

## TESA UPD Gauge Block Comparator with a 25 mm Measuring Span

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- Direct measurement of gauge blocks with a variation in nominal length of up to 25 mm or 1 in.
  - Allows the number of required reference gauge blocks to be reduced by nearly 80%.
- Typical comparative measurement of gauge blocks having a same nominal length.
  - Enables lower measurement uncertainties to be achieved due to weaker influences of the systematic errors.
- Equipped with HEIDENHAIN high-precision incremental probes.
- Templates with a new concept for positioning the gauge blocks.
  - Single or dual template system to provide optimum ease of handling of the gauge blocks
- Integrated device for most accurate temperature acquisition.
- On-line transfer of both measured length and temperature values.
- Computer-aided data processing with all needed corrections included.



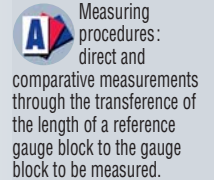
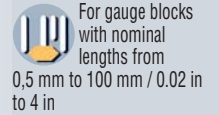
### New Technical Concept through Direct Measurement

Two mutually opposed aligned probes connected in sum measurement (+A+B) also check thin gauge blocks reliably as the upper sensor A is able to capture lengths up to 25 mm. Displacement of the measuring bolt and activation of the measuring force are both electro-motorised.

PT 100 platinum resistances let you capture the temperature of the two gauge blocks as well as the measuring table and support.

The TESA UP software programme processes length and temperature values as measured while executing and controlling your measurement cycles simultaneously.

#### General



In **direct measurement**, the nominal length of the two gauge blocks to be compared may vary up to the size of the measuring span, i.e. 25 mm.

In **comparative measurement**, comparison is always based on two gauge blocks of same nominal length.

**Measuring configuration**  
Two probes with mechanical contact with the measuring face to be probed are connected in sum measurement (function +A+B).

**Measuring points**  
On the reference gauge block: at the centre of the measuring face (point R). On the gauge block to be measured: at the centre (point 1) as well as the four corners of the measuring face, each lying 2 mm away from the adjacent faces (points 2 to 5). The central length  $l_c$  is determined by probing both points R and 1. For establishing lengths at any point, the measurements shall be carried out at points R plus 1 to 5. The variation in length  $v$  is obtained from measurements taken at points 1 to 5.



**TESA UPD – The flexible concept that provides distinctive metrological features with substantial savings**

**Direct Measurement**

- Permits over 90% of a 122-piece set to be checked using the same reference gauge block. All nominal lengths of the full gauge set being contained within 0,5 and 25 mm, the measuring span is therefore not exceeded.
- Allows the reference gauge set to be reduced by nearly 80% against the ones needed until now.
- Provides substantial savings in the gauge block supply and recalibration through reduced set compositions.
- Enables direct measurement of gauge blocks that cannot be compared with other existing gauge blocks due to their unusual nominal lengths.



**Comparative Measurement**

- Allows the gauge blocks of same nominal lengths to be measured by comparison as usual.
- Enhances the measuring conditions, thus permitting all measurements to be taken with a lower uncertainty.
- Reduces the number of systematic errors through limited length related influences of both the upper probe A and the gauge block to be compared.

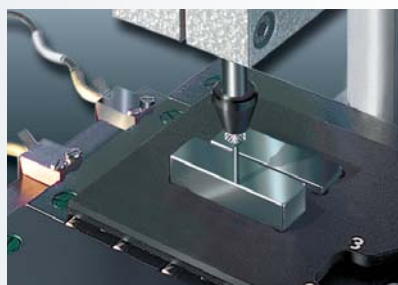


**TESA dual template system that protects expensive reference gauge blocks (patented)**

- Simultaneous use of two templates allows you to release your reference gauges until their handling becomes necessary.
- This system makes it possible for you to save time and money.
- During the measurement cycles on a routine basis, the travel length of the reference gauges over the measuring table is reduced by nearly 70%. This contributes to significantly lower the risks of damaging and wearing the measuring faces.
- The double protection of your reference gauges leads to significant cost savings by reducing the need for:
  - recalibration
  - restoring the measuring faces
  - replacing worn or damaged reference gauge blocks
  - long downtime while extending the life of your full reference gauge sets.

**Single Template System**

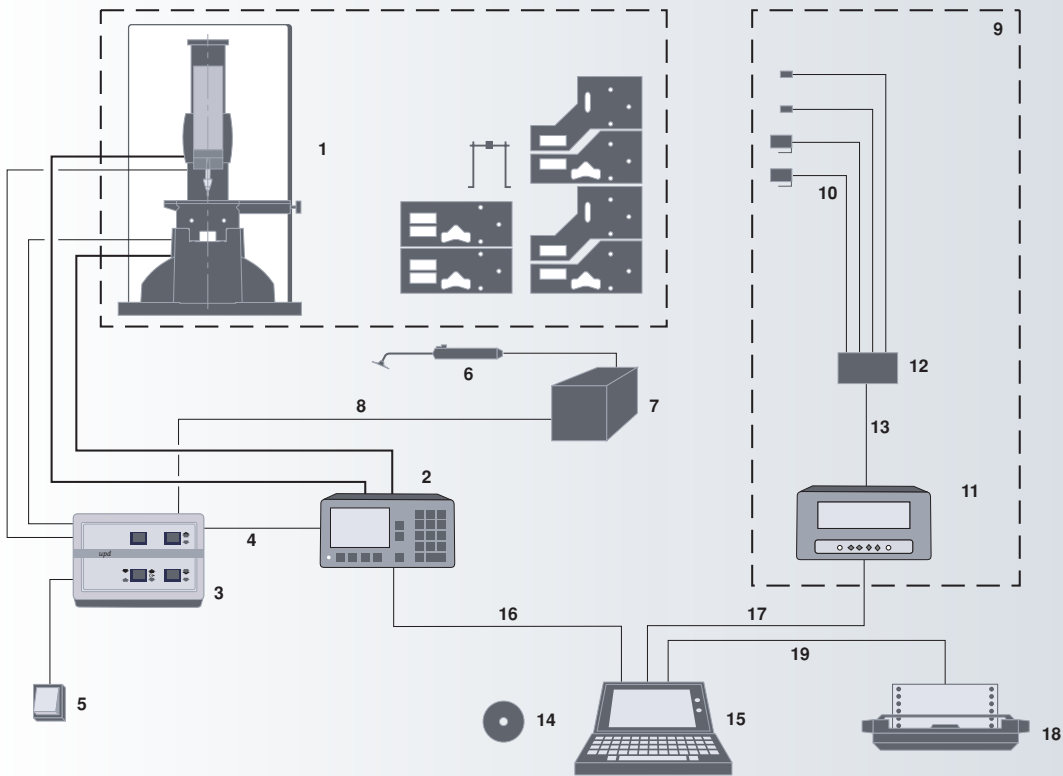
- With this system, your reference gauge blocks along with those to be calibrated are moved together during the measurement cycles.



## TESA UPD Delivery Programme – Three Ordering Variations

№	=			
05930005		TESA UPD gauge block comparator with temperature device*		●
05930004		TESA UPD gauge block comparator without temperature device*		●
S59300102		TESA UPD gauge block comparator, complete* with temperature device, TESA UP software programme for value processing, PC (standard), printer	●	
<i>Key components</i>				
1	05930008	1 TESA UPD mechanical part	●	● ●
2	05960016	1 HEIDENHAIN computing counter ND 287 featuring 2 probe inputs	●	● ●
3	05960013	1 Control panel	●	● ●
4	05960014	1 Connecting cable for control panel to ND 287 computing counter	●	● ●
5	04768001	1 Foot switch	●	● ●
6	01660011	1 Suction loader	●	●
7	03260433	1 Electrical vacuum pump with external control, 230 Vac, 50 Hz	●	●
8	05960028	1 Connecting cable for electric vacuum pump to control panel	●	●
9	05930011	1 TESA UPT temperature device, complete	●	●
14	05960025	1 TESA UP software programme for value processing	●	
15	S59070014	1 Computer. For minimum requirements, refer to page L-14	●	
16	03969007	1 Connecting cable for ND 287 counter to host computer	●	
17	05960026	1 Connecting cable for temperature device to host computer	●	
18	S59070012	1 Laser printer, colour	●	
19	S59070013	1 Connecting cable for host computer to printer	●	

\* Special execution for 110 Vac, 60 Hz also available on request.



### Measuring stand

Heavy construction with toothed rack guide plus hand wheel for setting the measuring arm. Fixing bores (16 and 3 mm dia, resp.) for upper probe A plus one temperature sensor No. 05960010

Main body in cast iron. Hardened steel column, dull-chrome plated and ground.

### Special table

Solid measuring table fitted with 6 cylindrical pins so as to ensure and protect each handled gauge block.

3 mm diameter clamping bore for one temperature sensor No. 05960010 as well as retaining plate mounted laterally on the table for both sensors 05960008 and 05960009 fitted with clip.

Steel, hardened. Tungsten carbide pins, cylindrical.

### Positioning device for gauge blocks

Single and dual template systems to shift the gauge blocks to selected measuring points.

For more details on both systems, report to the previous page.

### Sensors for length measurements

Two HEIDENHAIN axial probes, opto-electronic with electro-motorised bolt activation.

ZERODUR® glass ceramic with incremental divisions

Dividing periods 4 µm



25 mm / 1 in for upper probe A. 1 mm for lower probe B.

Measuring bolt on a plain bearing


1,0 N for upper probe A. 0,63 N for lower probe B.



## TESA UPD System Components

-  Measuring bolt in invar steel
-  Tungsten carbide tip with a spherical measuring face, R = 20 mm

**Computing counter**  
HEIDENHAIN up and down computing counter ND 287 provided with two probe inputs


 TFT type, 9-decade display plus sign. Also with auxiliary display for activated functions.

 Signal division  $\leq 400\times$


 0,5 to 0,002  $\mu\text{m}$   
0,02 to 0.0000001 in

 14 mm

 21 keys available for digit input as well as operating functions

 Sum measurement with both probes set to +A+B. Linear correction of systematic errors. PRESET function for digit entry. 2 programmable datum points.

 RS 232 and V.24

 100 to 240 Vac (-15% to 10%), 50 to 60 Hz

 0°C to 45°C


 -30°C to 70°C



 75%, non-condensing

 Die-cast aluminium housing

 IP40 (IEC 60529)

 EN 55022, Class B

 211x112x209 mm (W x H x D)

		
1	<b>05930008</b>	<b>TESA UPD Mechanical Part</b>
		<i>Consisting of:</i>
	05930009	1 Measuring stand with toothed rack guide. Manually operated for setting the measuring arm. Attachment has a 16 mm dia. fixing bore for the upper probe.
	05960015	1 Solid measuring table in special version Made from hardened steel and fitted with 6 tungsten carbide cylindrical pins for safe positioning of the gauge blocks. Provide high protection and wear resistance to the gauge blocks over many years. Threaded bores for clamping the lower probe. Prepared for the integration of the temperature sensor (see below).
	05960029	1 Positioning device provided with a single or dual template system Interchangeable templates to shift the gauge blocks from a given measuring point to another delivered as follows: 1 Pair for gauge blocks having a 9 x 30 mm cross-section. Consists of 1 template No. 05960019 for the reference gauge blocks plus 1 template No. 05960020 for the gauge blocks to be calibrated. 1 Pair for gauge blocks having a 9 x 35 mm cross-section. Consists of 1 template No. 05960021 for the reference blocks plus 1 template No. 05960022 for the blocks to be calibrated. Also with added support to prevent the blocks from tilting. 1 Template No. 05960023 for reference blocks and those to be calibrated (9x30 mm) Template No. 05960024 for the reference blocks and those to be calibrated having a 9 x 35 mm cross-section. Also with added support to prevent the gauge blocks from tilting.
	05930010	1 System for value acquisition with electro-motorised bolt activation. <i>Consisting of:</i> 1 Upper probe A, type HEIDENHAIN CT 25 (No. 05930006). Measuring span 25 mm/1 in. Measuring force 1,0 N. Fitted with probe insert No. 03510003. 1 Lower probe B, type HEIDENHAIN special (No. 05930007). Measuring span 1 mm. Measuring force 0,63 N. Fitted with probe insert No. 03510003.
	01660031	1 Setting piece for probe alignment
	01640420	1 Heat protection shield, 250 x 380 mm
	01660001	1 Pair of grip pliers for safe handling of gauge blocks
	01660030	1 Dust cover
2	<b>05960016</b>	<b>HEIDENHAIN Computing Counter ND 287</b> Up and down computing counter with LCD color monitor consisting of: 1 counter 05969029 + 1 card 05960040, each with a single entry - i.e. 2 probe entries along with 1 RS 232 data output, 100 to 240 Vac, 50 to 60 Hz.
3	<b>05960013</b>	<b>Control Panel</b> With touch keys for electro-motorised activation of the measuring bolt as well as for triggering data transfer.
4	<b>05960014</b>	<b>Connecting Cable</b> For control panel No. 05960013 to HEIDENHAIN computing counter ND 287 No. 05960016.
5	<b>04768001</b>	<b>Foot Switch</b> For fine displacement of the measuring bolt as well as data transfer.
6	<b>01660011</b>	<b>Pneumatic Suction Loader</b> For safe and easy handling of the gauge blocks with nominal length up to 10 mm. To be connected to the vacuum pump.
7		<b>Electrical Vacuum Pump with External Control</b> For the connection of the suction loader No. 01660011.
	<b>03260433</b> <b>S32070030</b>	Execution 230 Vac, 50 Hz Execution 110 Vac, 60 Hz
8	<b>05960028</b>	<b>Connecting Cable</b> For vacuum pump to control panel No. 05960013.

*continued next page*



9	<b>05930011</b>	<b>TESA UPT temperature device for TESA Gauge Block Comparators</b> Fully calibrated for the measuring ranges from 19 °C up to 24 °C with a numerical interval to 0,001 °C. Supplied with a calibration certificate issued by the Swiss Calibration Service (SCS). Uncertainty of measurement achieved during calibration $U = \pm 0,03^{\circ}\text{C}$ .  <i>Consisting of:</i>
10	05960018	1 Set of 4 temperature sensors PT 100 platinum resistances giving exceptional long-term stability while drifts are kept to a minimum over years of use. This set includes the following single sensors: 1 Temperature sensor with clamp R for reference gauge blocks having nominal lengths from about 14 mm, No. 05960009 1 Temperature sensor with clamp P for gauge blocks to be calibrated having nominal lengths from about 14 mm, No. 05960008. 2 Temperature sensors to be mounted on the measuring stand or the table. PT 100 diameter: 3 g8 mm, 10 mm long. Order number 05960010 for 1 item.
11	05960038	1 FLUKE 1529 temperature measuring unit Precision thermometer including a switch for the measuring points. With use of the PT 100 platinum resistances, provides 4 measuring channels with a 0,001°C numerical interval. RS 232 or IEEE 488 data output, 115 or 230 Vac for 50 or 60 Hz.
12	05960012	1 Adapter For connecting up to 4 temperature sensors
13	05960011	1 Connecting cable For adapter N° 05960012 to temperature unit N° 05960038.
14	<b>05960025</b>	<b>TESA UP Software Programme for Value Processing</b> Running under WINDOWS 98, 2000, NT or XP. Software package including 1 CD-ROM along with 1 Hardkey. 10 languages available for function menus. For more details, see page L-14.
15	<b>S59070014</b>	<b>Computer</b> Available upon request.
16	<b>03969007</b>	<b>Connecting cable</b> For serial data transmission from HEIDENHAIN ND 287 to host computer (2 connectors 9-pin/female).
17	<b>05960026</b>	<b>Connecting cable</b> For serial data transmission from temperature device to host computer (9-pin/male and 9-pin/female).
18	<b>S59070012</b>	<b>Laser printer, colour</b> Upright A4 format. USB interface.
19	<b>S59070013</b>	<b>Connecting cable</b> For USB data transmission from host computer to printer

### Temperature Sensors

4 PT 100 platinum resistances, 4-wire type

### Temperature Device

Multiple-channel precision thermometer. Also equipped with a switch for the measuring points.

Procedure: 4-wire resistance measurement with continuous value acquisition through connected sensors. PT 100 linearisation according to EN 60751.

Alphanumeric LC display with background lighting

0,001°C

°C, °F or K

8 mm

6 keys available for the functions

RS 232 and IEEE 488

115 ±10% Vac or 230 ±10% Vac, for 50 and 60 pHz

5°C to 40°C

-25°C to 60°C

75%, non-condensing

EN 61010, EN 50081, EN 50082 and EN 55011

191 x 102 x 208 mm (W x H x D)

### Errors of Measurement

Provided all metrological conditions are met, the reliability of the comparator used for direct measurement of steel gauge blocks is expressed as follows:

Repeatability limit (with no influence of external temperature): 0,015 µm

Uncertainty of measurement:  $U = \pm (0,05 + 0,5 \cdot L) \mu\text{m} (L \text{ in } \text{m})$

Condition requires the use of reference standards whose measurement uncertainty is equal to

$U \leq \pm 0,015 \mu\text{m}$   
for the comparator

$U \leq \pm (0,02 + 0,2 \cdot L) \mu\text{m} (L \text{ in } \text{m})$   
for the gauge blocks