

Test Indicators

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Testing of Test Indicators, Dial Indicators and Dial Comparators



All test indicators, dial indicators and dial comparators are subject to a final inspection in production on Mahr measuring machines (865, 875 and Optimar 100).

The following, in

- DIN 2270 (test indicators)
 - DIN 878 (dial indicators)
 - DIN 879 (dial comparators)
- defined parameters, will be tested:

• Span of error f_e

Span of error f_e is the distance between the ordinates of the highest and lowest points in the deviation diagram either when the plunger is being pressed in (dial indicators, dial comparators) or in the case of excursion of stylus against measuring force (test indicators).

• Total span of error f_{ges}

The total span of error f_{ges} is the distance between the ordinates of the highest and lowest points in the deviation diagram when the plunger is being pressed in and let out (dial indicators, dial comparators) or in the case of excursion of stylus against and with the same direction of measuring force (test indicators). The total span of error includes the hysteresis error of the measured value f_u .

• Local span of error f_t

Span of error f_t is the distance between the ordinates between the highest and lowest points in the deviation diagram, measured for a local measuring span of 10 scale divisions within 0,1 mm when the plunger is being pressed in (dial indicators, dial comparators) or in the case of excursion of stylus against measuring force (test indicators).

• Repeatability f_w

Repeatability f_w is a characteristic for measured value fluctuations in measurements of the same measurand within the measuring span and with the same direction of movement of the plunger (dial indicators, dial comparators) or of the stylus (test indicators).

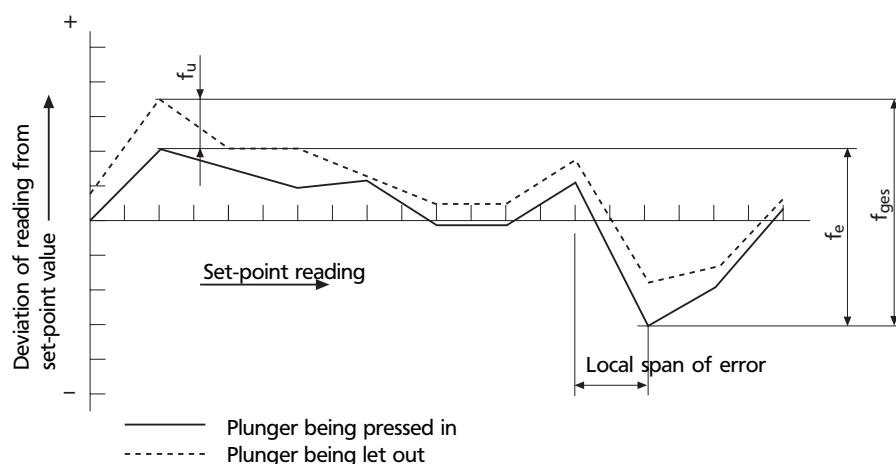


Diagram for the spans of error f_e and f_{ges} and hysteresis error of the measured value f_u (example)

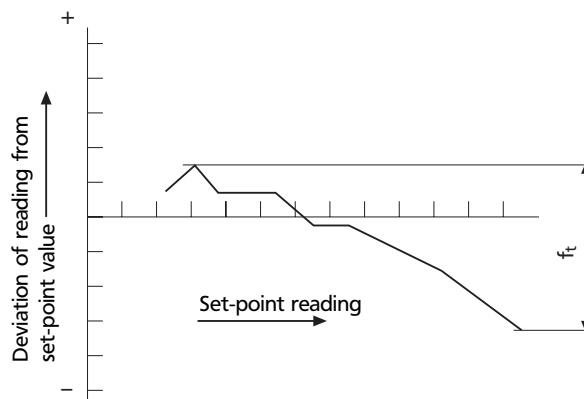


Diagram of the span of error f_t (example)

Design features of Mahr Test Indicators Puppitast

- Easy to read thanks to high-contrast, rotatable dial face
- Box-type housing open on one side only
- Bottom and side walls made of one piece. This shell totally encloses the movement and provides maximum protection against shock and damage
- The front end of the housing is of fork-shaped design with the stem of the stylus mounted in the fork to provide high stability. The precision alignment of the two bearings ensures maximum accuracy



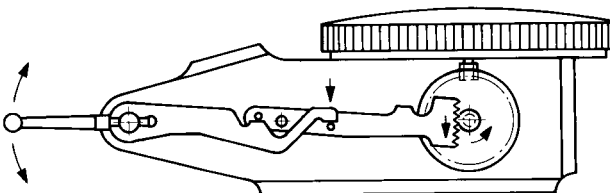
- Overload protection provided by slip clutch
- Low measuring force



- Maximum sensitivity and accuracy provided by precision gears and pinions
- Jewelled movement bearings



- Corrosion-proof due to satin-chrome finish on housing



- Automatic matching to sensing direction, i. e. pointer always moves in clockwise direction, thus ensuring error-free reading

- Rigid mounting
- Mounting shank can move on three dovetail guideways which are integral parts of the sturdy housing
- They can be clamped at any desired point with a knurled nut. No tools are required.
- No plastic parts except for transparent cover over dial face



800 S
Standard model



800 SG
Extra-large dial face



800 SL
Extra-long stylus

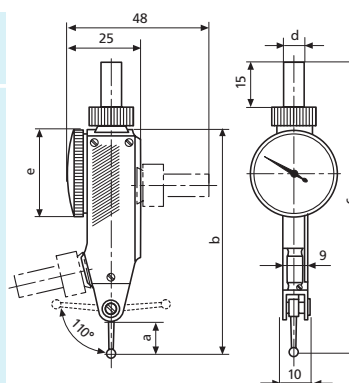
Technical Data

	Measuring range	Readings	Dial diam.	Swivel-range of styluses	Measuring force	f_e	f_{ges}	f_u	Order no.
800 S	$\pm 0,4$ mm	0,01 mm	27,5 mm	11,5 mm	0,15 N	10 μ m	13 μ m	3 μ m	4305100
800 SG	$\pm 0,4$ mm	0,01 mm	38 mm	11,5 mm	0,15 N	10 μ m	13 μ m	3 μ m	4307100
800 SL	$\pm 0,4$ mm	0,01 mm	27,5 mm	36 mm	0,07 N	10 μ m	13 μ m	5 μ m	4306100
800 SM	$\pm 0,1$ mm	0,002 mm	38 mm	11,5 mm	0,15 N	3 μ m	4 μ m	2 μ m	4308100
800 W	$\pm 0,4$ mm	0,01 mm	27,5 mm	12 mm	0,3 N	10 μ m	13 μ m	5 μ m	4303000
800 SGI	$\pm 0,3$ mm ($\pm .15''$)	0,01 mm (.0005'')	38 mm (1.5'')	11,5 mm (.45'')	0,15 N	.0004''	.0005''	.00012''	4307106
800 SZ	$\pm .015''$	.0005''	1.1''	.45''	0,15 N	.0004''	.0005''	.00012''	4305910
800 SGZ	$\pm .015''$	.0005''	1.5''	.45''	0,15 N	.0004''	.0005''	.00012''	4307910
800 SLZ	$\pm .015''$	.0005''	1.1''	1.35''	0,07 N	.0004''	.0005''	.0002''	4306910
800 SMZ	$\pm .004''$	.0001''	1.5''	.45''	0,15 N	.00012''	.00016''	.00008''	4308910
800 WZ	$\pm .015''$	.0005''	1.1''	.47''	0,3 N	.0004''	.0005''	.0002''	4303900

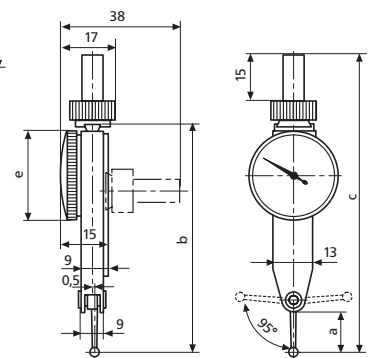
800 S

Diameters mm

	a	b	c	d	e
800 S	11,5	76	99	8h6	29
800 SG	11,5	76	99	8h6	40
800 SL	36	100,5	123,5	8h6	29
800 SM	11,5	76	99	8h6	40
800 W	12	73	96	8h6	29
800 SGI	11,5	76	99	8h6 and $\frac{1}{4}''$	40
800 SZ	11,5	76	99	8h6 and $\frac{1}{4}''$	29
800 SGZ	11,5	76	99	8h6 and $\frac{1}{4}''$	40
800 SLZ	34	98,5	121,5	8h6 and $\frac{1}{4}''$	29
800 SMZ	11,5	76	99	8h6 and $\frac{1}{4}''$	40
800 WZ	11,3	72,3	95,3	8h6 and $\frac{1}{4}''$	29



800 W/800 WZ



Standard accessories:
Mounting shank 8h6 mm and $\frac{1}{4}''$
(for instruments with inch-scale),
stylus dia. 2 mm and plastic case

Test Indicators

Mahr



800 SM
with high resolution



800 W
Stylus moves parallel
to dial



800 SGI
with mm/inch scale

Accessories

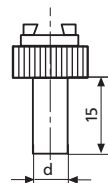
Styluses 801 t

for types	Stylus length /in mm	801 te chromium-plated ball dia. in mm			801 tl chromium-plated ball dia. in mm		801 tr, with ruby ball ball dia. in mm
		ø1	ø2	ø3	ø1	ø2	ø2,5
800 S / 800 SZ	16,1	4309015	4309016	4309014			4309088
800 SG / 800 SGZ	16,1	4309015	4309016	4309014			4309088
800 SM	16,1	4309015	4309016	4309014			4309088
800 SMZ	16,1	4309015	4309016	4309014			4309088
800 W	16,85	4309011	4309012	4309013			4309030
800 WZ	16,1	4309015	4309016	4309014			4309088
800 SGI	16,1	4309015	4309016	4309014			4309088
800 SL	40				4309021	4309020	
800 SLZ	38					4309920	

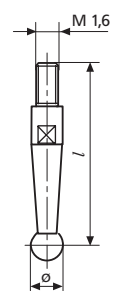
Mounting Shank 801 a

	mounting shank dia. d	Order no.
801 a8	8h6 mm	4300800
801 a4	4h6 mm	4300801
801 a 1/4"	1/4" (6,35 mm)	4300805

801 a



801 t



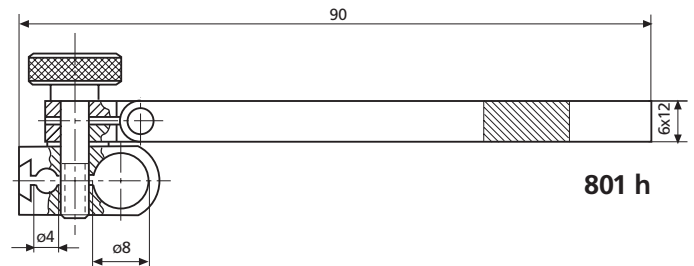
	Order no.
Spanner for changing styluses	4309040
Adapter Bush for adapting mounting shank dia. 8h6 mm to inch bore .375"	940 4310103

Accessories

Universal Holder 801 h

- For mounting test indicators on machine tools
- With swivel-type knuckle

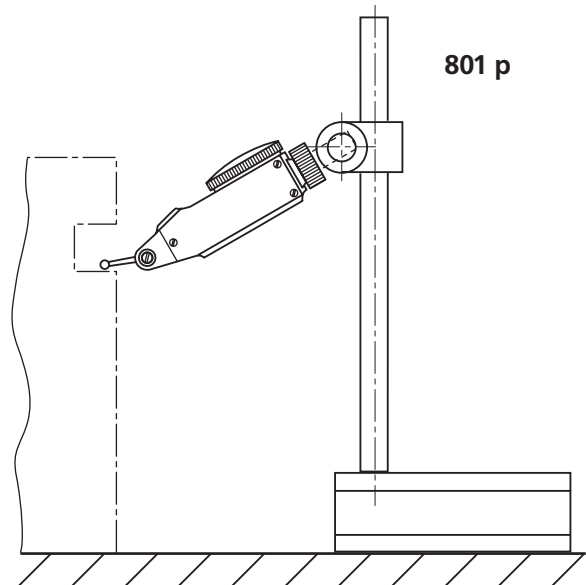
Order no. 4309066



Stand 801 p

- With swivel holder
- Base with V-groove 140°
- Overall height 150 mm
- Mounting bore dia. 4 and 8 mm
- Column dia. 8 mm
- Base surface 65 x 40 mm

Order no. 4309081

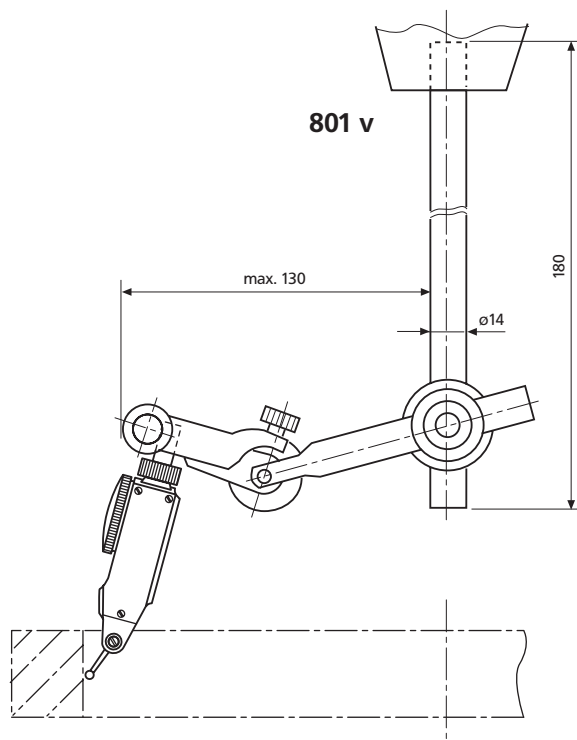


Centering Support Rods 801 v

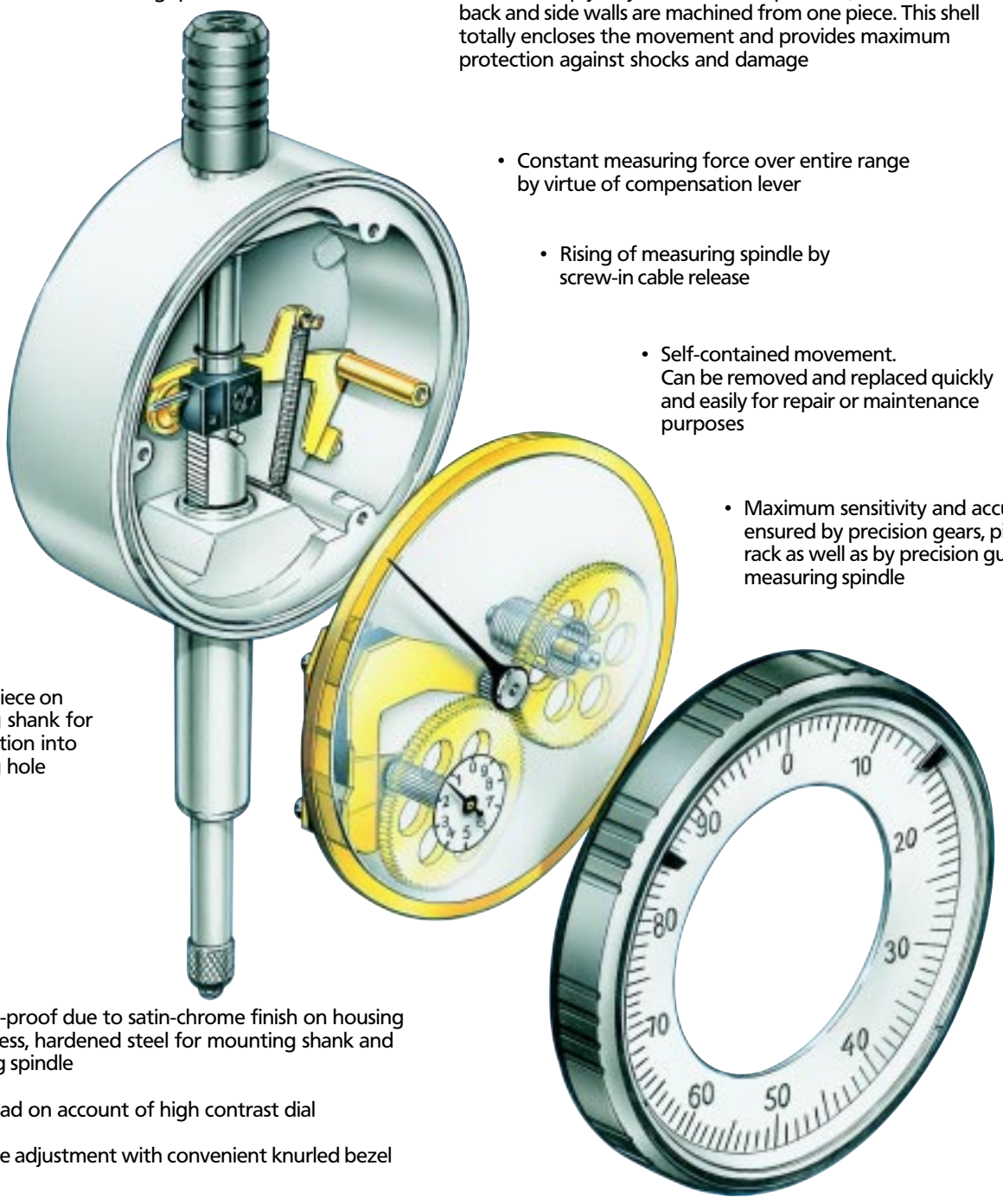
- For aligning and centering workpieces on machine tools
- Swivel mounting clamp and fine adjustment
- Stainless steel rods

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

Order no. 4309070



Design features of Mahr dial indicators

- Protective and lifter cap mounted on upper end of measuring spindle
 - Protective housing only opens at the front. The housing is thus not simply a cylinder with a cap over it, but rather the back and side walls are machined from one piece. This shell totally encloses the movement and provides maximum protection against shocks and damage
 - Constant measuring force over entire range by virtue of compensation lever
 - Rising of measuring spindle by screw-in cable release
 - Self-contained movement. Can be removed and replaced quickly and easily for repair or maintenance purposes
 - Maximum sensitivity and accuracy ensured by precision gears, pinion and rack as well as by precision guide for measuring spindle
 - Tapered piece on mounting shank for easy insertion into mounting hole
 - Corrosion-proof due to satin-chrome finish on housing and stainless, hardened steel for mounting shank and measuring spindle
 - Easy to read on account of high contrast dial
 - Simple fine adjustment with convenient knurled bezel
 - Shockproof movement
On all dial indicators with the exception of the long-range model 810 V the rack is not located directly on the measuring spindle, but rather on a sleeve which floats on the spindle. The shocks to which the spindle is subjected in everyday use are therefore not transmitted to the rack and mechanism. In the event of shocks, the sleeve lifts off and follows slowly due to spring force. The movement is thus reliably protected even against severe shocks.
 - Adjustable tolerance markers for setting tolerance limits
- 

Dial Indicators shockproof version according to DIN 878



803



803 W



810/810 L



810 W

Features

Small Dial Indicator 803

where available space is limited

- Shockproof via sleeve which floats over the spindle
- Constant measuring force
- Protective housing (back wall integrated in housing)
- Raising of measuring spindle via lifting cap
- Adjustable tolerance markers
- Delivered in plastic case

Small Dial Indicator 803 W

waterproof and oilproof

- Design features identical to 803, but
- Upper protective cap on measuring spindle as well as bezel and transparent dial cover with O-rings hermetically sealed
- Measuring spindle sealed by means of rubber sleeve, thus preventing contamination by liquids and impurities
- Delivered in plastic case

Dial Indicator 810

standard version

- Shockproof via sleeve which floats over the spindle
- Constant measuring force
- Protective housing (back wall integrated in housing)
- Raising of measuring spindle via lifting cap or cable release 951 (accessory)
- Adjustable tolerance markers
- Delivered in plastic case

Dial Indicator 810 L

- Design features identical to 810, but with tapped holes for mounting lugs 961 and 962 (accessories)
- Delivered in plastic case

Dial Indicator 810 W

waterproof and oilproof

- Design features identical to 810, but upper protective cap on measuring spindle as well as bezel and transparent dial cover with O-rings hermetically sealed
- Measuring spindle sealed by means of rubber sleeve, thus preventing contamination by liquids and impurities
- Delivered in plastic case

Technical Data

	Range	Readings	Dial dia.	Overtravel	Measuring force	Accuracy (DIN 878)			Order no.
	mm	mm	mm	mm	N	f_e μm	f_{ges} μm	f_u μm	
803	3	0,01	35	0,2	1,1 N	10	12	3	4324110
803 W	3	0,01	35	0,2	1,1 N	10	12	3	4326100
810	10	0,01	50	1,1	1,0 N	15	17	3	4311110
810 L	10	0,01	50	1,1	1,0 N	15	17	3	4327110
810 W	10	0,01	50	1,1	1,0 N	15	17	3	4315100
810 B	0,8(±0,4)	0,01	50	0,05	1,0 N	7	9	3	4317110

	Range	Readings	Dial dia.	Overtravel	Measuring force	Accuracy (DIN 878)			Order no.
	inch	inch	inch	inch	N	f_e inch	f_{ges} inch	f_u inch	
803 Z	.120"	.0005"	1.4"	.008"	1,1 N	.0004"	.0005"	.00012"	4324911
810 Z	.400"	.0005"	2.0"	.040"	1,0 N	.0006"	.0007"	.00012"	4311911

Dial Indicators shockproof version according to DIN 878



810 B



803 Z



810 Z

Features

Dial Indicator 810 B with limited measuring range

Design features identical to 810, but

- Limited measuring range (0,8 mm) for error-free readings

- Large overtravel (10 mm); for example for easier insertion of test items in measuring devices
- Standard accessory: Plastic case

Small Dial Indicator 803 Z inch version

Design features identical to 803, but

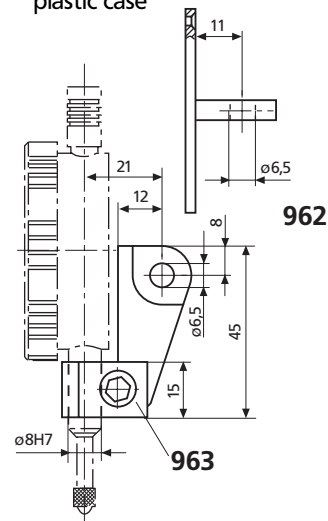
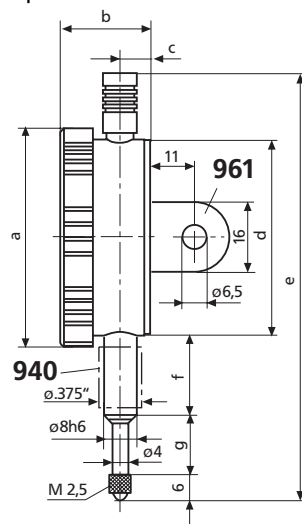
- Standard accessories: Adapter Bush 940 for adapting mounting shank 8h6 mm to inch bore .375", plastic case

Dial Indicator 810 Z inch version

Design features identical to 810, but

- Standard accessories: Adapter Bush 940 for adapting mounting shank 8h6 mm to inch bore .375", plastic case

Dimensions mm	a	b	c	d	e	f	g
803	ø 40	21	7	ø 37	74	13,5	6
803 W	ø 44	21,5	7	ø 37	80	15	11
810	ø 58	23	7,5	ø 53	112	21	15,5
810 L	ø 58	23	7,5	ø 53	112	21	15,5
810 W	ø 60	24	7,5	ø 53	118	16,5	22,5
810 B	ø 58	23	7,5	ø 53	112	21	15,5
803 Z	ø 40	21	7	ø 37	74	13,5	6
810 Z	ø 58	23	7,5	ø 53	112	21	15,5



Accessories

	Order no.	
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	940	4310103
Cable Release for lifting of measuring spindle (except 803, 803 Z, 803 W, 810 U, 810 V)	951	4372000
Splash Guard Covers for bezel dia. 58 mm	955	4373020
for bezel dia. 40 mm	956	4373021

	Order no.	
Mounting Lugs for 810 L, 810 V		
Bore is perpendicular to mounting shank	961	4375010
Bore is parallel to mounting shank	962	4375011
Mounting Lug for mounting on mounting shank for all types (except 810 V)	963	4375002
Additional Accessories		page
Contact Points	901-913	3-24
Special Holders	941	3-25
Sensor Level	943	3-25

Dial Indicators shockproof version



810 U



810 X



810 V

Features

Dial Indicator 810 U with reverse measuring force

Design features identical to 810, but

- Numerals on dial increase anti-clockwise
- Measuring force acting towards the top
- Delivered in plastic case

Dial Indicator 810 X readings 0,1 mm

Design features identical to 810, but

- 1 pointer movement on 10 mm
- Delivered in plastic case

Long-Range Dial Indicator 810 V with extra-large measuring range

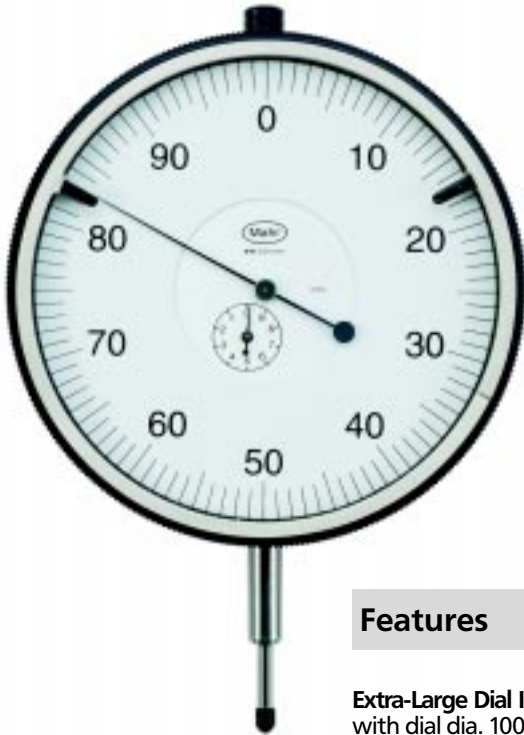
Design features identical to 810, but

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

Technical Data

	Range	Readings	Dial dia.	Overtravel	Measuring force	f_e	Accuracy	f_u	Order no.
	mm	mm	mm	mm	N	μm	f_{ges} μm	μm	
810 U	10	0,01	50	1,1	1	15	17	5	4329110
810 V	40	0,01	50	0,3	0,75-1,5	25	30	6	4321110
810 X	10	0,1	50	0,5	1	40	55	15	4331110
810 G	10	0,01	100	1,1	1,3	15	17	5	4322100

Dial Indicators shockproof version



Features

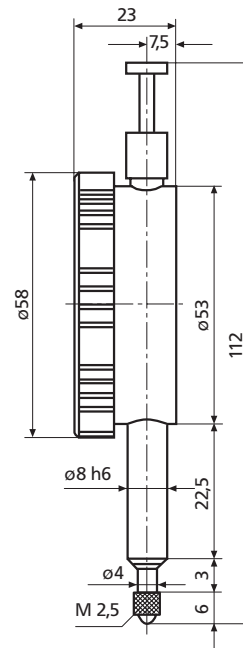
Extra-Large Dial Indicator 810 G
with dial dia. 100 mm

Design features identical to
810, but

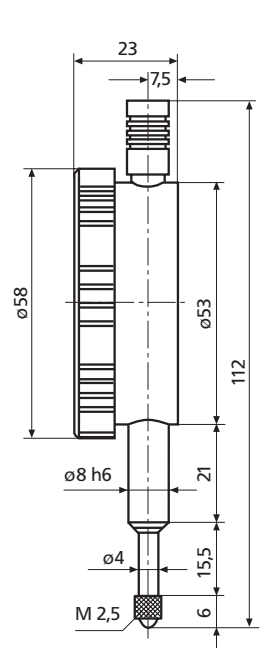
- Application for large reading distance and bad light conditions
- Plastic outer ring
- Delivered in folded box

Dimensions

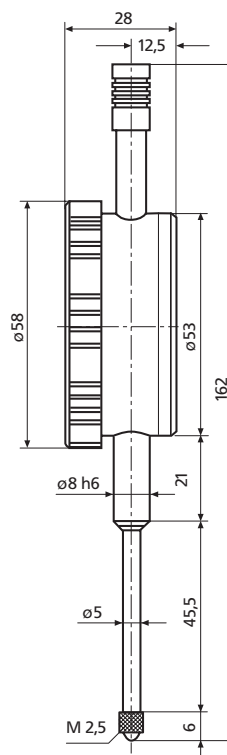
810 U



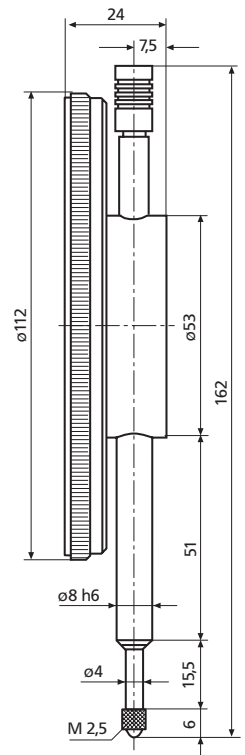
810 X



810 V



810 G



Accessories

	Order no.	
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	940	4310103
Cable Release for lifting of measuring spindle (except 803, 803 Z, 803 W, 810 U, 810 V)	951	4372000
Splash Guard Cover for bezel dia. 58 mm	955	4373020
Mounting Lugs for 810 L, 810 V		
Bore is perpendicular to mounting shank	961	4375010
Bore is parallel to mounting shank	962	4375011
Mounting Lug for mounting on mounting shank for all types (except 810 V)	963	4375002

Additional Accessories	page	
Contact Points	901-913	3-24
Special Holders	941	3-25
Sensor Lever	943	3-25

Digital Dial Indicators 1083/1085 Millitast

Features

Millitast 1083

- Functions:
 - ON/OFF
 - RESET (zero setting of display)
 - PRESET (set buttons can be used to enter any numerical value)
 - mm/inch-switching
 - DATA (data transmission in connection with data connection cable)
 - HOLD (storage of current measuring value)
 - mm/inch-switch
 - Reversal of counting direction
 - Switching of analog display
- Capacitive measuring system, life of battery approx. 2 years
- Max. measuring speed 1,5 m/s (60"/s)
- Data output: OPTO RS232C (Mahr Duplex)
- Dial indicator can be operated by remote control via interface
- High-contrast 6,5 mm liquid crystal display, analog display with 4 mm pointer length for better visual perception when checking roundness or flatness as well as reversal point search when measuring bores
- Function and display section can be rotated through 280°
- Class of protection IP 52 as per IEC 529
- Operating temperature 5 - 40° C
- Standard accessory: Battery

Millitast 1085

- Design features identical to 1083, but additional functions:
- 3 x PRESET can be stored
 - 2 additional analog displays
 - MAX / MIN memory, for example for reversal point search
 - MAX-MIN for example for checking of roundness and flatness
 - ABS: zero setting does not cause reference to current PRESET value to be lost
 - LOCK: buttons can be locked to avoid inadvertent adjustment
 - Standard accessory: Battery

Technical Data

	Range mm (inch)	Resolution mm/inch	Span of error f _e mm (inch)	Measuring force N	Weight g	Order no.
1083	12,5 (.5")	0,001 / .00005"	0,005 (.0002")	0,7-0,95	160	4336800
	25 (1")	0,001 / .00005"	0,005 (.0002")	0,6-1,1	160	4336801
1085	12,5 (.5")	0,001 / .00005"	0,005 (.0002")	0,7-0,95	160	4336301
	25 (1")	0,001 / .00005"	0,005 (.0002")	0,6-1,1	160	4336300

Analog display 1083

Readings mm / inch	Display range mm (inch)
0,001 / .00005"	± 0,03 (± .0015")
0,01 / .0005"	± 0,30 (± .0150")

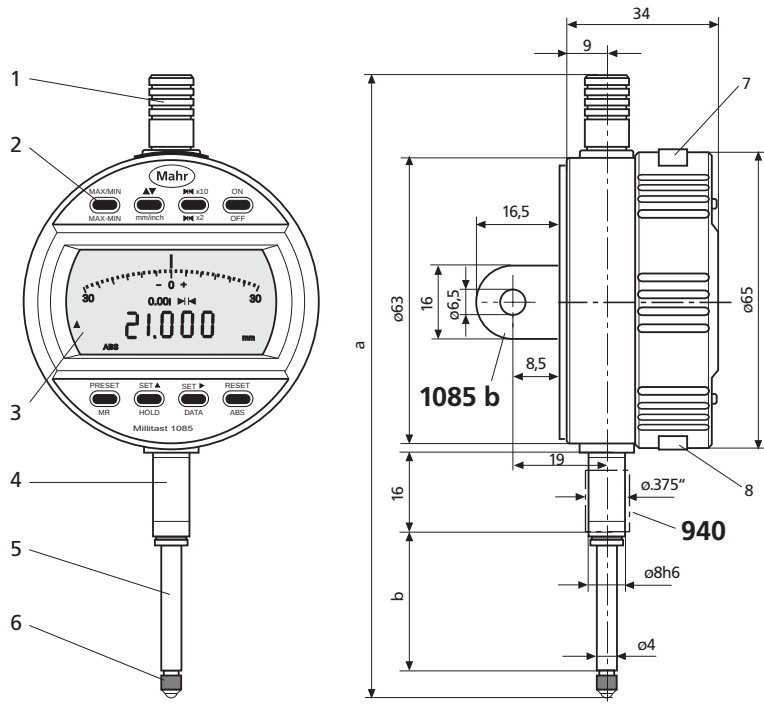


Analog display 1085

Readings mm (inch)	Display range mm (inch)
0,001 (.00005")	± 0,03 (± .0015")
0,002 (.0001")	± 0,06 (± .0030")
0,01 (.0005")	± 0,30 (± .0150")
0,02 (.001")	± 0,60 (± .0300")

Digital Dial Indicators 1083/1085 Millitast

- 1 Protective lifting cap for measuring spindle
- 2 Operating buttons
- 3 Display
- 4 Mounting shank
- 5 Measuring spindle
- 6 Contact Point 901
- 7 RS232C-Data output
- 8 Battery compartment
- 9 Swivelling operating and display unit

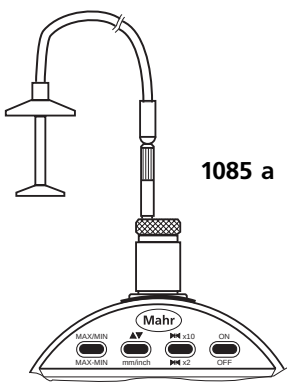


Dimensions (mm)		a	b
1083 / 1085 12,5 mm (.5")		125,5	19
1083 / 1085 25 mm (1")		138	31,5

Accessories

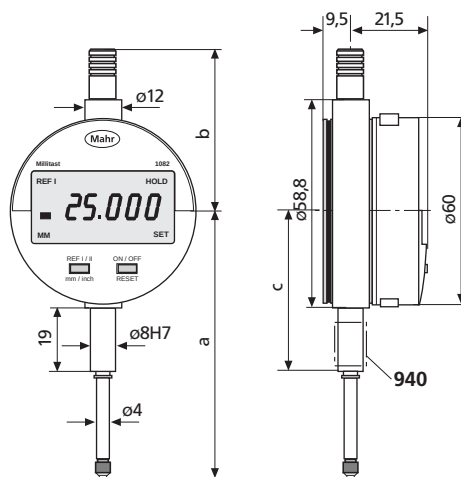
	Order no.
Battery 3V, type CR 2450	4884464
Data Connecting Cable RS232C (2m) for connection to PC, SUB-D-jack 9-pin	1085 v 4336305
Data Connecting Cable RS 232C (2m) for connection to peripheral units	16 ESv 4102510
Cable Release	1085 a 4336311
Mounting Lug	1085 b 4336310
Adapter Bush for adapting mounting shank dia. 8h6 mm to inch bore .375"	940 4310103

Additional Accessories		page
Contact Points	901-913	3-24
Special Holder	941	3-25
Sensor Lever	943	3-25



Accessories for data processing see chapter 9

Digital Dial Indicator 1082



Dimensions mm	a	b	c
12,5 mm (.5")	65,9	53,4	50
25 mm (1")	78,4	53,4	50
50 mm (2")	150,5	124	99,5
100 mm (4")	250,5	174	149,5

Features

- Functions:
 - ON/OFF
 - RESET (zero setting)
 - PRESET (set buttons can be used to enter any numerical value)
 - mm/inch-switch
 - DATA (data transmission)
 - HOLD (storage of current measuring value)
- Capacitive measuring system, life of battery approx. 2 years
- Max. measuring speed 1,5 m/s (60"/s)
- Data output: OPTO RS232C
- High-contrast 8,5 mm liquid crystal display
- Function and display section can be rotated through 280°
- Class of protection IP 51 as per IEC 529
- Operating temperature 5 - 40°C
- Standard accessory: Battery

Technical Data

Range	Resolution	Span of error f _p	Measuring force	Weight	Order no.
mm (inch)	mm/inch	mm (inch)	N	g	
25 (1")	0,01 / .0005"	0,01 (.0004")	0,6 - 1,1	220	4336206
50 (2")	0,01 / .0005"	0,02 (.0008")	2,0 - 3,0	400	4336207
100 (4")	0,01 / .0005"	0,02 (.0008")	2,3 - 4,0	600	4336208
12,5 (.5")	0,001 / .00005"	0,005 (.0002")	0,7 - 0,95	220	4336201
25 (1")	0,001 / .00005"	0,005 (.0002")	0,6 - 1,1	220	4336200
50 (2")	0,001 / .00005"	0,012 (.0005")	2,0 - 3,0	430	4336202
100 (4")	0,001 / .00005"	0,015 (.0006")	2,3 - 4,0	620	4336203

Accessories

	Order no.
Battery 3V, type CR 2032	4102520
Data Connecting Cable (2m), for connection to peripheral units, with SUB-D jack 9-pin	16 ESv 4102510
Cable Release for range 12,5 and 25 mm	1085 a 4336311
Pneumatic Lifting for range 50 and 100 mm	1082 p 4336230
Mounting Lug	1082 b 4336313
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	940 4310103

Additional Accessories

	page
Contact Points	901-913 3-24
Special Holders	941 3-25
Sensor Lever	943 3-25
	chapter
Accessories for data processing	9

Design features of Mahr dial comparators

- Constant measuring force over entire range due to built-in compression spring



- Corrosion-proof by virtue of hardened, stainless steel mounting shank and measuring spindle

- Protection of ball guide against contamination by means of a sleeve seal ring which is provided with a groove for mounting slip-on rubber bellows to prevent the ingress of splashwater

- Drip-proof version available on request. Features rubber bellows at measuring spindle, sealed screws and splash guard cover

- Measuring spindle mounted in high-precision ball guide prevents tilting and virtually precludes friction and play. The extremely low level of friction makes for high measurement accuracy and minimal hysteresis

- Dial comparators with ball guide are particularly insensitive to lateral forces acting on the spindle (Dial Comparators 1010 and 1050 feature high-precision sleeve bearings for the spindle)

- Shockproof movement.
The precision ball of the first transmission lever rest on the lapped sapphire plane surface of the upper end of the measuring spindle. If the spindle is subject to severe impact, the plane surface is automatically raised, thus preventing transmission of the shock to the movement

- Box-type housing only open at the front

- Bottom and side walls made of one piece. This shell totally encloses the movement and provides maximum protection against shock and damage

- Simple fine adjustment by way of lockable screw

- Self-contained movement.
This unit can be removed and replaced quickly and easily for repair or maintenance purposes



- Maximum sensitivity and accuracy are ensured by jewelled bearings of movement in conjunction with precision gears and pinions



- Easy to read due to clear-cut scale

- Pointer moves over limited sector

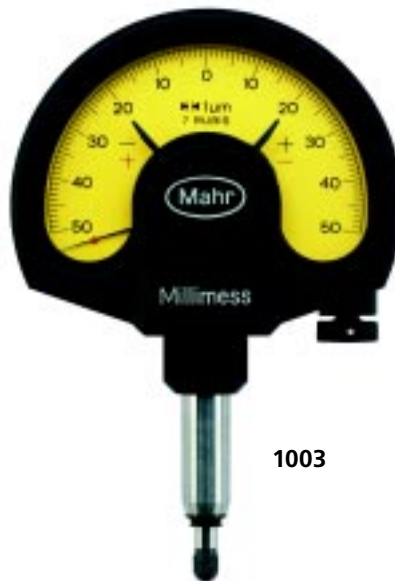
- Adjustable tolerance markers facilitate setting and observation of tolerance limits

- Raising of measuring spindle either by way of screw-in cable or lifting knob

Mechanical Dial Comparators



1002



1003



1004

Technical Data

Metric	Measuring range	Readings	Over-travel	Meas. force	Accuracy* (DIN 879-1)			Order no. standard**	Order no. drip-proof***
					f_e	f_{ges}	f_u		
1002 Supramess	$\pm 25 \mu\text{m}$	$0,5 \mu\text{m}$	2,8 mm	1 N	$0,5 \mu\text{m}$	$0,6 \mu\text{m}$	$0,25 \mu\text{m}$	4335000	4335005
1003 Millimes	$\pm 50 \mu\text{m}$	$1 \mu\text{m}$	2,8 mm	1 N	$1 \mu\text{m}$	$1,2 \mu\text{m}$	$0,5 \mu\text{m}$	4334000	4334005
1004 Compramess	$\pm 0,13 \text{ mm}$	$5 \mu\text{m}$	2,5 mm	1 N	$3,5 \mu\text{m}$	$4 \mu\text{m}$	$1 \mu\text{m}$	4333000	4333005
1010 Zentimes	$\pm 0,25 \text{ mm}$	$0,01 \text{ mm}$	2,5 mm	1 N	$7 \mu\text{m}$	$8 \mu\text{m}$	$2 \mu\text{m}$	4332000	4332005
1050 Dezimes	$\pm 1,5 \text{ mm}$	$0,05 \text{ mm}$	0,3 mm	1 N	$35 \mu\text{m}$	$40 \mu\text{m}$	$10 \mu\text{m}$	4330000	4330005
Inch									
1002 Z Supramess	$\pm .0010''$	$.00002''$	.11"	1 N	$.00002''$	$.000025''$	$.00001''$	4335900	4335905
1003 Z Millimes	$\pm .0020''$	$.00005''$	.11"	1 N	$.00005''$	$.00006''$	$.000025''$	4334900	4334905
1004 Z Compramess	$\pm .0050''$	$.0001''$	.10"	1 N	$.0001''$	$.00012''$	$.00003''$	4333900	4333905
1010 Z Zentimes	$\pm .0100''$	$.0005''$	.10"	1 N	$.00035''$	$.0004''$	$.0001''$	4332900	4332905

* Accuracy of 1004, 1010, 1010 Z, 1050 better than DIN 879-1

** Incl. plastic case; Adapter 940 (for inch instruments only)

*** Incl. plastic case, Splash Guard Cover 957, rubber bellows (only 1002/1003/1004); Adapter 940 (for inch instruments only)

Mechanical Dial Comparators

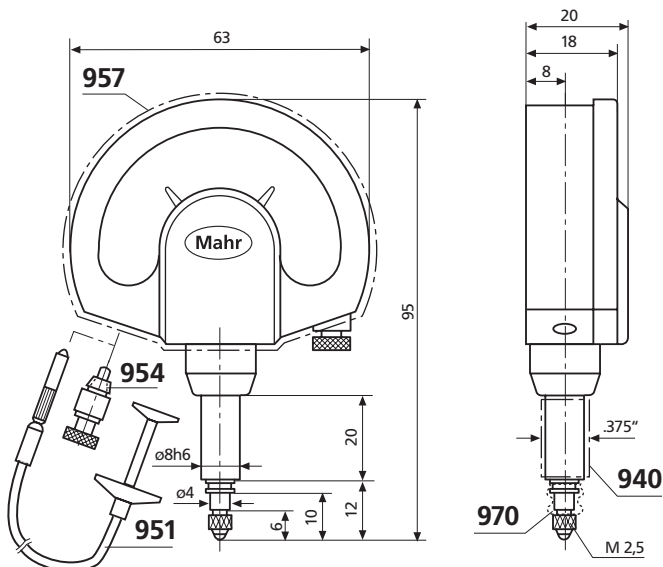


1010

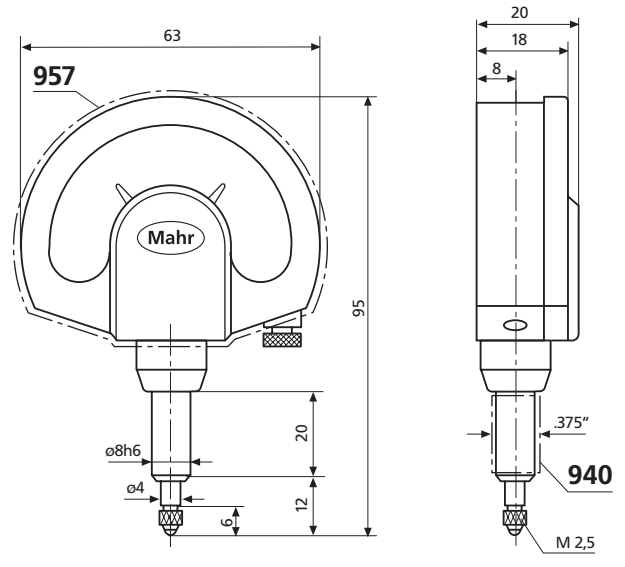


1050

1002/1003/1004



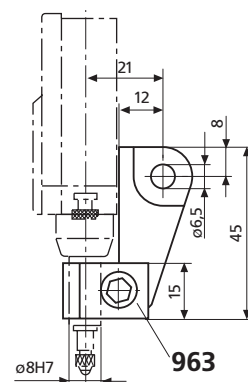
1010/1050



Accessories

	Order no.	
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	940	4310103
Cable Release for lifting of measuring spindle	951	4372000
Lifting Knob for raising measuring spindle	954	4372030
Splash Guard Cover	957	4373030
Rubber Bellow for 1002/1003/1004 for sealing open end of measuring spindle	970	4334786
Mounting Lug for mounting on mounting shank 8h6 mm	963	4375002

Additional Accessories	page	
Contact Points	901-913	3 - 24
Special Holders	941	3 - 25
Sensor Lever	943	3 - 25



Mechanical Dial Comparators with limit contacts



1103 N



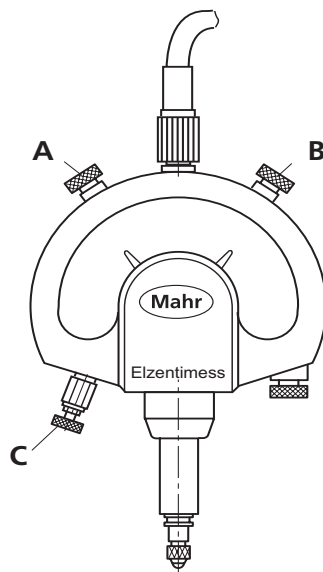
1110 N



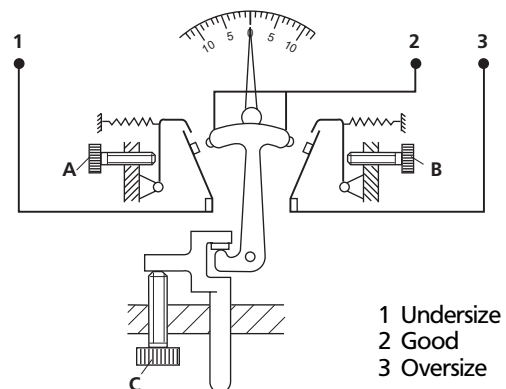
1150 N

Features

- Application for example for tolerance control or as precision contactor in automatic control systems
- Design features identical to mechanical dial comparators, but additional adjustable limit contacts made of high-grade precious metal
- Limit contacts particularly well protected against vibration and mechanical wear



Wiring diagram



Technical Data

Metric	Measuring range	Readings	Over-travel	Meas. force	Accuracy* (DIN 879-3)			Order no. standard**	Order no. drip-proof***
					f_e	f_{ges}	f_u		
1103 N Elmillimess	$\pm 50 \mu\text{m}$	$1 \mu\text{m}$	2,8 mm	2 N	$1 \mu\text{m}$	$1,8 \mu\text{m}$	$1 \mu\text{m}$	4345100	4345105
1104 N Elcompramess	$\pm 0,13 \text{ mm}$	$5 \mu\text{m}$	2,5 mm	2 N	$3,5 \mu\text{m}$	$6 \mu\text{m}$	$1,7 \mu\text{m}$	4344100	4344105
1110 N Elzentimess	$\pm 0,25 \text{ mm}$	$0,01 \text{ mm}$	2,3 mm	2 N	$6,5 \mu\text{m}$	$12 \mu\text{m}$	$3,5 \mu\text{m}$	4343100	4343105
1150 N Eldezimess	$\pm 1,5 \text{ mm}$	$0,05 \text{ mm}$	0,3 mm	1,5 N	$35 \mu\text{m}$	$60 \mu\text{m}$	$17 \mu\text{m}$	4342100	4342105
Inch									
1103 NZ Elmillimess	$\pm .0020''$	$.00005''$	.11"	2 N	$.00005''$	$.00009''$	$.00005''$	4345910	4345915
1104 NZ Elcompramess	$\pm .0050''$	$.0001''$	.10"	2 N	$.0001''$	$.00018''$	$.00005''$	4344910	4344915
1110 NZ Elzentimess	$\pm .0100''$	$.0005''$	.10"	2 N	$.00035''$	$.0006''$	$.00017''$	4343910	4343915

* Accuracy of 1104 N, 1110 N and 1150 N better than DIN 879

** Incl. plastic case, Setting Knob 953, cable (1,2m); Adapter 940 (for inch instruments only)

*** Incl. plastic case, Setting Knob 953, cable (1,2m), Splash Guard Cover 958 and Rubber Bellow 970; Adapter 940 (for inch instruments only)

Mechanical Dial Comparators with limit contacts

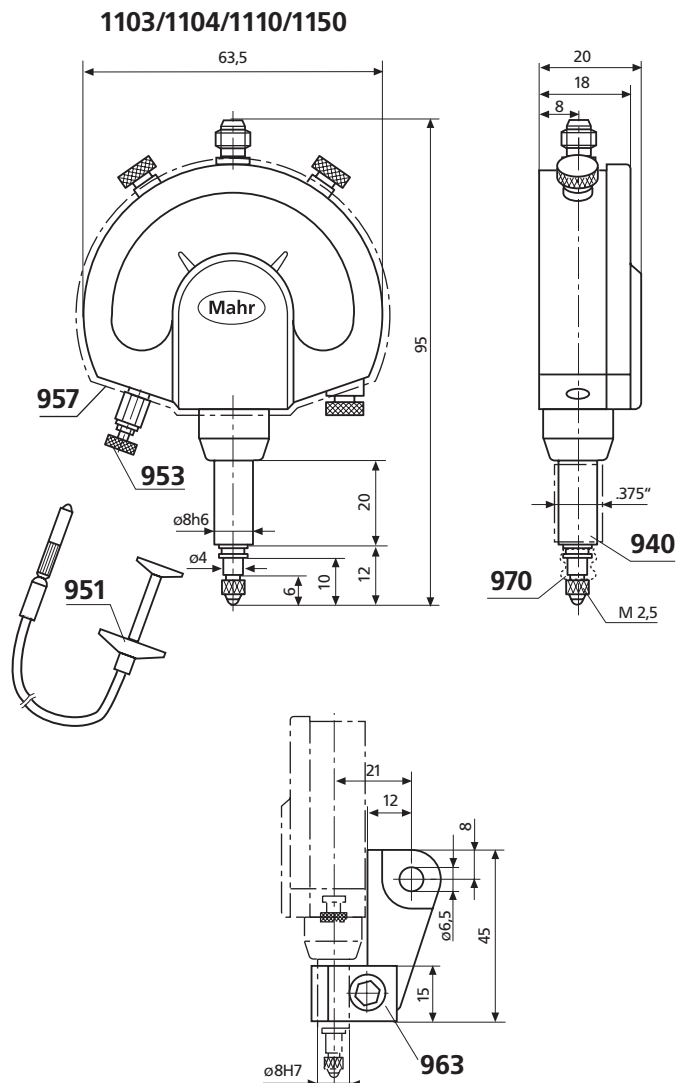
Electrical specifications

	Switching accuracy with non-inductive load of 10 mA/24 V	max. contact rating	max. contact voltage	max. contact current
1103 N	+/- 0,3 μm	240 mW	24 V	100 mA
1104 N	+/- 0,75 μm			
1110 N	+/- 1,5 μm			
1150 N	+/- 7 μm			

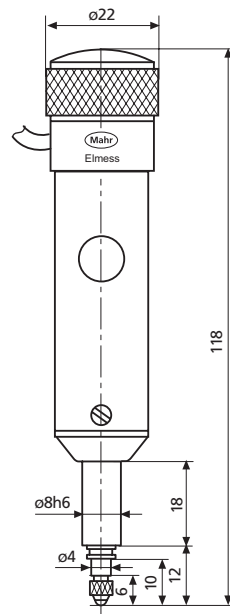
Accessories

	Order no.
Connecting cable (1,2 m), axial	4345695
Connecting cable (5 m), axial	4345694
Adapter Bush for adapting mounting shank 8h6 mm to inch bore .375"	940 4310103
Cable Release for lifting of measuring spindle	951 4372000
Setting Knob for setting of limit contacts without additional setting standard	953 4372020
Lifting Knob for raising measuring spindle	954 4372030
Splash Guard Cover	958 4373031
Rubber Bellow for sealing open end of measuring spindle	970 4334786
Mounting Lug for mounting on mounting shank 8h6 mm	963 4375002

Additional accessories	page
Contact Points	901-913 3-24
Special Holders	941 3-25
Sensor Lever	943 3-25
Electrical Indicator	1141 SN 3-20



Mechanical Dial Comparator 1100 with limit contacts



Elmess 1100

Features

- Identical to comparators with limit contacts, but without analog display
- Ideal for applications where available space is limited

Electrical specifications

Switching accuracy with non-inductive load of 10 mA/24 V	+/- 0,3 µm
max. contact rating	240 mW
max. contact voltage	24 V
max. contact current	100 mA

Technical Data

	Range	Overtravel	Measuring force	Order no.
1100	± 0,4 mm	2 mm	1,5 N	4340000

Electrical Indicator 1141 SN for dial comparators and comparators with limit contacts



Features

- For dial comparators with limit contacts
- Indicates no-go (red), go (green) and no-go re-work (yellow). Lamp sequence can be switched for outside and inside measurement
- Test results can be processed via control output
- Standard accessory: Mains adapter

Technical Data

Housing dimensions WxHxD	82x52x150 mm		
Contact voltage at dial comparator	6 V		
Maximum contact rating	60 W		
Maximum contact voltage	48 V		
Maximum contact current	3 A		
Power pack connections	5 V 250 mA		
Mains voltage	230 V		115 V
Order no.	4352300		4352310

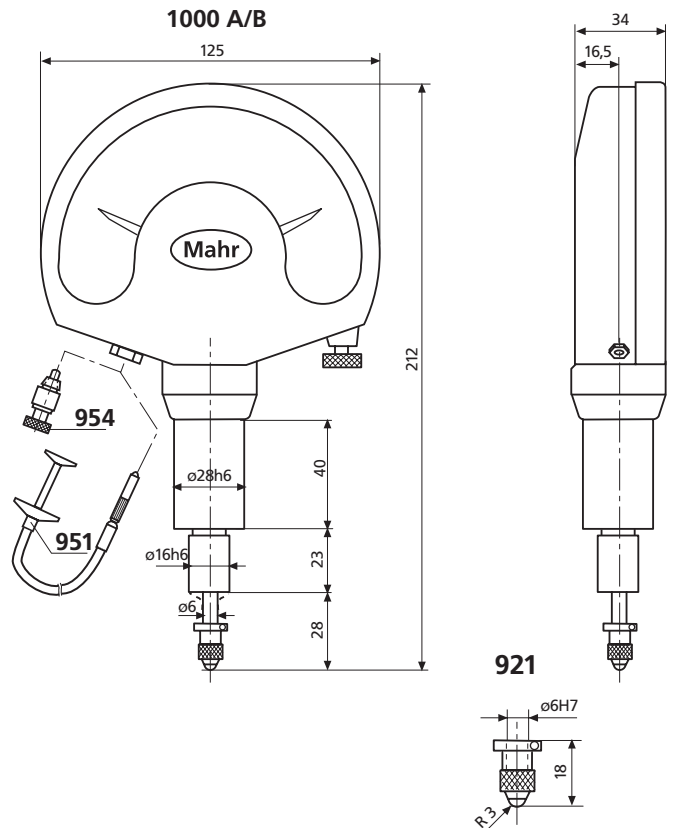
Dial Comparators

Mahr

Mechanical Dial Comparator Large Type Millimess



1000 A



921

Features

- Large design
- Clear dial
- Shockproof movement
- Jewelled movement bearings
- Measuring spindle mounted in high-precision ball guides precludes play
- Standard accessories: Cable Release 951 and plastic case

Accessories

		Order no.
Measuring Attachments		
with steel ball	921	4362001
with ruby ball	921 R	4362002
Cable Release		
for raising measuring spindle	951	4372000
Lifting Knob		
for raising measuring spindle	954	4372030
Rubber Bellow for sealing open end of measuring spindle		4338008

Additional Accessories		page
Precision Stand	824 GT	5-8

Technical Data

Metric	Range	Readings	Scale division	Over-travel	Measuring force	f_e	Accuracy f_u	f_{ges}	Order no.
1000 A	$\pm 100 \mu\text{m}$	$1 \mu\text{m}$	1 mm	5 mm	3,5 N	$1,5 \mu\text{m}$	$1 \mu\text{m}$	$2 \mu\text{m}$	4338000
1000 B	$\pm 50 \mu\text{m}$	$1 \mu\text{m}$	2 mm	5 mm	3,5 N	$1,5 \mu\text{m}$	$1 \mu\text{m}$	$2 \mu\text{m}$	4339000
Inch									
1000 Z	$\pm .0020''$	.00005"	.08"	.2"	3,5 N	.000075"	.00005"	.0001"	4339900

Inductive Dial Comparator 2000 Extramess



Features

Extramess 2000

- Functions:
 - ON/OFF
 - RESET (zero setting of digital and analog display)
 - 0 - (zero setting of analog display)
 - PRESET (set buttons can be used to enter any numerical value)
 - mm/inch switching
 - Reversal of counting direction
 - RANGE (switching of measuring range and readings)
 - ABS (reference to elect. zero point)
 - Display of battery status
- Linearized inductive measuring system
- Power supply via integrated NiMH batteries (40 hours) or via mains adapter
- Data output: alternatively OPTO RS232C or Digimatic
- Dial Comparator can be operated by remote control via interface
- High-contrast 6,5 mm liquid crystal display, analog display with 4 mm pointer length for better visual perception when checking roundness or flatness as well as reversal point search when measuring bores
- Function and display section can be rotated through 280°
- Spring for measuring force interchangeable
- Lower stop adjustable
- Class of protection IP 54 as per IEC 529
- Operating temperature 5 - 40°C
- Standard accessories: Mains adapter, rubber bellow and spanner for preliminary stroke setting

Extramess 2001

- Features identical to Extramess 2000, but additional:
- MAX / MIN memory for example for reversal point search
 - MAX-MIN, for example for checking concentricity and flatness
 - TOL (tolerance release)
 - LOCK: buttons can be locked to avoid inadvertent adjustment
 - Control output compatible to dial comparators with limit contacts
 - Standard accessories: Mains adapter, rubber bellow and spanner for preliminary stroke setting

Technical Data

	Measuring ranges switchable mm (inch)	Selectable resolution and readings mm/inch	Display range of analog display mm (inch)	Span of error**	Over-travel	Measuring force N	Order no. 230 V	Order no. 115 V
				μm (inch)	mm			
2000	1,8 (.07")	0,001 / .00005"	$\pm 0,030$ (.0015")	0,6 (.000025")	2,4	0,7 - 0,9	4346000	4346900*
	1,8 (.07")	0,0005 / .00002"	$\pm 0,015$ (.0006")	0,6 (.000025")	2,4			
	0,8 (.031")	0,0002 / .00001"	$\pm 0,006$ (.0003")	0,3 (.000012")	2,9			
2001	1,8 (.07")	0,001 / .00005"	$\pm 0,030$ (.0015")	0,6 (.000025")	2,4	0,7 - 0,9	4346100	4346910*
	1,8 (.07")	0,0005 / .00002"	$\pm 0,015$ (.0006")	0,6 (.000025")	2,4			
	0,8 (.031")	0,0002 / .00001"	$\pm 0,006$ (.0003")	0,3 (.000012")	2,9			

* including Adapter Bush 940

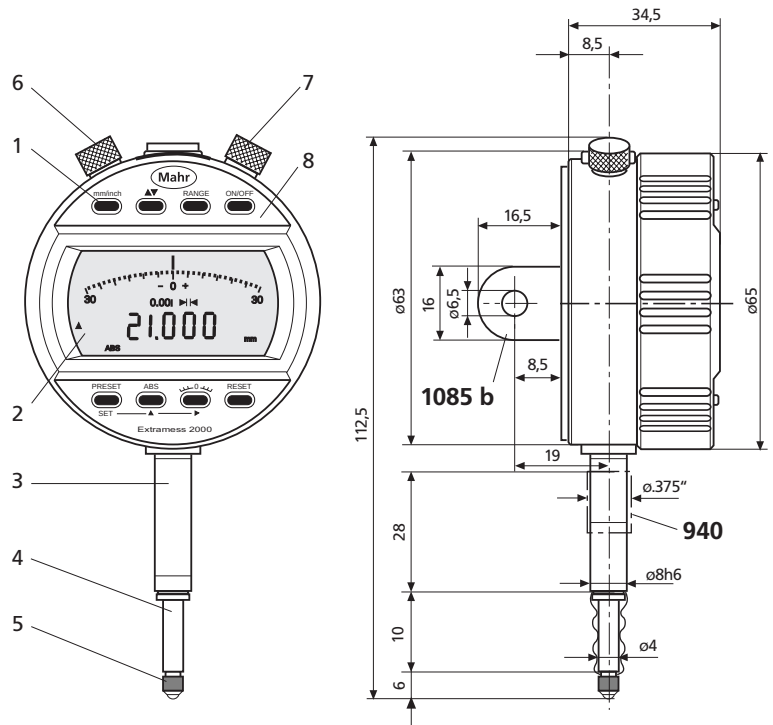
** indicated value + display span of error ($\leq 0,5$ resolution)

Dial Comparator

Mahr

Inductive Dial Comparator 2000 Extramess

- 1 Operating buttons
- 2 Display
- 3 Mounting shank
- 4 Measuring spindle
- 5 Contact Point 901H
- 6 Connection for mains adapter
- 7 Data output
- 8 Swivelling operating and display unit

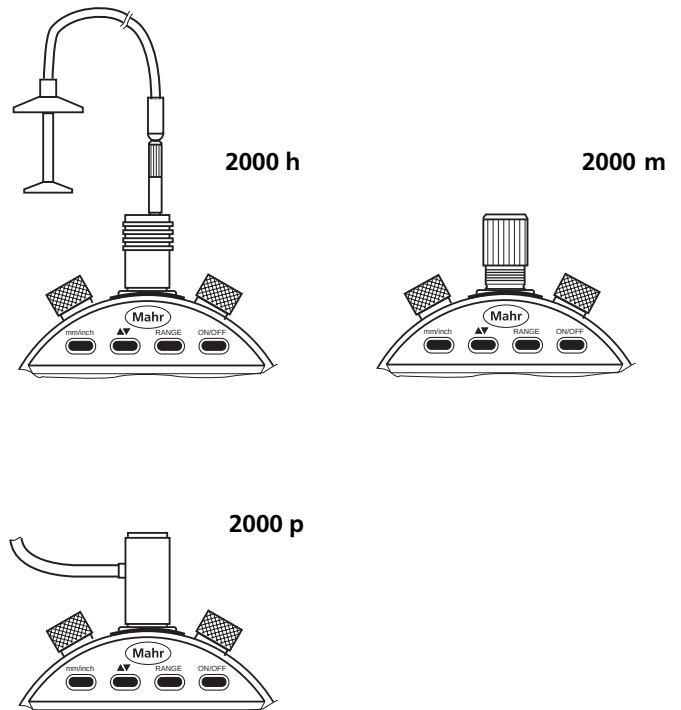


Accessories

Data connecting cable		
Opto RS232C (2m), SUB-D jack 9-pin		4346020
Data connecting cable Digimatic (2m),		
Flat plug 10-pin		4346021
Hand Lifter with		
cable release	2000 h	4346010
Pneumatic Lifter	2000 p	4346011
Adjuster for measuring force	2000 m	4346012
Mounting Lug	1085 b	4336310
Adapter Bush for adapting		
mounting shank dia. 8h6 mm to		
inch bore .375"	940	4310103

Additional Accessories		page
Contact Points	901-913	3-24
Special Holder	941	3-25

Accessories for data processing see chapter 9

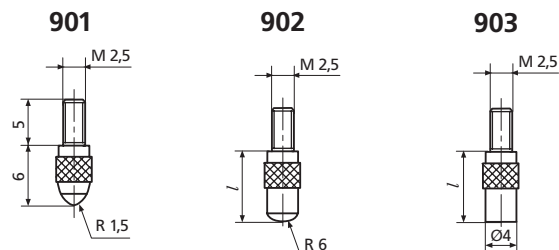


Contact Points for dial indicators, dial comparators

Standard Contact Points 901

Ball dia. 3 mm

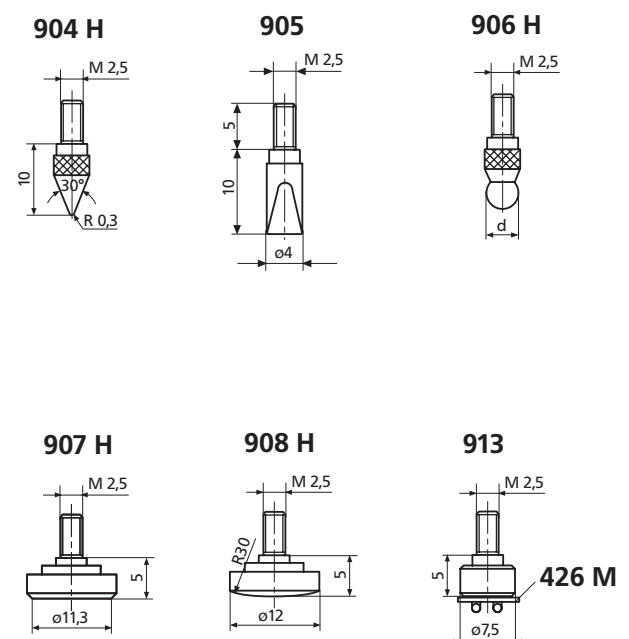
Cat. No.		Order no.
901	Steel ball	4360001
901 H	Carbide ball	4360002
901 R	Ruby ball	4360003



Spherical Contact Points 902

Flat Contact Points 903

902 made of steel length Order no. mm	902 H carbide contact face Order no.	903 made of steel Order no.	903 H carbide- tipped Order no.
4 4360007	—	4360070	—
6 4360009	—	4360071	4360101
8 4360010	4360040	4360072	4360102
10 4360011	4360041	4360073	4360103
12 4360012	4360042	4360074	4360104
15 4360013	4360043	4360075	4360105
20 4360014	4360044	4360076	4360106
25 4360015	4360045	4360077	4360107
30 4360016	4360046	4360300	4360110
35 4360017	4360047	4360078	4360108
40 4360019	4360049	4360310	4360111
45 4360026	4360050	4360303	—
50 4360018	4360048	4360079	4360109
55 4360031			
65 4360035			
75 4360020			
85 4360036			
95 4360029			



Ball Contact Points 906 H

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

Ball dia. d mm	Order no.	Ball dia. d mm	Order no.
1	4360150	5,5	4360161
1,25	4360151	6	4360162
1,5	4360152	6,35 (1/4")	4360163
1,75	4360153	6,5	4360164
2	4360154	7	4360165
2,5	4360155	7,5	4360166
3	4360156	8	4360167
3,5	4360157	8,5	4360168
4	4360158	9	4360169
4,5	4360159	10	4360170
5	4360160		

Special Contact Points

	Order no.
Conical Contact Points, made of steel	904 4360130
carbide-tipped	904 H 4360131
Wedge-Shaped Contact Points, steel	905 4360140
carbide-tipped	905 H 4360141
Flat Contact Plates, steel, A = 1 cm ²	907 4360200
carbide-tipped, dia. 7 mm	907 H 4360201
Spherical Contact Plates, made of steel	908 4360210
carbide-tipped	908 H 4360211
Flat Contact Point for mounting Pin Gauge Holders 426 M for mea- suring threads using three-wire method	913 4360400

Contact Points for dial indicators, dial comparators

Contact Rollers 909

Concentricity error 2 µm

		Order no.
cylindrical roller	909 A	4360220
radiused roller, R = 5 mm	909 B	4360221

Measuring Attachment 910 H

	Order no.
with carbide wedge adjustable in parallel	910 H 4360230

Pin Contact Point 911 H

	Order no.
carbide-tipped, dia. 1 mm, flat	911 H 4360240

Measuring Spindle Extensions 912

Length mm	Order no.	length mm	Order no.
10	4360 250	35	4360 254
15	4360 251	50	4360 255
20	4360 252	75	4360 256
25	4360 253	100	4360 257

Special Holders 941

For all types of testing equipment
For placing the dial indicator at a certain distance or angle
Measuring spindle travel 3 mm
Contact Point 901 (interchangeable)

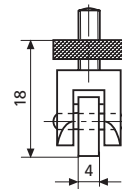
Straight Holder 941 G		Angular Holder 941 W		
Mounting shank length l mm	Order no.	Order no. angle $\alpha=45^\circ$	Order no. angle $\alpha=60^\circ$	Order no. angle $\alpha=90^\circ$
25	4365000	4365010	4365020	4365030
50	4365001	4365011	4365021	4365031
75	4365002	4365012	4365022	4365032

Transmission accuracy for 941 W
max. 1%;
for travel 3 mm = 0,03 mm

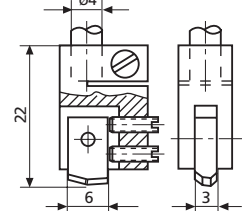
Sensor Lever 943

	Order no.
For checking concentricity in bores and on outside diameters difficult to reach. For insertion in measuring stands With lifting device Contact Point 901 interchangeable Travel ± 1 mm	4367000

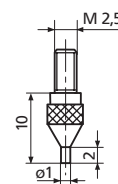
909 A



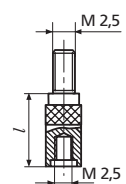
910 H



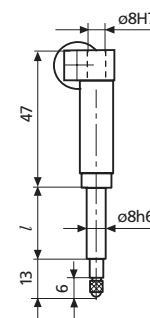
911 H



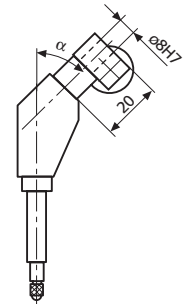
912



941 G



941 W



943

