Mahr

Chapter - page

Test Indicators

Dial Indicators

Dial Comparators

Accessories for Dial Indicators and Dial Comparators

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).

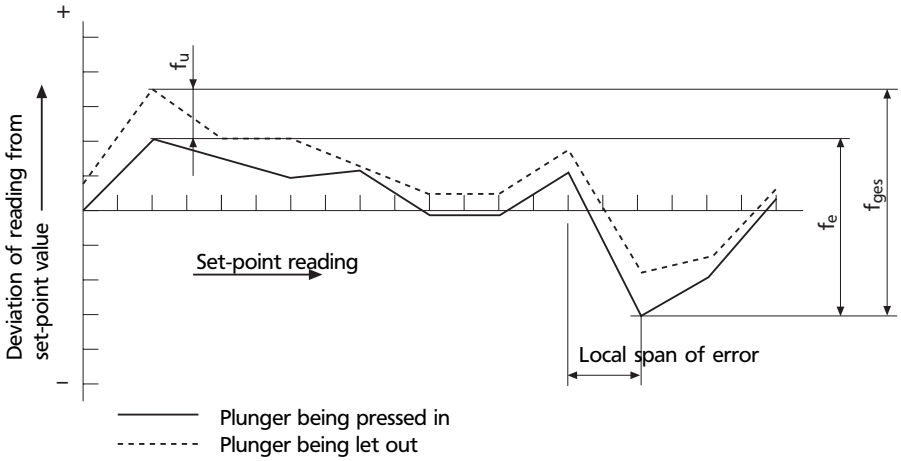


Diagram for the spans of error f_e and f_{ges} and hysteresis error of the measured value f_u (example)

• 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).

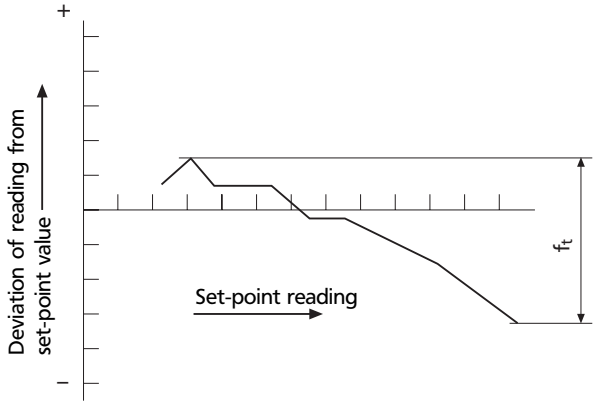


Diagram of the span of error f_t (example)

Design features of Mahr Test Indicators Puppitast

- 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

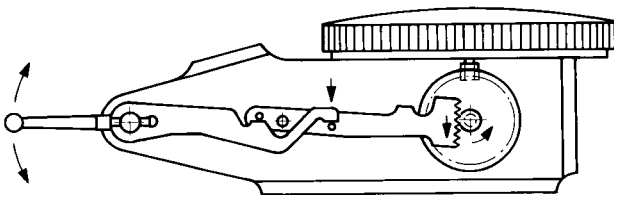
- Easy to read thanks to high-contrast, rotable dial face

- Self-contained movement. This unit can be easily removed and quickly replaced for maintenance and repair purposes.
- Insensitivity to magnetic fields

- 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



- 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

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

Mahr

Test Indicators

800 S
Standard model

800 SG
Extra-large dial face

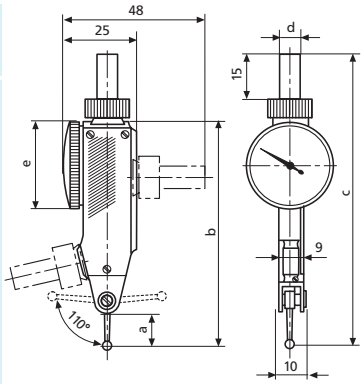
800 SL
Extra-long stylus

Technical Data

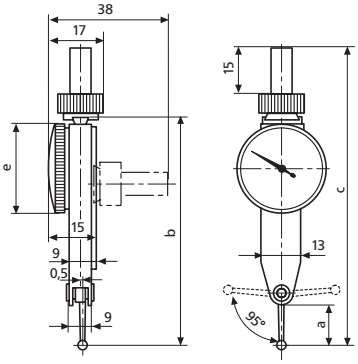
	Measuring range	Readings	Dial diam.	Swivel-range of styluses	Measuring force	Accuracy f_e	Accuracy f_{ges}	Accuracy f_u	Order no.
800 S	± 0,4 mm	0,01 mm	27,5 mm	11,5 mm	0,15 N	10 µm	13 µm	3 µm	**4305100**
800 SG	± 0,4 mm	0,01 mm	38 mm	11,5 mm	0,15 N	10 µm	13 µm	3 µm	**4307100**
800 SL	± 0,4 mm	0,01 mm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

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 1/4"	40
800 SZ	11,5	76	99	8h6 and 1/4"	29
800 SGZ	11,5	76	99	8h6 and 1/4"	40
800 SLZ	34	98,5	121,5	8h6 and 1/4"	29
800 SMZ	11,5	76	99	8h6 and 1/4"	40
800 WZ	11,3	72,3	95,3	8h6 and 1/4"	29

800 S



800 W/800 WZ



Standard accessories:
Mounting shank 8h6 mm and 1/4" (for instruments with inch-scale), stylus dia. 2 mm and plastic case

800 SM
with high resolution

800 W
Stylus moves parallel to dial

800 SGI
with mm/inch scale

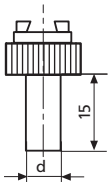
Accessories

Styluses 801 t for types	Stylus length /in mm	801 te chromium-plated ball dia. in mm ø1	ø2	ø3	801 tl chromium-plated ball dia. in mm ø1	ø2	801 tr, with ruby ball ball dia. in mm 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**	

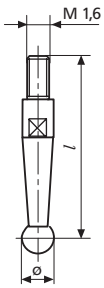
Mounting Shank 801 a	mounting shank dia. d	Order no.
801 a8	8h6 mm	**4300800**
801 a4	4h6 mm	**4300801**
801 a1/4"	1/4" (6,35 mm)	**4300805**

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

801 a



801 t

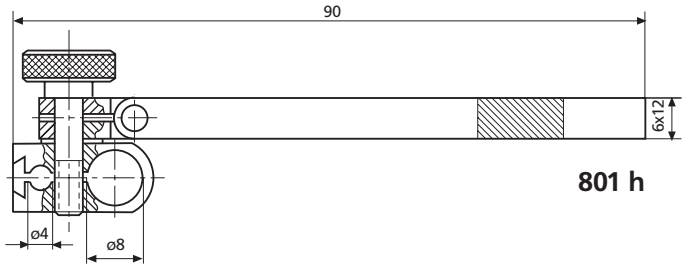


Accessories

Universal Holder 801 h

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

Order no. **4309066**

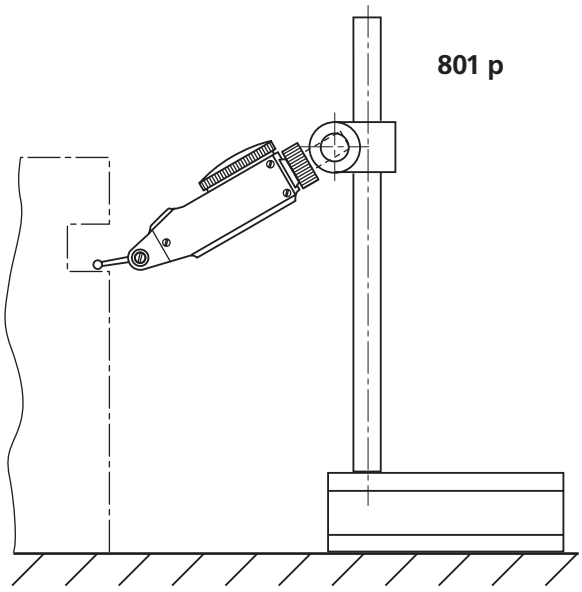


Stand 801 p

- 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**

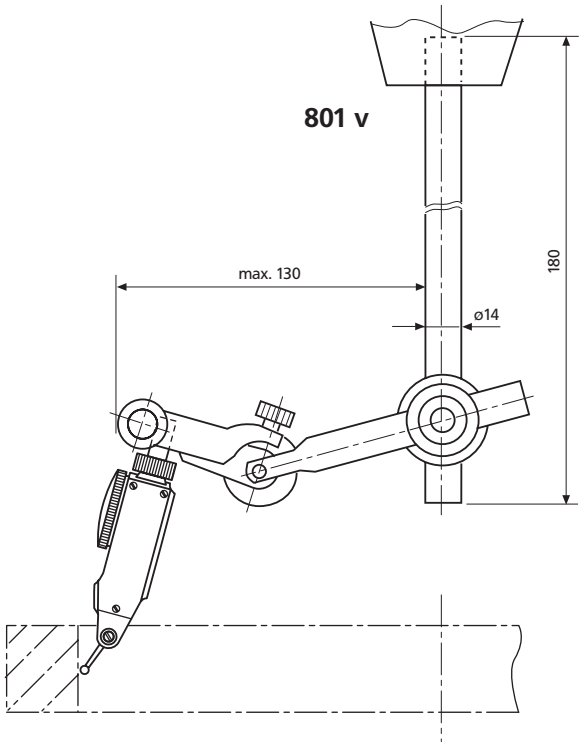


Centering Support Rods 801 v

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

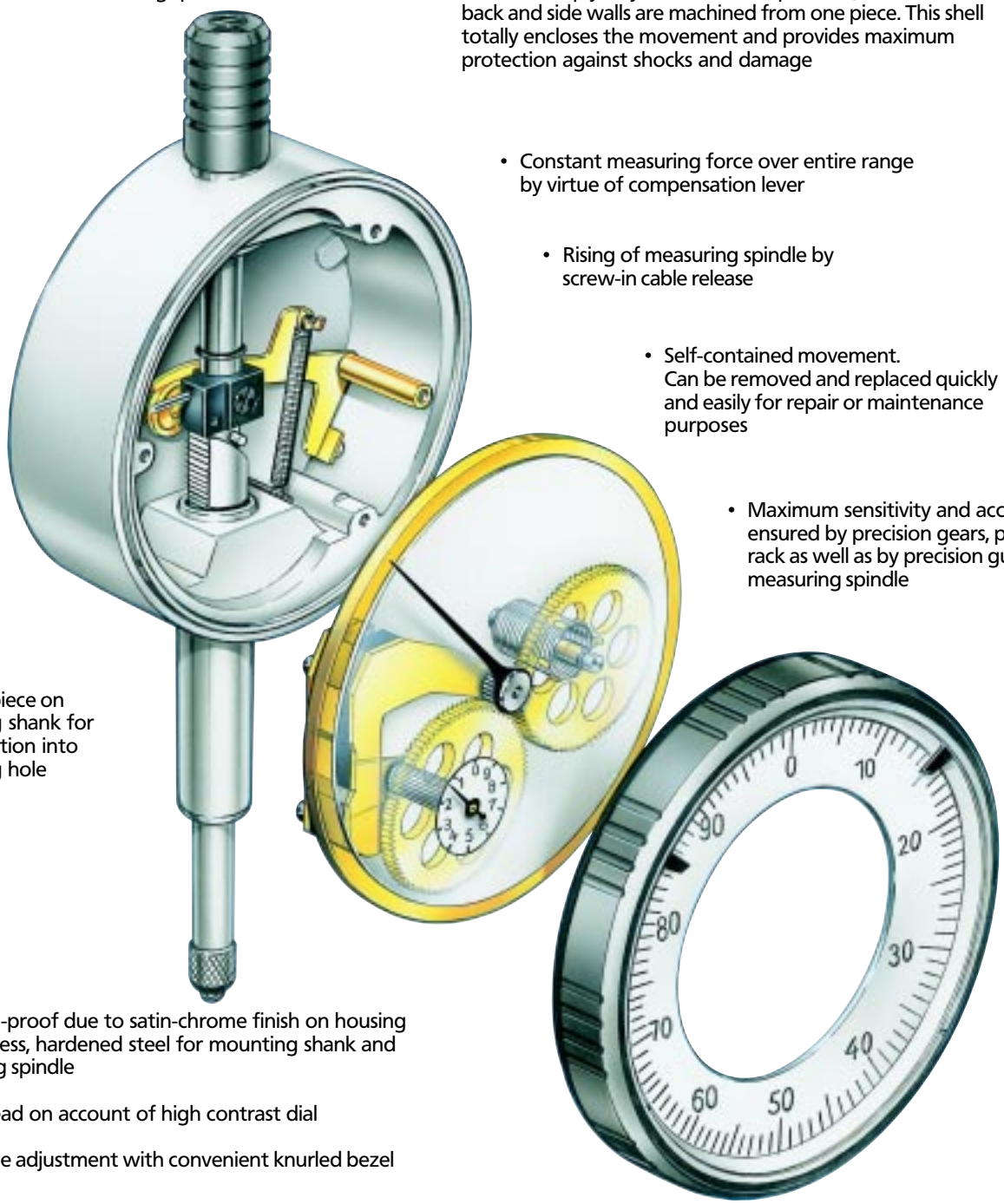
Mounting bore dia.	8 mm
Swivel range of mounting clamp	180°

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

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

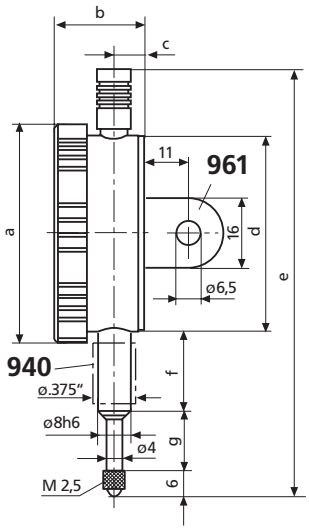
Features

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

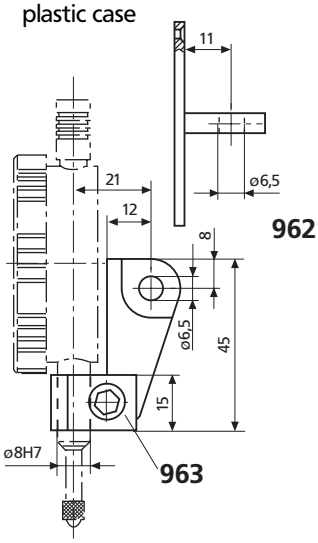
Small Dial Indicator 803 Z
inch version

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

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

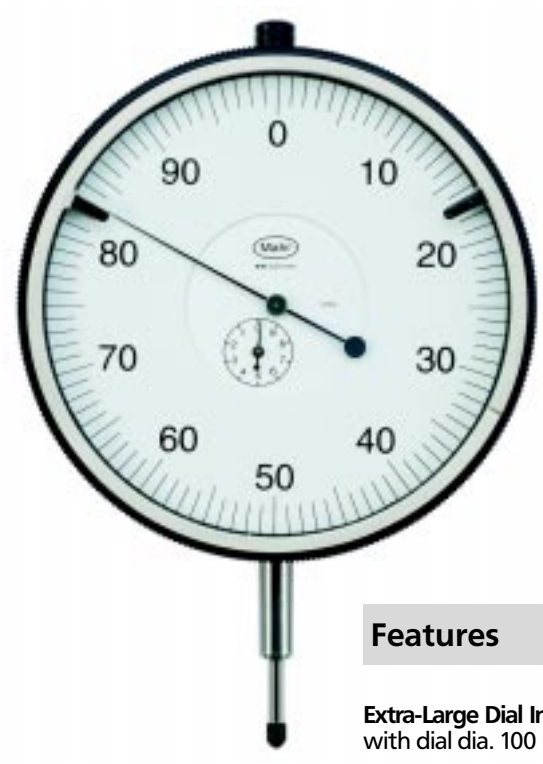
Long-Range Dial Indicator 810 V
with extra-large measuring range

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 mm	Readings mm	Dial dia. mm	Overtravel mm	Measuring force N	Accuracy f_e µm	f_{ges} µm	f_u µm	Order no.
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

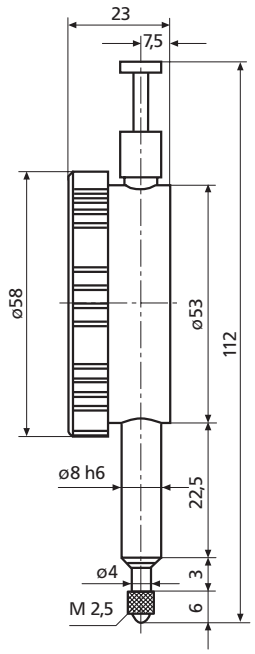
Extra-Large Dial Indicator 810 G with dial dia. 100 mm

Design features identical to 810, but

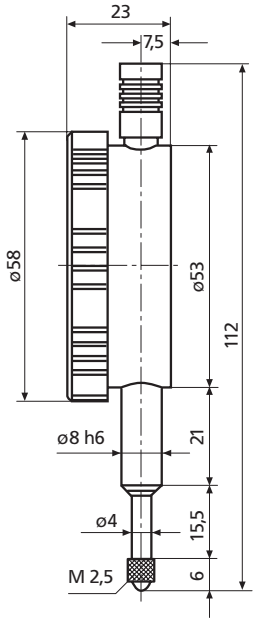
- Application for large reading distance and bad light conditions
- Plastic outer ring
- Delivered in folded box

Dimensions

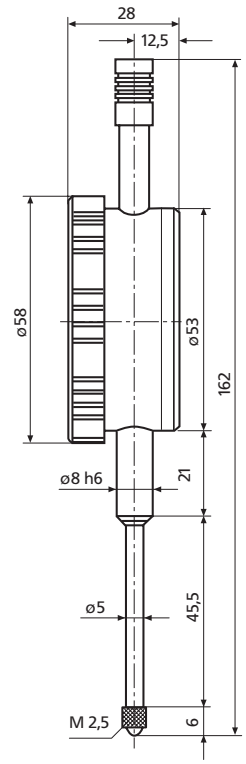
810 U



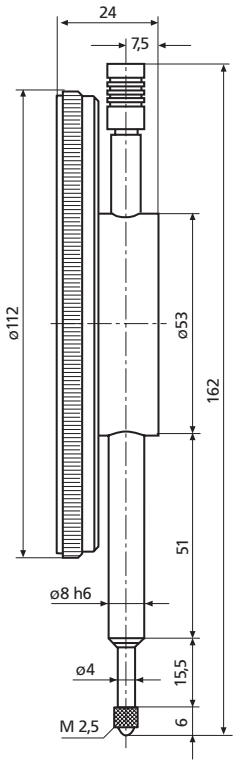
810 X



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		
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Additional Accessories		page
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Mahr

Digital Dial Indicator

Digital Dial Indicators 1083/1085 Millitast

1085

1083

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

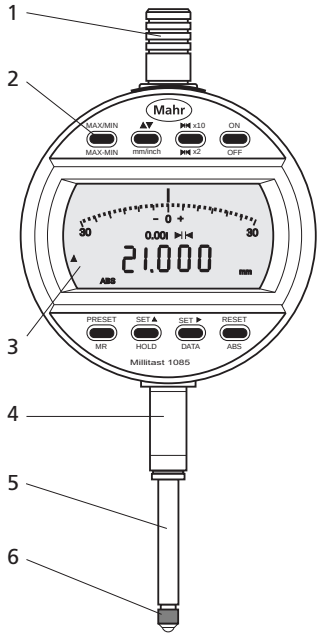
	Range mm (inch)	Resolution mm/inch	Span of error f_e mm (inch)	Measuring force N	Weight g	Order no.
1083	12,5 (.5") 25 (1")	0,001 / .00005" 0,001 / .00005"	0,005 (.0002") 0,005 (.0002")	0,7-0,95 0,6-1,1	160 160	**4336800** **4336801**
1085	12,5 (.5") 25 (1")	0,001 / .00005" 0,001 / .00005"	0,005 (.0002")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

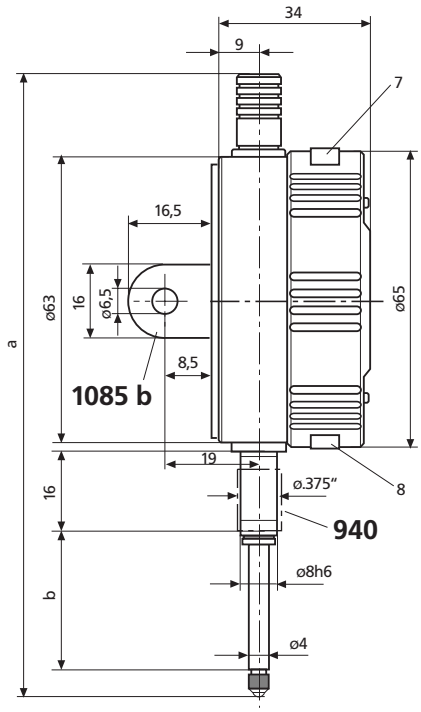
Analog display 1083 Readings mm / inch	Display range mm (inch)
0,001 / .00005"	± 0,03 (± .0015")
0,01 / .0005"	± 0,30 (± .0150")

Analog display 1085 Readings mm (inch)	Display range mm (inch)
0,001 (.00005") 0,002 (.0001") 0,01 (.0005") 0,02 (.001")	± 0,03 (± .0015") ± 0,06 (± .0030") ± 0,30 (± .0150") ± 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



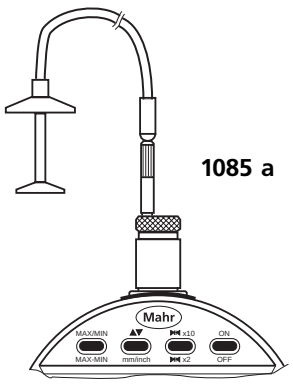


Dimensions (mm)		a	b
1083 / 1085	12,5 mm (.5")	125,5	19
1083 / 1085	25 mm (1")	138	31,5

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 RS232C SUB-D-jack 9-pin	**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**

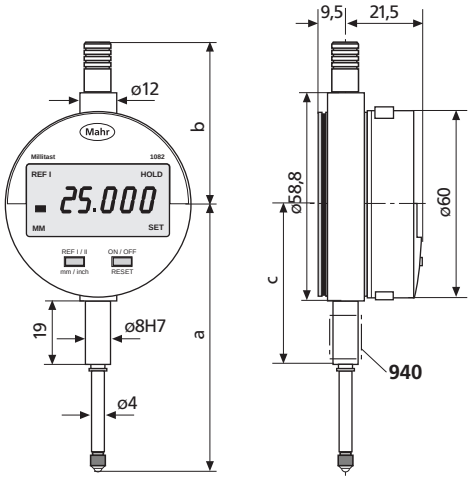
Additional Accessories		page
Contact Points	**901-913**	3-24
Special Holder	**941**	3-25
Sensor Lever	**943**	3-25



Accessories for data processing see chapter 9

Digital Dial Indicators

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 mm (inch)	Resolution mm/inch	Span of error f_e mm (inch)	Measuring force N	Weight g	Order no.
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 saphire 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

Dial Comparators

Mechanical Dial Comparators

1002

1003

1004

Technical Data

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

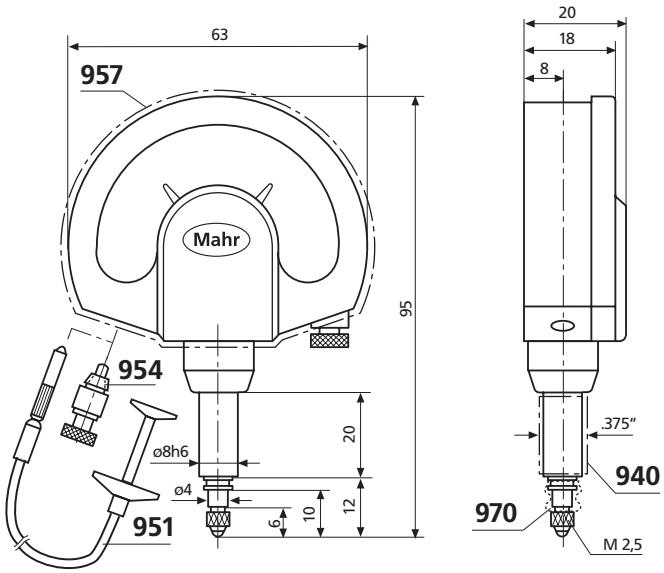
Dial Comparators

Mechanical Dial Comparators

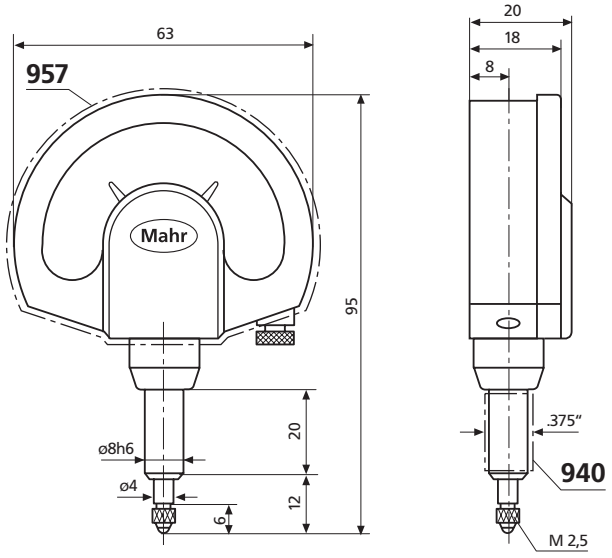
1010

1050

1002/1003/1004



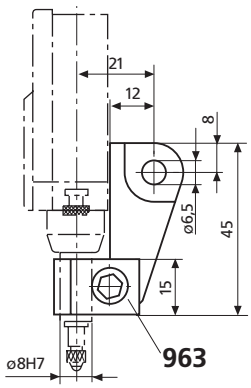
1010/1050



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



Dial Comparators

Mechanical Dial Comparators with limit contacts

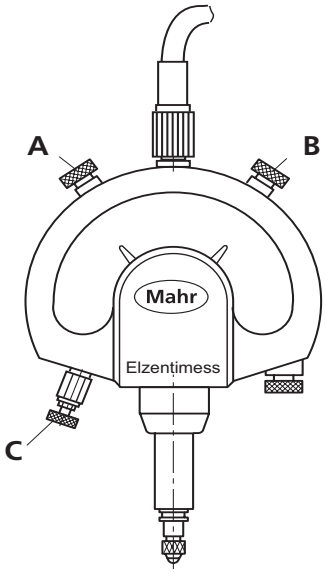

1103 N


1110 N

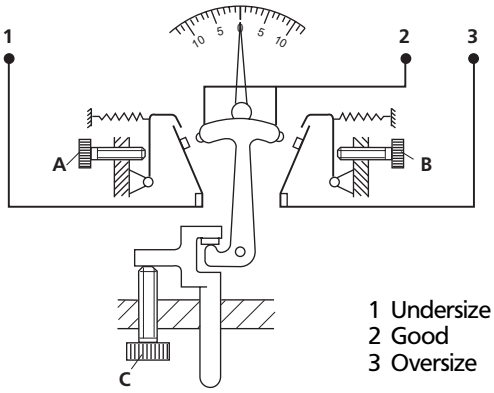

1150 N

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



1 Undersize
2 Good
3 Oversize

Technical Data

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

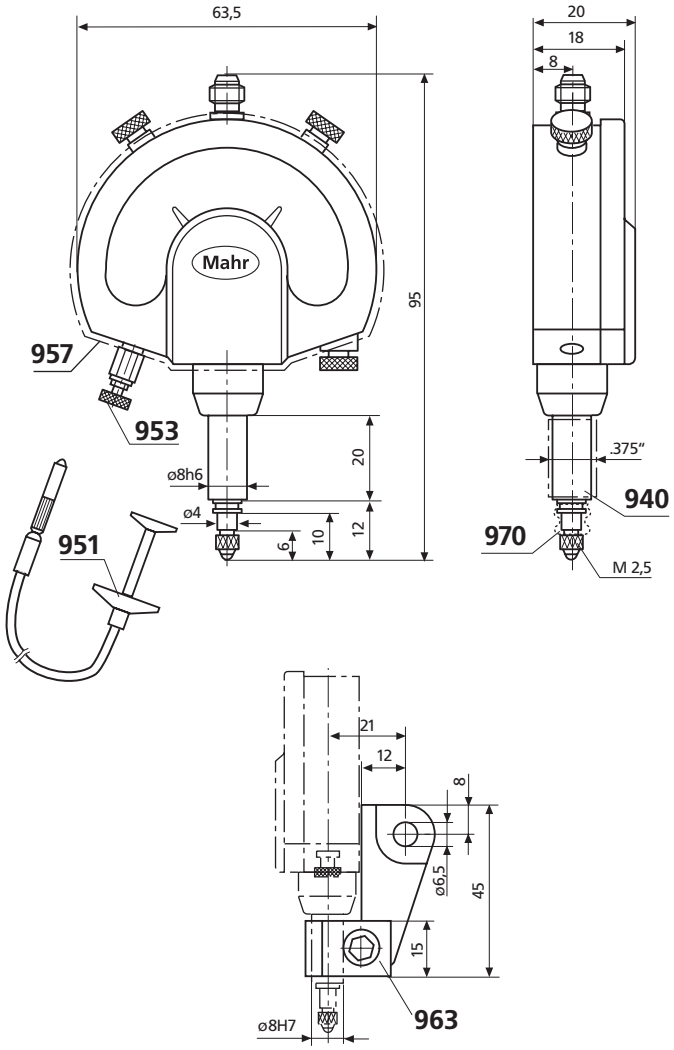
	Switching accuracy with non-inductive load of 10 mA/24 V	max. contact rating	max. contact voltage	max. contact current
1103 N **1104 N** **1110 N** **1150 N**	+/- 0,3 µm +/- 0,75 µm +/- 1,5 µm +/- 7 µm	240 mW	24 V	100 mA

Accessories

		Order no.
Connecting cable (1,2 m), axial **Connecting cable** (5 m), axial		**4345695** **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**

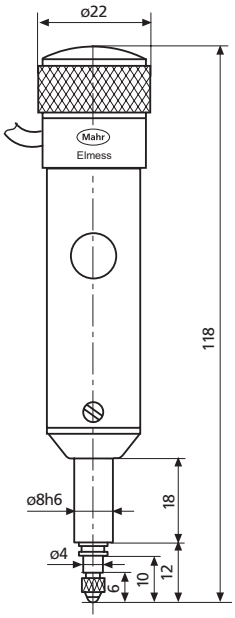
Additional accessories		page
Contact Points	**901-913**	3-24
Special Holders	**941**	3-25
Sensor Lever	**943**	3-25
Electrical Indicator	**1141 SN**	3-20

1103/1104/1110/1150



Dial Comparators

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

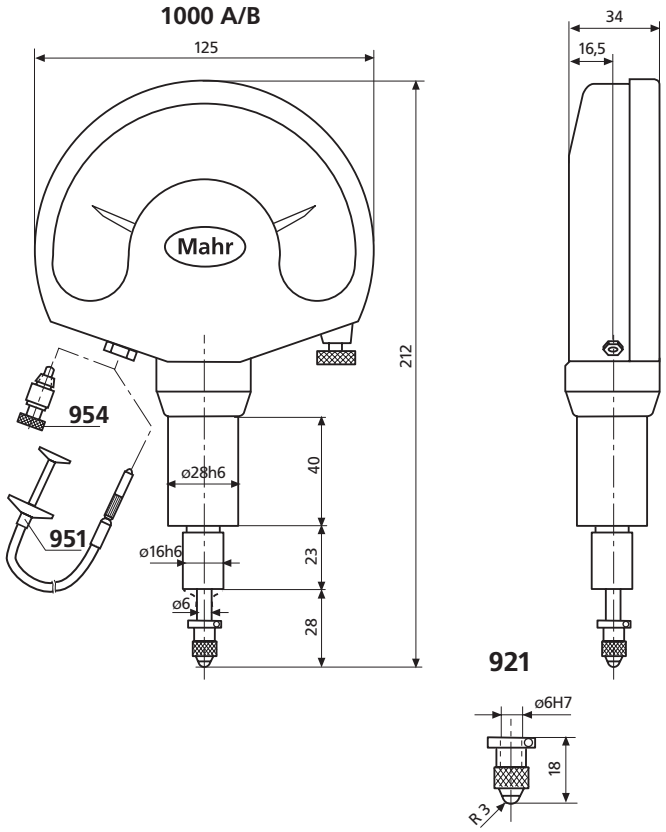
- For dial comparators with limit contacts
- Indicates no-go (red), go (green) and no-go re-work (yellow). Lamp sequence can be switched for outside and inside measurement
- Test results can be processed via control output
- Standard accessory: Mains adapter

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**

Mechanical Dial Comparator Large Type Millimess

1000 A



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	Accuracy f_e	Accuracy f_u	Accuracy f_{ges}	Order no.
1000 A	± 100 µm	1 µm	1 mm	5 mm	3,5 N	1,5 µm	1 µm	2 µm	**4338000**
1000 B	± 50 µm	1 µm	2 mm	5 mm	3,5 N	1,5 µm	1 µm	2 µm	**4339000**
Inch									
1000 Z	± .0020"	.00005"	.08"	.2"	3,5 N	.000075"	.00005"	.0001"	**4339900**

Dial Comparator

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

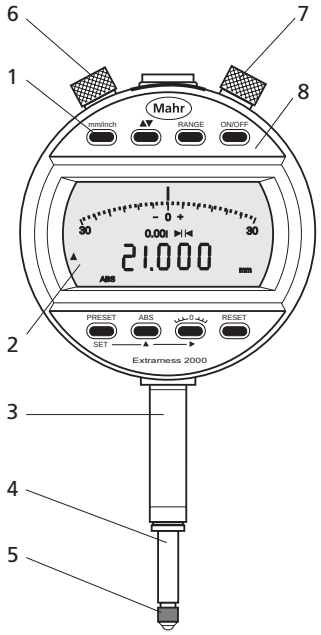
Technical Data

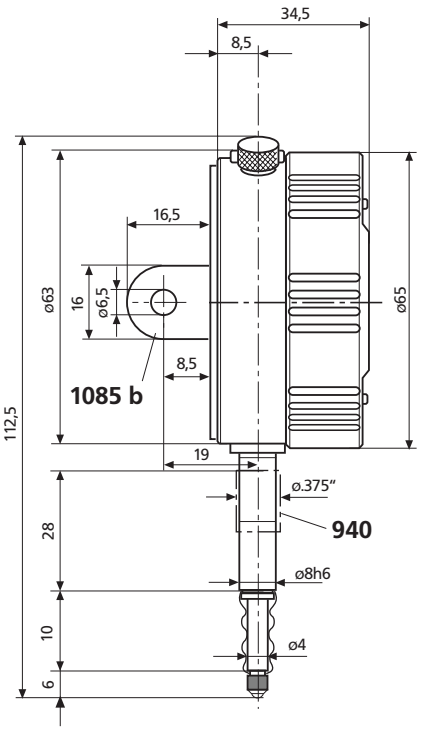
	Measuring ranges switchable mm (inch)	Selectable resolution and readings mm/inch	Display range of analog display mm (inch)	Span of error** µm (inch)	Over-travel mm	Measuring force N	Order no. 230 V	Order no. 115 V
2000	1,8 (.07") 1,8 (.07") 0,8 (.031")	0,001 /.00005" 0,0005 /.00002" 0,0002 /.00001"	±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

** including Adapter Bush 940* *** indicated value + display span of error (≤ 0,5 resolution)*

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



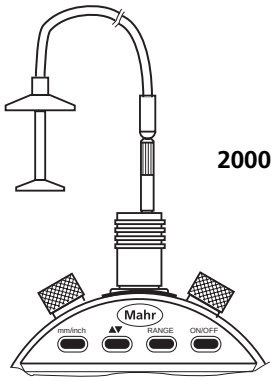


Accessories

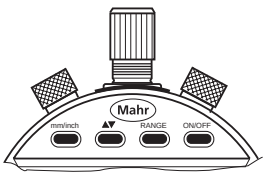
Data connecting cable Opto RS232C (2m), SUB-D jack 9-pin		**4346020**
Data connecting cable Digimatic (2m), Flat plug 10-pin		**4346021**
Hand Lifter with cable release	**2000 h**	**4346010**
Pneumatic Lifter	**2000 p**	**4346011**
Adjuster for measuring force	**2000 m**	**4346012**
Mounting Lug	**1085 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

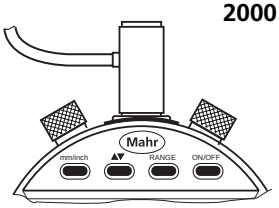
Accessories for data processing see chapter 9



2000 h



2000 m



2000 p

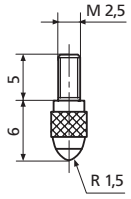
Contact Points for dial indicators, dial comparators

Standard Contact Points 901

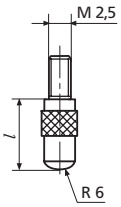
Ball dia. 3 mm

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

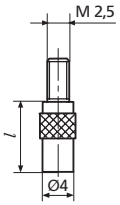
901



902



903

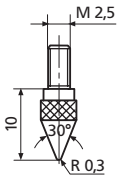


Spherical Contact Points 902

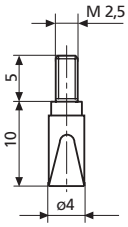
Flat Contact Points 903

902 made of steel length mm	**Order no.**	**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**			

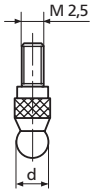
904 H



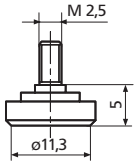
905



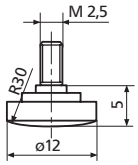
906 H



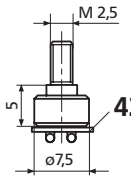
907 H



908 H



913



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 cm²	**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 measuring threads using three-wire method	**913**	**4360400**

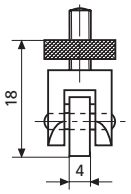
Contact Points for dial indicators, dial comparators

Contact Rollers 909

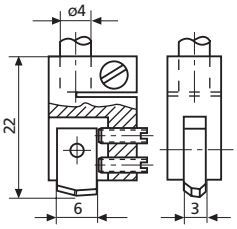
Concentricity error 2 µm

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

909 A



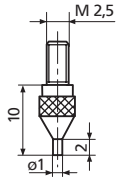
910 H



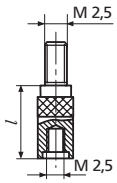
Measuring Attachment 910 H

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

911 H



912



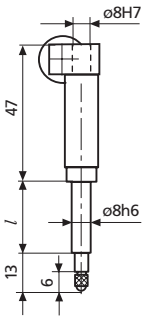
Pin Contact Point 911 H

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

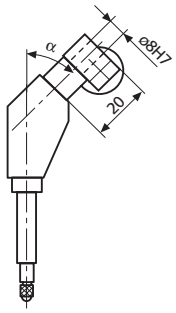
Measuring Spindle Extensions 912

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

941 G



941 W



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 Mounting shank length *l* mm	Order no.	Angular Holder 941 W Order no. angle α=45°	Order no. angle α=60°	Order no. angle α=90°
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

943