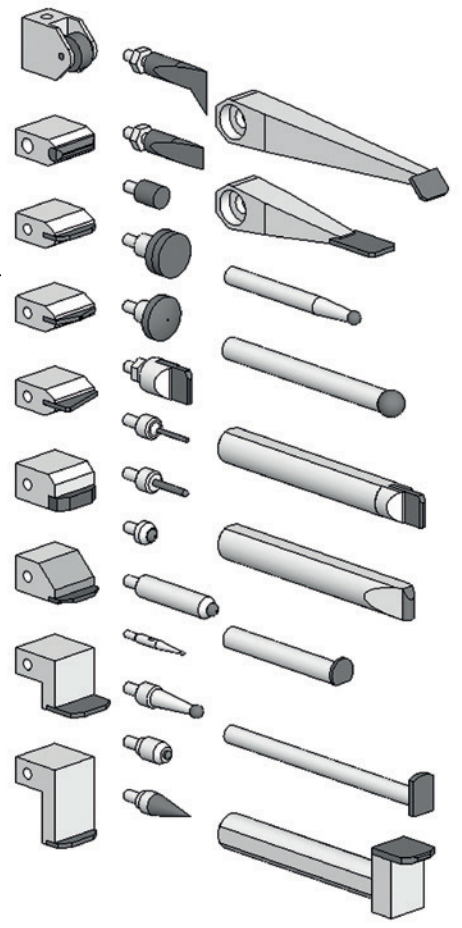
XY tables
Travel distance: 2.5 - 5 - 7 mm



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



Styli



Millimar 832 PE/F1 / 832 PE/F2

Compact Length Measuring Instrument



FEATURES

- Digital and analog display in one unit
- Large, high contrast digital display of the exact deviation from zero
- Analog display of measurement related information
- With its fixed ratio and controlled compressed air supply, the digital Dimensionair is a sturdy, reliable system for manufacturing environments
- Only one standard needed for zero offset; the instrument is precalibrated for the correct ratio
- Measuring ranges and resolutions for almost all measuring applications (including measuring equipment with 2, 3, 4 and 6 nozzles, air sensors and nozzle measuring probes, etc.)
- Suitable for dynamic measurement
- RS-232 output for communication with a data storage device, computer or printer, for statistical process control
- Master deviation – improved measurement with even more accurate automatic zero offset
- **Package contains:** power source, supply hose AHO-2, adapter for pneumatic plug gages, Federal compatible



TECHNICAL DATA

Order no.	2004100	2004112	2004106	2004118	2004103	2004115	2004109	2004121	
Product type	832 PE/F1		832 PE/F2		832 PE/F1		832 PE/F2		
Magnification	1260:1, 2500:1, 5000:1				10000:1, 20000:1				
Tooling ID	60, 50, 20				10, 5				
Inputs for pneumatic measuring equipment	1		2		1		2		
Number of jets	1-3								
Range of digital display	µm	± 80, ± 40, ± 20				± 8, ± 4			
Range of digital display	inch	± .003", ± .0015", ± .00075"				± .0003", ± .00015"			
Resolution	µm	0.2				0.1			
Resolution	inch	.00001"				.000005"			
Graduation value	µm	4, 2, 1				0.4, 0.2			
Graduation value	inch	150 µ", 75 µ", 38 µ"				15 µ", 8 µ"			
Display	Display mode A (or A and B for 2 channel models only)								
Tolerance display	5 LEDs								
Compatibility	Federal								
Dynamic functions	Max, Min, Max-Min								
Statistical functions	Actual value, nominal value								
Response time digital display	s	0.43							
Response time (Air)	Approx. 1 s (depending on the hose length of the measuring equipment)								
Error limit	+/-1 digit								
Repeatability [µm]	±1 digit or ±1% of the indication range (whichever is greater)								
Data interface	RS232C								
Control outputs	5 TTL optocoupler outputs								
Analog output	±5 VDC at maximum amplitude of the selected measuring range for signal ±A, ±B								
Energy supply	110 V / 60 Hz, Power source	230 V / 50 Hz, Power source	110 V / 60 Hz, Power source	230 V / 50 Hz, Power source	110 V / 60 Hz, Power source	230 V / 50 Hz, Power source	110 V / 60 Hz, Power source	230 V / 50 Hz, Power source	

Order no.	Depth	Depth	Height	Height	Width	Width
	mm	inch	mm	inch	mm	inch
2004100	254	10"	197	7.75"	216	10.25"
2004112	254	10"	197	7.75"	216	10.25"
2004106	254	10"	197	7.75"	216	10.25"
2004118	254	10"	197	7.75"	216	10.25"
2004103	254	10"	197	7.75"	216	10.25"
2004115	254	10"	197	7.75"	216	10.25"
2004109	254	10"	197	7.75"	216	10.25"
2004121	254	10"	197	7.75"	216	10.25"

Millimar 832 PE/F1 / 832 PE/F2

Compact Length Measuring Instrument

ACCESSORIES

Order no.	Product name	Product type
7024634	Data connection cable RS232C (3 m)	
2212852	Oil splashguard storage cover non-transparent	ECV-1276
2212858	Oil splashguard cover transparent	ECV-1285
2211464	Foot switch for hold/measure 3 m / 10 ft cable	ECB-1857
2211465	Footswitch for Dynamic Reset (15 pin connector)	ECB-1858
2211466	Foot switch for data transmit, 3 m / 10 ft	ECB-1859
2211462	Push button for dynamic reset/zeroing, 1.5 m / 5 ft cable	ECB-1855
2211467	Push button for data transmit, 1.5 m / 5 ft cable	ECB-1860
2211481	Push button for measurement hold/measure/data transmit, 3 m / 10 ft	ECB-1868
2214163	Control box with 5 relays (120 V)	EKT-1236-W3
2214165	Control box with 5 relays (240 V)	EKT-1236-W5
2010000	Plug in power supply (832 units with 3 pin connector), 120 VAC	
2010001	Power supply module (832 Amp with 3 pin connector), 220/240 VAC	
2212340	15 pin connector - male (digital I/O)	ECN-1695-W2
2212336	Phone plug male connector for Reset / Data	ECN-1693
2212339	9 pin RS232 connector - male (digital output)	ECN-1695-W1
2009118	Magnification kit, for calibrating pneumatic display units, Magnification: 2500:1, 4000:1	AMR-12
2009119	Magnification kit, for calibrating pneumatic display units, Magnification: 5000:1, 8000:1	AMR-13
2086962	Magnification kit, for calibrating pneumatic display units, Magnification: 10000:1, 16000:1	AMR-14
2009183	Particle filter, filter size 5µm	AFL-10
2201994	Oil and water separator trap	AFL-24
2201992	Replacement filter element for AFL-10 filter	AFL-21
2201993	Replacement filter element for AFL-24 filter	AFL-23



AMR-SPEC-136;
D60;
AMR-12;
AMR-13;
AMR-14;
AMR-15



AFL-24

Millimar C 1208 PE/F

Compact Length Measuring Instrument



FEATURES

- When using pneumatic compact length measuring instruments, we recommend using a supply filter (see accessories)
- Favorites: the „SELECT“ button allows you to access frequently used settings
- Static measurements $\pm A$
- Dynamic measurements: Max, Min, Max-Min, Max+Min, Average
- 1-point or 2-point master measurement
- Programmable via the integrated keypad or the RS-232 interface with MS Windows® D1000S configuration software
- When using pneumatic compact length measuring instruments, we recommend using a supply filter (see accessories)
- Favorites: the “SELECT” button allows you to access frequently used settings
- Static measurements $\pm A$
- Dynamic measurements: Max, Min, Max-Min, Max+Min, Average
- Auto-detect mode (automatic detection).
- A pneumatic measuring instrument can be connected (nozzle plug gage or nozzle ring gage)
- The instrument in use is automatically switched to the display
- 1-point or 2-point master measurement
- Programmable via the integrated keypad or the RS-232 interface with MS Windows® D1000S configuration software
- Backlit LCD for scale display and two line digital display
- 5 three color status lamps for warning and tolerance limits
- 1 input for pneumatic measuring equipment (compatible with Mahr / Federal electrical spec.)
- RS- 232 interface
- 3 digital inputs for measurement start, master measurement, measured value transfer
- 3 digital outputs for good, reject, rework, measuring time
- **Package contains:** instruction manual, power source
- SoftwareMarCom Professional free download: www.mahr.com/marcom (only for Mahr data cables and wireless systems with USB and RS232 interface)



TECHNICAL DATA

Order no.	5312095	5312093
Product type	C1208 PE/F	
Magnification	2500:1, 5000:1	10000:1
Inputs for pneumatic measuring equipment	1	
Number of jets	1-3	
Scale reading	Pointer, 61 scale graduations	
Digital display	7 digit LCD, 7 segments	
Range of analog display	μm	$\pm 3, \pm 10, \pm 30, \pm 100, \pm 300, \pm 1000, \pm 3000, \pm 10000$, tolerance related
Range of analog display	inch	$\pm .0001", \pm .0003", \pm .001", \pm .003", \pm .01", \pm .03", \pm .1", \pm .3"$, tolerance related
Measuring span	μm	76
Display	Background illuminated LCD, 115 mm x 70 mm	
Tolerance display	5 LEDs, 3 color	
Compatibility	Federal	
Measuring combination	+A, -A, +B, -B, A+B, +A-B, -A+B, -A-B	
Features	1	
Programs	1	
Test steps	1	
Dynamic functions	Max, Min, Max-Min, (Max+Min)/2, Average	
Configuration	PC, keyboard	
Zero setter	Can be set to zero at any point	
Error limit, digital display	0.05 %	
Error limit, analog display	2% (decimal scale display)	
Temperature coefficient	$\mu\text{m}/^\circ\text{C}$	0.005
Air pressure	2.1 bar ± 5 %	
Air consumption in l/h	Approx. 1-2 m ³	
Data interface	RS232C, Wireless	
Control inputs	3 optocoupler inputs, 24 V, 10 mA	
Control outputs	3 optocoupler outputs, 24 V, 100 mA	
Energy supply	Power source, 230 V/115 V; 50/60 Hz	
IP protection category	IP 43	

Order no.	Depth	Height	Width
	mm	mm	mm
5312095	165	205	160
5312093	165	205	160

Millimar C1208 PE/F

Compact Length Measuring Instrument

ACCESSORIES

Order no.	Product name	Product type
2009118	Magnification kit, for calibrating pneumatic display units, Magnification: 2500:1, 4000:1	AMR-12
2009119	Magnification kit, for calibrating pneumatic display units, Magnification: 5000:1, 8000:1	AMR-13
2086962	Magnification kit, for calibrating pneumatic display units, Magnification: 10000:1, 16000:1	AMR-14
2201994	Oil and water separator trap	AFL-24
2201992	Replacement filter element for AFL-10 filter	AFL-21
2201993	Replacement filter element for AFL-24 filter	AFL-23
7024634	Data connection cable RS232C (3 m)	
4102331	Millimar - USB Adapter cable RS232-USB (0.2 m)	Millimar - USB
5318430	Control unit with 3 push buttons	
5330955	Foot switch for input 1	
5330956	Foot switch for input 2	
5330957	Foot switch for input 3	
2121236	Supply filter with adapter kit	
3025712	Keypad dust cover	
4102233	RS232 e transmitter for e-Stick	RS232 e
4102230	e-Stick receiver	e-Stick



AMR-SPEC-136;
D60;
AMR-12;
AMR-13;
AMR-14;
AMR-15



AFL-24



RS232 e; RS232
f; 817 f



e-Stick

Millimar μ Dimensionair®II

Mobile pneumatic Length Measuring Instrument



FEATURES

- Affordable
- Versatile
- Innovative
- Robust
- No other pneumatic measuring system is as versatile as the μ Dimensionair, which can be used as a hand-held device, as a stationary table-top device or even directly on the machine tool. With its IP54 protection rating it is suitable for use in harsh workshop environments. The compressed air flowing out of the measuring equipment removes any contamination from the test piece to ensure reliable measuring results.
- Directly and clearly readable measuring results.
- With its fixed ratio and controlled compressed air supply, this sturdy, reliable measuring instrument is ideal for use in manufacturing environments.
- The μ Dimensionair II offers:
 - Choice of setup with one standard or with Min/Max standards
 - All other functions of the μ Max- μ m II digital dial comparator:
 - Dynamic measurement: Min, Max, measuring span
 - Multiplication factor and hold function („freeze“)
 - Choice of data transfer with serial number
- MarConnect data output: USB, Opto RS-232C and Digimatic
- **Package contains:** instruction manual, supply hose AHO-2
- SoftwareMarCom Professional free download: www.mahr.com/marcom (only for Mahr data cables and wireless systems with USB and RS232 interface)



Application:

Applications with pneumatic measuring equipment requiring mobile measurement and evaluation.

TECHNICAL DATA

Order no.		2103200
Product type		μ Dimensionair II®
Magnification		5000:1, 2500:1, 1260:1
Inputs for pneumatic measuring equipment		1
Digital display		Rotates through 270°
Storage temperature MAX	°C	60
Graduation value	μ m	0.5, 1, 2
Graduation value	inch	.00002", .00005", .0001"
Display		Analog display with one line digital display
Tolerance display		Two - over / under (3 class)
Compatibility		Federal
Features		1
Programs		1
Test steps		1
Dynamic functions		MAX, MIN, MAX-MIN
Statistical functions		Difference, Nominal Average
Response time (Air)		Approx. 1 s
Error limit		$\pm 1\%$ of the total range
Air pressure		2.10 \pm .01 bar
Repeatability [μ m]		± 1 numerical increment
Data interface		Digimatic, Opto RS232C, USB, Wireless
Energy supply		Battery operation, approx. 3000 h
IP protection category		IP 54

Order no.	Depth	Height	Length	Length (inch)	Width
	mm	mm	mm	inch	mm
2103200	60	3	100	4	70

Millimar μ Dimensionair II®

Mobile pneumatic Length Measuring Instrument

ACCESSORIES

Order no.	Product name	Product type
2238020	Pressure regulator with filter	
2095924	Pressure meter	
2239307	Universal bench mount	
2237666	Standard plastic handle	
2240993	Shut off slide valve	
2241109	Table stand for μ Dimensionair®	
2240594	Swivel coupling adapter for rotating tooling	
2201994	Oil and water seperator trap	AFL-24
2237713	Connecting hose, 6 m	
2202076	Supply hose, 1.5 m	AHO-2
4102520	Battery 3 V, CR 2032	
4346023	2000 USB data connection cable USB (2 m)	2000 USB
4346021	Digimatic data cable (2 m)	2000 d
4346020	Data connection cable RS232C (2 m)	2000 r



AFL-24

Millimar S 1840 PE/F

Compact Column Measuring Instrument



FEATURES

- Measuring results can be determined and addressed at a glance
- Suitable for measurements with pneumatic measuring equipment
- Offers a wide range of functions for the combined evaluation of signals from static and dynamic measurements
- Measuring results are displayed with 101 three color LEDs if programmable warning and tolerance limits are exceeded, LED segments on display change color accordingly from green to yellow or red
- When using pneumatic compact amplifiers, it is recommended at all times to use both a pressure regulator and a supply filter (see accessories)
- Clear, three color analog light bar display of warning and tolerance limits
- Backlit, two line LCD for displaying measured values, help texts and units of measurement
- 1 channel
- RS-232 interface
- Analog output
- 3 digital inputs for measurement start, master measurement, etc.
- 3 digital outputs for good, reject, rework classification, measuring time, etc.
- Dynamic measurements: Max, Min, Max-Min, Max+Min, Average
- Can either be programmed via the integrated membrane keypad using the menu driven interface or via the configuration software for MS Windows®
- 1-point or 2-point master measurement
- Password block in setup mode
- **Package contains:** instruction manual, power source
- SoftwareMarCom Professional free download: www.mahr.com/marcom (only for Mahr data cables and wireless systems with USB and RS232 interface)



TECHNICAL DATA

Order no.	5318455	5318457
Product type	S1840 PE/F	
Magnification	2500:1	10000:1
Inputs for pneumatic measuring equipment	1	
Scale reading	± 10, 30, 100, 300, 1000, 3000, 10000 µm	
Digital display	7 digit LCD, 7 segments	
Range of analog display	inch	± .0001", ± .0003", ± .001", ± .003", ± .01", ± .03", ± .1", ± .3", tolerance related
Display	101 LED elements, 3 color	
Tolerance display	Via color change of the analog display	
Measuring span	mm	76 16
Compatibility	Federal	
Measuring combination	+A, -A	
Features	1	
Programs	1	
Test steps	1	
Dynamic functions	Max, Min, Max-Min, (Max+Min)/2, Average	
Configuration	PC, keyboard	
Zero setter	electrical	
Response time digital display	s	0.5
Response time analog display	s	0.5
Error limit	0.5 - 1%	
Error limit, digital display	+/- 1 place	
Error limit, analog display	1% (101 LEDs)	
Temperature coefficient	µm/°C	0.005
Air pressure	2.1 bar ± 5%	
Air consumption in l/h	Approx. 1-2 m³	
Data interface	RS232C, Wireless	
Control inputs	3 optocoupler inputs, 24 V, 10 mA	
Control outputs	3 optocoupler outputs, 24 V, 100 mA	
Analog output	1 V/mm	
Energy supply	Power source, 230 V/115 V; 50/60 Hz	
IP protection category	IP 43	

Order no.	Depth	Height	Width
	mm	mm	mm
5318455	144	487	47
5318457	144	487	47

Millimar S1840 PE/F

Compact Column Measuring Instrument

ACCESSORIES

Order no.	Product name	Product type
2248282	2-way manifold - low mag	AAD-82
2248283	3-way manifold - low mag	AAD-83
2248284	4-way manifold - low mag	AAD-84
2248285	5-way manifold - low mag	AAD-85
2086960	Magnification kit, for calibrating pneumatic display units, Magnification: 2500:1, 4000:1	AMR-12
2086961	Magnification kit, for calibrating pneumatic display units, Magnification: 5000:1, 8000:1	AMR-13
2086962	Magnification kit, for calibrating pneumatic display units, Magnification: 10000:1, 16000:1	AMR-14
5330914	Base foot with 1 pressure regulator	
5330915	Base foot with 2 pressure regulators	
5330916	Base foot with 3 pressure regulators	
2121236	Supply filter with adapter kit	
5318430	Control unit with 3 push buttons	
5330955	Foot switch for input 1	
5330956	Foot switch for input 2	
5330957	Foot switch for input 3	
7024634	Data connection cable RS232C (3 m)	
4102331	Millimar - USB Adapter cable RS232-USB (0.2 m)	Millimar - USB
4102233	RS232 e transmitter for e-Stick	RS232 e
4102230	e-Stick receiver	e-Stick



AAD-84;
AAD-85;
AAD-83;
AAD-82



AMR-SPEC-136;
D60;
AMR-12;
AMR-13;
AMR-14;
AMR-15



RS232 e;RS232
f;817 f



e-Stick