

11 DETERMINATION OF THE PROBE CONSTANT

11.1 Masterpiece

Each height gauge is provided with a standard, also called master piece.

Masterpiece of the TESA-HITE MAGNA 6.35 mm / .25 in	Masterpiece of the TESA-HITE 12.5 mm / .5 in
	

In order to allow the user to carry out measurements without any time-consuming calculations, the constant of the probing system is determined on the master piece, whose dimension is known.



Calibration with groove of the master piece



Calibration with rib of the master piece



The master piece has to be as clean as possible when it is used, as it is, to a large extent, the measurement of this tool that will determine the accuracy of the results obtained later.



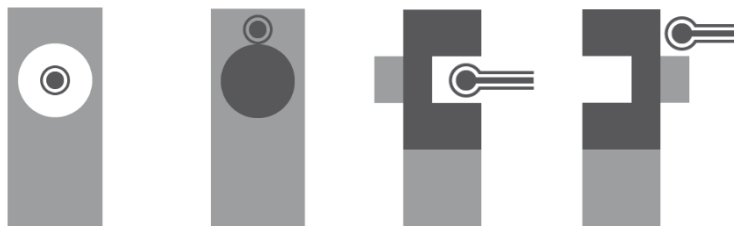
It is important to only use the master piece provided with the height gauge. TESA do not guarantee correct functioning of the instrument if it is used with another master piece than the one provided by default.



The final inspection and the certificate of the instrument both refer to this master piece.

11.2 Concept

When measuring elements that require probing in two directions, it is necessary to take into account the probe constant.



Elements that require two probe hits in two directions: bore, axis, groove, rib

The probe constant is a permanent correction factor. It is calculated by the control panel after master piece measurements, then saved and automatically taken into account during the next measurements.

The probe constant considers and compensates the main influencing factors such as:

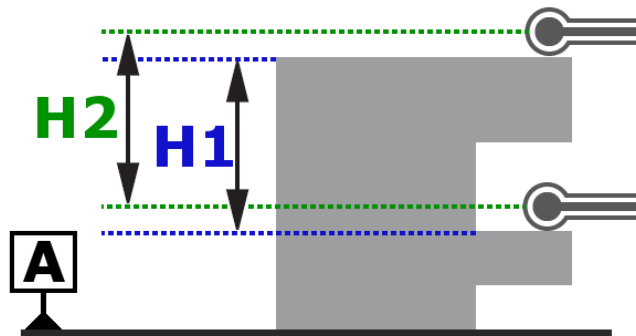
- Diameter of the used ball or disc probe
- Elastic deformation of the probe and its support due to the measuring force
- Hysteresis error of the measurement system



Each time the measurement conditions change, the probe constant has to be determined again. The main causes of modification are:

- Turning off the instrument
- Probe change
- Probe position modification
- Measurement mode change

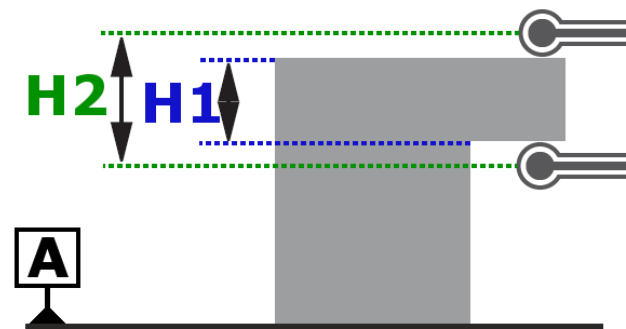
In case the measurement sequence does not require the use of the probe constant, all values are offsetted from a constant value, the radius of the probe. This is the ST1  mode.



$$H1 = H2$$

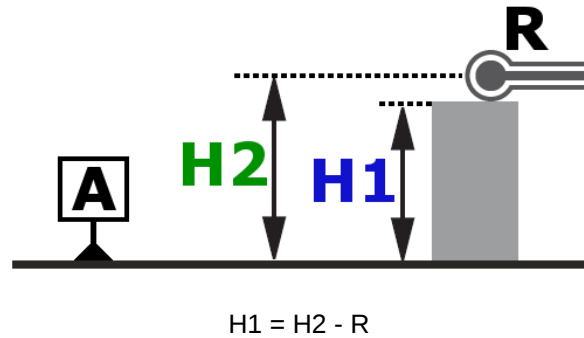
If probing in two directions is needed in the same measurement sequence, this is achieved with the compensation of the ball-tip radius in the probing direction. This is the ST2  mode.

Without compensation of the ball-tip, the displayed value in the case below would be H2, although the required value is H1.



$$H2 \neq H1$$

Diagram representing the compensation of the ball-tip:

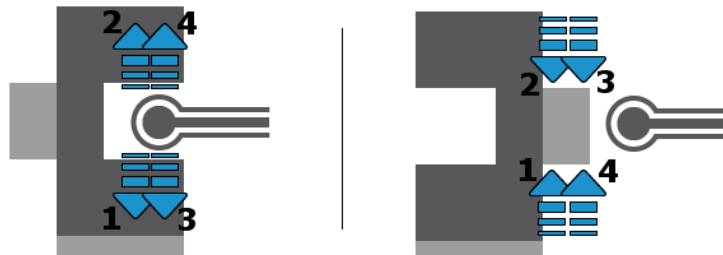


In order to determine the right point, each height $H1$ is recalculated according to $H2$ (which corresponds to the centre of the ball-tip) and the radius R of the insert (defined when detecting the probe constant).

11.3 Procedure

There are several processes to determine the probe constant. The TESA master piece design has been thought to minimise the determination time and avoid any errors that could occur when moving the master piece during a sequence.

The calibration procedure of the probe (or determination of the probe constant) requires at least two probe contacts for each measurement point.



The deviation between the two values obtained for each point cannot exceed a maximum value that depends on the selected resolution. If it is higher than this limit value, the difference is displayed. The user then has the choice to accept it

and bypass the process with  or to restart the process for a new calibration with .

If the user accepts the result, the display resolution will be automatically reduced to be in line with the result obtained as probe constant.

Deviation	Display resolution
5 to 10 μm	0.01 mm
> 10 μm	0.1 mm
.0002 to .0005 in	.0005 in
> .0005 in	.005 in

11.4 Steps

There are several ways to start the calibration process of the insert:

- Enter the ST2 mode for the first time
- From ST2 or STP modes, force the recalibration of the probe by pressing the context action .



Once the probe has been calibrated, you can navigate through all measurement modes without being asked by the software to calibrate the probe again.