TESA TECHNOLOGY

Instruction manual

HEIGHT GAUGES

for TESA-HITE (TH)

for TESA-HITE MAGNA (MG)

TABLE OF CONTENTS

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1 INTRODUCTION

1.1 Acknowledgements

Dear user,

We would like to thank you for having chosen TESA as your metrology partner. We thank you for your confidence in purchasing a height gauge of our TESA-HITE or TESA-HITE MAGNA range.

Your metrological concerns are important to us and we are convinced that this instrument will meet your expectations. We are constantly striving to develop solutions adjusted to your needs.

The result? Your satisfaction for many years. Our pleasure? To know that our products help you meet your needs in research, development and production in a quick and efficient way, and for a long time.

The whole TESA team welcomes you to our family of TESA product users.

Your TESA team

1.2 Warning

This instruction manual must be read by every technician or operator before the installation, maintenance or use of the instrument. Not adhering to certain instructions regarding its use could lead to malfunction or deterioration of the instrument.

1.3 Copyright (document)

The French version is the reference language. All other language versions are only translations.

1.4 Copyright (software)

For more information, please contact your local reseller.

1.5 Patents

This product and its accessories are protected by the following patents:

EP 1 241 436 B1	US 6 802 133	CN 1 199 029 C	JP 3 629 461 B2
EP 1 319 921 B1	US 6 952 883	CN 1 232 797 C	JP 3 656 068 B2
EP 1 319 922 B1	US 6 763 604	CN 1 267 695 C	JP 5 414 155 B2
EP 1 319 925 B1	US 6 802 135	CN 1 217 249 C	
EP 1 320 000 B1	US 6 745 488	CN 100 374 812 C	
EP 1 319 923 B1	US 7 043 846	CN 100 397 029 C	
EP 1 847 798 B1	US 6 813 845	CN 101 059 328 B	
	US 7 434 331	CN 206 496 736 U	
	US 7 263 786		

1.6 Preamble

The TESA-HITE and TESA-HITE MAGNA are the result of more than 70 years of experience in the conception and production of high-precision measurement equipment. It has been designed to meet the needs of a production environment and to offer its users an affordable, quick and precise way for dimensional control of small or large workpieces mainly in workshops.

This document describes the different procedures to be followed in order to allow for a quick and easy handling of our TESA-HITE range including the four models:

- TESA-HITE 400 or 700 (optical sensor)
- TESA-HITE MAGNA 400 or 700 (magnetic sensor)

The software provided with all these height gauges is the same, which allows an experienced user of TESA-HITE height gauges to easily use a TESA-HITE MAGNA height gauge (and vice versa).

1.7 Symbols

Several different types of symbols are used in this manual. They give important information that has to be taken into account in order to correctly use the measuring instrument.

Position	Description
⚠	Not adhering to these instructions can lead to incorrect measurement results.
💡	Corresponds to an assistance for better use.

2 PRESENTATION

2.1 General description

The TESA-HITE height gauge range is different from any other height gauge as it offers an exceptional performance as well as an intuitive and easy use.

These autonomous measuring instruments are designed for measuring lengths such as external, internal, step, height or depth dimensions as well as distances.

A cast-iron base (7) supports the instrument. Three machined support surfaces (for TESA-HITE only) called “air bearings” guarantee the stability of the height gauge. The integrated electric pump (9) generates the air cushion so that your height gauge can easily be moved across the granite table.

The rigid vertical column under the protective housing (13) includes the guiding part that is rigorously straight and perpendicular to the base.

A measuring head slides on the guiding element, while the optoelectronic measuring system (2) for the TESA-HITE and the magnetic measuring system for the TESA-HITE MAGNA measure any head displacement. Both systems are patented by TESA.

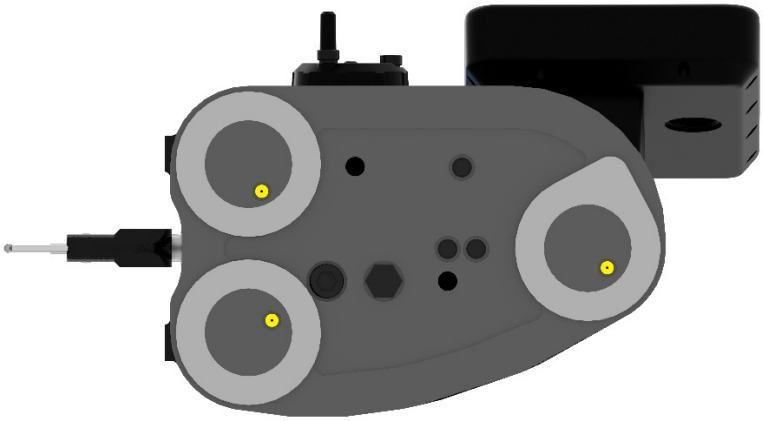
Each height gauge is used with an IP65 control panel (11+12) with numerous calculation possibilities offering a measuring solution adjusted to each application.

No.	Description
1	Cap cover
2	Electronic system reading the position (sensor + scale)
3	Mounting shaft for probe support
4	Probe support
5	Probe
6	Guiding and support faces
7	Cast-iron base
8	Handwheel for displacement (with locking screw and fine adjustment screw)
9	Electric pump (TESA-HITE) and battery
10	Switch for electric pump (TESA-HITE)
11	Panel keyboard
12	Screen
13	Protective housing

Description of the main constitutive elements of the TESA-HITE and TESA-HITE MAGNA

2.2 Instrument base

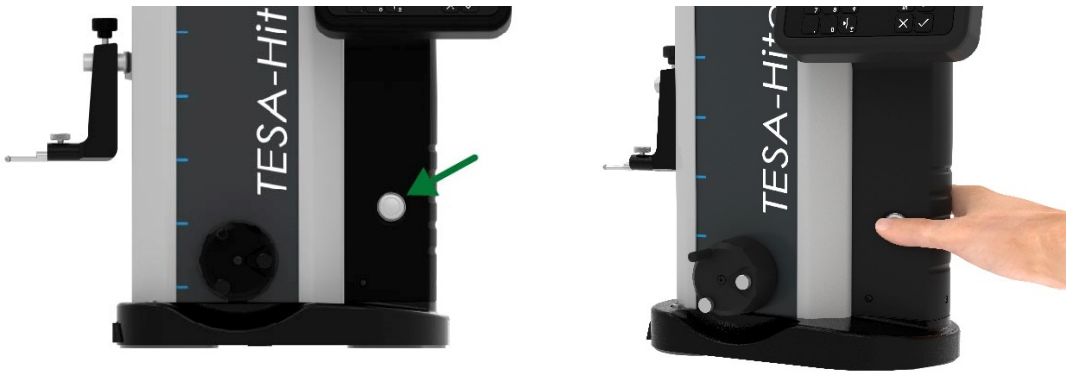
The base is chemically nickel-plated in order to make it very resistant to corrosion. The lower face of the TESA-HITE includes three finely-machined support surfaces (air bearings for TESA-HITE only) that guarantee the stability of the height gauge.



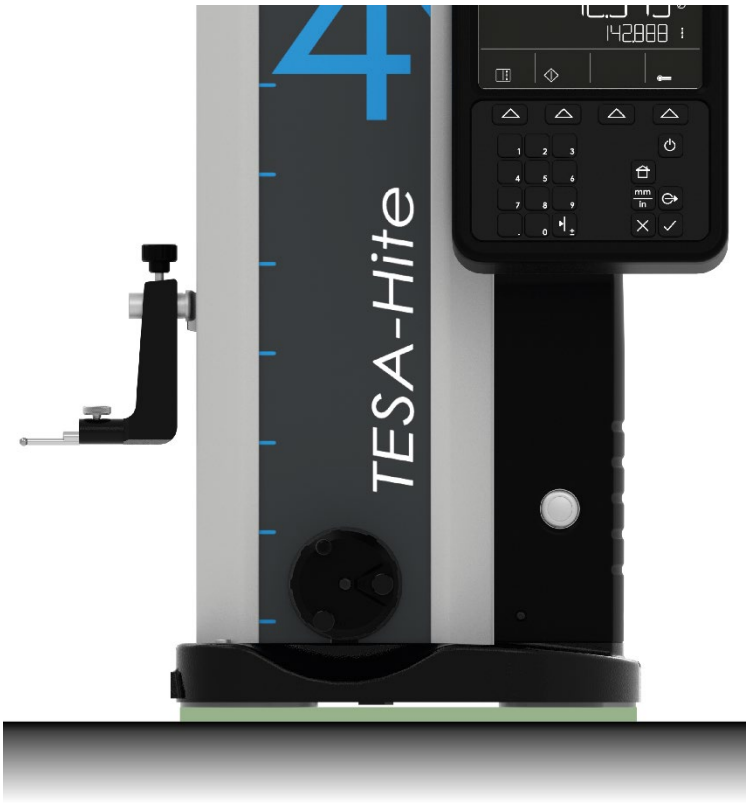
The faces defined by the green zones in the schema below are specially designed to support the instrument against a parallel gauge block or for guiding it along such a block.

2.3 Air cushion

For the TESA-HITE only, the air cushion, which is generated by an integrated electric pump, allows the height gauge to be easily moved on the granite table. The height gauge can then be moved effortlessly and any wear created by friction is avoided.



This pump is activated by pushing a control button (green arrow above), which immediately activates an air cushion between the instrument and the granite table (green zone below), which is only a few microns thick. The thickness of the green area in the diagram below has been deliberately exaggerated to be more visible.



The thickness of the air cushion can be adjusted according to the quality of the granite table. You can adjust it via the control software.

When measuring workpieces where the dimensions or weight don't allow for any movement, the height gauge can be moved by using the air cushion.

⚠	**Experience has shown that the air cushion should not be thicker than necessary. When it is activated, it has to support the weight of the instrument while still being slightly in contact with the granite table.**

⚠	**The 'air cushion' option is not integrated in the TESA-HITE Magna models. This kind of displacement is only possible with the TESA-HITE models.**

💡	**It is not necessary to switch the height gauge on to activate the air cushion.**

2.4 Vertical column

The rigid vertical column of the instrument is perpendicular to the cast-iron base, to which it is permanently fixed.

The perpendicularity of each TESA-HITE model is adjusted mechanically in the factory using a patented TESA system, which makes it possible to use it for a reliable and quick control of perpendicularity.

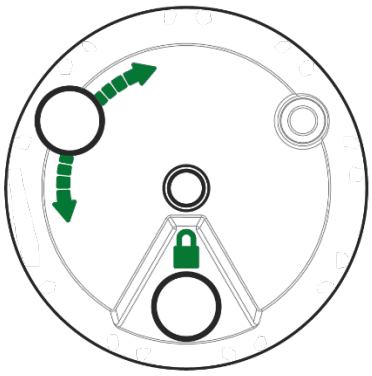
A maximum mechanical frontal perpendicularity error is given exclusively for the TESA-HITE models.

The perpendicularity of a surface can for example be checked using an additional device to the TESA-HITE such as a 1D probe and a TWIN-T10 type indicator.

Perpendicularity errors cannot be measured with the TESA-HITE MAGNA models.

2.5 Handwheel

The handwheel located above the base is the element that allows you to move the probe during a measurement.



This handwheel has two screws enabling:

Icon	Description
	Blocking the carriage for displacement at a desired height
	More precise carriage displacement (also called “fine adjustment”)

This handwheel and the drive system it is linked to have been specially designed to allow the user to feel the different pressure on the probe and when the measurement is carried out.

2.6 Electric power supply

There are two different possibilities for supplying the instrument with power.

- Via a power supply
- Via a rechargeable battery

The battery simplifies working on the granite table as no power cable hinders the operator when displacing the height gauge.

The battery also supplies with power the panel connected to the instrument base.

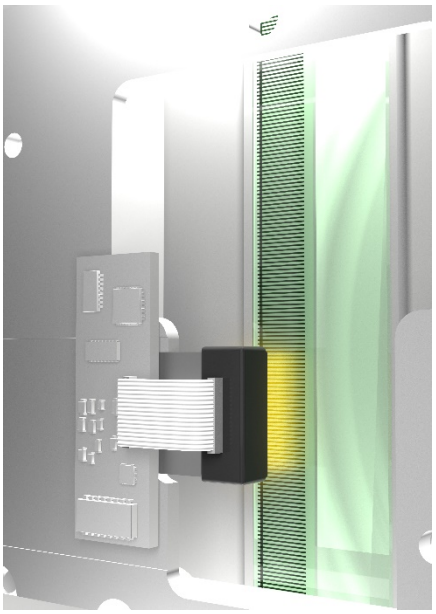
It is important to use only the cable and power supply units provided with the height gauge. Not adhering to these instructions can lead to malfunction of your instrument or irreversible damage.

In case of questions, please contact your local reseller.

2.7 Measuring system

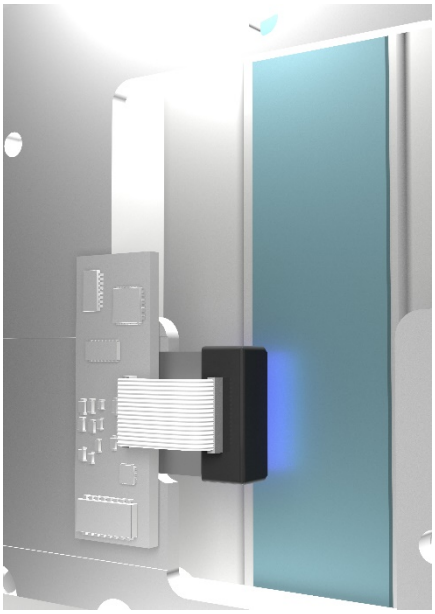
The TESA-HITE models feature an optoelectronic measuring system digitally capturing the measured length, which is also called measurand (TESA patent). The glass scale with both incremental graduations and a reference mark serve as material measure. According to a principle of reflection, the scale is scanned by a sensor with no mechanical contact. The measuring signal is then transmitted to the control panel.

opto µ system



The TESA-HITE MAGNA models for their part feature a patented magnetic measuring system, also known as the "magna µ system". This scale has incremental graduations based on a magnetic technology.

magna µ system



From the neutral position A of the carriage, the system for determining the measured values can move in both directions up or down to the switch points. As soon as one of the two points is reached, it takes the measurement. The position of the measuring head is always taken in relation to the scale and is captured by the sensor. This information is then sent to the control panel.

In order to guarantee that your height gauge (TESA-HITE models) is functioning correctly, it is important that the scale and the sensor remain free of any solid or liquid particles that could impede the functioning of the scale.

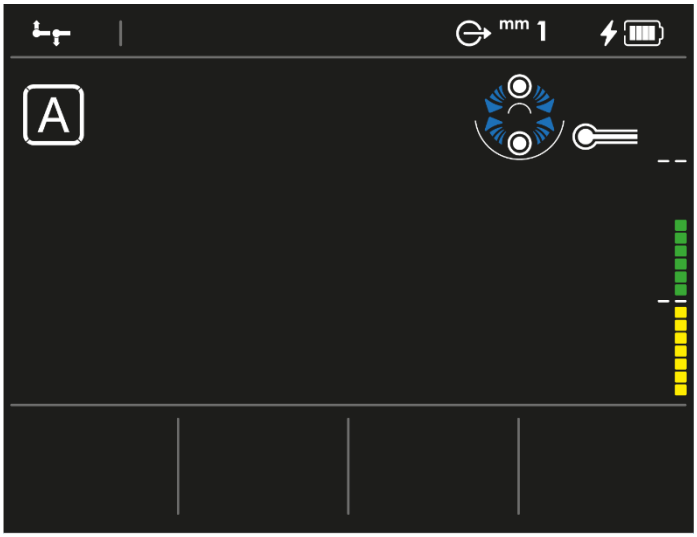
The distance C, which is symmetrical to the position of the relevant trigger point, is only used for detecting the culmination point when probing cylindrical circular surfaces.

The system for obtaining the measured values can be moved from the neutral position up to the spring-loaded end stops via the distance D. However, too much pressure will lead to an invalid measurement of the point.

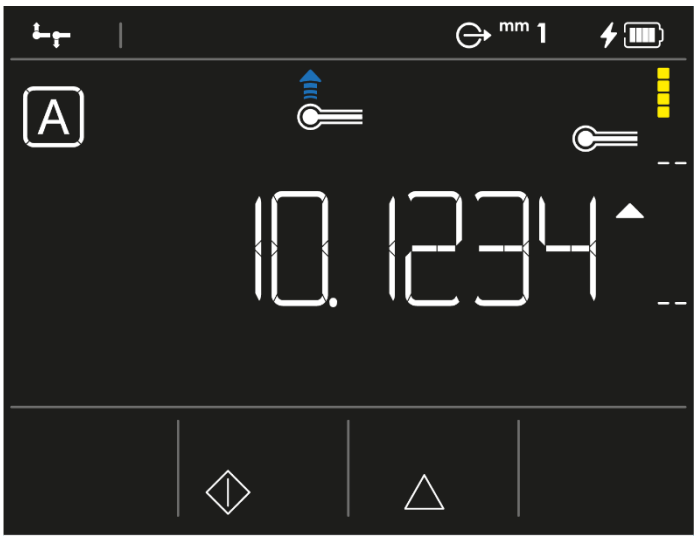
The probing force (and therefore the position of the probe on the measuring carriage) is visible through a coloured bar on the right side of the screen. This bar is also called “strain gauge”. At any moment, when the probe comes in contact with the workpiece to be measured, this bar is activated and changes its colour according to the applied pressure.

When the probe touches the workpiece, the bar on the right displays two horizontal white marks.

When measuring downwards with the probe, the lower mark corresponds to the minimum required pressure in order to have a single probing value to be taken. If the pressure is not high enough, the bar colour is yellow. When the mark has been passed by the displayed force, the colour becomes green or even red if the pressure is too high.

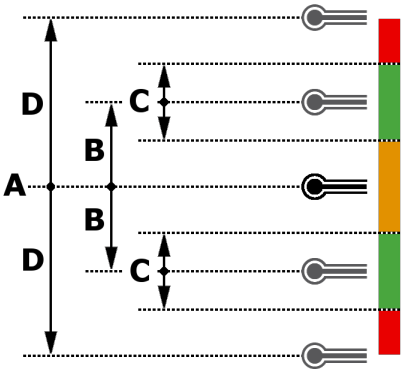


Inversely, the upper mark corresponds to the minimum pressure required if an upward measurement is made.



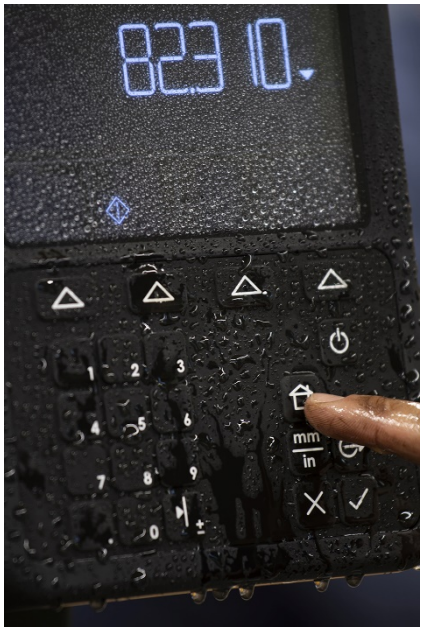
The two horizontal lines represent the ends of the measurement zone defined by letter C in the table below.

Position	Description
A	Neutral position
B	Travel to the upper (resp. lower) trigger point for determination of the value
C	Partial measuring span for detecting the culmination point
D	Travel in one direction from the neutral position to the end stops.



2.8 Control panel

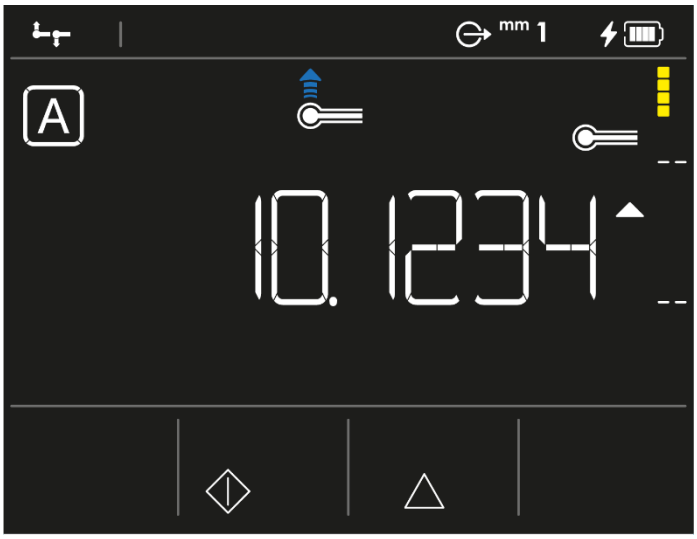
The control panel has been developed as ergonomic and intuitive as possible. Its keyboard is separated in 3 distinct zones. The degree of protection of the panel is IP65.



For further details, see the chapter corresponding to the description of the control panel.

2.9 Interface & displayed values

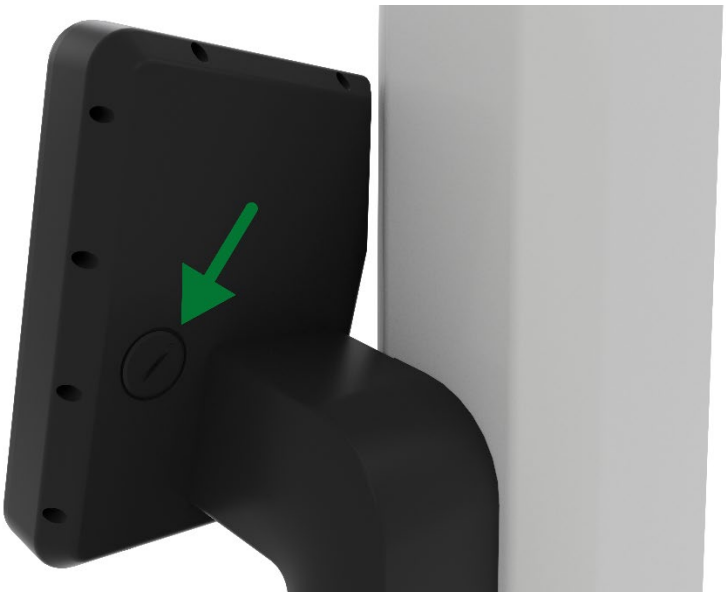
The ergonomic software has been designed to avoid any ambiguous situations. At any time, the displayed values correspond only to a measurement or a calculation and never to the probe position.



In order to avoid any reading errors of the displayed values on the screen, only measurement results or calculations are visible. Apart from the STP measuring mode, your height gauge will not display the current value of the probe position.

2.10 Connector

The control panel features a TLC connector (TESA Link Connector) IP65 for data management and data transmission via cable or wireless to an external device.



3 TECHNICAL SPECIFICATIONS

Series	TESA-HITE MAGNA		TESA-HITE	
Reference	00730082	00730083	00730084	00730085
Displacement	manual	manual	manual	manual
Model	400	700	400	700
Max. permissible error [µm] L in mm	≤8	≤8	2.5+4L/1000	2.5+4L/1000
Repeatability [µm] • On surface (2δ) • On arc (2δ)	 3 5	 3 5	 2 3	 2 3
Perpendicularity* [µm] Mechanical frontal	 -	 -	 9	 13
Battery life [h]	60	60	60	60
Air cushion	no	no	yes	yes
Probing force [N]	1.5 ± 0.5	1.5 ± 0.5	1.5 ± 0.5	1.5 ± 0.5
Degree of protection • PANEL • Reading system • TLC system	 IP65 IP55 IP67	 IP65 IP55 IP67	 IP65 - IP67	 IP65 - IP67
Screen [mm]	Colour 92 x 121	Colour 92 x 121	Colour 92 x 121	Colour 92 x 121
Panel [mm]	155 x 210 x 43	155 x 210 x 43	155 x 210 x 43	155 x 210 x 43
Main digit size [mm]	21 x 10	21 x 10	21 x 10	21 x 10
Resolution [mm]	0.001 / 0.005 0.01	0.001 0.005 0.01	0.0001 0.001 0.01	0.0001 0.001 0.01
Dimensions of the instrument HxLxP [mm]	810 x 220 x 265	1110 x 220 x 265	810 x 220 x 265	1110 x 220 x 265
Dimensions of the packaging HxLxP [mm]	481 x 450 x 930	481 x 450 x 1230	481 x 450 x 930	481 x 450 x 1230
Weight [kg] • Net • With packaging	 15 25	 18 28.5	 24 35.5	 30 41
Conditions for the specifications • Temperature [°C] • Relative humidity • Accessories	 20°C ± 5°C <80% standard	 20°C ± 5°C <80% standard	 20°C ± 1°C <80%, without condensation standard	 20°C ± 1°C <80%, without condensation standard
Limit operating conditions • Temperature [°C] • Relative humidity	 10°C to 40°C 100%, without condensation	 10°C to 40°C 100%, without condensation	 10°C to 40°C <80%, without condensation	 10°C to 40°C <80%, without condensation
Limit storage conditions • Temperature [°C] • Relative humidity	 -10°C to 60°C <80%	 -10°C to 60°C <80%	 -10°C to 60°C <80%	 -10°C to 60°C <80%

4 DELIVERY CONTENTS

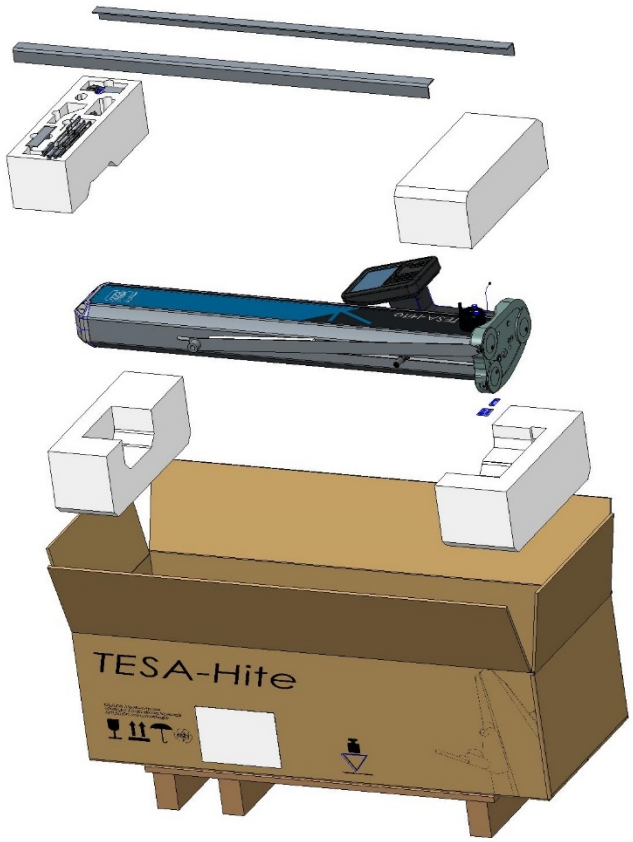
4.1 System components

Each configuration is composed of the following elements:

Qty	Description
1x	Height gauge
1x	Control panel
1x	Standard probe support
1x	Hard-metal probe, Ø 5 mm
1x	Master piece
1x	Power supply and power cable
1x	SCS calibration certificate
1x	Declaration of conformity
1x	Printed document “Quickstart manual”
1x	Instruction manual on USB key
1x	Shipment case (pallet, box, support inserts)

4.2 Packaging

The elements that constitute the packaging of your height gauge are very important and should be kept. It is absolutely necessary to use the original packaging when transporting the instrument in order to avoid any unfortunate deterioration which could result in malfunctioning or complete impossibility to use the instrument.



4.3 Calibration certificate

Each TESA-HITE MAGNA and TESA-HITE instrument is provided with an individual calibration certificate. The number of the certificate is the same as the serial number of the instrument, as it is indicated on its label. If the two numbers are not the same, please contact your local reseller.

The documented measuring results of the calibration certificate refer to the condition of the instrument during its final inspection in the factory of TESA. The results obtained and the technical specifications indicated depend on the environmental factors. If the instrument is not used in ideal conditions, it is very likely that its performances will be downgraded.

Reference conditions during calibration

Air conditioning in measurement laboratory	Temperature: (20 ± 0,5) °C Humidity: ≤ 65 %
Flatness standard	Granite table, precision class 00 according to DIN 876 part 1 Total guaranteed flatness of 1 µm.
Control equipment for determining measurement uncertainty of lengths	Step gauge block with nominal distance of the measuring faces of 20 mm. The measurement line of the step gauge block is oriented perpendicularly to the reference granite plate
Instrument	Equipped with standard probe insert with tungsten carbide ball tip, Ø5mm and a standard probe support.
Master piece	Belonging to the instrument itself, therefore same number on it as indicated on gauge label.

Measurements

- The measuring face of the step gauge block, which is approximately at the same height as the reference surface of the granite plate, is the reference point for measurements.
- The reference point is captured once (probing down) and is valid for the following three series of measurements.
- For each series, the measurements of the step gauge blocks are carried out with regular nominal distances of 20 mm (see calibration certificate).
- The measurements are carried out with inversion of the probing direction. This means that the measuring faces of the step gauge blocks are probed alternately up and down until the end of the measuring range of the instrument is reached.

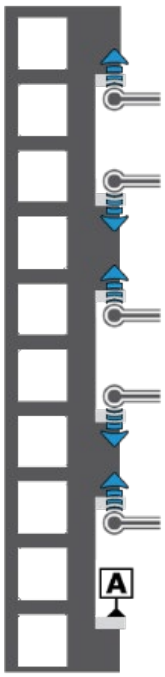


Diagram representing an example of step gauge blocks on which BMPE measurements are carried out

Interpreting the results

Interpreting the results according to the standard ISO 13225 your height gauge refers to, requires a definition of the following parameters.

B Error of indication of the height gauge for surfaces measured in opposite directions. We talk about bi-directional measurements.

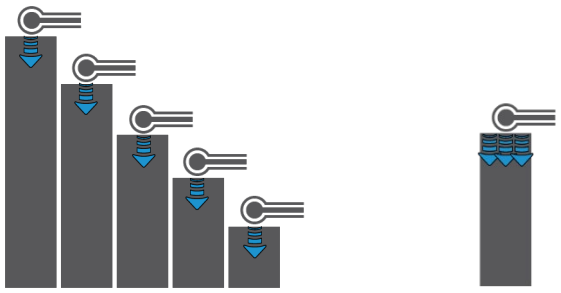
B_{MPE} Upper tolerance of B parameter.

E Error of indication of the height gauge for surfaces measured down. We talk about uni-directional measurement.

E_{MPE} Upper tolerance of E parameter.

R Repeatability error (2σ).

R_{MPE} Upper tolerance of R parameter.

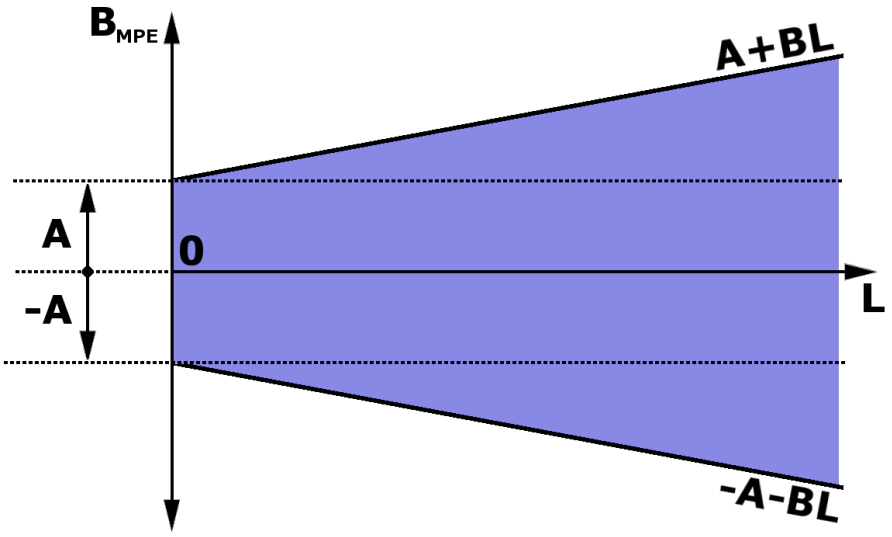


E_{MPE} R_{MPE}

The maximum permissible error is indicated as follows (A, B, C and D are constants, L corresponds to the measured length in meters).

$$B_{MPE} = A + B \times L$$
$$E_{MPE} = C + D \times L$$

Starting from the zero reference point, with its height position corresponding approximately to the reference surface of the granite plate, no error (measured value – nominal value) is above the admissible limits. All measuring results are therefore in the violet zone.



The visualisation of the schema of E_{MPE} is identical to the one above, except that parameters A and B are replaced by C and D. It is also possible that the technical specifications of certain products indicate A = C and B = D.

The TESA-HITE MAGNA and TESA-HITE are instruments with a “fixed zero”. This means that in order to have measuring results in accordance with the specifications indicated by the maximum permissible error, the reference used in a measurement sequence has to be measured on the level of the granite table generally used for most applications.

5 INSTALLATION, SECURITY & MAINTENANCE

5.1 Location	The instrument has to be installed in a location satisfying the general required conditions, but also the specific and very precise conditions regarding the environment, power supply, etc. It is essential to be able to identify important factors and to correctly prepare the zone the instrument is installed and used in.
5.2 Place of use	In order to use the instrument correctly, the following precautions have to be taken into account: • Avoid placing the instrument close to a window, door, cooling or heating system. • Avoid causing recurrent temperature variations due to direct exposure of the instrument to the sun. • Avoid installing it close to other machines that could induce large electromagnetic fields.
5.3 Lighting	Use indirect or fluorescent light. Avoid direct exposure to the sun or any other strong light.
5.4 Measuring surface	Choose a surface free of any vibrations that could lead to measurement or reading errors despite the stability of the mechanical and electronic components. Make sure that the surface can carry the weight of the machine and the workpiece to be measured. Ideally, the surface should not have any splits or joints. It is recommended to use a measuring surface that is big enough to enable smooth and easy movements of the instrument around the workpiece to be measured if the latter cannot be displaced manually.
5.5 Cleanliness	Make sure that the floor surface is clean, so that there is no dust, condensation or metal filings. The supports and scales have to be perfectly clean without any oily particles on it.
5.6 Vibrations	Floors of companies are constantly at risk of vibration due to different reasons: CNC and other machines, transportation vehicles and any other source of vibrations. These vibrations can directly influence the metrological performances of the machine.
5.7 Electric power supply	**Stability** When the instrument is powered electrically via the cable connected to the network, make sure that the electric power supply of the machine is as stable as possible, as it could otherwise deteriorate the system. If the electric network the machine is connected to does not provide sufficient stability, it is highly recommended to use an additional device to avoid any damage. These devices can be found locally. **Power cable** Do not use any other power cable than the one provided with the instrument. **Transformer** Do not use any other transformer than the one provided with the instrument. **Voltage** Do not use the instrument with any other voltage than the one indicated in this manual.
5.8 Final use	The instrument is to be used for measurements only.
5.9 Storage	It is important to respect the storage temperature limit indicated in the specifications of the instrument.
5.10 Cleaning	Only use a dry, lint-free cloth for cleaning the instrument. Do not use aggressive solvents.

5.11 Opening elements

Never try to open the control panel or the height gauge. Access is only allowed to qualified and authorised personnel.

If a person not authorised opens one of these elements, the warranty period automatically ends.

5.12 Recycling

Do not dispose of this product with municipal waste.

This product has been designed to allow a proper reuse and recycling of parts. The crossed-out bin symbol indicates that the product (electrical, electronic and/or mercury battery equipment) should not be disposed of with municipal waste. Consult local regulations for disposal of electronic products.

6 INSTALLATION

6.1 Packaging

Each TESA-HITE MAGNA or TESA-HITE instrument is delivered in packaging developed to protect it from shocks and corrosion.

Only transport the height gauge in this packaging. Any other transport using unofficial packaging is not recommended and will not be covered by TESA in case of dispute.

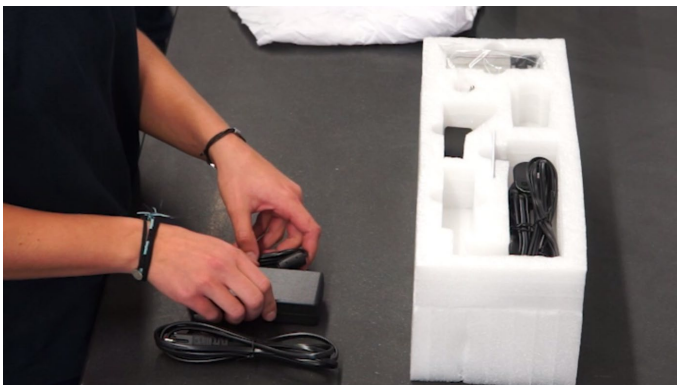
6.2 Unpacking & installation

1. Bring the pallet as close as possible from the installation area

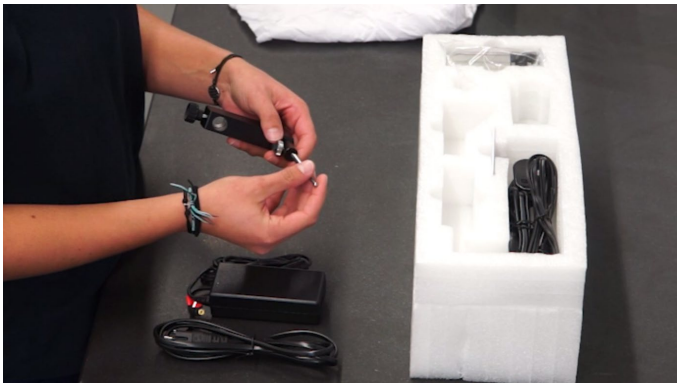
2. Carefully open the box with a cutter

3. Remove the foam block in which the accessories are stored from the pallet and place it on the granite table

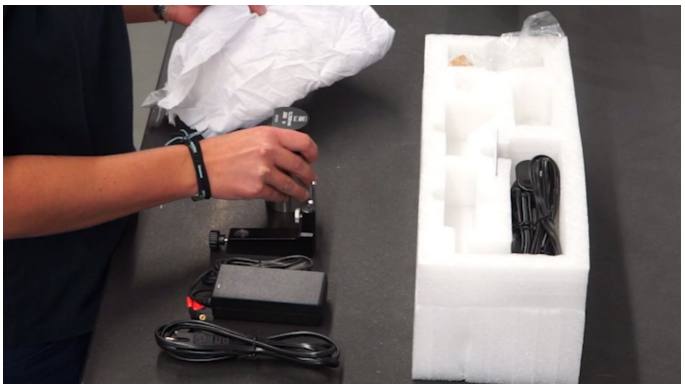
4. Remove power supply and cables from the box.



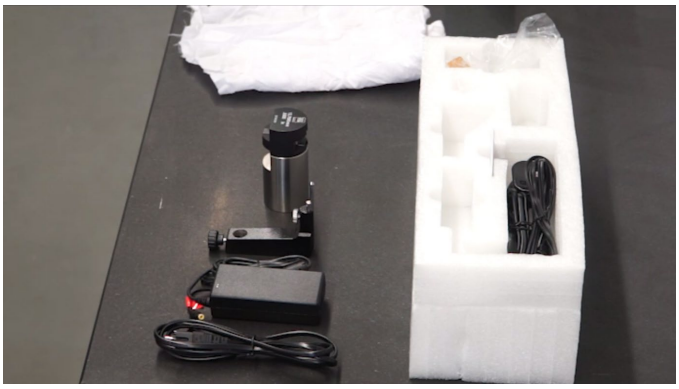
5. Remove the probe and its support from the box. Mount the probe on the support. Do not forget to tighten the assembly with the tightening wheel.



6. Remove the masterpiece from the box and its plastic bag. Clean its base before placing it on the granite table.



7. Accessories are now ready to be used.



8. Remove the second (upper) protection foam block from the box

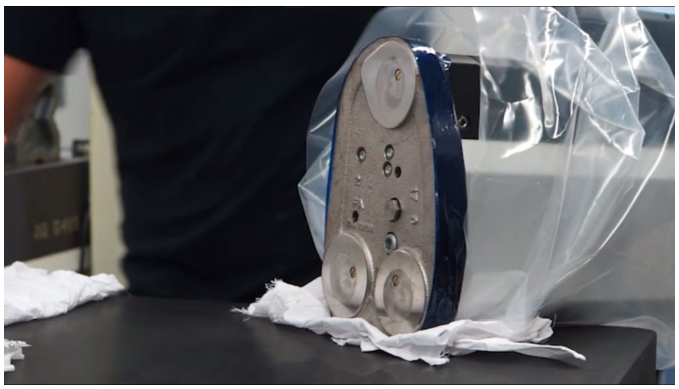
9. With a second person, remove carefully the gauge from the box

It is highly recommended not to do this step alone. Two persons are required to avoid any damage of the instrument in case of a shock or mishandling. Because of the weight of the instrument, it is not recommended to lift the unit on your own.

10. Carefully place the height gauge on the measuring surface keeping it in a horizontal position.

11. Delicately unpack the plastic cover protecting the base of the height gauge

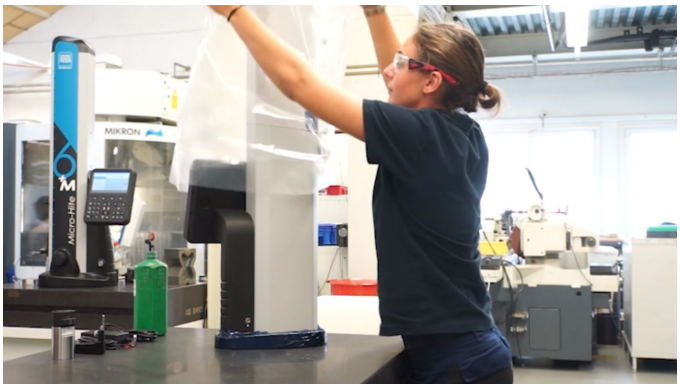
12. Make sure you have access to the support surfaces.



13. Remove the grease from the instrument base surface. Use a non-aggressive solvent to do so.

14. Install the instrument vertically on the clean granite plate (or any other support).

15. Remove the protective plastic cover.



16. Carefully remove the blue protective tape from the top cap.

17. Remove the bag of silica gel.

18. Gently remove the blue tape located in the middle of the height gauge.

19. Gently remove the blue protective tape from the base.

20. Remove the screw holding the shipping bracket.

21. Remove the shipping bracket by gently sliding it over the foam around the mounting pin of the probe support.

22. Remove the foam around the mounting pin of the probe support

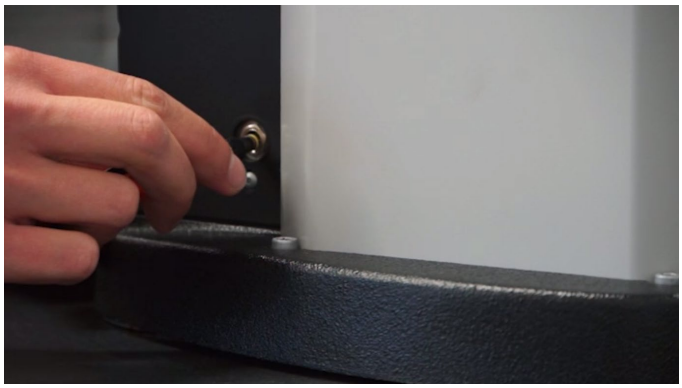
23. Mount the setscrew in the bore in which the shipping bracket was fixed.

24. Unscrew the carriage locking screw on the handwheel for displacement so that the carriage can be moved along the range of the instrument.

25. Position the probe support mounting pin at a comfortable height to mount the accessories and lock the carriage again.

26. Mount the probe support and the probe on the pin by tightening the screw on the top of the probe support.

27. Connect the height gauge to a source of power using the power supply unit for direct mains operation or subsequent use (with batteries once they are charged).

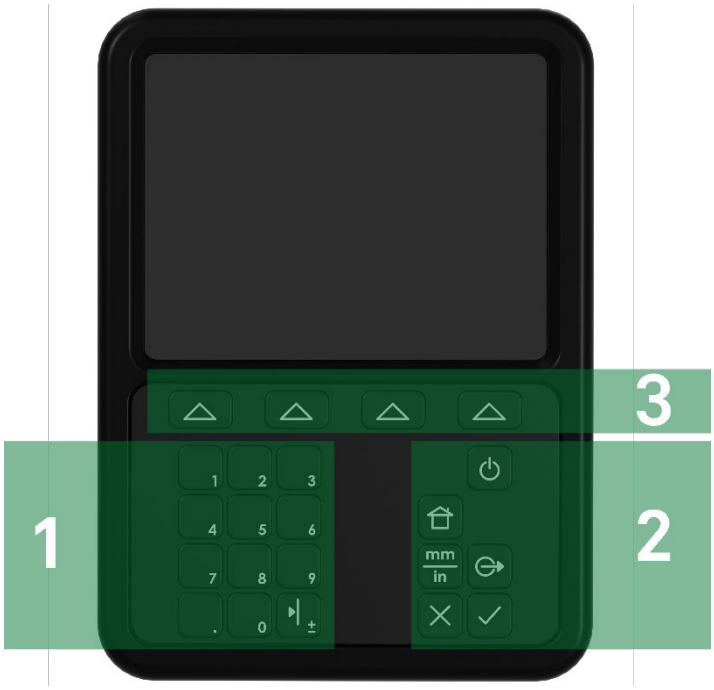


7 CONTROL PANEL

7.1 General description

The control panel of your height gauge has been developed to enable an ideal navigation through its software and an intuitive use.

Its keyboard is separated in three zones of keys that are easily distinguishable by the functions accessible through them.



No.	Description
1	**Measurement zone + numerical keyboard** • To save the active position of a measuring probe (example: measurement with a cone-shaped probe) • Insert a numerical value
2	**Software interaction** • Turn the instrument on or off • Validate or cancel actions • Go back to main menu • To change the active unit
3	**Validation of context-based options/actions**

7.2 Measurement zone

There are two different types of actions possible using the keys of this zone:

- Numerical keyboard
- Measurement function

The numerical keyboard can be used at any moment, when the user has to enter a value manually.

Definition of keys	
1	Insert value 1
2	Insert value 2
3	Insert value 3

4	Insert value 4
5	Insert value 5
6	Insert value 6
7	Insert value 7
8	Insert value 8
9	Insert value 9
.	Insert a point
0	Insert value 0
±|	Save the position of the measuring probe in the memory ± Change the sign of the active value

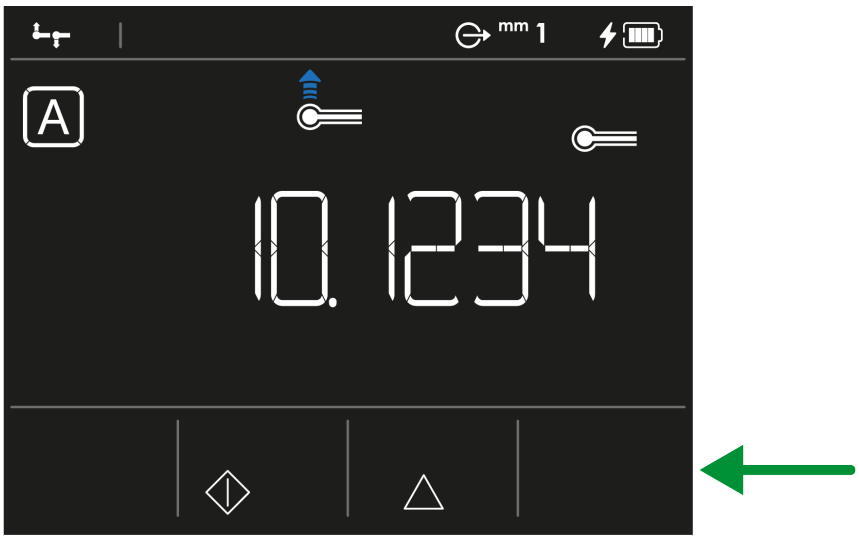
7.3 Software interaction

Definition of keys	
	Turning on and off the instrument.
	Return to main menu
mm in	Change of active unit
	Send the displayed main value via the TLC port to a connected external device
	Abandon or cancel
	Validate

7.4 Context-based actions

At any moment, context-based actions will be displayed in the black bar positioned at the bottom of the screen.

These options can be selected by pressing the key that corresponds to the respective action.



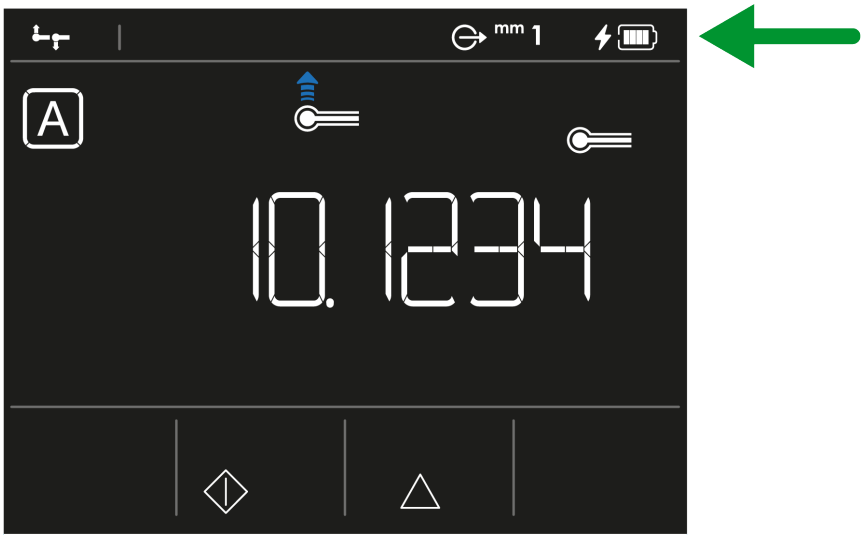
Location of additional options displayed according to the active screen

A chapter which summarises the context-based actions is available at the end of this document.

8 MEASUREMENT INTERFACE

8.1 Status bar

The status bar on top of the screen gives you access to the state of the system at any time.



This bar provides the following information:

Definition of icons	
	Battery level
	Battery charging (or almost empty if the red icon is blinking)
	Interface theme
	Unit
	Manage transmission of data
   	Mode/menu title

This bar is also used to display system options. For further information, please refer to the corresponding chapter.

8.2 Main zone

All values and measurement results will be calculated and displayed in the main zone.

Information and help regarding the different steps of a process will also be displayed in this zone in order to help the user with the measurement.

No.	Description
1	• Display of the main measurement value • Characteristic concerning the value displayed on the main line
2	• Display of the secondary measurement value • Characteristic concerning the value displayed on the secondary line
3	Display of the measurement help icons

8.3 Measuring force

The zone dedicated to the measuring force is displayed on the right of the screen.

When capturing a point, a bar moves up and down. As it evolves, the colour of the displayed squares changes. The colours represent the force applied on the probe (and thus on the measuring carriage).

Colour	Description
	The pressure applied on the probe is perfect. The measurement is correct.
	The pressure applied on the probe is not sufficient to trigger the measurement.
	The pressure applied on the probe is too high. The measurement would not be correct and is therefore not possible.

8.4 Bar of context-based actions

In this bar, actions are displayed according to the interface context.

8.5 Measurements list

A maximum of three measurements (not counting the displayed measurement) are stored in the memory.

In ST2 mode, it may happen that a measurement contains two features: △ / ∅ and ⋮

9 SYSTEM OPTIONS

9.1 Access

The system options are accessible at any moment from the main menu by pressing the key  .

Main menu of the software

It is possible to go back to main menu from any page of the software by pressing the key  .

9.2 System parameters

Definition of options	
	Definition of the backlighting of the display (1 to 10).
	Time defined before complete shutdown of the system (if the system is not used during this period). This time is given in minutes. • If the height gauge is connected to the electric power network, this option is not taken into account and the height gauge will never shut down. • If the height gauge is not connected to the power supply, this option must be set to 0 if the height gauge should not shut down automatically.

	Time defined before standby mode of the system (if the system is not used during this period). This time is given in minutes. • If the height gauge is connected to the electric power network, this option is not taken into account and the height gauge will never go into the standby mode. • If the height gauge is not connected to the power supply, this option must be set to 0 if the height gauge should not go into the standby mode automatically.
	Definition of the resolution • **Metric** TESA-HITE MAGNA: 0.001, 0.005, 0.01 mm TESA-HITE: 0.0001, 0.001, 0.01 mm • **Imperial** TESA-HITE MAGNA: .0001, .0002, .001 in TESA-HITE: .00001, .0001, .001 in
	Managing the loudspeaker (0 to 10)
	Managing of the size of the master piece (value to be inserted manually), given in mm or in depending on the active unit for the instrument.
	Managing the air cushion (0 to 10)
	Managing of the data sent through the TLC port • **Manual** The displayed main value is only sent after pressing the button on the panel keyboard  . • **Automatic** The measured or calculated value is sent automatically, at the same time as it is displayed on the main line of the screen.  **A value displayed on the secondary line is never sent through the TLC port.**
	Managing the units • mm • inch
	Management of the interface themes. For further information, please refer to the corresponding chapter.
	• Move the selection of the option to the left • Validation of the possible modification of the previous option
	• Move the selection of the option to the right • Validation of the possible modification of the previous option
	Change the selected parameter in order to go through the options proposed for this parameter.

Once the parameters have been modified, press the button  on the panel keyboard to validate the changes of the active option and to return to the main page of the software.

9.3 Interface themes

As described above, the height gauge can be configured through the system options menu  accessible from the main page of the software. One of these options, called "Themes"  , allows you to determine how certain interface pictograms will be displayed on the screen before, during or after the measurement.

Measurement aid icons

Theme 1

- This theme is active by default.
- The help icons above blink when the software expects an action from the user
- In the ST2 menu, when measuring by double probing, the second result line is used and the results are displayed there if necessary
- The strain gauge on the right side of the screen is active and is displayed during any measurement.

Theme 2

- The help icons above are displayed **but do not blink**
- In the ST2 menu, when measuring by double probing, the second result line is used and the results are displayed there if necessary
- The strain gauge on the right side of the screen is active and is displayed during any measurement.

Theme 3

- The help icons above blink when the software expects an action from the user
- In the ST2 menu, when measuring by double probing, **the second result line is not displayed**
- The strain gauge on the right side of the screen is active and is displayed during any measurement.

Theme 4

This theme is intended to be a replica very close to the interface of the previous generation TESA-HITE models:

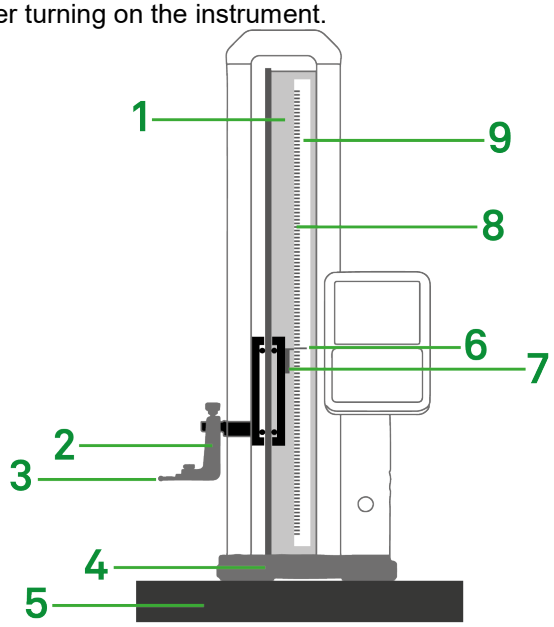
- Same icon when initializing the gauge
- Same horizontal strain gauge displayed when measuring the culmination point
- Same management of the help icons/instrument status
- …

10 INITIALISATION

10.1 Concept

The initialisation process is the first step after turning on the instrument.

No.	Description
1	Height gauge frame
2	Probe support
3	Probe
4	Base
5	Granite table
6	Reference mark
7	Sensor
8	Increments
9	Scale

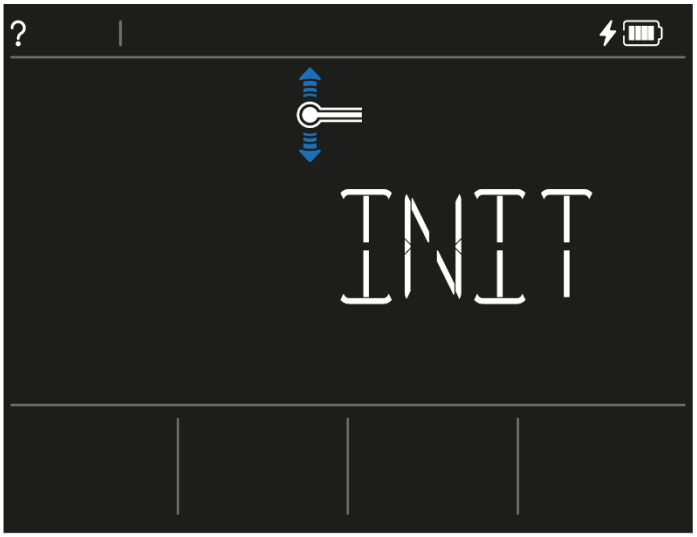


The probe support (2) is directly linked to a carriage system with a sensor (7) on it. As soon as the instrument has been turned on, this non-contact sensor will read the incremental divisions (8) on the scale (9) at all times. One of these increments is considered as the reference from which the height gauge will always calculate its position. This mark is called the reference mark (6).

The initialisation process therefore consists in moving the sensor in front of the reference mark, which is located approximately at 15 cm from the instrument base.

10.2 Process

Once the height gauge is switched on and the software is loaded, the initialisation page is accessed.



The carriage must be moved with the handwheel to find the reference which is about 15cm above the instrument base. The process is finished once the sensor has detected the reference mark on the scale.

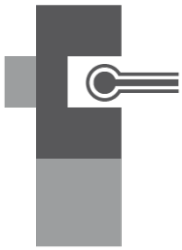
11 DETERMINATION OF THE PROBE CONSTANT

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

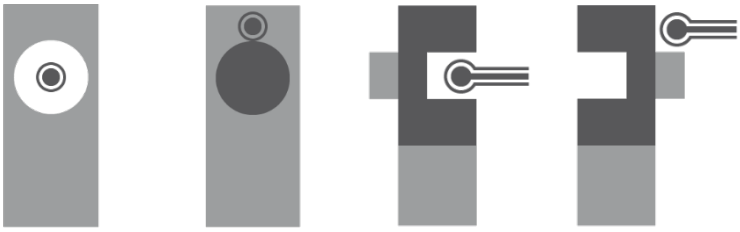
The master piece has to be as clean as possible when it is used, as it is, to a large extent, the measurement of this tool that will determine the accuracy of the results obtained later.

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.

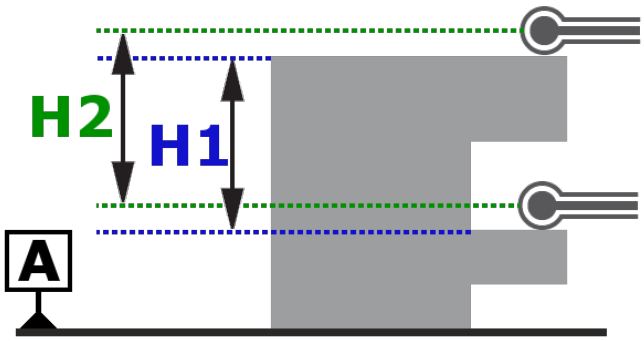
The probe constant considers and compensates the main influencing factors such as:

- 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**

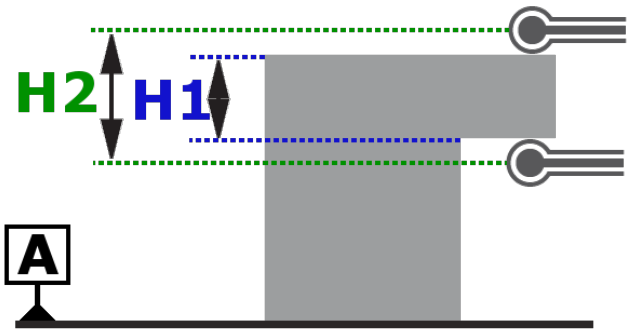
In case the measurement sequence does not require the use of the probe constant, all values are offseted from a constant value, the radius of the probe. This is the ST1 mode.



H1 = H2

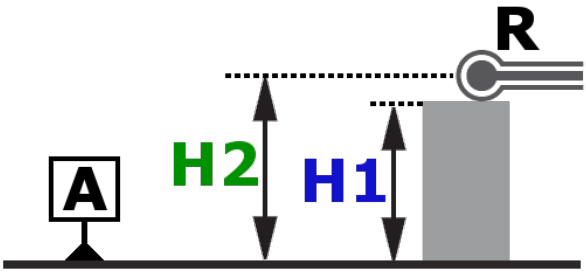
If probing in two directions is needed in the same measurement sequence, this is achieved with the compensation of the ball-tip radius in the probing direction. This is the ST2 mode.

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



H2 ≠ H1

Diagram representing the compensation of the ball-tip:



H1 = H2 - R

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.

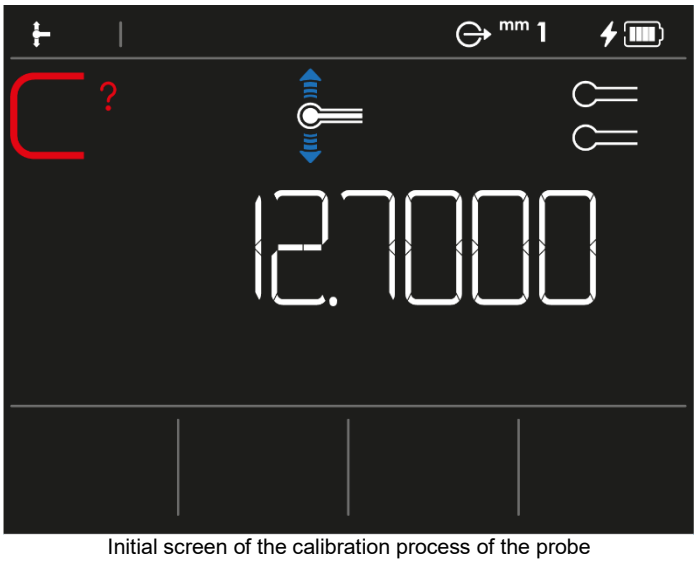
Deviation	Display resolution
5 to 10 µm	0.01 mm
> 10 µm	0.1 mm
.0002 to .0005 in	.0005 in
> .0005 in	.005 in

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.



Initial screen of the calibration process of the probe

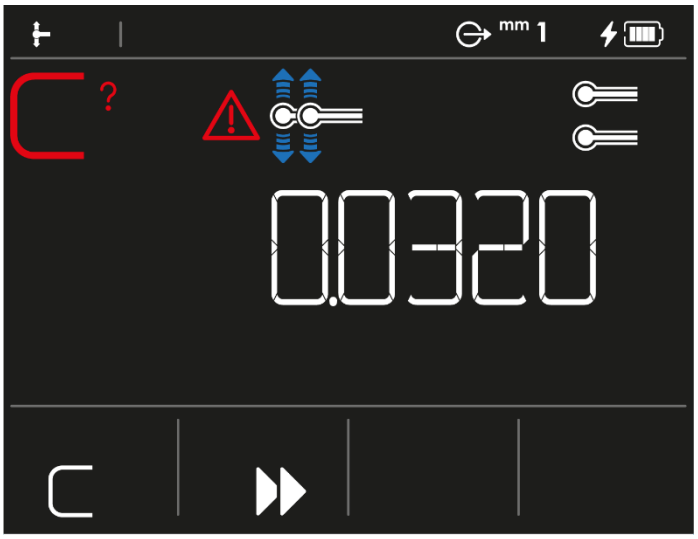
Each time the procedure for determining the probe constant is started, the screen above is automatically displayed. It clearly shows the dimension of the gauge to be measured.

If this displayed dimension does not match the dimension of the master piece you are going to measure, the result of the probe calibration cannot be correct.

In order to obtain good results, it is mandatory to modify the value relative to the master piece from the system options before calibrating the probe again.

In order to calibrate the probe, the points have to be measured using the handwheel and moving the probe from top to bottom. Measurements can be made in a groove or rib without having to give the information to the software.

If the calibration process goes wrong, the following alert screen appears. As explained above, the value on the screen corresponds to the maximum deviation between two master piece measurements.



Definition of keys	
	Restart the calibration process of the probe.

	Skip the alert page and enter ST2 mode. The resolution of the display will be adjusted according to the deviation displayed on the screen.

12 PRINCIPLES OF MEASUREMENT

12.1 Generality

Before using the TESA-HITE MAGNA or TESA-HITE height gauge, it is important to remember that the way in which the values are measured is determined by the measurement problem. It is essential, that the user can define the nature of the measurement process according to the application, in order to quickly get reliable results.

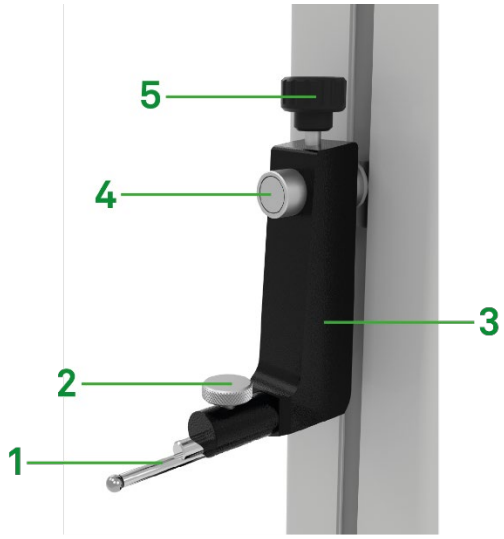
In general, it is important to ask yourself the following basic questions:

- Does the measured value require a single or double probe hit?
- Does the measurement require an inversion of the probing direction?
- Do you have to measure with or without detection of the culmination point?
- Which accessory fits the most with the desired measurement?

These questions are the first step to guarantee ease of measurement with correct metrological results.

12.2 Probe support

It is very likely that during the use of the height gauge, the type of application the user will be confronted will imply changing accessories in order to guarantee a reliable and precise measurement. Mounting or removing a probe or probe support is a process that requires to be careful and done in a correct way. Indeed, not mounting it correctly could lead to significant measurement errors.



In order to guarantee the reliability of the measured values, it is necessary that the following condition is met: the probe (1) has to be firmly attached to the probe holder (3) using the locking screw (2). The probe holder (3) must also be mounted on the mounting shaft (4). Make sure that the screw of the probe holder (5) is tightened. This procedure is the same for all types of probes and supports.

12.3 Measurement modes

Once the workpiece and the wanted dimensions to be measured are known, the user has the possibility to choose among several modes:

ST1
Measurement with unidirectional probing

ST2
Measurement with bi-directional probing

STP
Detection parallelism errors
Continued display

12.4 ST1 & ST2 philosophy

The two main modes integrated in the height gauge range are defined by the names ST1 and ST2. These are the most frequently used modes. They can directly be selected via the main menu of the measurement software, which can be displayed at any moment by pressing key .

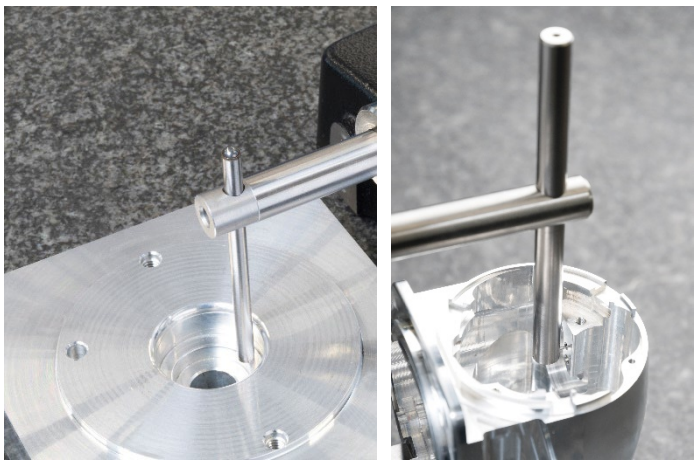
Main menu of the software

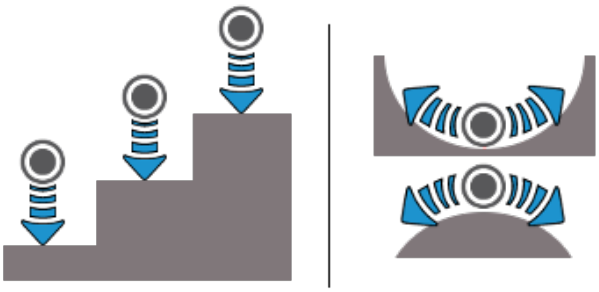
The major difference between these two measurement modes is closely linked to the features (height, diameter etc.) that will have to be measured during the same sequence. The determination of certain features does not require an inversion of the probing direction, while others entirely depend on it.

Mode	Description
ST1	• Lengths measurement in only one probing direction. • The calibration of the probe is not necessary.
ST2	• Lengths measurement in two probing directions. • The calibration of the probe is mandatory.

Each one of the two modes has been developed in order to best suit the different application cases and possibilities of use. The flexibility of mode ST2 allows you to measure any elements, while ST1 mode minimises the time of access to the measurement (avoiding the probe calibration process) and allows you to use accessories that cannot be easily calibrated with the master piece.

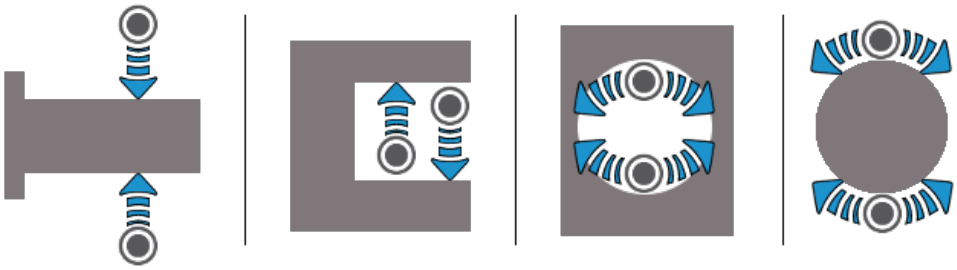
For example a rod required to measure a blind bore cannot be calibrated. Therefore, the ST1 mode is required to perform this measurement.





Measurement without inversion of probing direction

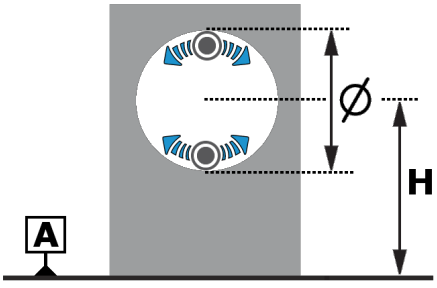
In the above examples, all heights are measured by down hits. All measurements therefore have a similar probing direction.

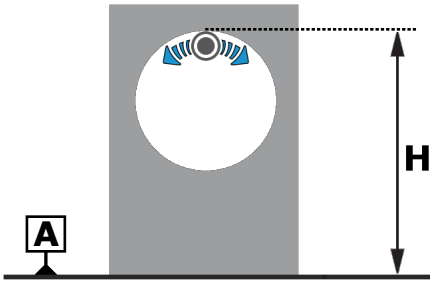
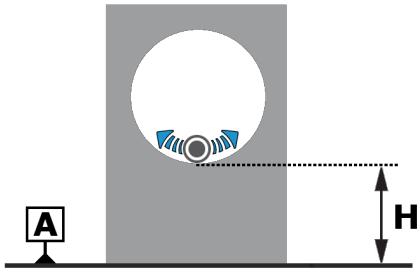
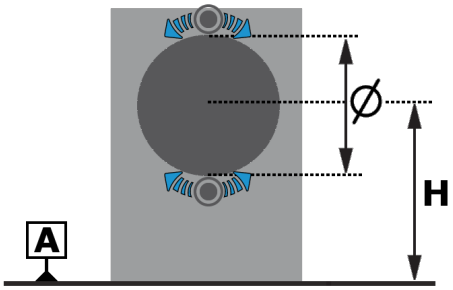
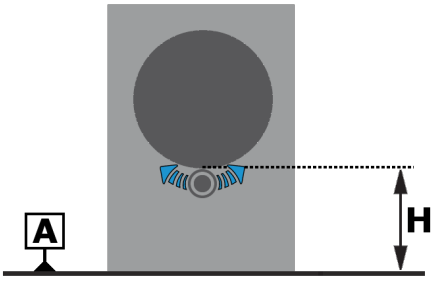


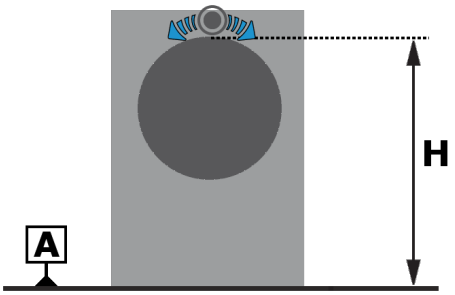
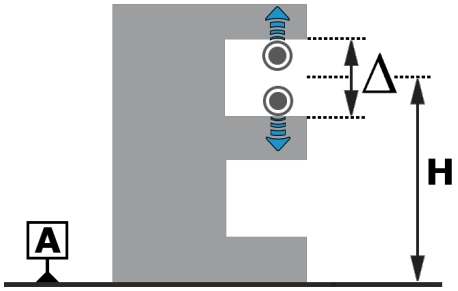
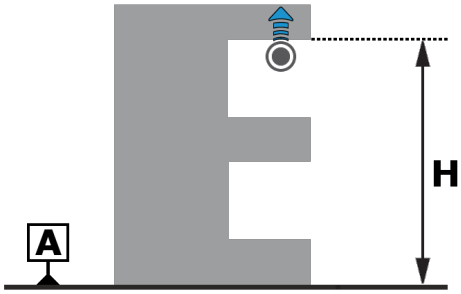
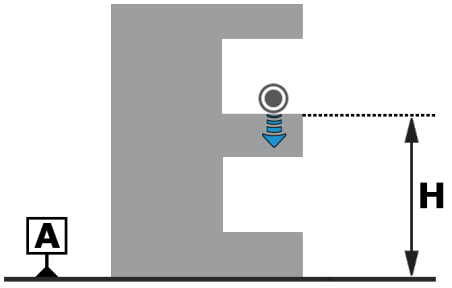
Measurement with inversion of probing direction

The above examples show that the measured elements require two hits, one by pushing upward and one downward. This is called a measurement that requires an inversion of probing direction as the two measurements have an opposite direction.

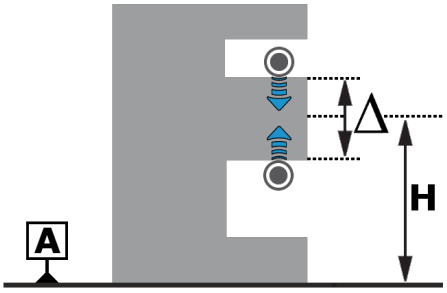
12.5 Measurement functions

Measurement	Result
Bore	 The software will display the diameter of the bore ∅ and the height of its centre with respect to the active reference.

 Upper internal culmination point	 The software will display the height  of the culmination point with respect to the active reference.
 Lower internal culmination point	 The software will display the height  of the culmination point with respect to the active reference.
 Axis	 The software will display the diameter of the axis  and the height of its centre  with respect to the active reference.
 Lower external culmination point	 The software will display the height  of the culmination point with respect to the active reference.

 Upper external culmination point	 The software will display the height  of the culmination point with respect to the active reference.
 Groove	 The software will display the width of the groove  and the height of its centre  with respect to the active reference.
 Upper point	 The software will display the height of the point  with respect to the active reference.
 Lower point	 The software will display the height of the point  with respect to the active reference.

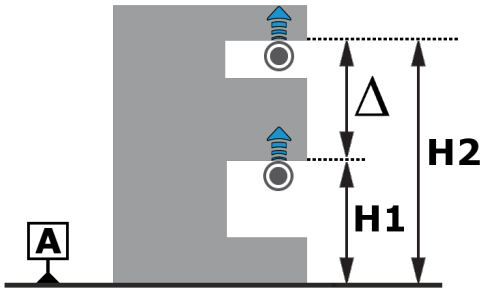
Rib



The software will display the width of the rib Δ and the height of its centre ⊙ with respect to the active reference.

Calculation	Result

Difference between two values



The software will display the difference between the value displayed on the screen and the last value in memory: H2-H1.

This function only calculates height differences.

Therefore, in ST2 mode, the type (⌀ or ⊙) defined for the characteristic of the main value is not decisive for the calculation.

All possible scenarios are described in the table below:

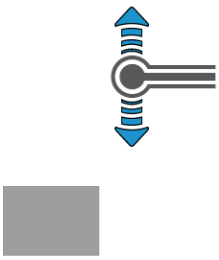
Case	Line	Measurement 1	Measurement 2	Realized calculation
1	Main	⌀$_1$	⌀$_2$	⊙$_2$ - ⊙$_1$
	Secondary	⊙$_1$	⊙$_2$	
2	Main	⌀$_1$	⊙$_2$	⊙$_2$ - ⊙$_1$
	Secondary	⊙$_1$	⌀$_2$	
3	Main	⊙$_1$	⌀$_2$	⊙$_2$ - ⊙$_1$
	Secondary	⌀$_1$	⊙$_2$	
4	Main	⊙$_1$	⊙$_2$	⊙$_2$ - ⊙$_1$
	Secondary	⌀$_1$	⌀$_2$	

12.6 Single probing

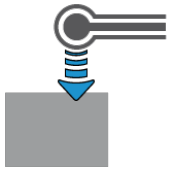
Probing with one hit corresponds to the measurement of a height by establishing contact between a probe and a flat surface. This process depends on the user, as they have to move the probe at all times using the handle provided for that purpose.

Process

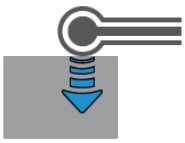
1. Move the probe using the handwheel. Make sure you do not hit anything (probe, probe support etc.) during the movement.



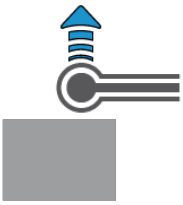
2. Position the probe close to the point to be measured.



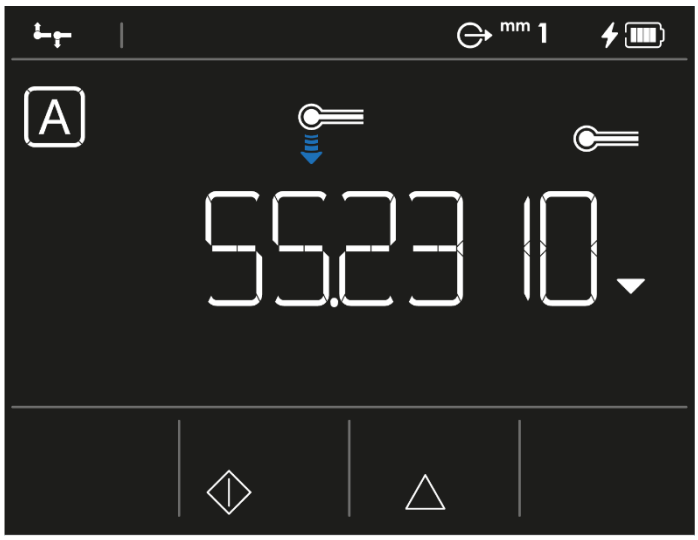
3. Once the location of the measurement is clearly defined, put the probe in contact with the surface. Continue to apply pressure on the insert (and make sure that the strain gauge is still in the green zone) until the point is captured. An information beep should sound. If you hear a triple beep, it is very likely that the pressure on the insert is too high.



4. Release the system, so that the probe is not in contact with the workpiece any more.



5. Visualise the result on the screen.



Measuring result from a downward probing in ST1 mode

12.7 Measurement of a culmination point

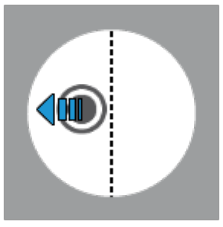
A culmination point can be measured in dynamic mode meaning by moving the workpiece back and forth, so that the probe passes the maximum or minimum culmination point to be detected. The height of the culmination point is then measured on the fly and stored in the memory.

At each passage, a new culmination point is calculated and compared with the previous ones. If the difference between all the memorised points is above a certain limit, the measurement is considered as invalid.

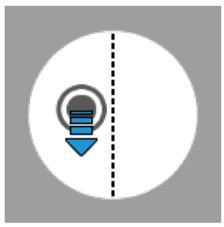
Process

1. Place the probe inside the bore.

2. Displace the probe slightly to one side of the culmination point visually.

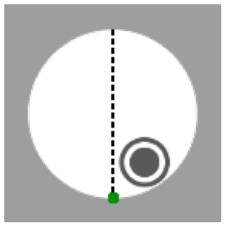


3. Move the probe up or down in order to establish contact with the workpiece.



4. Once the contact established, continue to apply pressure in order to place the strain gauge in the green zone. At that moment, the software has to detect that you want to measure a culmination point. If you have selected theme 1, 2 or 3, you will see a help icon  asking to move the probe into the bore.

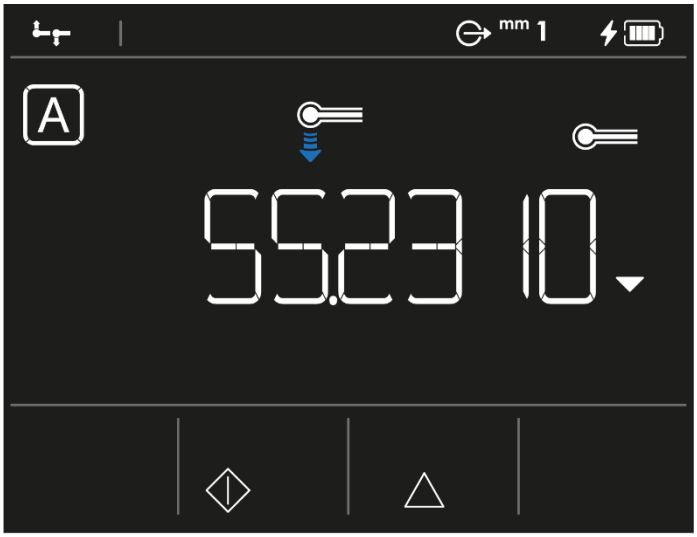
5. Once the minimum point is passed, the software emits a beep and the help icon  is updated according to an internal or external measurement. The probe is now located on the opposite side.



6. It is now possible to release the pressure on the probe and to remove it from the workpiece. This action finishes the process.

   It is also possible to pass again and to move to the opposite direction again in order to define a new inflection point, which will be compared to the first one. This step can be repeated as often as you want until the pressure on the probe is stopped.

7. The result is automatically displayed on the screen.

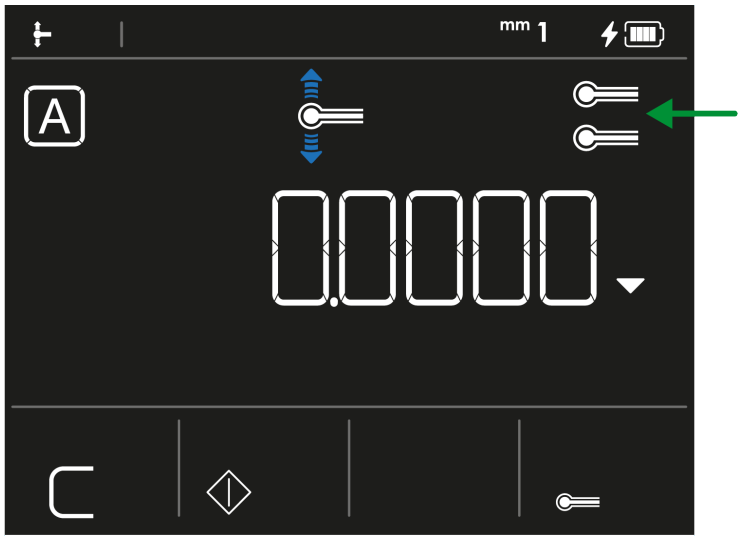


The above process shows a lower internal culmination point measurement. All other types of culmination points (internal/external, lower/upper) are measured in exactly the same way.

12.8 Bore/axis measurement

The measurement of a bore or axis is not possible while mode ST1 is active as it requires probing in two directions. Therefore, mode ST2 is mandatory.

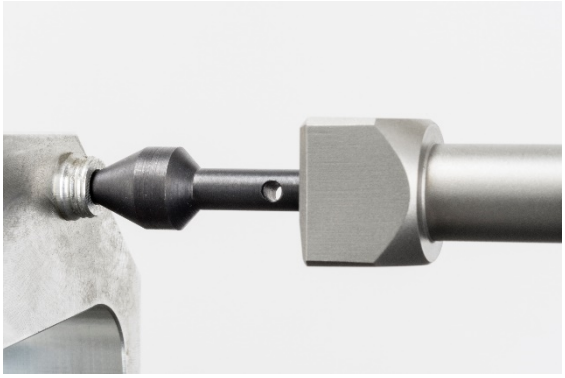
Once in mode ST2, it is important to verify that the option of probing with two probe hits has been correctly selected.



Then, for each of the two points of the element to be measured, simply follow the procedure defined for a culmination point in the previous chapter.

12.9 Manually defined heights

In the three measuring modes (ST1, ST2 and STP continued display), it is possible to define the active height of the probe as a measurement point. In order to keep a height in memory, it is necessary to press the button on the keyboard .



This function is often used with cone-shaped probes to measure the distance between small bores whose direct measurement (via their culmination points) is complicated due to their small dimension.

In order to use this option, in ST1 and ST2 modes it is mandatory to define the active reference  also with this method. If the active reference has been measured in a standard way (using the double carriage), the use of this function is not allowed and blocked.

In the STP continued display menu no reference is requested.

In all measuring modes, this function is only active if the double carriage has been blocked.

When using the function  , it is mandatory to lock the double carriage. **Please refer to the procedure explained in the chapter on STP mode for information on how to lock the double carriage.**

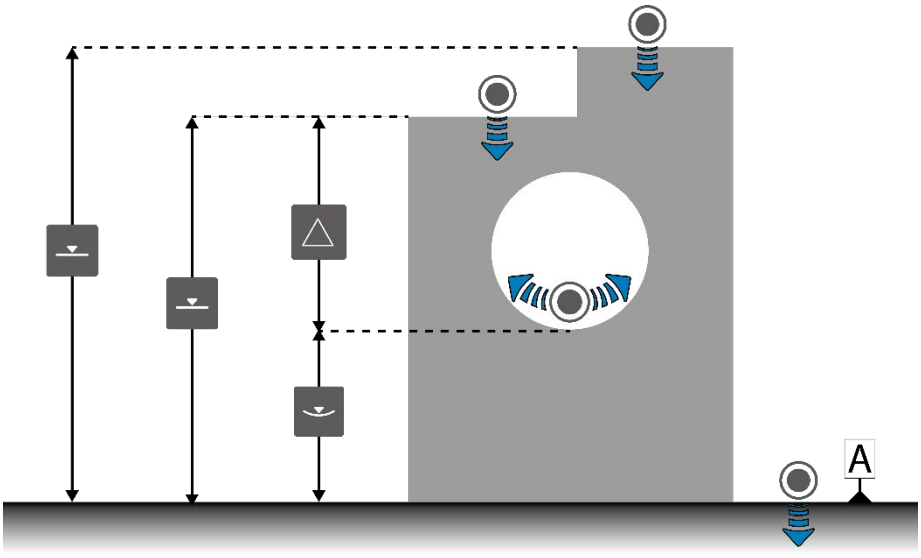
13 ST1 MODE (START 1 DIRECTION)

13.1 Generality

The access to ST1 mode does not require the determination of the probe constant. This has a direct impact on carrying out a measurement sequence. **All measurements regarding the same reference have to be carried out by probing in a direction similar to the one chosen when the active reference has been captured.**

Probing (capturing the reference) \ Probing direction (during the same measurement sequence)						
	•	•	•	-	-	-
	•	•	•	-	-	-
	•	•	•	-	-	-
	-	-	-	•	•	•
	-	-	-	•	•	•
	-	-	-	•	•	•

Example of a measurement sequence when the active reference has been probed down. All measurements are also taken down hits.



Example of measurements when the active reference has been determined by probing down.

This mode is accessible from the main menu by pressing the key at any moment.

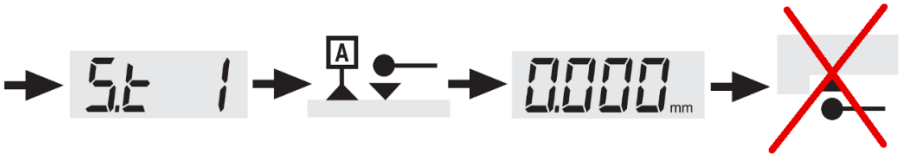
Main menu of the software

13.2 Capturing the reference value

In ST1 mode, the reference value is always captured with single probing.

This reference value can be defined by a single probe hit ( ) or by measuring a culmination point ( ).

As explained before, the probing direction used when capturing this reference value will determine the probing direction of the following measurements. Thus, the following process is impossible as the reference is probed down and the measurement up:



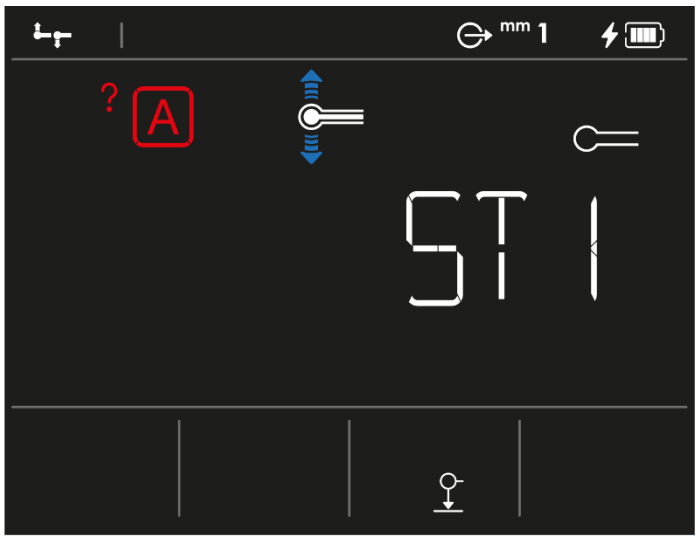
Any measurement with inverted probing direction compared to the direction defined when the reference value has been captured, will generate a warning beep. Therefore, no point is stored in the memory.

13.3 Indirect reference (PRESET)

Please refer to the chapter describing the principles of indirect reference for ST2 mode . The use of the indirect reference is identical in ST1 mode.

13.4 Managing the reference

The TESA-HITE MAGNA or TESA-HITE allows the management of one single reference at any time. If a new reference is to be defined, the active measurement mode must be reset using the context action . At this point, all measured values previously stored in memory and the active reference will be deleted. The software will return to the main page of ST1 mode, asking you to measure again a reference .



Main screen of the ST1 measurement mode

13.5 Cancellation of the measurement

At any time, the measurement displayed on the screen can be cancelled by pressing the button on the control panel . The software will then display the values of the previous measurement stored in memory.

It is possible to "go back" in the measurement history until the active reference is displayed. This one cannot be deleted with the keyboard button but only with the context-based action .

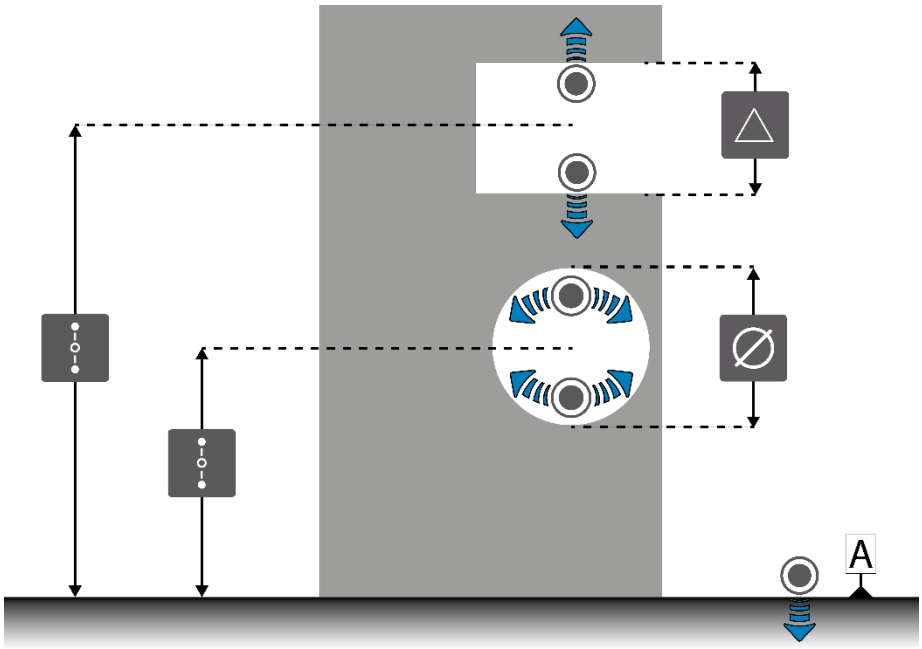
13.6 Context-based actions

A list which defines all the context-based actions of the ST1 mode is available at the end of this document.

14 ST2 MODE (START 2 DIRECTIONS)

14.1 Generality

Each time when entering ST2 mode, it is necessary to calibrate the probe . Once this has been carried out, you can either probe up or down for any measurement sequence.



Examples of a measurement sequence in *ST2* mode

This mode is accessible from the main menu by pressing the key at any moment.

Main menu of the software

14.2 Probe calibration

When entering ST2 mode for the first time, the probe calibration process starts automatically.

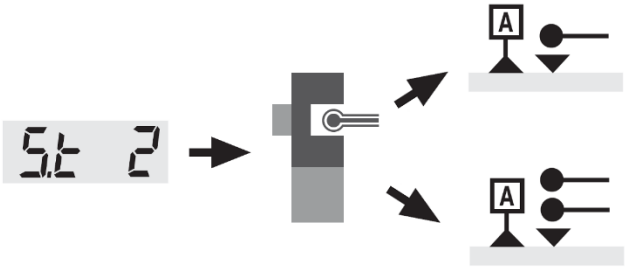
Once the calibration procedure of the probe has been performed, it is no longer automatically requested, even if the user exits the ST2 measurement mode. The probe constant is also kept in memory for STP mode (and vice versa).

If the user wishes to recalibrate his probe, he must activate the context-based action  **available in the ST2 and STP measurement modes.**

Re-calibrating a probe involves resetting the ST2 and STP measuring modes.

14.3 Capturing the reference value

When entering *ST2*  mode, once the probe calibration has been performed, the reference values can be captured through single or double probing.



Once this reference value has been captured, the measurements can be carried out with single or double probing.

14.4 Single & double probing

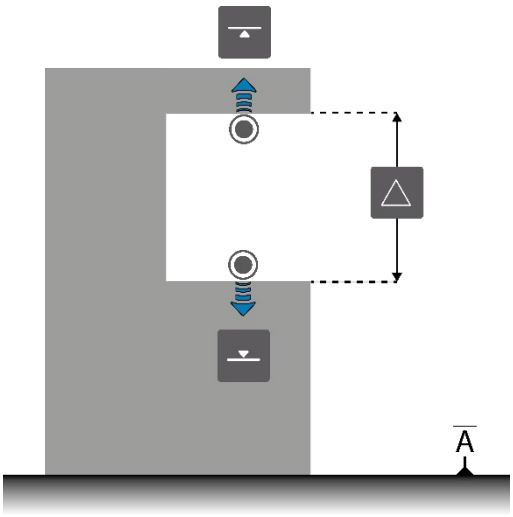
The concept of single and double probing has been developed in order to allow the direct measurement of certain elements and quick access to their features. While single probing  enables only height measurements in order to gain some time, double probing  is the way to minimise the number of measurement steps and to improve cycle time. Therefore, everything depends on the application.

Double probing allows you to position a reference value at levels that would be impossible in ST1  **mode:**

- **Centre of groove or rib**
- **Centre of bore or axis**

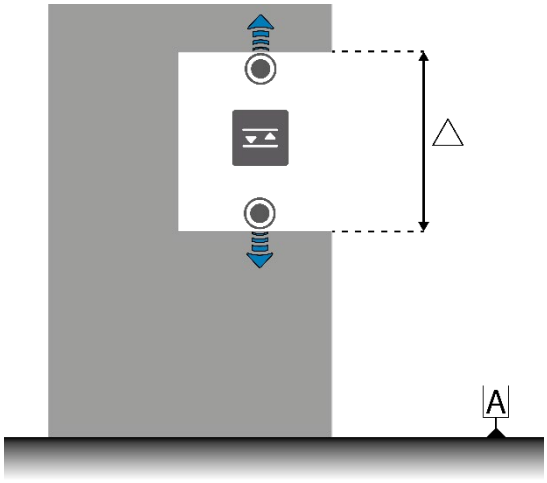
As each application is different, it is the responsibility of the user to define the most appropriate measurement steps. In many cases, a similar result can be reached via two measurement sequences. Only their steps are different.

In order to illustrate single and double probing, two different measurement procedures with the same result are shown below.



M1	AAAAAAA	A	
M2	BBBBBBB	A	
M3	CCCCCCC = M2-M1	A	

Measurement process with single probing



M1	CCCCCCC	A	

Measurement process with double probing

The two examples above clearly show that in certain cases, it is better to go for double probing:

The first solution requires 3 measurement blocks. Single probing is activated . First, each height must be measured. Then the height difference has to be calculated with the context-based action .

To achieve the same result, the second solution only requires having the double probing enabled. The user then measures the two points required for groove measurement and the software displays directly the width of the element. Please note that in this case the height of the groove centre is also displayed on the screen.

It is important not to mix single/double probing and ST1/ST2 concepts. Here is a summary giving the overview:

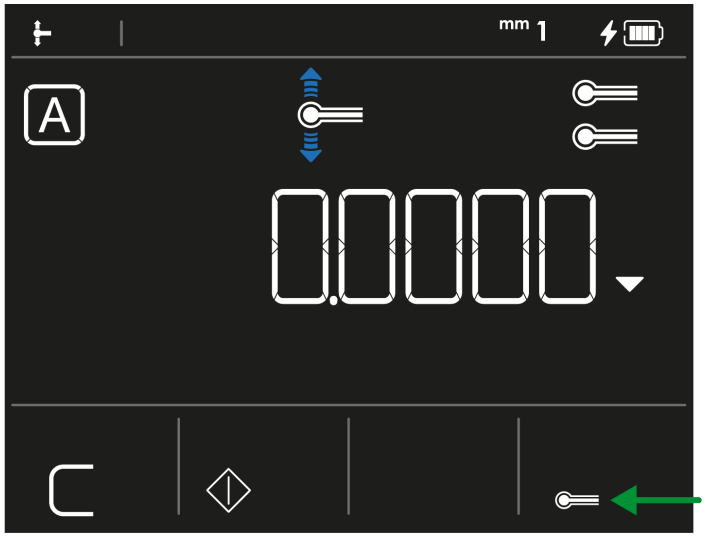
ST1 mode	• **Single probing only** • **Probing in reference's direction only**
ST2 mode	• **Single or double probing possible**

In the ST2 mode the number of probe contacts after which a measured element will be calculated can be chosen: one or two hits.

Icon	Description
	Two probe hits
	Two probe hits One point has already been measured

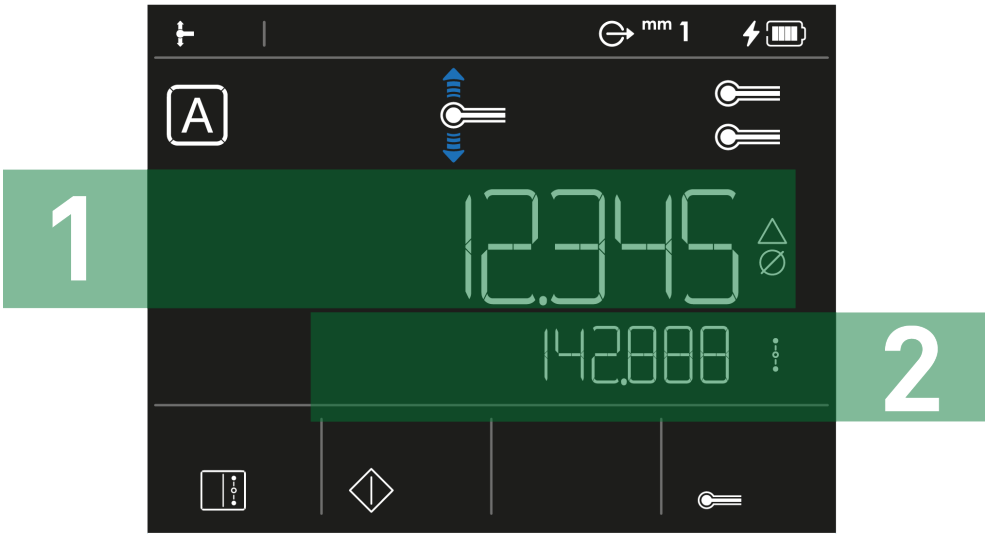
	
	Two probe hits Both points are measured.
	One probe hit
	One probe hit The point is measured

You can change from one probe hit to two (and vice versa) by pressing the context-based action  or  .



14.5 Main and secondary Result

When measuring an element by double probing, several results are displayed on the screen. In addition to the main value (1), a secondary value (2) can also be available. If the secondary value is displayed depends on the selected theme since it is displayed only for themes 1 and 2.



The main value is sent through the TLC port manually or automatically. The secondary value is not sent, it is only displayed for information.

The characteristic types can be inverted, defining the main and secondary values by using the context-based action  or  .

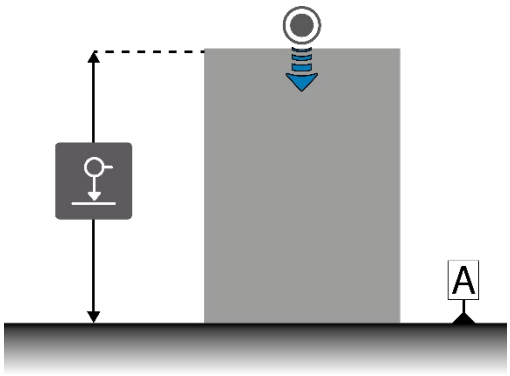
The main characteristic is kept in memory for all subsequent measurements, unless modified by the user, when measuring an element by double probing.

For example, if the user has chosen to display the diameter  as the main characteristic, at each bore measurement, the diameter value will be displayed on the main line and sent through the TLC port if necessary.

14.6 Indirect reference (PRESET)

This function allows you to enter numerical values, in particular for capturing dimensions with a reference point that cannot be measured directly. For example, as detailed in the drawing below, it is strongly recommended not to take the reference directly on a granite table but to use a gauge block whose dimension is known.

The distance between the chosen surface to be probed and the reference point used has to be known at least in the form of a theoretical dimension with a positive or negative sign. In our example, the size of the gauge block is known.



The indirect reference is at the granite table level

1. When the software requests to take the reference in the measurement modes, the user can press the context action  to manually insert an indirect reference value. The dimension of the gauge block must be inserted for example at this point.

2. The following step is the definition of the measurement reference. This simply means measuring a height accessible for the gauge. Then the measured height will not be considered by the software as height 0. Instead, it will be defined by the indirect reference value inserted in point 1. In our example, the gauge block on the granite is measured. The value displayed on the screen gives the value of the gauge block, which means that the indirect reference is then the average height of the granite table.

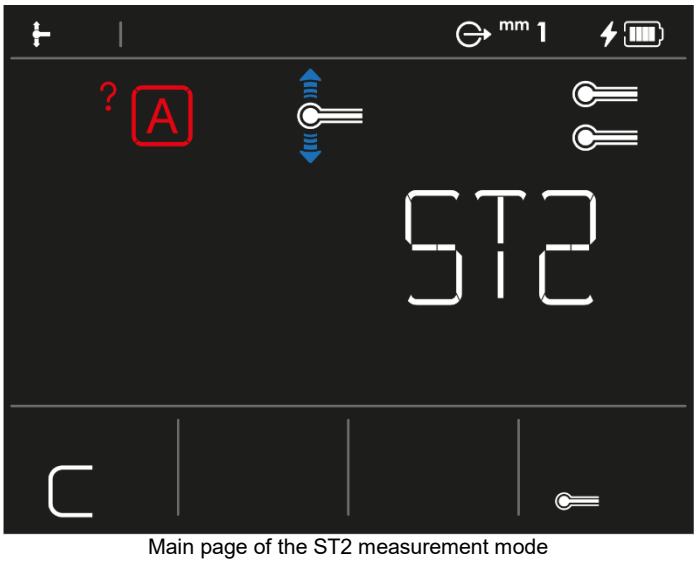
The option can only be selected when the software requires to define a measurement reference. Any modification of the value of the indirect reference will implicate a redetermination of the measurement reference.

14.7 Managing the reference

The TESA-HITE MAGNA or TESA-HITE allows the management of one single reference at any time. If a new reference is to be defined, the active measurement mode must be reset using the context action  . At this point, all measured values previously stored in memory and the active reference will be deleted. The software will return to the main page of ST2 mode, asking you to measure again a reference. When pressing the context-based action  , the value of the probe constant is not lost.

14.8 To run a probe calibration

The context-based action allows you to force the recalibration of a probe. It is only visible on the main page of the ST2 mode that can be reached by resetting the mode with the context-based action .



Main page of the ST2 measurement mode

14.9 Distance between two heights

It is possible to calculate the distance between two heights using the context-based action of the control panel.

This function only calculates height differences. Therefore, in ST2 mode, the type (or) defined for the characteristic of the main value is not decisive for the calculation. For example, even if the main value defines a diameter, pressing the button on the keyboard will take into consideration the height of the active measurement and the height of the previous measurement stored in memory. For further information, please refer to the chapter that describes the measurement functions.

14.10 Cancellation of the measurement

At any time, the measurement displayed on the screen can be cancelled by pressing the button on the control panel . The software will then display the values of the previous measurement stored in memory.

It is possible to "go back" in the measurement history until the active reference is displayed. This one cannot be deleted with the keyboard button but only with the context-based action .

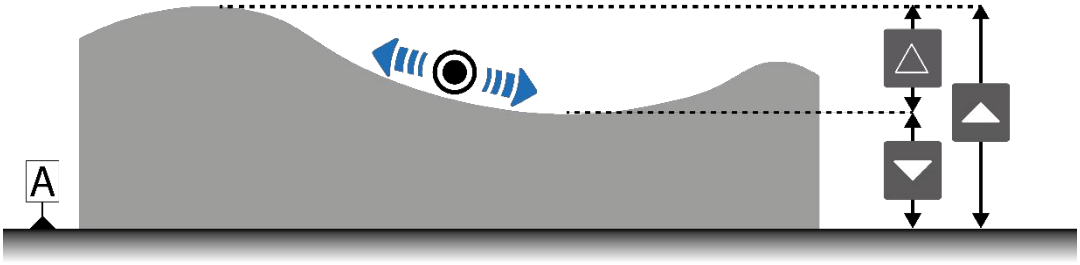
14.11 Context-based actions

A list which defines all the context-based actions of the ST2 mode is available at the end of this document.

15 STP MODE (START PARALLELISM)

15.1 Introduction

This measurement mode is also called “Min, Max, Delta”. It can be defined as a mode that enables scanning a surface in order to detect parallelism errors in regards to a reference surface.



This mode is accessible from the main menu by pressing the key at any moment.

Main menu of the software

15.2 Probe calibration

Contrary to ST2 mode, when entering STP mode, the process for determining the probing constant does not start automatically. Indeed, it is not absolutely necessary to calibrate the probe to perform a measurement in this mode. However, some measurements are not allowed without calibrating the probe before, as in ST1 mode.

Probe calibrated	Possibility
No	To carry out a measurement, the pressure on the probe must be applied in the same direction as the one chosen to determine the active reference. In other words, if the reference was captured by downward probing, the downward measurement is accepted whereas upward measurement is not.
Yes	Measurement in both probe directions is possible.

Once the calibration procedure of the probe has been carried out, the probe constant is kept in memory regardless of the measuring mode used (ST2 or STP).

Nevertheless, a recalibration can be forced by pressing the context-based action. Re-calibrating a probe involves resetting the ST2 and STP measuring modes. The new value of the probe constant will be applied for the ST2 and STP measuring modes.

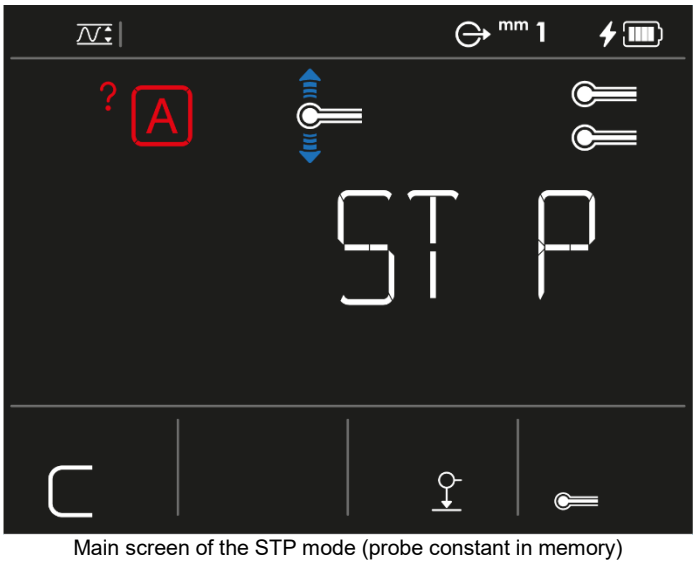
15.3 Capturing the reference value

When entering the STP mode , the reference values can be captured through:

- Single probe hit, if there is no probe constant in memory.
- Single or double probe hits, if there is a probe constant in memory.

15.4 Managing the reference

The TESA-HITE MAGNA or TESA-HITE allows the management of one single reference at any time. If a new reference is to be defined, the active measurement mode must be reset using the context action . At this point, all measured values previously stored in memory and the active reference will be deleted. The software will return to the main page of STP mode, asking you to measure again a reference.



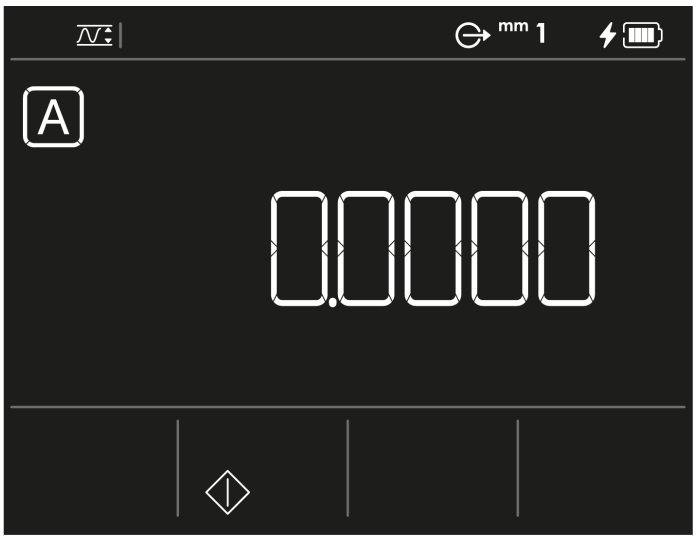
Main screen of the STP mode (probe constant in memory)

15.5 Indirect reference (PRESET)

Please refer to the chapter describing the principles of indirect reference for ST2 mode . The use of the indirect reference is identical in STP mode.

15.6 Principle of parallelism error measurement

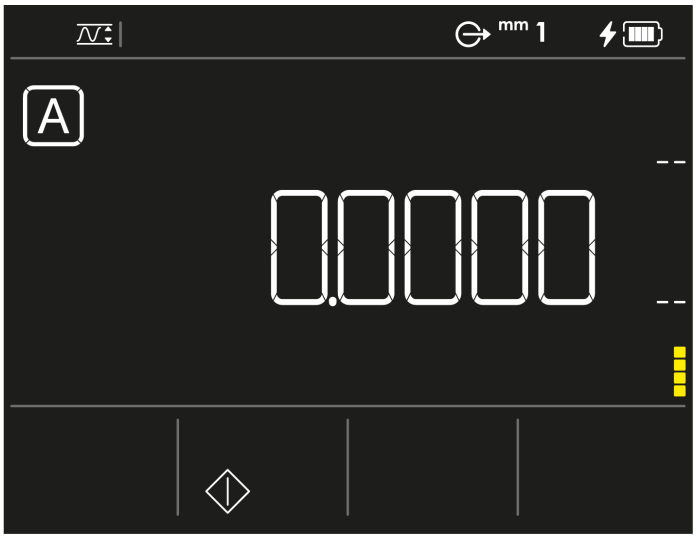
1. Once the reference is measured, position the probe above the surface to be measured.



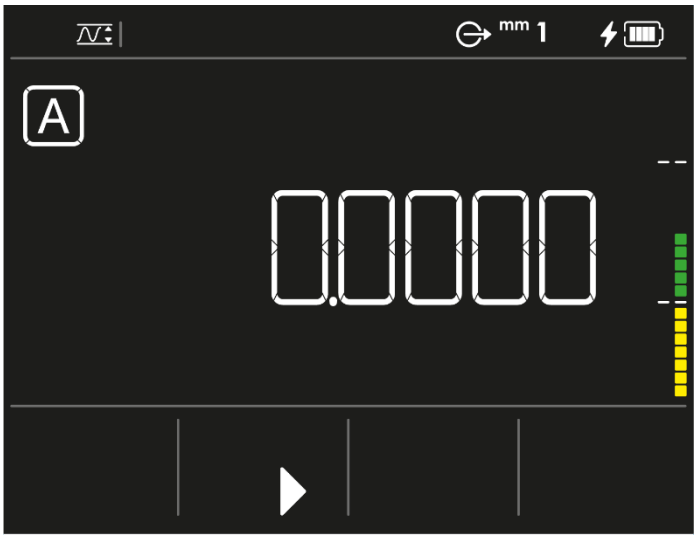
2. Move the probe, so that it establishes contact with the surface of the workpiece to be measured. At that moment, you can decide to use the locking screw of the handwheel.

It allows you to get the probe positioned at a predefined height in order to carry out your measurement (also using the fine adjustment system).

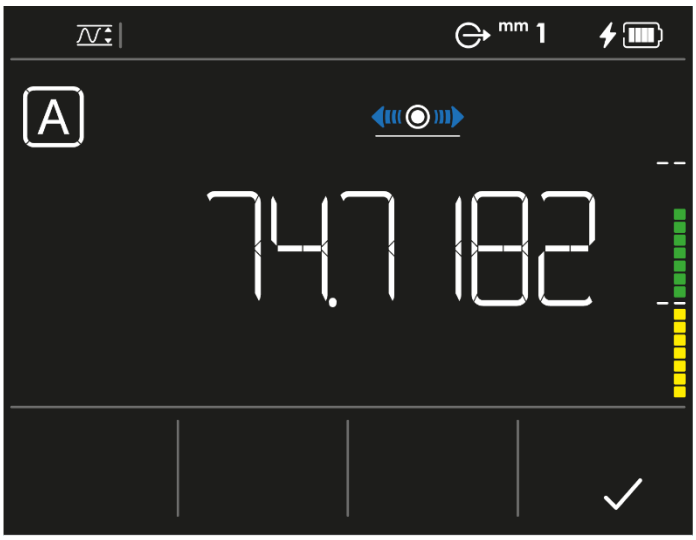
3. Apply increasing pressure on the probe. As the pressure increases, the strain gauge on the right side of the screen evolves.



4. Once the pressure on the probe is sufficient (i.e. the strain gauge is in the central green zone), the context-based action  is displayed. As long as the strain gauge is in the green zone, this context-based action is proposed. If the pressure is too high or too low, the context-based action is no longer proposed by the software.



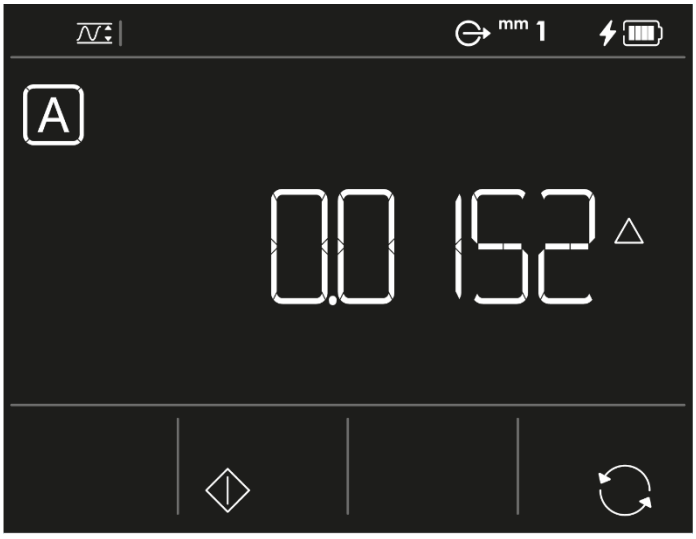
5. To start the measurement, it is now necessary to select the context-based action  . The value on the screen is now updated in real time according to the movement of the probe.



From this step, if the probing force is too high or low (i.e. the strain gauge is outside the green range), the measurement process is automatically reset and the software starts again from step 1.

6. The help icon blinks. Move the workpiece to be measured, so that the probe is displaced along the whole measurement zone.

7. Validate and finish the measurement using the key .



By default, the value is always displayed first when a measurement is made. This value is the difference between the maximum and the minimum measured values. This is therefore the desired parallelism error.

Definition of keys	
	To scroll through the results minimum , maximum or on the screen
	Initialize the measuring mode and resume the active reference.

To start a new measurement, simply apply again pressure with the probe on a new surface to be measured. As soon as the pressure becomes sufficient, the button  will be displayed again.

15.7 Context-based actions

A list which defines all the context-based actions of the STP mode is available at the end of this document.

16 CONTINUED DISPLAY MODE

16.1 Introduction

This mode is also called “ZZ”. It can be accessed from the STP mode. To activate it regardless of which page is active in the STP mode, simply block the double carriage by following the procedure described in the next chapter.

16.2 Blocking the double carriage

1. Move the carriage until the upper stop

2. Once the stop has been reached, continue to turn the rotary control handle slightly in the same direction of rotation

3. The double carriage will be blocked when you hear a "click" sound

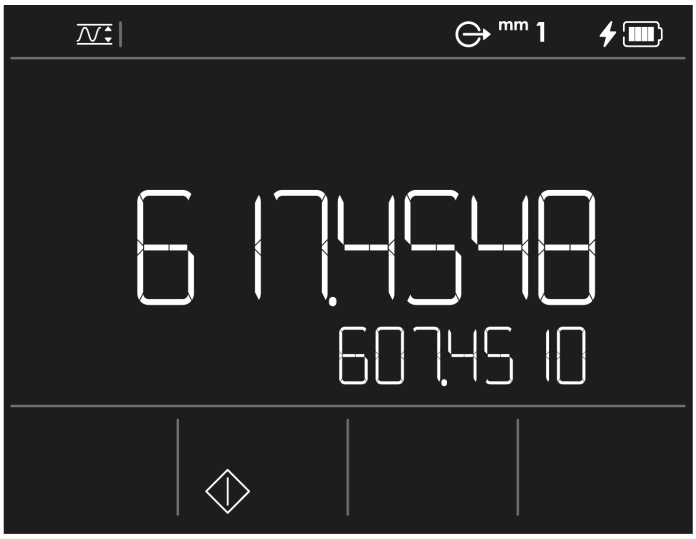
The software has now automatically recognized the blocking of the double carriage and the display is updated in real time according to the movement of the probe.

Definition of keys	
	Zero setting of the displayed value

You can return to the STP menu simply by unlocking the double carriage. To do this, it is simply a matter of measuring a point on a surface and the pressure applied on the carriage will be sufficient to disengage the locking system. From then on, the software will automatically return to the main screen of the STP mode.

16.3 Manually defined height

As a reminder, although in this mode the double carriage must be locked, not allowing the standard (trigger) point capturing, it is nevertheless possible to store a height in memory by simply pressing the button  on the keyboard. By default, the value that is updated in real time is displayed on the main line as mentioned in the previous chapter. However, once a height is defined manually, the real time update of the probe position will be done on the secondary line. The main line is now used to display the defined height.



In the example above, the user pressed the keyboard button when the software displayed a value of 617.4548. This value is then set and displayed on the main line. The value on the secondary line (607.4510) is updated in real time according to the movement of the probe up or down.

16.4 Cancellation of the measurement

At any time, the measurement displayed on the screen can be cancelled by pressing the button on the control panel . The software will then display the values of the previous measurement stored in memory.

16.5 Context-based actions

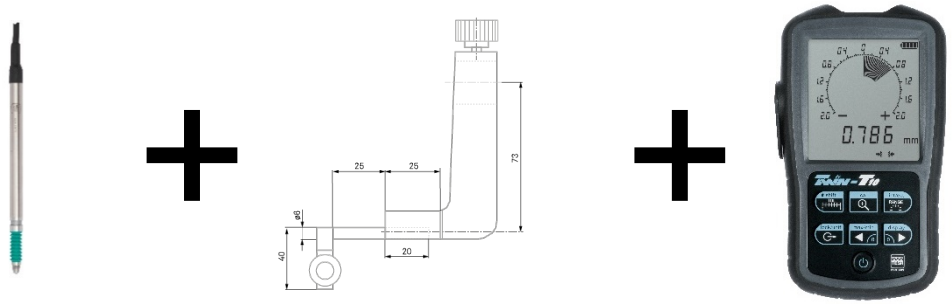
A list which defines all the context-based actions of the STP mode is available at the end of this document.

17 PERPENDICULARITY MEASUREMENT

17.1 Generality

The TESA-HITE models also provide the possibility to measure perpendicularity errors. This measurement is not possible with the TESA-HITE MAGNA models.

Since the panel does not allow a direct connection to an instrument like a 1D probe, the measurement and display must be done using a system that is external to the gauge. Below is an example of a system that can be used to measure perpendicularity deviations.



TESA 1D probe | Support for probe | Display Twin-T10

Other configurations are also possible. For any advice please contact your local representative.

17.2 Measurement principle

Before performing a perpendicularity error measurement, it is essential to block the double carriage. To do this, please refer to the corresponding chapter.

Once the measuring carriage has been blocked, the mounting of the probe-holder system can be performed as described on the photo above (for example).

Then just move the 1D probe (or any other instrument) slowly along the surface to be measured and visualize the variations on the display.

18 DATA MANAGEMENT

18.1 Generality

Your control panel can manage the measurement data by sending it to a device through the TLC port (TESA Link Connector) located on the back of the control panel.

It is not possible to connect the control panel directly to the local network of a company. The only possible solution is to send data to a computer, which is itself connected to the intranet.

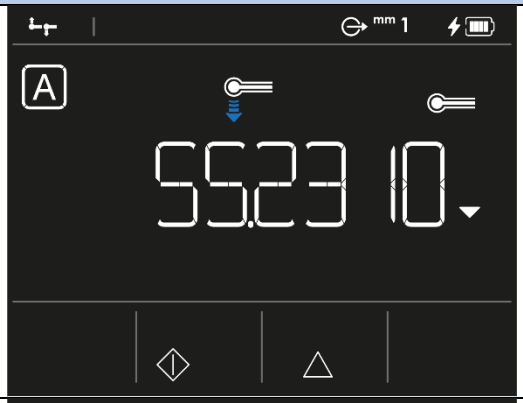
This data management can be configured from the menu relating to the system options accessible through the context-based action available on the main page of the software. To reach the main page of the software, simply press the button of the control panel from any screen of the software.

Main menu of the software

In the system options menu, the option corresponding to data management is .

18.2 Which value is managed?

In all the measurement modes, the value that can be sent through the TLC port is the value that is displayed on the main line.

Mode	Example screen	Value managed when sending data
ST1		55.2310
ST2		12.345
STP		0.0152
STP continued display		617.4548

18.3 Automatic or manual transmission

There are two ways to send the value displayed on the main line of each mode through the TLC port of your gauge. You can set this sending by changing the option in the system options menu .

Option	Description
Manual	No value will be sent unless the user presses the key of the control panel.
Automatic	When a value is displayed on the main line of the screen, it is sent automatically through the TLC port.

18.4 Sending formats

Only the measured value is sent

18.5 Transmission via TLC (cable)

Data can be sent via the TLC port to a computer using a data transmission cable type TLC-USB (TESA reference: 04760181). This cable has a length of 2 meters.

The use of such a cable requires the prior installation of a driver on your computer.

For further information, please refer to the instruction manual provided with the cable or contact your local reseller.

Once the cable is correctly connected at the back of your panel and to your computer, there are several ways to manage the data: by using additional software such as TESA DATA-VIEWER, TESA STAT-EXPRESS or TESA DATA-DIRECT. The use of other software is also possible. For further information, please contact your local reseller.

The connection data is:

Data rate	4800
Parity	Even
Data bits	7
Stop bits	2

18.6 Transmission via TLC (wireless)

It is also possible to send the data to a computer via the wireless (Bluetooth) TLC connection. Therefore, it is necessary to use a TLC-BLE connection kit (TESA part number: 04760183) including a TLC-BLE cap to connect to the back of the control panel and an dongle receiver to connect to your computer.

TLC-BLE emitter cap

Dongle receiver

This system requires the use of the TESA DATA-VIEWER software available and downloadable free of charge from the TESA website.

For more information about the installation and configuration of the system, please refer to the instruction manual provided with the TLC-BLE accessories and the information available in the TESA DATA-VIEWER software. You can also contact your local reseller.

19 CONTEXT-BASED ACTIONS

19.1 Main menu

Definition	
	ST1 measuring mode (Start 1 Direction)
	ST2 measuring mode (Start 2 Directions)
	STP measuring mode (Start parallelism, double carriage not locked) ZZ measuring mode (truscan, double carriage locked)
	System options

19.2 Actions regarding ST1 mode

Definition	
	**Initialisation of the mode** Allows you to restart the process to define the active reference. The measured values in the memory are lost.
	**Indirect reference (PRESET)** Allows you to take into account an offset regarding the active reference, so that you can work with an indirect reference.
	**Difference** Calculates the height difference between the active measurement displayed on the screen and the last one stored in memory.
	**Validation** Allows to confirm a value inserted manually.

19.3 Actions regarding ST2 mode

Definition	
	**Initialisation of the mode** Allows you to restart the process to define the active reference. The measured values in the memory are lost.
	**Indirect reference (PRESET)** Allows you to take into account an offset regarding the active reference, so that you can work with an indirect reference.
	**Difference** Calculates the height difference between the active measurement displayed on the screen and the last one stored in memory.
	**Validation** Allows you to confirm a value inserted manually.
	**Calibration** Allows you to restart the calibration process of the probe.
	**Change characteristic 1** Allows you to modify the type regarding the main measurement. The main measurement becomes: • The width of a groove or rib • The diameter of a bore or axis
	**Change characteristic 2** Allows you to modify the type regarding the main measurement. The main measurement becomes the height of the centre of a groove, rib, bore or axis.
	**Skip** Allows you to skip the wrong calibration of a probe.
	**Two probe hits** Allows you to enable double probing.
	One probe hit

	Allows you to enable single probing.

19.4 Actions regarding STP mode

Definition	
	**Initialisation of the mode** • Allows you to restart the process to define the active reference. The measured values in the memory are lost.
	**Indirect reference (PRESET)** Allows you to take into account an offset regarding the active reference, so that you can work with an indirect reference.
	**Results** Allows you to scroll through the results after a parallelism measurement.
	**Validation** • Allows you to confirm a value inserted manually. • Allows you to finish the parallelism error measurement.
	**Calibration** Allows you to restart the calibration process of the active probe.
	**Two probe hits** Allows you to enable double probing.
	**One probe hit** Allows you to enable single probing.
	**Starting** Allows you to start the parallelism error measurement.

19.5 Actions regarding STP mode with continued display

Definition	
	**Initialisation of the mode** Allows to set the continuously updated value that is representing the position of the probe to zero.
	**Difference** Calculates the height difference between the measurement displayed on the screen and the last one stored in memory. These measurements are only made by pressing the keyboard key  .

OPTIONAL ACCESSORIES:

Master piece (TH)
00760236

Master piece (TH MAGNA)
00760231

TLC-USB cable, 2m
04760181

DATA-DIRECT software
04981001

STAT-EXPRESS software
04981002

DATA-VIEWER software
Downloadable free of charge from the TESA website.

TLC-BLE emitter
04760184*

USB receiver + 1,5 m USB cable
04760185

Starter kit
04760183* = 04760184 + 04760185

Practice part
00760124

Cleaning liquid for granite tables
00760249

Other Accessories are also available:

- Probes
- Probe supports
- Systems for measuring perpendicularity deviation
- …

For further information, please refer to the catalogue, the range brochure or contact your local reseller.

*Requires the use of the TESA DATA-VIEWER software

DECLARATION OF CONFORMITY EU

We thank you for purchasing our product. We hereby certify that it was inspected in our works.

Declaration of conformity and confirmation of traceability of indicated values
We declare under our sole responsibility that its quality is in conformity with all technical data as specified in our sales literature (instruction manual, leaflet, general catalogue). In addition, we certify that the measuring equipment used to check this product refers to national standards. Traceability of the measured values is ensured by our Quality Assurance.

Name of manufacturer	TESA
Address of manufacturer	Rue du Bugnon 38 CH – 1020 Renens
Declares under its sole responsibility	
The product	Height gauge: TESA-HITE MAGNA TESA-HITE
Type	00730082 TESA-HITE MAGNA 400 00730083 TESA-HITE MAGNA 700 00730084 TESA-HITE 400 00730085 TESA-HITE 700

is in compliance with

- the directives: CEM 2014/30/UE; ROHS2 201165/UE; DEEE 2012/19/UE
- the regulation: REACH CE1907/2006
- the standards: EN 55011:2016; CISPR 11:2015 /AMD1:2016; EN 61000-3-2:2014; IEC 61000-3-2:2014 (ed. 2.0); EN 61000-3-3:2013; IEC 61000-3-3:2013 (ed. 3.0); EN 61326-1:2013; IEC 61326-1:2012
- and the continued technical data in our sales documents

Renens, 17 January 2019

Quality Assurance Service

EXAMPLE, TESA WORKPIECE