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Chapter - Page

Electrical Length Measuring Instruments

Electronic Length Measuring Instruments

General Features

Millitron Compact Measuring Instruments for Length Measurements with Inductive Probes

- Small, handy, easy to use
- Precise and clear reading by large scales or digits
- Single, sum and difference measurements, limit switches, extreme-value memories
- High accuracy, long-time stability, insensitive to environmental influences
- Good zero stability, even when changing of range
- Short setting time, assessment of fast processes
- Analog or digital displays
- Digital output for connection of control units and computers
- Analog output

Milligraph Length Measuring and Recording Instrument

- Compact, reliable, simple
- Large frequency range with full recording width
- Electronically controlled paper speed
- Electro-sensitive paper for a clear, steady, fine recording line

Inductive Measuring Probe

- Large linearity range, strong output signal, insensitive to disturbing influences
- Precision bearing of measuring bolt and lever, frictionless ball or spring bearing for highest resolution with lowest hysteresis
- Rigid construction for workshop applications, standard types for general use

Millitron Long-Range Measuring Instruments for Length Measurements with Incremental Probes

- Large indicating range with six-digit, seven-segment planar indication
- High measurement value resolution
- Functionally designed operating elements, simple, quick setting of zero or preset value to any point within the measuring length
- BCD-data output and RS232C interface for connection to a control unit or computer

Incremental Probe

- High accuracy by means of precision glass scale
- Large measuring range with high resolution for absolute measurement
- Pneumatically damped measuring lifting bolt

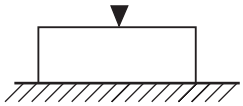
Application Examples

Inductive Measuring Systems

Single measurement with one measuring probe

Indicating instrument displays the measured value directly.

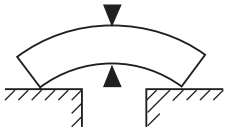
- All kinds of direct measurements of cylindrical and flat workpieces
- Switching facility for positive and negative measuring direction makes for useful indication of deviation, irrespective of whether lengths, outside diameters or bores are being checked
- It is applied in the same way as dial indicators, dial comparators, test indicators



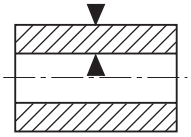
Sum measurement with two probes

Display of total composite error established by the two probes irrespective of form, support or concentricity.

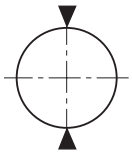
- Thickness measurement irrespective of form deviations or support, e.g. precise measurement of gauge blocks, tapes and wires



- Measurement of wall thickness on pipes

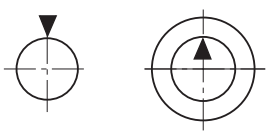


- Measurement of form and diameter on shafts irrespective of concentricity



- Thickness measurement on discs irrespective of position or runout

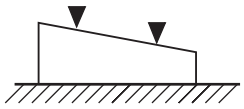
- Checking of mating between shaft and bore. Indication is given of play or oversize irrespective of absolute dimensions of parts



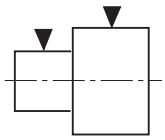
Difference measurement with two probes

Display of difference between the measured values acquired by the two probes irrespective of the absolute dimension of the test piece. Particularly suited for a dimensional comparison of two testpoints.

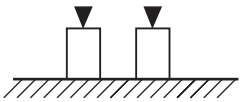
- Measurement of form on wedges, tapers, shafts, irrespective of overall workpiece dimension



- Concentricity checks at two shaft diameters



- Comparative measurements between two workpieces and a standard (gauge block)



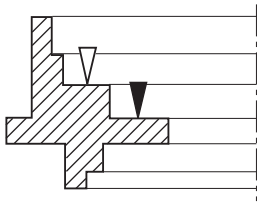
- Checks on parallelism on workpieces and support surface. Flatness and angle measurements

Incremental Measuring Systems

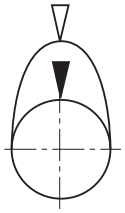
Measurement with long-range instrument

Particularly large measuring ranges can be achieved when using incremental probes in conjunction with Long-Range Measuring Instrument Millitron 1500 and 1501. Numerous difficult measurement problems can thus be solved.

- Measurement of distance between several steps on workpieces with differing shoulders or registers. The probe only has to be set once, the absolute value is displayed



- Measurement of cam elevation on a camshaft. The probe only has to be set once, the absolute value is displayed



Electrical Length Measuring Instruments

Millitron 1200 IC Compact Measuring Instrument with Analog Display

Features

- Compact housing
- Mains-independent application in the workshop
- Large analog display with two tolerance markers
- Measured value is displayed quickly and directly without exceeding it
- Switchable measuring direction
- Sensitively adjustable via large range zero setter
- Battery operation via customary R14 baby cells
- Battery check button
- Standard accessory: Mains adapter

Technical Data

See “Technical Data for Millitron IC instruments with analog display“ on page 4-8

Type	Order no.	Remarks
1200 IC (without illustration)	**5312000**	
1200 IC/MZ	**5312009**	Identical to 1200 IC, but switchable metric/inch

Accessories

	Order no.
Battery, R 14 baby cell 1,5 V (6 pieces required)	**3004424**
Mains adapter from 90 V up to 264 V with EU-US-UK-plug	**7025210**

Appropriate inductive probes see page 4-15

Millitron 1202 IC, 1204 IC Universal Measuring Instrument with Analog Display

Features

- Electrical indicating instrument for workshop and laboratory
- Indicating instrument with two adjustable tolerance markers
- Measured value is displayed quickly and directly without exceeding it
- Switchable measuring direction
- Sensitively adjustable via two large range zero setters
- Two inductive probes can be connected for single, sum and differential measurement
- Zero position not affected by change of measuring range
- Millitron 1204 IC with 2 additional measuring ranges for extra-large resolution
- Standard accessory: Mains cable

Technical Data

See “Technical Data for Millitron instruments with analog display“ on page 4-8

Type	Order no.	Remarks
1202 IC	**5312020**	
1202 IC/MZ (without illustration)	**5312029**	Identical to 1202 IC, but switchable from metric/inch
1204 IC (without illustration)	**5312040**	Identical to 1202 IC, but with 8 measuring ranges, 2 of these with extremely high resolution
1204 IC/MZ (without illustration)	**5312049**	Identical to 1204 IC, but switchable metric/inch

Accessories

	Order no.
External Zero Adjuster 1282 Setting range ± 200 µm, connecting cable 0,5 m	**5312823**

Appropriate inductive probes see page 4-15

Electrical Length Measuring Instruments

Millitron 1222 IC, 1224 IC Universal Measuring and Control Instruments with Electronic Limit Switches

Features

- Electrical indicating instrument for automatic control processes (classification)

Identical to Millitron 1202 IC or 1204 IC, but additionally:

- 2 or 4 adjustable electronic limit switches with small switching error and switching hysteresis
- For automatic use the indicating instrument can be switched off, limit switches remain active
- Signal lights indicate the position of the measured value in relation to the set limits
- Simultaneously with each signal light, a floating relay contact at the control output is available
- External command permits signal light and relay to be held
- Standard accessory: Mains cable

Technical Data

See "Technical Data for Millitron instruments with analog display" on page 4-8

Type	Order no.	Remarks
1222 IC	**5312220**	Identical to 1202 IC, but with 2 electronic limit switches
1222 IC/MZ (without illustration)	**5312229**	Identical to 1222 IC, but switchable metric/inch
1224 IC (without illustration)	**5312240**	Identical to 1222 IC, but with 4 electronic limit switches
1224 IC/MZ (without illustration)	**5312249**	Identical to 1224 IC, but switchable metric/inch

Accessories

	Order no.
External Zero Adjuster 1282 Setting range ± 200 µm, connecting cable 0,5 m	**5312823**
Amphenol Opposite Connector 1280 24-pin for limit switch	**3001730**

Appropriate inductive probes see page 4-15

Millitron 1254 IC Universal Measuring and Control Instrument with Electronic Extreme-Value Memories

Features

- For measurement of deviations from axial and radial run-out as well as flatness errors

Features identical to Millitron 1222 IC, but additionally:

- Two additional analog extreme-value memories without time delay accept maximum and minimum value from a sequence of measured values
- An arithmetic unit determines the sum and the difference
- Limit switches operate independently of the indicating instrument, thus simultaneous supervising of Min, Max and Max-Min is permitted
- Holding, clearance and release of the extreme-value memory manually or via relay contact
- The operating range is twice the indicating range, thus also measured values exceeding the indicating range by ±50% are reliably registered

Technical Data

See "Technical Data for Millitron instruments with analog display" on page 4-8

Type	Order no.	Remarks
1254 IC	**5312540**	
1254 IC/MZ (without illustration)	**5312549**	Identical to 1254 IC, but switchable metric/inch

Accessories

	Order no.
External Clearing Contact 1254 IC/1 Pushbutton, connecting cable 0,5 m	**5312541**
External Measuring Contact 1254 IC/2 Pushbutton, connecting cable 0,5 m	**5312543**
External Zero Adjuster 1282 Setting range ± 200 µm, connecting cable 0,5 m	**5312823**

Appropriate inductive probes see page 4-15

Electrical Length Measuring Instruments

Technical Data for Millitron Instruments (metric) with Analog Display

	1200 IC	1202 IC	1222 IC	1224 IC	1254 IC	1204 IC
Measuring range / readings	± 3 µm / 0,1 µm ± 10 µm / 0,2 µm ± 30 µm / 1 µm ± 100 µm / 2 µm ± 300 µm / 10 µm	± 3 µm / 0,1 µm ± 10 µm / 0,2 µm ± 30 µm / 1 µm ± 100 µm / 2 µm ± 300 µm / 10 µm ± 1000 µm / 20 µm				± 0,3 µm / 0,01 µm ± 1 µm / 0,02 µm ± 3 µm / 0,1 µm ± 10 µm / 0,2 µm ± 30 µm / 1 µm ± 100 µm / 2 µm ± 300 µm / 10 µm ± 1000 µm / 20 µm
Scale length	120 mm					
Setting time	350 ms	300 ms				
Probe inputs	1	2				
Appropriate probes	Inductive Probes 1300, 1301, 1303, 1304 K, 1310[1], 1318 und 1340[2]					
Single measurement	+A, -A	+A, -A, +B, -B				
Measuring combinations	-	+A+B, +A-B, -A+B, -A-B				
Zero adjuster setting range: 5 and 100 µm	1 large range setter	2 large range setters				
Stability of zero		≤ 0,2%				
Deviation spread referred to measuring range	≤ 2,5 %	≤ 1,5 %				
Output voltage	no output	± 3V bei ± 3, ± 30, ± 300 µm / ± 3,16V for ± 10, ± 100, ± 1000µm				
Data output	not available					
Limit switches	-	-	2 for measured value	4 for measured value	2 f. meas. value 2 f. Max-Min	-
Signal lights	-	-	3 for measured value	5 for measured value	3 f. measured 2 f. Max-Min	-
Switching error			0,1 % of the measuring range			
Switching hysteresis			0,5 % of the measuring range			
Response time			appr. 0.01 sec.			
Control outputs (floating relay contacts[3])	-	-	3	5	5	-
Class of protection acc. to DIN	IP 40					
Operating temperature range	+ 10 ... + 40 °C					
Mains connection	Mains adapter 9V = / 5VA [4]	230 V~/115 V~ ± 10%, 50-60 Hz (switchable)				
Power consumption	appr. 0,1 W	appr. 5 VA	appr. 10 VA		appr. 5 VA	
Dimensions	137x157x80 mm	156 x 195 x 120 mm				
Weight	1 kg	2 kg	2 kg	2 kg	2 kg	appr. 2 kg
Order no.	**5312000**	**5312020**	**5312220**	**5312240**	**5312540**	**5312040**

Technical Data for Millitron Instruments (metric/inch) with Analog Display

	1200 IC/MZ	1202 IC/MZ	1222 IC/MZ	1224 IC/MZ	1254 IC/MZ	1204 IC/MZ
Measuring range/ readings	± .1 µin / .002 µin ± .3 µin / .01 µin ± 1 µin / .02 µin ± 3 µin / .1 µin ± 10 µin / .2 µin	± .1 µin / .002 µin ± .3 µin / .01 µin ± 1 µin / .02 µin ± 3 µin / .1 µin ± 10 µin / .2 µin ± 30 µin / 1 µin				± .01 µin / .0002 µin ± .03 µin / .001 µm ± .1 µin / .002 µin ± .3 µin / .01 µin ± 1 µin / .02 µin ± 3 µin / .1 µin ± 10 µin / .2 µin ± 30 µin / 1 µin
Order no.	**5312009**	**5312029**	**5312229**	**5312249**	**5312549**	**5312049**

Further technical data see table above

1) the displayed value has to be multiplyed by factor 10
2) to be connected only via adapter 5313490
3) Max. permissible contact rating 42 V = / 50 W; 42 V~ / 100 VA
4) mains adapter available for 115 V mains supply

Millitron 1202 D Universal Measuring Instrument with Digital Display

Features

- Clear, high-contrast digital display, thus error-free reading
- Display fades out if measuring range is exceeded
- 3 measuring ranges
- 2 inputs for inductive probes for single, sum or differential measurements
- Switchable measuring direction
- Two sensitively adjustable large range zero setter
- Very high measuring resolution. Each measuring range is resolved into 4000 steps.
- Analog output for connection of a recorder
- BCD output for connection of data memories and computers
- Standard accessory: Mains cable

Technical Data

See “Technical Data Millitron instruments with digital display“ on page 4-11

Type	Order no.	Remarks
1202 D	**5312028**	
1202 D/MZ	**5312027**	Identical to 1202 D, but switchable metric/inch

Accessories

	Order no.
External Zero Adjuster 1282 Setting range ± 200 µm, connecting cable 0,5 m	**5312823**
Amphenol Opposite Connector 1280 24-pin for BCD signals	**3001730**

Appropriate inductive probes see page 4-15

Electrical Length Measuring Instruments

Millitron 1222 D Universal Measuring and Control Instrument with Electronic Limit Switches

Features

- Electrical indicating instrument for manual or automatic control processes

Features identical to Millitron 1202 D, but additionally:

- Two adjustable electronic limit switches which have a very high switching accuracy
- Limit switches have a small defined hysteresis and a small switching time
- For automatic use the digital display can be switched off, limit switches remain active
- Signal lights indicate the position of the measured value in relation to the set limits
- Simultaneously with each signal light, a floating relay contact at the control output is available
- External command permits signal light and relay to be held
- Standard accessory: Mains cable

Technical Data

See "Technical Data Millitron instruments with digital display" on page 4-11

Design	Order no.	Remarks
1222 D	**5312228**	
1222 D/MZ	**5312227**	Identical to 1222 D, but switchable metric/inch

Accessories

	Order no.
External Zero Adjuster 1282 Setting range ± 200 µm, connecting cable 0,5 m	**5312823**
Amphenol Opposite Connector 1280 24-pin for limit switches and BCD signals	**3001730**

Appropriate inductive probes see page 4-15

Technical Data for Millitron Instruments (metric) with Digital Display

	1202 D	1222 D
Display range	± 1999	
Measuring range / resolution	± 20 µm / 0,01 µm	
Measuring range / resolution	± 200 µm / 0,1 µm	
Measuring range / resolution	± 2000 µm / 1 µm	
Setting time Display and BCD output	< 400 ms	
Setting time Analog output	< 10 ms	
Probe inputs	2	
Appropriate probes	Inductive Probes 1300, 1301, 1303, 1304 K, 1310[1)], 1318 and 1340[2)]	
Single measurement	+A, -A, +B, -B	
Measuring combinations	+A+B, +A-B, -A+B, -A-B	
Zero adjuster setting ranges: 5 and 100 µm	2 large range setters	
Deviation spread		
Display and BCD output	≤ 0,5 % of measured value + 1 digital step	
Analog output	≤ 0,5 % of measured value + 1digital step	
Output voltage	± 6V for ± 20, ± 200, ± 2000µm	
Data output	BCD	
Limit switches	-	2 for measured value
Signal lights	-	3 for measured value
Switching error	-	0,1 % of the measuring range
Hysteresis	-	0,5 % of the measuring range
Response time	-	appr. 0.01 sec.
Control outputs (floating relay contacts[3)])	-	3
Protection class acc. to DIN	IP 40	
Operating temperature range	+ 10 ... + 40 °C	
Mains connection Power consumption	230 V~ ± 10 % for 50 - 60Hz switchable to 115 V~ ± 10 % for 50 - 60Hz appr. 15 VA	
Dimensions	156 x 195 x 120 mm	
Weight	2 kg	
Order no.	**5312028**	**5312228**

Technical Data for Millitron Instruments (metric/inch) with Digital Display

	1202 D/MZ	1222 D/MZ
Display range	± 1999	
Measuring range/ resolution	± .002 inch / .000001 inch	
Measuring range / resolution	± .02 inch / .00001 inch	
Order no.	**5312027**	**5312227**

Further technical data see table above

1) the displayed value has to be multiplyed by factor 10
2) to be connected only via adapter 5313490
3) max. permissible contact rating 42 V= / 50 W; 42 V~ / 100 VA

Electrical Length Measuring Instruments

Millitron 1240 High-precision Universal Measuring Instrument with Analog and Digital display

Features

- Extremely precise processing of measured values
- Zero setting possible at any point within the measuring range
- Acquisition of actual values of the standard at the touch of a button
- Statistical functions x-bar, s, r and n for one feature
- 2 inputs for inductive probes for single, sum or differential measurements
- Tolerance monitoring (with adjustable hysteresis)
- Presentation of the tolerance zone over the entire scale width
- Universal classification possibilities
- Extreme-value memories of long-time stability
- Interface RS232C for connecting printer / computer / data logger
- Analog output allows connection of a recorder
- Remote control of all functions via interface RS232C
- Standard accessory: Mains cable

Technical Data

Analog display									
Measuring range									
µm	± 1	± 3	± 10	± 30	± 100	± 300	± 1000	± 3000	± 10000
µinch	± .03	± .1	± .3	± 1	± 3	± 10	± 30	± 100	± 300
Readings									
µm	0,02	0,1	0,2	1	2	10	20	100	200
µinch	.001	.002	.01	.02	.1	.2	1	2	10

Digital display	± $6^1/_2$ digits (± 1 999 999)	
Measuring range	± 200 µm / .008"	± 2000 µm / .08"
Readings	0,01 µm / .000001"	0,1 µm / .00001"

Span of error	
of analog display	1,5 %
of digital display	0,01 %
Analog output	1 %
Digital output	0,01 %
Voltage analog output	± 5 V
Operating temperature	+ 10 to + 40° C
Protection class acc. to DIN	IP 40
Mains connection	230 V / 115 V ± 10 %; 50 - 60 Hz
Power consumption	appr. 30 VA
Dimensions	156 x 195 x 120 mm
Weight	2,3 kg

	Order no.	Remarks
1240	**5312400**	Cover plate German
1240	**5312401**	Cover plate English
1240	**5312402**	Cover plate French

Accessories

	Order no.		Order no.
Push-Buttons 1240/3D for activating 3 different functions such as starting, zero, setting, etc; connecting cable 1,5 m	**5312430**	**Data cable** for DIN A4 Printer FX 870	**6860215**
Foot switch 1240/1F, connecting cable 2 m	**5312431**	**Data cable** for any PC (9-pin Sub-D)	**7024634**
		DIN A4 Printer with RS232 Interface	**7020626**
		Data cable for Statistics Printer MSP1	**4102081**
		Statistics Printer MSP1, 230V~	**4102070**

Recommended Probe **1340** see page 4-19
Further appropriate Probes **1300, 1301, 1303, 1304 K, 1310** and **1318** see as of page 4-15

Millitron 1260 Multiple Measuring Computer with LCD Display

Features

- Universal multiple length measuring computer for production
- Simple process computer for simultaneous evaluation of up to 8 inductive measuring probes
- Large, coloured LCD display with plain text and graphic layout
- Up to 4 digital measuring instruments can be connected additionally
- Installed PCMCIA-card for extensive data storage and measuring programmes
- Measuring programmes can be made out automatically by Teach-In method
- Connection of probes or measuring instruments of other manufacturers possible on request
- 3 integrated signal lights (Go - No-go - Re-work)
- Key pad IP 54 protected against splash-water
- Standard accessory: Mains cable

Technical Data

LCD display 320 x 240 pixel / 8 colours

Display ranges of column display (200 pixel)	± 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000 µm or ± 200, 500, 1000, 2000, 5000 µinch; 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1.0 inch or tolerance-limited
Resolution of digital display	± 0,1; 1,0; 10 µm or ± 5; 10; 100 µinch

Inputs for inductive probes	8
Carrier frequency	20 kHz
Exciter voltage	5 Volt
Rate of measuring data acquisition	200/s for resolution 0,01 mm 100/s for resolution 0,001 mm 40/s for resolution 0,0001 mm
Operating temperature range	+ 10 up to + 40° C
Class of protection acc. to DIN	IP 52, keyboard IP 54
Mains connection	100 ... 240 V; 50 - 60 Hz
Dimensions	156 x 195 x 120 mm
Weight	3,8 kgs
Digital inputs: foot switch, Start- and STOP - function	3
Digital outputs for: Go/No-go/Re-work, classification or motor control, lifting device, master measurement	3

Inputs for:	
digital measuring instruments	4 (channels 10 - 13)
incremental measuring probes	2 (channels 10 &11)
Interface for PC or printer	RS232C
Interface for printer	Centronics
Interface for memory cards	PCMCIA, type 1&2
Measuring programmes	40
Features/programme	50
Test steps/programme	40
Measured value memory:	
Data files	40
Meas. values without PCMCIA-card	10000
Order no.	**5322600**

Connection of probes of other manufacturers on request

Accessories

	Order no.
Classifying Instrument 1240 KG with 20 optocoupler outputs for output of group of class	**5312438**
Control Unit 1240 SG with 3 push-buttons: starting, zero setting, master value acquisition	**5312439**

	Order no.
PCMCIA Memory card, 4MB Flash Memory	**3016026**

Appropriate measuring probes 1300, 1301, 1303, 1304 K, 1310, 1318 and 1340 see as of page 4-15

Electrical Length Measuring Instruments

Milligraph 1292 IC, 1293 IC Electrical Recorder

Features

- Milligraph 1293 IC is a compact electrical recorder, suitable for connection to Millitrons with analog output
- Frequency range 0 - 100 Hz responds to slow as well as fast changes of the measuring value
- Adjustment of the sensitivity permits the optimum use of the available recording width
- Zero setting of the pen at any position of the recording width
- Recording impulses for time based allocation to external events
- Milligraph 1293 IC is a combination of Electrical Recorder Milligraph 1292 IC and the measuring possibilities of a Millitron Length Measuring Instrument
- Use as compact length measuring and recording instrument i.e. in gear testing equipment
- Examination of time related processes possible

Technical Data 1292 IC

Recording pointer	Linear guided
Recording paper	electro-sensitive, recording width 40 mm, roll length 50 m
Paper feed	on front-side and externally switchable
Paper speed	1, 2, 5, 10, 20 and 50 mm/sec
Sensitivity	variable 1 V/cm to 0 pointer deflection
Frequency range	0-100 Hz at ± 10 mm recording width
Zero setting range	coarse-fine to cover recording width
Setting time	max. 10 ms
Linearity error	max. 1,5% of recording width
Voltage input	max. ± 10 V
Mains voltage	230 V; 50 Hz/60 Hz,
Power consumption	approx. 20 VA
Dimension/weight	156 mm x 195 mm x 120 mm / 3 kg
Order-no.	**5312920**

Technical Data 1293 IC (not shown)

Overshot	max. 1% for ± 10 mm printing width					
Probes connections	1					
Appropriate Probes	Inductive Probes 1300, 1301, 1303, 1304 K, 1310[1], 1318 and 1340[2]					
Measuring range	20 µm	40 µm	80 µm	200 µm	400 µm	800 µm
Sensivity	1 µm/Skt	2 µm/Skt	4 µm/Skt	10 µm/Skt	20 µm/Skt	40 µm/Skt
Zero setting range	Coarse/fine ± 400 µ					
Order no.	**5312930**					

Remaining technical data identical to Milligraph 1292 IC

1) the displayed value has to be multiplyed by factor 10
2) to be connected only via adapter 5313490

Accessories

	Order no.
Chart paper 1292 IC/1 width 50 mm, metric 1 pack = 10 rolls	**5312921**
Chart paper 1292 IC/1 width 50 mm, inch 1 pack = 10 rolls	**6872102**
Connecting Cable 1292 IC/2 for connecting 1292 IC to Millitron Compact Measuring Instruments with analog signal output	**5312922**

Appropriate inductive probes see page 4-15

Inductive Measuring Probes for Measuring Instruments with Digital and/or Analog Display 1200 IC to 1240

Common features

- Compact design
- Robust, workshop suited
- Based on the principle of the differential transformer which results in reactionless measuring data acquisition
- Measuring probes offer high measuring accuracy and linearity
- Measuring spindle runs in high precision ball guide, safe against canting, virtually no play and friction
- Tungsten carbide tipped contact points with connecting thread M 2.5
- Operating temperature range + 10 ... + 40 °C
- Satin-chrome finished steel housing
- Cable length 1,5 m

Inductive Measuring Probes 1300, 1300 A

Features

- Both measuring probes can be clamped over their entire length
- Spindle lift on Probe 1300 A pneumatically
- Inductive measuring probes for connection to other manufacturers products available upon request

Technical Data

	1300	1300 A
Measuring range	± 2 mm	
Travel of measuring spindle	4 mm	
Repeatability	≤ 0,1 µm	
Measuring force [1]	0,75 N	
Spindle lift	-	pneumatically vacuum 0,5 bar
Contact point [2]	tungsten carbide ball	
Mounting shank	8 h6 mm	
Class of protection acc. to DIN	IP 64	
Cable length	1,5 m	
Cable outlet	axial	
Order-no.	**5313000**	**5313001**

1) Measuring forces 0,25 N, 0,5 N, 1 N, 1,5 N, 2 N on request
2) For contact points see page 3-24

Accessories

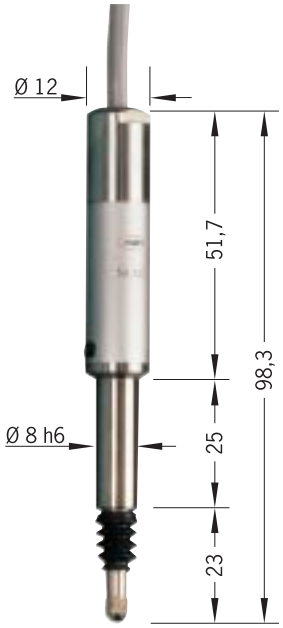
		Order-no.
Extension cable	1 m	**9024001**
Extension cable	3 m	**9024003**
Extension cable	7 m	**9024007**
Extension cable	10 m	**7021788**

		Order-no.
Pneumatic Lifter	**1300 A/1**	**5313002**
Electrical Lifter	**1300 A/2**	**5313007**
Hand Button for 1300 A/2	**1300 A/3**	**5313006**
Foot Switch for 1300 A/2	**1300 A/3F**	**5313008**
Pneumatic Foot Switch for max. 4 Probes 1300 A	**1340/1F**	**5313419**

Stating type of measuring probe or order-no. a detailed data sheet can be requested.

Electrical Length Measuring Instruments

Inductive Measuring Probes 1301, 1303



Features

- Both probes are identical in their measuring and electrical characteristics
- Probe 1301 has axial, Probe 1303 radial cable outlet
- Inductive probes for connection to other manufacturers products upon request

Technical Data

	1301	1303
Measuring range	± 1 mm	
Travel of measuring spindle	4 mm	
Repeatability	≤ 0,1 µm	
Measuring force[1)]	0,75 N	
Spindle lift	manually	
Contact point[2)]	Tungsten carbide ball	
Mounting shank	8 h6 mm	
Class of protection acc. to DIN	IP 64	
Cable length	1,5 m	
Cable outlet	axial	radial
Order-no.	**5313010**	**5313030**

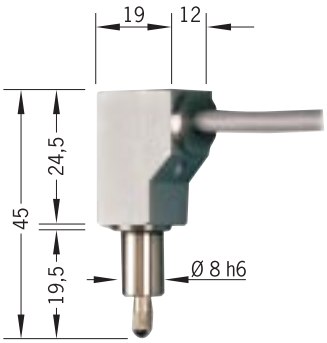
1) Measuring forces 0,25 N, 0,5 N, 1 N, 1,5 N, 2 N on request
2) For contact points see page 3-24

Accessories

		Order-no.
Cable Release with clamping ring	**1399**	**5313990**

Additional accessories listed below

Inductive Measuring Probe 1304 K



Features

- Measuring probe in compact design
- Ideally suited for fixtures in akward positions
- Inductive probes for connection to other trade marks on request

Technical Data

	1304 K
Measuring range	± 1 mm
Travel of measuring spindle	2 mm
Repeatability	≤ 0,15 µm
Measuring force[1)]	0,75 N
Spindle lift	-
Contact point[2)]	Tungsten carbide ball
Mounting shaft	8 h6 mm
Class of protection acc. to DIN	IP 62
Cable outlet	radial
Order-no.	**5313049**

1) Measuring forces 0,25 N, 0,5 N, 1 N, 1,5 N, 2 N on request
2) For contact points see page 3-24

Accessories

			Order-no.
Extension Cable	1 m	**1288/1**	**5312881**
Extension Cable	2,5 m	**1288/2,5**	**5312882**
Extension Cable	5 m	**1288/5**	**5312885**
Extension Cable	7,5 m	**1288/7,5**	**5312887**
Extension Cable	10 m	**1288/10**	**5312889**

Remark:
Stating type of measuring probe or order-no. a detailed data sheet can be requested.

Inductive Measuring Probes 1310, 1310 A

Features

- Large measuring range of 10 mm
- Spindle lift on Probe 1310 A pneumatically
- As a result of the reduced sensitivity of this probe the displayed value has to be multiplied by factor 10
- Inductive probes for connection to other manufacturers products upon request

Technical Data

	1310	1310 A
Measuring range	± 5 mm	
Travel of measuring spindle	11 mm	
Repeatability	≤ 0,1 µm	
Measuring force [1]	0.75 N	
Spindle lift	-	pneumatically
Contact point [2]	Tungsten carbide ball	
Mounting shaft	8 h6 mm	
Class of protection acc. to DIN	IP 52	
Cable length	1,5 m	
Cable outlet	axial	
Order-no.	**5313100**	**5313101**

1) Measuring forces 0,25 N, 0,5 N, 1 N, 1,5 N, 2 N on request
2) For contact points see page 3-24

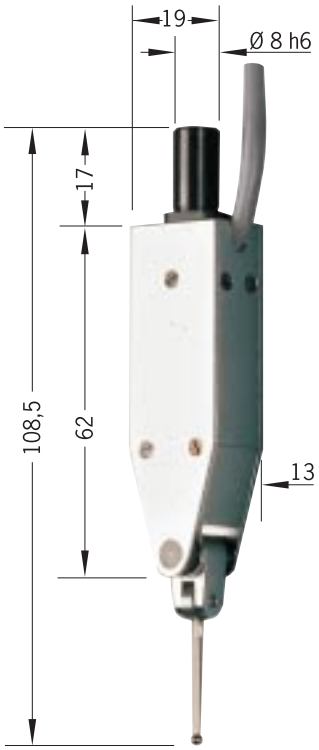
Accessories

		Order-no.
Extension cable	1 m	**9024001**
Extension cable	3 m	**9024003**
Extension cable	7 m	**9024007**
Extension cable	10 m	**7021788**

		Order-no.
Pneumatic Foot Switch for max. 4 Probes 1310 A	**1340/1F**	**5313419**

Stating type of measuring probe or order-no. a detailed data sheet can be requested.

Inductive Lever-type Test Indicator 1318 Puppitron



Features

- Fast and reliable determination of permissable dimensional deviations even on difficult accessible measurement locations
- Tungsten carbide-tipped stylus can move sideways and has a swivel range of 180°
- 2 slip clutches prevent overloading in both directions
- Mounting shank can be attached to rear and top side

Technical Data

	1318
Measuring range	± 0,3 mm
Upper stop 1)	+ 1 mm
Lower stop 1)	- 0,3 mm
Repeatability	≤ 0,03 µm
Measuring force	0,25 N
Spindle lift	-
Contact point	Tungsten carbide ball 2 mm ø
Free stylus length	21 mm
Swivel range of stylus	180°
Mounting shank	8 h6
Class of protection acc. to DIN	IP 50
Cable outlet	on side
Order-no.	**5313180**

1) with reference to electrical zero

Accessories

			Order-no.
Extension Cable	1 m	**1288/1**	**5312881**
Extension Cable	2,5 m	**1288/2,5**	**5312882**
Extension Cable	5 m	**1288/5**	**5312885**
Extension Cable	7,5 m	**1288/7,5**	**5312887**
Extension Cable	10 m	**1288/10**	**5312889**

	Order-no.
Stylus with tungsten carbide ball d = 2 mm; L = 21 mm (standard)	**3005223**
Stylus with tungsten carbide ball d = 1 mm; L = 21 mm	**7003902**
Stylus with tungsten carbide ball d = 3 mm; L = 21 mm	**7003903**

Stating type of measuring probe or order-no. a detailed data sheet can be requested.

Inductive Measuring Probe 1340

Features

- Best results when used with Millitron 1240
- Unprecedented measuring accuracy and minimum linearity error < 0,01 %, i. e. 0,4 µm over entire measuring range
- Probe protected against dirt and moisture thus well suited for factory applications

Technical Data

	1340
Measuring range	± 2 mm
Travel of measuring spindle	5,2 mm
Repeatability	≤ 0,08 µm
Linearity error	≤ 0,01 %
Measuring force	0,75 N
Spindle lift	pneumatically
Contact points	Tungsten carbide ball
Mounting shank	8 h6 mm
Class of protection acc. to DIN	IP 64
Cable outlet	on side
Order-no.	**5313400**

Accessories

		Order-no.
Extension cable	5 m	**5313425**
Extension cable	10 m	**5313421**
Extension cable	20 m	**5313422**
Extension cable	30 m	**5313423**

		Order-no.
Pneumatic Lifter	**1340/1**	**5313420**
Pneumatic Foot Switch for max. 4 Probes 1340	**1340/1F**	**5313419**
Adapter which connects to Millitron instruments with 5-pin socket		**5313490**

Stating type of measuring probe or order no. a detailed data sheet can be requested.

Electrical Length Measuring Instruments

Digital Long Range Measuring Instruments Millitron 1500 and 1501 with Digital Display

Features

- Connection for one incremental measuring probe
- Counting direction selectable
- Zeroing at any position of the measuring stroke
- 3 operating modes: continuous display, permanent storage of display value and storage after acceptance (manually or via switching contact)
- All functions can be externally actuated
- Millitron 1501 with additional preset switch for entering of nominal values
- Display of the absolute value of preset and actual measuring value of the incremental measuring probe
- Standard accessories: operating instructions and mains cable

Technical Data

	1500	1501
Measuring range	up to 100 mm, depending on measuring probe used	
Resolution (adjustable)	1 µm, 0,5 µm, 0,1 µm	
Display	6 1/2 digits (± 1 999 999 µm)	
Suitable probes	1512, 1525, 1581 und 1591	
Selector switch for pre-set [1]	-	1
Selector switch for limit values [1] [3]	-	-
Deviation span	≤ 0,5 of resolution	
Data output	RS232C and BCD-bit serial	
Class of protection	IP 40	
Operating temperature range	+ 10 ... + 40 °C	
Mains connection	230 V~/115 V~ ± 10%, 50-60 Hz (selectable)	
Power consumption	appr. 15 VA	
Dimensions	156 x 195 x 120 mm	
Weight	2 kg	
Order-no.	**5315000**	**5315010**

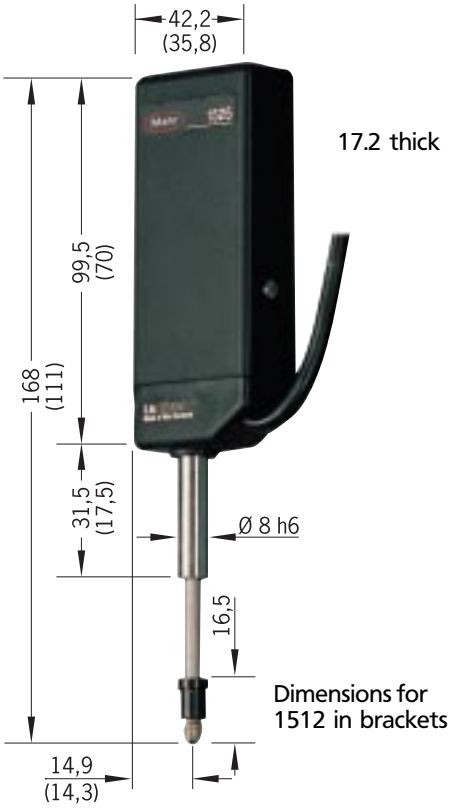
1) 6 digits + sign
2) Preset value can be accepted via switch or external switching contact
3) A signal is available on the control output when a limit value is exceeded

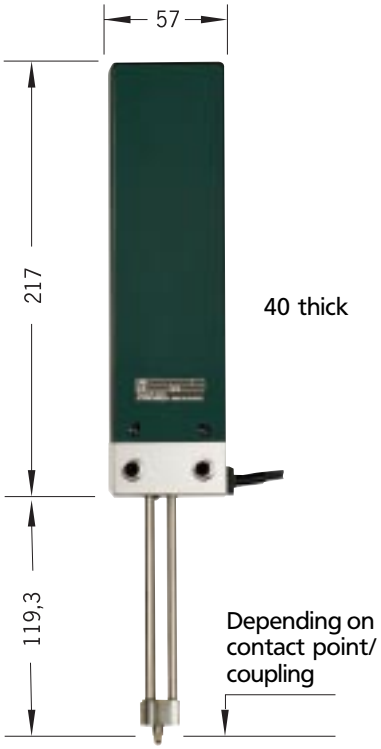
Accessories

		Order-no.
Ext. Zeroing Contact	**1500/2**	**5315002**
Ext. Storage Contact	**1500/3**	**5315003**
Ext. Preset Button	**1500/4**	**5315004**

		Order-no.
Data cable Millitron to PC		**7024634**
Data Plug for control input	**1280**	**3001730**

Incremental Measuring Probes for Long-range Measuring Instrument with Digital Display





Features

- Movement of the measuring spindle is detected by a scan grid system employing photo-electric cells responding to light/dark contrasts
- On Measuring Probes 1512 and 1525 the measuring spindle is retracted by means of a pneumatically cushioned cable release (standard accessory)

Technical Data

	1512	1525	1581
Measuring system	DIADUR-grid line glass scale, resolution 10 µm		
Measuring range	12 mm	25 mm	100 mm
Deviation limits	±0,5 µm	±0,5 µm	±1 µm
Operating position	no limitation	no limitation	no limitation
Measuring force vertical, downw.	0,55...0,8 N	0,55 N	–
Measuring force vertical, upwards	0,35...0,6 N	0,3 N	–
Measuring force horizontal	0,45...0,7 N	0,42 N	–
Mass to be moved	9 g	13 g	165 g
Max. measuring speed	0,25 m/s	0,25 m/s	0,25 m/s
Permissable lateral force	0,2 N	0,2 N	2 N
Max. shock acceleration*	1000 m/s²	1000 m/s²	1000 m/s²
Max. acceleration from vibrations	100 m/s²	100 m/s²	100 m/s²
Class of protection	IP 50	IP 50	IP 50
Reference temperature	20° C	20° C	20° C
Operating temperature	0...50° C	0... 50° C	10...50° C
Storage temperature	-30...+70° C	-30..+70° C	-30...+70° C
Mode of attachment	Mounting shank	Mounting shank	Face for screws
Weight incl. cable and plug	240 g	300 g	1200 g
Connecting cable**	1,5 m	1,5 m	1,5 m
Order-no.	**5315120**	**5315250**	**5315810**

** Accuracy not guaranteed* *** Cable extension up to max. 10 m on request*

Accessories

For contact points see page 3-24