

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



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

**[www.mahr.com](http://www.mahr.com), WebCode 211**

► | MaraMeter is the ideal measuring instrument for highly precise measurements of internal and external diameters on either an individual part or on serial components. Our indicating measuring instruments obtain the best results due to their constant measuring force, their exact transmission lever system as well as their high parallelism on the measuring faces. For special measuring tasks such as threads, teeth, grooves or precision mechanical parts MaraMeter offers the right solution. I ◀

Call Rapp Industrial for your discounted pricing 724-789-7853 / 888-789-7288. Email us - [sales@rappindustrialsales.com](mailto:sales@rappindustrialsales.com)

## ► | MaraMeter. Indicating Measuring Instruments

### Indicating Measuring Instruments for Outside Dimensions, Indicating Snap Gages

**MaraMeter 1000 P / 300 P / 840 F / 840 FC / 840 FH /  
840 FG / 840 FM / 840 FS** **9- 2**

With fixed or interchangeable measuring faces

**MaraMeter 840 E** **9- 18**

For extremely high precision

**MaraMeter 852 / 852 TS / 853** **9- 19**

For threads, pitches, roots, serrations

### Portable Thickness Gages

**MaraMeter 22 P / 26 P / 838 A / 838 B / 838 AB / 57 B** **9-26**

With digital and/or analog display

### Caliper Gages

**MaraMeter 49 P / 838 TA / 838 EA / 838 TI / 838 EI** **9-33**

With digital and/or analog display

### Depth Gages

**MaraMeter 837 / 65 P-40 / 75 P-30 / 75 P-30 / 75 B-1** **9-41**

### Indicating Measuring Instruments for Inside Dimensions,

**Dimentron® Plug Inside Diameter Gages** **9-46**

Designed for high production I.D. gaging

**MaraMeter 844 D** **9-51**

Indicating Plug Gage for rapid testing of serial components

**MaraMeter 844 K** **9-58**

Self-centering Dial Bore Gage

**MaraMeter 1280 P Adjustable Bore Gages** **9-63**

Superior accuracy for production and inspection

**MaraMeter 844 N / NH / NR / NB** **9-66**

Self-centering Dial Bore Gage

**MaraMeter 844 Z** **9-72**

Dial Bore Gage for internal serrations

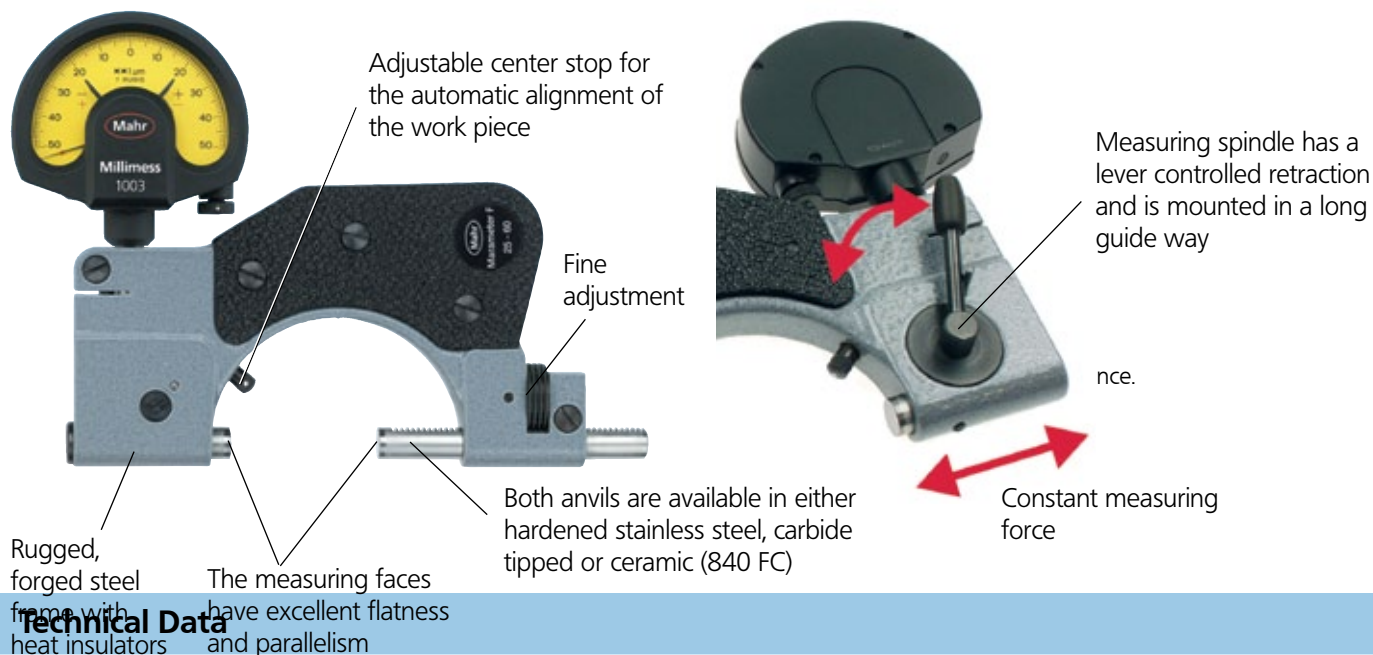
# MaraMeter. Indicating Snap Gages

## OVERVIEW

### Features

► The Indicating Snap Gages **MaraMeter** 840 F / 300 P-1 are ideal for highly accurate and reliable results on cylindrical work pieces with a narrow tolerance. I ◀

### MaraMeter 840 F



### Technical Data

#### Order

### MaraMeter 300 P-1

57B-14M

57B-14

Indicator can be rotated to read from front or rear of the gage.

57B-15M

57B-15

0 - 2.5 / 0 - .10"

0 - 25 / 0

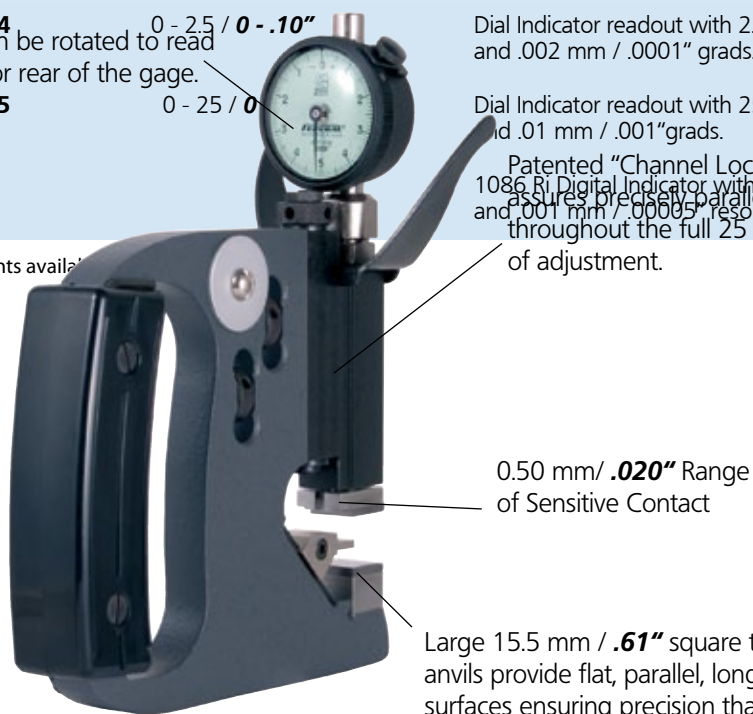
Dial Indicator readout with 2.5 mm / .10" sensitive range and .002 mm / .0001" grads.

Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm / .001" grads.

Patented "Channel Lock" design  
1086 R Digital Indicator with 25 mm / 1" range and .001 mm / .0005" resolution throughout the full 25 mm / 1" range of adjustment.

Alternate Indicators and contact points available. Contact Mahr Federal.

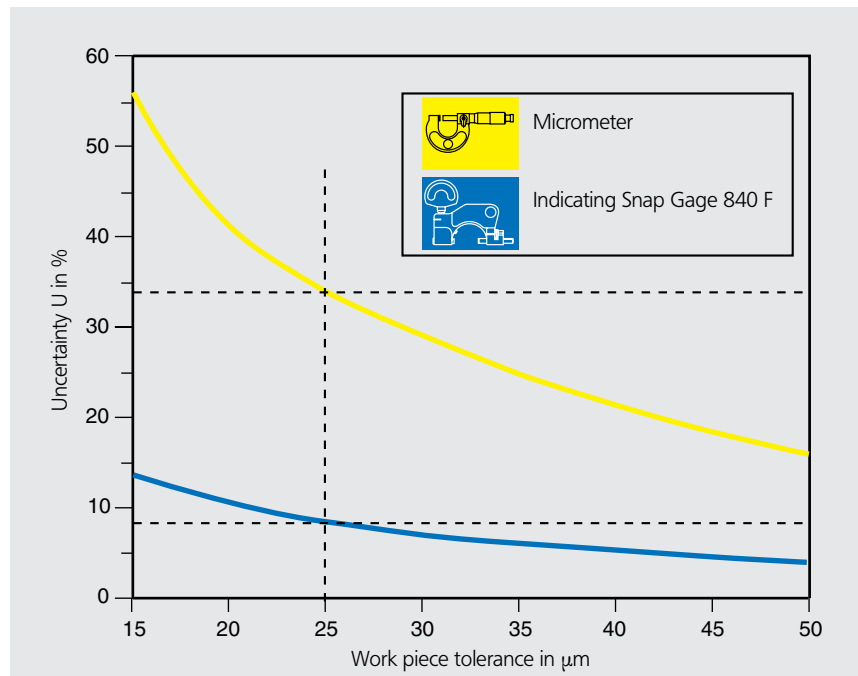
\* Integrated wireless



## Advantages of the Snap Gage 840 F compared to a Micrometer

### • Reduced Measuring Uncertainty

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



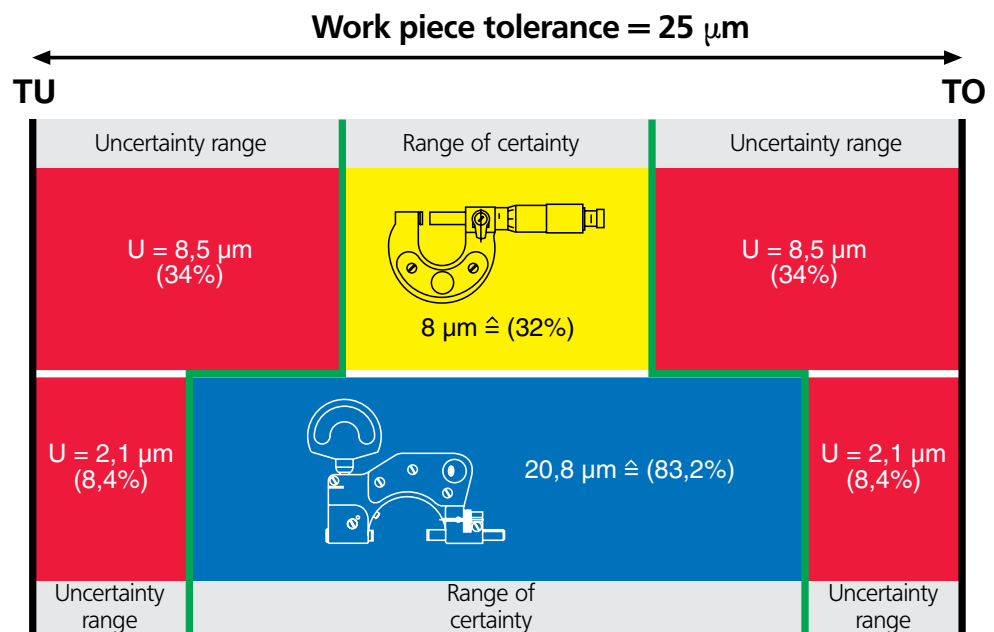
Measuring Uncertainty  $U$  is dependent upon the tolerance of the work piece

### • Better utilization of the tolerance zone

Example:  
Work piece tolerance 25  $\mu\text{m}$

The measured value in the uncertainty range can lie outside of the tolerance range, therefore the utilized tolerance of the micrometer is reduced to only 32% (8  $\mu\text{m}$ ).

With a MaraMeter Indicating Snap Gage 840 F, 83% (20.8  $\mu\text{m}$ ) of the work piece tolerance can be utilized.



### Advantage:

With the Indicating Snap Gage the tolerance zone can be used to far greater extent, thus reducing the production costs.

## Snap Gages for Outside Diameters 1000P



The economical way to check outside diameters on the shop floor.

### Features

- Flat lower anvil (reference) adjustable over a broad range.
- Radiused upper anvil (sensitive) spring-loaded to counter balance the weight of the gage.
- 0.01 mm grads. on Metric Models. .0005" grads. on Inch Models.
- 0.50 mm / .020" Range of Sensitive Contact.
- Indicator can be rotated to read from front or rear of the gage.
- Anvils are tungsten carbide for long life.

### Technical Data

0.01 mm or .0005" Dial Indicator normally furnished

Order

Metric

Inch

Capacity  
mm / inch

Description

### Technical Data

| Capacity<br>mm | (inch)         | Reference Anvil Diameter<br>mm / inch | Order no.<br>Metric | Order no.<br>Inch |
|----------------|----------------|---------------------------------------|---------------------|-------------------|
| 0 - 25         | (0 - 1")       | 13 / .50"                             | 1000P-1M*           | 1000P-1*          |
| 19 - 50        | (.75 - 2")     | 13 / .50"                             | 1000P-2M*           | 1000P-2*          |
| 44 - 82        | (1.75 - 3.25") | 13 / .50"                             | 1000P-3M            | 1000P-3           |
| 76 - 114       | (3 - 4.5")     | 16 / .625"                            | 1000P-4M            | 1000P-4           |
| 102 - 152      | (4 - 6")       | 16 / .625"                            | 1000P-5M            | 1000P-5           |
| 152 - 203      | (6 - 8")       | 19 / .75"                             | 1000P-6M            | 1000P-6           |
| 203 - 254      | (8 - 10")      | 19 / .75"                             | 1000P-7M            | 1000P-7           |

Series 1000P gages with greater capacity, alternate Indicators, alternate contact configurations, or other modification to suit specific applications are available – contact Mahr Federal.

\* Insulated grip not available.

## Snap Gages for Outside Diameters 300P

### Superior precision for O.D. checks



**EDI-301P-1**  
BA-26 Bench Stand (not included)

### Features

- Patented "Channel Lock" design assures precisely parallel anvil surfaces throughout the full 25 mm / 1" range of adjustment.
- All Series 300P Snap Gages are fully adjustable with positive position locking at any point within the range.
- 0.50 mm / .020" Range of Sensitive Contact.
- Snap Gages available over a wide range of sizes, styles, and readout configurations.
- Large 15.5 mm / .61" square tungsten carbide anvils provide flat, parallel, long lasting working surfaces ensuring precision that lasts.
- Indicator can be rotated to read from front or rear of the gage.
- Optional lift-lever model (301P) available for retracting the upper anvil.
- All adjustments accomplished using a single hex wrench (furnished).

### Technical Data

| Style                      | Normally Furnished Indicating Instruments Readings | Snap Style   | Separately, Order no.  |
|----------------------------|----------------------------------------------------|--------------|------------------------|
| 12I/22I                    | <b>.0001"</b>                                      | Flat Anvil   | <b>IDT-102/IDT-106</b> |
| O1I/P1I                    | 0.002 mm                                           | Flat Anvil   | <b>IDS-206/IDS-208</b> |
| 2034201                    | 0.0005 mm / <b>.00002"</b>                         | Flat Anvil   | <b>2034201</b>         |
| B5M/C5M                    | <b>.0005"</b>                                      | Groove Anvil | <b>IDS-101/IDS-105</b> |
| O6I/P6I                    | 0.010 mm                                           | Groove Anvil | <b>IDS-207/IDS-209</b> |
| Maxµm®III (1)              | selectable (3)                                     | All          | <b>2033109</b>         |
| Maxµm®III (2)              | selectable (3)                                     | All          | <b>2033119</b>         |
| with Air Probe             |                                                    | All          | <b>*</b>               |
| for 2500:1                 |                                                    |              |                        |
| with Electronic Gage Heads |                                                    | All          | <b>*</b>               |



**A300P-2**

\* Call Mahr Federal.

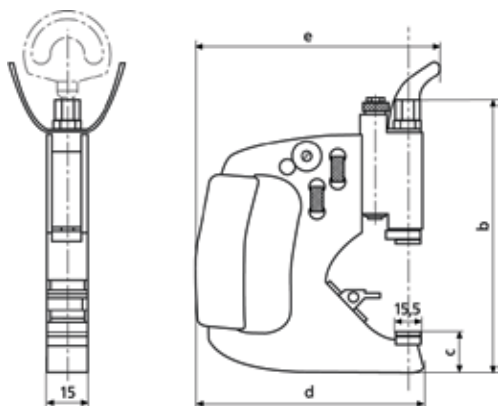
(1) With no Data Output

(2) With Data Output (6 pin)

(3) Selectable Readings — 0.001 mm / 0.005 mm / 0.0005 mm / .0001" / .0005" / .00002"

## Snap Gages for Outside Diameters 300P

### Technical Data



### Dimensions

| Meas. range<br>mm / <i>inch</i> | b                  | c                 | d                 | e                  |
|---------------------------------|--------------------|-------------------|-------------------|--------------------|
| 0 - 25.4 / <b>0-1"</b>          | 150 / <b>6"</b>    | 29 / <b>1.16"</b> | 145 / <b>5.8"</b> | 158 / <b>6.3"</b>  |
| 25.4 - 50.8 / <b>1-2"</b>       | 175 / <b>7"</b>    | 29 / <b>1.16"</b> | 141 / <b>5.6"</b> | 154 / <b>6.16"</b> |
| 50.8 - 76.2 / <b>2-3"</b>       | 200 / <b>8"</b>    | 29 / <b>1.16"</b> | 155 / <b>6.2"</b> | 167 / <b>6.7"</b>  |
| 76.2 - 101.6 / <b>3-4"</b>      | 226 / <b>9"</b>    | 29 / <b>1.16"</b> | 167 / <b>6.7"</b> | 180 / <b>7.2"</b>  |
| 101.6 - 127 / <b>4-5"</b>       | 251 / <b>10"</b>   | 29 / <b>1.16"</b> | 180 / <b>7.2"</b> | 193 / <b>7.7"</b>  |
| 127 - 152.4 / <b>5-6"</b>       | 278 / <b>11"</b>   | 30 / <b>1.2"</b>  | 203 / <b>8"</b>   | 215 / <b>8.6"</b>  |
| 152.4 - 177.8 / <b>6-7"</b>     | 303 / <b>12"</b>   | 30 / <b>1.2"</b>  | 213 / <b>8.5"</b> | 226 / <b>9"</b>    |
| 177.8 - 203.2 / <b>7-8"</b>     | 329 / <b>13"</b>   | 30 / <b>1.2"</b>  | 231 / <b>9.2"</b> | 244 / <b>9.7"</b>  |
| 203.2 - 228.6 / <b>8-9"</b>     | 335 / <b>13.5"</b> | 30 / <b>1.2"</b>  | 248 / <b>9.9"</b> | 261 / <b>10.4"</b> |

### Ordering Information

Plain Anvils (Anvils included in price – choose from list below)

|          | No Indicator<br>3/8" Adaptor | No Indicator<br>3/8" Adaptor<br>With Lift<br>Lever | No Indicator<br>8 mm<br>Adaptor | No Indicator<br>8 mm<br>Adaptor<br>With Lift Lever | With Dial<br>Indicator<br>3/8" Adaptor<br>.0001" Grads | With Dial<br>Indicator<br>3/8" Adaptor<br>With Lift Lever | With<br>µMaxµm II | With<br>Maxµm III |
|----------|------------------------------|----------------------------------------------------|---------------------------------|----------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------|-------------------|-------------------|
| 0 - 1"   | OMI-300P-1                   | OMI-301P-1                                         | 2003100                         | 2003110                                            | 300P-1                                                 | 301P-1                                                    | EDI-300P-1        | EMD-300P-1        |
| 1 - 2"   | OMI-300P-2                   | OMI-301P-2                                         | 2003101                         | 2003111                                            | 300P-2                                                 | 301P-2                                                    | EDI-300P-2        | EMD-300P-2        |
| 2 - 3"   | OMI-300P-3                   | OMI-301P-3                                         | 2003102                         | 2003112                                            | 300P-3                                                 | 301P-3                                                    | EDI-300P-3        | EMD-300P-3        |
| 3 - 4"   | OMI-300P-4                   | OMI-301P-4                                         | 2003103                         | 2003113                                            | 300P-4                                                 | 301P-4                                                    | EDI-300P-4        | EMD-300P-4        |
| 4 - 5"   | OMI-300P-5                   | OMI-301P-5                                         | 2003104                         | 2003114                                            | 300P-5                                                 | 301P-5                                                    | EDI-300P-5        | EMD-300P-5        |
| 5 - 6"   | OMI-300P-6                   | OMI-301P-6                                         | 2003105                         | 2003115                                            | 300P-6                                                 | 301P-6                                                    | EDI-300P-6        | EMD-300P-6        |
| 6 - 7"   | OMI-300P-7                   | OMI-301P-7                                         | 2003106                         | 2003116                                            | 300P-7                                                 | 301P-7                                                    | EDI-300P-7        | EMD-300P-7        |
| 7 - 8"   | OMI-300P-8                   | OMI-301P-8                                         | 2003107                         | 2003117                                            | 300P-8                                                 | 301P-8                                                    | EDI-300P-8        | EMD-300P-8        |
| 8 - 9"   | OMI-300P-9                   | OMI-301P-9                                         | 2003108                         | 2003118                                            | 300P-9                                                 | 301P-9                                                    | EDI-300P-9        | EMD-300P-9        |
| 9 - 10"  | OMI-300P-10                  | OMI-301P-10                                        | 2063910                         | 2064110                                            | 300P-10                                                | 301P-10                                                   | EDI-300P-10       | EMD-300P-10       |
| 10 - 11" | OMI-300P-11                  | OMI-301P-11                                        | 2063911                         | 2064111                                            | 300P-11                                                | 301P-11                                                   | EDI-300P-11       | EMD-300P-11       |
| 11 - 12" | OMI-300P-12                  | OMI-301P-12                                        | 2063912                         | 2064112                                            | 300P-12                                                | 301P-12                                                   | EDI-300P-12       | EMD-300P-12       |
| 12 - 13" | OMI-300P-13                  | OMI-301P-13                                        | 2063913                         | 2064113                                            | 300P-13                                                | 301P-13                                                   | EDI-300P-13       | EMD-300P-13       |
| 13 - 14" | OMI-300P-14                  | OMI-301P-14                                        | 2063914                         | 2064114                                            | 300P-14                                                | 301P-14                                                   | 2063714           | EMD-300P-14       |
| 14 - 15" | 2063315                      | 2063415                                            | 2063915                         | 2064115                                            | 2063515                                                | 2063615                                                   | 2063715           | 2063815           |
| 15 - 16" | 2063316                      | 2063416                                            | 2063916                         | 2064116                                            | 2063516                                                | 2063616                                                   | 2063716           | 2063816           |
| 16 - 17" | 2063317                      | 2063417                                            | 2063917                         | 2064117                                            | 2063517                                                | 2063617                                                   | 2063717           | 2063817           |
| 17 - 18" | 2063318                      | 2063418                                            | 2063918                         | 2064118                                            | 2063518                                                | 2063618                                                   | 2063718           | 2063818           |
| 18 - 19" | 2063319                      | 2063419                                            | 2063919                         | 2064119                                            | 2063519                                                | 2063619                                                   | 2063719           | 2063819           |
| 19 - 20" | 2063320                      | 2063420                                            | 2063920                         | 2064120                                            | 2063520                                                | 2063620                                                   | 2063720           | 2063820           |

Blade Anvils (Anvils included in price – choose from list below)

|        |             |             |         |         | .0005" Grads | .0005" Grads |             |             |
|--------|-------------|-------------|---------|---------|--------------|--------------|-------------|-------------|
| 0 - 1" | OMI-300P-31 | OMI-301P-31 | 2063931 | 2064131 | 300P-31      | 301P-31      | EDI-300P-31 | EMD-300P-31 |
| 1 - 2" | OMI-300P-32 | OMI-301P-32 | 2063932 | 2064132 | 300P-32      | 301P-32      | 2063732     | EMD-300P-32 |
| 2 - 3" | OMI-300P-33 | OMI-301P-33 | 2063933 | 2064133 | 300P-33      | 301P-33      | 2063733     | EMD-300P-33 |
| 3 - 4" | OMI-300P-34 | OMI-301P-34 | 2063934 | 2064134 | 300P-34      | 301P-34      | 2063734     | EMD-300P-34 |
| 4 - 5" | OMI-300P-35 | OMI-301P-35 | 2063935 | 2064135 | 300P-35      | 301P-35      | 2063735     | EMD-300P-35 |
| 5 - 6" | 2063336     | 2063436     | 2063936 | 2064136 | 2063536      | 2063636      | 2063736     | 2063836     |
| 6 - 7" | 2063337     | 2063437     | 2063937 | 2064137 | 2063537      | 2063637      | 2063737     | 2063837     |
| 7 - 8" | 2063338     | 2063438     | 2063938 | 2064138 | 2063538      | 2063638      | 2063738     | 2063838     |
| 8 - 9" | 2063339     | 2063439     | 2063939 | 2064139 | 2063539      | 2063639      | 2063739     | 2063839     |

Larger capacities available on request.

To specify Metric models, add suffix "M" to the Model number. To specify Digital Output, add suffix "D" to Model numbers of EMD-300P and EMD-301P Series Gages. To specify both, add suffix "MD" to Model numbers of EMD-300P and EMD-301P Series Gages.

**Examples:** 300P-2 specifies a Snap Gage with a 12I (.0001" grad.) Dial Indicator, 25-50 mm / 1-2" capacity. EMD-301P-33D specifies a Groove Diameter Snap Gage with lift lever, 50-76 mm / 2-3" capacity, AL-110 Blade Anvils, 2033119 (selectable units and resolution) Maxµm/III Indicator with Digital Output

## Snap Gages for Outside Diameters 300P

### Accessories



**BA-71**  
Bench Stand for Disc Masters



**Groove Diameter Snap Gages** – One pair of anvil inserts must be specified with each gage. Stocked anvils (shown below) are hardened steel. If no other anvils are specified, AL-110 will be provided.

**Anvil Inserts** – For all Series 300P-30 and 301P-30 groove gages (2 required per gage).

#### Bench Stand for Gages

Clamps 300P and 1000P Series Gages firmly. A 6.4 mm / .25" mounting hole allows permanent fastening to bench surface.

Order no.

**BA-26**

#### Bench Stand for Disc Masters

Holds any AGD style 3 Disc up to 127 mm / 5" diameter and 27 mm / 1.12" wide. Two 6.4 mm / 0.25" mounting holes allow permanent fastening to bench surface

**BA-71**

#### Gaging pressure options

For EMD, OMI and Dial Indicator models

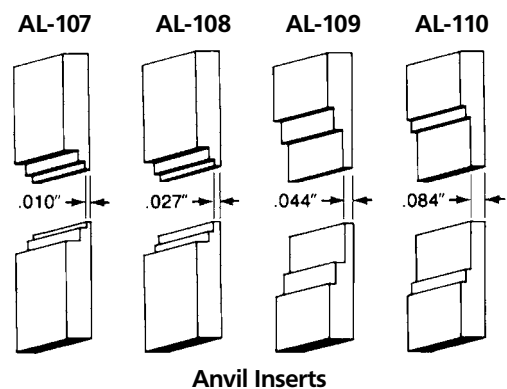
Lighter  
Heavier

**SP-192**  
**SP-118**

For EDI models only

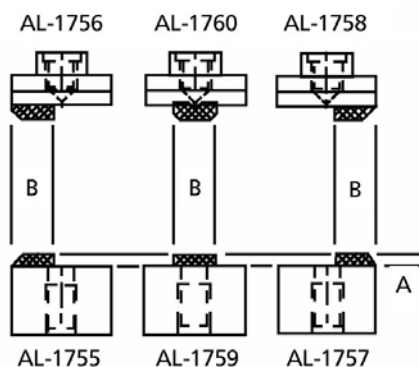
Lighter  
Heavier

**2243295**  
**2243297**



**Anvil Inserts**

#### Plain Anvil Options Front View



A = 2mm/.080in  
B = 6.35mm/.250in

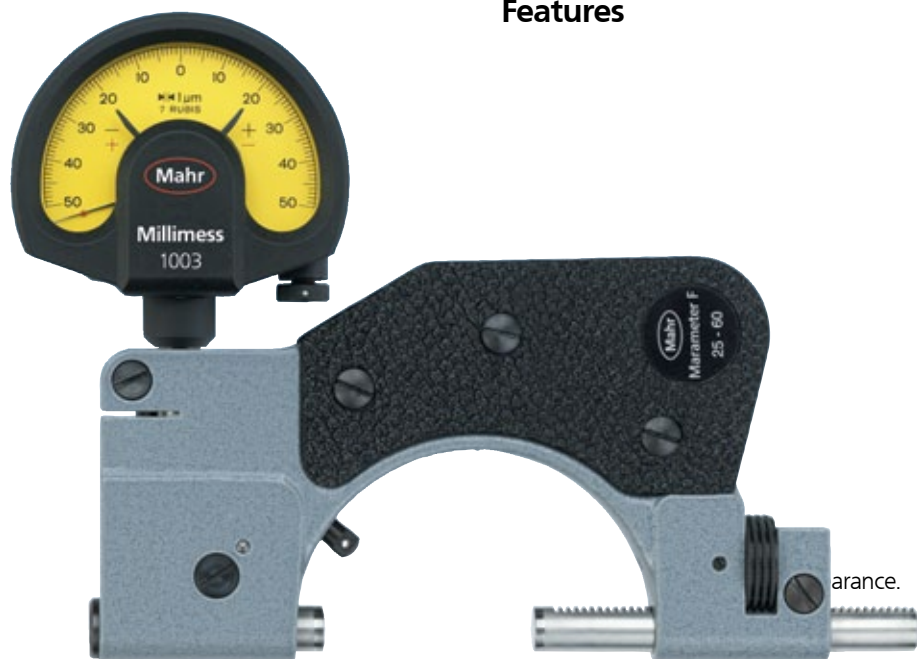
#### Blade Anvils

| Width<br>mm / inch | Depth<br>mm / inch | Order no.<br>Steel | T.C.    |
|--------------------|--------------------|--------------------|---------|
| 0.25 / .010"       | 0.76 / .030"       | AL-107             | AL-1741 |
| 0.69 / .027"       | 1.02 / .040"       | AL-108             | AL-1742 |
| 1.12 / .044"       | 4.83 / .19"        | AL-109             | AL-1743 |
| 2.13 / .084"       | 6.35 / .25"        | AL-110*            | AL-1744 |

\* normally provided

## Indicating Snap Gages 840 F / 840 FC MaraMeter F

### Features



### Features

- For cylindrical parts such as shafts, bolts and spindles, for thickness and length measurements
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle are both made of hardened stainless steel, carbide-tipped or ceramic (840 FC) measuring faces
- Adjustable center stop for automatic alignment
- Maximum wear resistance due to non-contact positioning in conjunction with carbide-tipped measuring faces
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable and extremely versatile. Each instrument spans a broad measuring range, within this range any dimension and fit can be very quickly and easily adjusted
- Supplied with: Wooden case, steel flat contact points 903

Alternate indicators and contact points available upon request.

### Technical Data

|               | Measuring range |             | Repeatability<br>$f_w$<br>$\mu\text{m}$ | Distance of<br>moveable anvil<br>mm | Measuring<br>force**<br>N | Measuring face            |                              | Order no.*     |
|---------------|-----------------|-------------|-----------------------------------------|-------------------------------------|---------------------------|---------------------------|------------------------------|----------------|
|               | mm              | (inch)      |                                         |                                     |                           | Flatness<br>$\mu\text{m}$ | Parallelism<br>$\mu\text{m}$ |                |
| <b>840 F</b>  | 0 - 25          | (0 - 1")    | $\leq 0.5$                              | 2                                   | 7.5                       | $\leq 0.2$                | $\leq 1$                     | <b>4450000</b> |
|               | 25 - 60         | (1 - 2.36") | $\leq 0.5$                              | 2                                   | 7.5                       | $\leq 0.2$                | $\leq 2$                     | <b>4450001</b> |
|               | 50 - 100        | (2 - 4")    | $\leq 1$                                | 2.5                                 | 7.5                       | $\leq 0.2$                | $\leq 2$                     | <b>4450002</b> |
|               | 100 - 150       | (4 - 6")    | $\leq 1$                                | 2.5                                 | 7.5                       | $\leq 0.2$                | $\leq 2$                     | <b>4450003</b> |
|               | 150 - 200       | (6 - 8")    | $\leq 1$                                | 2.5                                 | 7.5                       | $\leq 0.2$                | $\leq 2$                     | <b>4450004</b> |
| <b>840 FC</b> | 0 - 25          | (0 - 1")    | $\leq 1$                                | 2                                   | 7.5                       | $\leq 0.2$                | $\leq 1$                     | <b>4450100</b> |
|               | 25 - 60         | (1 - 2.36") | $\leq 1$                                | 2                                   | 7.5                       | $\leq 0.2$                | $\leq 2$                     | <b>4450101</b> |

\* Excludes indicating instrument

\*\* Further measuring forces are available on request

## Indicating Instruments

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

| Dial Comparator               |               | Readings          |   |         | Order no. |   |         |
|-------------------------------|---------------|-------------------|---|---------|-----------|---|---------|
|                               |               | mm                | / | inch    | mm        | / | inch    |
| Millimess                     | 1004 / 1004 Z | 5 $\mu\text{m}$   | / | .0001"  | 4333000   | / | 4333900 |
| Millimess                     | 1003 / 1003 Z | 1 $\mu\text{m}$   | / | .00005" | 4334000   | / | 4334900 |
| Millimess                     | 1003 XL       | 2 $\mu\text{m}$   |   |         | 4334001   |   |         |
| Millimess                     | 1002 / 1002 Z | 0.5 $\mu\text{m}$ | / | .00002" | 4335000   | / | 4335900 |
| Extramess                     | 2000          | 0.2 $\mu\text{m}$ | / | .00001" | 4346000*  |   |         |
|                               |               | 0.5 $\mu\text{m}$ | / | .00002" |           |   |         |
|                               |               | 1 $\mu\text{m}$   | / | .00005" |           |   |         |
| Extramess                     | 2001          | 0.2 $\mu\text{m}$ | / | .00001" | 4346100*  |   |         |
|                               |               | 0.5 $\mu\text{m}$ | / | .00002" |           |   |         |
|                               |               | 1 $\mu\text{m}$   | / | .00005" |           |   |         |
| $\mu\text{Max}\mu\text{m II}$ |               | 0.0005 mm         | / | .00002" | 2034205** |   |         |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

\* 230 V, for 115 V please refer to page 6-5

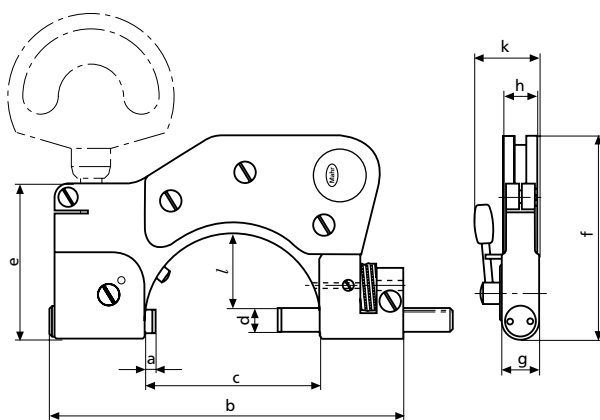
\*\* requires contact 4360107



2000



1003



| Meas. range<br>mm | 0 - 25 | 25 - 60 | 50 - 100 | 100 - 150 | 150 - 200 |
|-------------------|--------|---------|----------|-----------|-----------|
| a*                | 5      | 5       | 6.5      | 6.5       | 6.5       |
| b                 | 97     | 140     | 193      | 258       | 316       |
| c                 | 34     | 68      | 110      | 162       | 212       |
| d                 | 8      | 9       | 10       | 12        | 12        |
| e                 | 54     | 60      | 60       | 70        | 75        |
| f                 | 65     | 77      | 103      | 141       | 171       |
| g                 | 12     | 13      | 14       | 16        | 16        |
| h                 | 13     | 13      | 13       | 12        | 12        |
| k                 | 23     | 25      | 28       | 31        | 31        |
| l                 | 14     | 30      | 54       | 81        | 106       |

\* In initial position

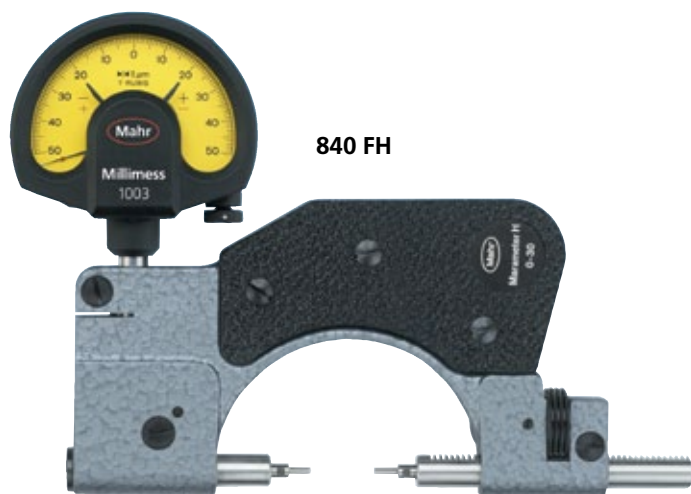
## Accessories

Reference Discs 390 see Chapter 13

Gage Blocks see Chapter 13

Holder 840 Fk and Stand 840 Ff see Page 9-15

## Indicating Snap Gage 840 FH with interchangeable anvils



### Features

- Measuring spindle and anvil spindle have precision tapered bores for mounting interchangeable anvils 40 He
- For cylindrical parts such as shafts, bolts and spindles
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle and both made from hardened stainless steel
- Maximum wear resistance due to non-contact positioning
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable
- All kinds of measurement problems can be solved with the broad range of interchangeable anvils
- Supplied with: Wooden case, steel flat contact points 903, spanner DIN 902-3.5

### Technical Data

|        | Measuring range* |             | Repeatability | Distance of moveable anvil | Measuring force | Order no.** |
|--------|------------------|-------------|---------------|----------------------------|-----------------|-------------|
|        | mm               | (inch)      |               | mm                         | N               |             |
| 840 FH | 0 - 30           | (0 - 1.18") | ≤ 1           | 2                          | 7.5             | 4451000     |
|        | 30 - 80          | (1.18 - 3") | ≤ 1           | 2.5                        | 7.5             | 4451005     |

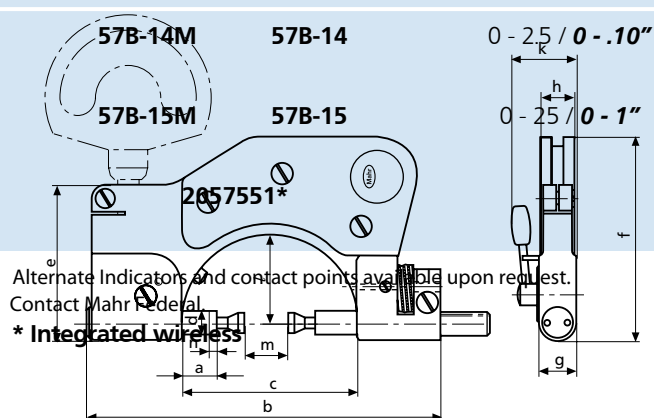
\* Measuring is dependent upon the length of the anvils being used

\*\* Excludes indicating instrument (and anvils)

| Order | Metric | Inch | Capacity  | Description |                                    |
|-------|--------|------|-----------|-------------|------------------------------------|
|       | mm     | inch | mm / inch | Meas. range | 840 FH                             |
|       |        |      |           | m (mm)      | 0 - 30 30 - 80                     |
|       |        |      |           |             | with 2.5 mm / .10" sensitive range |
|       |        |      |           | a*          | 12.5 7.5                           |
|       |        |      |           | b           | 140 193                            |
|       |        |      |           | c           | 68 110                             |
|       |        |      |           | d           | 9 10                               |
|       |        |      |           | e           | 60 60                              |
|       |        |      |           | f           | 77 103                             |
|       |        |      |           | g           | 13 13                              |
|       |        |      |           | h           | 13 13                              |
|       |        |      |           | k           | 25 28                              |
|       |        |      |           | l           | 34 59                              |
|       |        |      |           | n**         | 2 2.5                              |

\* In initial position

\*\* Distance of moveable anvil



Alternate Indicators and contact points available upon request.

Contact Mahr Federal

\* Integrated wireless

## Interchangeable Anvils for Indicating Snap Gage 840 FH

with tapered shank

| Catalog no. | Features                                     | Order no. |
|-------------|----------------------------------------------|-----------|
| 40 He 0H*   | Flat faces                                   | 4152036   |
| 40 He 1     | Stepped flat faces                           | 4152011   |
| 40 He 1H*   | Stepped flat faces                           | 4152033   |
| 40 He 2     | Stepped flat faces                           | 4152012   |
| 40 He 2H*   | Stepped flat faces                           | 4152032   |
| 40 He 3     | Discs                                        | 4152013   |
| 40 He 4     | Discs with V-groove                          | 4152014   |
| 40 He 5     | Blades                                       | 4152015   |
| 40 He 6     | Offset blades                                | 4152016   |
| 40 He 7     | Recessed blades                              | 4152017   |
| 40 He 8     | Recessed flat faces with V-grooves on sleeve | 4152018   |
| 40 He 9     | Recessed flat faces with slip on support     | 4152019   |
| 40 He 10    | With clearance bores                         | 4152020   |
| 40 He 11    | Point                                        | 4152021   |

\* Carbide version

## Indicating Instruments

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

| Dial Comparator               |               | Readings            |         | Order no.       |
|-------------------------------|---------------|---------------------|---------|-----------------|
|                               |               | mm                  | / inch  |                 |
| Millimess                     | 1004 / 1004 Z | 5 $\mu\text{m}$ /   | .0001"  | 4333000/4333900 |
| Millimess                     | 1003 / 1003 Z | 1 $\mu\text{m}$ /   | .00005" | 4334000/4334900 |
| Millimess                     | 1003 XL       | 2 $\mu\text{m}$ /   |         | 4334001         |
| Millimess                     | 1002 / 1002 Z | 0.5 $\mu\text{m}$ / | .00002" | 4335000/4335900 |
| Extramess                     | 2000          | 0.2 $\mu\text{m}$ / | .00001" |                 |
|                               |               | 0.5 $\mu\text{m}$ / | .00002" | 4346000*        |
|                               |               | 1 $\mu\text{m}$ /   | .00005" |                 |
| Extramess                     | 2001          | 0.2 $\mu\text{m}$ / | .00001" |                 |
|                               |               | 0.5 $\mu\text{m}$ / | .00002" | 4346100*        |
|                               |               | 1 $\mu\text{m}$ /   | .00005" |                 |
| $\mu\text{Max}\mu\text{m II}$ |               | .0005 mm /          | .00002" | 2034205**       |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

\* 230 V, for 115 V please refer to page 6-5 \*\* requires contact 4360107

## Accessories

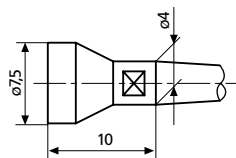
**Spanner** (Included in scope of supply)  
for 840 FH, to loosen anvils

**Order no.** 4880210

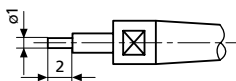
**Reference Discs 390** see Chapter 13

**Gage Blocks** see Chapter 13

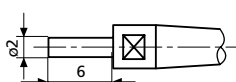
**Holder 840 Fk** and **Stand 840 Ff** see Page 9-15



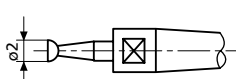
40 He 0H



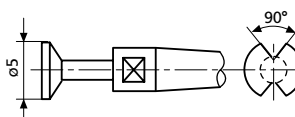
40 He 1



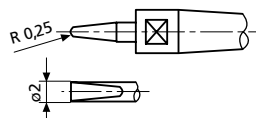
40 He 2



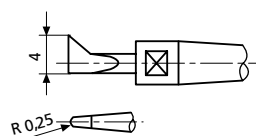
40 He 3



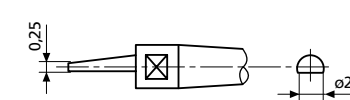
40 He 4



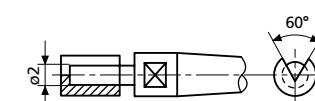
40 He 5



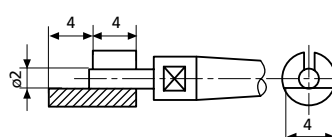
40 He 6



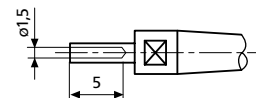
40 He 7



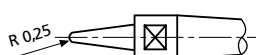
40 He 8



40 He 9



40 He 10



40 He 11

## Indicating Snap Gages 840 FG with interchangeable anvils



### Features

- Measuring spindle and anvil spindle have a M 2.5 connection thread, thus enabling the use of interchangeable anvils that are also used in dial indicators and dial comparators
- For cylindrical parts such as shafts, bolts and splines
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle and both made from hardened stainless steel
- Maximum wear resistance due to non-contact positioning
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable
- All kinds of measurement problems can be solved with the broad range of interchangeable anvils
- Supplied with: Wooden case, steel flat contact point 903

### Technical Data

|        | Measuring range* |                | Repeatability | Distance of moveable anvil | Measuring force | Order no.** |
|--------|------------------|----------------|---------------|----------------------------|-----------------|-------------|
|        | mm               | (inch)         | $f_w \mu m$   | mm                         | N               |             |
| 840 FG | 0 - 50           | (0 - 2")       | $\leq 0.5$    | 2                          | 7.5             | 4454000     |
|        | 40 - 90          | (1.57 - 3.57") | $\leq 0.5$    | 2.5                        | 7.5             | 4454001     |

\* Measuring is dependent upon the length of the anvils being measured / inch

\*\* Excludes indicating instrument (and anvils)

57B-14M 57B-14 0 - 2.5 / 0 - .10"

Dial Indicator readout with 2.5 mm / .10" sensitive range and .002 mm / .0001" grads.

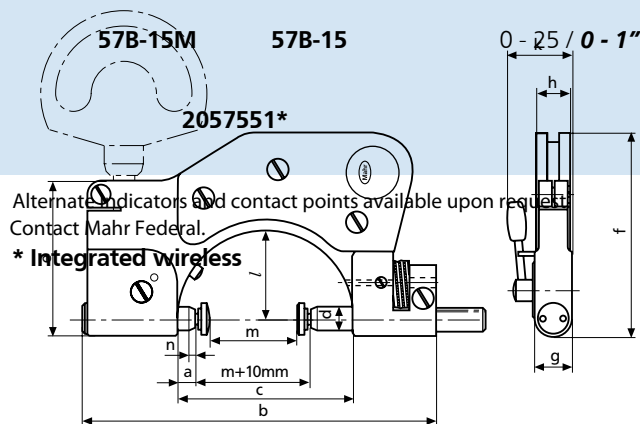
#### Meas. range 840 FG

m (mm) 0 - 50 40 - 90 with 25 mm / 1" sensitive range

|     |     |     |
|-----|-----|-----|
| a*  | 5   | 6.5 |
| b   | 140 | 193 |
| c   | 68  | 110 |
| d   | 9   | 10  |
| e   | 60  | 60  |
| f   | 77  | 103 |
| g   | 13  | 14  |
| h   | 13  | 13  |
| k   | 25  | 28  |
| l   | 34  | 59  |
| n** | 2   | 2.5 |

\* In initial position

\*\* Distance of moveable anvil



Alternate indicators and contact points available upon request. Contact Mahr Federal.

\* Integrated wireless

## Interchangeable Anvils for Indicating Snap Gage 840 FG

| Catalog no.       | Features                                                     | Order no.    |                   |                |              |
|-------------------|--------------------------------------------------------------|--------------|-------------------|----------------|--------------|
| 901 H             | Standard contact point with carbide ball, ball dia. 3 mm     | 4360002      |                   |                |              |
| 902 H             | Spherical contact point, with carbide face, R = 6 mm         |              |                   |                |              |
|                   | Length <i>l</i> in mm                                        |              |                   |                |              |
|                   | 10                                                           |              |                   |                |              |
|                   | 15                                                           | 4360043      |                   |                |              |
|                   | 20                                                           | 4360044      |                   |                |              |
| 903 H*            | Flat contact point, carbide tipped                           | 4360101      |                   |                |              |
|                   | Length <i>l</i> in mm                                        |              |                   |                |              |
|                   | 6                                                            |              |                   |                |              |
|                   | 10                                                           |              |                   |                |              |
|                   | 15                                                           |              |                   |                |              |
|                   | 20                                                           | 4360106      |                   |                |              |
| 904 H             | Conical contact point, carbide tipped                        | 4360131      |                   |                |              |
|                   |                                                              |              |                   |                |              |
| 906 H             | Ball Contact Points                                          |              |                   |                |              |
|                   | with carbide ball, manufacturing tolerance ball dia. 0/-6 μm |              |                   |                |              |
| Ball dia. d<br>mm | <i>l</i><br>mm                                               | Order<br>no. | Ball dia. d<br>mm | <i>l</i><br>mm | Order<br>no. |
| 1                 | 8.5                                                          | 4360150      | 5.5               | 9              | 4360161      |
| 1.25              | 8.5                                                          | 4360151      | 6                 | 9              | 4360162      |
| 1.5               | 8.5                                                          | 4360152      | 6.35 (1/4")       | 9              | 4360163      |
| 1.75              | 8.5                                                          | 4360153      | 6.5               | 10             | 4360164      |
| 2                 | 8.5                                                          | 4360154      | 7                 | 10             | 4360165      |
| 2.5               | 8.5                                                          | 4360155      | 7.5               | 11             | 4360166      |
| 3                 | 8.5                                                          | 4360156      | 8                 | 11             | 4360167      |
| 3.5               | 8.5                                                          | 4360157      | 8.5               | 12             | 4360168      |
| 4                 | 8.5                                                          | 4360158      | 9                 | 12             | 4360169      |
| 4.5               | 8.5                                                          | 4360159      | 10                | 13             | 4360170      |
| 5                 | 9                                                            | 4360160      |                   |                |              |

## Indicating Instruments

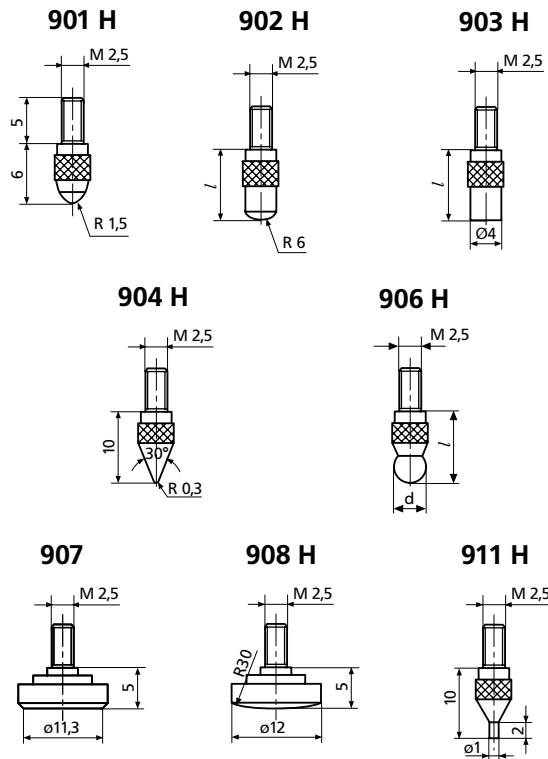
All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

| Dial Comparator                | Readings<br>mm / inch | Order no.<br>mm / inch |
|--------------------------------|-----------------------|------------------------|
| <b>Millimess 1004 / 1004 Z</b> | 5 µm / .0001"         | <b>4333000/4333900</b> |
| <b>Millimess 1003 / 1003 Z</b> | 1 µm / .00005"        | <b>4334000/4334900</b> |
| <b>Millimess 1003 XL</b>       | 2 µm /                | <b>4334001</b>         |
| <b>Millimess 1002 / 1002 Z</b> | 0.5 µm / .00002"      | <b>4335000/4335900</b> |
| <b>Extramess 2000</b>          | 0.2 µm / .00001"      |                        |
|                                | 0.5 µm / .00002"      | <b>4346000*</b>        |
|                                | 1 µm / .00005"        |                        |
| <b>Extramess 2001</b>          | 0.2 µm / .00001"      |                        |
|                                | 0.5 µm / .00002"      | <b>4346100*</b>        |
|                                | 1 µm / .00005"        |                        |
| <b>µMaxµm II</b>               | .0005 mm / .00002"    | <b>2034205**</b>       |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

\* 230 V, for 115 V please refer to page 6-5 \*\* requires contact 4360107



| Catalog no.  | Features                                               | Order no.      |
|--------------|--------------------------------------------------------|----------------|
| <b>907</b>   | Flat contact plates*<br>steel, dia. 11.3 mm, A = 1 cm² | <b>4360200</b> |
| <b>907 H</b> | Flat contact plates*, carbide tipped,<br>dia. 7 mm     | <b>4360201</b> |
| <b>908</b>   | Spherical contact plates, steel                        | <b>4360210</b> |
| <b>908 H</b> | Spherical contact plates,<br>carbide tipped            | <b>4360211</b> |
| <b>911 H</b> | Pin contact point, carbide tipped,<br>dia. 1 mm, plan  | <b>4360240</b> |

\* When using a flat contact plate the opposite facing anvil must be a spherical contact plate.

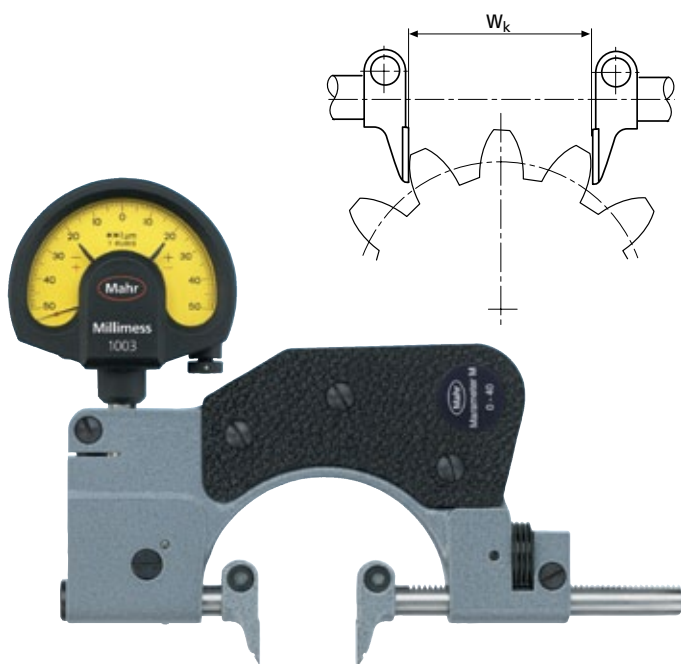
## Accessories

**Reference Discs 390** see Chapter 13

**Gage Blocks** see Chapter 13

**Holder 840 Fk and Stand 840 Ff** see Page 9-15

## Indicating Snap Gages 840 FM MaraMeter M with measuring jaws



### Features

- For diameters of small hubs, registers, shoulders on shafts and groove widths as well as for tooth span  $W_k$  as indirect, reference-free determination of tooth thickness on spur gears with straight and helical teeth
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Maximum wear resistance due to non-contact positioning in conjunction with carbide-tipped measuring faces
- Measuring spindle and anvil spindle made of hardened stainless steel; with extending carbide-tipped measuring jaws
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable and extremely versatile, each instrument spans a broad measuring range, within this range any dimension and fit can be very quickly and easily adjusted
- Supplied with: Wooden case, steel flat contact points 903

### Technical Data

|               | Measuring range |             | Repeatability | Measuring force | Measuring face |                        |                           | Tooth span measurements as per module m | Order no.*     |
|---------------|-----------------|-------------|---------------|-----------------|----------------|------------------------|---------------------------|-----------------------------------------|----------------|
|               | mm              | (inch)      |               |                 | Area mm        | Flatness $\mu\text{m}$ | Parallelism $\mu\text{m}$ |                                         |                |
| <b>840 FM</b> | 0 - 40          | (0 - 1.57") | 1             | 7.5             | 12 x 12        | $\leq 0.5$             | $\leq 2$                  | 0.5                                     | <b>4452000</b> |
|               | 40 - 80         | (1.57 - 3") | 1             | 7.5             | 12 x 12        | $\leq 0.5$             | $\leq 3$                  | 0.5                                     | <b>4452001</b> |
|               | 80 - 130        | (3 - 5")    | 1             | 9               | 15 x 17        | $\leq 0.5$             | $\leq 3$                  | 1.0                                     | <b>4452002</b> |
|               | 130 - 180       | (5 - 7")    | 1             | 9               | 15 x 17        | $\leq 0.5$             | $\leq 3$                  | 1.0                                     | <b>4452003</b> |

\* Excludes indicating instrument

3/8" - 1 1/4" 3/8" - 1 1/4" 0 - 2.5 / 0 - 1"

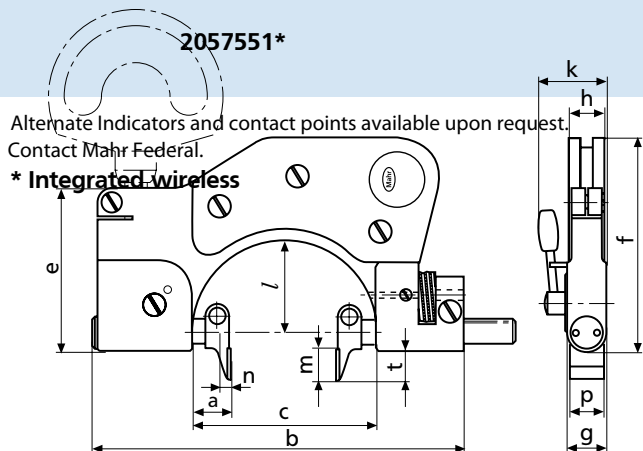
### Dimensions

| Meas. range (mm)       | 0 - 40 | 40 - 80 | 80 - 130 | 130 - 180 |
|------------------------|--------|---------|----------|-----------|
| Dist mov. anvil n (mm) | 2      | 2.5     | 2.5      | 2.5       |
| <b>a*</b>              | 14     | 14      | 19       | 15        |
| <b>b</b>               | 140    | 193     | 258      | 316       |
| <b>c</b>               | 68     | 110     | 162      | 212       |
| <b>e</b>               | 60     | 60      | 70       | 75        |
| <b>f</b>               | 77     | 103     | 141      | 171       |
| <b>g</b>               | 13     | 14      | 16       | 16        |
| <b>h</b>               | 13     | 13      | 12       | 12        |
| <b>k</b>               | 25     | 28      | 31       | 31        |
| <b>l</b>               | 34     | 59      | 87       | 112       |
| <b>m</b>               | 12     | 12      | 17       | 17        |
| <b>p</b>               | 12     | 12      | 15       | 15        |
| <b>t</b>               | 11     | 11      | 17       | 17        |

\* In initial position

### Accessories

Indicating instruments, see Page 9-9  
 Reference Discs 390 see Chapter 13  
 Gage Blocks see Chapter 13  
 Holder 840 Fk and Stand 840 Ff see Page 9-15



## Accessories for Dial Indicators and Dial Comparators



### Holder 840 Fk for Dial Indicators and Dial Comparators

- For attaching to the following measuring instruments **840 F/FC, 840 FH, 840 FG, 840 FM** and **852**
- Straight transfer of the spindle movement to the indicator
- Following the Abbe principle allows an even higher degree of accuracy than the already excellent level obtained with the standard set-up employing 90° transmission
- When the indicating instrument is in the shown position it is often easier to read
- For stationary application when in conjunction with the **Stand 840 Ff**

| Catalog no.     | Suitable for instruments with measuring ranges (mm) |         |         |           |           | Order no.      |
|-----------------|-----------------------------------------------------|---------|---------|-----------|-----------|----------------|
|                 | 840 F/FC                                            | 840 FH  | 840 FG  | 840 FM    | 852       |                |
| <b>840 Fk/1</b> | 0 - 25                                              |         |         |           |           | <b>4450050</b> |
| <b>840 Fk/2</b> | 25 - 60                                             | 0 - 30  | 0 - 50  | 0 - 40    | 0 - 45    | <b>4450051</b> |
| <b>840 Fk/3</b> | 50 - 100                                            | 30 - 80 | 40 - 90 | 40 - 80   | 45 - 85   | <b>4450052</b> |
| <b>840 Fk/4</b> | 100 - 150                                           |         |         | 80 - 130  | 85 - 140  | <b>4450053</b> |
|                 | 150 - 200                                           |         |         | 130 - 180 | 140 - 190 |                |



### Stand 840 Ff

- For stationary application in conjunction with the following measuring instruments **840 F/FC, 840 FH, 840 FG, 840 FM, 840 E** and **852**
- User has both hands free for insertion of work piece and retraction of moving spindle
- Indicating instrument is always in operator's field of vision
- Rugged, rigid cast-iron stand with clamp for locking the indicating snap gage
- Indicating snap gage is locked in mounting hole for dial comparator
- Only in conjunction with **Holder 840 Fk**

| Catalog no.   | Suitable for instruments with measuring ranges (mm) |        |        |        |        | Order no.      |
|---------------|-----------------------------------------------------|--------|--------|--------|--------|----------------|
|               | 840 F/FC                                            | 840 FH | 840 FG | 840 FM | 852    |                |
| <b>840 Ff</b> | { 0 - 25<br>25 - 60                                 | 0 - 30 | 0 - 50 | 0 - 40 | 0 - 45 | <b>4450020</b> |

## Indicating Snap Gages 840 FS MaraMeter S



### Features

- For all kinds of cylindrical work pieces, whether directly on a machine tool or in the production control
- Rigid frame; convenient handle with heat insulators open on one end to eliminate heat transfer from user's hand
- Both spindles are made of hardened stainless steel and mounted in long guide ways
- Carbide-tipped measuring faces slightly chamfered at the front to facilitate positioning
- Projects over width of frame for measurement of narrow registers or when measuring directly at shoulders
- Maximum accuracy. Straight transfer of spindle movement to indicator. During the measurement, the weight of the gage rests on the anvil spindle
- Adjustable center stop for automatic alignment
- Indicating instrument is protected against possible impact during handling by a laterally projecting guard
- Direct indication and evaluation of measurement results
- Universally applicable and extremely versatile, each instrument spans a broad measuring range, within this range any dimension and fit can be very quickly and easily adjusted
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Supplied with:  
Wooden case, allen key

### Technical Data

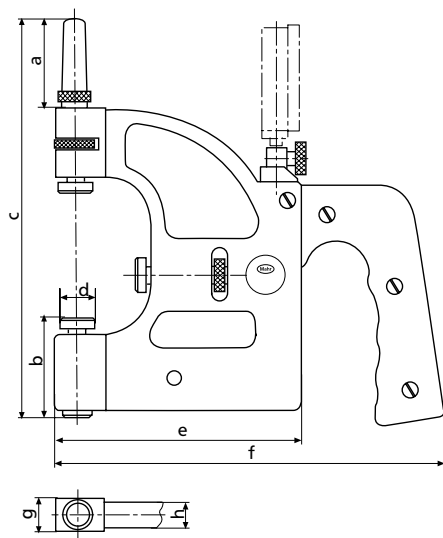
| Metric  | Order  | Inch | Capacity<br>mm / inch |
|---------|--------|------|-----------------------|
| 57B-14M | 57B-14 |      | 0 - 2.5 / 0 - .10"    |
| 57B-15M | 57B-15 |      | 0 - 25 / 0 - 1"       |

### Technical Data

|        | Measuring range |                | Repeatability<br>$f_w$<br>$\mu\text{m}$ | Measuring force<br>N | Distance of moveable anvil<br>mm | Measuring faces           |                              | Weight<br>kg | Order no.* |
|--------|-----------------|----------------|-----------------------------------------|----------------------|----------------------------------|---------------------------|------------------------------|--------------|------------|
|        | mm              | (inch)         |                                         |                      |                                  | Flatness<br>$\mu\text{m}$ | Parallelism<br>$\mu\text{m}$ |              |            |
| 840 FS | 10 - 30         | (.39 - 1.18")  | 1                                       | 13.5                 | 0.7                              | $\leq 0.5$                | $\leq 3$                     | 0.6          | 4455000    |
| 840 FS | 30 - 60         | (1.18 - 2.36") | 1                                       | 13.5                 | 0.7                              | $\leq 0.5$                | $\leq 3$                     | 0.9          | 4455001    |
| 840 FS | 60 - 100        | (2.36 - 4")    | 1                                       | 13.5                 | 0.7                              | $\leq 0.5$                | $\leq 3$                     | 1.3          | 4455002    |
| 840 FS | 100 - 150       | (4 - 6")       | 1                                       | 15                   | 0.7                              | $\leq 0.5$                | $\leq 3$                     | 1.7          | 4455003    |
| 840 FS | 150 - 200       | (6 - 8")       | 1                                       | 15                   | 0.7                              | $\leq 0.5$                | $\leq 3$                     | 2.0          | 4455004    |
| 840 FS | 200 - 250       | (8 - 10")      | 1                                       | 15                   | 0.7                              | $\leq 0.5$                | $\leq 3$                     | 2.2          | 4455005    |
| 840 FS | 250 - 300       | (10 - 12")     | 1                                       | 15                   | 0.7                              | $\leq 0.5$                | $\leq 3$                     | 2.5          | 4455006    |
| 840 FS | 300 - 350       | (12 - 14")     | 1                                       | 15                   | 0.7                              | $\leq 0.5$                | $\leq 4$                     | 3.3          | 4455007    |
| 840 FS | 350 - 400       | (14 - 16")     | 1                                       | 15                   | 0.7                              | $\leq 0.5$                | $\leq 4$                     | 3.3          | 4455008    |
| 840 FS | 400 - 450       | (16 - 18")     | 1                                       | 15                   | 0.7                              | $\leq 0.5$                | $\leq 4$                     | 4.3          | 4455009    |
| 840 FS | 450 - 500       | (18 - 20")     | 1                                       | 15                   | 0.7                              | $\leq 0.5$                | $\leq 4$                     | 4.7          | 4455010    |

\* Excludes indicating instrument

## Technical Data



### Dimensions

| Meas. range<br>mm | dia. d | a  | b  | c   | e   | f   | g  | h  |
|-------------------|--------|----|----|-----|-----|-----|----|----|
| 10 - 30           | 18     | 37 | 46 | 154 | 87  | 161 | 17 | 15 |
| 30 - 60           | 18     | 45 | 51 | 199 | 122 | 196 | 17 | 15 |
| 60 - 100          | 22     | 56 | 62 | 260 | 154 | 228 | 20 | 18 |
| 100 - 150         | 22     | 71 | 62 | 335 | 189 | 263 | 20 | 18 |
| 150 - 200         | 22     | 71 | 62 | 385 | 214 | 288 | 20 | 18 |
| 200 - 250         | 22     | 71 | 62 | 436 | 248 | 322 | 20 | 18 |
| 250 - 300         | 22     | 71 | 62 | 487 | 280 | 354 | 20 | 18 |
| 300 - 350         | 22     | 71 | 62 | 537 | 310 | 384 | 20 | 18 |
| 350 - 400         | 22     | 71 | 62 | 587 | 350 | 424 | 20 | 18 |
| 400 - 450         | 22     | 71 | 62 | 637 | 380 | 454 | 20 | 18 |
| 450 - 500         | 22     | 71 | 62 | 687 | 410 | 484 | 20 | 18 |

## Accessories

### Indicating Instruments

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

| Dial Comparator         | Readings<br>mm / inch | Order no.<br>mm / inch |
|-------------------------|-----------------------|------------------------|
| Millimess 1004 / 1004 Z | 5 $\mu$ m / .0001"    | 4333000/4333900        |
| Millimess 1003 / 1003 Z | 1 $\mu$ m / .00005"   | 4334000/4334900        |
| Millimess 1003 XL       | 2 $\mu$ m /           | 4334001                |
| Millimess 1002 / 1002 Z | 0.5 $\mu$ m / .00002" | 4335000/4335900        |
| Extramess 2000          | 0.2 $\mu$ m / .00001" |                        |
|                         | 0.5 $\mu$ m / .00002" | 4346000*               |
|                         | 1 $\mu$ m / .00005"   |                        |
| Extramess 2001          | 0.2 $\mu$ m / .00001" |                        |
|                         | 0.5 $\mu$ m / .00002" | 4346100*               |
|                         | 1 $\mu$ m / .00005"   |                        |
| $\mu$ Max $\mu$ m II    | .0005 mm / .00002"    | 2034205**              |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

\* 230 V, for 115 V please refer to page 6-5 \*\* requires contact 4360107



2000



1003

## Electronic Snap Gage 840 E MaraMeter E for extremely high accuracy



### Features

- Inductive measuring system incorporated directly into frame
- Readings selectable down to 0.01  $\mu\text{m}$
- Rugged, forged steel frame with heat insulators
- Measuring spindle mounted in extra long guideway with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle made of hardened stainless steel; measuring faces carbide-tipped
- Adjustable center stop for automatic alignment
- Extremely accurate due to the straight transfer of spindle movement to the inductive measuring system according to the Abbe principle
- Universally applicable and extremely versatile, each instrument spans a broad measuring range, within this range any dimension and fit can be very quickly and easily adjusted
- Maximum wear resistance due to non-contact positioning in conjunction with carbide-tipped measuring faces
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Supplied with:  
Wooden case

### Technical Data

|              | Measuring range | Readings / Resolution adjustable to* | Measuring force | Measuring faces dia. | Repeatability $f_w$ | Measuring faces Parallelism | Order no.**    |
|--------------|-----------------|--------------------------------------|-----------------|----------------------|---------------------|-----------------------------|----------------|
|              | mm              | $\mu\text{m}$                        | N               | mm                   | $\mu\text{m}$       | $\mu\text{m}$               |                |
| <b>840 E</b> | 0 - 25          | 0.01                                 | 4.5             | 7.5                  | $\leq 0.1$          | $\leq 0.3$                  | <b>4453000</b> |

\* Depending upon which indicating instrument is being used

\*\* Excludes indicating instrument

1086 Ri Digital Indicator with 25 mm / 1" range and .001 mm / .00005" resolution.

### Accessories

**Reference Discs 390** see Chapter 13

**Gage Blocks** see Chapter 13

**Stand 840 Ff** see Page 9-15

#### Recommended indicating instruments:

Electrical indicating instruments; recommended are C1216M, C1208M and 1240; please refer to Chapter 7



C 1208M



1240

## Indicating Bench Snap Gage 852 TS



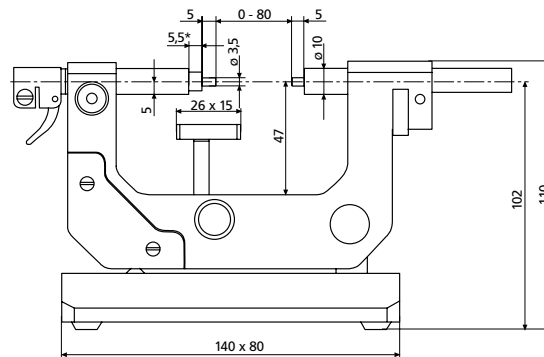
### Applications

- For rapid measurements of diameters of cylindrical parts (shafts, bolts and shanks)
- For measuring pitch, root and outside diameters of all kinds of external threads as well as serrations
- For thickness and length measurement
- Particularly suited for batch produced parts

### Features

- Rugged steel frame, can be inclined up to 45° from the sturdy base
- Measuring spindle and anvil spindle are both made of hardened stainless steel, with mounting bore for insertion of interchangeable anvils
- Anvil spindle can easily be fine adjusted
- Height adjustable stop
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable and extremely versatile, each instrument spans a broad measuring range
- Scope of supply: TC-tipped -anvils dia. D= 3.5 mm, Dial Comparator 1003

### Technical Data



| Measuring range**  | Repeatability | Retraction | Measuring force | Measuring face    | Mounting dia.         | Order no.                            |
|--------------------|---------------|------------|-----------------|-------------------|-----------------------|--------------------------------------|
| mm (inch)          | $f_w$<br>μm   | mm         | N               | Parallelism<br>μm |                       |                                      |
| 0 - 80 (0 - 3.15") | 1             | 1.2        | 6.5             | ≤ 2               | 8 mm<br>8 mm<br>.375" | 4510030***<br>4510031 +<br>4510035 + |

\* In initial position

\*\* Depending upon which anvils are being used

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

+ Excludes indicating instrument, order indicating instrument separately.

### Accessories

Order no.

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

4510840

Interchangeable Anvils please refer to Pages 9-24 and 9-25

## Indicating Thread Snap Gage 852



### Features

- For measuring pitch, root and outside diameters of all kinds of external threads as well as serrations
- Rugged, forged steel frame with heat insulators
- Measuring spindle is mounted in long guide way with lever-controlled retraction
- Anvil spindle can easily be fine adjusted
- Measuring spindle and anvil spindle are both made of hardened stainless steel, with mounting bore for insertion of interchangeable anvils
- Adjustable center stop for automatic alignment
- Maximum wear resistance due to non-contact positioning
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Universally applicable and extremely versatile. each instrument spans a broad measuring range
- Supplied with: Wooden case, steel flat contact points 903

### Technical Data

|     | Measuring range* |                | Repeatability    | Measuring force | Order no.** |
|-----|------------------|----------------|------------------|-----------------|-------------|
|     | mm               | (inch)         | $f_w$<br>$\mu m$ | N               |             |
| 852 | 0 - 45           | (0 - 1.77")    | 1                | 7.5             | 4510000     |
| 852 | 45 - 85          | (1.77 - 3.34") | 1                | 7.5             | 4510001     |
| 852 | 85 - 140         | (3.34 - 5.51") | 1                | 9               | 4510002     |
| 852 | 140 - 190        | (5.51 - 7.48") | 1                | 9               | 4510003     |

\* Depending upon which anvils are being used, purchase separately

\*\* Excludes indicating instrument and anvils

57B-15M 57B-15 0 - 25 / 0 - 1"

2057551\*

Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm / .001" grads.

1086 Ri Digital Indicator with 25 mm / 1" range and .001 mm / .00005" resolution.

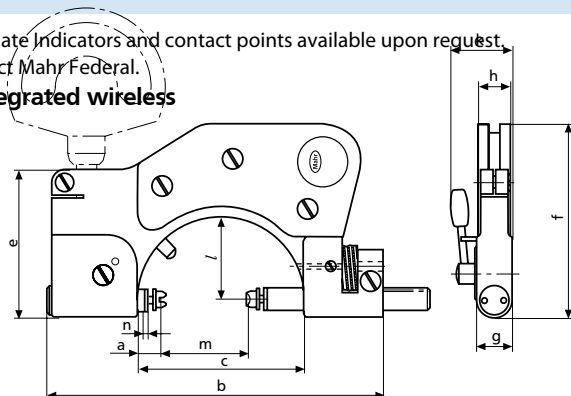
|                        |      |       |        |         |
|------------------------|------|-------|--------|---------|
| Meas. range m (mm)     | 0-45 | 45-85 | 85-140 | 140-190 |
| Dist mov. anvil n (mm) | 2    | 2.5   | 2.5    | 2.5     |

|    |     |     |     |     |
|----|-----|-----|-----|-----|
| a* | 13  | 8   | 10  | 6   |
| b  | 140 | 193 | 258 | 316 |
| c  | 68  | 110 | 162 | 212 |
| e  | 60  | 60  | 70  | 75  |
| f  | 77  | 103 | 141 | 171 |
| g  | 13  | 14  | 16  | 16  |
| h  | 13  | 13  | 12  | 12  |
| k  | 25  | 28  | 31  | 31  |
| l  | 34  | 59  | 87  | 112 |

a\* = In initial position

Alternate indicators and contact points available upon request.  
Contact Mahr Federal.

\* Integrated wireless



## Technical Data

### Indicating Instruments

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

| Dial Comparator |               | Readings<br>mm / <i>inch</i> | Order no.<br>mm / <i>inch</i> |
|-----------------|---------------|------------------------------|-------------------------------|
| Millimess       | 1004 / 1004 Z | 5 µm / .0001"                | 4333000/4333900               |
| Millimess       | 1003 / 1003 Z | 1 µm / .00005"               | 4334000/4334900               |
| Millimess       | 1003 XL       | 2 µm                         | 4334001                       |
| Millimess       | 1002 / 1002 Z | 0.5 µm / .00002"             | 4335000/4335900               |
| Extramess       | 2000          | 0.2 µm / .00001"             |                               |
|                 |               | 0.5 µm / .00002"             | 4346000*                      |
|                 |               | 1 µm / .00005"               |                               |
| Extramess       | 2001          | 0.2 µm / .00001"             |                               |
|                 |               | 0.5 µm / .00002"             | 4346100*                      |
|                 |               | 1 µm / .00005"               |                               |
| µMaxµm II       |               | .0005 mm / .00002"           | 2034205**                     |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

\* 230 V, for 115 V please refer to page 6-5 \*\* requires contact 4360107



## Accessories

**Interchangeable Anvils** please refer to Pages 9-19

**Holder 840 Fk** and **Stand 840 Ff** (for 0-45 mm) see Page 9-15

## Indicating Thread Snap Gage 853 for taps



### Features

- For pitch, root and outside diameters on taps in conjunction with interchangeable anvils
- Measuring spindle mounted in long guideway, lever-controlled retraction with mounting bore for interchangeable anvils
- Anvil spindle adjustable with thumbscrew via worm and rack, for mounting interchangeable support yokes
- Measuring spindle and anvil spindle are made of hardened stainless steel
- Further features are similar to the model 852; for details please refer to Page 9-20
- Supplied with: Wooden case, steel flat contact points 903

Clearance.

### Technical Data

|     | Measuring range |               | Repeatability    | Measuring force | Order no.* |
|-----|-----------------|---------------|------------------|-----------------|------------|
|     | mm              | (inch)        | $f_w$<br>$\mu m$ | N               |            |
| 853 | 1.2 - 35        | (.04 - 1.37") | 2                | 7.5             | 4511000    |
| 853 | 35 - 75         | (1.37 - 3")   | 2                | 7.5             | 4511001    |

\* Excludes indicating instrument and the support yokes 853 q & anvils

| Order | Metric   | Inch   | Capacity<br>mm / inch | Description            |
|-------|----------|--------|-----------------------|------------------------|
|       | 57B-14M  | 57B-14 | 0 - 2.5 / 0 - .10"    | Meas. range m (mm)     |
|       | 57B-15M  | 57B-15 | 0 - 25 / 0 - 1"       | Dist mov. anvil n (mm) |
|       | 2057551* |        |                       |                        |
|       |          |        |                       | a*                     |
|       |          |        |                       | b                      |
|       |          |        |                       | c                      |
|       |          |        |                       | e                      |
|       |          |        |                       | f                      |
|       |          |        |                       | g                      |
|       |          |        |                       | h                      |

Alternate Indicators and contact points available upon request.  
Contact Mahr Federal.

\* Integrated wireless

a\* = In initial position

## Technical Data

### Interchangeable Support Yokes 853 q

Depending upon the number of flutes, allowance has to be made for a compensation factor when reading the result. See table below:

|          | No. of flutes<br>of taps | For measuring range<br>mm | Compensation<br>factor** | Order no. |
|----------|--------------------------|---------------------------|--------------------------|-----------|
| 853 qk 3 | 3                        | 1.2 - 35                  | x 1                      | 4511024   |
| 853 qk 5 | 5                        | 1.2 - 35                  | x 1.34                   | 4511026   |
| 853 qk 7 | 7                        | 1.2 - 35                  | x 1.42                   | 4511028   |
| 853 qg 3 | 3                        | 35 - 75                   | x 1                      | 4511025   |
| 853 qg 5 | 5                        | 35 - 75                   | x 1.34                   | 4511027   |
| 853 qg 7 | 7                        | 35 - 75                   | x 1.42                   | 4511029   |

\*\* Allowance is to be made for other compensation methods when using the Holder 840 Fk

### Indicating Instruments

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

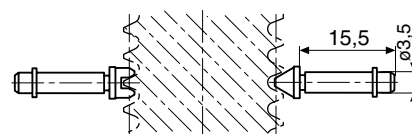
|          |               | Readings         | Order no.       |
|----------|---------------|------------------|-----------------|
| MarCator | 810 S         | 0.001 mm         | 4311000         |
| Millimes | 1004/1004 Z   | 5 µm / .0001"    | 4333000/4333900 |
| Millimes | 1010/1010 Z   | 0.01 mm / .0005" | 4332000/4332900 |
| MarCator | 1087R/1087 ZR | 1 µm / .00005"   | 4337660/4337670 |

## Accessories

**Interchangeable Anvils** see from Pages 9-24 and 9-25

## Interchangeable Anvils for 852, 852 TS and 853

For pitch, root and outside diameters. Special wear-resistant hardened steel. With cylindrical mounting shank and retainer ring which ensures locking while permitting rotation in bore of indicating snap gages.



### Sets consist of:

#### For pitch diameters

852 - 1 V-anvil and 1 blade  
853 - 1 V-anvil and 2 radiused blades

#### For root diameters

852 - 1 V-anvil and 1 blade  
853 - 1 V-anvil and 2 blades

#### For outside diameters

852 - 2 flat-face anvils  
853 - 3 flat-face anvils

## Anvils for pitch diameters for 852 and 852 TS

| Metric thread (60°) |           |           | Whitworth thread (55°) |           |           | American UST thread (60°) |           |           |
|---------------------|-----------|-----------|------------------------|-----------|-----------|---------------------------|-----------|-----------|
| Pitch               | V-anvil   | Blade     | Pitch range            | V-anvil   | Blade     | Pitch range               | V-anvil   | Blade     |
| mm                  | Order no. | Order no. | tpi                    | Order no. | Order no. | tpi                       | Order no. | Order no. |
| 0.2*                | 4173007   | 4173707   | 40 - 32                | 4173043   | 4173743   | 60 - 48                   | 4173113   | 4173813   |
| 0.25*               | 4173008   | 4173708   | 32 - 24                | 4173044   | 4173744   | 48 - 40                   | 4173114   | 4173814   |
| 0.3*                | 4173009   | 4173709   | 24 - 18                | 4173045   | 4173745   | 40 - 32                   | 4173115   | 4173815   |
| 0.35*               | 4173010   | 4173710   | 18 - 14                | 4173046   | 4173746   | 32 - 24                   | 4173116   | 4173816   |
| 0.4*                | 4173011   | 4173711   | 14 - 10                | 4173047   | 4173747   | 24 - 18                   | 4173117   | 4173817   |
| 0.45*               | 4173012   | 4173712   | 10 - 7                 | 4173048   | 4173748   | 18 - 14                   | 4173118   | 4173818   |
| 0.5 - 0.7           | 4173000   | 4173700   | 7 - 4.5                | 4173049   | 4173749   | 14 - 10                   | 4173119   | 4173819   |
| 0.7 - 1             | 4173001   | 4173701   | 4.5 - 3                | 4173050   | 4173750   | 10 - 7                    | 4173120   | 4173820   |
| 1.25 - 2            | 4173002   | 4173702   | 3 - 2.5                | 4179408   | 4179410   | 7 - 4.5                   | 4173121   | 4173821   |
| 2 - 3.5             | 4173003   | 4173703   |                        |           |           | 4.5 - 3                   | 4173122   | 4173822   |
| 3.5 - 5             | 4173004   | 4173704   |                        |           |           |                           |           |           |
| 5 - 7               | 4173005   | 4173705   |                        |           |           |                           |           |           |
| 7 - 9               | 4173006   | 4173706   |                        |           |           |                           |           |           |

## Anvils for pitch diameters for Indicating Thread Snap Gage 853

| Metric thread (60°) |           |           | Whitworth thread (55°) |           |           | American UST thread (60°) |           |           |
|---------------------|-----------|-----------|------------------------|-----------|-----------|---------------------------|-----------|-----------|
| Pitch               | V-anvil   | Blade     | Pitch range            | V-anvil   | Blade     | Pitch range               | V-anvil   | Blade     |
| mm                  | Order no. | Order no. | tpi                    | Order no. | Order no. | tpi                       | Order no. | Order no. |
| 0.2                 | 4173051   | 4174007   | 40 - 32                | 4173043   | 4176043   | 60 - 48                   | 4173124   | 4176113   |
| 0.25                | 4173052   | 4174008   | 32 - 24                | 4173044   | 4176044   | 48 - 40                   | 4173125   | 4176114   |
| 0.3                 | 4173053   | 4174009   | 24 - 18                | 4173045   | 4176045   | 40 - 32                   | 4173115   | 4176115   |
| 0.35                | 4173054   | 4174010   | 18 - 14                | 4173046   | 4176046   | 32 - 24                   | 4173116   | 4176116   |
| 0.4                 | 4173055   | 4174011   | 14 - 10                | 4173047   | 4176047   | 24 - 18                   | 4173117   | 4176117   |
| 0.45                | 4173056   | 4174012   | 10 - 7                 | 4173048   | 4176048   | 18 - 14                   | 4173118   | 4176118   |
| 0.5 - 0.7           | 4173000   | 4174000   | 7 - 4.5                | 4173049   | 4176049   | 14 - 10                   | 4173119   | 4176119   |
| 0.7 - 1             | 4173001   | 4174001   | 4.5 - 3                | 4173050   | 4176050   | 10 - 7                    | 4173120   | 4176120   |
| 1.25 - 2            | 4173002   | 4174002   | 3 - 2.5                | 4179408   | 4179411   | 7 - 4.5                   | 4173121   | 4176121   |
| 2 - 3.5             | 4173003   | 4174003   |                        |           |           | 4.5 - 3                   | 4173122   | 4176122   |
| 3.5 - 5             | 4173004   | 4174004   |                        |           |           |                           |           |           |
| 5 - 7               | 4173005   | 4174005   |                        |           |           |                           |           |           |
| 7 - 9               | 4173006   | 4174006   |                        |           |           |                           |           |           |

## Carbide anvils for 852, 852TS and 853

|          |         |         |
|----------|---------|---------|
| 1.25 - 2 | 4511105 | 4511104 |
| 2 - 3.5  | 4511108 | 4511107 |
| 3.5 - 5  | 4511140 | 4511139 |
| 5 - 7    | 4511142 | 4511141 |

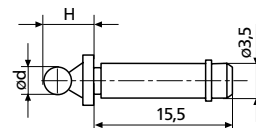
\* V-anvil covers 3 pitches

## Interchangeable Anvils for 852 and 852 TS

### Ball Anvils

For measuring gears and for special applications. Carbide ball. With cylindrical mounting shank and retainer ring. For mounting into mounting bores of thread micrometers 40 Z and 852.

Shank dia. 3.5 mm  
Shank length 15.5 mm  
Manufacturing tolerance  
Ball dia.  $\pm 2 \mu\text{m}$



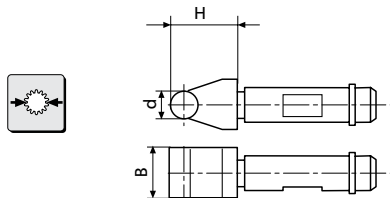
| dia. d<br>mm | H<br>mm | Order no. | dia. d<br>mm | H<br>mm | Order no. | dia. d<br>mm | H<br>mm | Order no. |
|--------------|---------|-----------|--------------|---------|-----------|--------------|---------|-----------|
| 0.5          | 5.0     | 4179150   | 1.65         | 6.2     | 4179168   | 3.048        | 7.5     | 4179182   |
| 0.551        | 5.1     | 4179151   | 1.7          | 6.2     | 4179169   | 3.2          | 7.7     | 4170570   |
| 0.62         | 5.1     | 4179152   | 1.75         | 6.3     | 4170553   | 3.25         | 7.8     | 4170566   |
| 0.623        | 5.1     | 4179153   | 1.782        | 6.3     | 4179170   | 3.4          | 7.9     | 4179183   |
| 0.63         | 5.1     | 4179154   | 1.8          | 6.3     | 4179171   | 3.5          | 8.0     | 4170558   |
| 0.722        | 5.2     | 4179155   | 1.829        | 6.3     | 4179172   | 3.658        | 8.2     | 4179184   |
| 0.862        | 5.4     | 4179156   | 1.9          | 6.4     | 4179173   | 3.7          | 8.2     | 4170571   |
| 0.895        | 5.4     | 4179157   | 2            | 6.5     | 4170554   | 4            | 8.5     | 4170559   |
| 0.965        | 5.5     | 4179158   | 2.032        | 6.5     | 4170568   | 4.5          | 9.0     | 4170560   |
| 1            | 5.5     | 4170550   | 2.2          | 6.7     | 4170569   | 4.835        | 9.3     | 4179185   |
| 1.1          | 5.6     | 4179159   | 2.25         | 6.8     | 4170564   | 5            | 9.5     | 4170561   |
| 1.118        | 5.6     | 4179160   | 2.284        | 6.8     | 4179174   | 5.25         | 9.8     | 4179186   |
| 1.125        | 5.6     | 4179161   | 2.386        | 6.9     | 4179175   | 5.486        | 10.0    | 4179187   |
| 1.25         | 5.8     | 4170551   | 2.438        | 6.9     | 4179176   | 5.5          | 10.0    | 4170562   |
| 1.35         | 5.9     | 4179162   | 2.5          | 7.0     | 4170556   | 6            | 10.5    | 4170563   |
| 1.372        | 5.9     | 4179163   | 2.667        | 7.2     | 4179177   | 6.096        | 10.6    | 4179188   |
| 1.385        | 5.9     | 4179164   | 2.704        | 7.2     | 4179178   | 6.35         | 10.9    | 4179189   |
| 1.5          | 6.0     | 4170552   | 2.713        | 7.2     | 4179179   | 6.5          | 11.0    | 4170567   |
| 1.524        | 6.0     | 4179165   | 2.721        | 7.2     | 4179180   | 7            | 11.5    | 4170572   |
| 1.54         | 6.0     | 4179166   | 2.743        | 7.2     | 4179181   | 8            | 12.5    | 4170573   |
| 1.6          | 6.1     | 4179167   | 2.75         | 7.3     | 4170565   | 9            | 13.5    | 4170574   |
|              |         |           | 3            | 7.5     | 4170557   | 10           | 14.5    | 4170575   |

Further sizes are available upon request (material: steel or carbide)

### Roller Blades

For measuring gears and for special applications. The measuring roller is made of carbide. To be mounted in the mounting bores of the 40 Z and 852.

Shank dia. 3.5 mm  
Shank length 15.5 mm  
Manufacturing tolerance  
Ball dia.  $\pm 2 \mu\text{m}$



Further sizes are available upon request (material: steel)

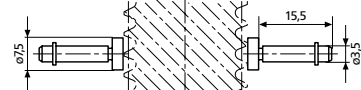
| dia. d<br>mm | Dimension H<br>mm | Dimension B<br>dia. mm | Order no. |
|--------------|-------------------|------------------------|-----------|
| 1            | 5.5               | 5                      | 4510200   |
| 1.25         | 5.8               | 5                      | 4510201   |
| 1.5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

### For outside diameters

#### Anvil 40 Za, flat

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

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



## Portable Thickness Gages 22 P

Portable measurement of sheet materials and small parts

### Features

### Features

- Indicator built into gage frame for maximum ruggedness.
- Lift-lever for one-hand operation.
- Continuous reading dials with revolution counter for absolute measurement of thin materials, plastic films, a small parts.
- 6.3 mm / .25" diameter, flat steel contacts.
- Digital models can be Left/Right hand operated or front mounted and used with BA-26 Stand for bench applications.



22P-15



**2057541** with **4337651 1086 ZR** Digital Indicator (Metric and inch) and BA-26 Stand (Metric and inch)  
 \* Integrated wireless

**Capacity**  
 mm / inch  
 0 - 2.5 / **0 - .10"**  
 0 - 25 / **0 - 1"**



**2057541** with **4337651 1086 ZR** Digital Indicator

Dial Indicator readout with 2.5 mm / .10" sensitive range and .002 mm / .0001" grads.  
 Dial Indicator readout with 25 mm / 1" sensitive range and .001" grads.  
 Digital Indicator with 25 mm / 1" range and .001 mm / .00005" resolution.

### Technical Data

| Metric          | Inch   | Capacity  |   |                 | Throat Depth |   |              | Graduation |   |                                |
|-----------------|--------|-----------|---|-----------------|--------------|---|--------------|------------|---|--------------------------------|
|                 |        | mm        | / | inch            | mm           | / | inch         | mm         | / | inch                           |
| 22P-10M         | 22P-11 | 0 - 2.54  | / | <b>0 - .10"</b> | 28.6         | / | <b>1.13"</b> | .002       | / | <b>.0001"</b>                  |
| 22P-15M         | 22P-15 | 0 - 12.70 | / | <b>0 - .50"</b> | 50           | / | <b>2"</b>    | .01        | / | <b>.001"</b>                   |
| 22P-20M         | 22P-20 | 0 - 25    | / | <b>0 - 1"</b>   | 50           | / | <b>2"</b>    | .01        | / | <b>.001"</b>                   |
| <b>2057541*</b> |        | 25        | / | <b>0 - 1"</b>   | 50           | / | <b>2"</b>    | .001       | / | <b>.00005"</b><br>(Resolution) |

\* integrated wireless option available, contact MF Technical Assistance

## Portable Thickness Gages 26 P



### Features

- Push-down movement.
- Molded body fits shape of hand; built-in indicator.
- Gage is normally open for easy part entry. Push-down button to close the contacts.
- Rugged and compact for roving inspection.
- 6.3 mm / .25" diameter, flat steel contacts.

### Technical Data

| Metric | Inch  | Capacity<br>mm / <i>inch</i> | Throat Depth<br>mm / <i>inch</i> | Graduation<br>mm / <i>inch</i> |
|--------|-------|------------------------------|----------------------------------|--------------------------------|
| 26P-7M | 26P-7 | 0 - 7.6 / 0 - .30"           | 16 / .63"                        | .01 / .001"                    |

## Portable Thickness Gages 838

838 A



Features  
838 B



clearance.

### Features

- Rugged sturdy frame made from hard aluminum
- Built-in Digital or Dial Indicator
- With a lifting lever for the moveable upper measuring spindle
- Convenient heat insulated handle, open at one end
- Versions with a throat depth of 200 mm have a removable stand

### Thickness Gage 838 A

- With flat measuring faces
- For measuring soft materials for example; foil, felt, rubber, paper and cardboard

### Thickness Gage 838 B Description

- With spherical measuring faces
- For measuring hard materials for example; sheet metal, hardboard, wooden panels and panes of glass.

578-15M

578-15

0 - 25 / 0 - 1"

Dial Indicator readout with 25 mm / 1" sensitive range

### Technical Data

|       | Throat depth |        | Measuring range |             | Measuring face dia.       | Measuring face radius | Order no.<br>with Indicator 810<br>0.01 mm Res | Order no.<br>with Indicator 1075 R<br>0.005mm/.0001" Res | Order no.<br>Wooden<br>case |
|-------|--------------|--------|-----------------|-------------|---------------------------|-----------------------|------------------------------------------------|----------------------------------------------------------|-----------------------------|
|       | mm           | (inch) | mm              | (inch)      | mm                        | mm                    |                                                |                                                          |                             |
| 838 A | 50           | (2")   | 0 - 20          | (0 - .750") | 11.3 = 1 cm <sup>2</sup>  | -                     | 4495000                                        | 4495120                                                  | 4495050                     |
|       | 100          | (4")   | 0 - 20          | (0 - .750") | 11.3 = 1 cm <sup>2</sup>  | -                     | 4495001                                        | 4495121                                                  | 4495051                     |
|       | 200          | (8")   | 0 - 20          | (0 - .750") | 11.3 = 1 cm <sup>2</sup>  | -                     | 4495002                                        | 4495122                                                  | 4495052                     |
|       | 50           | (2")   | 0 - 20          | (0 - .750") | 20 = 3.14 cm <sup>2</sup> | -                     | 4495103                                        | 4495125                                                  | 4495050                     |
|       | 100          | (4")   | 0 - 20          | (0 - .750") | 20 = 3.14 cm <sup>2</sup> | -                     | 4495104                                        | 4495126                                                  | 4495051                     |
|       | 200          | (8")   | 0 - 20          | (0 - .750") | 20 = 3.14 cm <sup>2</sup> | -                     | 4495105                                        | 4495127                                                  | 4495052                     |
|       | 50           | (2")   | 0 - 20          | (0 - .750") | 30 = 7.06 cm <sup>2</sup> | -                     | 4495109                                        | 4495130                                                  | 4495050                     |
|       | 100          | (4")   | 0 - 20          | (0 - .750") | 30 = 7.06 cm <sup>2</sup> | -                     | 4495110                                        | 4495131                                                  | 4495051                     |
|       | 200          | (8")   | 0 - 20          | (0 - .750") | 30 = 7.06 cm <sup>2</sup> | -                     | 4495111                                        | 4495132                                                  | 4495052                     |
| 838 B | 50           | (2")   | 0 - 20          | (0 - .750") | 12                        | 30                    | 4495010                                        | 4495135                                                  | 4495050                     |
|       | 100          | (4")   | 0 - 20          | (0 - .750") | 12                        | 30                    | 4495011                                        | 4495136                                                  | 4495051                     |
|       | 200          | (8")   | 0 - 20          | (0 - .750") | 12                        | 30                    | 4495012                                        | 4495137                                                  | 4495052                     |

838 AB



## Features

- Rugged sturdy frame made from hard aluminum
- Built-in Digital or Dial Indicator or Dial Comparator
- With a lifting lever for the moveable upper measuring spindle
- Convenient heat insulated handle, open at one end

## Thickness Gage 838 AB

- Lower measuring face is flat
- Upper measuring face is spherical
- For measuring hard materials for example; sheet metal and hardboard

## Technical Data

|                  | Throat depth<br>mm<br>(inch) | Measuring range<br>mm<br>(inch) | Measuring face dia.<br>mm<br>lower | Measuring face radius<br>mm<br>upper | Order no.<br>with Indicator <b>810</b><br>0.01 mm Res | Order no.<br>with Indicator <b>1075 R</b><br>0.005mm/.0001" Res | Order no.<br>Wooden case |
|------------------|------------------------------|---------------------------------|------------------------------------|--------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------|--------------------------|
| <b>838 AB</b>    | 50 (2")                      | 0 - 20 (0 - .750")              | 11.3 = 1 cm <sup>2</sup>           | 30                                   | <b>4495504</b>                                        | <b>4495140</b>                                                  | <b>4495050</b>           |
| flat / spherical | 100 (4")                     | 0 - 20 (0 - .750")              | 11.3 = 1 cm <sup>2</sup>           | 30                                   |                                                       | <b>4495141</b>                                                  | <b>4495051</b>           |

|                  | Throat depth<br>mm<br>(inch) | Measuring range<br>mm<br>(inch) | Measuring face dia.<br>mm<br>lower | Measuring face radius<br>mm<br>upper | Order no.<br>with Indicator <b>1075 R</b><br>0.005mm/.0001" Res | Order no.<br>with Comparator <b>1003</b><br>1 µm Res | Order no.<br>Wooden case |
|------------------|------------------------------|---------------------------------|------------------------------------|--------------------------------------|-----------------------------------------------------------------|------------------------------------------------------|--------------------------|
| <b>838 AB</b>    | 50 (2")                      | 0 - 20 (0 - .750")              | 11.3 = 1 cm <sup>2</sup>           | 30                                   | <b>4495145</b>                                                  | <b>4495519</b>                                       | <b>4495050</b>           |
| flat / spherical | 100 (4")                     | 0 - 20 (0 - .750")              | 11.3 = 1 cm <sup>2</sup>           | 30                                   | <b>4495146</b>                                                  | <b>4495517</b>                                       | <b>4495051</b>           |

## Dead Load Thickness Gages 57B



2057551\*

- Solid casting with ribbed frame provides strength and rigidity for accurate measurements.
- 0.003 mm / .0001" parallelism with tables up to 19 mm / .75" diameter.
- 283 g / 10 oz. dead load weight for constant gaging pressure.
- 10 mm / .407" diameter flat upper 54.0 mm / 2.125" lower contacts.
- Indicator mounts with adjustable back for quick positioning for each gaging requirement.
- Available with Dial Indicator or Digital Electronic Indicator.
- Gage is supplied with a lift lever so work can be easily placed between the table and contact.
- Four-inch throat depth for part

### Technical Data

| Metric  | Order    | Inch | Capacity<br>mm / <i>inch</i> | Description                                                                           |
|---------|----------|------|------------------------------|---------------------------------------------------------------------------------------|
| 57B-14M | 57B-14   |      | 0 - 2.5 / <b>0 - .10"</b>    | Dial Indicator readout with 2.5 mm / .10" sensitive range and .002 mm / .0001" grads. |
| 57B-15M | 57B-15   |      | 0 - 25 / <b>0 - 1"</b>       | Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm / .001" grads.      |
|         | 2057551* |      |                              | 1086 Ri Digital Indicator with 25 mm / 1" range and .001 mm / .00005" resolution.     |

Alternate Indicators and contact points available upon request.  
Contact Mahr Federal.

**\* Integrated wireless**

## Wire Insulation Thickness Gages 57B

For checking wall thickness of wire insulation and other small-diameter tubular parts



2057750

### Features

- Using the basic design of the Model 57B-13 (Model 57B-13M — Metric) Gage, the lower contact is PT-103, 1.10 mm / .043" diameter rod, mounted horizontally. The upper contact is a flat chisel contact, in line with the rod. By slipping tubular parts onto the lower contact, the gage can measure the thickness of the wall of the tube. An auxiliary weight on the Indicator provides a total dead-load weight of 25 grams. (Replacement lower rod: PS-43)

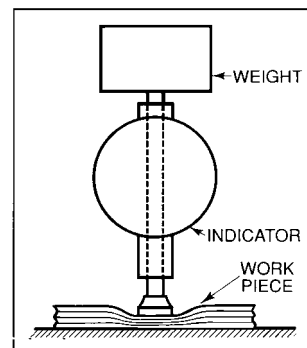
### Technical Data

| Metric         | Order no. | Inch | Capacity<br>mm / <i>inch</i> | Description                                                                           |
|----------------|-----------|------|------------------------------|---------------------------------------------------------------------------------------|
| 57B-13M        | 57B-13    |      | 7.62 / 0 - .30"              | Dial Indicator readout with 7.6 mm / .30" sensitive range and 0.01 mm / .0005" grads. |
| 2057550        |           |      |                              | 1086 Digital Indicator with 25 mm / 1" range and 0.001 mm / .00005" resolution.       |
| <b>Options</b> |           |      |                              |                                                                                       |
|                | PT-2245   |      |                              | 0.050 mm / .02" diameter Pin, Lower Contact Assembly                                  |

### Measuring Compressible Materials

Compressible materials such as paper, plastics, rubber or fabrics must be measured under controlled conditions. Many materials have measurement standards specified by A.S.T.M., U.L., or other industry standards organizations. Measurement standards specify dead load weight, upper and lower contact configurations, and Indicator resolution.

Series 57B Gages are easily modified to meet most of these industry standards. Mahr Federal has on file designs for the measurement of paper, latex foam rubber, sponge rubber, vulcanized rubber, asbestos tape and cloth, sheet and roll felt, and many other materials. When inquiring, specify A.S.T.M. Specification Number, if possible.



## Thickness Gages 57B Bench Style



57B-12

### Features

- Solid casting with ribbed frame provides strength and rigidity for accurate measurements.
- Gage is furnished with a lift lever so work can be easily placed between the contacts.
- Large 54 mm/ 2.125" diameter lower anvil provides convenient stage for small parts or flat materials.
- 4.75 mm/ .187" diameter radiused upper contact normally provided.
- 102 mm/ 4" throat depth for part clearance.
- Indicator mounts with adjustable back for quick positioning for each gaging requirement.
- Available with Dial Indicator or Digital Electronic Indicator.

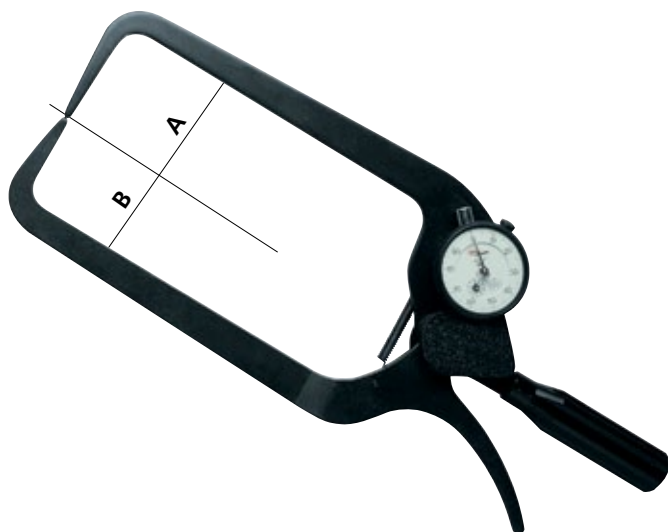
### Technical Data

| Metric  | Order no.  | Inch | Capacity<br>mm / <i>inch</i> | Description                                                                             |
|---------|------------|------|------------------------------|-----------------------------------------------------------------------------------------|
| 57B-11M | 57B-11     |      | 0 - 25 / <b>0 - 1"</b>       | Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm / .001" grads.        |
| 2057548 |            |      |                              | 1086 Digital Indicator with 25 mm/ 1" range and .001 mm / .00005" resolution.           |
|         | EMD-57B-11 |      | 0 - 21.5 / <b>0 - .85"</b>   | MaxumIII Digital Indicator with selectable range and resolution, 2033101.               |
|         | EDI-57B-11 |      |                              | 1086 Digital Indicator with 2 mm / .08" sensitive range, .0005 mm / .00002" resolution. |
| 57B-12M | 57B-12     |      | 0 - 12.5 / <b>0 - .5"</b>    | Dial Indicator readout with 12.50 mm/ .50" sensitive range and .01 mm / .0005" grads.   |
| 2057549 |            |      |                              | 1086 Digital Indicator with 12.50 mm / .50" range and .001 mm / .00005" resolution.     |

*Alternate Indicators and contact points available upon request.  
Contact Mahr Federal.*

## Caliper Gages 49P

The most widely used gages for checking medium tolerance dimensions on patterns, castings, forgings, dies, sheet metal.



49P

### Features

- The most widely used gages for checking medium tolerance dimensions on patterns, castings, forgings, dies, sheet metal.
- Generous clearance on jaws reaches over non-measured part protrusions for easy access to areas where thickness must meet critical dimensional specs.
- Retraction lever is conveniently located for one-hand operation.
- .02 mm or .1 mm / .01", .001", or 1/64" grads. available.
- Continuous reading dials with revolution counters normally provided.
- Cylindrical radius steel contact tips normally furnished.

### Technical Data

| Metric  | Order no. | Inch | Capacity*<br>mm / <i>inch</i> | Gaging<br>Depth<br>mm / <i>inch</i> | Minimum<br>Graduation<br>mm / <i>inch</i> | A      | B     |
|---------|-----------|------|-------------------------------|-------------------------------------|-------------------------------------------|--------|-------|
| 49P-17M | 49P-17    |      | 0 - 50 / <b>0 - 2"</b>        | 100 / <b>4"</b>                     | 0.02 / <b>.001"</b> grads.                | 1-1/4  | 1-1/4 |
| 49P-19M | 49P-19    |      | 0 - 50 / <b>0 - 2"</b>        | 200 / <b>8"</b>                     | 0.02 / <b>.001"</b> grads.                | 2-9/16 | 2     |
| 49P-1M  | 49P-1     |      | 0 - 75 / <b>0 - 3"</b>        | 100 / <b>4"</b>                     | 0.1 / <b>.01"</b> grads.                  | 1-1/4  | 1-1/4 |
| 49P-2M  | 49P-2     |      | 0 - 75 / <b>0 - 3"</b>        | 200 / <b>8"</b>                     | 0.1 / <b>.01"</b> grads.                  | 2-9/16 | 2     |

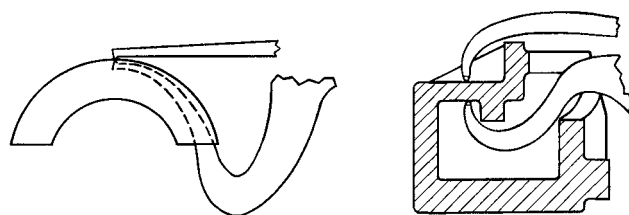
\* Ordinarily this gage is used as a comparator. The actual measuring range of the instrument is 38 mm / 1.50".

If the gage is used for direct linear measurement, chordal errors may need to be corrected.

Contact Mahr Federal Technical Assistance for details.

### Special Applications

**Series 49P and 149P Caliper Gages** have many design possibilities. Specially shaped arms of various lengths can be designed to reach inaccessible spots or get around obstructions to make measurements possible which might otherwise go unchecked. For alternate contact shapes or materials, alternate capacities and gaging depths, and special designs to meet your application contact Mahr Federal Technical Assistance.

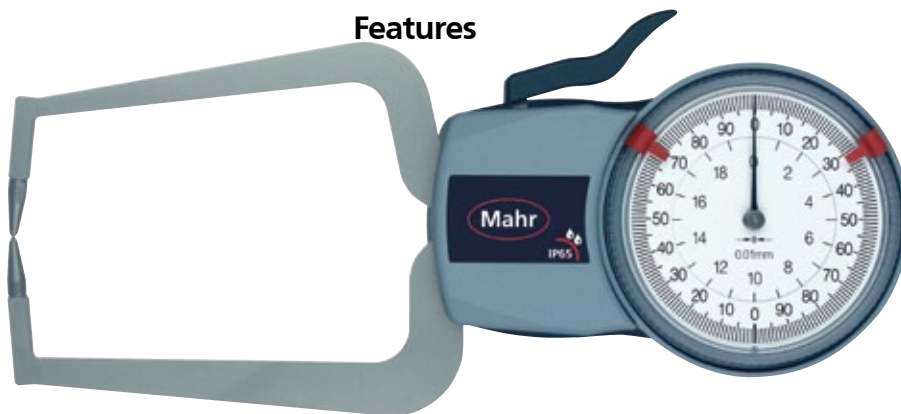


## Gages (Metric) for External Measurement 838 TA to measure thickness and wall thicknesses

### Features

- Contact points are made from carbide
- Absolute measuring instrument
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- IP protection class IP65 according to EN 60529
- Supplied with:  
Test certificate

### Features



### Application

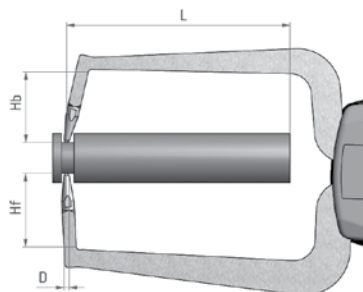
- For measuring thicknesses and wall thicknesses

clearance.

## Technical Data and Dimensions

|                                |        |           |           |           |           |           |
|--------------------------------|--------|-----------|-----------|-----------|-----------|-----------|
| Measuring range                | Meb mm | 0 - 10    | 0 - 20    | 0 - 20    | 0 - 50    | 0 - 50    |
| Readings                       | Skw mm | 0.005     | 0.01      | 0.01      | 0.05      | 0.05      |
| Error limit                    | G mm   | 0.015     | 0.03      | 0.03      | 0.05      | 0.05      |
| Repeatability limit            | r mm   | 0.005     | 0.01      | 0.01      | 0.025     | 0.025     |
| Measuring depth                | L mm   | 35        | 85        | 85        | 167       | 169       |
| Contact point - length (move.) | Hb mm  | 19.1      | 24.6      | 24.6      | 30        | 30        |
| Contact point - length (fixed) | Hf mm  | 18.6      | 24.6      | 2.5       | 30        | 4.3       |
| Contact point - ball dia.      | D mm   | 1.5       | 1.5       | 1.5       | 3         | 3         |
| Measuring force                | F N    | 0.8 - 1.2 | 1.1 - 1.6 | 1.1 - 1.6 | 0.8 - 1.7 | 0.8 - 1.7 |
| Order no.                      |        | 4495550   | 4495551   | 4495552   | 4495555   | 4495556   |

\* Integrated wireless



## Gages (Inch) for External Measurement 838 TA to measure thickness and wall thicknesses

### Features

- Contact points are made from carbide
- Absolute measuring instrument
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- IP protection class IP65 according to EN 60529
- Supplied with:  
Test certificate

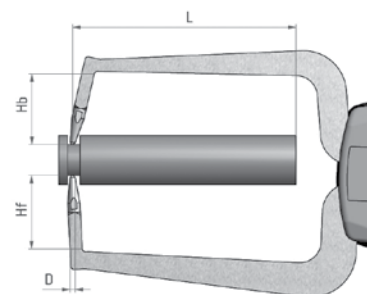


### Application

- For measuring thicknesses and wall thicknesses

### Technical Data and Dimensions

|                                |                 |           |           |           |           |           |
|--------------------------------|-----------------|-----------|-----------|-----------|-----------|-----------|
| Measuring range                | Meb <i>inch</i> | 0 - .40"  | 0 - .80"  | 0 - .80"  | 0 - 2.0"  | 0 - 2.0"  |
| Readings                       | Skw <i>inch</i> | .0002"    | .0005"    | .0005"    | 1"        | 1"        |
| Error limit                    | G <i>inch</i>   | .0008"    | .0015"    | .0015"    | 2"        | 2"        |
| Repeatability limit            | r <i>inch</i>   | .0002"    | .0005"    | .0005"    | .001"     | .001"     |
| Measuring depth                | L <i>inch</i>   | 1.37"     | 3.2"      | 3.2"      | 6.6"      | 6.7"      |
| Contact point - length (move.) | Hb <i>inch</i>  | .75"      | .97"      | .97"      | 1.18"     | 1.18"     |
| Contact point - length (fixed) | Hf <i>inch</i>  | .75"      | .97"      | .097"     | 1.18"     | .17"      |
| Contact point - ball dia.      | D <i>inch</i>   | .06"      | .06"      | .06"      | .12"      | .12"      |
| Measuring force                | F N             | 0.8 - 1.2 | 1.1 - 1.6 | 1.1 - 1.6 | 0.8 - 1.7 | 0.8 - 1.7 |
| Order no.                      |                 | 4495950   | 4495951   | 4495952   | 4495955   | 4495956   |



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

### Features

#### Functions:

ON/OFF, mm/inch, TOL (enter tolerance limit values), ABS (display can be set to zero, without losing the reference to the Preset value), DATA (Data transmission via connection cable)

- High contrast analog and digital LCD
- Specified measuring programs according to application
- Absolute/Relative measuring program
- Tolerance is displayed with 2 LEDs
- Data interface: Digimatic, USB
- Energy supply: Battery operation
- Protection class IP 67 according to EN 60529
- Supplied with: Instruction manual, Battery, Test certificate

### Features



### Applications

clearance measuring thicknesses and wall thicknesses

## Technical Data and Dimensions

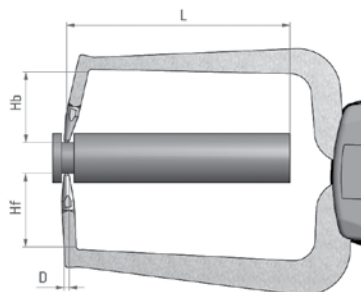
|                                |     |    |           |           |           |           |           |           |           |
|--------------------------------|-----|----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Measuring range                | Meb | mm | 0 - 10    | 0 - 20    | 0 - 20    | 0 - 30    | 0 - 50    | 0 - 30    | 0 - 50    |
| Resolution                     | Skw | mm | 0.005     | 0.01      | 0.01      | 0.02      | 0.02      | 0.02      | 0.02      |
| Error limit                    | G   | mm | 0.015     | 0.03      | 0.03      | 0.04      | 0.06      | 0.04      | 0.06      |
| Repeatability limit            | r   | mm | 0.005     | 0.01      | 0.01      | 0.02      | 0.04      | 0.02      | 0.04      |
| Measuring depth                | L   | mm | 35        | 85        | 85        | 116       | 167       | 116       | 169       |
| Contact point - length (move.) | Hb  | mm | 19.1      | 24.6      | 24.6      | 30        | 30        | 30        | 30        |
| Contact point - length (fixed) | Hf  | mm | 18.6      | 24.6      | 2.5       | 30        | 30        | 4         | 4.3       |
| Contact point - ball dia.      | D   | mm | 1.5       | 1.5       | 1.5       | 3         | 3         | 3         | 3         |
| Measuring force                | F   | N  | 0.8 - 1.2 | 1.1 - 1.6 | 1.1 - 1.6 | 0.9 - 1.6 | 0.8 - 1.7 | 0.9 - 1.6 | 0.8 - 1.7 |
| Order no.                      |     |    | 4495560   | 4495561   | 4495562   | 4495563   | 4495564   | 4495565   | 4495566   |

\* Integrated wireless

### Accessories

|                                         |            | Order no. |
|-----------------------------------------|------------|-----------|
| Battery Alkaline AAA 1.5 V              |            | 4243073*  |
| Data Connection Cable USB (1.5 m)       | 838 usb    | 4495079   |
| Data Connection Cable Digimatic (1.5 m) | 838 di (A) | 4495083   |

\* 2 batteries are required



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

### Features

#### Functions:

ON/OFF, mm/inch, TOL (enter tolerance limit values), ABS (display can be set to zero, without losing the reference to the Preset value), DATA (Data transmission via connection cable)

- High contrast analog and digital LCD
- Specified measuring programs according to application
- Absolute/Relative measuring program
- Tolerance is displayed with 2 LEDs
- Data interface: Digimatic, USB
- Energy supply: Battery operation
- Protection class IP 67 according to EN 60529
- Supplied with:  
Instruction manual, Battery,  
Test certificate



### Applications

- For measuring bores and internal grooves

### Technical Data and Dimensions

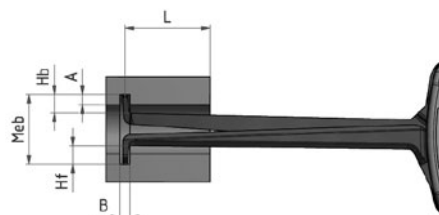
|                                |     |    |           |           |           |           |           |           |           |           |           |
|--------------------------------|-----|----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Measuring range                | Meb | mm | 5 - 15    | 10 - 30   | 20 - 40   | 30 - 50   | 40 - 60   | 50 - 70   | 13 - 43   | 30 - 60   | 50 - 80   |
| Resolution                     | Skw | mm | 0.005     | 0.01      | 0.01      | 0.01      | 0.01      | 0.01      | 0.02      | 0.02      | 0.02      |
| Error limit                    | G   | mm | 0.015     | 0.03      | 0.03      | 0.03      | 0.03      | 0.03      | 0.04      | 0.04      | 0.04      |
| Repeatability limit            | r   | mm | 0.005     | 0.01      | 0.01      | 0.01      | 0.01      | 0.01      | 0.02      | 0.02      | 0.02      |
| Measuring depth                | L   | mm | 35        | 85        | 85        | 85        | 85        | 85        | 127       | 132       | 132       |
| Groove depth                   | A   | mm | 2.3       | 5.2       | 7.0       | 7.0       | 8.3       | 8.3       | 5.7       | 6.2       | 8.3       |
| Groove width                   | B   | mm | 0.8       | 1.2       | 1.2       | 1.2       | 1.2       | 1.2       | 1.6       | 1.8       | 2.4       |
| Contact point - length (move.) | Hb  | mm | 2.5       | 5.4       | 7.3       | 7.3       | 12.2      | 12.2      | 5.7       | 6.5       | 8.5       |
| Contact point - length (fixed) | Hf  | mm | 2.5       | 5.4       | 7.3       | 7.3       | 12.2      | 12.2      | 5.7       | 6.5       | 8.5       |
| Contact point - ball dia.      | D   | mm | 0.6       | 1         | 1         | 1         | 1         | 1         | 1.3       | 1.5       | 2         |
| Measuring force                | F   | N  | 0.8 - 1.2 | 1.1 - 1.6 | 1.1 - 1.6 | 1.1 - 1.6 | 1.1 - 1.6 | 1.1 - 1.6 | 1.2 - 1.7 | 1.2 - 1.7 | 1.2 - 1.7 |

**Order no.** 4495590 4495591 4495592 4495593 4495594 4495595 4495598 4495599 4495600

### Accessories

|                                                |            | Order no. |
|------------------------------------------------|------------|-----------|
| <b>Battery</b> Alkaline AAA 1.5 V              |            | 4243073*  |
| <b>Data Connection Cable</b> USB (1.5 m)       | 838 usb    | 4495079   |
| <b>Data Connection Cable</b> Digimatic (1.5 m) | 838 di (A) | 4495083   |

\* 2 batteries are required

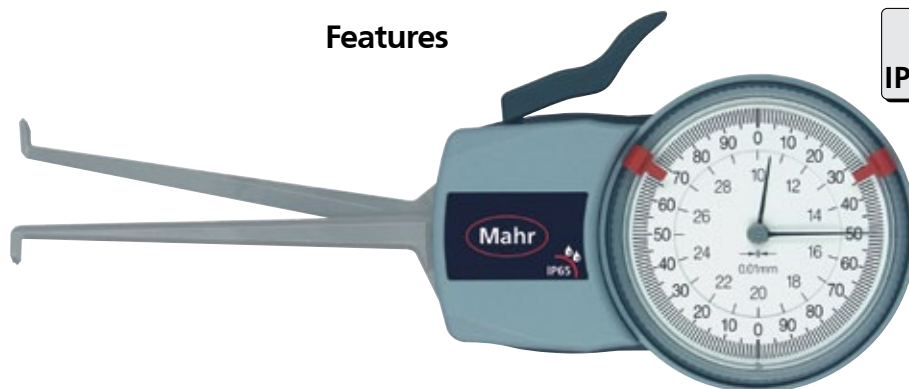


## Gages (Metric) for Internal Measurement 838 TI for measuring bores and internal grooves

### Features

- Contact points are made from carbide
- Absolute measuring instrument
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- IP protection class IP65 according to EN 60529
- Supplied with:  
Test certificate

### Features



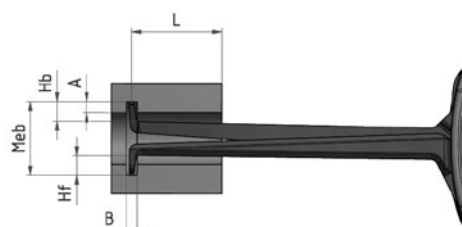
### Applications

- For measuring bores and internal grooves

clearance.

## Technical Data and Dimensions

|                                |     |    |           |           |           |           |           |           |           |           |
|--------------------------------|-----|----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Measuring range                | Meb | mm | 5 - 15    | 10 - 30   | 20 - 40   | 30 - 50   | 40 - 60   | 50 - 70   | 15 - 65   | 40 - 90   |
| Readings                       | Skw | mm | 0.005     | 0.01      | 0.01      | 0.01      | 0.01      | 0.01      | 0.05      | 0.05      |
| Error limit                    | G   | mm | 0.015     | 0.03      | 0.03      | 0.03      | 0.03      | 0.03      | 0.05      | 0.05      |
| Repeatability limit            | r   | mm | 0.005     | 0.01      | 0.01      | 0.01      | 0.01      | 0.01      | 0.025     | 0.025     |
| Measuring depth                | L   | mm | 35        | 85        | 85        | 85        | 85        | 85        | 188       | 192       |
| Groove depth                   | A   | mm | 2.3       | 5.2       | 7.0       | 7.0       | 8.3       | 8.3       | 5.5       | 8.3       |
| Groove width                   | B   | mm | 0.8       | 1.2       | 1.2       | 1.2       | 1.2       | 1.2       | 1.9       | 2.4       |
| Contact point - length (move.) | Hb  | mm | 2.5       | 5.4       | 7.3       | 7.3       | 12.2      | 12.2      | 6         | 8.5       |
| Contact point - length (fixed) | Hf  | mm | 2.5       | 5.4       | 7.3       | 7.3       | 12.2      | 12.2      | 6         | 8.5       |
| Contact point - ball dia.      | D   | mm | 0.6       | 1         | 1         | 1         | 1         | 1         | 1.5       | 2         |
| Measuring force                | F   | N  | 0.8 - 1.2 | 1.1 - 1.6 | 1.1 - 1.6 | 1.1 - 1.6 | 1.1 - 1.6 | 1.1 - 1.6 | 0.9 - 1.9 | 0.9 - 1.9 |
| Order no.                      |     |    | 4495580   | 4495581   | 4495582   | 4495583   | 4495584   | 4495585   | 4495586   | 4495587   |



## Gages (Inch) for Internal Measurement 838 TI for measuring bores and internal grooves

### Features

- Contact points are made from carbide
- Absolute measuring instrument
- Easy to operate, very habile and portable
- Easy to read tolerance markers
- IP protection class IP65 according to EN 60529
- Supplied with:  
Test certificate

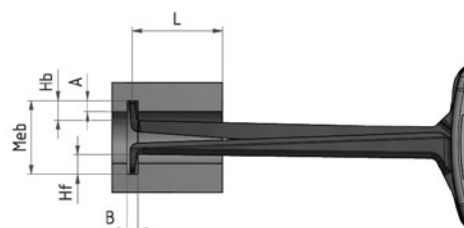


### Applications

- For measuring bores and internal grooves

### Technical Data and Dimensions

|                                |     |             |           |           |           |            |            |            |           |            |
|--------------------------------|-----|-------------|-----------|-----------|-----------|------------|------------|------------|-----------|------------|
| Measuring range                | Meb | <i>inch</i> | .20-.60"  | .40-1.20" | .80-1.60" | 1.20-2.00" | 1.60-2.40" | 2.00-2.80" | .60-2.60" | 1.60-3.60" |
| Readings                       | Skw | <i>inch</i> | .0002"    | .0005"    | .0005"    | .0005"     | .0005"     | .0005"     | .001"     | .001"      |
| Error limit                    | G   | <i>inch</i> | .0008"    | .0015"    | .0015"    | .0015"     | .0015"     | .0015"     | .002"     | .002"      |
| Repeatability limit            | r   | <i>inch</i> | .0002"    | .0005"    | .0005"    | .0005"     | .0005"     | .0005"     | .001"     | .001"      |
| Measuring depth                | L   | <i>inch</i> | 1.37"     | 3.2"      | 3.2"      | 3.2"       | 3.2"       | 3.2"       | 7.5"      | 7.6"       |
| Groove depth                   | A   | <i>inch</i> | .09"      | .19"      | .26"      | .26"       | .31"       | .31"       | .2"       | .2"        |
| Groove width                   | B   | <i>inch</i> | .032"     | .06"      | .08"      | .08"       | .08"       | .08"       | .08"      | .1"        |
| Contact point - length (move.) | Hb  | <i>inch</i> | .097"     | .21"      | .29"      | .29"       | .33"       | .33"       | .25"      | .33"       |
| Contact point - length (fixed) | Hf  | <i>inch</i> | .097"     | .21"      | .29"      | .29"       | .33"       | .33"       | .25"      | .33"       |
| Contact point - ball dia.      | D   | <i>inch</i> | .024"     | .04"      | .04"      | .04"       | .04"       | .04"       | .06"      | .08"       |
| Measuring force                | F   | N           | 0.8 - 1.2 | 1.1 - 1.6 | 1.1 - 1.6 | 1.1 - 1.6  | 1.1 - 1.6  | 1.1 - 1.6  | 0.9 - 1.9 | 0.9 - 1.9  |
| Order no.                      |     |             | 4495980   | 4495981   | 4495982   | 4495983    | 4495984    | 4495985    | 4495986   | 4495987    |



# Definition of Terms Specifications for inspection and test acceptance procedure of mechanical and electronic caliper gages

## 1. Basics

The inspection only follows approximately the testing methods and procedures of the German standard DIN 878 for dial gages and the testing statements for caliper gages according to VDI/VDE/DGQ 2618 sheet 12.1 and 13.1. The gages are referred to without special reference as gages for 'absolute' measurements and adjustable zero point.

## 2. Definitions

Definitions of length checking techniques see DIN 2257 part 1 and part 2 (see Illustration).

### 2.1 Application range Awb

Application range Awb of a gage corresponds to the sum of adjusting and measuring range.

### 2.2 Measuring range Meb

The measuring range of an indicating gage represents the range of measuring values in which agreed error limits must not be exceeded.

### 2.3 Reading Zw

The reading Zw of a numerical interval of a numerical scale is the modification of the value of a measured variable that causes the modification of the indication by one interval. The numerical interval corresponds to the scale interval of a line scale and is indicated in the unity of the measured variable.

### 2.4 Scale interval Skw

The scale interval Skw is indicated on the scale, i.e. 0.01 mm. It corresponds to the measuring value between two scale graduation marks.

## 2.5 Deviation within the measuring range $f_M$

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

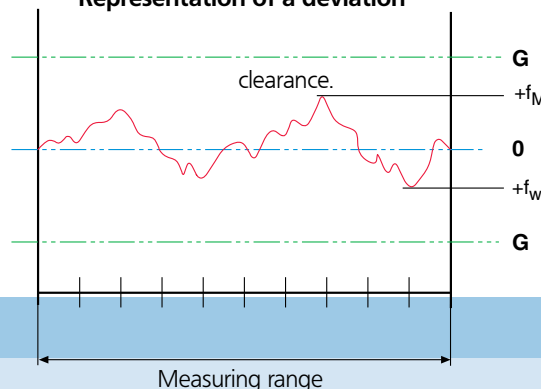
The deviation in the partial measuring range  $f_t$  can only be determined by using electronic testing methods during the preparation of certificates of quality.

### 2.6 Repeatability $f_w$

Repeatability  $f_w$  is a characteristic value for deviations of the measured variable within the measuring range in the same motion direction of the movable caliper arm (usually n is 5).

The limits of error  $f_w$  are referred to with **repeatability limit r**.

Representation of a deviation



## Technical Data

| Order  |      |                       |             |
|--------|------|-----------------------|-------------|
| Metric | Inch | Capacity<br>mm / inch | Description |

## Measuring Capacity of Internal Measuring Instruments

and 0.02 mm / 0.001 inch.

Data listed in the table referring to groove depth B and measuring depth L are only meant to be rough guidelines.

For each type of instrument there is dependence of these intervals for each center point.

After use, please return the gage to the factory.

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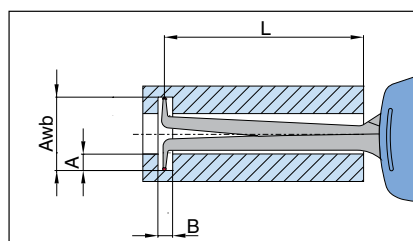
For each type of instrument there is dependence of these intervals for each center point.

After use, please return the gage to the factory.

### Application range Awb (mm)

|                     | 10   | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18     | 19     | 20     |
|---------------------|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Groove depth A (mm) |      |        |        |        |        |        |        |        |        |        |        |
| 0                   | 0/55 | 0/55   | 0/56   | 0/56   | 0/57   | 0/57   | 0/57   | 0/57   | 0/57   | 0/57   | 0/58   |
| 0.5                 |      | 1.4/55 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/57 | 1.4/57 | 1.4/57 |
| 1                   |      |        | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/57 |
| 1.5                 |      |        |        | 1.4/55 | 1.4/55 | 1.4/55 | 1.4/55 | 1.4/56 | 1.4/56 | 1.4/56 | 1.4/56 |
| 2                   |      |        |        |        | 1.4/55 | 1.4/55 | 1.4/55 | 1.5/55 | 1.5/55 | 1.5/56 | 1.5/56 |
| 2.5                 |      |        |        |        |        | 1.4/55 | 1.5/55 | 1.5/55 | 1.6/55 | 1.6/55 | 1.6/55 |
| 3                   |      |        |        |        |        |        | 1.5/54 | 1.6/54 | 1.6/55 | 1.6/55 | 1.6/55 |
| 3.5                 |      |        |        |        |        |        |        | 1.6/54 | 1.6/54 | 1.6/54 | 1.6/55 |
| 4                   |      |        |        |        |        |        |        |        | 1.7/54 | 1.7/54 | 1.7/54 |
| 4.5                 |      |        |        |        |        |        |        |        |        | 1.7/53 | 1.8/54 |

Relationship W/L



B = Min. groove depth (mm)  
L = Max. usable caliper arm length (mm)

Example: Awb = 12 B = 1.4  
A = 0.5 L = 56

## Indicating Depth Gage 837



### Features

- Cross beam is hard chrome plated and hardened
- Measuring faces are finely lapped
- Supplied with:  
Cross beam,  
Anvil 902 12 mm

### Technical Data

| Length of cross beam<br>mm | Width of cross beam<br>mm | Flatness of the cross beam | Mounting hole<br>mm | Order no.* |
|----------------------------|---------------------------|----------------------------|---------------------|------------|
| 80                         | 16                        | DIN 876/0                  | 8H7                 | 4494010    |
| 100                        | 16                        | DIN 876/0                  | 8H7                 | 4494011    |
| 150                        | 20                        | DIN 876/0                  | 8H7                 | 4494012    |

\* Excludes indicating instrument

### Accessories

#### Spherical Contact Points 902

| Depth measuring range* | L  | Order no. |
|------------------------|----|-----------|
| mm                     | mm |           |
| 10 - 20                | 25 | 4360015   |
| 20 - 30                | 35 | 4360017   |
| 30 - 40                | 45 | 4360026   |
| 40 - 50                | 55 | 4360031   |
| 50 - 60                | 65 | 4360035   |
| 60 - 70                | 75 | 4360020   |
| 70 - 80                | 85 | 4360036   |
| 80 - 90                | 95 | 4360029   |

\* for Indicators with a 10 mm measuring range

#### Indicating Instruments

Recommended are:

| Indicator | Readings / Resolution<br>mm | Measuring range<br>mm | Order no. |
|-----------|-----------------------------|-----------------------|-----------|
| 810 AT    | 0.01                        | 10                    | 4311060   |
| 1075 R    | 0.01                        | 12.5                  | 4336010   |
| 1086 R    | 0.01                        | 25                    | 4337130   |
| 1086 R    | 0.01                        | 50                    | 4337131   |

## Indicating Depth Gage 65P-40, 75P-30

### Features

### Features



75P-35



75P-30



• **65P-40** has a "V" shaped base and a needle contact. Movement is "Push-Down" style. Ideal for measuring etch depth, pits, or small, shallow recesses.

• **75P-30** Depth Gages have rectangular, flat base and a radiused contact point. 75P-30 is supplied with contact point, for measuring depths from the base as a reference. Contact points for other depths are available upon request.

• **75P-35** Depth Gages have three interchangeable contact points, allowing inspection of depths to 76 mm / 3". Check depths against a setting

### Technical Data

| Metric  | Order    | Inch | Capacity           | 65P-40 | Description                                              |
|---------|----------|------|--------------------|--------|----------------------------------------------------------|
|         |          |      | mm / inch          |        |                                                          |
| 57B-14M | 57B-14   |      | 0 - 2.5 / 0 - .10" |        | Dial Indicator readout with and .002 mm / .0001" grad    |
| 57B-15M | 57B-15   |      | 0 - 25 / 0 - 1"    |        | Dial Indicator readout with and .01 mm / .001" grads.    |
|         | 2057551* |      |                    |        | 1086 Ri Digital Indicator with and .001 mm / .00005" res |

Alternate Indicators and contact points available upon request.

### Technical Data

| Order no. |        | Capacity                | Range of Sensitive      | Graduation Contact      | Base Dimensions            | Contact Style/ Length                                                               |
|-----------|--------|-------------------------|-------------------------|-------------------------|----------------------------|-------------------------------------------------------------------------------------|
| Metric    | Inch   |                         |                         |                         |                            |                                                                                     |
| 65P-40M   | 65P-40 | 0-2 mm / <i>0-.075"</i> | 0-2 mm / <i>0-.075"</i> | 0.01 mm / <i>.0005"</i> | 64 mm / <i>2.50"</i>       | Needle                                                                              |
| 75P-30M   | 75P-30 | 0-4 mm / <i>0-.15"</i>  | 0-4 mm / <i>0-.15"</i>  | 0.01 mm / <i>.0005"</i> | 64x14 mm / <i>2.5x.56"</i> | radiused:<br>3 mm / <i>.13"</i>                                                     |
| 75P-35M   | 75P-35 | 0-75 mm / <i>0-3"</i>   | 0-75 mm / <i>0-3"</i>   | 0.01 mm / <i>.001"</i>  | 64x14 mm / <i>2.5x.56"</i> | (3) radiused:<br>3 mm / <i>.13"</i><br>28 mm / <i>1.13"</i><br>54 mm / <i>2.13"</i> |

## Depth Gages 75P-50



75P-52 with  
Setting Master

### Features

- Modular depth gages for all applications.
- Single and multi-purpose bases with choice of Dial Indicator for comparative or direct measurement.
- Indicator collet mounting allows easy interchangeability of Indicators and bases — use one Indicator with several bases or change Indicators to meet range requirements.
- Family of contact points available to cover wide range of depth measurement applications.
- Setting masters available with anvil ground to specified depth ( $\pm 0.0025$  mm /  $\pm .0001$ " in accuracy).

### Technical Data

- **For Comparative Measurement:** Unless otherwise specified, a comparative measurement Indicator will be furnished. Correct contact point will be furnished for the gaging depth specified.  
Metric: Furnished with .01 mm grads. / 2.50 mm range, balance dial.  
Inch: Furnished with .0005" grads. / .075" range, balanced dial.

- **For Direct Measurement:** (Special Order) Contact point for 0-25 mm / 0-1" depth will be furnished unless otherwise specified.  
Metric: Model SP6IS (0.01 mm grads. / 25 mm range, continuous dial with revolution counter).  
Inch: Model 28ISN (.001" grads. / 1" range, continuous dial with revolution counter).  
Digital: Model 2034212 (.001 mm/.00005" resolution, 25 mm / 1" range)  
• For long range models contact Mahr Federal.

**Base Dimensions** (all bases are 15 mm / .59" high x 19 mm / .75" wide)

| Order no.<br>Metric | Inch   | Length<br>mm / <i>inch</i> | Width<br>mm / <i>inch</i> | Diameter<br>mm / <i>inch</i> | Measuring<br>Positions | Base only<br>Model* |
|---------------------|--------|----------------------------|---------------------------|------------------------------|------------------------|---------------------|
| 75P-50M             | 75P-50 | 50 / 2"                    | 19 / .75"                 | —                            | One                    | BA-42               |
| 75P-51M             | 75P-51 | 76 / 3"                    | 19 / .75"                 | —                            | One                    | BA-43               |
| 75P-52M             | 75P-52 | 102 / 4"                   | 19 / .75"                 | —                            | Two                    | BA-44               |
| 75P-53M             | 75P-53 | 152 / 6"                   | 19 / .75"                 | —                            | Three                  | BA-45               |
| 75P-54M             | 75P-54 | 203 / 8"                   | 19 / .75"                 | —                            | Three                  | BA-46               |
| 75P-55M             | 75P-55 | —                          | —                         | 19 / .75"                    | One                    | BA-47               |
| 75P-56M             | 75P-56 | —                          | —                         | 32 / 1.25"                   | One                    | BA-76               |

### Ordering Information

#### When ordering please specify:

1. Model Number.
2. Comparative or Direct Measurement.
3. Depth to be gaged.
4. Master Setting Block, if required.
5. Any special or optional features such as special contact points, Indicator Housing, or alternate Indicators.

\* If base only is specified, it is supplied without the indicator holding collet, model AD-87.

Order collet separately if required.

## Depth Gages 75P-50

### Contact Points

To increase the versatility of any **75P-50** Series Depth Gage, additional contacts may be used to extend the capacity of the gage. Specify additional contact points required from the table at right.

To order the entire set of points, order by Model **PT-750** Contact Point Set.

| Gaging Depth |   |       |                  | Contact Point model* | μMaxμm |
|--------------|---|-------|------------------|----------------------|--------|
| mm           | / | inch  |                  |                      |        |
| 0.00         | - | 1.60  | / 0 - .063"      | PT-201               | PT-564 |
| 1.60         | - | 4.80  | / .063 - .188"   | PT-232               | PT-14  |
| 4.80         | - | 8     | / .188 - .313"   | PT-305               | PT-564 |
| 8            | - | 11    | / .313 - .438"   | PT-565               | PT-31  |
| 11           | - | 14    | / .438 - .563"   | PT-239               | PT-201 |
| 14           | - | 17.50 | / .563 - .688"   | PT-50                | PT-232 |
| 17.50        | - | 21    | / .688 - .813"   | PT-235               | PT-305 |
| 21           | - | 24    | / .813 - .938"   | PT-241               | PT-565 |
| 24           | - | 27    | / .938 - 1.063"  | PT-100               | PT-239 |
| 27           | - | 30    | / 1.063 - 1.188" | PT-51                | PT-50  |
| 30           | - | 33.40 | / 1.188 - 1.313" | PT-243               | PT-235 |
| 33.4         | - | 37    | / 1.313 - 1.438" | PT-696               | PT-241 |
| 37           | - | 40    | / 1.438 - 1.563" | PT-101               | PT-100 |
| 40           | - | 43    | / 1.563 - 1.688" | PT-245               | PT-51  |
| 43           | - | 46    | / 1.688 - 1.813" | PT-102               | PT-243 |
| 46           | - | 49    | / 1.813 - 1.938" | PT-566               | PT-696 |
| 49           | - | 52.4  | / 1.938 - 2.063" | PT-247               | PT-101 |

\* For "C" size dial indicators, "EDI-" and μMaxμm Digital Indicators.

### Semi-finished Model

| 0-25 mm/<br>0-1" | 25-50 mm/<br>1-2" | Gaging Positions | Used with Model      | "A"            | "B"            | "C"          | "D"          |
|------------------|-------------------|------------------|----------------------|----------------|----------------|--------------|--------------|
| <b>MR-501</b>    | <b>MR-502</b>     | One              | 75P-50,<br>75P-30/35 | 25 mm/<br>1"   | 25 mm/<br>1"   | —            | —            |
| <b>MR-511</b>    | <b>MR-512</b>     | One              | 75P-51               | 38 mm/<br>1.5" | 38 mm/<br>1.5" | —            | —            |
| <b>MR-521</b>    | <b>MR-522</b>     | Two              | 75P-52               | 50 mm/<br>2"   | 25 mm/<br>1"   | 25 mm/<br>1" | —            |
| <b>MR-531</b>    | <b>MR-532</b>     | Three            | 75P-53               | 75 mm/<br>3"   | 25 mm/<br>1"   | 25 mm/<br>1" | 25 mm/<br>1" |
| <b>MR-541</b>    | <b>MR-542</b>     | Three            | 75P-54               | 102 mm/<br>4"  | 25 mm/<br>1"   | 25 mm/<br>1" | 25 mm/<br>1" |
| <b>MR-551</b>    | <b>MR-552</b>     | One<br>75P-56    | 75P-55,<br>.68"      | 17 mm/<br>.68" | 17 mm/<br>.68" | —            | —            |

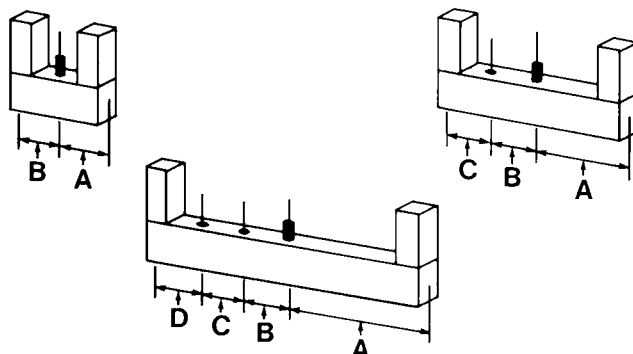
Six different setting masters are available for Series 75P Models. Setting masters are available in two styles: Finished (ground to final size) and Semi-finished (assembled but not ground to final size). Finished depths available from 0 - 50 mm / 0 - 2". Unground Anvil can be purchased separately. Specify **Model AL-89**.

For multi-position masters, please specify the anvil location.

Protective Housings for the Dial Indicator are available, see page 5-23.

For Series 75P-50 style depth gages with alternate Indicators, greater gaging depth, alternate contact configurations or other modifications, contact Mahr Federal Technical Assistance.

For master finished to size, specify size and add suffix "F". Example: MR-502F, size 1.265" (Master for 75P-50 set to 1.265").



## Bench Depth Gages 75B-1

For inspecting small parts



75B-1

### Features

- Available with Dial Indicator (75B-1 Models) or Max $\mu$ m<sup>®</sup>/// and  $\mu$ Max $\mu$ m<sup>®</sup>/// Digital Electronic Indicators (EMD-75B and XLI-75B Models).
- Two contact points provided, 6 mm / .25" and 32 mm / 1.25" to check features up to 50 mm / 2" deep.
- 89 x 102 mm / 3.50 x 4" hardened, ground work surface provides excellent reference surface.
- Four #10-32 tapped holes provided for mounting part location fixturing.
- Indicator adjustable vertically over 32 mm / 1.25".

### Technical Data

| Metric | Order no.        | Inch         | Indicator Range / Graduation or Resolution                                                    |
|--------|------------------|--------------|-----------------------------------------------------------------------------------------------|
|        | <b>75B-1M</b>    | <b>75B-1</b> | 25 mm / .01 mm ( <b>1" / .001"</b> ) graduation Dial Indicator.                               |
|        | <b>EMD-75B-1</b> |              | Max $\mu$ m <sup>®</sup> /// Digital Indicator with selectable range and resolution, 2033201. |
|        | <b>2057552</b>   |              | 1086 R Digital Indicator, 25 mm / <b>1"</b> range, .001 mm / <b>.00005"</b> resolution        |
|        | <b>2057553</b>   |              | 1086 R Digital Indicator, 12 mm / <b>.50"</b> range, .001 mm / <b>.00005"</b> resolution      |

To specify Digital Output on EMD-75B Models, add suffix "D". Example = EMD-75B-1D.  
Output is standard with 1086 R and EDI models.



1086 R

## Dimentron® Plug Gages

### The Dimentron System - Built for Performance



Dimentron Plug Assembly – shown with *Maxum®III* Indicator, Housing and Handle

The Dimentron plug gage, which is formed by the plug body, the panto-assembly with contacts and the transfer rod, is the measuring system comprising the Dimentron plug. It can be interchanged by simply unscrewing it from the display assembly.

The **plug body** is made from through hardened 440 stainless steel, tempered and ground, with hardness 52-56 HRC, guides the plug gage; its easy entry guide facilitate introduction into the bore.

Standard **contacts** are made of tungsten carbide and based on the bore diameter range, come in two possible radii. Other contact materials are available based on the part being measured. Diamond, Ruby or hard-chrome-covered contacts are also available. Diamond or ruby contacts are suggested for soft aluminum or highly wearing applications; hard chromed ones (1000 HV) for aluminum and relevant alloys. Also based on the thickness of the surface available options cylindrical contacts may be ordered.

Either 2 or 4 steel spring assemblies **form panto-spring assemblies**. The design of the transfer assembly is determined by the diameter of the plug. This panto-design produces true straight-line transfer to the Vee-rod.

A **transfer rod**, with spherical tungsten carbide tip, slides on a tempered steel V-shaped guide and inclined plane, transferring the measurement to the display device. This unique floating system has been designed and tested to resist for over 10,000,000 measuring cycles.

Though designed for the toughest shop conditions, wear items do occasionally need replacement. Because of the individual components **service is fast and easy**. All parts are available separately from Mahr Federal and with standard tools, can be replaced in minutes to help maintain up time on the floor.

### Technical Data

Metric

57B-14

57B-15

Capacity  
mm / inch

0 - 2.5 / 0 - .10"

0 - 25 / 0 - 1"

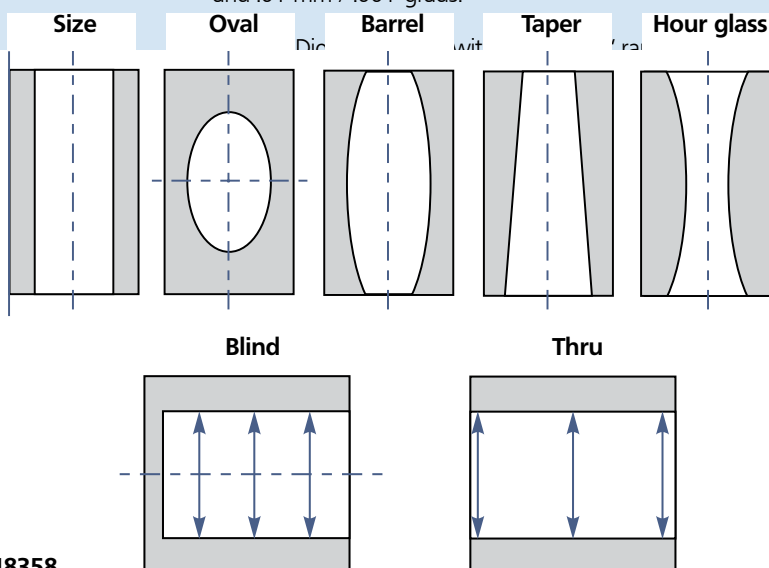
Special depth gaging applications

Alternate Indic  
Contact Mahr F  
\* Integratec



Shown with bench stand 2239307 & plug holder 2248358

Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm / .001" grads.



## Dimentron® Plug Inside Diameter Gages



Thru-hole and Blind Hole  
Dimentron Plugs

### Features

- Designed for high production I.D. gaging.
- High chrome content; hardened stainless steel bodies ground precisely for specified size measurement.
- Plug tooling interchangeable for quick changeover.
- Measuring is easy — just insert plug into diameter and read. No rocking needed.
- Set to nominal dimension with a single master ring.
- Long life: Tungsten carbide contacts and vee rod ensure durable motion transfer.
- Three styles of plugs available — Thru-hole, Blind Hole and Super-blind.
- Open design rinses clean easily.
- Explore bores for taper, barrel shape, bell-mouth and 2-point out-of-round.
- Stop Collars available for all standard sizes.
- Captive vee rod design.

### Technical Data

#### Blind Hole Plugs

Use Dimension "A" below. Dimension "B" is 4 mm / .157".

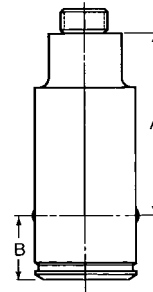
#### Super-blind Plugs

Use Dimension "A" below. Dimension "B" is 2 mm / .08", for 5.5 mm / .217" & up .108" for 3.2 mm / .125" to 5.5 mm / .217"

#### Super-Super blind Plugs

Use Dimension "A" below. Dimension "B" is 0.79 mm / .031". (4.500" to 9.00" are not available with this model.)

### Dimentron Plug Dimensions



Blind Hole Plugs



A Dimentron Plug Gage with digital Electronic Indicator makes a compact, portable hand tool.

### Thru-hole Plugs

| Sizes above   | To and include | A            | B           | Group*    |
|---------------|----------------|--------------|-------------|-----------|
| mm / inch     | mm / inch      | mm / inch    | mm / inch   |           |
| 3.2 / .125"   | 5.5 / .217"    | 31.4 / 1.23" | 6.4 / .25"  | no group* |
| 5.5 / .217"   | 8.2 / 0.322"   | 34.8 / 1.37" | 6.5 / .256" | 5         |
| 8.2 / .322"   | 9.5 / .375"    | 34.8 / 1.37" | 6.5 / .256" | 6         |
| 9.5 / .375"   | 12.7 / 0.50"   | 35.4 / 1.39" | 13 / .512"  | 8         |
| 12.7 / .50"   | 19.05 / .75"   | 35.4 / 1.39" | 13 / .512"  | 8         |
| 19.05 / .75"  | 25 / 1"        | 48.3 / 1.90" | 16 / .63"   | 12        |
| 25 / 1"       | 38 / 1.50"     | 48.3 / 1.90" | 16 / .63"   | 12        |
| 38 / 1.50"    | 63 / 2.50"     | 46.7 / 1.84" | 19 / .748"  | 12        |
| 63 / 2.50"    | 114.3 / 4.5"   | 46.7 / 1.84" | 19 / .748"  | 12        |
| 114.3 / 4.50" | 228.6 / 9.0"   | 46.7 / 1.84" | 9.5 / .375" | 12        |

\* Group Number specifies thread size on gaging plugs. Threaded bushings are provided with each plug to allow mounting to Maxym® Adaptor or Electronic Handle Assembly.

\*\* Only available as Thru- and Blind Hole Small Bore Probe. For larger or smaller plugs, alternate contact materials, extended gaging depths, more clearance, or other plug modifications - contact Mahr Federal Technical Assistance.

## Dimetron® Plug Inside Diameter Gages



shown with 1087 Digital Indicator and Housing

Dimetron Plug Assembly  
shown with Maxum® III Indicator,  
Housing and Handle

### Ordering Information

When ordering specify:

1. Diameter
2. Tolerance
3. Gaging depth
4. Plug style
5. Contact type — polished chrome steel or tungsten carbide
6. Stop collar

### Gaging Range:

Dimetron Plugs are ground to one of four measuring ranges, based on part tolerance.

### Technical Data

|                |                | Maximum Part Tolerance |                  |                  |                  |
|----------------|----------------|------------------------|------------------|------------------|------------------|
| Sizes<br>above | To and include | Metric M01<br>Inch 050 | M02<br>100       | M05<br>200       | M08<br>400       |
| mm / inch      | mm / inch      | mm / inch              | mm / inch        | mm / inch        | mm / inch        |
| 3.18 / .1250"  | 3.62 / .1426"  | ±0.025 / ±.0010"       | ±0.038 / ±.0015" |                  |                  |
| 3.62 / .1426"  | 5.52 / .2171"  | ±0.025 / ±.0010"       | ±0.046 / ±.0018" | ±0.076 / ±.0030" |                  |
| 5.50 / .2171"  | 7.94 / .3125"  | ±0.025 / ±.0010"       | ±0.046 / ±.0018" | ±0.069 / ±.0027" | ±0.102 / ±.0040" |
| 7.94 / .3125"  | 9.50 / .375"   | ±0.030 / ±.0012"       | ±0.051 / ±.0020" | ±0.069 / ±.0027" | ±0.127 / ±.0050" |
| 9.50 / .3750"  | 12.7 / .500"   | ±0.038 / ±.0015"       | ±0.058 / ±.0023" | ±0.086 / ±.0034" | ±0.137 / ±.0054" |
| 12.7 / .5000"  | 19.05 / .750"  | ±0.038 / ±.0015"       | ±0.069 / ±.0027" | ±0.102 / ±.0040" | ±0.165 / ±.0065" |
| 19.05 / .750"  | 25.4 / 1.000"  | ±0.038 / ±.0015"       | ±0.076 / ±.0030" | ±0.127 / ±.0050" | ±0.180 / ±.0071" |
| 25.4 / 1.000"  | 38 / 1.500"    | ±0.038 / ±.0015"       | ±0.076 / ±.0030" | ±0.152 / ±.0060" | ±0.221 / ±.0087" |
| 38 / 1.500"    | 114.3 / 4.50"  |                        | ±0.076 / ±.0030" | ±0.152 / ±.0060" | ±0.254 / ±.0100" |
| 114.3 / 4.5"   | 229 / 9.00"    |                        |                  | ±0.152 / ±.0060" | ±0.254 / ±.0100" |

Order Maxum Indicator and Accessories separately.

Dial indicator readout with .02 mm / .001" sensitive range and .01 mm / .001" grads.

### Maxum III Indicator

Inch: Specify **2033101** (**2033111** if Digital Output is required) for .00005" resolution, .0001" grad., and "0" on the Indicator in the 12 o'clock position.  
For "0" at 6 o'clock position, specify **2033201**.

Metric: Specify **2033101** (**2033111** if Digital Output is required) for 0.001 mm resolution, 0.001 mm grad., and "0" at 12 o'clock.  
For "0" at 6 o'clock position, specify **2033201**.

**EKT-1120-W1** is required to mount the Maxum III Indicator to Dimetron Plugs. (Specify **EKT-1120-W2** for Maxum III Indicators with 8 mm stems). This adaptor kit includes mounting adaptor, hex wrench, and flat-end, contact point for the Indicator.

Other models include:

**EKT-1120-W3** — EDI/Dial .375" stem — 4-48 thread

**EKT-1120-W4** — EDI/Dial 8 mm stem — 2.5 thread

**EKT-1120-W6** — 1002 - 1010 8 mm stem — 2.5 thread

### Protective Housings for Plugs over 50 mm/ 2"

**EHG-1172** For Maxum III Indicators without Output. Requires in-line or pistol style grip Handle (**HA-88** Handle and **AT-124** Adaptor).  
**EHG-1198** For Maxum III Indicators with Output. Requires pistol style grip Handle (**HA-88** and **AT-124** Adaptor).

**B-12668** For Maxum III Indicators with Output. Complete with in-line style handle. **AT-125** Bench Stand Adaptor permits the Maxum Indicator in a Protective Housing to be clamped in **BA-26** Bench Stand. (See pages 9-5 and 9-7)

## Dimentron® Plug Inside Diameter Gages

### With Electronic Gage Heads

Gage heads are mounted to Dimentron Plugs using HA-88 and AD-140 Adaptor. Electronic Gage Heads can be ordered separately. The following Handle Assemblies include Adaptor, Wrenches and Gage Head:

### Handle Assemblies

| Order no.       | Description                                  |
|-----------------|----------------------------------------------|
| <b>EHA-1146</b> | Flat Contact<br>3 m / 11 ft, coiled cable    |
| <b>EHA-1145</b> | Flat Contact<br>1.5 m / 5 ft, straight cable |

### Accessories

#### Base, BA-100

Heavy cast base has tooling plate allowing plug to be mounted vertically or horizontally. Can be used with Electronic Gage Heads or Maxµm Remote Transducers or Maxµm/// Digital Transducers.

#### Stop Collars

Stop collars are available for all Dimentron Plugs.



Right Angle Adaptor  
AT-155

### Extensions

Extensions for Dimentron Plugs are available for Plugs over 9.5 mm / .375". See table below:

| Group 8 Plugs<br>9.3 mm/.366" O.D. | Group 12 Plugs<br>16 mm/.63" O.D. | Extension<br>Length   |
|------------------------------------|-----------------------------------|-----------------------|
| <b>EX-204</b>                      | <b>EX-210</b>                     | 50 mm / <b>1.97"</b>  |
| <b>EX-205</b>                      | <b>EX-211</b>                     | 100 mm / <b>3.94"</b> |
| <b>EX-206</b>                      | <b>EX-212</b>                     | 200 mm / <b>7.87"</b> |

Consists of 1280P Indicator and Handle Assembly with stocked adaptor:

| Order no.             | Minimum graduation                       |
|-----------------------|------------------------------------------|
| Inch <b>550P-10</b>   | Dial Indicator <b>.0001"</b>             |
| Metric <b>550P-20</b> | Dial Indicator <b>.002 mm</b>            |
| <b>EDI-550P-10</b>    | (with 2034101) <b>.00005" / .001 mm</b>  |
| <b>EDI-550P-20</b>    | (with 2034201) <b>.00002" / .0005 mm</b> |



EDI-550P-10



Remote Maxµm Transducer or Maxµm///  
Digital Transducer Dimentron Plug  
Handle/ Adaptor: **HA-141**



**BA-100** (Dimentron Plug  
not included)

## Dimentron® Plug Inside Diameter Gages

This table depicts available readouts for Dimentron Plug Inside Diameter Gages. After making a Plug selection, follow the chart for all the components needed to make up a gaging system suited to your application.

| Dimetron Plug Gage | Adaptors    | Handles     | Readout                                    | Housing Housings | Handle |
|--------------------|-------------|-------------|--------------------------------------------|------------------|--------|
| Dimetron Plug      |             |             | 2014802                                    |                  |        |
| Stop Collar        |             |             | 2034201                                    |                  |        |
| Extension          | EKT-1120-WX |             | 2033111                                    | B-12668          |        |
|                    |             |             |                                            | EHG-1198         | AT-124 |
|                    |             |             | 2033101                                    | EHG-1172         | HA-88  |
|                    |             |             | 2033001 - no Data Output                   |                  |        |
|                    |             | HA-141      | 2033011 - with Data Output (6 pin)         |                  |        |
|                    |             |             | 2033091 - canister style*                  |                  |        |
|                    |             |             | 2033099 - pencil style*                    |                  |        |
|                    |             |             | * ± 1 mm/ ±.040" Range Digital Transducer. |                  |        |
|                    |             |             | 550P-10/20                                 | Dial Indicator   |        |
|                    |             | EHA-1146    | 832 AMP                                    |                  |        |
|                    |             | EHA-1145    |                                            |                  |        |
|                    |             | BA-100      |                                            |                  |        |
|                    |             | AAT-192     | D-2500: 1 - 4000:1                         |                  |        |
|                    |             | AAT-193     |                                            |                  |        |
|                    |             | AAT-194     |                                            |                  |        |
|                    |             | EDI-550P-10 | µMaxµm//                                   |                  |        |
|                    |             | EDI-550P-20 |                                            |                  |        |

Change-WX suffix as required:  
For adaptor selection see page 9-48

## Indicating Plug Gages 844 D



### Features

- For the rapid testing of diameter, roundness and conicity of bores
- Especially suitable for testing batches with tight tolerances
- No rocking in the bore is required to determine the reversal point
- Therefore ideal for use in conjunction with a digital indicating instrument and for subsequent processing of measured values
- Measuring head has a hardened chromium plated guide cylinder and carbide tipped anvils
- The carbide expanding pin transfers radial movement to indicating instrument
- Constant measuring force as a result of built-in spring, thus eliminating user influence
- Measuring head, holder, depth extension, right angle attachments and depth stops are part of an extensive modular system

### Technical Data of the Measuring Heads

| Nominal diameter of the bore | Measuring range starting from the minimum bore dimension to be measured |                     |
|------------------------------|-------------------------------------------------------------------------|---------------------|
|                              | 844 Dk/844Dkr                                                           | 844 Dks (from 4 mm) |
| 2.98 - 8 mm                  | = - 0.02 + 0.1 mm                                                       | = - 0.02 + 0.1 mm   |
| over 8 - 16 mm               | = - 0.02 + 0.15 mm                                                      | = - 0.02 + 0.15 mm  |
| over 16 - 32 mm              | = - 0.02 + 0.2 mm                                                       | = - 0.02 + 0.15 mm  |
| over 32 - 70 mm              | = - 0.03 + 0.2 mm                                                       | = - 0.03 + 0.15 mm  |
| over 70 - 200 mm             | = - 0.04 + 0.2 mm                                                       | = - 0.04 + 0.15 mm  |

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

| Bore diameter | Tolerance |              |
|---------------|-----------|--------------|
| 35 D7         | + 80      | +105 $\mu$ m |
| 35 H7         | + 0       | +25 $\mu$ m  |
| 35 R7         | - 50      | -25 $\mu$ m  |

The diameter of the guide cylinder is produced between 0.02 and 0.07 mm smaller than the minimum dimension of the bore to be checked.

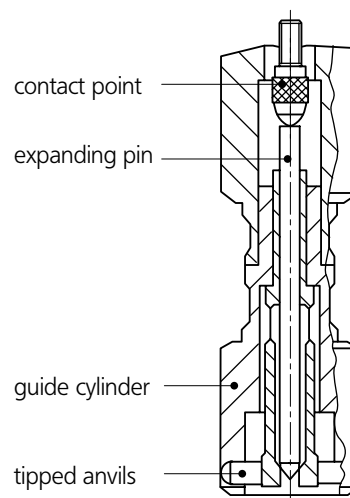
#### Example:

Plug Gage 844 Dk for bore 35 D7  
 Nominal diameter: 35 mm  
 Minimum dimension: 35.080 mm  
 Maximum dimension: 35.105 mm  
 Meas. range: 35.050 - 35.280 mm

### Accuracy

Hysteresis  
 Repeatability  
 Linearity  
 Linearity 844 Dks >8 mm

$f_u \leq 0.4 \mu\text{m}$   
 $f_w \leq 1 \mu\text{m}$   
 $\leq 1 \%$   
 $\leq 2 \%$



## Plug Gages

### Measuring Head 844 Dk, Standard version

### Features

|                                                                                                                              | Nominal <sup>①</sup><br>diameter<br>mm mm                                                                                                                        | Manufacturing <sup>②</sup><br>tolerance<br>mm                                                                                                                                                                                 | Meas. range <sup>③</sup><br>dia. d                                                                    | Order no.                                                                                                                                                                                                                              |  |
|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| over                                                                                                                         | 2.98 - 3.99<br>3.99 - 8                                                                                                                                          | -0.02/-0.04<br>-0.02/-0.04                                                                                                                                                                                                    | 0.1<br>0.1                                                                                            | <b>4480184*</b><br><b>4478200*</b>                                                                                                                                                                                                     |  |
| over                                                                                                                         | 8 - 16                                                                                                                                                           | -0.02/-0.04                                                                                                                                                                                                                   | 0.15                                                                                                  | <b>4478201</b>                                                                                                                                                                                                                         |  |
| over<br>over<br>over                                                                                                         | 16 - 25<br>25 - 32<br>32 - 44                                                                                                                                    | -0.02/-0.05<br>-0.02/-0.05<br>-0.02/-0.06                                                                                                                                                                                     | 0.2<br>0.2<br>0.2                                                                                     | <b>4478202</b><br><b>4478204</b><br><b>4478205</b>                                                                                                                                                                                     |  |
| over<br>over<br>over                                                                                                         | 44 - 50<br>50 - 60<br>60 - 70                                                                                                                                    | -0.03/-0.06<br>-0.03/-0.06<br>-0.03/-0.06                                                                                                                                                                                     | 0.2<br>0.2<br>0.2                                                                                     | <b>4478206</b><br><b>4478207</b><br><b>4478208</b>                                                                                                                                                                                     |  |
| over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over | 70 - 80<br>80 - 90<br>90 - 100<br>100 - 110<br>110 - 120<br>120 - 130<br>130 - 140<br>140 - 150<br>150 - 160<br>160 - 170<br>170 - 180<br>180 - 190<br>190 - 200 | -0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07 | 0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2 | <b>4478209</b><br><b>4478210</b><br><b>4478211</b><br><b>4478212</b><br><b>4478213</b><br><b>4478214</b><br><b>4478215</b><br><b>4478216</b><br><b>4478217</b><br><b>4478218</b><br><b>4478219</b><br><b>4478220</b><br><b>4478221</b> |  |

① Nominal diameter = smallest bore diameter

② dia. d in reference to the smallest bore diameter

③ Measuring range refers to the nominal diameter

\* With Adaptor for connection to the holder

## Plug Gages

**Measuring Head 844 Dks**, for blind holes, to measure almost to the base of a bore

|                                                              | Nominal <sup>①</sup><br>diameter<br>mm                                                          | Manufacturing <sup>②</sup><br>tolerance<br>mm                                                                        | Meas. range <sup>③</sup><br>dia. d<br>mm                     | Order no.                                                                                                                                    |  |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                              | 4 - 8                                                                                           | -0.02/-0.04                                                                                                          | 0.10                                                         | <b>4478285*</b>                                                                                                                              |  |
| over                                                         | 8 - 16                                                                                          | -0.02/-0.04                                                                                                          | 0.15                                                         | <b>4478245</b>                                                                                                                               |  |
| over<br>over<br>over                                         | 16 - 25<br>25 - 32<br>32 - 44                                                                   | -0.02/-0.05<br>-0.02/-0.05<br>-0.02/-0.06                                                                            | 0.15<br>0.15<br>0.15                                         | <b>4478230</b><br><b>4478232</b><br><b>4478233</b>                                                                                           |  |
| over<br>over<br>over                                         | 44 - 50<br>50 - 60<br>60 - 70                                                                   | -0.03/-0.06<br>-0.03/-0.06<br>-0.03/-0.06                                                                            | 0.15<br>0.15<br>0.15                                         | <b>4478234</b><br><b>4478235</b><br><b>4478236</b>                                                                                           |  |
| over<br>over<br>over<br>over<br>over<br>over<br>over<br>over | 70 - 80<br>80 - 90<br>90 - 100<br>100 - 110<br>110 - 120<br>120 - 130<br>130 - 140<br>140 - 150 | -0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07 | 0.15<br>0.15<br>0.15<br>0.15<br>0.15<br>0.15<br>0.15<br>0.15 | <b>4478237</b><br><b>4478238</b><br><b>4478239</b><br><b>4478240</b><br><b>4478241</b><br><b>4478242</b><br><b>4478243</b><br><b>4478244</b> |  |

① Nominal diameter = smallest bore diameter

② dia. d in reference to the smallest bore diameter

③ Measuring range refers to the nominal diameter

\* With adaptor for connection to the holder

## Plug Gages

**Measuring Head 844 Dkr**, with an extended guide cylinder to measure through holes from the edge of a bore, ideal for narrow parts

### Features

|                                                                                                                                                                      | Nominal <sup>①</sup><br>diameter<br>mm                                                                                                                           | Manufacturing <sup>②</sup><br>tolerance<br>mm                                                                                                                                                                                                                                             | Meas. range <sup>③</sup><br>dia. d<br>mm                                                                                                 | Order no.                                                                                                                                                                                                                              |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| over                                                                                                                                                                 | 2.98 - 3.99<br>3.99 - 8                                                                                                                                          | -0.02/-0.04<br>-0.02/-0.04                                                                                                                                                                                                                                                                | 0.1<br>0.1                                                                                                                               | <b>4478272*</b><br><b>4478250*</b>                                                                                                                                                                                                     |  |
| over                                                                                                                                                                 | 8 - 16                                                                                                                                                           | -0.02/-0.04                                                                                                                                                                                                                                                                               | 0.15                                                                                                                                     | <b>4478251</b>                                                                                                                                                                                                                         |  |
| over<br>over<br>over                                                                                                                                                 | 16 - 25<br>25 - 32<br>32 - 44                                                                                                                                    | -0.02/-0.05<br>-0.02/-0.05<br>-0.02/-0.06                                                                                                                                                                                                                                                 | 0.2<br>0.2<br>0.2                                                                                                                        | <b>4478252</b><br><b>4478254</b><br><b>4478255</b>                                                                                                                                                                                     |  |
| over<br>over<br>over                                                                                                                                                 | 44 - 50<br>50 - 60<br>60 - 70                                                                                                                                    | -0.03/-0.06<br>-0.03/-0.06<br>-0.03/-0.06                                                                                                                                                                                                                                                 | 0.2<br>0.2<br>0.2                                                                                                                        | <b>4478256</b><br><b>4478257</b><br><b>4478258</b>                                                                                                                                                                                     |  |
| over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over<br>over | 70 - 80<br>80 - 90<br>90 - 100<br>100 - 110<br>110 - 120<br>120 - 130<br>130 - 140<br>140 - 150<br>150 - 160<br>160 - 170<br>170 - 180<br>180 - 190<br>190 - 200 | -0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07<br>-0.04/-0.07 | 0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2<br>0.2 | <b>4478259</b><br><b>4478260</b><br><b>4478261</b><br><b>4478262</b><br><b>4478263</b><br><b>4478264</b><br><b>4478265</b><br><b>4478266</b><br><b>4478267</b><br><b>4478268</b><br><b>4478269</b><br><b>4478270</b><br><b>4478271</b> |  |

① Nominal diameter = smallest bore diameter  
② dia. d in reference to the smallest bore diameter

③ Measuring range refers to the nominal diameter  
\* With adaptor for connection to the holder

## Modular Unit System 844 D

### Standard Holder 844 Kg/844 Dg - Standard version

With locking clamp for an indicating instrument and a connecting thread for a measuring head. Heat insulated handle. The model 844 Dg is made from Invar steel.

| Cat. no. | Connecting thread g | Length L mm | Handle dia. D mm | Order no. |
|----------|---------------------|-------------|------------------|-----------|
| 844 Kg   | M6 x 0.75           | 50          | 14               | 4470851   |
| 844 Dg   | M10 x 1             | 150         | 26               | 4478851   |

### Short Holder 844 Dgk - Short version

With locking clamp for an indicating instrument and a connecting thread for a measuring head. Heat insulated handle.

| Cat. no. | Connecting thread g | Length L mm | Handle dia. D mm | Order no. |
|----------|---------------------|-------------|------------------|-----------|
| 844 Dgk  | M10 x 1             | 61          | 26               | 4478050   |

### Holder 844 Dge for Inductive Measuring Probes

With long sleeve for shock and waterproof mounting of inductive measuring probes. Strain relief clamp for probe cable. Threaded connection for measuring heads. Heat insulated handle.

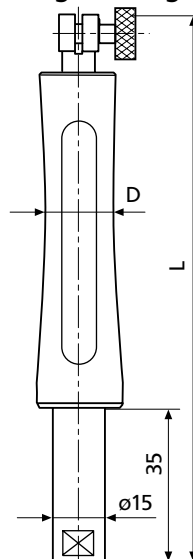
| Cat. no. | Connecting thread g | Length L mm | Handle dia. D mm | Order no. |
|----------|---------------------|-------------|------------------|-----------|
| 844 Dge  | M6 x 0.75           | 195         | 33               | 4478020   |
|          | M10 x 1             | 195         | 33         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

### Right Angle (Elbow) Attachment

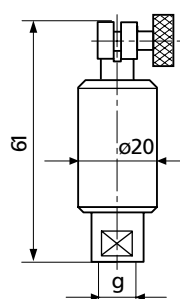
For measuring difficult to reach bores, e.g. in tight spaces, on a machine tool or when work piece bores are inconveniently located. For screwing in between holder and measuring head.

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

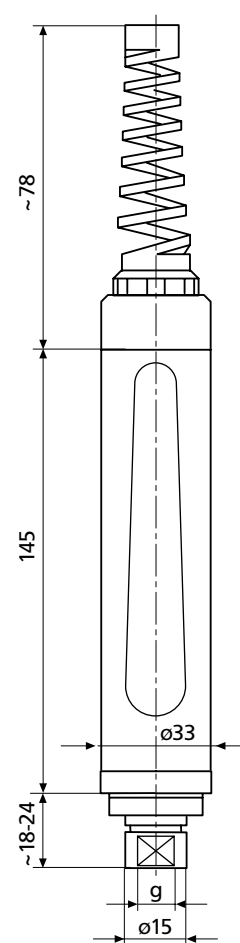
844 Kg / 844 Dg



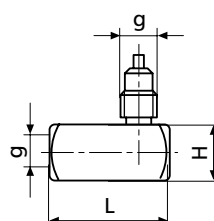
844 Dgk



844 Dge



844 Kw / 844 Dw



## Modular Unit System 844 D

### Extensions

For extra-deep bores. Screws in between holder and measuring heads. Several extensions can be screwed together as of 8 mm. Models 844 Dv and 844 Dvk made of **Invar steel**.

| Cat. no.       | Connecting thread g | Length L mm/inch | dia. D mm/inch    | Order no.      |
|----------------|---------------------|------------------|-------------------|----------------|
| <b>844 Dvk</b> | M6x0.75/M3.5x0.35   | 64 / <b>2.5"</b> | 3.8 / <b>.15"</b> | <b>4478080</b> |
| <b>844 Kv</b>  | M6 x 0.75           | 64 / <b>2.5"</b> | 8 / <b>.32"</b>   | <b>4470070</b> |
| <b>844 Dv</b>  | M10 x 1             | 64 / <b>2.5"</b> | 15 / <b>.6"</b>   | <b>4478070</b> |
| <b>844 Dv</b>  | M10 x 1             | 80 / <b>3"</b>   | 15 / <b>.6"</b>   | <b>4478071</b> |
| <b>844 Dv</b>  | M10 x 1             | 100 / <b>4"</b>  | 15 / <b>.6"</b>   | <b>4478072</b> |
| <b>844 Dv</b>  | M10 x 1             | 125 / <b>5"</b>  | 15 / <b>.6"</b>   | <b>4478073</b> |
| <b>844 Dv</b>  | M10 x 1             | 250 / <b>10"</b> | 15 / <b>.6"</b>   | <b>4478074</b> |
| <b>844 Dv</b>  | M10 x 1             | 500 / <b>20"</b> | 15 / <b>.6"</b>   | <b>4478075</b> |

### Depth Stops

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

| Cat. no.      | Mounting hole dia. d mm/inch | Stop surface dia. A mm/inch | Height h mm/inch | Order no.      |
|---------------|------------------------------|-----------------------------|------------------|----------------|
| <b>844 Kt</b> | 8 / <b>.32"</b>              | 24 / <b>1"</b>              | 60 / <b>2.36</b> | <b>4470115</b> |
| <b>844 Dt</b> | 15 / <b>.6"</b>              | 45 / <b>1.8"</b>            | 30 / <b>1.18</b> | <b>4478115</b> |
| <b>844 Dt</b> | 15 / <b>.6"</b>              | 75 / <b>3"</b>              | 30 / <b>1.18</b> | <b>4478116</b> |
| <b>844 Dt</b> | 15 / <b>.6"</b>              | 110 / <b>4.3"</b>           | 30 / <b>1.18</b> | <b>4478117</b> |
| <b>844 Dt</b> | 15 / <b>.6"</b>              | 160 / <b>6.3"</b>           | 30 / <b>1.18</b> | <b>4478118</b> |
| <b>844 Dt</b> | 15 / <b>.6"</b>              | 220 / <b>8.6"</b>           | 30 / <b>1.18</b> | <b>4478119</b> |

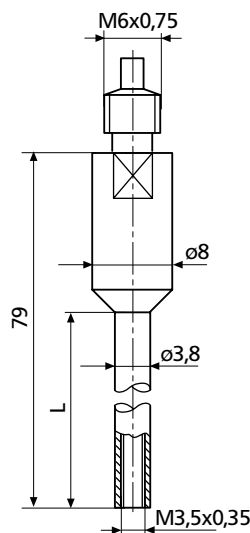
**57B-14M 57B-14 0 - 2.5 / 0 - .10"**

### Depth Stop Rings

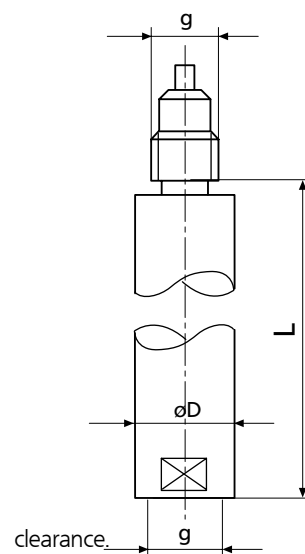
For limiting depth of insertion of measuring head in bore. Clamped onto the measuring head.

| Cat. no.       | Mounting hole dia. d mm | Stop surface dia. A mm/inch | Height h mm/inch | Order no.      |
|----------------|-------------------------|-----------------------------|------------------|----------------|
| <b>844 Dtr</b> | 3 - 5                   | 27 / <b>1.1"</b>            | 10 / <b>.4"</b>  | <b>4478130</b> |
|                | > 5 - 8                 | 30 / <b>1.2"</b>            | 10 / <b>.4"</b>  | <b>4478130</b> |
|                | > 8 - 11                | 33 / <b>1.3"</b>            | 10 / <b>.4"</b>  | <b>4478130</b> |
|                | > 11 - 15               | 37 / <b>1.5"</b>            | 10 / <b>.4"</b>  | <b>4478130</b> |
|                | > 15 - 20               | 42 / <b>1.7"</b>            | 10 / <b>.4"</b>  | <b>4478130</b> |
|                | > 20 - 25               | 50 / <b>1.9"</b>            | 12 / <b>.5"</b>  | <b>4478131</b> |
|                | > 25 - 30               | 55 / <b>2.1"</b>            | 12 / <b>.5"</b>  | <b>4478131</b> |
|                | > 30 - 35               | 60 / <b>2.3"</b>            | 12 / <b>.5"</b>  | <b>4478131</b> |
|                | > 35 - 40               | 65 / <b>2.5"</b>            | 12 / <b>.5"</b>  | <b>4478131</b> |
|                | > 40 - 45               | 70 / <b>2.8"</b>            | 12 / <b>.5"</b>  | <b>4478131</b> |
|                | > 45 - 50               | 75 / <b>3.0"</b>            | 12 / <b>.5"</b>  | <b>4478132</b> |
|                | > 50 - 60               | 85 / <b>3.3"</b>            | 12 / <b>.5"</b>  | <b>4478132</b> |
|                | > 60 - 70               | 95 / <b>3.7"</b>            | 12 / <b>.5"</b>  | <b>4478132</b> |
|                | > 70 - 80               | 105 / <b>4.1"</b>           | 12 / <b>.5"</b>  | <b>4478132</b> |
|                | > 80 - 90               | 115 / <b>4.5"</b>           | 12 / <b>.5"</b>  | <b>4478133</b> |
|                | > 90 - 100              | 125 / <b>4.9"</b>           | 12 / <b>.5"</b>  | <b>4478133</b> |

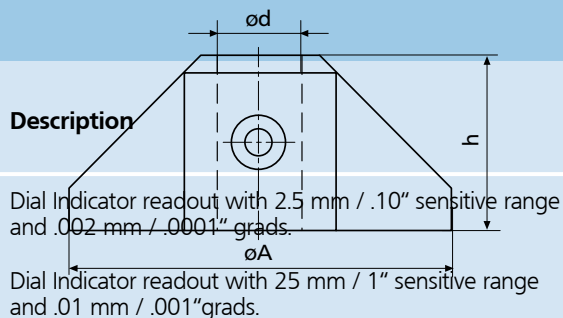
### Feature 844 Dvk



### 844 Kv / 844 Dv

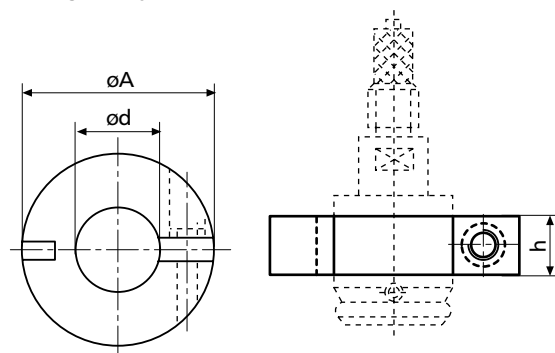


### 844 Kt / 844 Dt

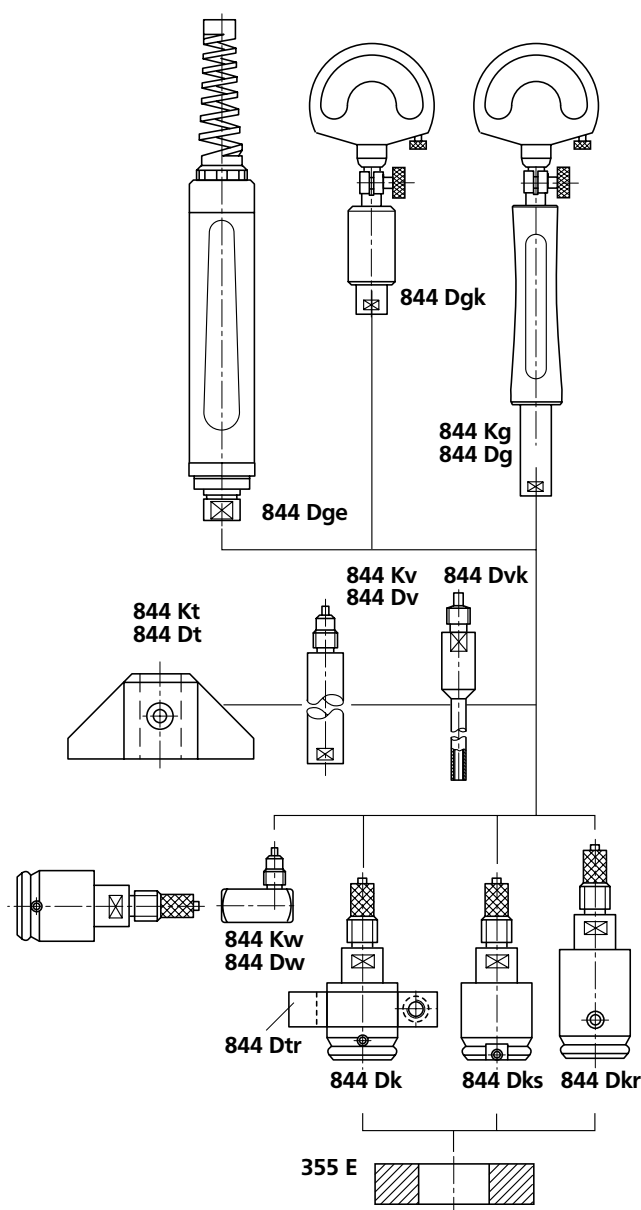


1086 Ri Digital Indicator with 25 mm / 1" range and .001 mm / .00005" resolution.

### 844 Dtr



| Modular units                | Diameter of Measuring Heads |            |                          |             |
|------------------------------|-----------------------------|------------|--------------------------|-------------|
|                              | 2.98 - 8 mm                 | 8 - 16 mm  | over 16 mm               |             |
| 844 Kg                       | 4470851                     |            | 4478851                  |             |
| 844 Dg                       |                             |            |                          |             |
| 844 Dgk                      |                             |            |                          |             |
| 844 Dge                      |                             |            |                          |             |
|                              | 4478020                     |            | 4478021                  |             |
| 844 Dvk<br>844 Kv<br>844 Dv  | 4478080                     | 4470070    | 4478070<br>to<br>4478076 |             |
| 844 Kt<br>844 Dt             |                             |            |                          |             |
|                              |                             | 4470115    | 4478115<br>to<br>4478119 |             |
| 844 Kw<br>844 Dw             | 4470110                     |            | 4478110                  |             |
| 844 Dk<br>844 Dks<br>844 Dkr |                             |            |                          |             |
| 355 E                        | see page 9-71               |            |                          |             |
| Modular unit                 | Diameter of Measuring Heads |            |                          |             |
|                              | 2.98 - 20 mm                | 20 - 44 mm | 44 - 80 mm               | 80 - 100 mm |
| 844 Dtr                      | 4478130                     | 4478131    | 4478132                  | 4478133     |



## Indicating Instruments

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

| Indicator         | Readings                                                | Order no. |
|-------------------|---------------------------------------------------------|-----------|
| Millimess 1004    | 5 $\mu\text{m}$                                         | 4333000   |
| Millimess 1003    | 1 $\mu\text{m}$                                         | 4334000   |
| Millimess 1002    | 0.5 $\mu\text{m}$                                       | 4335000   |
| MarCator 1086 R   | 1 $\mu\text{m}$                                         | 4337620   |
| MarCator 1086 Ri  | 1 $\mu\text{m}$                                         | 4337624   |
| Extramess 2000    | 0.2 $\mu\text{m}$ , 0.5 $\mu\text{m}$ , 1 $\mu\text{m}$ | 4346000   |
| Extramess 2001    | 0.2 $\mu\text{m}$ , 0.5 $\mu\text{m}$ , 1 $\mu\text{m}$ | 4346100   |
| Millimar C 1208 M | 0.1 $\mu\text{m}$ , 1 $\mu\text{m}$                     | 5312080   |
| Millimar P 2004 M |                                                         | 5323010   |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

## Adjustment of Plug Gages 844 D

### Ring Gauge 355 E:

Special wear-resistant gage steel. Hardened and lapped. With actual deviation engraved.

Dimensions: DIN 2250, type C  
Manufacturing tolerance: DIN 2250  
Available diameters: see page 13-19

## Self-Centering Dial Bore Gages 844 K Intramess



### Features

- Measuring the diameter, roundness and conicity of bores
- Spring-loaded halves of measuring probe are split via expanding pin with precision lapped taper. This movement is transferred to indicating instrument
- Maximum wear-resistance due to hard chrome plating. From 4 mm alternatively with carbide tipped available on request
- Constant measuring force as a result of built-in spring thus eliminating user influence
- Highly versatile, each gage covers a large range. Within the respective limits, quickly and easily adjustable to any size and any type of measuring application
- Measuring probe, holder, depth extensions, right-angle attachments and depth stops are part of an extensive modular system
- Supplied with: Holder, probe, expanding pin and a wooden case, excludes an indicating instrument

### Technical Data

#### Complete Instrument

**844 K** Measuring heads hard chrome plated, expanding pin made of stainless steel

**844 KH** Measuring heads carbide tipped on both sides, carbide expanding pin

**844 KS** Blind hole measuring heads hard chrome plated, expanding pin made of stainless steel

| Catalog no.   | Measuring range | Number of measuring probes | Order no.*       |
|---------------|-----------------|----------------------------|------------------|
|               | mm              |                            |                  |
| <b>844 K</b>  | 0.47 - 0.97     | 6                          | <b>4470000</b>   |
|               | 0.95 - 1.55     | 5                          | <b>4470001</b>   |
|               | 1.5 - 4.2       | 10                         | <b>4470002</b>   |
|               | 3.7 - 7.3       | 7                          | <b>4470003**</b> |
|               | 6.7 - 10.3      | 7                          | <b>4470004**</b> |
|               | 9.4 - 18.6      | 9                          | <b>4470005**</b> |
| <b>844 KH</b> | 1.5 - 4.2       | 10                         | <b>4471002</b>   |
|               | 3.7 - 7.3       | 7                          | <b>4471003**</b> |
|               | 6.7 - 10.3      | 7                          | <b>4471004**</b> |
|               | 9.4 - 18.6      | 9                          | <b>4471005**</b> |
| <b>844 KS</b> | 1.5 - 4.2       | 10                         | <b>4482163</b>   |
|               | 3.7 - 7.3       | 7                          | <b>4482164**</b> |
|               | 6.7 - 10.3      | 7                          | <b>4482165**</b> |
|               | 9.4 - 18.6      | 9                          | <b>4482166**</b> |

\* Excludes an indicating instrument

\*\* Additionally includes measuring force spring 4470828 and disk 4470821

### Accuracy

#### Deviation of linearity

- ≤ 2 % measuring ranges 0.47-1.55 mm
- ≤ 1 % measuring ranges 1.5-18.6 mm

#### Repeatability

- 1 µm manual measurement
- ≤ 0.5 µm measurement with Stand 844 Kst and Floating Holder 844 Ksts

Dial Indicator readout with 2.5 mm / .10" sensitive range and .002 mm / .0001" grads.

Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm / .001" grads.

1086 Ri Digital Indicator with 25 mm / 1" range and 0.01 mm resolution.

### Indicating Instruments

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

| Indicators               | Readings                | Order no.      |
|--------------------------|-------------------------|----------------|
| <b>Millimess 1004</b>    | 5 µm                    | <b>4333000</b> |
| <b>Millimess 1003</b>    | 1 µm                    | <b>4334000</b> |
| <b>Millimess 1003 XL</b> | 2 µm                    | <b>4334001</b> |
| <b>Millimess 1002</b>    | 0.5 µm                  | <b>4335000</b> |
| <b>Extramess 2000</b>    | 0.2 µm, 0.5 µm, 1 µm    | <b>4346000</b> |
| <b>Extramess 2001</b>    | 0.2 µm, 0.5 µm, 1 µm    | <b>4346100</b> |
| <b>MarCator 1087 BR</b>  | 1 µm, 2 µm, 4 µm, 10 µm | <b>4337662</b> |
| <b>MarCator 1087 BRi</b> | 1 µm, 2 µm, 4 µm, 10 µm | <b>4337664</b> |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

## Modular Unit System for 844 K Standard Measuring Probes

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

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

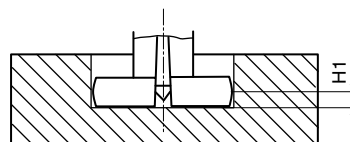
| Nominal dimension<br>mm | Measuring range<br>mm | Measuring depth<br>mm | Measuring probe<br>hard chrome<br>plated | Expanding<br>pin<br>steel | Measuring probe<br>carbide<br>tipped | Expander<br>pin<br>carbide | Ring<br>gage |
|-------------------------|-----------------------|-----------------------|------------------------------------------|---------------------------|--------------------------------------|----------------------------|--------------|
| 0.50                    | 0.47 - 0.53           | 1.25                  | 4470586                                  | 4470801                   |                                      |                            | 4482300      |
| 0.55                    | 0.52 - 0.58           | 1.5                   | 4470587                                  |                           |                                      |                            | 4482301      |
| 0.60                    | 0.57 - 0.67           | 1.7                   | 4470588                                  | 4470802                   |                                      |                            | 4482302      |
| 0.70                    | 0.65 - 0.77           | 2.2                   | 4470589                                  |                           |                                      |                            | 4482303      |
| 0.80                    | 0.75 - 0.87           | 2.55                  | 4470590                                  |                           |                                      |                            | 4482304      |
| 0.90                    | 0.85 - 0.97           | 2.65                  | 4470591                                  |                           |                                      |                            | 4482305      |
| 1.00                    | 0.95 - 1.15           | 10.5                  | 4470592                                  | 4470803                   |                                      |                            | 4482306      |
| 1.10                    | 1.07 - 1.25           | 10.5                  | 4470593                                  |                           |                                      |                            | 4482307      |
| 1.20                    | 1.17 - 1.35           | 10.5                  | 4470594                                  |                           |                                      |                            | 4482308      |
| 1.30                    | 1.27 - 1.45           | 10.5                  | 4470595                                  |                           |                                      |                            | 4482309      |
| 1.40                    | 1.37 - 1.55           | 10.5                  | 4470596                                  |                           |                                      |                            | 4482310      |
| 1.75                    | 1.50 - 1.90           | 16                    | 4470597                                  | 4470804                   | 4471234                              | 4471207                    | 4482311      |
| 2.00                    | 1.80 - 2.20           | 16                    | 4470598                                  |                           | 4471206                              |                            | 4482312      |
| 2.25                    | 2.05 - 2.45           | 16                    | 4470599                                  |                           | 4471812                              |                            | 4482313      |
| 2.50                    | 2.30 - 2.70           | 21                    | 4470600                                  | 4470805                   | 4471813                              | 4471819                    | 4482314      |
| 2.75                    | 2.55 - 2.95           | 21                    | 4470601                                  |                           | 4471814                              |                            | 4482315      |
| 3.00                    | 2.80 - 3.20           | 21                    | 4470602                                  |                           | 4471208                              |                            | 4482316      |
| 3.25                    | 3.05 - 3.45           | 21                    | 4470603                                  |                           | 4471815                              |                            | 4482317      |
| 3.50                    | 3.30 - 3.70           | 21                    | 4470604                                  |                           | 4471816                              |                            | 4482318      |
| 3.75                    | 3.55 - 3.95           | 21                    | 4470605                                  |                           | 4471817                              |                            | 4482319      |
| 4.00                    | 3.80 - 4.20           | 21                    | 4470606                                  |                           | 4471204                              |                            | 4482320      |
| 4.00                    | 3.70 - 4.30           | 38                    | 4470607                                  | 4470806                   | 4471607                              | 4471200                    | 4482320      |
| 4.50                    | 4.20 - 4.80           | 38                    | 4470608                                  |                           | 4471608                              |                            | 4482321      |
| 5.00                    | 4.70 - 5.30           | 38                    | 4470609                                  |                           | 4471609                              |                            | 4482322      |
| 5.50                    | 5.20 - 5.80           | 38                    | 4470610                                  |                           | 4471610                              |                            | 4482323      |
| 6.00                    | 5.70 - 6.30           | 38                    | 4470611                                  |                           | 4471611                              |                            | 4482324      |
| 6.50                    | 6.20 - 6.80           | 38                    | 4470612                                  |                           | 4471612                              |                            | 4482325      |
| 7.00                    | 6.70 - 7.30           | 38                    | 4470613                                  |                           | 4471613                              |                            | 4482326      |
| 7.50                    | 7.20 - 7.80           | 38                    | 4470615                                  |                           | 4471615                              |                            | 4482327      |
| 8.00                    | 7.70 - 8.30           | 38                    | 4470616                                  |                           | 4471616                              |                            | 4482328      |
| 8.50                    | 8.20 - 8.80           | 45                    | 4470617                                  |                           | 4471617                              |                            | 4482329      |
| 9.00                    | 8.70 - 9.30           | 45                    | 4470618                                  |                           | 4471618                              |                            | 4482330      |
| 9.50                    | 9.20 - 9.80           | 45                    | 4470619                                  |                           | 4471619                              |                            | 4482331      |
| 10.00                   | 9.70 - 10.30          | 45                    | 4470620                                  |                           | 4471620                              |                            | 4482332      |
| 10.00                   | 9.40 - 10.60          | 45                    | 4470621                                  | 4470808                   | 4471621                              | 4471202                    | 4482332      |
| 11.00                   | 10.40 - 11.60         | 45                    | 4470622                                  |                           | 4471622                              |                            | 4482333      |
| 12.00                   | 11.40 - 12.60         | 45                    | 4470623                                  |                           | 4471623                              |                            | 4482334      |
| 13.00                   | 12.40 - 13.60         | 45                    | 4470624                                  |                           | 4471624                              |                            | 4482335      |
| 14.00                   | 13.40 - 14.60         | 45                    | 4470625                                  |                           | 4471625                              |                            | 4482336      |
| 15.00                   | 14.40 - 15.60         | 45                    | 4470626                                  |                           | 4471626                              |                            | 4482337      |
| 16.00                   | 15.40 - 16.60         | 80                    | 4470627                                  |                           | 4471627                              |                            | 4482338      |
| 17.00                   | 16.40 - 17.60         | 80                    | 4470628                                  |                           | 4471628                              |                            | 4482339      |
| 18.00                   | 17.40 - 18.60         | 80                    | 4470629                                  |                           | 4471629                              |                            | 4482340      |



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

| Nominal dimension<br>mm | L<br>mm | H 1<br>mm |
|-------------------------|---------|-----------|
| 0.50                    | 19.50   | 0.25      |
| 0.55                    | 19.50   | 0.27      |
| 0.60                    | 19.50   | 0.29      |
| 0.70                    | 19.50   | 0.31      |
| 0.80                    | 19.50   | 0.33      |
| 0.90                    | 19.50   | 0.35      |
| 1.00                    | 19.50   | 0.60      |
| 1.75                    | 25.30   | 0.90      |
| 2.50                    | 30.60   | 1.20      |
| 4.00                    | 47.30   | 2.00      |
| 10.00                   | 48.50   | 3.30      |

Minimum measurement height



## Modular Unit System for 844 KS Blind Hole Measuring Probes

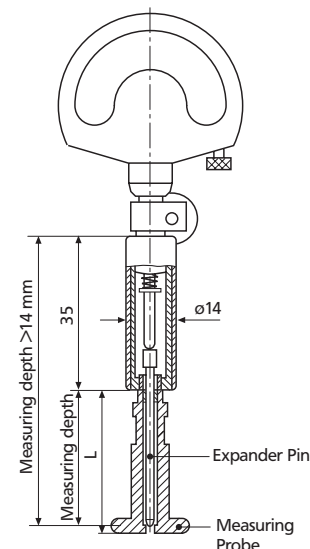
In addition to complete Dial Bore Gages 844 KS, modular units are available for assembly as required to suit a individual measuring task and or application.

### Blind Hole Measuring Probe 844 Kk, Blind Hole Expander Pin

| Nominal dimension<br>mm | Measuring range<br>mm | Measuring depth<br>mm | Blind hole measuring probe<br>hard chrome plated | Blind hole expander pin<br>steel |
|-------------------------|-----------------------|-----------------------|--------------------------------------------------|----------------------------------|
| 1.75                    | 1.50 - 1.90           | 16                    | 4482228                                          | 4482176                          |
| 2.00                    | 1.80 - 2.20           | 16                    | 4482229                                          |                                  |
| 2.25                    | 2.05 - 2.45           | 16                    | 4482230                                          |                                  |
| 2.50                    | 2.30 - 2.70           | 21                    | 4470301                                          |                                  |
| 2.75                    | 2.55 - 2.95           | 21                    | 4482227                                          | 4482177                          |
| 3.00                    | 2.80 - 3.20           | 21                    | 4482178                                          |                                  |
| 3.25                    | 3.05 - 3.45           | 21                    | 4482179                                          |                                  |
| 3.50                    | 3.30 - 3.70           | 21                    | 4470300                                          |                                  |
| 3.75                    | 3.55 - 3.95           | 21                    | 4482188                                          |                                  |
| 4.00                    | 3.80 - 4.20           | 21                    | 4482180                                          |                                  |
| 4.00                    | 3.70 - 4.30           | 38                    | 4482057                                          | 4482028                          |
| 4.50                    | 4.20 - 4.80           | 38                    | 4482162                                          |                                  |
| 5.00                    | 4.70 - 5.30           | 38                    | 4482056                                          |                                  |
| 5.50                    | 5.20 - 5.80           | 38                    | 4470953                                          |                                  |
| 6.00                    | 5.70 - 6.30           | 38                    | 4482140                                          |                                  |
| 6.50                    | 6.20 - 6.80           | 38                    | 4482055                                          |                                  |
| 7.00                    | 6.70 - 7.30           | 38                    | 4482108                                          |                                  |
| 7.50                    | 7.20 - 7.80           | 38                    | 4482204                                          | 4482192                          |
| 8.00                    | 7.70 - 8.30           | 38                    | 4482054                                          |                                  |
| 8.50                    | 8.20 - 8.80           | 45                    | 4482206                                          |                                  |
| 9.00                    | 8.70 - 9.30           | 45                    | 4482170                                          |                                  |
| 9.50                    | 9.20 - 9.80           | 45                    | 4482182                                          |                                  |
| 10.00                   | 9.70 - 10.30          | 45                    | 4470375                                          |                                  |
| 10.00                   | 9.40 - 10.60          | 45                    | 4482205                                          |                                  |
| 11.00                   | 10.40 - 11.60         | 45                    | 4482042                                          | 4482192                          |
| 12.00                   | 11.40 - 12.60         | 45                    | 4482112                                          |                                  |
| 13.00                   | 12.40 - 13.60         | 45                    | 4482102                                          |                                  |
| 14.00                   | 13.40 - 14.60         | 45                    | 4482181                                          |                                  |
| 15.00                   | 14.40 - 15.60         | 45                    | 4482202                                          |                                  |
| 16.00                   | 15.40 - 16.60         | 80                    | 4482021                                          |                                  |
| 17.00                   | 16.40 - 17.60         | 80                    | 4482203                                          |                                  |
| 18.00                   | 17.40 - 18.60         | 80                    | 4482113                                          |                                  |

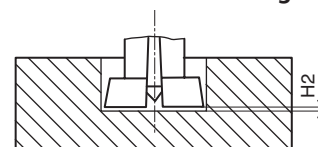


for further technical data (e.g. nominal dimensions up to 40 mm) see **WebCode 11070**



844 Kk

### Minimum measurement height



| Nominal dimension<br>mm | L<br>mm | H 2<br>mm |
|-------------------------|---------|-----------|
| 1.75 - 2.25             | 25.30   | 0.30      |
| 2.50 - 4.00             | 30.60   | 0.30      |
| 4.00 - 10.00            | 47.30   | 0.50      |
| 10.00 - 18.00           | 48.50   | 1.00      |

## Ring Gage Sets 844 Ke

For setting Dial Bore Gages 844 K, 844 KH and 844 KS. Supplied in sets to match the measuring ranges of these instruments. Can be stored in the wooden case of the bore gages.

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

Ring Gages 844 Ke are only available with the diameters shown in the table.

For all other dimensions, Ring Gages 355 E with dimensions as per DIN 2250 and with actual deviation engraved are available.

| For Meas. range<br>mm | Diameter<br>mm                             | Order no. |
|-----------------------|--------------------------------------------|-----------|
| 0.47 - 0.97           | 0.5/0.55/0.6/0.7/0.8/0.9                   | 4470160   |
| 0.95 - 1.55           | 1/1.1/1.2/1.3/1.4                          | 4470161   |
| 1.5 - 4.2             | 1.75/2/2.25/2.5/2.75/<br>3/3.25/3.5/3.75/4 | 4470162   |
| 3.7 - 7.3             | 4/4.5/5/5.5/6/6.5/7                        | 4470163   |
| 6.7 - 10.3            | 7/7.5/8/8.5/9/9.5/10                       | 4470164   |
| 9.4 - 18.6            | 10/11/12/13/14/15/<br>16/17/18             | 4470165   |

## Modular Unit System for 844 K

### Holder 844 Kg

With locking clamp for an indicating instrument and a connecting thread for a **Measuring Head 844 Kk**. Heat insulated handle

Order no. 4470851

### Extensions 844 Kv

For extra-deep bores. Screws in between Holder 844 Kg and Measuring Head 844 Kk for measuring range 10-18 mm. Length 64 mm,  $\varnothing$  8 mm,

Order no. 4470070

### Right Angle Attachment 844 Kw

For measuring bores which are difficult to reach, e.g. in tight spaces, on machine tools or when work piece bores are inconveniently located. For screwing in between Holder 844 Kg and Measuring Head 844 Kk

Order no. 4470110

### Lifter 954

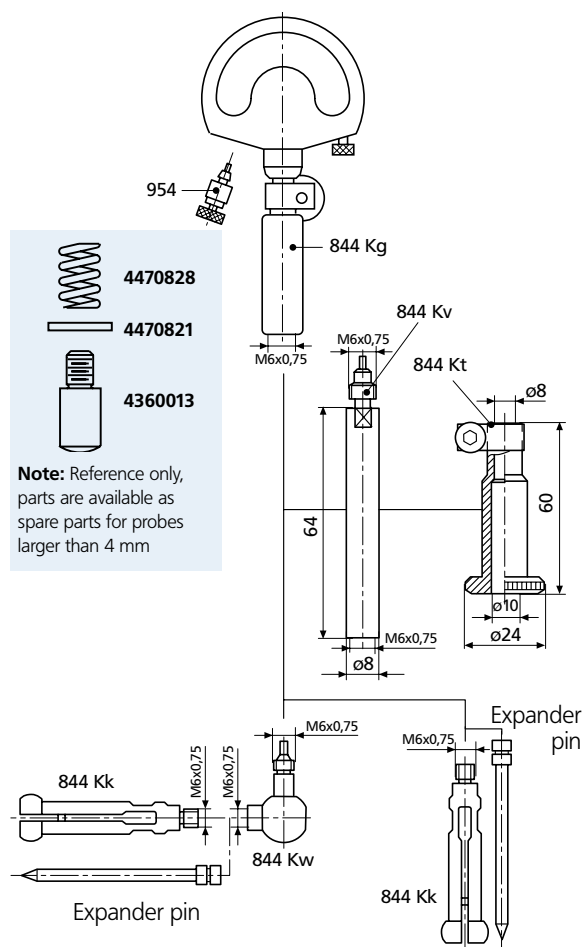
Facilitates insertion of measuring probe in bore by lifting measuring spindle of dial comparator.

Order no. 4372030

### Depth Stop 844 Kt

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

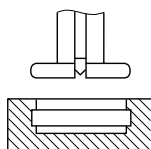
Order no. 4470115



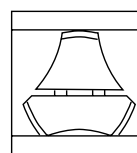
## Measuring Probes for Special Applications

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

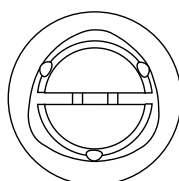
1. Measurement of the diameter of recesses



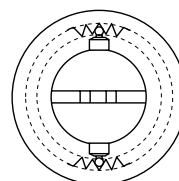
2. Measurement of plane-parallel surfaces



3. Measurement of polygon bores



4. Measurement of inside serrations, see 844 Z Page 9-72



## Accessories

### Stand 844 Kst



### Floating Holder 844 Ksts Features



### Features

For quick checks of bores in small work pieces. Hardened table plate can be raised with lever, thus moving test piece into position. Plate can be clamped at any height for checking eccentricity. Particularly suited to use with digital indicators, where appropriate in conjunction with data printers or computer equipment, in cases where the determination of the reversal point is inappropriate.

|                        |            |
|------------------------|------------|
| Table dia.             | 58 mm      |
| Throat depth of arm    | 45 mm      |
| Table stroke           | 30 mm      |
| Max. work piece height | ca. 100 mm |

**Order no. 4470100**

### Features

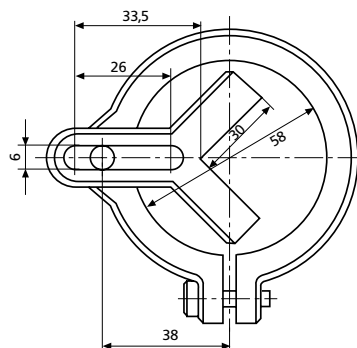
For use in conjunction with Stand 844 Kst. Enables measuring probe to find common axis of bore and measuring instrument quickly and easily on insertion into hole, thus providing optimum measuring speed and high accuracy. Particularly suitable for small diameters, as measuring confidence is considerably enhanced.

**Order no. 4470105**

### Angle Stop 844 Ka

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

**Order no. 4470120**



## Adjustable Bore Gages 1280 P

Superior Accuracy for Production and Inspection.



1280P Shown wireless Digital Indicators and 1280P-1W1

### Features

- Rugged construction for long life and low maintenance: Stainless steel gaging head, one piece centralizing yoke with replaceable tungsten carbide balls.
- Heavy duty housing protects Indicator.
- Flow-through design makes Series 1280P Bore Gages swish clean, no disassembly required.
- Outstanding stability: Holds mastered value.
- Bore gages may be furnished with various Dial or Digital Indicators.
- Digital bore gages are available with standard or advanced indicators.
  - Standard models 1075 R and 1086 R provide live reading with data output.
  - Advanced models, Maxum III and 1087 R, provide dynamic memory that hold the reading of a diameter measured in a single sweep.
  - Wireless data collection with 1086 Ri, 1087 Ri provides more flexibility of movement during the measurement and increased portability by bringing the gage to the part.

### Technical Data

#### With Dial Indicator

Range of Sensitive Contact: 0.63 mm / **.025"**,  
0.002 mm / **.0001"** grad.

#### With Maxum®/III Indicators

Range of Sensitive Contact: 0.39 mm / **.020"**  
Resolution: 0.001 mm / **.00005"** resolution,  
0.001 mm / **.001"** grad.

If gage capacity is 25 mm / 1" or greater, the Maxum®/III Indicator is covered with a cast aluminum protective housing.

If under 25 mm / 1" capacity, the protective housing is not normally furnished.

| With Dial Indicator | With Maxum®/III Digital Indicators | Capacity<br>mm/ <i>inch</i> | Gaging Depth<br>mm/ <i>inch</i> | End of Head to Contact<br>mm/ <i>inch</i> |
|---------------------|------------------------------------|-----------------------------|---------------------------------|-------------------------------------------|
| 1280P-1W1           | 1282P-1W1                          | 12 - 25 / <b>.50 - 1"</b>   | 76 / <b>3"</b>                  | 2.77 / <b>.11"</b>                        |
| 1280P-2W2           | 1282P-2W2                          | 25 - 50 / <b>1 - 2"</b>     | 152 / <b>6"</b>                 | 4.37 / <b>.17"</b>                        |
| 1280P-3W2           | 1282P-3W2                          | 50 - 203 / <b>2 - 8"</b>    | 152 / <b>6"</b>                 | 7.92 / <b>.31"</b>                        |
| 1280P-1W2           | 1282P-1W2                          | 12 - 25 / <b>.50 - 1"</b>   | 152 / <b>6"</b>                 | 2.77 / <b>.11"</b>                        |
| 1280P-2W3           | 1282P-2W3                          | 25 - 50 / <b>1 - 2"</b>     | 305 / <b>12"</b>                | 4.37 / <b>.17"</b>                        |
| 1280P-3W3           | 1282P-3W3                          | 50 - 203 / <b>2 - 8"</b>    | 305 / <b>12"</b>                | 7.92 / <b>.31"</b>                        |

See matrix on next page.

Note: Model numbers do not include extensions.

**Series 1280P** Adjustable Bore Gages are normally furnished with adjusting wrenches. Reference contacts for particular measurement sizes must be specified separately (see table on following page). If not specified, T.C. contacts will be furnished. For alternate gaging depths, contact materials, and other modifications are available.

Example: **1282P-3MW3** with **PT-156** and **EX-224** specifies an Adjustable Bore Gage with tungsten carbide reference contact and an extension to cover the range from 75 mm / 3" to 89 mm / 3.5".

The Gage is furnished with a Metric Maxum/III Indicator, **2033119** (which has selectable resolution, units and includes Digital Output).

## Adjustable Bore Gages 1280 P

### Ordering Information

To order the correct bore gage to suit your measurement application, start with the base Model Number: **128XP-XXXX** and substitute the X with the appropriate number or letter from the boxes below:

**128 X P - X X X X**

#### Indicator

- 0** – Dial Indicator
- 2** – Maxµm®III with Output

#### Capacity

- 1** – 12.50 - 25 mm / **.50 - 1"** gaging depth to 305 mm / **12"**
- 2** – 25 - 50 mm / **1 - 2"** gaging depth to 610 mm / **24"**
- 3** – 50 - 200 mm / **2 - 8"** gaging depth to 1220 mm / **48"**

#### Units

- Omit for Inch
- M** – Metric

#### Configuration

- W** – Gage only
- S** – Complete kit with steel contacts\*
- T** – Complete kit with T.C. contacts\*

*\* Each kit is complete with components needed for capacity ranging from 12.70 - 203 mm / .50 - 8". A fitted case is furnished for all models with a gaging depth 150 mm / 6" or under. It contains a Dial or MaxµmIII Indicator with each tube assembly and all contacts, extensions, extenders, locknuts and necessary wrenches.*

#### Gaging Depth

- 1** – 76 mm / **3"**
- 2** – 150 mm / **6"**
- 3** – 300 mm / **12"**
- 4** – 450 mm / **18"**
- 5** – 600 mm / **24"**
- 6** – 760 mm / **30"**
- 7** – 910 mm / **36"**
- 8** – 1220 mm / **48"**

**Example:** If you chose **1282P-3S5** as your model number, you would have chosen an Inside Diameter gage with MaxµmIII Indicator, 50 - 200 mm / 2 - 8" capacity, inch units, having a complete kit with steel contacts and a gaging depth of 600 mm / 24". Metric equivalent Model would be: **1282P-3MS5**.

## Handles / Housing

All 1280P gages have a removable handle as a part of the Indicator Housing.

All 1282P gages can be equipped with a handle which projects at 90° to the gage housing.

1282P gages with capacity 12-25 mm / .50-1" are not normally furnished with a protective housing. Handles and Housings may be ordered separately.

For Handles order **HA-88** with **AT-124** Adaptor. For Housings order **EHG-1198**.

## Gaging Extensions

Specify the Reference Contact Gaging Extensions required from the table below. For all diameters below 50 mm / 2" the Reference Contact is integral with each Extension. For diameters over 50 mm / 2" the Reference Contact is separate and interchangeable among Extension Sets.



**1282P-1W1**  
(Output Cable not included)

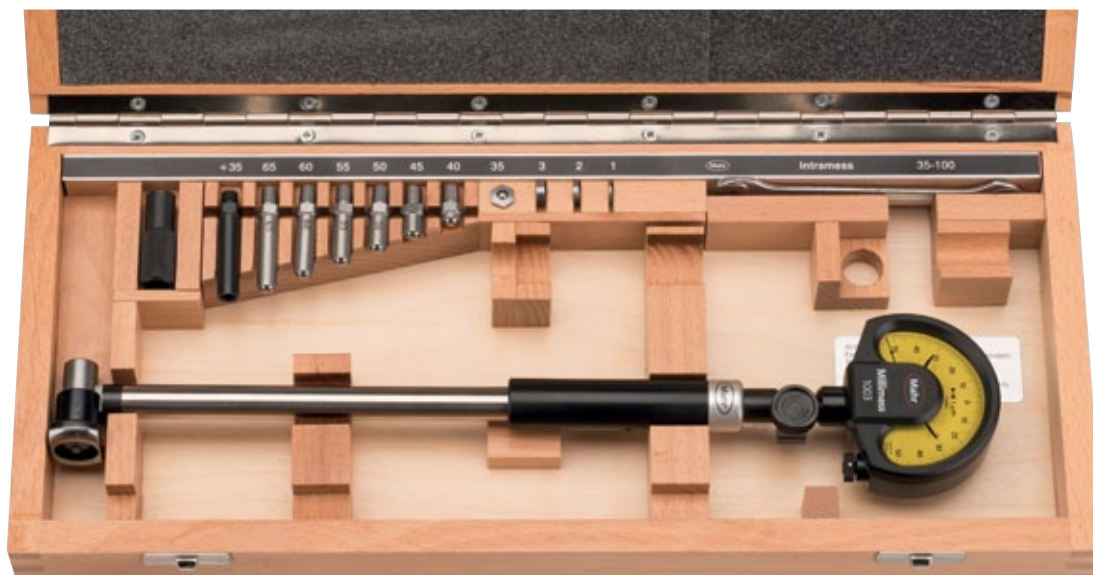
## Technical Data

| Diameter to be measured<br>mm/ <i>inch</i> | Extension Required |               | Used on Gage Model Numbers |
|--------------------------------------------|--------------------|---------------|----------------------------|
|                                            | Carbide            | Steel         |                            |
| 12 - 16 / <b>.50 - .625"</b>               | <b>PT-562</b>      | <b>PT-558</b> | 1280P-1xxx                 |
| 16 - 19 / <b>.625 - .75"</b>               | <b>PT-567</b>      | <b>PT-559</b> |                            |
| 19 - 22 / <b>.75 - .875"</b>               | <b>PT-568</b>      | <b>PT-560</b> | 1282P-1xxx                 |
| 22 - 25 / <b>.875 - 1"</b>                 | <b>PT-557</b>      | <b>PT-561</b> |                            |
| 25 - 32 / <b>1 - 1.25"</b>                 | <b>PT-554</b>      | <b>PT-555</b> | 1280P-2xxx                 |
| 32 - 38 / <b>1.25 - 1.50"</b>              | <b>PT-553</b>      | <b>PT-556</b> |                            |
| 38 - 45 / <b>1.50 - 1.75"</b>              | <b>PT-552</b>      | <b>PT-569</b> | 1282P-2xxx                 |
| 45 - 50 / <b>1.75 - 2"</b>                 | <b>PT-550</b>      | <b>PT-551</b> |                            |

For the gaging diameters listed below, select one Contact Point and at least one Extension Set.

| Contact Point:  |                                            | Extension Required        | Used on Gage Models |
|-----------------|--------------------------------------------|---------------------------|---------------------|
|                 | Carbide                                    | PT-156                    | 1280P-3XXX          |
|                 | Steel                                      | PT-2224                   | 1282P-3XXX          |
| Extension Sets: | Diameter to be Measured<br>mm/ <i>inch</i> | Extension Sets            | Used on Gage Models |
|                 | 50 - 64 / <b>2 - 2.5"</b>                  | <b>EX-222</b>             |                     |
|                 | 64 - 76 / <b>2.5 - 3"</b>                  | <b>EX-223</b>             |                     |
|                 | 76 - 89 / <b>3 - 3.5"</b>                  | <b>EX-224</b>             | 1280P-3XXX          |
|                 | 89 - 100 / <b>3.5 - 4"</b>                 | <b>EX-225</b>             |                     |
|                 | 100 - 127 / <b>4 - 5"</b>                  | <b>EX-223 with EX-226</b> | 1282P-3XXX          |
|                 | 127 - 152 / <b>5 - 6"</b>                  | <b>EX-225 with EX-226</b> |                     |
|                 | 152 - 178 / <b>6 - 7"</b>                  | <b>EX-223 with EX-228</b> |                     |
|                 | 178 - 200 / <b>7 - 8"</b>                  | <b>EX-225 with EX-228</b> |                     |

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



### Features

- Measuring the diameter, roundness and conical form of a bore as well as the distances of plane-parallel surfaces
- Measuring head consists of a carbide-tipped moving anvil and an interchangeable stationary anvil which has a hardened steel ball; alternatively a carbide ball is available
- Transmission lever system transfers movement of the movable anvil to indicating instrument
- The broad centering bridge ensures automatic centering in the bore
- Insensitive to temperature due to both the shank and transfer rod being made from heat resistant **Invar steel**
- Highly resistant to wear and tear due to the carbide tipped moving anvil
- Constant measuring force due to built-in spring thus eliminating user influence
- Universally applicable and extremely versatile as every instrument spans a broad measuring range, within this range it is quick and easy to adjust to any size
- Measuring head, holder, extensions, right-angle attachments and depth stops are all part of this extensive modular system
- Supplied with: Holder, measuring head, stationary anvil, wooden case, excludes an indicating instrument

57B-15M

57B-15

0 - 25 / 0 - 1"

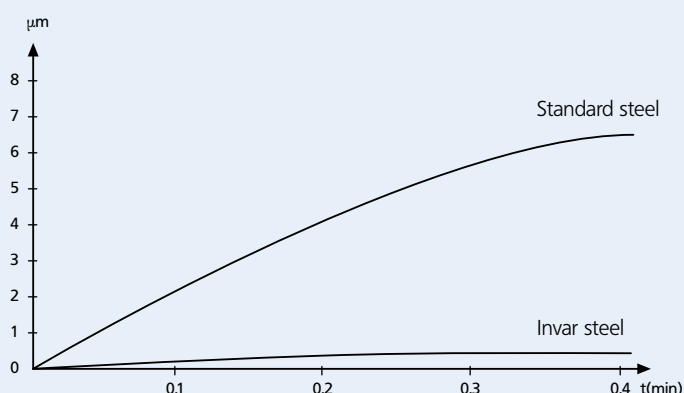
Dial Indicator readout with 25 mm / 1" sensitive range

### The comparison between Invar and Standard steel

**Invar steel** has a particularly low expansion coefficient and thus makes the instrument totally insensitive to any kind of heat. Body heat from the user, increases in ambient temperature have no influence on the measuring results.

The graph on the right compares the Invar steel version to a standard type. Both gages were hand-held and thus influenced by body heat. The deviation when using Invar steel is negligible.

Change in length due to heat



## Technical Data

| Measuring range |            | Error limit            | Repeatability          | Hysteresis             | Order no* | Order no* |
|-----------------|------------|------------------------|------------------------|------------------------|-----------|-----------|
| mm              | (inch)     | $G_e$<br>$\mu\text{m}$ | $f_w$<br>$\mu\text{m}$ | $f_u$<br>$\mu\text{m}$ | 844 N     | 844 NH    |
| 18 - 50         | (.7 - 2")  | 2                      | 0.5                    | 2.5                    | 4474000   | 4475000   |
| 35 - 100        | (1.4 - 4") | 2                      | 0.5                    | 2.5                    | 4474001   | 4475001   |
| 100 - 250       | (4 - 10")  | 2                      | 0.5                    | 2.5                    | 4474002   | 4475002   |
| 250 - 400       | (10 - 16") | 3                      | 1.5                    | 3.5                    | 4474003   | 4475003   |
| 400 - 800       | (16 - 32") | 3                      | 1.5                    | 3.5                    | 4474004   | 4475004   |
| 250 - 800       | (10 - 32") | 3                      | 1.5                    | 3.5                    | 4474005   | 4475005   |

\* Excludes indicating instrument

## Complete Instrument

**844 N** Carbide-tipped moving anvil; stationary anvil with steel ball

**844 NH** Moving anvil **and** stationary anvil are carbide-tipped

| Measuring range      | a    | b  | c   | d   | e  |
|----------------------|------|----|-----|-----|----|
| mm (inch)            |      |    |     |     |    |
| 18 - 50 (.7 - 2")    | 5.35 | 8  | 115 | 63  | 22 |
| 35 - 100 (1.4 - 4")  | 8.5  | 12 | 148 | 80  | 22 |
| 100 - 250 (4 - 10")  | 11.5 | 18 | 230 | 100 | 25 |
| 250 - 400 (10 - 16") | 16   | 24 | 366 | 110 | 28 |
| 400 - 800 (16 - 32") | 17.5 | 24 | 366 | 110 | 28 |

## Indicating Instruments

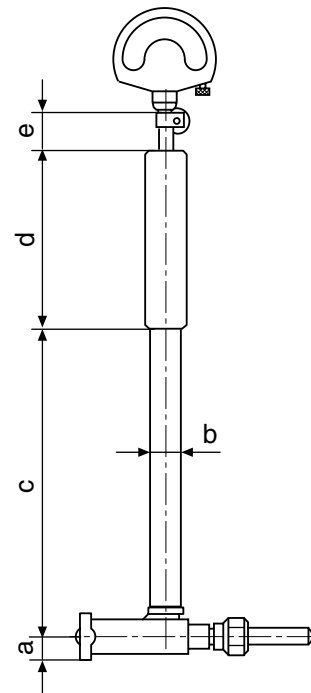
All indicating instruments that has a 8 mm mounting shank may be used. Recommended are:

| Indicator                     |             | Readings<br>mm / inch                                                                | Order no.<br>mm / inch |
|-------------------------------|-------------|--------------------------------------------------------------------------------------|------------------------|
| Millimess                     | 1004/1004 Z | 5 $\mu\text{m}$ /.0001"                                                              | 4333000/4333900        |
| Millimess                     | 1003/1003 Z | 1 $\mu\text{m}$ /.00005"                                                             | 4334000/4334900        |
| Millimess                     | 1003 XL     | 2 $\mu\text{m}$                                                                      | 4334001                |
| Millimess                     | 1002/1002 Z | 0,5 $\mu\text{m}$ /.00002"                                                           | 4335000/4335900        |
| Extrameass                    | 2001        | 0,2 $\mu\text{m}$ /.00001"<br>0,5 $\mu\text{m}$ /.00002"<br>1 $\mu\text{m}$ /.00005" | 4346100*               |
| $\mu\text{Max}\mu\text{m II}$ |             | 0,0005 mm /.00002"<br>0,001 mm /.00005"<br>0,002 mm /.0001"                          | 2034205**              |
| MarCator                      | 1087 BR     | 0,004 mm /.0005"<br>0,010 mm /.001"<br>0,001 mm /.00005"<br>0,002 mm /.0001"         | 4337662                |
| MarCator                      | 1087 BRi    | 0,004 mm /.0005"<br>0,010 mm /.001"                                                  | 4337664                |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

\* 230 V, for 115 V please refer to page 6-5 \*\* requires contact 4360043



2001



1003

## Modular Unit System 844 N

In addition to complete Dial Bore Gages 844 N, modular units can also be compiled as required to suit a individual measuring task and or application.

### Measuring Head 844 Nk, steel

### Measuring Head 844 NHk, carbide

With built-in lever transmission system, carbide-tipped anvil and extra-wide centering bridge. With interchangeable stationary anvil. Threaded connection for Holders 844 Ng and 844 Ngk.

| Measuring range<br>mm (inch) | Order no.<br>844 Nk | Order no.<br>844 NHk |
|------------------------------|---------------------|----------------------|
| 18 - 50 (.7 - 2")            | 4474151             | 4474156              |
| 35 - 100 (1.37 - 4")         | 4474152             | 4474157              |
| 100 - 250 (4 - 10")          | 4474153             | 4474158              |
| 250 - 400 (10 - 16")         | 4474154             | 4474159              |
| 400 - 800 (16 - 32")         | 4474155             | 4474160              |

### Extension Set 844 Nes

For extending range of Measuring Head 844 Nk/NHk from 250-400 mm to 800 mm. Consists of additional centering bridge and two extensions.

Order no.: 4474010

## Technical Data

| Order                                                                                          |                  | Inch             |                    | Capacity         |
|------------------------------------------------------------------------------------------------|------------------|------------------|--------------------|------------------|
| Holder                                                                                         | Metric           |                  |                    | mm / <i>inch</i> |
| 844 Ng                                                                                         | mm               |                  |                    |                  |
|                                                                                                | 57B-14M          | 57B-14           | 0 - 2.5 / 0 - .10" |                  |
| Shank and transfer rod made of heat-resistant Invar steel. With a locking clamp for indicator. |                  |                  |                    |                  |
| For meas. range                                                                                | L                | d1               | d2                 | Order no.        |
| mm ( <i>inch</i> )                                                                             | mm/ <i>inch</i>  | mm/ <i>inch</i>  | mm/ <i>inch</i>    |                  |
| 18 - 50 ( <i>.7 - 2"</i> )                                                                     | 200 / <i>8"</i>  | 14 / <i>.6"</i>  | 8 / <i>.3"</i>     | 4474040          |
| 35 - 100 ( <i>1.37 - 4"</i> )                                                                  | 250 / <i>10"</i> | 18 / <i>.7"</i>  | 12 / <i>.5"</i>    | 4474041          |
| 100 - 250 ( <i>4 - 10"</i> )                                                                   | 350 / <i>14"</i> | 26 / <i>1.0"</i> | 18 / <i>.7"</i>    | 4474042          |
| 250 - 800 ( <i>10 - 32"</i> )                                                                  | 500 / <i>20"</i> | 30 / <i>1.2"</i> | 24 / <i>.9"</i>    | 4474043          |

Contact Mahr Federal.

\* Integrated wireless

### Short Holder 844 Ngk

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

| For meas. range      | L         | d1        | d2       | Order no. |
|----------------------|-----------|-----------|----------|-----------|
| mm (inch)            | mm/inch   | mm/inch   | mm/inch  |           |
| 18 - 50 (.7 - 2")    | 120 / 5"  | 14 / .6"  | 8 / .3"  | 4474050   |
| 35 - 100 (1.37 - 4") | 120 / 5"  | 18 / .7"  | 12 / .5" | 4474051   |
| 100 - 250 (4 - 10")  | 150 / 6"  | 26 / 1.0" | 18 / .7" | 4474052   |
| 250 - 800 (10 - 32") | 250 / 10" | 30 / 1.2" | 24 / .9" | 4474053   |

## Right Angle Attachment 844 Nw Features

For measuring difficult to reach bores, e.g. in tight spaces, inconveniently located or on machine tools. For screwing in between 844 Ng or 844 Ngk and 844 Nk/NHk.

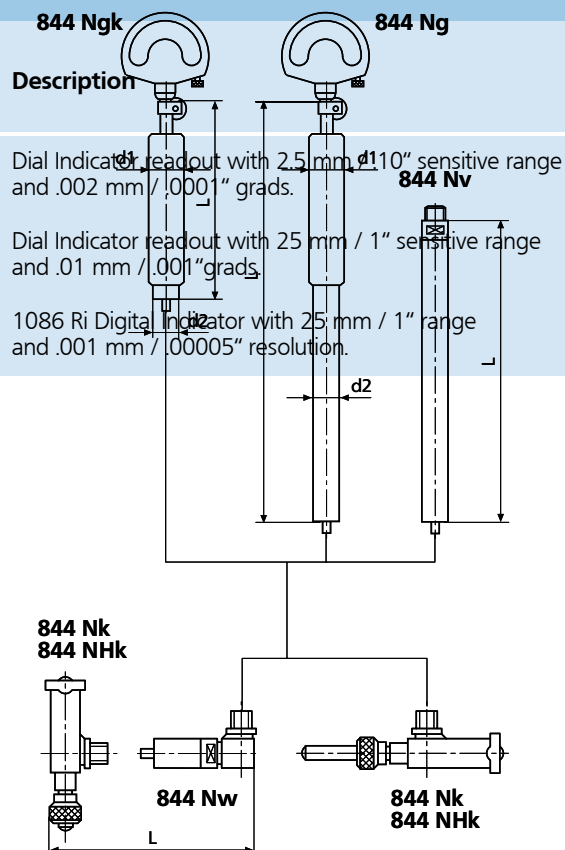
| For meas. ranges     | Length*    | Bore depth | Order no. |
|----------------------|------------|------------|-----------|
| mm (inch)            | L mm/inch  | mm/inch    |           |
| 18 - 50 (.7 - 2")    | 66 / 2.6"  | 45 / 1.8"  | 4474070   |
| 35 - 100 (1.37 - 4") | 80 / 3.1"  | 55 / 2.2"  | 4474071   |
| 100 - 250 (4 - 10")  | 105 / 4.1" | 70 / 2.8"  | 4474072   |

\* With measuring heads 844 Nk/NHk

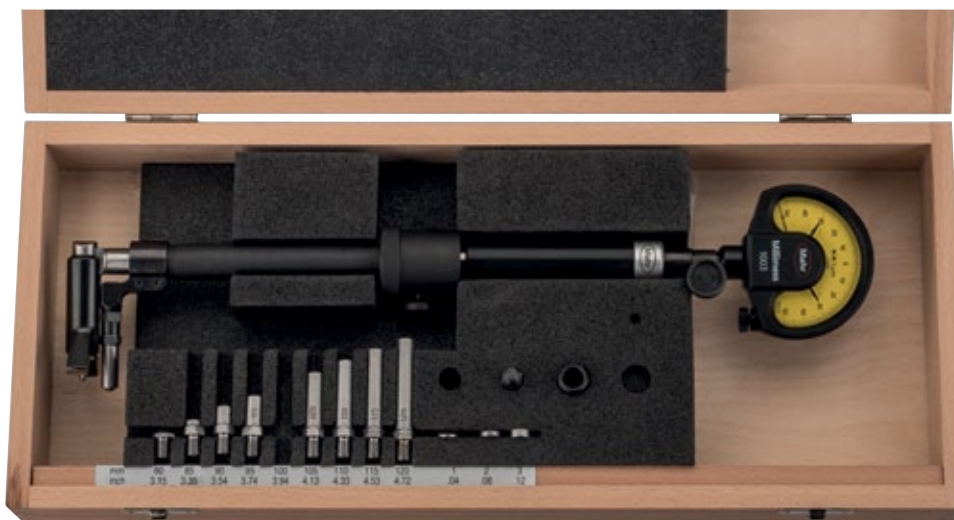
### Extension 844 Nv

For extra deep bores. For screwing in between 844 Ng and 844 Nk/NHk. Shank and transfer rod made of Invar steel.

| For instruments      | Length      | Order no. |
|----------------------|-------------|-----------|
| mm (inch)            | L (mm/inch) |           |
| 18 - 50 (.7 - 2")    | 250 / 9.8"  | 4474066   |
| 35 - 100 (1.37 - 4") | 250 / 9.8"  | 4474060   |
| 100 - 250 (4 - 10")  | 250 / 9.8"  | 4474061   |
|                      | 500 / 19.7" | 4474062   |
| 250 - 800 (10 - 32") | 250 / 9.8"  | 4474063   |
|                      | 500 / 19.7" | 4474064   |

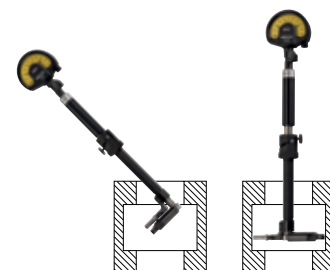


## Self-Centering Dial Bore Gages 844 NR



### Applications

- Ideal for measuring difficult to reach bore diameters, grooves and recesses.



### Features

- Measuring head consists of a carbide-tipped moving anvil and an interchangeable stationary anvil with a carbide ball
- Transmission lever system transfers movement of the movable anvil to indicating instrument
- The broad centering bridge ensures automatic centering in the bore
- Insensitive to temperature due to both the shank and transfer rod being made from heat resistant **Invar steel** (for further information see page 9-66)
- Highly resistant to wear and tear due to the carbide tipped moving anvil
- Constant measuring force due to built-in spring thus eliminating user influence
- Universally applicable and extremely versatile as every instrument spans a broad measuring range, within this range it is quick and easy to adjust to any size
- Supplied with: Measuring holder, measuring head, anvil spindle, wooden case, excludes indicator

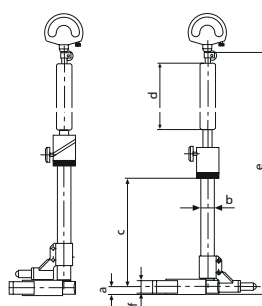
### Technical Data

| Measuring range |                | Error limit            | Repeatability          | Hysteresis             | Order no* |
|-----------------|----------------|------------------------|------------------------|------------------------|-----------|
| mm              | (inch)         | $G_e$<br>$\mu\text{m}$ | $f_w$<br>$\mu\text{m}$ | $f_u$<br>$\mu\text{m}$ |           |
| 50 - 70         | (2 - 2.8")     | 2                      | 1                      | 2.5                    | 4474580   |
| 60 - 100        | (2.4 - 4")     | 2                      | 1                      | 2.5                    | 4474590   |
| 80 - 150        | (3.2 - 6")     | 2                      | 1                      | 2.5                    | 4474600   |
| 120 - 220       | (4.7 - 8.7)    | 3                      | 1.5                    | 3.5                    | 4474610   |
| 180 - 360       | (7.1 - 14.2")  | 3                      | 1.5                    | 3.5                    | 4474620   |
| 290 - 530       | (11.4 - 20.7") | 3                      | 1.5                    | 3.5                    | 4474630   |

\* Excludes indicating instrument

### Dimensions

| Measuring range          | a   | b  | c   | d  | e   | f  |
|--------------------------|-----|----|-----|----|-----|----|
| mm (inch)                |     |    |     |    |     |    |
| 50 - 70 (2 - 2.8")       | 5   | 12 | 60  | 60 | 203 | 6  |
| 60 - 100 (2.4 - 4")      | 7   | 15 | 110 | 80 | 264 | 8  |
| 80 - 150 (3.2 - 6")      | 7   | 15 | 110 | 80 | 264 | 8  |
| 120 - 220 (4.7 - 8.7)    | 7.5 | 15 | 110 | 80 | 264 | 10 |
| 180 - 360 (7.1 - 14.2")  | 11  | 23 | 150 | 90 | 343 | 10 |
| 290 - 530 (11.4 - 20.7") | 15  | 30 | 170 | 90 | 409 | 10 |



### Indicating Instruments

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

Recommendations see page 9-67

Digital Indicators see Chapter 5  
Electrical Indicating Instruments see Chapter 7

## Self-Centering Dial Bore Gages 844 NB



### Applications

- Ideal for measuring blind holes. Can be measured almost to the base of a bore

### Features

- Measuring head consists of a carbide-tipped moving anvil and an interchangeable stationary anvil with a carbide ball
- Transmission lever system transfers movement of the movable anvil to indicating instrument
- The broad centering bridge ensures automatic centering in the bore
- Insensitive to temperature due to both the shank and transfer rod being made from heat resistant **Invar steel** (for further information see page 9-66)
- Highly resistant to wear and tear due to the carbide tipped moving anvil
- Constant measuring force due to built-in spring thus eliminating user influence
- Universally applicable and extremely versatile as every instrument spans a broad measuring range, within this range it is quick and easy to adjust to any size
- Supplied with: Measuring holder, measuring head, anvil spindle, wooden case, excludes indicator

### Technical Data

| Measuring range |                 | Error limit      | Repeatability    | Hysteresis       | Order no* |
|-----------------|-----------------|------------------|------------------|------------------|-----------|
| mm              | (inch)          | $G_e$<br>$\mu m$ | $f_w$<br>$\mu m$ | $f_u$<br>$\mu m$ |           |
| 20 - 50         | (0.79 - 2")     | 4                | 1                | 2.5              | 4474179   |
| 50 - 110        | (2 - 4.33")     | 2.5              | 1                | 2.5              | 4474180   |
| 110 - 300       | (4.33 - 11.81") | 2.5              | 1                | 3                | 4474186   |

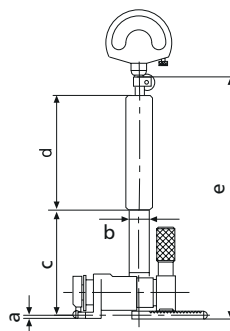
\* Excludes indicating instrument

Alternate Indicators and contact points available upon request.  
Contact Mahr Federal.

\* Integrated wireless

### Dimensions

| Measuring range           | a   | b  | c  | d  | e   |
|---------------------------|-----|----|----|----|-----|
| mm (inch)                 |     |    |    |    |     |
| 20 - 50 (0.79 - 2")       | 1.5 | 10 | 77 | 60 | 163 |
| 50 - 110 (2 - 4.33")      | 1.5 | 12 | 60 | 60 | 144 |
| 110 - 300 (4.33 - 11.81") | 2   | 18 | 90 | 90 | 163 |



### Indicating Instruments

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

Recommendations see page 9-67

Digital Indicators see Chapter 5  
Electrical Indicating Instruments see Chapter 7

## Accessories to set and adjust Dial Bore Gages

### 1. Setting Device

Uses standard gage blocks for setting any bore diameter and any tolerance. Replaces ring gages and is universally applicable.

### 2. Ring Gage 355 E

Special wear-resistant gage steel. Hardened and lapped.  
With actual deviation engraved

Dimensions: DIN 2250, type C  
Manufacturing tolerance: DIN 2250  
Available diameters: see page 13-19



355 E

### Components

#### Measuring Jaw 844 em

| Measuring range<br>mm | Dimensions<br>(inch) | Dimensions<br>mm/inch            | Order no. |
|-----------------------|----------------------|----------------------------------|-----------|
| 18 - 800              | (.7 - 32")           | 60 x 9.5 x 9 / 2.36 x .37 x .35" | 4470095   |

#### Setting Bridge 844 Neb

| Measuring range<br>mm | Width<br>(inch) | Width<br>mm/inch | Height<br>mm/inch | Order no. |
|-----------------------|-----------------|------------------|-------------------|-----------|
| 18 - 250              | (.7 - 10")      | 70 / 2.75"       | 12 / .47"         | 4474080   |
| 18 - 400              | (.7 - 16")      | 165 / 6.49"      | 17 / .67"         | 4474081   |
| 18 - 800              | (.7 - 32")      | 320 / 12.59"     | 20 / .78"         | 4474082   |

#### Gage Block Holder 420 h

| Clamping range<br>mm | Clamping range<br>(inch) | Order no. |
|----------------------|--------------------------|-----------|
| 0 - 70               | (0 - 2.75")              | 4800120   |
| 0 - 120              | (0 - 4.72")              | 4800121   |
| 100 - 220            | (4 - 8.66")              | 4800122   |
| 100 - 420            | (4 - 16.53")             | 4800123   |
| 400 - 820            | (16 - 32.28")            | 4800124   |

#### Stand 844 ef

For mounting setting device up to 420 mm

Order no. 4470098



## Dial Bore Gage for Internal Serrations 844 Z



### Dial Bore Gage 844 Z

Diametrical two ball measurement "Mdk" from **3.5 - 333 mm**

### Modular Unit Parts 844 Kk

"Mdk" from **3.5 - 26.1 mm**  
(see table below)

### Modular Unit Parts 844 Z

"Mdk" **26 - 333 mm** (see table on opposite page)

## Features

- For diametrical two ball measurement Mdk, to obtain the pitch diameter and conical form of internal gears in any position and at any depth
- For ball dimensions from 3.5 to 26.1 mm use the 844 Kk with carbide ball anvils and in conjunction with an expander pin
- For ball dimensions >26 mm the measuring heads 844 z1 or 844 z2 with the appropriate modular units are to be employed
- Maximum wear resistance due to carbide ball anvils
- Constant measuring force due to built-in spring thus eliminating user influence
- Anvils, measuring heads, holder, spacer (intermediate piece) and depth extensions form a very comprehensive modular system which can rapidly be converted to measure further gear sizes

## Modular Unit Parts:

Diametrical two ball measurement „M<sub>dk</sub>“ from **3.5 - 26.1 mm**

| Ball dimension<br>M <sub>dk</sub> (mm) | Order no.<br>ball dia. 1-5<br>graduation 0.5 | Ball dia.<br>according<br>to table | Order no.<br>ball dia. 7.5-10<br>graduation 0.5 | Expander<br>pin<br>Steel |
|----------------------------------------|----------------------------------------------|------------------------------------|-------------------------------------------------|--------------------------|
| 3.5 - 4.1                              | 4482450                                      | 4482550                            | 4470806                                         |                          |
| 4.0 - 4.6                              | 4482451                                      | 4482551                            |                                                 |                          |
| 4.5 - 5.1                              | 4482452                                      | 4482552                            |                                                 |                          |
| 5.0 - 5.6                              | 4482453                                      | 4482553                            |                                                 |                          |
| 5.5 - 6.1                              | 4482454                                      | 4482554                            |                                                 |                          |
| 6.0 - 6.6                              | 4482455                                      | 4482555                            |                                                 |                          |
| 6.5 - 7.1                              | 4482456                                      | 4482556                            |                                                 |                          |
| 7.0 - 7.6                              | 4482457                                      | 4482557                            |                                                 |                          |
| 7.5 - 8.1                              | 4482458                                      | 4482558                            |                                                 |                          |
| 8.0 - 8.6                              | 4482459                                      | 4482559                            |                                                 |                          |
| 8.5 - 9.1                              | 4482460                                      | 4482560                            | 4470808                                         |                          |
| 9.0 - 9.6                              | 4482461                                      | 4482561                            |                                                 |                          |
| 9.3 - 10.6                             | 4482462                                      | 4482562                            |                                                 |                          |
| 10.3 - 11.6                            | 4482463                                      | 4482563                            |                                                 |                          |
| 11.3 - 12.6                            | 4482464                                      | 4482564                            |                                                 |                          |
| 12.3 - 13.6                            | 4482465                                      | 4482565                            |                                                 |                          |
| 13.3 - 14.6                            | 4482466                                      | 4482566                            |                                                 |                          |
| 14.5 - 16.1                            | 4482467                                      | 4482567                            |                                                 |                          |
| 15.5 - 17.1                            | 4482468                                      | 4482568                            |                                                 |                          |
| 16.5 - 18.1                            | 4482469                                      | 4482569                            |                                                 |                          |
| 17.5 - 19.1                            | 4482470                                      | 4482570                            |                                                 |                          |
| 18.5 - 20.1                            | 4482471                                      | 4482571                            |                                                 |                          |
| 19.5 - 21.1                            | 4482472                                      | 4482572                            |                                                 |                          |
| 20.5 - 22.1                            | 4482473                                      | 4482573                            |                                                 |                          |
| 21.5 - 23.1                            | 4482474                                      | 4482574                            |                                                 |                          |
| 22.5 - 24.1                            | 4482475                                      | 4482575                            |                                                 |                          |
| 23.5 - 25.1                            | 4482476                                      | 4482576                            |                                                 |                          |
| 24.5 - 26.1                            | 4482477                                      | 4482577                            |                                                 |                          |

**Table** (Sizes in mm)

0.500 - 0.551 - 0.620 - 0.623 - 0.630 - 0.722 - 0.862 - 0.895 - 0.965 - 1.100 - 1.118 - 1.125 - 1.250  
 1.350 - 1.372 - 1.385 - 1.524 - 1.540 - 1.600 - 1.650 - 1.700 - 1.750 - 1.782 - 1.800 - 1.829 - 1.900  
 2.032 - 2.250 - 2.284 - 2.386 - 2.438 - 2.667 - 2.704 - 2.713 - 2.721 - 2.743 - 2.750 - 3.048 - 3.250  
 3.400 - 3.658 - 4.835 - 5.250 - 5.486 - 5.500 - 6.000 - 6.096 - 6.350 - 6.500 - 7.000

## Lifting Knob 954

enables the dial bore gage to gently guided into the serration. The measuring spindle of the indicating instrument can also be lifted.

Order no. **4372030**

## Description

## Holder 844 Kg

with a clamping device for the indicating instrument. The 0.001" grads. mounting bore diameter 8 mm

Order no. **4470851**  
 Dial Indicator readout with 25 mm / 1" sensitive range and .01 mm / .001" grads.

## Extension 844 Kv

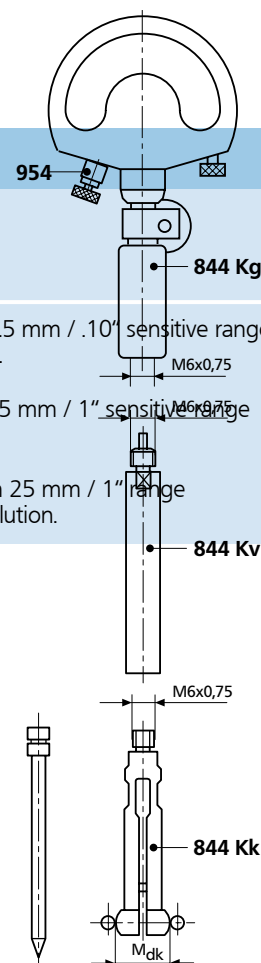
for measuring in deep bores. Dial Indicator with 25 mm / 1" range and .001 mm / .00005" resolution.

Order no. **4470070**

## 844 Kk Anvil

for internal serrations.  
 ball dimension „M<sub>dk</sub>“ from

**3.5 - 26.1 mm**



## Modular Unit Parts

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

### Measuring Heads

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

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

### Order no.

**4485000**

**4485001**

### Floating Ball Anvils with carbide ball

|                                                       | Grad. (mm) | Ball dia. mm  |                |
|-------------------------------------------------------|------------|---------------|----------------|
| <b>844 z3</b> Meas. range 3 mm, for Meas. Head 844 z1 | 0.5        | 1.0 - 5.0     | <b>4488300</b> |
|                                                       |            | acc. to table | <b>4488301</b> |
|                                                       | 0.5        | 7.5 - 10      | <b>4488302</b> |
| <b>844 z4</b> Meas. range 3 mm, for Meas. Head 844 z2 | 0.5        | 1.0 - 5.0     | <b>4488310</b> |
|                                                       |            | acc. to table | <b>4488311</b> |
|                                                       | 0.5        | 7.5 - 10      | <b>4488312</b> |

### Ball Anvils with carbide ball

|                                                  |     |               |                |
|--------------------------------------------------|-----|---------------|----------------|
| <b>844 z5</b> , Length 2.5 mm                    | 0.5 | 1.0 - 5.0     | <b>4488320</b> |
|                                                  |     | acc. to table | <b>4488321</b> |
|                                                  | 0.5 | 7.5 - 10      | <b>4488322</b> |
| <b>844 z6</b> , Length 5.0 mm                    | 0.5 | 1.0 - 5.0     | <b>4488330</b> |
|                                                  |     | acc. to table | <b>4488331</b> |
|                                                  | 0.5 | 7.5 - 10      | <b>4488332</b> |
| <b>844 z7</b> , Length 7.5 mm                    | 0.5 | 1.0 - 5.0     | <b>4488340</b> |
|                                                  |     | acc. to table | <b>4488341</b> |
|                                                  | 0.5 | 7.5 - 10      | <b>4488342</b> |
| <b>844 z8</b> , Length 10.0 mm                   | 0.5 | 1.0 - 5.0     | <b>4488350</b> |
|                                                  |     | acc. to table | <b>4488351</b> |
|                                                  | 0.5 | 7.5 - 10      | <b>4488352</b> |
| <b>844 z15</b> , Length adjustable from 24-34 mm | 0.5 | 1.0 - 5.0     | <b>4488360</b> |
|                                                  |     | acc. to table | <b>4488361</b> |
|                                                  | 0.5 | 7.5 - 10      | <b>4488362</b> |

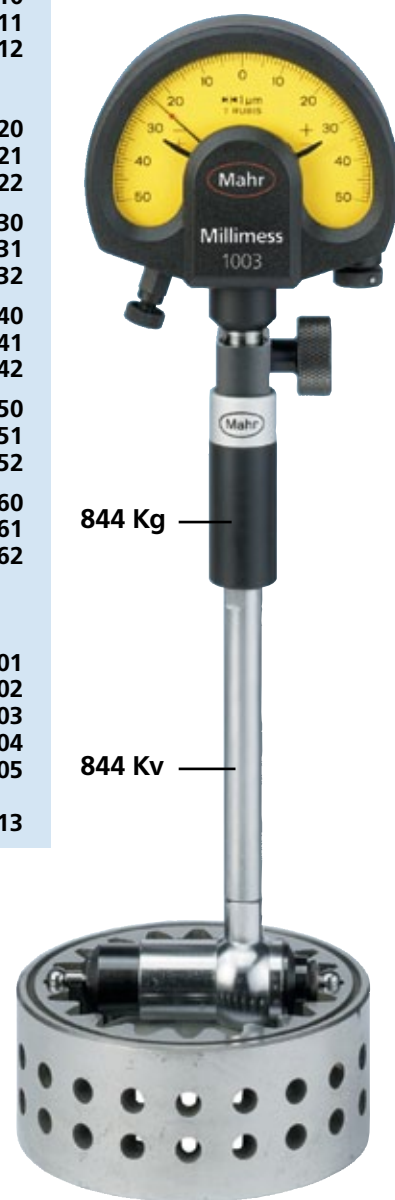
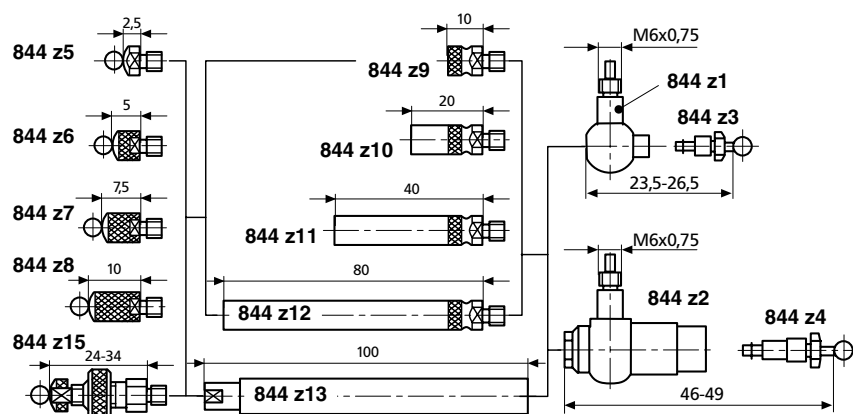
### Spacer (intermediate piece)

|                | Length (mm) |                |
|----------------|-------------|----------------|
| <b>844 z9</b>  | 10          | <b>4486501</b> |
| <b>844 z10</b> | 20          | <b>4486502</b> |
| <b>844 z11</b> | 40          | <b>4486503</b> |
| <b>844 z12</b> | 80          | <b>4486504</b> |
| <b>844 z13</b> | 100 *       | <b>4486505</b> |

### Wooden case

**4485013**

\* Only for 844 z2



## Dial Bore Gage for Internal Serrations 844 Z

### Selecting Modular Unit Parts Measuring Head 844 z1 and Floating Ball Anvil 844 z3

| M <sub>dk</sub> in mm | 844 z5 | 844 z6 | 844 z7 | 844 z8 | 844 z15 | 844 z9 | 844 z10 | 844 z11 | 844 z12 | 844 z13 |
|-----------------------|--------|--------|--------|--------|---------|--------|---------|---------|---------|---------|
| 26.0 - 29.0           | x      |        |        |        |         |        |         |         |         |         |
| 28.5 - 31.5           |        | x      |        |        |         |        |         |         |         |         |
| 31.0 - 34.0           |        |        | x      |        |         |        |         |         |         |         |
| 33.5 - 36.5           |        |        |        | x      |         |        |         |         |         |         |
| 36.0 - 39.0           | x      |        |        |        |         | x      |         |         |         |         |
| 38.5 - 41.5           |        | x      |        |        |         | x      |         |         |         |         |
| 41.0 - 44.0           |        |        | x      |        |         | x      |         |         |         |         |
| 43.5 - 46.5           |        |        |        | x      |         | x      |         |         |         |         |
| 46.0 - 49.0           | x      |        |        |        |         |        | x       |         |         |         |
| 47.5 - 60.5           |        |        |        |        | x       |        |         |         |         |         |
| 48.5 - 51.5           |        | x      |        |        |         |        | x       |         |         |         |
| 51.0 - 54.0           |        |        | x      |        |         |        | x       |         |         |         |
| 53.5 - 56.5           |        |        |        | x      |         |        | x       |         |         |         |
| 56.0 - 59.0           | x      |        |        |        |         | x      | x       |         |         |         |
| 57.5 - 70.5           |        |        |        |        | x       | x      |         |         |         |         |
| 58.5 - 61.5           |        | x      |        |        |         | x      | x       |         |         |         |
| 61.0 - 64.0           |        |        | x      |        |         | x      | x       |         |         |         |
| 63.5 - 66.5           |        |        |        | x      |         | x      | x       |         |         |         |
| 66.0 - 69.0           | x      |        |        |        |         |        |         | x       |         |         |
| 67.5 - 80.5           |        |        |        |        | x       |        | x       |         |         |         |
| 68.5 - 71.5           |        | x      |        |        |         |        |         | x       |         |         |
| 71.0 - 74.0           |        |        | x      |        |         |        |         | x       |         |         |
| 73.5 - 76.5           |        |        |        | x      |         |        |         | x       |         |         |
| 76.0 - 79.0           | x      |        |        |        |         | x      |         | x       |         |         |
| 77.5 - 90.5           |        |        |        |        | x       | x      | x       |         |         |         |
| 78.5 - 81.5           |        | x      |        |        |         | x      |         | x       |         |         |
| 81.0 - 84.0           |        |        | x      |        |         | x      |         | x       |         |         |
| 83.5 - 86.5           |        |        |        | x      |         | x      |         | x       |         |         |
| 86.0 - 89.0           | x      |        |        |        |         |        | x       | x       |         |         |
| 87.5 - 100.5          |        |        |        |        | x       |        |         | x       |         |         |
| 88.5 - 91.5           |        | x      |        |        |         |        | x       | x       |         |         |
| 91.0 - 94.0           |        |        | x      |        |         |        | x       | x       |         |         |
| 93.5 - 96.5           |        |        |        | x      |         |        | x       | x       |         |         |
| 96.0 - 99.0           | x      |        |        |        |         | x      | x       | x       |         |         |
| 97.5 - 110.5          |        |        |        |        | x       | x      |         | x       |         |         |
| 98.5 - 101.5          |        | x      |        |        |         | x      | x       | x       |         |         |
| 101.0 - 104.0         |        |        | x      |        |         | x      | x       | x       |         |         |
| 103.5 - 106.5         |        |        |        | x      |         | x      | x       | x       |         |         |
| 107.5 - 120.5         |        |        |        |        | x       |        | x       | x       |         |         |
| 117.5 - 130.5         |        |        |        |        | x       | x      | x       | x       |         |         |

57B-15M

57B-15

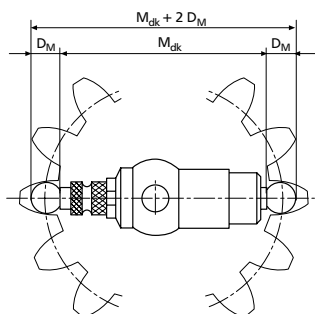
0 - 25 / 0 - 1"

2057551\*

Alternate Indicators and contact points available upon request.  
Contact Mahr Federal.

\* Integrated wireless

### Determination of setting values



$D_M$  = Ball diameter of the ball anvil

$M_{dk}$  = Diametrical two ball measurement

$M_{dk} + 2 D_M$  =  
Setting value (length of the gage block required for setting)

### Features

#### Example:

|                                     |          |
|-------------------------------------|----------|
| Diametrical two ball meas. $M_{dk}$ | 73.0 mm  |
| Ball dia.                           | 5.486 mm |

When placing an order please quote the ball diameter of the modular unit system for 844 z3 - 844 z8, as well as 844 z15. On the basis of the above specified example above result several combinations that are possible to choice from is dependent upon the work piece. For further details please refer to the illustration on Page 9-67.

The measuring application can be solved with either one of the following 4 versions:

| Type               | Description         | Ball dia.<br>mm | Length<br>mm | Order no. |
|--------------------|---------------------|-----------------|--------------|-----------|
| <b>Version 1</b>   |                     |                 |              |           |
| 844 z1             | Meas. Head          |                 | 23.5-26.5    | 4485000   |
| 844 z3             | Floating Ball Anvil | 5.486           |              | 4488301   |
| 844 z7             | Ball Anvil          | 5.486           | 7.5          | 4488341   |
| 844 z11            | Spacer              |                 | 40.0         | 4486503   |
| <b>Meas. range</b> |                     |                 | 71.0-74.0    |           |
| <b>Version 2</b>   |                     |                 |              |           |
| 844 z1             | Meas. Head          |                 | 23.5-26.5    | 4485000   |
| 844 z3             | Floating Ball Anvil | 5.486           |              | 4488301   |
| 844 z15            | Ball Anvil          | 5.486           | 24.0-34.0    | 4488361   |
| 844 z10            | Spacer              |                 | 20.0         | 4486502   |
| <b>Meas. range</b> |                     |                 | 67.5-80.5    |           |
| <b>Version 3</b>   |                     |                 |              |           |
| 844 z2             | Meas. Head          |                 | 46.0-49.0    | 4485001   |
| 844 z4             | Floating Ball Anvil | 5.486           |              | 4488311   |
| 844 z6             | Ball Anvil          | 5.486           | 5.0          | 4488331   |
| 844 z10            | Spacer              |                 | 20.0         | 4486502   |
| <b>Meas. range</b> |                     |                 | 71.0-74.0    |           |
| <b>Version 4</b>   |                     |                 |              |           |
| 844 z2             | Meas. Head          |                 | 46.0-49.0    | 4485001   |
| 844 z4             | Floating Ball Anvil | 5.486           |              | 4488311   |
| 844 z15            | Ball Anvil          | 5.486           | 24.0-34.0    | 4488361   |
| <b>Meas. range</b> |                     |                 | 70.0-83.0    |           |

### Indicating Instruments

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

| Dial Comparator       | Readings<br>mm / inch | Order no.<br>mm / inch |
|-----------------------|-----------------------|------------------------|
| Millimess 1004/1004 Z | 5 $\mu$ m / .0001"    | 4333000/4333900        |
| Millimess 1003/1003 Z | 1 $\mu$ m / .00005"   | 4334000/4334900        |

Digital Indicators see Chapter 5

Electrical Indicating Instruments see Chapter 7

## Selecting Modular Unit Parts 844 Z Measuring Head f 844 z2 and Floating Ball Anvil 844 z4

| M <sub>dk</sub> in mm | 844 z5 | 844 z6 | 844 z7 | 844 z8 | 844 z15 | 844 z9 | 844 z10 | 844 z11 | 844 z12 | 844 z13 | M <sub>dk</sub> in mm | 844 z5 | 844 z6 | 844 z7 | 844 z8 | 844 z15 | 844 z9 | 844 z10 | 844 z11 | 844 z12 | 844 z13 |
|-----------------------|--------|--------|--------|--------|---------|--------|---------|---------|---------|---------|-----------------------|--------|--------|--------|--------|---------|--------|---------|---------|---------|---------|
| 48.5 - 51.5           | x      |        |        |        |         |        |         |         |         |         | 188.5 - 191.5         | x      |        |        |        |         |        |         | x       |         | x       |
| 51.0 - 54.0           |        | x      |        |        |         |        |         |         |         |         | 190.0 - 193.0         |        |        |        |        | x       |        |         |         |         | x       |
| 53.5 - 56.5           |        |        | x      |        |         |        |         |         |         |         | 191.0 - 194.0         |        | x      |        |        |         |        |         | x       |         | x       |
| 56.0 - 59.0           |        |        |        | x      |         |        |         |         |         |         | 193.5 - 196.5         |        |        | x      |        |         |        |         | x       |         | x       |
| 58.5 - 61.5           | x      |        |        |        |         | x      |         |         |         |         | 196.0 - 199.0         |        |        |        | x      |         |        |         | x       |         | x       |
| 61.0 - 64.0           |        | x      |        |        |         | x      |         |         |         |         | 198.5 - 201.5         | x      |        |        |        |         | x      |         | x       |         | x       |
| 63.5 - 66.5           |        |        | x      |        |         | x      |         |         |         |         | 200.0 - 213.0         |        |        |        |        | x       | x      |         |         |         | x       |
| 66.0 - 69.0           |        |        |        | x      |         | x      |         |         |         |         | 201.0 - 204.0         |        | x      |        |        |         | x      |         | x       |         | x       |
| 68.5 - 71.5           | x      |        |        |        |         |        | x       |         |         |         | 203.5 - 206.5         |        |        | x      |        |         | x      |         | x       |         | x       |
| 70.0 - 83.0           |        |        |        |        | x       |        |         |         |         |         | 206.0 - 209.0         |        |        |        | x      |         | x      |         | x       |         | x       |
| 71.0 - 74.0           |        | x      |        |        |         |        | x       |         |         |         | 208.5 - 211.5         | x      |        |        |        |         | x      | x       |         |         | x       |
| 73.5 - 76.5           |        |        | x      |        |         |        | x       |         |         |         | 210.0 - 223.0         |        |        |        |        | x       |        | x       |         |         | x       |
| 76.0 - 79.0           |        |        |        | x      |         |        | x       |         |         |         | 211.0 - 214.0         |        | x      |        |        |         | x      | x       |         |         | x       |
| 78.5 - 81.5           | x      |        |        |        |         | x      | x       |         |         |         | 213.5 - 216.5         |        |        | x      |        |         | x      | x       |         |         | x       |
| 80.0 - 93.0           |        |        |        |        | x       | x      |         |         |         |         | 216.0 - 219.0         |        |        |        | x      |         | x      | x       |         |         | x       |
| 81.0 - 84.0           |        | x      |        |        |         | x      | x       |         |         |         | 218.5 - 221.5         | x      |        |        |        |         | x      | x       | x       |         | x       |
| 83.5 - 86.5           |        |        | x      |        |         | x      | x       |         |         |         | 220.0 - 233.0         |        |        |        |        | x       | x      | x       |         |         | x       |
| 86.0 - 89.0           |        |        |        | x      |         | x      | x       |         |         |         | 221.0 - 224.0         |        | x      |        |        |         | x      | x       | x       |         | x       |
| 88.5 - 91.5           | x      |        |        |        |         |        |         | x       |         |         | 223.5 - 226.5         |        |        | x      |        |         | x      | x       | x       |         | x       |
| 90.0 - 103.0          |        |        |        |        | x       |        | x       |         |         |         | 226.0 - 229.0         |        |        |        | x      |         | x      | x       | x       |         | x       |
| 91.0 - 94.0           |        | x      |        |        |         |        |         | x       |         |         | 228.5 - 231.5         | x      |        |        |        |         |        |         |         | x       | x       |
| 93.5 - 96.5           |        |        | x      |        |         |        |         | x       |         |         | 230.0 - 243.0         |        |        |        |        |         | x      | x       |         |         | x       |
| 96.0 - 99.0           |        |        |        | x      |         |        |         | x       |         |         | 231.0 - 234.0         |        | x      |        |        |         |        |         |         | x       | x       |
| 98.5 - 101.5          | x      |        |        |        |         | x      |         | x       |         |         | 233.5 - 236.5         |        |        | x      |        |         |        |         |         | x       | x       |
| 100.0 - 113.0         |        |        |        |        | x       | x      | x       |         |         |         | 236.0 - 239.0         |        |        |        | x      |         |        |         |         | x       | x       |
| 101.0 - 104.0         |        | x      |        |        |         | x      |         | x       |         |         | 238.5 - 241.5         | x      |        |        |        |         | x      |         |         | x       | x       |
| 103.5 - 106.5         |        |        | x      |        |         | x      |         | x       |         |         | 240.0 - 253.0         |        |        |        |        | x       | x      | x       |         |         | x       |
| 106.0 - 109.0         |        |        |        | x      |         | x      |         | x       |         |         | 241.0 - 244.0         |        | x      |        |        |         | x      |         |         | x       | x       |
| 108.5 - 111.5         | x      |        |        |        |         |        | x       | x       |         |         | 243.5 - 246.5         |        |        | x      |        |         | x      |         |         | x       | x       |
| 110.0 - 123.0         |        |        |        |        | x       |        |         | x       |         |         | 246.0 - 249.0         |        |        |        | x      |         | x      |         |         | x       | x       |
| 111.0 - 114.0         |        | x      |        |        |         |        | x       | x       |         |         | 248.5 - 251.5         | x      |        |        |        |         | x      |         |         | x       | x       |
| 113.5 - 116.5         |        |        | x      |        |         |        | x       | x       |         |         | 250.0 - 263.0         |        |        |        |        | x       |        |         |         | x       | x       |
| 116.0 - 119.0         |        |        |        | x      |         |        | x       | x       |         |         | 251.0 - 254.0         |        | x      |        |        |         | x      |         |         | x       | x       |
| 118.5 - 121.5         | x      |        |        |        |         | x      | x       | x       |         |         | 253.5 - 256.5         |        |        | x      |        |         | x      |         |         | x       | x       |
| 120.0 - 133.0         |        |        |        |        | x       | x      |         | x       |         |         | 256.0 - 259.0         |        |        |        | x      |         | x      |         |         | x       | x       |
| 121.0 - 124.0         |        | x      |        |        |         | x      | x       | x       |         |         | 258.5 - 261.5         | x      |        |        |        |         | x      | x       |         | x       | x       |
| 123.5 - 126.5         |        |        | x      |        |         | x      | x       | x       |         |         | 260.0 - 273.0         |        |        |        |        | x       | x      |         |         | x       | x       |
| 126.0 - 129.0         |        |        |        | x      |         | x      | x       | x       |         |         | 261.0 - 264.0         |        | x      |        |        |         | x      | x       |         | x       | x       |
| 128.5 - 131.5         | x      |        |        |        |         |        |         |         | x       |         | 263.5 - 266.5         |        |        | x      |        |         | x      | x       |         | x       | x       |
| 130.0 - 143.0         |        |        |        |        | x       |        | x       | x       |         |         | 266.0 - 269.0         |        |        |        | x      |         | x      | x       |         | x       | x       |
| 131.0 - 134.0         |        | x      |        |        |         |        |         |         |         |         | 268.5 - 271.5         | x      |        |        |        |         |        |         | x       | x       | x       |
| 133.5 - 136.5         |        |        | x      |        |         |        |         |         |         |         | 270.0 - 283.0         |        |        |        |        | x       |        |         |         | x       | x       |
| 136.0 - 139.0         |        |        |        | x      |         |        |         |         |         |         | 271.0 - 274.0         |        | x      |        |        |         |        |         | x       | x       | x       |
| 138.5 - 141.5         | x      |        |        |        |         | x      |         |         | x       |         | 273.5 - 276.5         |        |        | x      |        |         |        |         | x       | x       | x       |
| 140.0 - 153.0         |        |        |        |        | x       | x      | x       | x       |         |         | 276.0 - 279.0         |        |        |        | x      |         |        |         | x       | x       | x       |
| 141.0 - 144.0         |        | x      |        |        |         | x      |         |         | x       |         | 278.5 - 281.5         | x      |        |        |        |         | x      |         | x       | x       | x       |
| 143.5 - 146.5         |        |        | x      |        |         | x      |         |         | x       |         | 280.0 - 293.0         |        |        |        |        | x       | x      |         |         | x       | x       |
| 146.0 - 149.0         |        |        |        | x      |         | x      |         |         | x       |         | 281.0 - 284.0         |        | x      |        |        |         | x      |         | x       | x       | x       |
| 148.5 - 151.5         | x      |        |        |        |         |        |         |         |         | x       | 283.5 - 286.5         |        |        | x      |        |         | x      |         | x       | x       | x       |
| 150.0 - 163.0         |        |        |        |        | x       |        |         |         |         | x       | 286.0 - 289.0         |        |        |        | x      |         | x      |         | x       | x       | x       |
| 151.0 - 154.0         |        | x      |        |        |         |        |         |         |         |         | 288.5 - 291.5         | x      |        |        |        |         | x      | x       |         | x       | x       |
| 153.5 - 156.5         |        |        | x      |        |         |        |         |         |         |         | 290.0 - 303.0         |        |        |        |        | x       |        |         | x       | x       | x       |
| 156.0 - 159.0         |        |        |        | x      |         |        |         |         |         |         | 291.0 - 294.0         |        | x      |        |        |         | x      | x       |         | x       | x       |
| 158.5 - 161.5         | x      |        |        |        |         | x      |         |         |         |         | 293.5 - 296.5         |        |        | x      |        |         | x      | x       |         | x       | x       |
| 160.0 - 173.0         |        |        |        |        | x       | x      |         |         | x       |         | 296.0 - 299.0         |        |        |        | x      |         | x      | x       |         | x       | x       |
| 161.0 - 164.0         |        | x      |        |        |         | x      |         |         |         | x       | 298.5 - 301.5         | x      |        |        |        |         | x      | x       |         | x       | x       |
| 163.5 - 166.5         |        |        | x      |        |         | x      |         |         |         | x       | 300.0 - 313.0         |        |        |        |        | x       |        | x       |         | x       | x       |
| 166.0 - 169.0         |        |        |        | x      |         | x      |         |         |         | x       | 301.0 - 304.0         |        | x      |        |        |         | x      | x       |         | x       | x       |
| 168.5 - 171.5         | x      |        |        |        |         |        | x       |         |         |         | 303.5 - 306.5         |        |        | x      |        |         | x      | x       |         | x       | x       |
| 170.0 - 183.0         |        |        |        |        | x       |        |         |         |         |         | 306.0 - 309.0         |        |        |        | x      |         | x      | x       |         | x       | x       |
| 171.0 - 174.0         |        | x      |        |        |         |        | x       |         |         |         | 310.0 - 323.0         |        |        |        |        | x       |        | x       |         | x       | x       |
| 173.5 - 176.5         |        |        | x      |        |         |        | x       |         |         |         | 320.0 - 333.0         |        |        |        |        | x       |        | x       |         | x       | x       |
| 176.0 - 179.0         |        |        |        | x      |         |        | x       |         |         | x       |                       |        |        |        |        |         |        |         |         |         |         |
| 178.5 - 181.5         | x      |        |        |        |         | x      | x       |         |         |         |                       |        |        |        |        |         |        |         |         |         |         |
| 180.0 - 193.0         |        |        |        |        | x       | x      |         |         |         |         |                       |        |        |        |        |         |        |         |         |         |         |
| 181.0 - 184.0         |        | x      |        |        |         | x      | x       |         |         |         |                       |        |        |        |        |         |        |         |         |         |         |
| 183.5 - 186.5         |        |        | x      |        |         | x      | x       |         |         |         |                       |        |        |        |        |         |        |         |         |         |         |
| 186.0 - 189.0         |        |        |        | x      |         | x      | x       |         |         |         |                       |        |        |        |        |         |        |         |         |         |         |