

CONFIDENCE IS NOT ENOUGH...

The control of inspection and measuring equipment is an element of quality management that is now more important than ever before. The introduction of the ISO 9000 family of international standards has also led to major changes in this field. Amongst other things, ISO 9001 specifies that : "all inspection and measuring equipment that can affect product quality must be identified, calibrated and adjusted at prescribed intervals, or prior to use, against certified equipment having a known valid traceable relationship to internationally or nationally recognised standards".

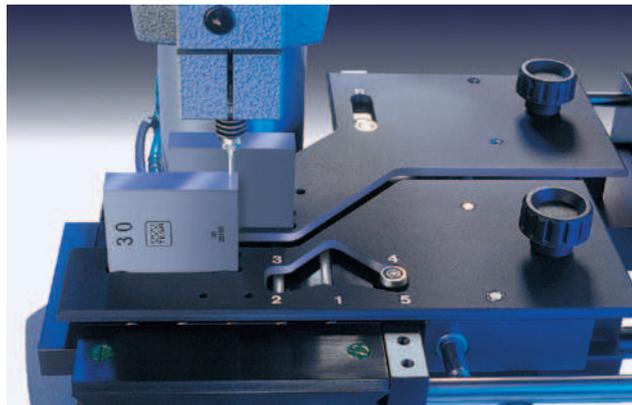
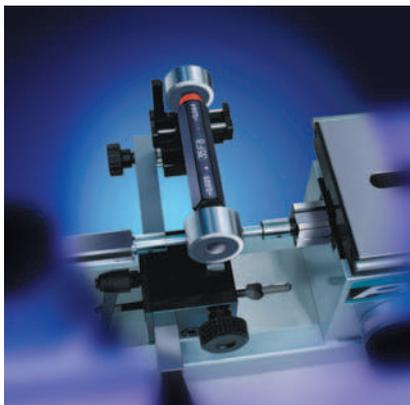
This standard also states that the supplier shall: "ensure that the inspection and measuring equipment is capable of the necessary accuracy and precision".

A Vast Choice

TESA can offer you the most varied methods of measurement specifically suited for the inspection and calibration of standards, handtools and plug gauges. Some of these are described in the various sections of this catalogue, in particular:

- Gauge blocks
- Setting rings
- Cylindrical setting standards with outside diameters
- Optical flats
- Parallel optical flats
- Electronic levels for both straightness and flatness measurement
- Instruments for both squareness and perpendicularity measurement
- Calibration equipment for length measuring devices fitted with inductive probes.

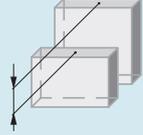
This section is devoted to measuring systems that serve to calibrate other inspection equipment, but they can also be used for high-accuracy measurement of precision parts.



PRESENTATION OF TESA MEASURING GAGE BLOCKS

TESA offers two models, the operation of which is based on two different measurement procedures.

- TESA UPD directly measures gauge blocks within a measuring span of 25 mm/1 in.
- TESA UPC is used for comparative measurement of gauge blocks having a same nominal length.

TESA Gauge Block Comparators		UPD	UPC
 Measuring procedures <ul style="list-style-type: none"> - Comparison of different nominal lengths up to 25 mm - Number of reference gauge blocks required for the calibration of a set of 122 pieces: 9 blocks - Number of blocks required for the calibration of the device: 9 blocks + 6 pairs 		●	●
		Comparative measurement <ul style="list-style-type: none"> - Comparison of gauge blocks having the same nominal length - Number of reference gauge blocks required for the calibration of a set of 122 pieces: 122 blocks - Number of gauge blocks required for the calibration of the device: 6 pairs 	●
 Measuring errors Read also the explanations provided in this same chapter with regard to the measuring errors of each instrument			
	Repeatability limit	0,015 µm 0,025 µm	●
Measuring uncertainty	U = ± (0,05 + 0,5 · L) µm L in m	●	●
	U = ± (0,10 + 1,0 · L) µm		●
 Range of application Nominal lengths	0,5 to 100 mm/0.02 to 4.0 in	●	●
	0,5 to 500 mm/0.02 to 20 in	▲	▲
 Measuring range 25 mm/1 in			●
 Sensors for capturing length dimensions <ul style="list-style-type: none"> - 2 axial probes in sum measurement - Digital measuring system, opto-electronic with incremental divisions - Analogue measuring system, electronic and inductive - Activation of the measuring force <ul style="list-style-type: none"> • electro-motorised • by spring force - Retraction of the measuring bolt <ul style="list-style-type: none"> • electro-motorised • by vacuum 		●	●
		●	
			●
		●	
			●
		●	
			●
		●	
			●
		●	
Template system <ul style="list-style-type: none"> - Single template system - Dual template system 		●	●
		●	○
Positioning of gauge blocks with a nominal length of up to 10 mm Suction loader with an electric vacuum pump		○	○
 TESA UPT temperature measuring device Measurement of the electrical resistance using 4 thermal sensors (4 wire type)		●	○
 TESA software for processing the measured values <ul style="list-style-type: none"> - TESA UP, WINDOWS 98, 2000, NT, XP, 7 (32 bits) 		●	●
▲ Available on request ○ Recommended option			



GAUGE BLOCK COMPARATORS

In the hierarchical chain of dimensional measurements that can be traced back to the standard metre length unit, gauge blocks hold a key position. This makes them the most important material references used in metrology.

The application of the length unit, based on specific wavelengths of light, to gauge blocks is achieved in the first instance by fundamental interferential measurement. Using gauge blocks measured by interferometry, defined lengths are thus transferred to other gauge blocks in measurements further down the hierarchical chain.

TESA UPD – for Direct and Comparative Measurements

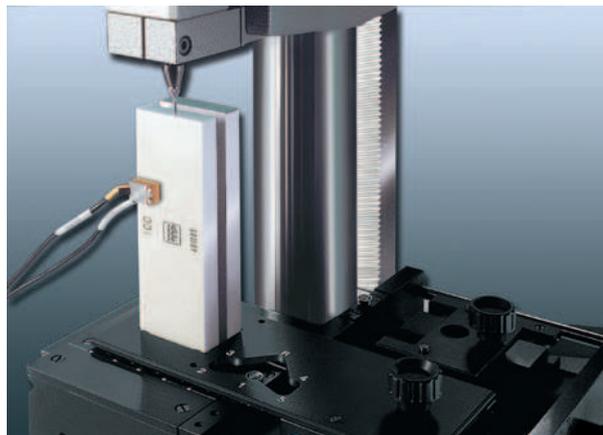
- Direct measurement of gauge blocks with a variation in nominal length of up to 25 mm or 1 in.
 - Enables the number of reference gauge blocks required to be reduced by nearly 80 %.
- Comparative measurement of gauge blocks having a same nominal length.
 - Enables lower measurement uncertainties to 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 the corrections necessary included.

Dual template system for the maintenance of your reference gauge blocks (TESA patented)

- The simultaneous use of two templates allows you to "rest up" your gauge blocks until you need them.
- The application of this new concept turns into significant savings in both time and money.
- During measurement cycles carried out on a routine basis, the distance travelled over the measuring table is reduced by nearly 70 %.
 - This contributes to significant reductions of the risks of damaging and wearing the measurement faces.
- The double protection of your reference gauge blocks leads to significant cost savings through the reduction if the need for:
 - recalibration
 - restoration of the measuring faces
 - replacement of worn or damaged gauge blocks
 - increased downtime (whilst extending the life of your reference gauge blocks)

Single Template System

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



N EN ISO 3650 (ASME B89.1.9-2002 on request)

I For gauge blocks with nominal lengths from 0,5 mm to 100 mm / 0.02 in to 4 in (0,5 to 500 mm on request)

A **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.

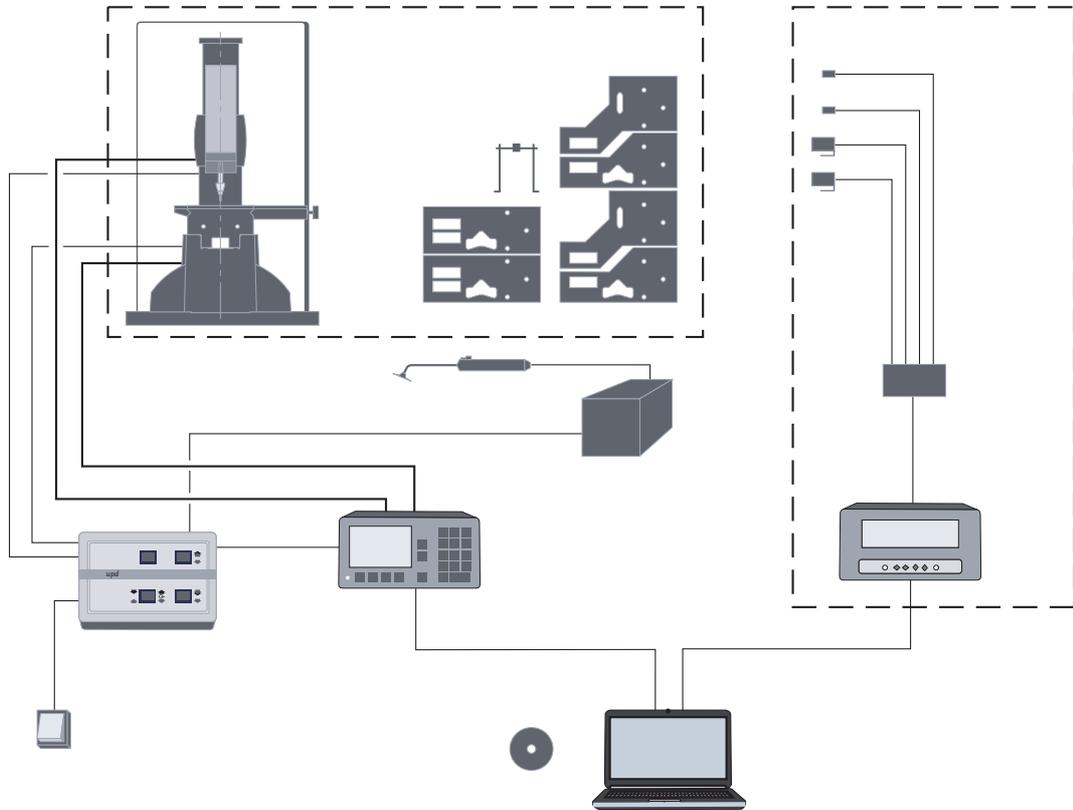
The variation in length v is obtained from measurements taken at points 1 to 5.

C Calibration certificate from the supplier for the comparator or the Swiss Calibration Service for the temperature device.



2 different delivery programs

No	=		
05930005	TESA UPD gauge block comparator with temperature device*		•
05930004	TESA UPD gauge block comparator without temperature device	•	
CONSISTENT OF:			
05930008	TESA UPD mechanical part	•	•
05960016	HEIDENHAIN computing counter ND 287 featuring 2 probe inputs	•	•
05960013	Control panel	•	•
05960014	Connecting cable for control panel to ND 287 computing counter	•	•
04768001	Foot switch	•	•
01660011	Suction loader		•
03260433	Electrical vacuum pump with external control, 230 VAC, 50 Hz		•
05960028	Connecting cable for electronic vacuum pump to control panel		•
05930011	TESA UPT temperature device, complete		•
Other delivery program available on request			
* Special execution for 110 VAC, 60 Hz also available on request (ref. S32070030 instead of 03260433)			



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 in 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 in m) for the gauge blocks

