Electronic Length Measuring Equipment
TESA LENGTH MEASURING EQUIPMENT WITH INDUCTIVE PROBES

TESA offers a complete family of value sensors (electronic probes) as well as dedicated measuring instruments for the most demanding applications. Our standard probes — also known as half-bridge probes — operate according to the electrical principle. They do not require any special setting.

Electronic probes that are used in conjunction with measuring instruments from other manufacturers work partly on the basis of a differential transformer. These probes are known as LVDT (Linear Variable Differential Transformer) probes. TESA also offer a full range of this kind of probes which, however, need to be fitted with a convenient socket and further adapted, accordingly.

For more details about TESA half-bridge or LVDT inductive probes, read the information that follows.

Countless Measuring Capabilities

All TESA electronic probes can either be used with hand-held tools, whether internal or external, or in conjunction with other typical measuring devices and supports.

TESA can supply such executions as axial probes with linear displacement of the measuring bolt, angled probes with inclinable lever or probes with parallel guiding that are specially designed for multigauging devices as well as any other equipment for in-process inspection — thus allowing to spare many assembly components.

With a very few exceptions, these probes perform comparative measurement, essentially. Based on a master standard, which can either be a gauge block, a setting ring or any other workpiece accepted as such, a number of sizes are compared on the test piece.

• All measurements are taken with high accuracy. The bias errors usually count for very little in the uncertainty budget since the comparison is made between two values nearly equal to the measurand.

• Random errors are also significantly reduced as display setting and all subsequent measurements are usually made under the same conditions.

• TESA provide measuring instruments equipped with an analogue and/or digital display, depending on their type.

Internal Data Processing

The measurement signals are processed differently, depending on the measuring application.

Mathematical Data Processing

Signal processing can equally be made with positive or negative polarity signs. The use of a single probe enables single measurement of internal or external dimensions while the combination of the signals of two probes produces either a «sum measurement» or a «difference measurement».

Value Storage

Provides the needed safety for your dynamic measurement cycles. The smallest or highest value as well as the difference between both values are some of the part features that are questioned when capturing form and position errors.

Value Classification

Uses limit deviations to classify the measured values while producing additional control signals usable through a remote unit.
MEASURING FUNCTIONS – OVERVIEW

Single measurements with positive polarity sign (+A)

Measuring external dimensions with use of a measuring stand, snap gauge etc.

Single measurements with negative polarity sign (-A)

Inspecting sizes with change of the polarity sign. Display shows a low value for a small bore or a high value for a large diameter.

Sum measurements with positive polarity signs (+A +B)

Measuring external dimensions regardless of form and position errors.

Difference measurements with opposite polarity signs (+A -B)

Performing step, cone and inclination measurements.

Establishing form and position errors such as runout errors with use of the memory function "max.-min." as shown in this example.

Measuring external dimensions with use of a measuring stand, snap gauge etc.

Inspecting sizes with change of the polarity sign. Display shows a low value for a small bore or a high value for a large diameter.

Measuring external dimensions regardless of form and position errors.

Performing step, cone and inclination measurements.

Establishing form and position errors such as runout errors with use of the memory function "max.-min." as shown in this example.
TESA Electronic Probes at the Forefront in Precision Measurement

TESA is a leading designer, manufacturer and user of inductive probes for more than 40 years. Its high-precision electronic probes are made to withstand the stresses sustained in the production environment where they can be constantly used for series inspection. But, these probes are also designed for high accuracy measurements such as those performed in gauge block calibration, for instance.

- All electronic probes are mounted on ball-bearings, except for miniature axial probes.
- Ball-bearings are virtually insensitive to radial forces.
- Probe guide system is efficiently protected against the penetration of solid and liquid contaminants by sealing rubber bellows. In normal conditions of use, nitrile elastomer bellows are sufficient. For applications where the probes remain permanently in contact with cooling and lubricating agents, we would recommend the use of Viton rubber bellows.
- Sealing bellows ensure full airtightness so that the measuring bolt is retracted by throwing off the air contained in the probe. This provides optimum protection of the guiding system as no mechanical device is used.
- Electronic signal amplification produces excellent repeatability and low hysteresis.
- Resolution is as high as 0.01 µm.

### Dimensions of the connector fitted on all TESA probes.
Smaller cable curve radius, R = 15 mm

### Sensitivity of standard half-bridge probes used in conjunction with TESA electronic probes

All given values are valid for the following reference conditions:

- Drive voltage: 3 V
- Drive frequency: 13 kHz
- Adjustment load: 2 kΩ
- mV/V/mm: 73.75

For any probe type: 73.75
except probe series:
- GT 61/62: 29.5
- GT 61S/62S: 7.375
- FMS 130/132: 49.17
Operating Principle
All TESA electronic probes (value sensors) work based on the inductive principle with mechanical contact of the workpiece. They are fitted with a coil system inducing an alternating output voltage that depends on the position of the ferromagnetic core. When symmetrically positioned - i.e., at electrical zero - no voltage is impressed.
A move of the core, which may be attached to the measuring bolt while the measurand is being taken, causes the inductance to change. This change generates a signal that is amplified and rectified before being displayed and further output. Depending on the instrument type, the analogue signal will be shown on a voltmeter or a numerical display after a digital transformation.
Unambiguous assessment of the measurand (at bolt position) to the signal (displayed value) is the main characteristic of analogue value acquisition. One of its distinct advantages lies in the value primarily displayed, which will be reproduced in the event of a power cut (switch-off or power failure).

TESA Standard Half-Bridge Probes for TESA Electronic Equipment
These probes have two serial coils with middle output mounted side by side, which are energized by a sinusoidal alternation at 13 kHz. Both are linked together to a Wheatstone bridge over an additional half-bridge.

TESA LVDT Probes
These probes are based on a Linear Variable Differential Transformer (LVDT). They have three coils, i.e., one primary coil being energized by a sinusoidal alternation at 5 kHz, and two secondary coils connected in opposite phase, which generate the output current proportional to the measuring travel. Available upon request

Compatible Probes
Upon request, all TESA's probes can be made available with a data output compatible with any electronic equipment from other makers.
**TESA Half-Bridge Probes**

- Full probe range. See pages O-8 to O-13.

**TESA BPI interface box**
Modular system for connecting up to 64 TESA half-bridge probes. Setting and operating the system requires the use of a host computer. See pages O-48 to O-49.

**Display unit with 2 connected probes TESATRONIC**
Measurements and value display with value classification. See pages O-42 to O-47.

**TESA USB Probes**

- Direct connection to host computer
Easy-to-use and effective for single accurate and multi-gauging devices. See pages O-14 to O-15.
**TESA DC Probes**

DC probes.  
See page O-16.

Interface boxes for TESA half-bridge probes. Analogue data output as for DC probes.  
See page O-50.

**TESA Accessories**

Accessories for TESA's probes.  
See pages O-34 to O-41.

**TESA Software Tools**

Software tools for data capture and data analysis (settings, measurements, inspection reports).  
See chapter A – Connectivity
### TESA Standard Probes – Overview

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Code</th>
<th>Measuring range (mm)</th>
<th>Cable exit</th>
<th>Measuring bolt retraction</th>
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** Electronic Length Measuring Equipment - Analogue **

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<th>Moving mass (g)</th>
<th>Frequency limit Hz**</th>
<th>Dismountable</th>
<th>μm</th>
<th>(L in mm)</th>
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<td></td>
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<td>0.63</td>
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<tr>
<td>0.63</td>
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<td>−10 ÷ 65</td>
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<td><strong>N</strong></td>
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<td>(L in mm)</td>
<td>°C</td>
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<td>0.2</td>
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### Miniature axial probes, 8 mm dia. probe housing

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<tr>
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<td>axial without Nitrile</td>
</tr>
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<td>03230002 GT 42</td>
<td>± 0,3</td>
<td>0,7</td>
<td>radial vacuum Nitrile</td>
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**Measuring bolt hanging from diaphragm springs**

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<td>2,1</td>
<td>axial mechanical Viton</td>
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<td>03230004 GT 44</td>
<td>± 1</td>
<td>2,1</td>
<td>radial vacuum Viton</td>
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**Measuring bolt mounted on a plain bearing**

**Axial probes with measuring bolt mounted on a ball-bearing, with no brand name**

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<tr>
<th>Measuring range mm</th>
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<td>4,3</td>
<td>axial/radial mechanical Viton</td>
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<td>96410012 410</td>
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<td>axial/radial mechanical Nitrile</td>
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<td>96430029 430</td>
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<td>96441041 451</td>
<td>± 0,5</td>
<td>2,1</td>
<td>radial vacuum Nitrile</td>
</tr>
</tbody>
</table>

**Standard probes**

**Standard probes with short body**

**Standard probes with short body, 6 mm dia. fixing shank**

**Miniature probes, 8 mm dia. fixing shank**

**Lever probes**

<table>
<thead>
<tr>
<th>Measuring range mm</th>
<th>Cable exit</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>96420004 420</td>
<td>± 0,15</td>
<td>0,525</td>
<td>parallel without none</td>
</tr>
<tr>
<td>96499007 499</td>
<td>± 0,5</td>
<td>1,2</td>
<td>parallel without none</td>
</tr>
<tr>
<td>N**</td>
<td>Moving mass g</td>
<td>Frequency limit Hz***</td>
<td>Dismount-able</td>
</tr>
<tr>
<td>------</td>
<td>---------------</td>
<td>----------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>0,63</td>
<td>2</td>
<td>60</td>
<td>–</td>
</tr>
<tr>
<td>0,63</td>
<td>2</td>
<td>60</td>
<td>–</td>
</tr>
<tr>
<td>0,4</td>
<td>2</td>
<td>60</td>
<td>–</td>
</tr>
<tr>
<td>0,4</td>
<td>2</td>
<td>60</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N**</th>
<th>Moving mass g</th>
<th>Frequency limit Hz***</th>
<th>Dismount-able</th>
<th>μm</th>
<th>%****</th>
<th>°C</th>
<th>IEC 60529</th>
<th>O-25</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,63</td>
<td>6</td>
<td>60</td>
<td>●</td>
<td>0,02</td>
<td>0,2</td>
<td>−10 ÷ 65</td>
<td>IP65</td>
<td>O-25</td>
</tr>
<tr>
<td>0,6</td>
<td>3,1</td>
<td>58</td>
<td>–</td>
<td>0,1</td>
<td>0,2</td>
<td>0 ÷ 60</td>
<td>IP62</td>
<td>O-26</td>
</tr>
<tr>
<td>0,6</td>
<td>2,5</td>
<td>60</td>
<td>–</td>
<td>0,1</td>
<td>0,2</td>
<td>0 ÷ 60</td>
<td>IP62</td>
<td>O-27</td>
</tr>
<tr>
<td>0,75</td>
<td>1,9</td>
<td>60</td>
<td>–</td>
<td>0,1</td>
<td>0,2</td>
<td>0 ÷ 60</td>
<td>IP62</td>
<td>O-27</td>
</tr>
<tr>
<td>0,6</td>
<td>3</td>
<td>60</td>
<td>–</td>
<td>0,1</td>
<td>0,2</td>
<td>0 ÷ 60</td>
<td>IP62</td>
<td>O-27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N**</th>
<th>Moving mass g</th>
<th>Frequency limit Hz***</th>
<th>Dismount-able</th>
<th>μm</th>
<th>%****</th>
<th>°C</th>
<th>IEC 60529</th>
<th>O-28</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,8</td>
<td>2,5</td>
<td>10</td>
<td>–</td>
<td>0,5</td>
<td>0,3</td>
<td>0 ÷ 60</td>
<td>IP40</td>
<td>O-28</td>
</tr>
<tr>
<td>0,02 ÷ 0,2</td>
<td>10,6</td>
<td>10</td>
<td>–</td>
<td>0,25</td>
<td>0,6</td>
<td>0 ÷ 60</td>
<td>IP40</td>
<td>O-28</td>
</tr>
</tbody>
</table>

** Nominal value of the measuring force at electrical zero, max. deviation ± 25%.
*** Highest mechanical frequency valid for the final value of the measuring range, amplified by 10%.
**** Linearity related max. permissible errors.
### TESA probe with inclinable lever

<table>
<thead>
<tr>
<th>Code</th>
<th>Model</th>
<th>Measuring range (mm)</th>
<th>mm</th>
<th>Cable exit</th>
<th>Measuring bolt retraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>03210802</td>
<td>GT 31</td>
<td>± 0.3</td>
<td>0.7</td>
<td>angled</td>
<td>without</td>
</tr>
</tbody>
</table>

### TESA universal probes

<table>
<thead>
<tr>
<th>Code</th>
<th>Model</th>
<th>Measuring range (mm)</th>
<th>mm</th>
<th>Cable exit</th>
<th>Measuring bolt retraction (accessory)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Standard probes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Probes «FMS Protected»</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03230019</td>
<td>FMS 100</td>
<td>± 2</td>
<td>5.8</td>
<td>parallel</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230028</td>
<td>FMS 102</td>
<td>± 2</td>
<td>5.8</td>
<td>angled</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230049</td>
<td>FMS 130</td>
<td>± 2.9</td>
<td>5.8</td>
<td>parallel</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230050</td>
<td>FMS 132</td>
<td>± 2.9</td>
<td>5.8</td>
<td>angled</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230037</td>
<td>FMS 100-P</td>
<td>± 2</td>
<td>5.8</td>
<td>parallel</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230038</td>
<td>FMS 102-P</td>
<td>± 2</td>
<td>5.8</td>
<td>angled</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230051</td>
<td>FMS 130-P</td>
<td>± 2.9</td>
<td>5.8</td>
<td>parallel</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230052</td>
<td>FMS 132-P</td>
<td>± 2.9</td>
<td>5.8</td>
<td>angled</td>
<td>air pressure</td>
</tr>
</tbody>
</table>

* Position against the measuring direction
### Electronic Length Measuring Equipment - Analogue

<table>
<thead>
<tr>
<th>N**</th>
<th>Moving mass (g)</th>
<th>Frequency limit Hz***</th>
<th>Dismountable</th>
<th>µm</th>
<th>(L in mm)</th>
<th>µm****</th>
<th>°C</th>
<th>IEC 60529</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,1</td>
<td>12</td>
<td>25</td>
<td>–</td>
<td>0,1</td>
<td>0,2 + 50 · L²</td>
<td>5 ÷ 60</td>
<td>IP40</td>
<td>0-29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N/mm</th>
<th>Moving mass (g)</th>
<th>Frequency limit Hz***</th>
<th>Dismountable</th>
<th>µm</th>
<th>(L in mm)</th>
<th>µm****</th>
<th>°C</th>
<th>IEC 60529</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>110</td>
<td>25</td>
<td>●</td>
<td>0,5</td>
<td>0,2 + 3 · L³</td>
<td>−10 ÷ 65</td>
<td>IP50</td>
<td>0-31</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
<td>25</td>
<td>●</td>
<td>0,5</td>
<td>0,2 + 3 · L³</td>
<td>−10 ÷ 65</td>
<td>IP50</td>
<td>0-32</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
<td>25</td>
<td>●</td>
<td>0,5</td>
<td>0,2 + 3 · L³</td>
<td>−10 ÷ 65</td>
<td>IP50</td>
<td>0-31</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
<td>25</td>
<td>●</td>
<td>0,5</td>
<td>0,2 + 3 · L³</td>
<td>−10 ÷ 65</td>
<td>IP50</td>
<td>0-32</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
<td>25</td>
<td>●</td>
<td>0,5</td>
<td>0,2 + 3 · L³</td>
<td>−10 ÷ 65</td>
<td>IP54</td>
<td>0-31</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
<td>25</td>
<td>●</td>
<td>0,5</td>
<td>0,2 + 3 · L³</td>
<td>−10 ÷ 65</td>
<td>IP54</td>
<td>0-32</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
<td>25</td>
<td>●</td>
<td>0,5</td>
<td>0,2 + 3 · L³</td>
<td>−10 ÷ 65</td>
<td>IP54</td>
<td>0-31</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
<td>25</td>
<td>●</td>
<td>0,5</td>
<td>0,2 + 3 · L³</td>
<td>−10 ÷ 65</td>
<td>IP54</td>
<td>0-32</td>
</tr>
</tbody>
</table>

** Nominal value of the measuring force at electrical zero, max. deviation ±25%.
*** Highest mechanical frequency valid for the final value of the measuring range, amplified by 10%.
**** Linearity related max. permissible errors.
New generation of TESA’s USB probes for a surprising ease of use

These probes can be directly connected to your host computer over the widely known USB interfaces. The highest number of connectable probes depends on the USB ports available. Since interface boxes or cards are no longer necessary, the use of a USB multiplexer provides Users with a flexible and affordable solution.

Each probe will be identified as a standard peripheral device, using an RS232 protocol for communicating. Electronics is optimized, thus guaranteeing high accuracy throughout the measuring range. Making use of this technology will allow you to fit and combine your inspection means according to given requirements for precision and probe travel.

Most of the software tools available for data processing are able to process the values obtained from the measurements taken in static multigauging. The USB technology is convenient for these devices besides complex metrology applications, but also for simple gauging operations where high precision is critical.

Software for data acquisition and data processing.
See chapter A – Connectivity

TESA’s probes available in the USB version and Half-bridge probes have the same dimensions. Their range of standard accessories is also identical.
**TESA USB Probes**

Probes for use with a USB interface.

- Easy and quick connection to the USB port. Data transmission uses a virtual port along with any RS 232 protocol.

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Instrument type</th>
<th>Measuring range (mm)</th>
<th>Bolt retraction</th>
<th>Sealing below</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230200</td>
<td>GTL 21 USB</td>
<td>+/- 2</td>
<td>mechanical</td>
<td>Viton</td>
</tr>
<tr>
<td>03230201</td>
<td>GTL 22 USB</td>
<td>+/- 2</td>
<td>mechanical</td>
<td>Viton</td>
</tr>
<tr>
<td>03230202</td>
<td>GTL 222 USB</td>
<td>+/- 1,5</td>
<td>air pressure</td>
<td>Viton</td>
</tr>
<tr>
<td>03230203</td>
<td>GTL 222-A USB</td>
<td>+/- 1,5</td>
<td>air pressure</td>
<td>–</td>
</tr>
<tr>
<td>03230204</td>
<td>GT 61 USB</td>
<td>+/- 5</td>
<td>mechanical</td>
<td>Viton</td>
</tr>
<tr>
<td>03230205</td>
<td>GT 62 USB</td>
<td>+/- 5</td>
<td>vacuum</td>
<td>Viton</td>
</tr>
<tr>
<td>03230206</td>
<td>GT 622 USB</td>
<td>+/- 5</td>
<td>air pressure</td>
<td>Viton</td>
</tr>
<tr>
<td>03230207</td>
<td>GT 622-A USB</td>
<td>+/- 5</td>
<td>air pressure</td>
<td>–</td>
</tr>
<tr>
<td>03230208</td>
<td>FMS 100 USB</td>
<td>+/- 2</td>
<td>air pressure</td>
<td>–</td>
</tr>
<tr>
<td>03230209</td>
<td>FMS 102 USB</td>
<td>+/- 2</td>
<td>air pressure</td>
<td>–</td>
</tr>
</tbody>
</table>

**Technical Data**

- **Mechanical displacement**: 0.1 µm
- **Precision**
  - GTL 21 USB: 4.3 µm
  - GTL 22 USB: 4.3 µm
  - GTL 222 USB: 3.1 µm
  - GTL 222-A USB: 3.1 µm
  - GT 61 USB: 10.3 µm
  - GT 62 USB: 10.3 µm
  - GT 622 USB: 10.3 µm
  - GT 622-A USB: 10.3 µm
  - FMS 100 USB: 5.8 µm
  - FMS 102 USB: 5.8 µm

- **µm**
  - GTL 21 USB: <0.1
  - GTL 22 USB: <0.1
  - GTL 222 USB: <0.1
  - GTL 222-A USB: <0.1
  - GT 61 USB: <0.24
  - GT 62 USB: <0.24
  - GT 622 USB: <0.24
  - GT 622-A USB: <0.24
  - FMS 100 USB: <0.1
  - FMS 102 USB: <0.1

- **Standard execution** (nm)
  - GTL 21 USB: 0-17
  - GTL 22 USB: 0-18
  - GTL 222 USB: 0-21
  - GTL 222-A USB: 0-21
  - GT 61 USB: 0-20
  - GT 62 USB: 0-20
  - GT 622 USB: 0-20
  - GT 622-A USB: 0-23
  - FMS 100 USB: 0-31
  - FMS 102 USB: 0-32

- **Technical data sheets**
  - GTL 21 USB: 03200587
  - GTL 22 USB: 03200588
  - GTL 222 USB: 03200589
  - GTL 222-A USB: 03200590
  - GT 61 USB: 03200591
  - GT 62 USB: 03200592
  - GT 622 USB: 03200593
  - GT 622-A USB: 03200594
  - FMS 100 USB: 03200597
  - FMS 102 USB: 03200597

**Note:**
- Adapter for standard probe to USB interface, see page O-50.
- Advised limite of amount; 49 probes on 2 Hub levels.
**TESA DC Probes**

Provided with a DC output for direct connection to a host computer or a peripheral fitted with an analogue input.

### Operating principle

![Diagram of TESA DC Probes](image)

### Measuring Output Sensitivity

<table>
<thead>
<tr>
<th>Standard probes</th>
<th>Measuring range (mm)</th>
<th>Output voltage V</th>
<th>Sensitivity V/mm</th>
<th>µm</th>
<th>(L in mm) µm*</th>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230059 GTL 21 DC</td>
<td>±2</td>
<td>±2</td>
<td>1</td>
<td>0,1</td>
<td>0,2 + 3,5 · L²</td>
<td>03200396</td>
</tr>
<tr>
<td>03230058 GTL 22 DC</td>
<td>±2</td>
<td>±2</td>
<td>1</td>
<td>0,1</td>
<td>0,2 + 3,5 · L²</td>
<td>03200397</td>
</tr>
</tbody>
</table>

### Probes with extended measuring range

<table>
<thead>
<tr>
<th>Probes with extended measuring range</th>
<th>Measuring range (mm)</th>
<th>Output voltage V</th>
<th>Sensitivity V/mm</th>
<th>µm</th>
<th>(L in mm) µm*</th>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230086 GTL 61 DC</td>
<td>±5</td>
<td>±5</td>
<td>1</td>
<td>0,1</td>
<td>1 + 4 · L</td>
<td>03200519</td>
</tr>
<tr>
<td>03230087 GTL 62 DC</td>
<td>±5</td>
<td>±5</td>
<td>1</td>
<td>0,1</td>
<td>1 + 4 · L</td>
<td>03200520</td>
</tr>
</tbody>
</table>

### Miniature probes with measuring bolt hanging from a diaphragm spring

<table>
<thead>
<tr>
<th>Miniature probes with measuring bolt hanging from a diaphragm spring</th>
<th>Measuring range (mm)</th>
<th>Output voltage V</th>
<th>Sensitivity V/mm</th>
<th>µm</th>
<th>(L in mm) µm*</th>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230082 GT 41 DC</td>
<td>±0,3</td>
<td>±0,3</td>
<td>1</td>
<td>0,1</td>
<td>0,2 + 5 · L³</td>
<td>03200516</td>
</tr>
</tbody>
</table>

### Miniature probes with measuring bolt mounted on a plain bearing

<table>
<thead>
<tr>
<th>Miniature probes with measuring bolt mounted on a plain bearing</th>
<th>Measuring range (mm)</th>
<th>Output voltage V</th>
<th>Sensitivity V/mm</th>
<th>µm</th>
<th>(L in mm) µm*</th>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230085 GT 44 DC</td>
<td>±1</td>
<td>±1</td>
<td>1</td>
<td>0,1</td>
<td>0,2 + 5 · L³</td>
<td>03200518</td>
</tr>
</tbody>
</table>

### Probes with inclinable lever

<table>
<thead>
<tr>
<th>Probes with inclinable lever</th>
<th>Measuring range (mm)</th>
<th>Output voltage V</th>
<th>Sensitivity V/mm</th>
<th>µm</th>
<th>(L in mm) µm*</th>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230081 GT 31 DC</td>
<td>±0,3</td>
<td>±0,3</td>
<td>1</td>
<td>0,1</td>
<td>0,2 + 50 · L²</td>
<td>03200484</td>
</tr>
</tbody>
</table>

* Linearity related max. permissible errors.

**Note:** Other existing probe types and versions are available on request (2 V/mm, 5 V/mm, 10 V/mm or 0 to +10 V; max. output voltage 10 V).
**TESA Axial Probes**

**Standard Probes**
Universal probes for common but constraining applications.

- 8 mm diameter probe housing. Can be clamped over its entire length.
- Measuring bolt mounted on a ball bearing.
- Both the probe housing and ball-bearing guide are separate from one another, so that the measuring bolt moves easily even if the probe is not clamped appropriately.
- Degree of protection IP65 according to IEC 60529.
- Wide range of accessories including measuring inserts, spring sets, etc.
- LVDT probes compatible with measuring equipment from other makers available on request.

**GT 21 and GTL 21 probes with axial cable exit**

**Standard probes**

<table>
<thead>
<tr>
<th>Probe Code</th>
<th>Description</th>
<th>Measuring Range (mm)</th>
<th>N*</th>
<th>Bolt Retraction</th>
<th>Sealing Bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03210904</td>
<td>GT 21</td>
<td>± 2</td>
<td>0.63</td>
<td>mechanical</td>
<td>nitrile</td>
</tr>
<tr>
<td>03210905</td>
<td>GT 21</td>
<td>± 2</td>
<td>1.0</td>
<td>mechanical</td>
<td>nitrile</td>
</tr>
<tr>
<td>03210906</td>
<td>GT 21</td>
<td>± 2</td>
<td>1.6</td>
<td>mechanical</td>
<td>nitrile</td>
</tr>
<tr>
<td>03210907</td>
<td>GT 21</td>
<td>± 2</td>
<td>2.5</td>
<td>mechanical</td>
<td>nitrile</td>
</tr>
<tr>
<td>03210908</td>
<td>GT 21</td>
<td>± 2</td>
<td>4.0</td>
<td>mechanical</td>
<td>nitrile</td>
</tr>
<tr>
<td>03230957</td>
<td>GTL 21</td>
<td>± 2</td>
<td>0.63</td>
<td>mechanical</td>
<td>nitrile</td>
</tr>
<tr>
<td>03230972</td>
<td>GTL 211</td>
<td>± 2</td>
<td>0.63</td>
<td>vacuum</td>
<td>Viton</td>
</tr>
</tbody>
</table>

**High-precision standard probes**

<table>
<thead>
<tr>
<th>Probe Code</th>
<th>Description</th>
<th>Measuring Range (mm)</th>
<th>N*</th>
<th>Bolt Retraction</th>
<th>Sealing Bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03200935</td>
<td>GT 21 HP</td>
<td>± 0.2</td>
<td>0.63</td>
<td>mechanical</td>
<td>nitrile</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero, max. ± 25%. Valid in upright assembly position, with downward oriented measuring bolt, as well as in static measuring.

---

**Technical data sheets**

- GT 21
- GTL 21
- GTL 211
- GT 21 HP

---

**Lower stop of the measuring bolt**, adjustable from... to ex-factory mm µm µm µm ***

<table>
<thead>
<tr>
<th>Probe Code</th>
<th>Description</th>
<th>Measuring Range (mm)</th>
<th>N*</th>
<th>Bolt Retraction</th>
<th>Sealing Bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT 21</td>
<td></td>
<td>-2.2</td>
<td>0.01</td>
<td>0.02</td>
<td>0.2 ± 3 · L³</td>
</tr>
<tr>
<td>GTL 21</td>
<td></td>
<td>-2.2</td>
<td>0.01</td>
<td>0.02</td>
<td>0.2 ± 2.4 · L²</td>
</tr>
<tr>
<td>GTL 211</td>
<td></td>
<td>-2.2</td>
<td>0.01</td>
<td>0.01</td>
<td>0.07 + 0.4 · L</td>
</tr>
<tr>
<td>GT 21 HP</td>
<td></td>
<td>-2.2</td>
<td>0.01</td>
<td>0.01</td>
<td>0.07 + 0.4 · L</td>
</tr>
</tbody>
</table>

** Distance from electrical zero. *** Linearity related max. perm. errors (L in mm).
GT 22 and GTL 22 probes with radial cable exit

<table>
<thead>
<tr>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03210924 GT 22</td>
<td>± 2</td>
<td>0,63 vacuum nitrile</td>
<td></td>
</tr>
<tr>
<td>03210921 GT 22</td>
<td>± 2</td>
<td>0,16 vacuum nitrile</td>
<td></td>
</tr>
<tr>
<td>03210922 GT 22</td>
<td>± 2</td>
<td>0,25 vacuum nitrile</td>
<td></td>
</tr>
<tr>
<td>03210923 GT 22</td>
<td>± 2</td>
<td>0,4 vacuum nitrile</td>
<td></td>
</tr>
<tr>
<td>03210925 GT 22</td>
<td>± 2</td>
<td>1,0 mechanical nitrile</td>
<td></td>
</tr>
<tr>
<td>03210926 GT 22</td>
<td>± 2</td>
<td>1,6 mechanical nitrile</td>
<td></td>
</tr>
<tr>
<td>03210927 GT 22</td>
<td>± 2</td>
<td>2,5 mechanical nitrile</td>
<td></td>
</tr>
<tr>
<td>03210928 GT 22</td>
<td>± 2</td>
<td>4,0 mechanical nitrile</td>
<td></td>
</tr>
<tr>
<td>03230056 GTL 22</td>
<td>± 2</td>
<td>0,63 vacuum Viton</td>
<td></td>
</tr>
<tr>
<td>03230076 GTL 22</td>
<td>± 2</td>
<td>1 vacuum Viton</td>
<td></td>
</tr>
</tbody>
</table>

High-precision standard probes

<table>
<thead>
<tr>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230021 GT 22 HP</td>
<td>± 0,2</td>
<td>0,63 vacuum nitrile</td>
<td></td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero, max. ± 25%. Valid in upright assembly position, with downward oriented measuring bolt, as well as in static measuring.

** Distance from electrical zero.  *** Linearity related max. perm. errors. (L in mm).
**TESA Axial Probes with Long Retraction Travel**

**Standard Probes**

Universal inductive probes for common applications, especially those using multigauging devices.

- Long retraction travel to prevent the probe from being damaged.

LVDT probes compatible with measuring equipment from other makers also available on request.

### GT 27 probes with axial cable exit

<table>
<thead>
<tr>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230027 GT 27</td>
<td>± 2</td>
<td>0.63</td>
<td>mechanical</td>
</tr>
<tr>
<td>03230073 GT 271</td>
<td>± 2</td>
<td>0.63</td>
<td>vacuum</td>
</tr>
</tbody>
</table>

### GT 28 probes with radial cable exit

<table>
<thead>
<tr>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230026 GT 28</td>
<td>± 2</td>
<td>0.63</td>
<td>vacuum</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero, max. ±25%. Valid in upright assembly position, with downward oriented measuring bolt, as well as in static measuring.
## TESA Axial Probes with Extended Measuring Range

### Standard Probes
Designed for long travels and low resolutions – Specially suited for use on multigauging devices.

- Correction factor applied to get the true value is 2.5x (10x for the S probe version).

LVDT probes compatible with measuring equipment from other makers also available on request.

#### GT 61 probes with axial cable exit

<table>
<thead>
<tr>
<th>Standard probes</th>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230041</td>
<td>± 5</td>
<td>0.9</td>
<td>mechanical</td>
<td>Viton</td>
</tr>
<tr>
<td>032070041</td>
<td>± 5</td>
<td>0.9</td>
<td>mechanical</td>
<td>Viton</td>
</tr>
<tr>
<td>03230074</td>
<td>± 5</td>
<td>0.9</td>
<td>vacuum</td>
<td>Viton</td>
</tr>
</tbody>
</table>

#### GT 62 probes with radial cable exit

<table>
<thead>
<tr>
<th>Standard probes</th>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230042</td>
<td>± 5</td>
<td>0.9</td>
<td>vacuum</td>
<td>Viton</td>
</tr>
<tr>
<td>032070042</td>
<td>± 5</td>
<td>0.9</td>
<td>vacuum</td>
<td>Viton</td>
</tr>
<tr>
<td>032680861</td>
<td>± 5</td>
<td>0.16</td>
<td>mechanical</td>
<td>none</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero, max. ± 25%. Valid for upright assembly position, with downward oriented measuring bolt, as well as in static measuring.

### Technical Data Sheets

<table>
<thead>
<tr>
<th>Measuring bolt stops**</th>
<th>Lower stop (mm)</th>
<th>Upper stop (mm)</th>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT 61</td>
<td>−5.1</td>
<td>5.2</td>
<td>03200294</td>
</tr>
<tr>
<td>GT 611</td>
<td>−5.1</td>
<td>5.2</td>
<td>03200437</td>
</tr>
<tr>
<td>GT 62</td>
<td>−5.1</td>
<td>5.2</td>
<td>03200295</td>
</tr>
</tbody>
</table>

** Distance from electrical zero.  *** Linearity related max. perm. errors (L in mm).
**TESA Axial Probes with Measuring Bolt Activation by Pneumatic Pressure**

**Standard Probes**

These probes are intended for use with measuring devices providing full or half-assisted inspection routines.

LVDT probes compatible with measuring equipment from other makers also available on request.

---

**GT 212 probes with axial cable exit**

<table>
<thead>
<tr>
<th>Standard probes</th>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230060 GTL 212</td>
<td>± 1,5</td>
<td>1,2</td>
<td>▼ ▲ Vitrin</td>
</tr>
<tr>
<td>03230067 GTL 212-A</td>
<td>± 1,5</td>
<td>0,2</td>
<td>▼ ▲ none</td>
</tr>
</tbody>
</table>

---

**GT 222 probes with radial cable exit**

<table>
<thead>
<tr>
<th>Standard probes</th>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt sealing bellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230054 GTL 222</td>
<td>± 1,5</td>
<td>1,2</td>
<td>▼ ▲ Vitrin</td>
</tr>
<tr>
<td>03230063 GTL 222-A</td>
<td>± 1,5</td>
<td>0,2</td>
<td>▼ ▲ none</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero, max. ± 25%. Valid for upright assembly position, with downward oriented measuring bolt, as well as in static measuring

▼ Downward movement of the measuring bolt activated by pneumatic pressure.

▲ Upward movement of the measuring bolt activated under the spring force only.

---

## Technical data sheets

<table>
<thead>
<tr>
<th>GTL 212</th>
<th>0,7</th>
<th>1,0</th>
<th>3,2</th>
<th>0,015</th>
<th>0,02</th>
<th>0,2 ± 2,4 · L²</th>
<th>03200413</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTL 212-A</td>
<td>0,25</td>
<td>6,0</td>
<td>3,2</td>
<td>0,015</td>
<td>0,02</td>
<td>0,2 ± 2,4 · L²</td>
<td>03200430</td>
</tr>
<tr>
<td>GTL 222</td>
<td>0,7</td>
<td>1,0</td>
<td>3,2</td>
<td>0,015</td>
<td>0,02</td>
<td>0,2 ± 2,4 · L²</td>
<td>03200393</td>
</tr>
<tr>
<td>GTL 222-A</td>
<td>0,25</td>
<td>6,0</td>
<td>3,2</td>
<td>0,015</td>
<td>0,02</td>
<td>0,2 ± 2,4 · L²</td>
<td>03200422</td>
</tr>
</tbody>
</table>

*** Linearity related max. perm. errors (L in mm).
**TESA Long-Travel Probes with Measuring Bolt Activation by Pneumatic Pressure**

**Standard Probes**

Made for use with measuring devices providing full or half-assisted inspection routines.

LVDT probes compatible with measuring equipment from other makers also available on request.

**GT 272 probes with axial cable exit**

<table>
<thead>
<tr>
<th>Standard probes</th>
<th>Measuring range (mm)</th>
<th>Upper travel (mm)*</th>
<th>N**</th>
<th>Measuring bolt activation</th>
<th>Sealing below</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230061 GT 272</td>
<td>± 2</td>
<td>8,1</td>
<td>1,0</td>
<td>▼ ▲</td>
<td>Viton</td>
</tr>
<tr>
<td>03230068 GT 272-A</td>
<td>± 2</td>
<td>8,1</td>
<td>0,85</td>
<td>▼ ▲</td>
<td>none</td>
</tr>
</tbody>
</table>

* Travel from the electrical zero up to the upper stop.

**GT 282 probes with radial cable exit**

<table>
<thead>
<tr>
<th>Standard probes</th>
<th>Measuring range (mm)</th>
<th>Upper travel (mm)*</th>
<th>N**</th>
<th>Measuring bolt activation</th>
<th>Sealing below</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230053 GT 282</td>
<td>± 2</td>
<td>8,1</td>
<td>1,0</td>
<td>▼ ▲</td>
<td>Viton</td>
</tr>
<tr>
<td>03230069 GT 282-A</td>
<td>± 2</td>
<td>8,1</td>
<td>0,85</td>
<td>▼ ▲</td>
<td>none</td>
</tr>
</tbody>
</table>

* Travel from the electrical zero up to the upper stop.

**Nominal value at electrical zero; max. deviation ±25%. Valid in upright assembly position with downward oriented measuring bolt, as well as in static measuring.**

▼ Downward movement of the measuring bolt activated by pneumatic pressure.

▲ Upward movement of the measuring bolt activated under the spring force only.

---

**Air pressure (bar)**

- **GT 272**: 1.1, 1.5
- **GT 272-A**: 1.0, 6.0
- **GT 282**: 1.1, 1.5
- **GT 282-A**: 1.0, 6.0

<table>
<thead>
<tr>
<th>Probe</th>
<th>mm</th>
<th>μm</th>
<th>μm</th>
<th>μm***</th>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT 272</td>
<td>10,3</td>
<td>0,05</td>
<td>0,05</td>
<td>0,2 ± 3 · L³</td>
<td>03200414</td>
</tr>
<tr>
<td>GT 272-A</td>
<td>10,3</td>
<td>0,05</td>
<td>0,05</td>
<td>0,2 ± 3 · L³</td>
<td>03200431</td>
</tr>
<tr>
<td>GT 282</td>
<td>10,3</td>
<td>0,05</td>
<td>0,05</td>
<td>0,2 ± 3 · L³</td>
<td>03200390</td>
</tr>
<tr>
<td>GT 282-A</td>
<td>10,3</td>
<td>0,05</td>
<td>0,05</td>
<td>0,2 ± 3 · L³</td>
<td>03200432</td>
</tr>
</tbody>
</table>

*** Linearity related max. permissible errors (L in mm).
**TESA Probes with Extended Measuring Range and Bolt Activation by Pneumatic Pressure**

**Standard Probes**
Probes intended for use with measuring devices providing full or half-assisted inspection routines.
LVDT probes compatible with measuring equipment from other makers also available on request.

### GT 612 probes with axial cable exit

<table>
<thead>
<tr>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt activation</th>
<th>Sealing bellow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard probes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03230062 03230070</td>
<td>2.0</td>
<td>▼ ▲</td>
<td>Viton</td>
</tr>
</tbody>
</table>

### GT 622 probes with radial cable exit

<table>
<thead>
<tr>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt activation</th>
<th>Sealing bellow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard probes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03230055 03230071</td>
<td>2.0</td>
<td>▼ ▲</td>
<td>Viton</td>
</tr>
<tr>
<td>03230055 03230071</td>
<td>1.0</td>
<td>▼ ▲</td>
<td>none</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero, max. ± 25%. Valid in upright assembly position with downward oriented measuring bolt, as well as in static measuring.

▼ Downward movement of the measuring bolt activated by pneumatic pressure.
▲ Upward movement of the measuring bolt activated under the spring force only.

---

- **GT 612**: 8 mm dia. carbide ball tip, M2.5 thread.
- **GT 622**: ø 3 mm dia. carbide ball tip, M3 thread.
- Interchangeable insert with axial cable exit.
- Interchangeable insert with radial cable exit.
- Nickel-plated housing.
- Stainless steel measuring bolt, hardened.
- Viton bellows in high-resistance elastomer.

---

**DIN 32876 Part 1**
See in tables
Any position of use
8 mm dia. fixing shank.
Ball-bearing measuring bolt.
Both lower and upper stops are fixed.

Interchangeable insert with a 3 mm dia. carbide ball tip. M2.5 thread.
Cable length: 2 m.
5-pin DIN 45322 connector.
Nickel-plated housing.
Stainless steel measuring bolt, hardened.
Viton bellows in high-resistance elastomer.

- **Moved mass**: 8 g
- 13 kHz (± 5%) drive frequency. Highest mechanical frequency 60 Hz.
- 0.09 µm/°C
- 20 ± 0.5°C
- -10°C to 65°C
- 80%
- IP65 (IEC 60529) or IP50 for GT 612-A plus GT 622-A
- Shipping packaging
- Identification number
- Inspection report with a declaration of conformity

---

**GT 622**

- **GT 622-A**: 8 mm dia. carbide ball tip, M3 thread.
- Interchangeable insert with axial cable exit.
- Interchangeable insert with radial cable exit.

---

**GT 612-A**

- **GT 622-A**: ø 3 mm dia. carbide ball tip, M3 thread.
- Interchangeable insert with axial cable exit.
- Interchangeable insert with radial cable exit.

---

**Electronics Length Measuring Equipment - Analogue**

**Air pressure (bar)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Nominal</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT 612</td>
<td>1.1</td>
<td>1.5</td>
</tr>
<tr>
<td>GT 612-A</td>
<td>1.0</td>
<td>1.5</td>
</tr>
<tr>
<td>GT 622</td>
<td>1.1</td>
<td>1.5</td>
</tr>
<tr>
<td>GT 622-A</td>
<td>1.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>03200415</td>
</tr>
<tr>
<td>03200433</td>
</tr>
<tr>
<td>03200594</td>
</tr>
<tr>
<td>03200434</td>
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**Technical data sheets**

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<td>03200594</td>
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<tr>
<td>03200434</td>
</tr>
</tbody>
</table>
## TESA Axial Miniature Probes

### Standard probes

Compact probes specially designed for use where there’s no room for longer probes – Possible assembly on measuring heads for bore measurement and the like.

#### GT 41 and GT 43 probes with axial cable exit

<table>
<thead>
<tr>
<th>Measuring bolt hanging from a diaphragm spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230001 GT 41 ± 0.3 0.63 without nitrile</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring bolt mounted on a plain bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230035 GT 43 ± 1 0.4 mechanical Viton</td>
</tr>
</tbody>
</table>

#### GT 42 and GT 44 probes with radial cable exit

<table>
<thead>
<tr>
<th>Measuring bolt hanging from a diaphragm spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230002 GT 42 ± 0.3 0.63 vacuum nitrile</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring bolt mounted on a plain bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230017 GT 44 ± 1 0.4 vacuum Viton</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero, max. ±25%. Valid in upright assembly position with downward oriented measuring bolt, as well as in static measuring.

### Measuring bolt stops**

<table>
<thead>
<tr>
<th>Technical data sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>03200258</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GT 41</th>
<th>GT 42</th>
<th>GT 43</th>
<th>GT 44</th>
</tr>
</thead>
<tbody>
<tr>
<td>±0.3</td>
<td>±1.05</td>
<td>±0.3</td>
<td>±1.05</td>
</tr>
<tr>
<td>0.4</td>
<td>0.4</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>0.7</td>
<td>0.7</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

** Distance from electrical zero.  *** Linearity related max perm. errors (L in mm).
**TESA Axial Probes – Serie 490**

Probes with no brand name for TESA’s electronic equipment

Universal probes to suit common but constraining applications.

- 8 mm diameter probe body that can be clamped over its entire length.
- Measuring bolt mounted on a ball-bearing.
- Probe body made in steel, nickel-plated.
- Degree of protection to IP65.
- Flexible axial cable exit fitted with a steel spring to prevent the cable from breaking.

Other probes compatible with measuring equipment from other makers also available on request.

---

**Probe series 490 with axial/radial**

**电缆 exit**

<table>
<thead>
<tr>
<th>No.</th>
<th>Measuring range (mm)</th>
<th>N°</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230490</td>
<td>± 1,5</td>
<td>0,63</td>
<td>mechanical</td>
<td>Viton</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero; max. deviation ± 0,15 N. Valid in upright assembly position with downward oriented measuring bolt, as well as in static measuring. Also available upon request: Probes 410 with measuring force to 0,4, 1,0, 1,6, 2,5 or 4 N.

**Using the right angle adaptor that came with the probe.**

---

**Lower stop of the measuring bolt**, adjustable from...

<table>
<thead>
<tr>
<th></th>
<th>mm</th>
<th>μm</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TESA 490</td>
<td>-2</td>
<td>-1,7</td>
<td>4,3</td>
</tr>
</tbody>
</table>

*** Distance from electrical zero.

**** Linearity related max. perm. errors within the measuring span of 3 mm (measuring range ±1,5 mm).
Axial Probes with Short Body – Serie 410

Probes for TESA’s electronic equipment

Universal probes for common but constraining applications.
- 8 mm diameter probe body that can be clamped over its entire length.
- Ball bearing measuring bolt.
- Hardened steel body, hard-chrome plated.
- Degree of protection to IP62.
- Flexible axial cable exit fitted with a steel spring to prevent the cable from breaking.

Other probes compatible with measuring equipment from other makers also available on request.

---

** Probe series 410 with axial/radial cable exit**

<table>
<thead>
<tr>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction</th>
<th>Sealing bellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>96410012</td>
<td>± 1</td>
<td>0.6</td>
<td>mechanical nitrile</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero; max. deviation ± 0.15 N. Valid in upright assembly position, with downward oriented measuring bolt, as well as in static measuring. Also available upon request:
Probes 410 with measuring force to 1.0 or 1.6 N.
** Using the right angle adaptor that came with the probe.

---

Technical data sheet

- Lower stop of the measuring bolt ***, adjustable from...
- mm to mm ex-factory mm
- mm μm % ****
- *** Distance from electrical zero.
- **** Linearity related max. perm. errors; within the measuring span of 2 mm (measuring range ±1 mm).
Axial Probes with Short Body –
Series 160, 430 and 451

Probes for TESA’s electronic equipment

Their compact size and robust construction make them the ideal probes for a frequent use.

- 8 mm diameter probe body (6 mm for probe series 160) that can be clamped over its entire length.
- Chrome-plated, hardened steel body. Ball-bearing probe insert.

Other probes compatible with measuring equipment from other makers also available on request.

<table>
<thead>
<tr>
<th>Series 160 – Probes with short body, axial cable exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>96160013</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Series 430 – Miniature probes with axial cable exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>96430029</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Series 451 – Miniature probes with radial cable exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>96441041</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero; max. deviation ± 0.15 N. Valid in upright assembly position with downward oriented measuring bolt, as well as in static measuring.

- Measuring range mm
- N*
- Measuring bolt retraction
- Sealing bellows

** Measuring range mm

- Series 160:
  - 3 mm dia. tungsten carbide ball tip
  - 2 m long cable
  - DIN 45322 connector
- Series 430:
  - Hardened steel probe body, chrome plated
  - Measuring bolt in stainless steel, hardened
  - 2.5 g (series 160), 1.9 g (series 430), 3.0 g (series 451)
- Series 451:
  - 3.0 g (series 451)

- Force increase to 0.3 N/mm (series 160), 0.25 N/mm (series 430) or 0.15 N/mm (series 451)

- Lower stop of measuring bolt**:
  - Series 160:
    - 1.2 mm
  - Series 430:
    - 0.7 mm
  - Series 451:
    - 0.58 mm

- Technical data sheets

** Distance from electrical zero.

*** Linearity related max. perm. errors; within either of both measuring spans of 2 mm (measuring range ±1 mm) and 1 mm (measuring range ±0.5 mm).
Lever Probes – Series 420 and 499
Probes for TESA’s electronic equipment

Probe series 420
- Very short body that can be recessed into a fixture or a plug gauge.
- Probe insert mounted on leaf springs.

Probe series 499
- Parallel guiding of the measuring bolt moving in both probing directions.
- Interchangeable probe insert. Any of those having a varying length can equally be used with no influence on the leverage.
- Used where probes with measuring bolt moving lengthwise cannot easily be handled.
- Without switch-over feature for the probing direction.

Other probes compatible with measuring equipment from other makers also available on request.

---

Series 420 – Miniature lever probes
96420004 ± 0,15 1,8 ± 0,4

Series 499 – Lever probes with parallel guiding
96499007 ± 0,5 0,02 ± 0,2

Accessories for probe series 499

**N**

| **03238401** | Measuring insert | 0,8 | carbide | 12,3
| **03238402** | Measuring insert | 1,6 | carbide | 12,3
| **03238403** | Measuring insert | 3,2 | carbide | 12,3
| **03238411** | Measuring insert | 0,8 | carbide | 37,7
| **03238412** | Measuring insert | 1,6 | carbide | 37,7
| **03238413** | Measuring insert | 3,2 | carbide | 37,7
| **01840105** | Cylindrical clamp | 8 |

For other clamping items, report to page G-6.

* Nominal values at electrical zero. Valid in static measuring.
** Adjustable with probe housing and lever lying horizontally.
TESA GT 31 Lever Probes

Models with inclinable probe insert for measuring in two directions – Well suited for use where probes with measuring bolt moving lengthwise can not be conveniently operated.

- Ball-bearing balanced lever.
- Interchangeable probe insert fitted with a tungsten carbide ball tip, inclinable through to 180°.
- Automatic reversal of the probing direction while that of the indication remains unchanged.
- Protected against shocks by 2 safety clutches.
- One-piece housing provided with 2 dovetails.

<table>
<thead>
<tr>
<th>No.</th>
<th>Measuring range (mm)</th>
<th>N*</th>
</tr>
</thead>
<tbody>
<tr>
<td>03210802</td>
<td>GT 31 ± 0,3</td>
<td>0,1 (standard)</td>
</tr>
<tr>
<td>03210801</td>
<td>GT 31 ± 0,3</td>
<td>0,02</td>
</tr>
<tr>
<td>03210803</td>
<td>GT 31 ± 0,3</td>
<td>0,2</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero; max. deviation ±25%. Valid with probe housing and lever lying horizontally, as well as in static measuring.

Note

With the insert lying parallel to the workpiece surface (Fig. A), the leverage matches 1:1. Therefore, no correction of the measured values is needed.

Any other position (angle α, Fig. B) will change the effective lever length, so that read values must be corrected. With regard to this, also report to the instructions for use that came with your electronic probes.
**Accessories for TESA Probes GT 31**

**Probe inserts**

<table>
<thead>
<tr>
<th></th>
<th>Ball tip mm</th>
<th>Lever – amplification</th>
<th>Length L in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard probes with a one-piece shaft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03260402</td>
<td>1</td>
<td>1:1</td>
<td>32</td>
</tr>
<tr>
<td>03260410</td>
<td>2</td>
<td>1:1</td>
<td>32</td>
</tr>
<tr>
<td>03260403</td>
<td>3</td>
<td>1:1</td>
<td>32</td>
</tr>
<tr>
<td>Special probes with a two-piece shaft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03590002</td>
<td>1</td>
<td>1:1</td>
<td>32</td>
</tr>
<tr>
<td>03590003</td>
<td>2</td>
<td>1:1</td>
<td>32</td>
</tr>
<tr>
<td>03590004</td>
<td>3</td>
<td>1:1</td>
<td>32</td>
</tr>
<tr>
<td>03590005</td>
<td>4</td>
<td>1:1</td>
<td>32</td>
</tr>
<tr>
<td>03590006</td>
<td>1</td>
<td>1:2</td>
<td>72</td>
</tr>
<tr>
<td>03590007</td>
<td>2</td>
<td>1:2</td>
<td>72</td>
</tr>
<tr>
<td>03590008</td>
<td>3</td>
<td>1:2</td>
<td>72</td>
</tr>
<tr>
<td>03590009</td>
<td>4</td>
<td>1:2</td>
<td>72</td>
</tr>
</tbody>
</table>

**Fixing brackets**

03240100  Fixing brackets
Features both a dovetail and cylindrical bore.

---

*Stainless steel insert holder, tungsten carbide ball tip*
*Shipping packaging*
**Electronic Length Measuring Equipment - Analogue**

**TESA Probes with Parallel Guiding**

*Standard or protected FMS probes*

Universal probes for multigauging devices. Let you capture the values measured on machines or other fixtures for in-process inspection.

- Long-life probes featuring a small-size, rugged design.
- Modular construction to eliminate the need for many assembly components.
- Ball-bearing probe displacement.
- Direction of the probing force and probe retraction depending on used accessory.
- Wide variety of measuring inserts and supports for optimum adaptation to your measuring job.

Other probes compatible with measuring equipment from other makers also available on request.

---

**FMS probes with parallel cable exit**

![Diagram of FMS probe](image)

### Standard probes

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Type</th>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction (accessory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230019</td>
<td>FMS 100</td>
<td>± 2</td>
<td>2</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230049</td>
<td>FMS 130</td>
<td>± 2,9</td>
<td>2</td>
<td>air pressure</td>
</tr>
</tbody>
</table>

**Probes «FMS protected»**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Type</th>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction (accessory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230037</td>
<td>FMS 100-P</td>
<td>± 2</td>
<td>2</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230051</td>
<td>FMS 130-P</td>
<td>± 2,9</td>
<td>2</td>
<td>air pressure</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero; max. deviation ± 25%. Valid for probing movement exerted horizontally or in static measuring.

---

**Specifications**

- 13 kHz (± 5%) drive frequency.
- Linear ball-bearing guiding with fixed stops.
- Insert holder attachment with dovetail.
- Cable length: 2 m.
- 5-pin connector including a feature matching DIN 45322 for signal adjustment.

Other probes compatible with measuring equipment from other makers also available on request.
Electronic Length Measuring Equipment - Analogue

FMS probes with angled cable exit

<table>
<thead>
<tr>
<th>Standard probes</th>
<th>Measuring range (mm)</th>
<th>N*</th>
<th>Measuring bolt retraction (accessory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03230028 FMS 102</td>
<td>± 2</td>
<td>2</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230050 FMS 132</td>
<td>± 2,9</td>
<td>2</td>
<td>air pressure</td>
</tr>
<tr>
<td>Probes «FMS protected»</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03230038 FMS 102-P</td>
<td>± 2</td>
<td>2</td>
<td>air pressure</td>
</tr>
<tr>
<td>03230052 FMS 132-P</td>
<td>± 2,9</td>
<td>2</td>
<td>air pressure</td>
</tr>
</tbody>
</table>

* Nominal value at electrical zero; max. deviation ±25%. Valid for probing movement exerted horizontally or in static measuring.

- ** Mechanical stop**
- **Technical lower upper data sheets**

**Distance from electrical zero. ** Linearity related max. perm. errors (L in mm).
Configuration and Use of TESA FMS Probes

The following examples provide you with a number of possibilities to activate and retract the measuring insert during your measurement cycles.

**Example A**
- Moving the probe insert toward the part to be inspected using the measuring force produced through the compression spring.
- No insert’s retraction.

**Effect**
The insert remains in position. Exchanging parts is made with mechanical contact of the probe under the measuring force.

---

**Example B**
- Moving the probe insert toward the part to be inspected using the measuring force produced through the compression spring.
- Insert’s retraction by pneumatic pressure.

**Effect**
Exchanging parts is made with no mechanical contact of the probe.

---

**Example C**
- Activating the measuring insert towards the part to be inspected by air pressure using the measuring force produced by the compression spring.
- Insert’s retraction by disabling the pneumatic pressure.

**Effect**
Exchanging parts is made with no mechanical contact of the probe, thus providing absolute security since the probe insert retracts itself due to a lack of air pressure.

This configuration is also applied where there is no room on the left side for the pneumatic jack (as shown in the example B).

---

The force of the spring set (5) must be equivalent to the force of the auxiliary spring-loaded element (10).

---

**Fixed probe body**
**Moving probe body**
**Measuring element with fine adjust**
**Adjustable stop**
**Spring set for the measuring force**
**Mounting bores**
**Holder for the probe insert**
**Spring set for the measuring force**
**Pneumatic jack, No. 03260440**
**Connector (No. 024388, page O-41)**
**Spring set for the measuring force**
**Pneumatic jack, No. 03260440**
**Connector (No. 024388, page O-41)**
**Auxiliary spring-loaded element, No. 03260445**


**Accessories for TESA FMS Probes**

**Spring set for the measuring force**

<table>
<thead>
<tr>
<th>03260440</th>
<th>Pneumatic jack</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8 x 0.75</td>
<td></td>
</tr>
</tbody>
</table>

**Examples A to C**

<table>
<thead>
<tr>
<th>Item 5</th>
<th>N (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03260448</td>
<td>0.4 red</td>
</tr>
<tr>
<td>03260449</td>
<td>0.63 yellow</td>
</tr>
<tr>
<td>03260450</td>
<td>1.0 green</td>
</tr>
<tr>
<td>03260451</td>
<td>1.6 blue</td>
</tr>
<tr>
<td>03260452</td>
<td>2.5 brown</td>
</tr>
<tr>
<td>03260453</td>
<td>4.0 black</td>
</tr>
</tbody>
</table>

* Provided with FMS probes

**Shipping packaging**

**Accessories for Pneumatic Activation of the Mobile Probe Body**

**Auxiliary spring-loaded element**

<table>
<thead>
<tr>
<th>03260441</th>
<th>N (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03260442</td>
<td>0.4 red</td>
</tr>
<tr>
<td>03260443</td>
<td>0.63 yellow</td>
</tr>
<tr>
<td>03260444</td>
<td>1.0 green</td>
</tr>
<tr>
<td>03260445</td>
<td>1.6 blue</td>
</tr>
<tr>
<td>03260446</td>
<td>2.0 nickel-plated</td>
</tr>
<tr>
<td>03260447</td>
<td>2.5 brown</td>
</tr>
</tbody>
</table>

**Probe Insert Holder with Fine Adjustment**

Helps you to set the probe – Setting and locking screws remain accessible even when several probes are mounted side by side.

**Mounting bores for probe inserts**

<table>
<thead>
<tr>
<th>mm</th>
<th>Number</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>02630053</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>02630055</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>02630052</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>02630054</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

**Shipping packaging**

**Accessories for TESA FMS Probes**

**Spring set for the measuring force**

<table>
<thead>
<tr>
<th>03260440</th>
<th>Pneumatic jack</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8 x 0.75</td>
<td></td>
</tr>
</tbody>
</table>

**Examples A to C**

<table>
<thead>
<tr>
<th>Item 5</th>
<th>N (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03260448</td>
<td>0.4 red</td>
</tr>
<tr>
<td>03260449</td>
<td>0.63 yellow</td>
</tr>
<tr>
<td>03260450</td>
<td>1.0 green</td>
</tr>
<tr>
<td>03260451</td>
<td>1.6 blue</td>
</tr>
<tr>
<td>03260452</td>
<td>2.5 brown</td>
</tr>
<tr>
<td>03260453</td>
<td>4.0 black</td>
</tr>
</tbody>
</table>

* Provided with FMS probes

**Shipping packaging**

**Accessories for Pneumatic Activation of the Mobile Probe Body**

**Auxiliary spring-loaded element**

<table>
<thead>
<tr>
<th>03260441</th>
<th>N (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03260442</td>
<td>0.4 red</td>
</tr>
<tr>
<td>03260443</td>
<td>0.63 yellow</td>
</tr>
<tr>
<td>03260444</td>
<td>1.0 green</td>
</tr>
<tr>
<td>03260445</td>
<td>1.6 blue</td>
</tr>
<tr>
<td>03260446</td>
<td>2.0 nickel-plated</td>
</tr>
<tr>
<td>03260447</td>
<td>2.5 brown</td>
</tr>
</tbody>
</table>

**Probe Insert Holder with Fine Adjustment**

Helps you to set the probe – Setting and locking screws remain accessible even when several probes are mounted side by side.

**Mounting bores for probe inserts**

<table>
<thead>
<tr>
<th>mm</th>
<th>Number</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>02630053</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>02630055</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>02630052</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>02630054</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

**Shipping packaging**
### Fixed probe insert holder

Mounting bores for probe inserts

<table>
<thead>
<tr>
<th>Number</th>
<th>Position</th>
<th>Width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02630042</td>
<td>horizontal</td>
<td>2</td>
</tr>
<tr>
<td>02630043</td>
<td>vertical</td>
<td>1</td>
</tr>
<tr>
<td>02630045</td>
<td>horizontal</td>
<td>2</td>
</tr>
<tr>
<td>02630046</td>
<td>vertical</td>
<td>1</td>
</tr>
</tbody>
</table>

### Probe inserts with a 4 mm diameter mounting shaft

#### Centred probe inserts with a flat, right-angle measuring face

<table>
<thead>
<tr>
<th>Number</th>
<th>Material</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02660066</td>
<td>Carbide</td>
<td>12</td>
</tr>
<tr>
<td>02660068</td>
<td>Carbide</td>
<td>25</td>
</tr>
</tbody>
</table>

#### Off-centre probe inserts with a flat, right-angle measuring face

<table>
<thead>
<tr>
<th>Number</th>
<th>Material</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02660067</td>
<td>Carbide</td>
<td>12</td>
</tr>
<tr>
<td>02660069</td>
<td>Carbide</td>
<td>25</td>
</tr>
</tbody>
</table>

#### Centred probe inserts with 2 cylindrical measuring faces

<table>
<thead>
<tr>
<th>Number</th>
<th>Material</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02660070</td>
<td>Carbide</td>
<td>20</td>
</tr>
<tr>
<td>02660071</td>
<td>Carbide</td>
<td>40</td>
</tr>
<tr>
<td>02660072</td>
<td>Carbide</td>
<td>60</td>
</tr>
</tbody>
</table>

#### Probe inserts with a 2 mm dia. contact pin with spherical measuring face

<table>
<thead>
<tr>
<th>Number</th>
<th>Material</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02660073</td>
<td>Carbide</td>
<td>20</td>
</tr>
<tr>
<td>02660074</td>
<td>Carbide</td>
<td>40</td>
</tr>
<tr>
<td>02660075</td>
<td>Carbide</td>
<td>60</td>
</tr>
</tbody>
</table>

#### Inserts with a tungsten carbide ball tip

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02660076</td>
<td>3</td>
</tr>
<tr>
<td>02660077</td>
<td>3</td>
</tr>
<tr>
<td>02660078</td>
<td>3</td>
</tr>
<tr>
<td>02660079</td>
<td>5</td>
</tr>
<tr>
<td>02660080</td>
<td>5</td>
</tr>
<tr>
<td>02660081</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Off-centre probe inserts with a tungsten carbide ball tip

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02660084</td>
<td>5</td>
</tr>
<tr>
<td>02660085</td>
<td>5</td>
</tr>
<tr>
<td>02660086</td>
<td>5</td>
</tr>
</tbody>
</table>
**Probe inserts with a 6 mm diameter mounting shaft**

_Probe inserts with a carbide ball tip_  

<table>
<thead>
<tr>
<th>Code</th>
<th>Dia (mm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00760058</td>
<td>3</td>
<td>Tungsten carbide ball tip for grooves, nuts, centering shoulders etc.</td>
</tr>
<tr>
<td>00760059</td>
<td>5</td>
<td>Tungsten carbide ball tip for grooves, nuts, centering shoulders etc.</td>
</tr>
<tr>
<td>00760060</td>
<td>10</td>
<td>Tungsten carbide ball tip for grooves, nuts, centering shoulders etc.</td>
</tr>
</tbody>
</table>

_Probe inserts with a barrel-shaped measuring face for cylindrical bores. Also serve for determining the position of internal threads._  

<table>
<thead>
<tr>
<th>Code</th>
<th>Dia (mm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00760066</td>
<td>2,2</td>
<td>M3 × M16</td>
</tr>
<tr>
<td>00760067</td>
<td>4,5</td>
<td>M6 × M48</td>
</tr>
<tr>
<td>00760068</td>
<td>9,7</td>
<td>M12 × M150</td>
</tr>
</tbody>
</table>

_Probe inserts with a tungsten carbide disc for grooves, nuts, centering shoulders etc._  

<table>
<thead>
<tr>
<th>Code</th>
<th>Dia (mm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00760074</td>
<td>4,5</td>
<td>1</td>
</tr>
<tr>
<td>00760075</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>00760076</td>
<td>19</td>
<td>3</td>
</tr>
</tbody>
</table>

_TESATAST probe inserts with a tungsten carbide ball tip. M1.4 mounting thread._  

<table>
<thead>
<tr>
<th>Code</th>
<th>Dia (mm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01860201</td>
<td>1</td>
<td>12.53</td>
</tr>
<tr>
<td>01860202</td>
<td>2</td>
<td>12.53</td>
</tr>
<tr>
<td>01860203</td>
<td>3</td>
<td>12.53</td>
</tr>
<tr>
<td>01860307</td>
<td>Wrench</td>
<td></td>
</tr>
</tbody>
</table>

_Probe insert with small cylindrical measuring face_  

<table>
<thead>
<tr>
<th>Code</th>
<th>Dia (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00760082</td>
<td>Carbide</td>
</tr>
</tbody>
</table>

_Centred probe insert with a small flat, right angle measuring face_  

<table>
<thead>
<tr>
<th>Code</th>
<th>Dia (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S26074380</td>
<td>Carbide</td>
</tr>
</tbody>
</table>

_Probe inserts with one flat and one spherical measuring faces_  

<table>
<thead>
<tr>
<th>Code</th>
<th>Dia (mm)</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>025589</td>
<td>Carbide</td>
<td>64</td>
</tr>
</tbody>
</table>

_Universal probe insert holder specially designed for various types of clamps_  

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S26074372</td>
<td>1 x Ø 4 mm</td>
</tr>
<tr>
<td></td>
<td>1 x Ø 6 mm</td>
</tr>
<tr>
<td></td>
<td>2 M1.4 threads</td>
</tr>
<tr>
<td></td>
<td>2 M2.5 threads</td>
</tr>
</tbody>
</table>

_Universal probe insert holder with 2 mounting threads_  

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00760096</td>
<td>M1.4, M2.5</td>
</tr>
</tbody>
</table>

**Electronic Length Measuring Equipment - Analogue**
**Probes with offset measuring face**

Probes with a flat, right-angle measuring face in tungsten carbide, whether centred or offset.

<table>
<thead>
<tr>
<th>#</th>
<th>Item</th>
<th>Material</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown opposite

- 02630047: 1
- 02630048: 2
- 02630049: 3
- 02630050: 4
- 02630051: 5

**Measuring Inserts for Axial Probes, Dial Gauges and the Like**

**Models with a M2,5 mounting thread**

- **Standard probe inserts with a ball tip**
  - 03510001: Steel 6
  - 03510002: Carbide 6

- **Probe inserts with a spherical measuring face**
  - 03510101: Steel 5
  - 03510102: Carbide 5

- **Probe insert with 4 interchangeable steel pins. Spherical face, R = 1.5 mm**
  - 03510201: Steel 16, 26, 36, 46

- **Probe inserts with a ball-bearing steel roller. Counternut for radial alignment.**
  - 03560010: Steel cylindrical
  - 03560011: Steel domed

- **Off-centre probe insert (A) with pointed measuring face. Counternut for radial alignment.**
  - 03510401: Steel 6,5

- **Probe insert with cylindrical measuring face. Counternut for radial alignment.**
  - 03510502: Carbide
**Offset probe insert with a narrow measuring face. Counternut for radial alignment.**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Material</th>
<th>B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03510602</td>
<td>Carbide</td>
<td>0,5</td>
</tr>
</tbody>
</table>

**Probe insert with a narrow measuring face, parallel adjustable. Counternut for radial alignment.**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Material</th>
<th>B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03510702</td>
<td>Carbide</td>
<td>0,5</td>
</tr>
</tbody>
</table>

**Probe insert with a flat measuring face, parallel adjustable. Counternut for radial alignment.**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Material</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>03510902</td>
<td>Carbide</td>
<td>2,5</td>
</tr>
</tbody>
</table>

**Probe inserts with a flat measuring face**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Material</th>
<th>D (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03510801</td>
<td>Steel</td>
<td>2,5</td>
</tr>
<tr>
<td>03510802</td>
<td>Carbide</td>
<td>2,5</td>
</tr>
<tr>
<td>03560022</td>
<td>Steel</td>
<td>3,4</td>
</tr>
<tr>
<td>03560023</td>
<td>Carbide</td>
<td>3,4</td>
</tr>
</tbody>
</table>

**Extensions for probe inserts**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>L (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03540501</td>
<td>10</td>
</tr>
<tr>
<td>03540502</td>
<td>15</td>
</tr>
<tr>
<td>03540503</td>
<td>20</td>
</tr>
<tr>
<td>03540504</td>
<td>40</td>
</tr>
</tbody>
</table>

**Additional probe inserts as well as extensions with M2,5 coupling thread as listed on the pages F-42 to F-44.**

**Probe Inserts with a M2 Coupling Thread for GT 43 and GT 44 Miniature Probes as well as Probes with Short Body, Series 160**

**Probe inserts with spherical measuring face. Also with a M2 thread.**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Material</th>
<th>R (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03510204</td>
<td>Carbide</td>
<td>1</td>
</tr>
<tr>
<td>03510203</td>
<td>Carbide</td>
<td>5</td>
</tr>
</tbody>
</table>

**Probe inserts with a spherical measuring face (R5). Also with a M2 thread.**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Material</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>03510202</td>
<td>Carbide</td>
<td>16</td>
</tr>
<tr>
<td>03510203</td>
<td>Carbide</td>
<td>26</td>
</tr>
</tbody>
</table>

**Probe insert with cylindrical measuring face. Counternut for radial alignment. M2 thread.**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>03510503</td>
<td></td>
</tr>
</tbody>
</table>

**Extensions for inserts with a M2 thread**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>L (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03540505</td>
<td>10</td>
</tr>
<tr>
<td>03540506</td>
<td>15</td>
</tr>
</tbody>
</table>
**Accessories for TESA Probes**

### Spring Sets for Axial Probes

<table>
<thead>
<tr>
<th>N°</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probes GT 22 and GTL 22</td>
<td></td>
</tr>
<tr>
<td>03260419</td>
<td>0.16</td>
</tr>
<tr>
<td>03260420</td>
<td>0.25</td>
</tr>
<tr>
<td>03260421</td>
<td>0.40</td>
</tr>
<tr>
<td>Probes GT 21, GT 22, GTL 21, GTL 22 plus probe series 490</td>
<td></td>
</tr>
<tr>
<td>03260457</td>
<td>0.63</td>
</tr>
<tr>
<td>03260422</td>
<td>1.0</td>
</tr>
<tr>
<td>03260423</td>
<td>1.6</td>
</tr>
<tr>
<td>03260424</td>
<td>2.5</td>
</tr>
<tr>
<td>03260425</td>
<td>4.0</td>
</tr>
</tbody>
</table>

### Spare Bellows for Axial Probes

Complete set with safety ring and washer

<table>
<thead>
<tr>
<th>N°</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probes GT 21, GT 22, GTL 21, GTL 22 plus probe series 490</td>
<td></td>
</tr>
<tr>
<td>03260468</td>
<td>nitrile</td>
</tr>
<tr>
<td>03260470</td>
<td>Viton</td>
</tr>
<tr>
<td>Probes GTL 212 and GTL 222</td>
<td></td>
</tr>
<tr>
<td>03260489</td>
<td>Viton</td>
</tr>
</tbody>
</table>

Bellows supplied individually

Probes GT 43 and GT 44

037608 Viton

### Extension Cable

<table>
<thead>
<tr>
<th>N°</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>03240201</td>
<td>1</td>
</tr>
<tr>
<td>03240202</td>
<td>2</td>
</tr>
<tr>
<td>03240203</td>
<td>3</td>
</tr>
</tbody>
</table>

Other cable lengths available on request

---

All values given in the table for the measuring force equal nominal values at electrical zero; max. deviation ± 25%. Valid for upright assembly position with downward oriented measuring bolt, as well as in static measuring.

Plastic sleeve marked with force related data.

Shipping packaging.

---

Nitile: resistant synthetic sealing for normal use.

Viton: high-resistance synthetic sealing used where probes are permanently exposed to cooling and lubricating agents.

Safety rings plus washer.

Shipping packaging.

---

For high accuracy requirements, we recommend to adjust each part of your measuring equipment all together.

Shipping packaging.
**Clamping Elements for Axial Probes**

Provided with 3 clamping faces – Prevent the metrology properties of the guiding system from being altered due to possible distortion.

**VKD clamp screw**

- **No**: 02611013
- **M4**

**VKE clamp**

- **No**: 02611014
- **8 mm**

**Clamp collar**

- **No**: 01860401
- **5.6 or 9.5 in diameter with dovetail**

**VDE clamps with fastening sleeve and screw included**

- **No**: 02660048
- **8 mm**

**Manually Operated Devices for Retracting the Measuring Bolt**

- **No**: 03540104
  - **Mechanical retraction device**
  - Consisting of:
    - 03540101: 1 Lift lever
    - 03540102: 1 Washer

- **No**: 03260401
  - **Pneumatic retraction device**
  - Suited for probes GT 22, 271, 28, 42, 44, 611, 62 – GTL 211, 22
  - Consisting of:
    - 1 Hand-operated vacuum pump
    - 03540405: 1 Air tube, 4.7 mm in diameter, 1 m long
Electropneumatic Systems for Activating the Measuring Bolt

Electropneumatic vacuum pump
For lifting up to 20 measuring bolts simultaneously with a measuring force up to 0.63 N

03260432 Operated via the mains powered foot switch
03260433 Externally controlled

FMS-C electropneumatic vacuum pump
Uses vacuum or air pressure; allows simultaneous connection of up to 30 TESA probes. Ideal for use with FMS probes with parallel guiding.

03260486 Controlled electrically through a TESA’s electronic unit or manually

Air tube connectors for TESA probes
GT 22, 271, 28, 42, 44, 611, 62 – GTL 211, 22
M4 coupling threads; suited for a 4.7 / 2 mm dia. air pipe (No. 03540405)

03560000 straight
03560002 angled

Air tube connectors for TESA FMS probes
M5 coupling threads; suited for a 4.7 / 2 mm dia. air pipe (No. 03540405)

026522 straight
024388 angled

Connecting T-piece
For air pipe diameter

03540403 Ø 4.7 / Ø 2 mm (No. 03540405)

Vacuum release delay valve
For controlling the lowering speed of axial probes

03540404 Ø 4.7 / Ø 2 mm (No. 03540405)
### TESATRONIC Length Measuring Instruments – General Overview

Dedicated compact units having either an analogue or a numerical display – Usually applied in association with precision handtools or on stationary devices for shop floor inspection and maintenance, but also in the measuring room.

---

#### TESATRONIC Length Measuring Instruments

<table>
<thead>
<tr>
<th>Model</th>
<th>TT 10</th>
<th>TT 20</th>
<th>TT 60</th>
<th>TT 80</th>
<th>TT 90</th>
<th>TTA 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>04430008</td>
<td>04430009</td>
<td>04430010</td>
<td>04430011</td>
<td>04430012</td>
<td>04430003</td>
</tr>
<tr>
<td>Number of probe inputs</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>– Automatic recognition</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Number of measuring ranges</td>
<td>3 ± 5 µm</td>
<td>7 ± 5 µm</td>
<td>7 ± 5 µm</td>
<td>9 ± 0,5 µm</td>
<td>9 / 6 ± 0,5 µm</td>
<td>6 ± 3 µm</td>
</tr>
<tr>
<td>– Lowest value</td>
<td>± 500 µm</td>
<td>± 5000 µm</td>
<td>± 5000 µm</td>
<td>± 5000 µm</td>
<td>± 5000 / ± 100 µm</td>
<td>± 1000 µm</td>
</tr>
<tr>
<td>– Highest value</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>– Zoom function (5x)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>– Automatic conversion</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Digital display</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>—</td>
</tr>
<tr>
<td>Numerical interval – lowest value</td>
<td>0,1 µm</td>
<td>0,1 µm</td>
<td>0,1 µm</td>
<td>0,1 µm</td>
<td>0,1 µm</td>
<td>0,01 / 0,001 µm</td>
</tr>
<tr>
<td>– highest value</td>
<td>10 µm</td>
<td>10 µm</td>
<td>10 µm</td>
<td>10 µm</td>
<td>10 µm</td>
<td>—</td>
</tr>
<tr>
<td>Analogue display</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Scale value</td>
<td>0,2 µm</td>
<td>0,2 µm</td>
<td>0,2 µm</td>
<td>0,2 µm</td>
<td>0,2 µm</td>
<td>0,1 µm</td>
</tr>
<tr>
<td>– lowest value</td>
<td>200 µm</td>
<td>200 µm</td>
<td>200 µm</td>
<td>200 µm</td>
<td>200 / 10 µm</td>
<td>50 µm</td>
</tr>
<tr>
<td>– highest value</td>
<td>10 µm</td>
<td>200 / 10 µm</td>
<td>200 / 10 µm</td>
<td>200 / 10 µm</td>
<td>200 / 10 µm</td>
<td>—</td>
</tr>
<tr>
<td>Metric/Inch unit systems</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Value classification</td>
<td>—</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>– Number of classes</td>
<td>3</td>
<td>&gt; 42</td>
<td>&gt; 42</td>
<td>&gt; 42 / —</td>
<td>—</td>
<td>3</td>
</tr>
<tr>
<td>– Signal outputs</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Memory</td>
<td>—</td>
<td>—</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>—</td>
</tr>
<tr>
<td>Analogue output</td>
<td>—</td>
<td>—</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Power supply</td>
<td>Batteries</td>
<td>Adapter</td>
<td>Adapter</td>
<td>Adapter</td>
<td>Adapter</td>
<td>Mains</td>
</tr>
</tbody>
</table>
TESATRONIC TT 10

Pocket-sized, battery-operated electronic unit for use on the move – Perfect for your measurement tasks on the surface plate, in the inspection room right next to the production floor or directly on the machine – Provides full portability where there’s no room for cumbersome power cable.

- Simple-to-use function keys used in conjunction with the combined analogue/digital indication providing easy reading.
- LCD, pointerless display for high repeatability and negligible hysteresis.
- 3 measuring ranges, switchable manually or automatically depending on the size of the measured value.
- Metric and inch conversion.
- Additional signal amplification (5x) for easy display setting.
- Quick zero-setting through to digital technology.
- Signal input for one probe.
- Opto-coupled RS 232 compatible digital output.

Electronic measuring unit with both analogue and numerical display; 3 measuring ranges, switchable from metric to inch; 1 probe input; RS 232 data output.

Provided with following accessories:
- 04768002 3 batteries, 1.5 V, type LRC 6, AA
- 04460007 1 Visual template for value classification

Measuring ranges with numerical intervals

<table>
<thead>
<tr>
<th>1</th>
<th>without</th>
<th>measuring</th>
<th>μm</th>
<th>μm</th>
<th>in</th>
<th>in</th>
</tr>
</thead>
<tbody>
<tr>
<td>5x</td>
<td>setting</td>
<td>± 500</td>
<td>10</td>
<td>± 0.025</td>
<td>0.0005</td>
<td>0.0001</td>
</tr>
<tr>
<td>2</td>
<td>without</td>
<td>measuring</td>
<td>± 50</td>
<td>1</td>
<td>± 0.0025</td>
<td>0.0005</td>
</tr>
<tr>
<td>5x</td>
<td>setting</td>
<td>± 10</td>
<td>0.2</td>
<td>± 0.0005</td>
<td>0.00001</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>without</td>
<td>measuring</td>
<td>± 5</td>
<td>0.1</td>
<td>± 0.00025</td>
<td>0.00005</td>
</tr>
</tbody>
</table>

*With reference to 20°C as well as a relative humidity of ± 50%..
TESATRONIC TT 20, TT 60, TT 80 and TT 90

Feature most advanced technology – Provide functional reliability – Simple to use – Essential for shop floor inspection or in the measurement laboratory.

TESATRONIC TT 20
Includes a combined analogue/numerical display – Two probe inputs for single, sum or difference measurements.

- Large LC display for error-free reading.
- Better repeatability and negligible hysteresis as the analogue display has no mechanical pointer.
- Choice between pointer or bargraph.
- All measuring functions are readable on the LC display.
- 7 measuring ranges, selectable manually or automatically according to the size of the measured value.
- Direct conversion from metric to inch units.
- Zeroing with just one touch button for each measuring channel.
- Setting of tolerances over the keyboard.
- 3 quality classes displayed through LEDs with control signal outputs.
- Lockable display for step by step measurement routines.
- Automatic recognition of the connected TESA’s probe with direct adaptation of the measurement signals to the right output (only for TESA probes made in 1997 or later).
- Opto-coupled RS 232 output, bidirectional.
- Power supply through mains adapter.

TESATRONIC TT 60
Same features as TESATRONIC TT 20, but with added functions that include:

- Memory for retaining extreme values «max.», «min.», «max.-min.» along with mean value obtained from «max.» minus «min.».
- Dynamic measurement with acquisition of more than 100 single values/s.
- Value classification with output signals through contact relay for 5, 10, 20 or 40 good classes.
- Remote signal processing using the analogue output.

* With reference to 20°C as well as a relative humidity of ≤ 50%.
### Electronic Length Measuring Equipment - Analogue

**Additional data on TESATRONIC TT 20**
- Response time* of analogue display with pointer and digital display: ≤ 80 ms.
- Holding time of digital display: 80 ms.
- Frequency limit for all displays with reference to the input: 12.5 Hz.
- Limit value* for analogue display: ≤ 2%.
- Digital display and output: ± 0.3%.
- Dwell frequency: 13 ±0.65 kHz.

*With reference to 20°C as well as a relative humidity of ≤ 50%.

**Additional data on TESATRONIC TT 60**
- Response time* of analogue display with pointer and digital display: ≤ 80 ms.
- Holding time of digital display: 80 ms.
- Response time of analogue signal output with reference to the analogue display: ≤ 30 ms.
- Response time of the LEDs used for value classification: ≤ 80 ms.
- Frequency limit for all displays with reference to the signal input: 12.5 Hz.
- Frequency limit with reference to the signal input: 20 Hz for the analogue output or 100 Hz for the memory.
- Limit value* for analogue display: ≤ 2%.
- Digital display, analogue and digital outputs: ± 0.3%.
- Voltage range: ± 2 V up to ±10 V.

*With reference to 20°C as well as a relative humidity of ≤ 50%.

#### Measuring ranges along with scale divisions or numerical intervals (TESATRONIC TT 20 and TT 60)

<table>
<thead>
<tr>
<th>µm</th>
<th>µm</th>
<th>µm</th>
<th>in</th>
<th>in</th>
<th>in</th>
</tr>
</thead>
<tbody>
<tr>
<td>± 5000</td>
<td>0.1</td>
<td>200</td>
<td>± 0.200</td>
<td>0.000005</td>
<td>0.01</td>
</tr>
<tr>
<td>± 2000</td>
<td>0.1</td>
<td>100</td>
<td>± 0.100</td>
<td>0.000005</td>
<td>0.005</td>
</tr>
<tr>
<td>± 500</td>
<td>0.1</td>
<td>20</td>
<td>± 0.02</td>
<td>0.000005</td>
<td>0.001</td>
</tr>
<tr>
<td>± 200</td>
<td>0.1</td>
<td>10</td>
<td>± 0.01</td>
<td>0.000005</td>
<td>0.0005</td>
</tr>
<tr>
<td>± 50</td>
<td>0.1</td>
<td>2</td>
<td>± 0.002</td>
<td>0.000005</td>
<td>0.0001</td>
</tr>
<tr>
<td>± 20</td>
<td>0.1</td>
<td>1</td>
<td>± 0.001</td>
<td>0.000005</td>
<td>0.00005</td>
</tr>
<tr>
<td>± 5</td>
<td>0.1</td>
<td>0.2</td>
<td>± 0.0002</td>
<td>0.000005</td>
<td>0.00001</td>
</tr>
</tbody>
</table>

**04430009 TESATRONIC TT 20**
Electronic length measuring unit with both analogue and digital display; 7 measuring ranges, switchable from metric to inch; value classification with 1 good class; signal output through contact relay; 2 probe inputs; RS 232 data output.

**04430010 TESATRONIC TT 60**
Same features as model TT 20, but with added memory; dynamic measuring and signal output through contact relay for 5, 10, 20 or 40 good classes; analogue output.

Delivery includes the following items:
- 04761054 1 Mains adapter, 100 to 240 Vac, 50 to 60 Hz, 6.6 Vdc, 750 mA
- 04761055 1 Adapter cable EU

**Optional accessory**
Adapter for 5, 10, 20 or 40 classes available on request.
TESATRONIC TT 80 / TT 90

High resolution electronic units – Combined analogue/digital display – Two probe inputs for single, sum and difference measurements.

Both models have the same features as TESATRONIC TT 20 besides additional ones, i.e.:

- 9 measuring ranges with numerical interval to 0,01 µm or 0.000001 in.
- Memory for storing each extreme value «max.», «min.», «max. minus min.» plus the mean of both values «max.» and «min.».
- Dynamic measurement with acquisition of more than 10 single values per second.
- Value classification with output signals through contact relay for 5, 10, 20 or 40 good classes.
- Remote signal processing through the analogue output.

The specifications of the switchable TESATRONIC TT 90 are identical to those of the TT 80 model or the UPC mode, except for the following added features:

- 6 measuring ranges with numerical interval to 0,001 µm or 0.5 µin.
- Output for the control of the bolt retraction.
- Selectable waiting period for temperature stabilisation between the measurement cycles.
- RS data output for all values to the micron.

04430011 TESATRONIC TT 80
High-resolution electronic length measuring unit featuring a combined analogue/digital display. RS 232 interface with analogue output.

04430012 TESATRONIC TT 90
Same as the TT 80 model, except for the specific UPC mode providing improved resolution and additional external controls.

Furnished with:
04761054 1 Mains adapter, 100 to 240 Vac, 50 to 60 Hz, 6.6 Vdc, 750 mA
04761055 1 Mains adapter EU

Optional accessories
Adapter for 5, 10, 20 or 40 good classes available on request. Accessories for UPC applications, see page L-11.

Measuring ranges with scale divisions or numerical intervals

<table>
<thead>
<tr>
<th>TT 80 / TT 90</th>
<th>TT 90 switched to the UPC mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>µm / in</td>
<td>µm / pin</td>
</tr>
<tr>
<td>± 5000 / ± 0.200</td>
<td>0.01 / 1</td>
</tr>
<tr>
<td>± 2000 / ± 0.100</td>
<td>0.01 / 1</td>
</tr>
<tr>
<td>± 500 / ± 0.020</td>
<td>0.01 / 1</td>
</tr>
<tr>
<td>± 20 / ± 0.002</td>
<td>0.01 / 1</td>
</tr>
<tr>
<td>± 2 / ± 0.0002</td>
<td>0.01 / 1</td>
</tr>
<tr>
<td>± 0.5 / ± 0.00002</td>
<td>0.01 / 1</td>
</tr>
</tbody>
</table>

*With reference to 20°C as well as a relative humidity of ± 50%.
**TESATRONIC TTA 20**

Compact design with analogue indication and value classification facility – Aluminium housing for harsh shop floor environment – Easy Handling.

- Easy-to-read analogue display with mirror strip in order to avoid parallax error.
- 6 measuring ranges.
- Metric/inch conversion.
- Easy display setting through electrical zero.
- 2 probe inputs for single, sum or difference measurements.
- 1 auxiliary signal input, e.g. for all correction values.
- LEDs for signalling the relevant quality class with green for «Good», yellow for «Rework» and red for «Scrap».
- Potentiometer for setting limit deviations.
- Polarity selector switch for the classification signals (internal or external dimensions).
- Switch for locking or unlocking a displayed value.
- Analogue output for the connection of a remote displaying or scribing unit.

**Measuring ranges and scale divisions**

<table>
<thead>
<tr>
<th>µm</th>
<th>µm</th>
<th>in</th>
<th>in</th>
</tr>
</thead>
<tbody>
<tr>
<td>± 1000</td>
<td>50</td>
<td>± 0.1</td>
<td>0.005</td>
</tr>
<tr>
<td>± 300</td>
<td>10</td>
<td>± 0.03</td>
<td>0.001</td>
</tr>
<tr>
<td>± 100</td>
<td>5</td>
<td>± 0.01</td>
<td>0.0005</td>
</tr>
<tr>
<td>± 30</td>
<td>1</td>
<td>± 0.003</td>
<td>0.0001</td>
</tr>
<tr>
<td>± 10</td>
<td>0.5</td>
<td>± 0.001</td>
<td>0.00005</td>
</tr>
<tr>
<td>± 3</td>
<td>0.1</td>
<td>± 0.0003</td>
<td>0.00001</td>
</tr>
</tbody>
</table>

* With reference to 20°C as well as a relative humidity of ± 50%.
**TESA Probe Interface Boxes**

Modular system that consists of three basic models acting as probe interfaces for the preparation and further transmission of the measurement signals to a computer, whether in their digital or analogue form – All models are key components for multigauging fixtures applied in centralised process control.

**BPI Series**

Signal inputs – TESA standard probes (half-bridge)

Signal outputs – RS 232 digital outputs

- Direct connection to the computer’s serial port.
- Programmable operating functions over the integrated microprocessor.
- Possible connection of up to 64 probes for optimum adaptation to your metrology applications.
- High functional reliability and precision.
- Total immunity to negative environmental effects, e.g. electrical interferences, liquid and solid contaminants.

### TESA Probe Interface Boxes

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of probe inputs</th>
<th>Number of control inputs/outputs</th>
<th>Integrated power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPIA 81</td>
<td>8</td>
<td>6/8</td>
<td>-</td>
</tr>
<tr>
<td>BPI 161</td>
<td>16</td>
<td>6/8</td>
<td>-</td>
</tr>
<tr>
<td>BPI 88</td>
<td>8*</td>
<td>6/8</td>
<td>-</td>
</tr>
</tbody>
</table>

* Each measurement signal includes a demodulator.
### Accessories for BPI series

<table>
<thead>
<tr>
<th>No.</th>
<th>Number of inputs/outputs</th>
<th>Power supply</th>
<th>mm</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPIA 81</td>
<td>6 / 8</td>
<td>220 ± 240 Vac, 100 ± 120 Vac, 50 ± 60 Hz, 25 VA</td>
<td>94 x 322 x 134</td>
<td>2,5</td>
</tr>
<tr>
<td>BPI 161</td>
<td>6 / 8</td>
<td>Via BPA 40</td>
<td>94 x 322 x 134</td>
<td>2,1</td>
</tr>
<tr>
<td>BPI 88</td>
<td>6 / 8</td>
<td>Via BPA 40</td>
<td>94 x 322 x 134</td>
<td>2,1</td>
</tr>
<tr>
<td>BPA 40</td>
<td></td>
<td>115 ± 230 Vac ± 20%, 50 ± 60 Hz, 140 VA</td>
<td>94 x 322 x 134</td>
<td>2,4</td>
</tr>
</tbody>
</table>

#### Connecting cables

<table>
<thead>
<tr>
<th>No.</th>
<th>Number of pins</th>
<th>Connecting cables</th>
<th>mm</th>
<th>Number of pins</th>
</tr>
</thead>
<tbody>
<tr>
<td>05060007</td>
<td>0,3</td>
<td>BPI – BPI</td>
<td></td>
<td>25 / 9</td>
</tr>
<tr>
<td>05060008</td>
<td>2</td>
<td>BPI – PC</td>
<td></td>
<td>25 / 9</td>
</tr>
<tr>
<td>05060003</td>
<td>2</td>
<td>BSF 10: Stacking set for BPI 88 and BPI 161 interface boxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05060002</td>
<td>5</td>
<td>BSF 20: Stacking set for both BPA 40 and BPIA 81 power units</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**USB Interface**

Allows for a quick and easy connection to any TESA’s standard probe to a USB port.

- **Signal inputs**: TESA standard probes (Half-bridge)
- **Signal outputs**: digital

---

**M4P-2 series**

- **Signal inputs**: TESA standard probes (Half-bridge)
- **Signal outputs**: analogue
  - System for connecting 32 TESA standard probes
  - Can be linked to a PC through the A/D transducer

---

**03260500** USB-Adapter

- ± 2 mm
- 73,75
- 0.3% ± 0.1 µm*
- ± 0.01%/°C*

**03260501** USB-Adapter

- ± 5 mm
- 29,5
- 0.3% ± 0.1 µm*
- ± 0.01%/°C*

* With reference to the temperature of 20°C and relative humidity of ≤ 50%.

**Note**: Total deviation must include that of both the standard probe and adapter.

---

**S48001721** M4P-2

- Probe interface
- 4 probe inputs with a demodulator included
- Sensitivity: 73.75 mV/V/mm
- Analogue outputs: ± 1 V/mm, ± 2.5 V/mm, ± 5 V/mm and ± 10 V/mm

Width: 36 x 100 x 120

- 0.6 kg

**S48001722** R2M-1

- Rack housing including 2 M4P-2 probe interfaces
- 2 x 4 = 8 probe inputs

Width: 55 x 212 x 144

- 0.9 kg

**S48001723** R4M-1

- Rack housing including 4 M4P-2 probe interfaces
- 4 x 4 = 16 probe inputs

Width: 160 x 212 x 144

- 1.2 kg

**S48001724** MA4-2

- Power unit
- 230 ± 10% Vac, 50 Hz
- Output voltage: ± 15 V for 32 probes

Width: 85 x 222 x 146

- 1.1 kg

**S48001731** MA4-2

- Power unit
- 110 ± 10% Vac, 60 Hz
- Output voltage: ± 15 V for 32 probes

Width: 85 x 222 x 146

- 1.1 kg

**Accessories**

**S48001725** CB37-1

- Connection cable to host computer, 2 m long
- Provided with two connectors, 37-pin male/female

---

**0.5% with reference to the measuring span**

**± 100 ppm/°C, stability at zero = ± 0.2 µm/°C**

**± 10 to ± 15 Vdc, 60 mA**

**± 15 °C to 40 °C**

**± 10% to 70% (non-condensing)**

**IP50 (IEC 60529)**

**USB Interface**

Allows for a quick and easy connection to any TESA’s standard probe to a USB port.

**Design**

- USB-Adapter
- 4 probe inputs with a demodulator included
- Sensitivity: 73.75 mV/V/mm
- Analogue outputs: ± 1 V/mm, ± 2.5 V/mm, ± 5 V/mm and ± 10 V/mm

**System**

- Power unit
- Output voltage: ± 15 V for 32 probes

**Shipping packaging**

- DIN 32876 Part 1
- See table
- Any position of use
- Distance between both stops and electrical zero can not be set.
- Cable length: 1.2 m.

---

**USB 2.0**

**RS232, virtual**

**2 Veff**

**13 kHz ± 0.5%**

**± 0.5°C**

**± 10 to ± 15 Vdc, 60 mA**

**± 15 °C to 40 °C**

**± 10% to 70% (non-condensing)**

**IP51 (IEC 60529)**

**Shipping packaging**

---

**Identification number**

- ± 0.5% with reference to the measuring span
- ± 100 ppm/°C, stability at zero = ± 0.2 µm/°C
- ± 10 to ± 15 Vdc, 60 mA
- ± 15 °C to 40 °C
- ± 10% to 70% (non-condensing)
- IP51 (IEC 60529)
- Shipping packaging

---

**± 0.5% with reference to the measuring span**

**± 100 ppm/°C, stability at zero = ± 0.2 µm/°C**

**± 10 to ± 15 Vdc, 60 mA**

**± 15 °C to 40 °C**

**± 10% to 70% (non-condensing)**

**IP51 (IEC 60529)**

**Shipping packaging**

---

**± 0.5% with reference to the measuring span**

**± 100 ppm/°C, stability at zero = ± 0.2 µm/°C**

**± 10 to ± 15 Vdc, 60 mA**

**± 15 °C to 40 °C**

**± 10% to 70% (non-condensing)**

**IP51 (IEC 60529)**

**Shipping packaging**
**Calibration devices**

Designed for calibrating and setting TESA length measuring equipment fitted with standard TESA inductive probes (half-bridge).

**Calibration of TESA inductive probes**

The regular system consists of the following components:

- 1 TESATRONIC TT90 length measuring instrument (№ 04430012).
- 1 Set of calibration probes № S41077249 with nominal values of ±0 µm, ±100 µm and ±1000 µm.
- 1 Measuring support such as INTERAPID UP 160 (№ 01639041) equipped with the UPZ 40 measuring table (№ 01640405).
- 1 Set of gauge blocks, accurate to calibration grade K (see section K).
- 1 Precision digital voltmeter, min. 5 ½ digits.

**Calibration of measuring instruments**

Calibration probes available as single or in sets

### Calibration Probes

Also called «Dummy Probes», these probes serve as resistance dividers producing a given length dimension, electrically simulated with high accuracy.

The whole system provides both positive and negative values. All those given in the table are matching nominal values. These products, which have been adequately calibrated, come with an inspection report that shows the values (actual values) as measured during calibration with related uncertainty of measurement.

Their connection to the instrument replaces that of a regular probe. Calibration and setting operations, if needed, are subject to a number of criteria that must be respected.

For a further information with regard to this, refer to the instruction manual or ask for our specialists.
**The way they work**

All electronic length measuring systems shown in this part of our catalogue work on the basis of value sensors in the form of digital probes with axial displacement. These probes generate the digital capture of measured physical quantities (i.e. measurands), which are changing as the incremental linear scale lying in front of the scanning unit and fitted with a reticle is moved. Divisions on both features are identical. The opto-electronic detection of these changes uses transmitted light.

Optical material measures are made up of quality glass gratings with a number of divisions distributed over the entire length. These divisions consist alternately of lines and blanks, which represent each individual increment. The distance from line to line or blank to blank is the dividing period, e.g. 20 µm or 40 µm.

As the gratings of both the scale and reticule are moved in relation to one another, the opaque divisions on the scanning reticle are covered alternately by the lines and blanks on the linear scale, which serves as material measure. This provides a bright/dark information, which is then converted into electrical signals. After their analogue/digital conversion, these signals are shown on the computing counter as the sum of counting impulses equal to the amount of changes of the measured quantity. So as to increase the resolution that results from the dividing periods, the probe signals are split by the electronics (interpolation).
**TESA TG Digital Measuring System**

Ideal for long measuring travels – Incremental probes with a 30 or 60 mm measuring span – Numerical display to 0.001 or 0.0005 mm – Analogue display with illuminated colour background for value classification – Value storage – PRESET function – To name just a few.

---

**Electronics Length Measuring Equipment - Digital**

---

**TESA TG - C10 Computing Counter**

Up/down computing counter with numerical display*, resolution to 0.001 and 0.0005 mm or 0.00001 in. Features 1 probe input. Also with value classification and value storage capabilities. RS232 data output.

**TESA TG - C10 computing counter (HEIDENHAIN)**

Same execution as above, but compatible with HEIDENHAIN probe MT-1201/2501 only*.

Each unit is supplied with the following accessories:

- 04630004 TESA TG - C10 computing counter with numerical display*, resolution to 0.001 and 0.0005 mm or 0.00001 in. Features 1 probe input. Also with value classification and value storage capabilities. RS232 data output.
- 04630009 TESA TG - C10 computing counter with value classification and value storage capabilities. RS232 data output.

*Compatible with equivalent HEIDENHAIN probes with same connector shape and signal.
Digital capture of both extreme values «max.» and «min.» along with the difference between «max.»-«min.» in dynamic measurement.

**TESA TG 30 and TG 60 Digital Probes**

**Digital Probes**
Axial probes with incremental glass scale

- **04630006** TESA TG 30
  - 30 mm measuring span
- **04630007** TESA TG 60
  - 60 mm measuring span

Each probe is supplied with the following item:
- **01960005** 1 Retract lever for the measuring bolt

* Compatible with equivalent HEIDENHAIN probes with same connector shape and signal.
### TG probes

**DIN 32876 Part 2**

Axial probe usable in any position. Measuring bolt guided on a plain bearing. Probe insert with M2.5 mounting thread. Measuring bolt retraction:

- **Mechanical retraction,** see standard accessories
- **Pneumatic retraction,** see table

4.3 mm dia. x 3 m cable. Max. cable extension 10 m.

<table>
<thead>
<tr>
<th></th>
<th>TESA electronic probes</th>
<th>TG 30</th>
<th>TG 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>30</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>mm</td>
<td>30.4</td>
<td>60.4</td>
<td></td>
</tr>
<tr>
<td>Dividing and signal periods</td>
<td>µm</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>µm</td>
<td>1.0</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>µm</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>µm</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>Close to</strong>&lt;br&gt;– lower stop of the measuring bolt*</td>
<td>N</td>
<td>0.85</td>
<td>0.90</td>
</tr>
<tr>
<td><strong>– upper stop of the measuring bolt</strong></td>
<td>N</td>
<td>± 0.15</td>
<td>± 0.20</td>
</tr>
<tr>
<td>Force hysteresis*</td>
<td>N</td>
<td>1.10</td>
<td>1.45</td>
</tr>
<tr>
<td>Max. transverse force</td>
<td>N</td>
<td>± 0.20</td>
<td>± 0.25</td>
</tr>
<tr>
<td>Max. transverse force</td>
<td>N</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Pneumatic retraction of the measuring bolt by vacuum or air pressure</td>
<td>bar</td>
<td>0.55 ÷ 0.70</td>
<td>0.60 ÷ 0.75</td>
</tr>
<tr>
<td>Position of use&lt;br&gt;– vertical</td>
<td>bar</td>
<td>0.42 ÷ 0.57</td>
<td>0.52 ÷ 0.67</td>
</tr>
<tr>
<td>– horizontal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– vertical (in suspension)</td>
<td>bar</td>
<td>0.30 ÷ 0.45</td>
<td>0.45 ÷ 0.60</td>
</tr>
<tr>
<td>m/s</td>
<td>1.4</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>350</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>28</td>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>

* Applicable with the probe used in vertical position with downward oriented measuring bolt, as well as in static measuring.

**TG 60 cannot be used with compressed air.**

### Optional accessories

**Connectors for lifting the measuring bolt by vacuum**

- **01960009** Suitable for TESA TG 30 (No. 04630006)
- **01960008** Suitable for TESA TG 60 (No. 04630007)

**Connector for lifting the measuring bolt by air pressure**

- **01960010** Suitable for TESA TG 30 (No. 04630006)