

# USER'S MANUAL

V7 / V9

750 50 0042 03





Dear customer, congratulations for choosing a TRIMOS measuring instrument. For more than 40 years, our products have built up an excellent reputation in terms of quality, accuracy and longevity. For full satisfaction with the present product, we recommend to read this user's manual carefully.

750 50 0042 03 Version 1.4 / 2018-04

Valid for firmware package 1.20/2.36/3.27

**TRIMOS**® - All modification rights reserved

**TRIMOS SA**

Av. de Longemalle 5  
CH - 1020 Renens  
T. + 41 21 633 01 01  
F. + 41 21 633 01 02  
[www.trimos.com](http://www.trimos.com)



# CONTENTS

<b>1. Safety Regulations.....</b>	<b>5</b>
1.1 Important Information .....	5
1.2 Security Symbols.....	5
1.3 General Warnings.....	5
<b>2. Instrument Description .....</b>	<b>6</b>
2.1 V7.....	6
2.2 V9.....	8
<b>3. Setting up .....</b>	<b>10</b>
3.1 Packing List .....	10
3.2 Setting-up.....	11
<b>4. Getting Started.....</b>	<b>13</b>
4.1 Start-up.....	13
4.2 Displacement Modes: Manual/Motorized .....	13
4.3 Reference and Probe Constant .....	15
<b>5. Display structure.....</b>	<b>17</b>
5.1 Display Modes .....	17
5.2 Function Menus.....	17
<b>6. Main Measurement Functions.....</b>	<b>18</b>
6.1 Height Measurements .....	18
6.2 Diameter and Centreline Measurement.....	19
6.3 Min, Max and Delta Modes .....	21
<b>7. Additional Functions.....</b>	<b>23</b>
7.1 Zero Setting of the Display .....	23
7.2 References and Preset .....	23
7.3 Selection of the Measuring Unit .....	24
7.4 Resolution.....	25
7.5 Buffer Management.....	25
7.6 Probe Constant.....	27
7.7 Difference Between the Last 2 Measurements.....	28
7.8 Operations Between Selected Values of the Buffer .....	28
7.9 Average of the Last 2 Measurements.....	30
7.10 Distance and Centreline Measurement .....	31
7.11 Angle (and cone) Measurements .....	32
7.12 Tolerance Limits .....	34
7.13 Display Modes of the Height Measurements .....	35
7.14 Probe Holder Change .....	36
7.15 Shrinking Factor .....	37
7.16 Inversion of the Measuring Direction.....	38
<b>8. Perpendicularity Measurements.....</b>	<b>39</b>
8.1 With Test Indicator .....	39
8.2 With Electronic Probe.....	39
<b>9. 2-Coordinate Measurements (2D) .....</b>	<b>44</b>
9.1 Getting Started.....	44
9.2 Acquisition of Points .....	45
9.3 Display Management .....	46

9.4	Transformations of the Axis System .....	47
9.5	Measurements and Analyses .....	49
9.6	Editing, Adding and Deleting Points .....	51
9.7	Quit the 2D mode.....	53
<b>10.</b>	<b>Measurement sequences .....</b>	<b>54</b>
10.1	Start .....	54
10.2	Programming a Sequence.....	55
10.3	Running a Sequence .....	57
10.4	Special Features of the Programming Mode.....	58
10.5	Quit the Measurement Sequence Mode .....	58
<b>11.</b>	<b>Statistical Analysis of Results .....</b>	<b>59</b>
11.1	Start .....	59
11.2	Batch Analysis .....	59
11.3	Quit the Statistic Analysis Mode .....	62
<b>12.</b>	<b>Sending Data and Printing .....</b>	<b>63</b>
12.1	Connectors.....	63
12.2	Configuring the Printing and the Data Transfer.....	63
12.3	Data Transfer via USB B.....	64
12.4	Data Transfer via RS232.....	65
12.5	Data Transfer to a USB Printer.....	66
<b>13.</b>	<b>Configuration .....</b>	<b>68</b>
13.1	Page 1.....	68
13.2	Page 2.....	68
13.3	Page 3.....	69
13.4	Page 4.....	69
13.5	Page 5.....	70
13.6	Page 6.....	70
<b>14.</b>	<b>Adjustments .....</b>	<b>71</b>
14.1	Configuration diameter measurements "SMART REVERSE" .....	71
14.2	Adjustment of Floating Probe Suspension Balancing .....	72
14.3	Air Cushion .....	73
14.4	Standby Mode.....	73
14.5	Resetting of the Instrument.....	73
14.6	Cleaning .....	73
<b>15.</b>	<b>After Sales Service .....</b>	<b>74</b>
15.1	Replacement of Battery Block.....	74
15.2	Replacement of Clock Back-up Battery .....	74
15.3	Recycling of Electronic Components .....	75
15.4	Complaints / Repairs.....	75
15.5	Agents .....	75
<b>16.</b>	<b>Technical Specifications .....</b>	<b>76</b>
16.1	V7 .....	76
16.2	V9.....	78
<b>17.</b>	<b>Declaration of Conformity.....</b>	<b>80</b>



# 1. SAFETY REGULATIONS

## 1.1 Important Information

In order to prevent any damages due to wrong manipulation, please carefully read the following instructions. TRIMOS will not accept any responsibility in case of damages caused by inadequate use not in line with the present manual.

## 1.2 Security Symbols

The following security symbols are used in this manual:



General warning, utilisation advice



Risk of electric shock



Electrostatic protection

## 1.3 General Warnings



Protection against electrostatic interferences:

Static electricity can damage the electronic components of the instrument. In order to prevent this type of damages, avoid any contact with the connector pins.



In order to prevent any changes of the instrument performance or any accident, the instrument should never be dismantled.



If, for any reason, the electronic unit has to be opened, only authorized personnel are allowed to do so.



Do not expose the instrument, its components and accessories to rain or any projection of fluids. Avoid penetration of foreign substances into the connectors and the instrument openings.



Do not cover or wrap the display unit during use. The unit must be kept well ventilated to avoid any overheating.



In case of problems with the instrument or any of its parts (no display, overheating, abnormal smell...), immediately switch off the instrument and disconnect the power supply. Please contact your local TRIMOS agent.



This is a high accuracy instrument. Particular care should be taken during its entire operational lifetime. Pay special attention to the following specific points :

- Use the instrument on a stable, smooth and clean surface plate.
- Avoid any shock to prevent the instrument from losing some or all of its performing characteristics.
- Use the instrument in a vibration free area.
- Avoid exposure to direct sunlight and excessive humidity.
- Avoid proximity of heating or air conditioning systems.
- Respect the advised environmental conditions.

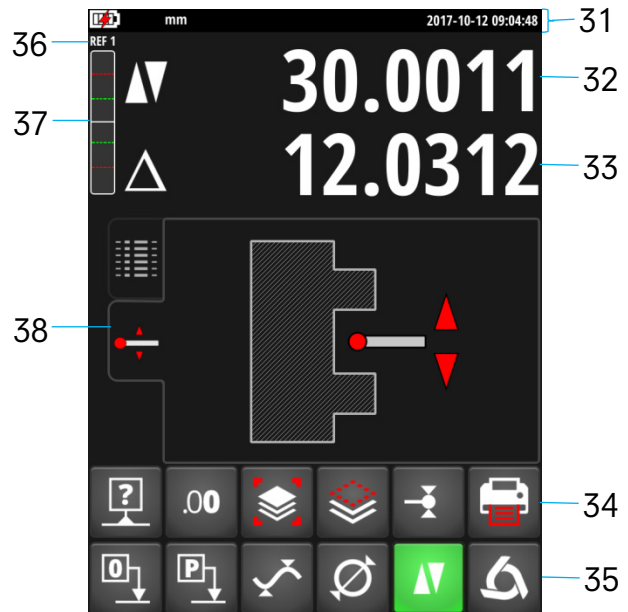
# 2. INSTRUMENT DESCRIPTION

## 2.1 V7

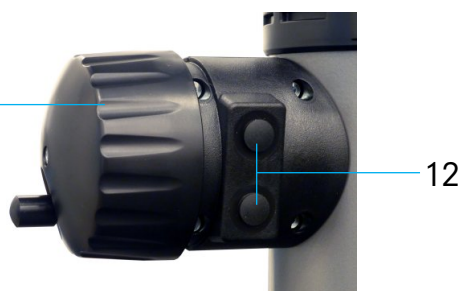
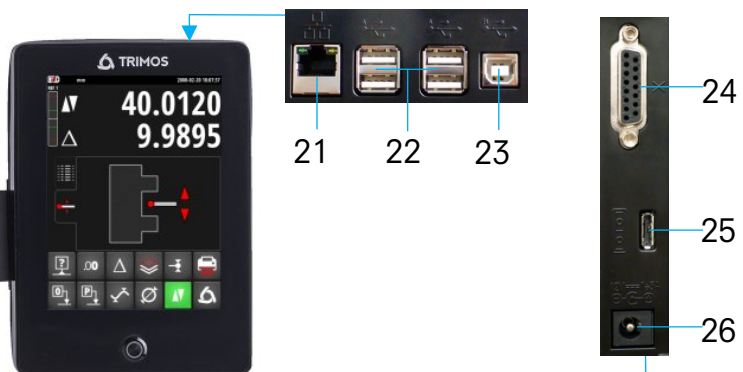
### 2.1.1



### 2.1.3



### 2.1.2





### **2.1.1 Instrument**

1. Upper probe holder
2. Screw for the adjustment of the floating probe suspension
3. Handle for carriage displacement
4. Transport safety screw for locking of probe suspension (chromium plated)
5. Lower probe holder
6. Insert holder
7. Measuring insert
8. Operating handle for the displacement of the instrument
9. Button for activation of air cushion and programmable functions keys (§ 13.3)
10. Base with air cushion system for instrument displacement
11. Handwheel for carriage displacement / Activation of manual/motorised movement
12. Buttons for motorised displacement

### **2.1.2 Interfaces/Connectors**

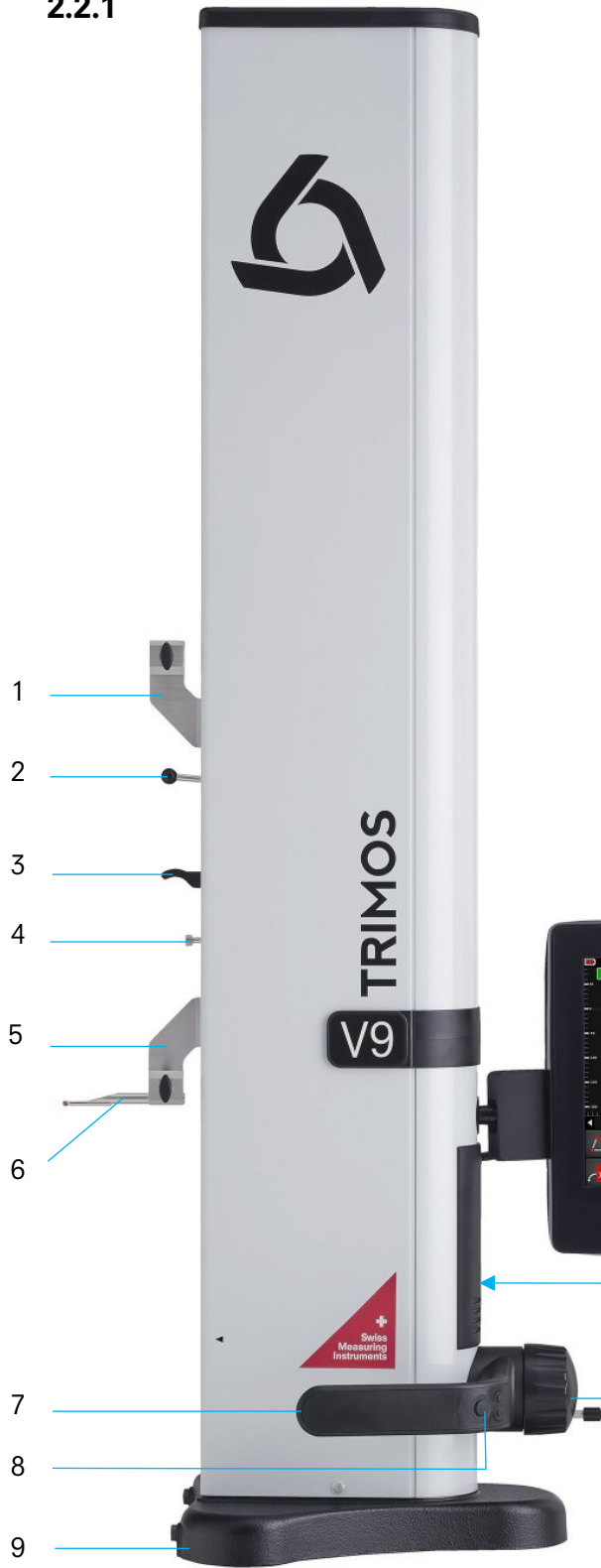
21. RJ45 connector
22. USB-A connectors (4x)
23. USB-B connector
24. Connector for electronic perpendicularity probe
25. Connector for RS232 communication (on lower right side of height gauge)
26. AC adapter connection (on lower right side of height gauge)

### **2.1.3 Display**

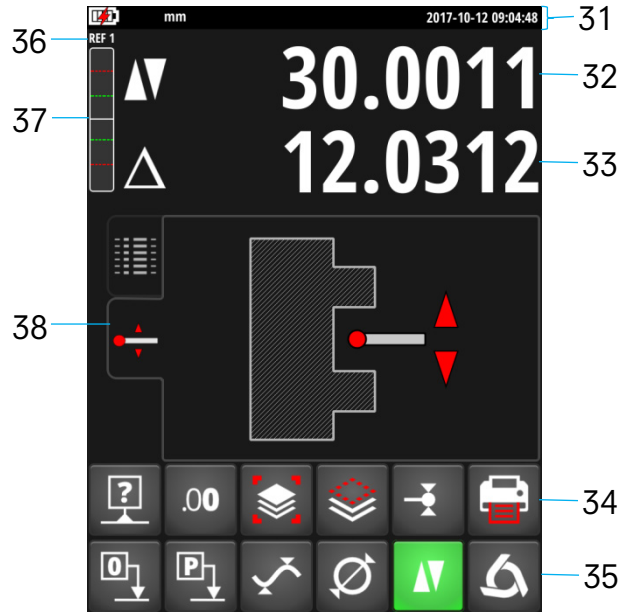
31. Status symbols (battery level, units, active functions, date and time)
32. 1<sup>st</sup> display line
33. 2<sup>nd</sup> display line
34. Menu line with scrolling functions
35. Menu line with fixed functions
36. Current reference
37. Probing indicator
38. Selection tabs of the measurement display mode

## 2.2 V9

### 2.2.1



### 2.2.3



### 2.2.2



### **2.2.1 Instrument**

1. Upper probe holder
2. Lever for the adjustment of the floating probe suspension
3. Handle for carriage displacement
4. Transport safety screw for locking of probe suspension (chromium plated)
5. Lower probe holder
6. Measuring insert
7. Operating handle for the displacement of the instrument
8. Button for activation of air cushion and programmable functions keys (§ 13.3)
9. Base with air cushion system for instrument displacement
10. Handwheel for carriage displacement / Activation of manual/motorised movement
11. Buttons for motorised displacement

### **2.2.2 Interfaces/Connectors**

21. RJ45 connector
22. USB-A connectors (4x)
23. USB-B connector
24. Connector for electronic perpendicularity probe
25. Connector for RS232 communication (on lower right side of height gauge)
26. AC adapter connection (on lower right side of height gauge)

### **2.2.3 Display**

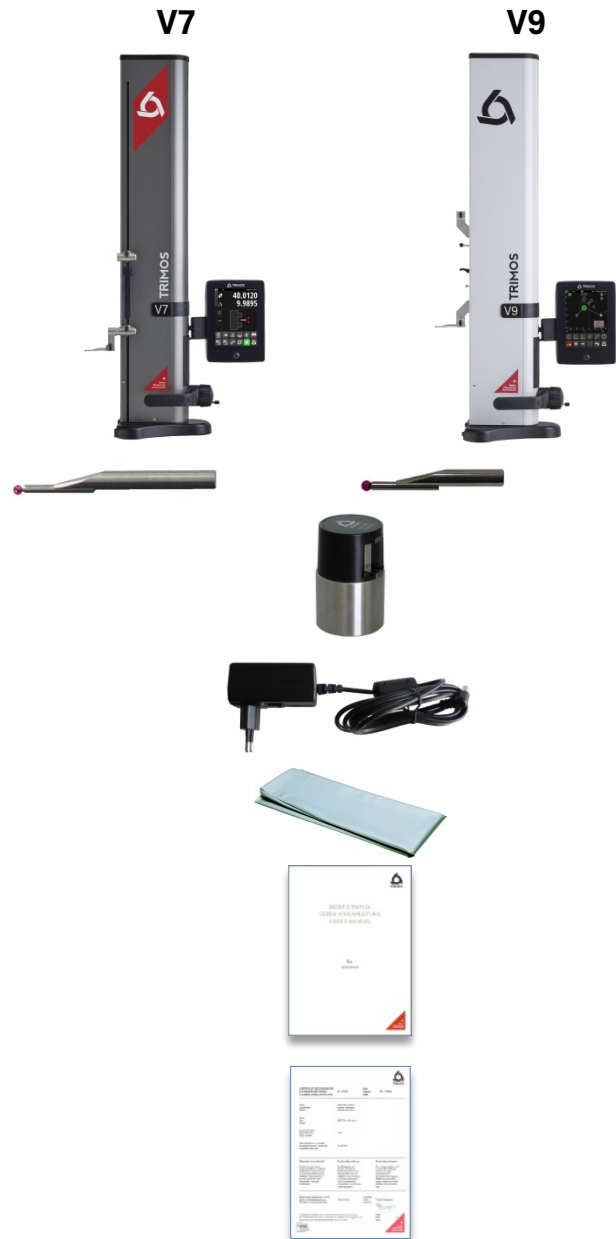
31. Status symbols (battery level, units, active functions, date and time)
32. 1<sup>st</sup> display line
33. 2<sup>nd</sup> display line
34. Menu line with scrolling functions
35. Menu line with fixed functions
36. Current reference
37. Probing indicator
38. Selection tabs of the measurement display mode

# 3. SETTING UP

## 3.1 Packing List

The standard packing of the instrument includes the following elements:

1. Instrument with display unit and connection cable (HDMI)
2. Measuring insert
3. Setting gauge
4. Charging unit
5. Protection cover
6. User's manual
7. Calibration certificate



While unpacking, carry the instrument by lifting it by its displacement handle and body. **In NO case should the instrument be carried by the handle for carriage displacement (3).** Keep the original packaging for future transportation.

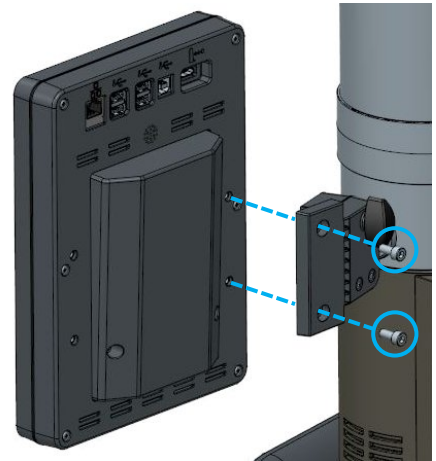
If the instrument has been stored at a temperature below 5°C, wait a few hours before unpacking to prevent the instrument parts from condensation. Condensation can affect sensitive parts of the instrument.

### 3.2 Setting-up

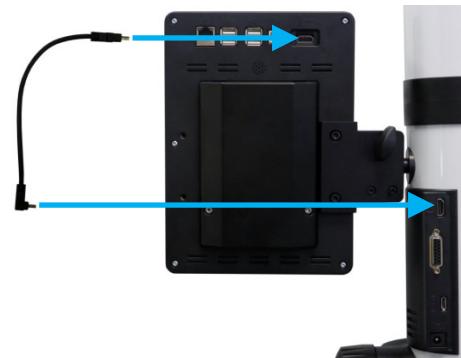
After unpacking, prepare the instrument as follows:

1. Clean the pads positioned underneath the base using a clean cloth, slightly dampened with alcohol.
2. Position the instrument with care on a clean measuring plate.

3. Mount the display unit on its support using the 2 screws.



4. Connect the HDMI cable between the instrument and the display unit.



The straight connector shall be connected to the display unit and the right-angle connector to the instrument.

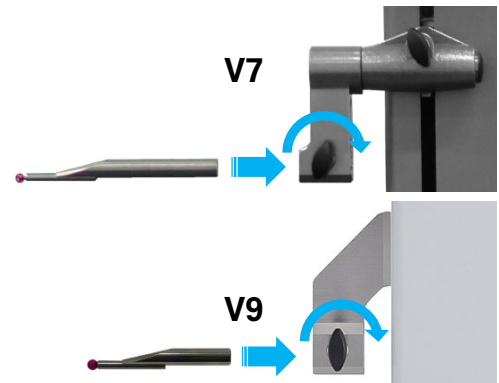


Static electricity can damage the electronic components of the instrument. In order to prevent this type of damages, avoid any contact with the connector pins.

5. The locking knob behind the support allows the adjustment of the display unit position.

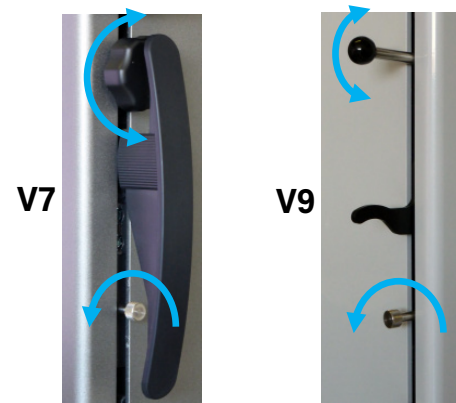


6. Slide the measuring insert into the holder and lock it, using the knob. Take care to position the eccentric probes correctly.



7. Release the transport safety screw.

8. Check / adjust the floating probe suspension balancing (§ 14.2).



9. If the instrument does not switch on or in case of low battery level, proceed to a full loading of the batteries (plug in the charging unit to the instrument).



Only use the charging unit supplied with the instrument to load the batteries. Empty batteries are fully loaded in about 12 hours. It is not necessary to wait until the battery pack is fully charged. The instrument becomes operational immediately after having connected the charging unit.

It is not dangerous to leave the charging unit connected. Permanently plugged-in instruments automatically switch to trickle charge mode.

The batteries are of Lithium-ion type. An excessive room temperature can affect the battery capacity and therefore the instrument autonomy. It is not recommended to load the battery in case of room temperature superior to 40C°.

Incorrect loading of the battery can result in a decrease of capacity, overheating, or even an explosion and cause important damages.

The battery can be loaded and unloaded 300 times before a significant reduction of their capacity. The number of loading cycles and the autonomy can vary according to use and operating conditions.

# 4. GETTING STARTED

## 4.1 Start-up

Switch on the instrument by pressing the **On/Off** button for 2 seconds.

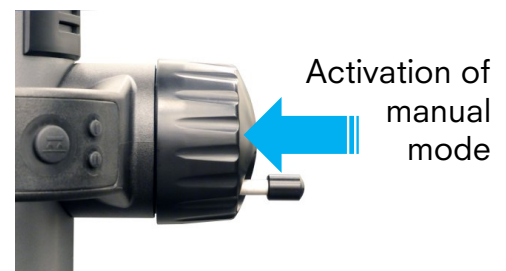


## 4.2 Displacement Modes: Manual/Motorized

V7 & V9 instruments can be used in manual or motorized mode.

### 4.2.1 Manual Displacement Mode

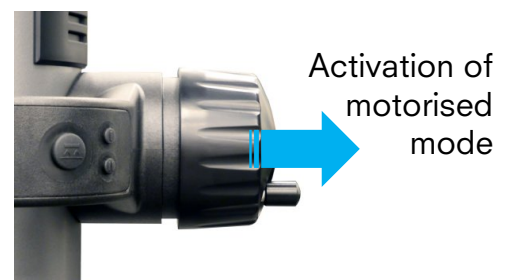
The manual displacement of the carriage is carried out with the help of the handle.



### 4.2.2 Motorized Displacement Mode

Pull the handle outwards to work in motorized mode. In this mode, the rotating handle can be tucked inside for ergonomic reasons.

When The motorisation is switched on, the "motor" symbol is displayed on the top of the screen.



Motorised displacement is carried out with the help of 2 buttons placed behind the handwheel or in some cases the touchscreen.

### Rapid Displacement

A prolonged press on one of the buttons causes a rapid movement in the chosen direction. The carriage will continue its displacement as long as the pressure is maintained.

### Slow Displacement (Probing)

A short pressure causes a continuous displacement in probing speed, i.e. speed used for measuring. As soon as the probe gets in touch with a surface, a measurement is made.

### Release of Probe

When the probe is in contact with the part (after probing), a short pressure on the button for the opposite direction allows to release the probe (ca. 0.5 mm).

### Movement Stop

While displacing in low speed mode, a short pressure on the button for the same direction as that of the displacement will stop the movement.

When the graphic display mode is selected, the displacement is carried out with the help of 2 grey arrows to the right of the screen.

Its usage is identical to the one described above in case of buttons.



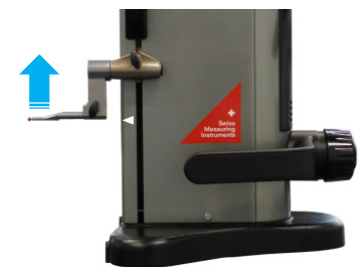
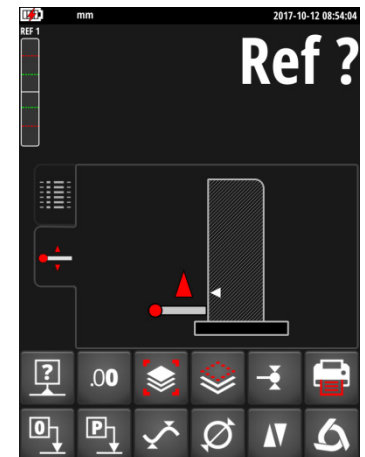


## 4.3 Reference and Probe Constant

1. After starting-up, the display will ask for the reference position. Move the measuring carriage slowly across the mark indicating the reference position with the help of the handle for carriage displacement (the acquisition of reference is carried out by displacing the carriage upwards). An acoustic signal will confirm that the reference has been detected.

Note:

This procedure is carried out automatically in motorised mode. Next, the measuring insert will come and position itself at the upper level of the setting gauge (see below).



2. The instrument is now asking for the probe constant. This function compensates the dimension and the bending of the measuring insert when probing downwards and upwards (reversed surfaces, diameters). The last stored probe constant value will be displayed.

Note:

This procedure may be interrupted by pressing on the constant recording button or on any other mode of measurement button. The latest probe constant value measured is then recorded.



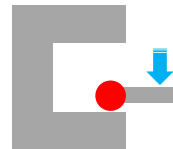
- Use the setting gauge supplied with the instrument to carry out this operation.

Note:

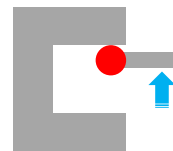
A different setting gauge may be used. In this case, its dimension must be configured in the set-up menu (§ 13.2).



- Move the measuring insert downwards (use the handwheel for the displacement of the measuring carriage) until it touches the surface and an acoustic signal confirms the measurement (=probing).



- Without moving any part (instrument and gauge), move the measuring insert towards the top and perform the same sequence on the upper surface of the setting gauge.



- Repeat the sequences 4 and 5 one more time. This allows establishing the probe constant more precisely.
- The screen will display the setting gauge value during the latest probing, as well as that of the new probe constant. The instrument is then ready to be used.

2x

In motorised mode, this procedure can be carried out automatically by pressing one of the grey arrows on the right of the screen.



The probe constant needs to be checked and stored again after each measuring insert change, after change of its position in the holder, after each adjustment of the measuring force or adjustment of the floating probe suspension.

# 5. DISPLAY STRUCTURE

The display has 4 main areas:

## Status bar

Working parameters

## Measured values

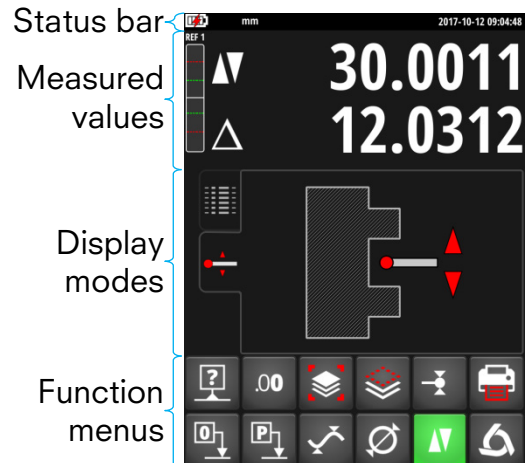
These show the units measured and the position of the carriage

## Display modes

These display the results history (buffer) or a customised graphic help.

## Function menus

Functions are placed in 2 rows in the lower part of the screen.



## 5.1 Display Modes

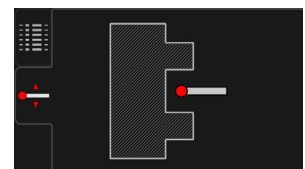
By clicking on one of the tabs alongside, the user can select between the following display modes:

- Display the measurement history (buffer)
- Graphic help to guide the user while taking measurements.



12	CEN	151.3679	mm
11	DIA	32.2160	mm
10	SUR	135.0061	mm
9	SUR	102.2191	mm
8	CEN	118.6768	mm
7	DIA	32.9924	mm
6	CEN	67.5481	mm
5	DIA	32.9969	mm
4	CEN	-16.4164	mm
3	DIA	32.9970	mm

Buffer

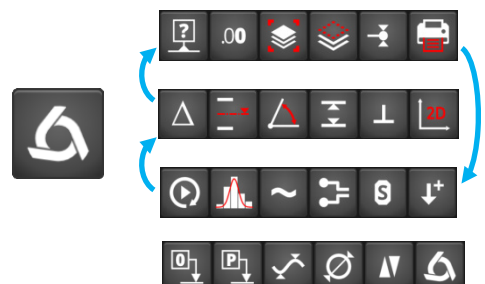


Graphic help

## 5.2 Function Menus

The lower functions menu line is the main line. It is static.

The upper function line is scrolling. A press on the *Logo* key scrolls the other function lines.



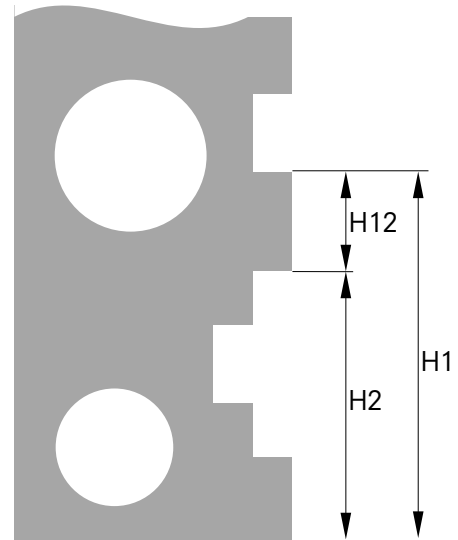
# 6. MAIN MEASUREMENT FUNCTIONS

## 6.1 Height Measurements

H1 = Height measurement downwards (▼)

H2 = Height measurement upwards (▲)

H12 = Chain dimensions



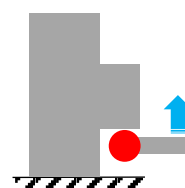
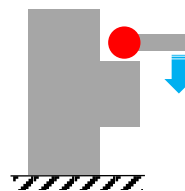
1. On starting-up, the instrument is in height measurement mode. If the instrument is not in this mode, select height measurement mode.



2. Set the display at zero or at a preset value with the measuring insert probing a reference surface (see § 7.1 and § 7.2).



3. Probe the surface to be measured downwards or upwards. The probing indicator will display the progression of the measuring force application. When the right force is reached, an acoustic signal will confirm the measurement.

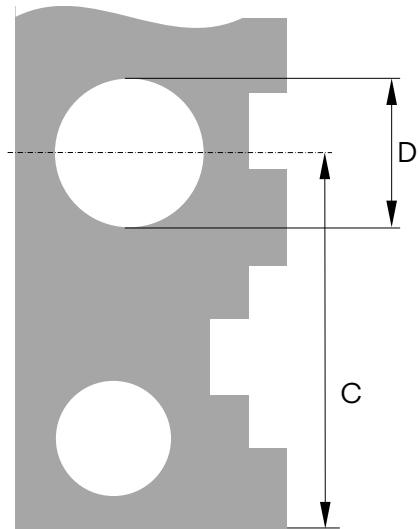


Note:

The first line of the display indicates the height measured. The second line indicates the distance from the former height measurement (chain of dimensions).

## 6.2 Diameter and Centreline Measurement

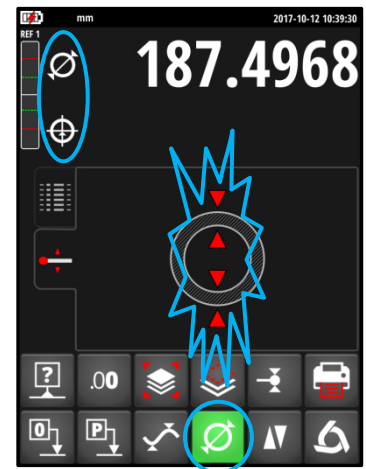
D = Diameter measurement (  $\varnothing$  )  
 C = Centreline measurement (  $\oplus$  )



1. Set the display at zero or at a preset value with the measuring insert probing a reference surface (see § 7.1 and § 7.2).

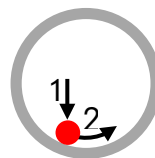


2. Select the diameter / centreline mode by pressing the key shown alongside.

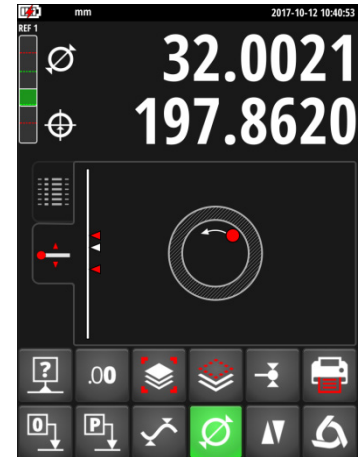
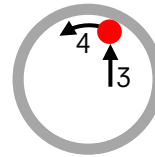


### Internal diameter

- 3a. Position the measuring insert into the bore and probe a point near the reversal point (1). Move the instrument (or the part) laterally to determine the reversal point (2). It is automatically stored.

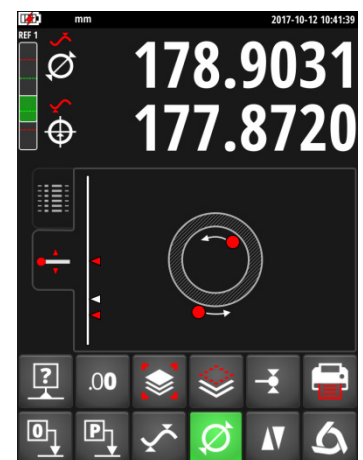
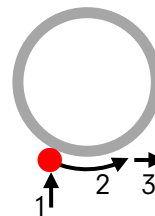


- 4a. Probe a point near the reversal point on the side opposite the diameter (3). Move the instrument (or the part) laterally to determine the reversal point (4). Diameter and centreline values are displayed on the 1<sup>st</sup> and 2<sup>nd</sup> lines of the display respectively.

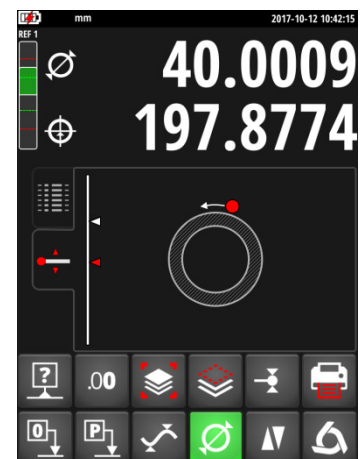
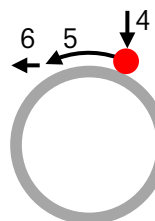


### External diameter

- 3b. Set the measuring insert off centre on the lower shaft profile as near as possible to the reversal point (1). Move the instrument (or the part) laterally to determine the reversal point (2). It is automatically stored. Remove the measuring insert slowly to the side, off centre (3).



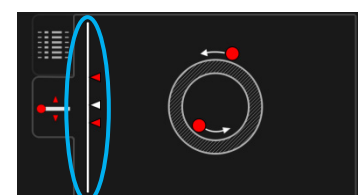
- 4b. Probe a point near the reversal point on the side opposite the diameter (4). Move the instrument (or the part) laterally to determine the reversal point (5). Remove the measuring insert to the side, off centre (6). Diameter and centreline values are displayed on the 1<sup>st</sup> and 2<sup>nd</sup> lines of the display respectively.






5. When the measuring insert is removed, the display remains frozen on the diameter and centreline values.  
Restart with point 3a or 3b for a new measurement.

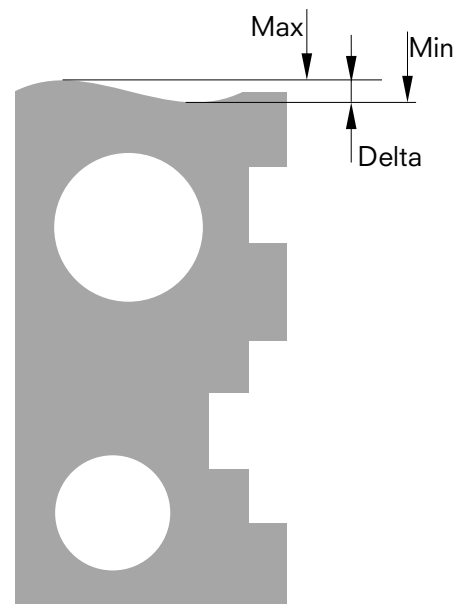
### Note:

In "Graphical help" display mode, an indicator helps in searching the reversal point. The diameter mode can also be configured (§ 14.1).



## 6.3 Min, Max and Delta Modes

Max = Measurement of maximum value (  )  
 Min = Measurement of minimum value (  )  
 Delta = Difference between Max and Min (  )



Measurements in *Min*, *Max* and *Delta* modes have always to be taken with the probe being in contact with the surface.

It allows to determine the following values:

**Min:** Minimum value of the measured surface  
**Max:** Maximum value of the measured surface  
**Delta:** Difference between the maximum and minimum value

To select the *Min*, *Max* or *Delta* measuring mode, press the key shown alongside. By pressing the same key several times, the required mode will be displayed.



Note:

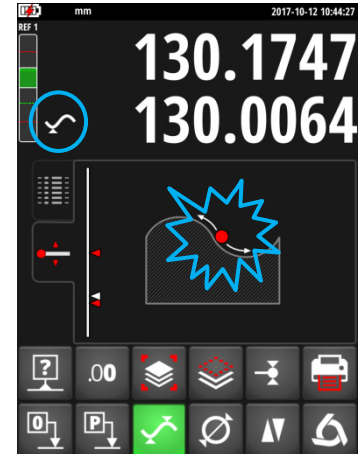
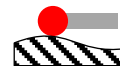
In manual mode, the difference between the Min and the Max should not exceed  $\pm 1$  mm. When motorisation is activated, a closed-loop control is used to monitor the surface over the entire measuring range of the instrument.

### 6.3.1 Measuring in Min or Max Mode

1. Select *Min* or *Max* function. The corresponding indicator shows the activated mode.



2. Probe the surface to be measured and displace the insert or the part along the portion to be analysed. The upper line of the display shows the current position, the lower line shows the extreme position of minimum or maximum reached respectively.



Note:

While probing, a zero setting or a preset will reinitialise the display on the minimum or maximum value measured.

### 6.3.2 Measuring in Delta Mode

1. Select *Delta* function. The corresponding indicator shows the activated mode.



2. Probe the surface to be measured and move the insert or the part along the portion to be analysed. The upper line shows the current position of the probe and the bottom line the difference between the 2 extreme positions.



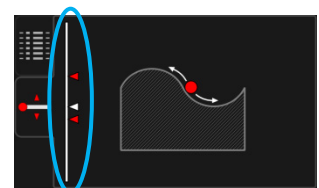
Note 1:

By pressing the *Zero* key, the Delta mode will be reset and the display will show zero.

Note 2:

After releasing the insert from the surface, the value of Delta is sent to the buffer together with the values of Min and Max.

In "Graphical help" display mode, an indicator helps in viewing the position of the measuring insert in relation to the scanned extreme points.





# 7. ADDITIONAL FUNCTIONS

## 7.1 Zero Setting of the Display

In height measuring mode a zero setting will be done on the last surface measured by pressing the zero setting key.

In diameter / centreline mode a zero setting will be done on the last centreline distance measured.



In Min or Max mode a zero setting will be done on the last Min or Max value measured.

By pressing the key longer than 2 seconds, the preset value of the current reference will be displayed, disregarding the last probing step.



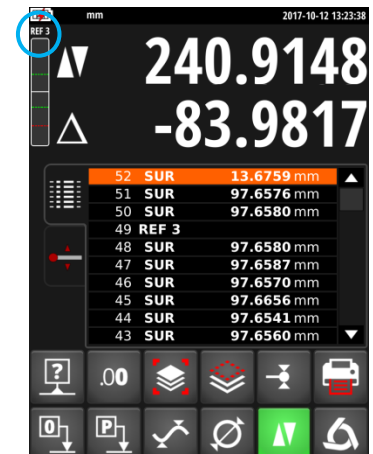
> 2 s

## 7.2 References and Preset

### 7.2.1 Selection of References

The use of references allows simultaneous measurement starting from different points of origin (=references).

The current reference is mentioned at the top left hand side of the display. To go to the next reference, press the key shown alongside.



### 7.2.2 Predefined Value - Preset

By pressing the *Preset* key, a previously defined value will be taken into consideration for height measurements, centreline distances or Min / Max values.



In direct mode (see § 7.13), the preset is executed at the current position of the probe.

### 7.2.3 Activation of References and Preset

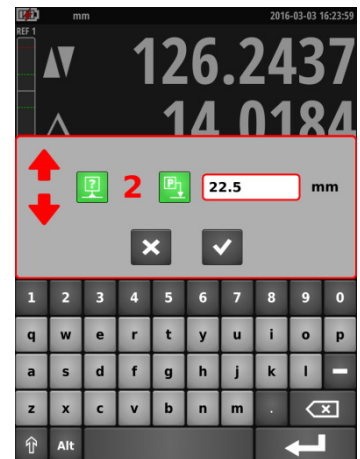
It is possible to activate the 9 references independently. A preset value can be programmed for each of them.

In order to display the corresponding menu, press on the *Preset* key for over 2 seconds. It is then possible to scroll through the references using the red arrows.



To activate a reference, press the key shown alongside. It turns green indicating that the reference is active.

Now it is possible to enter a preset value using the numeric keys of the displayed keyboard.



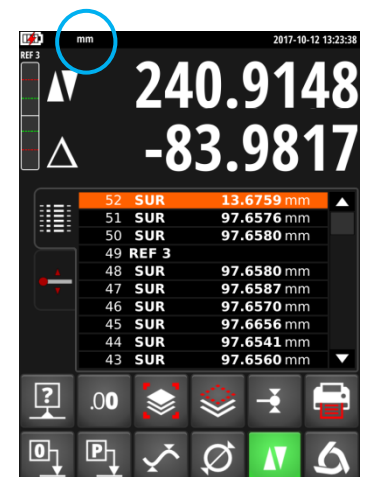
To end, validate with the *OK* key.  
To exit without saving the changes, press the *Cancel* key.



### 7.3 Selection of the Measuring Unit

Measurements can be performed either in mm or in inch. The current unit is displayed at the left side of the status bar.

The unit change is made in the configuration menu (§ 13.2).



## 7.4 Resolution

To modify the display resolution, press the key shown alongside.



## 7.5 Buffer Management

Each measurement is stored in the buffer. It can contain 9999 values.

### 7.5.1 Deleting Values from the Buffer

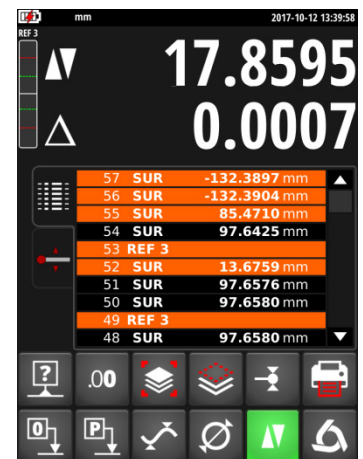
#### Deleting the last value from the buffer

To delete the last value from the buffer, press the key shown alongside.



#### Deleting specific lines from the buffer

It is possible to delete specific lines from the buffer. To do this, select the lines to be deleted on the touchscreen and press the delete key.

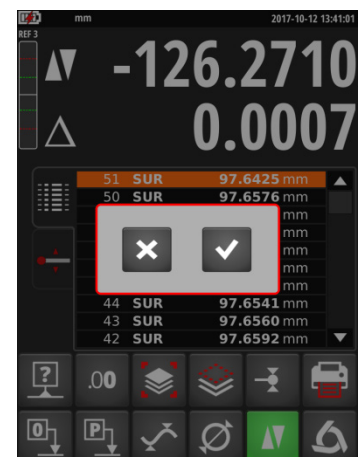


#### Deleting the buffer completely

To delete the buffer completely, press the same key for 2 seconds and then confirm the choice.



> 2 s



## 7.5.2 Backing up the Buffer

### Saving values from the buffer

The buffer can be exported to a USB key. To do this, press the symbol shown alongside and connect the USB key to one of the ports of the display. The drive appears on the screen.



Now select the directory where the buffer data must be stored and enter a file name.

Save with the backup key.

Note:

The data is backed up as a file with *.buf* extension. Values are separated by a semi-colon ";". This file can be easily edited with an Excel type spreadsheet.

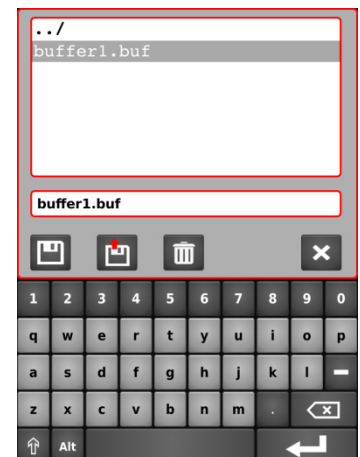
If a file with the same name already exists, it will be overwritten.



### Loading a buffer file

It is possible to load a buffer file from the USB key. Select a file and press the load key. Function key.

The current values in the buffer will be replaced by those of the selected file.



To delete a file, use the key alongside.



To exit the backup menu, press the Cancel key.



## 7.6 Probe Constant

### 7.6.1 Recording of the Probe Constant

To check and memorise the probe constant, press the key shown alongside and follow the same sequence as for "Setting into operation" (§ 4.3, points 2 to 7).

Note:

The current constant value is shown on the first line of the display by pressing this key once. A second pressure interrupts the acquisition of constant and brings the instrument back into height measuring mode.

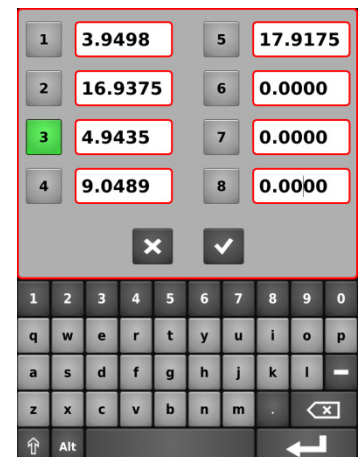


### 7.6.2 Probe Constant Library

8 probe constants can be stored.

To access the list, press the probe constant key for 2 seconds.

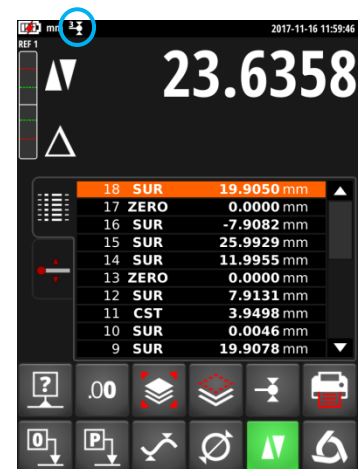
To select the constant to use, press the number from 1 to 8. The active constant is marked in green.



It is also possible to manually change the value of each probe constant.

When another constant than the No. 1 is activated, a symbol is displayed in the status bar.

To define a new value of the active constant, follow the same procedure as when starting (§ 4.3, points 2 to 7).



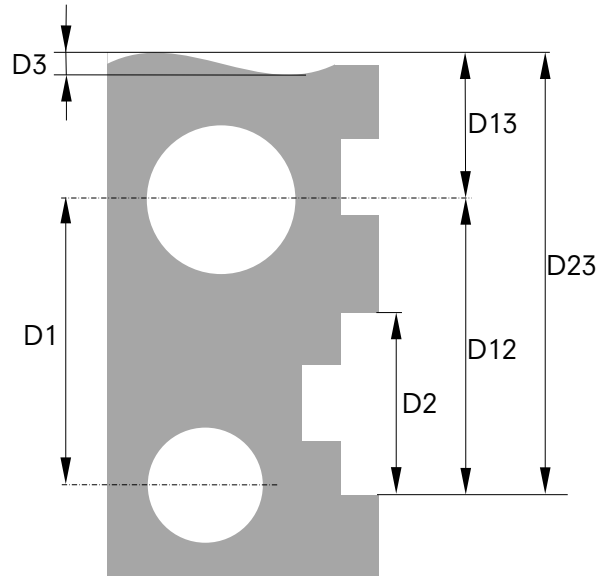
The constant is an essential element during bidirectional measurements. Great caution is essential while interpreting the measurements results when this value is entered manually.

## 7.7 Difference Between the Last 2 Measurements

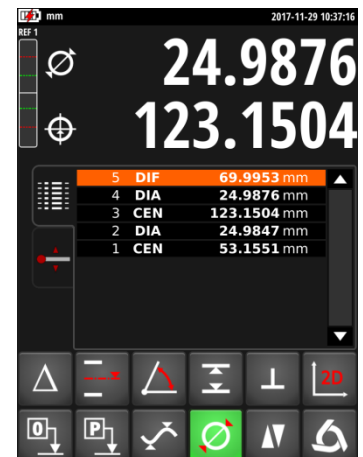
Distances:

D1 = Between 2 centrelines  
 D2 = Between 2 heights  
 D3 = Between 2 values Min-Min, Min-Max or Max-Max

D12 = Between centreline and height  
 D13 = Between centreline and Min or Max  
 D23 = Between height and Min or Max



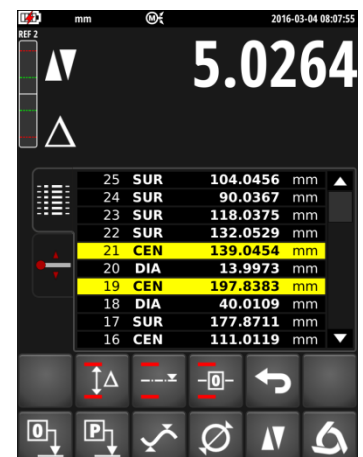
By pressing the difference key, the distance between the 2 last height measurements, centreline measurements, Min or Max measurements is determined and displayed in the buffer. These various measurements can be combined with each other.



## 7.8 Operations Between Selected Values of the Buffer

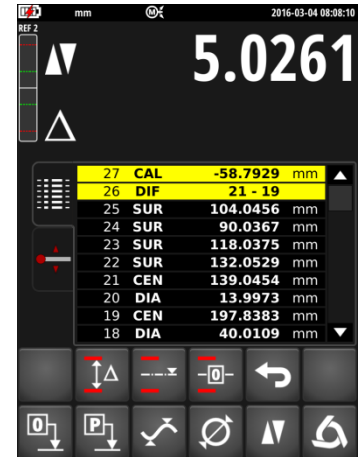
By pressing the difference key for 2 seconds, the calculation menu is displayed.

Just select at least 2 values in the buffer and select one of the calculation functions described below.



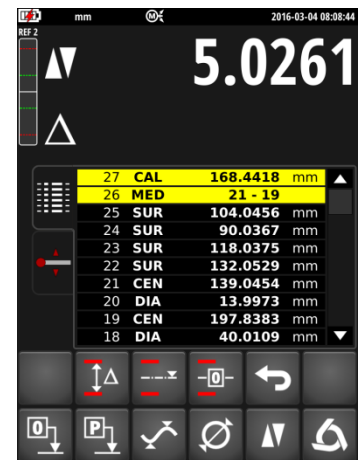
### Difference between the 2 extreme peak values

This function calculates the difference between the 2 extreme peak values of measurements selected from the buffer.



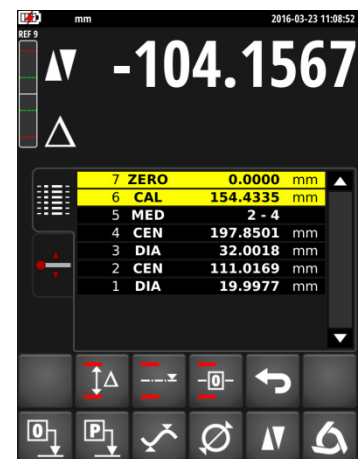
### Average between selected values

The average between 2 or more measurements selected from the buffer is calculated and displayed with this function.



### Zero setting on the average of selected values

This function enables zero setting on the average of 2 or more measurements selected from the buffer.



To exit the calculation mode, press the key shown alongside:



During calculations, the instrument considers all the significant numbers at its disposal (=maximum resolution). When maximum resolution is not used, the result of this difference can be apart by a digit in relation to the subtraction of the displayed values (rounding-off errors)

Example: Max. resolution = 0.0001:  $10.0054 - 5.0045 \Rightarrow$  Displayed value: 5.0009

Same calculation with resolution = 0.001:  $10.005 - 5.005 \Rightarrow$  Displayed value: 5.001!

## 7.9 Average of the Last 2 Measurements

Averages:

M1 = Between 2 centrelines

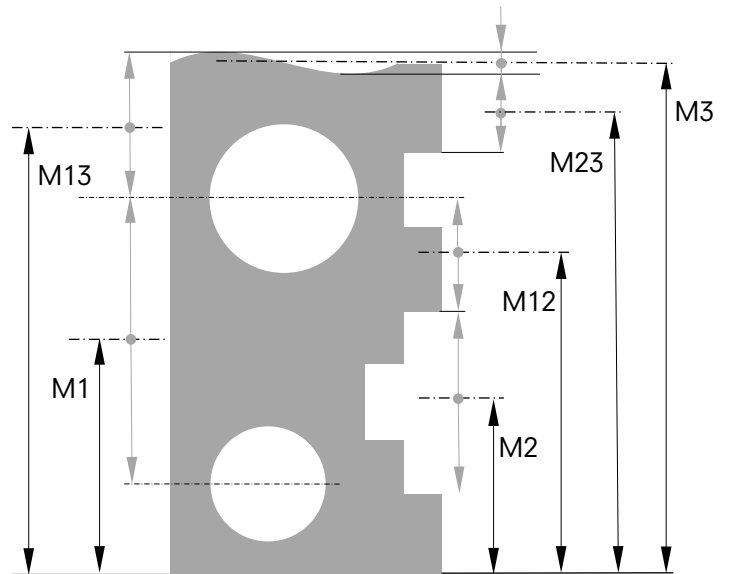
M2 = Between 2 heights

M3 = Between Min et Max

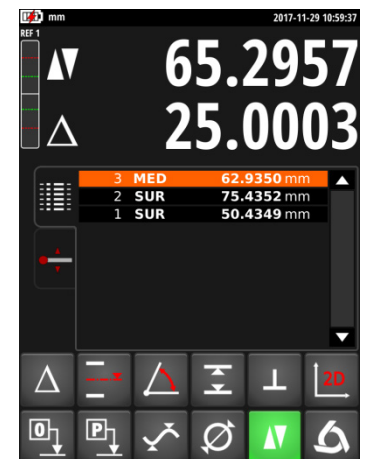
M12 = Between centreline and height

M13 = Between centreline and Min or Max

M23 = Between height and Min or Max



By pressing this key, the average between the 2 last height measurements, centreline measurements, Min or Max measurements is determined. These various measurements can be combined with each other.



Note:

After calculating an average value, it is possible to assign a zero value or Preset value to the calculated position.



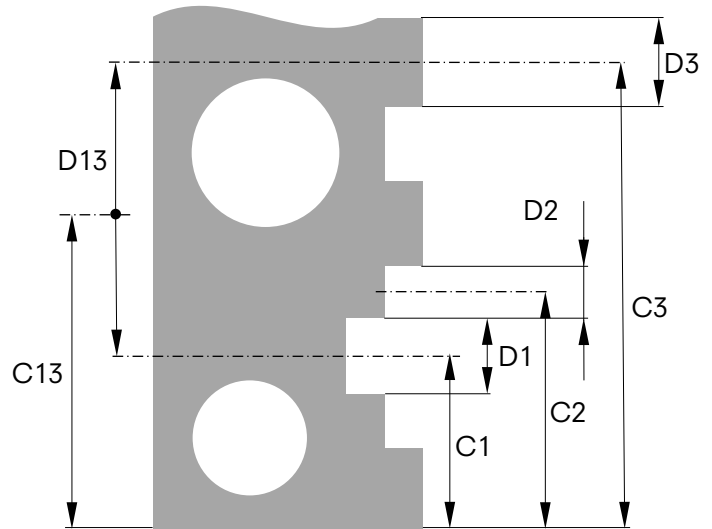
or





## 7.10 Distance and Centreline Measurement

- D1 = Internal distance
- C1 = Centreline corresponding to D1
  
- D2 = Distance between 2 sides of same direction
- C2 = Centreline corresponding to D2
  
- D3 = External distance
- C3 = Centreline corresponding to D3
  
- D13 = Distance between 2 centrelines
- C13 = Average between 2 centrelines



This function measures the centreline distances and distances between 2 surfaces that are not diameters. To activate it, press the key shown alongside for 2 seconds.

Probe the 1<sup>st</sup> surface, then the 2<sup>nd</sup>. When the measuring force is released after the 2<sup>nd</sup> measurement, the distance and centreline values are frozen on the 1<sup>st</sup> and 2<sup>nd</sup> lines of the display respectively.



### Zero or Preset on centreline

It is possible to assign a *Zero* or *Preset* value to the measured centreline distance.



or



### Difference between 2 centrelines

By pressing the difference key, the distance between the 2 last centrelines is determined and displayed in the buffer (DIF).



### Average of the centrelines

By pressing this key, the average of the 2 last centrelines is determined and displayed in the buffer (MED).



### Quit

To quit this mode, select any other measuring function

## 7.11 Angle (and cone) Measurements

This function measures the angle of a side or of a cone in relation to the measuring table. For this measurement, a support part and a gauge block are required.

1. Call the angle measurement function by pressing on the key shown alongside:



2. Take the first measurement with the support part (in grey) placed against the base of the probe and the gauge block (in red).  
For the cone measurement, search the reversal point by moving the instrument (or the part) perpendicular to the axis of the insert while maintaining the distance between the instrument and the constant part.



3. Withdraw the gauge block and take the second measurement using the support part as shown on the screen. For the cone measurement, search the reversal point by moving the instrument (or the part) perpendicular to the axis of the insert while maintaining the distance between the instrument and the constant part.



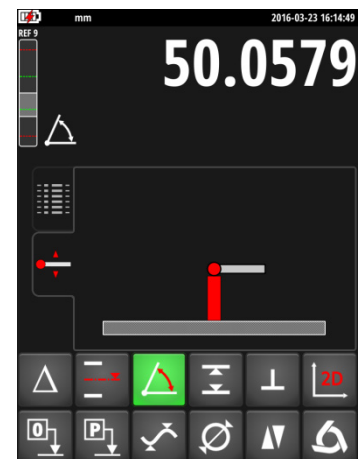
4. Perform a probing measurement on the measuring table.



5. Measure the gauge block.

Note:

Dimension of the gauge block can be recorded in the instrument parameters (see § 13.2). This measurement step and the previous one are then deleted.



6. Value of the angle is displayed and stored in the buffer. A new angle measurement can now be taken.

Note: Angles can be displayed in 3 different units:

1. Decimal degrees ( $x.x^\circ$ )
2. Degrees, minutes, seconds ( $x^\circ x' x''$ )
3. Radians (rad)

To change the angle unit, see § 13.2.



## 7.12 Tolerance Limits

This mode is used to measure parts in series and compare a height, diameter and/or a centreline as well as a Min or Max with pre-programmed permitted dimensions. Colours in the buffer indicate whether or not the tolerances are respected.

### 7.12.1 Programming the Tolerances

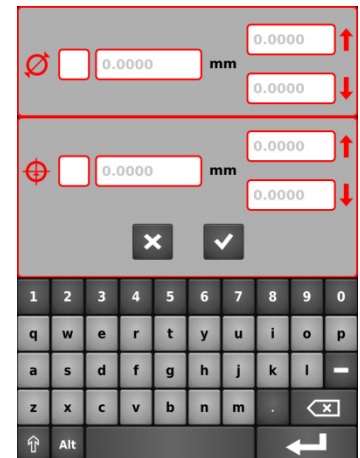
1. In order to store the dimensions with their tolerances, press the key shown alongside for 2 seconds. The menu corresponding to the active measurement mode is displayed (illustration given alongside for diameter/centreline).

Note:

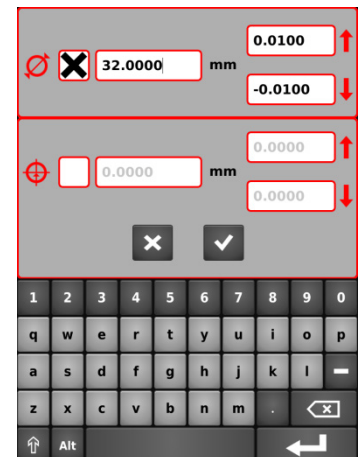
If the probe is a mode other than height, diameter/centreline or Min/Max, this menu will not display.



> 2 s



2. Activate the extent of tolerance by clicking in the box on the right side of the corresponding symbol and enter the base dimension as well as its tolerances using numeric keys.



3. To end, validate with the **OK** key.  
To exit without saving the changes, press the **Cancel** key.



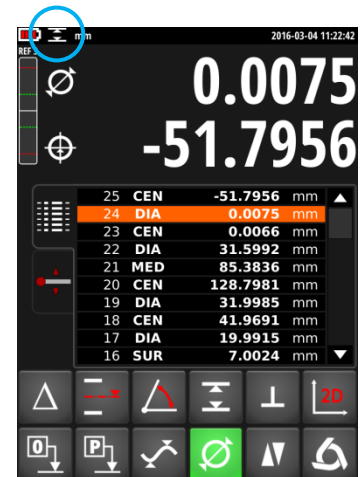
OK



Cancel

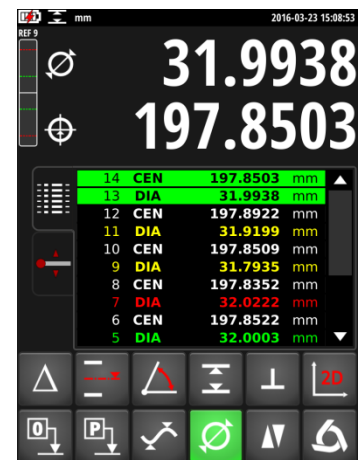
### 7.12.2 Using the Tolerance Limits

1. Activate the tolerance mode by pressing the *Tol* key. The function symbol is then displayed in the status bar.



2. For each height, diameter or centreline measurement for which tolerances have been activated, the corresponding buffer line is displayed in a colour corresponding to the result.

- Green: Within tolerance limits
- Yellow: Outside tolerance limits, reworking possible
- Red: Outside tolerance limits, reworking not possible



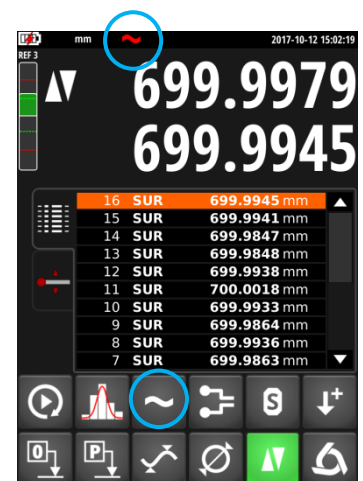
### 7.13 Display Modes of the Height Measurements

#### "Standard" display

When taking a height measurement, the upper line remains frozen at the measured value. The lower line shows the distance from the measurement of the previous height (chain dimension). When the measuring force is released, this value is replaced by that of the last measurement.

#### "Direct" display

When taking a height measurement, the upper line is not frozen and directly reacts to the part's height variations. The lower line indicates the frozen value of the last measurement.



Display in direct mode

Activate the "direct" display mode by pressing the key shown alongside. The "direct" display symbol is then displayed in the status bar. Do the same to return to "standard" mode.

## 7.14 Probe Holder Change

This function allows to pass from one probe holder to the other while keeping the same origin.

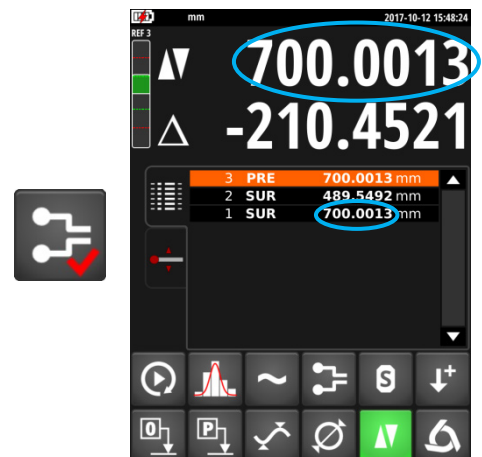
Procedure:

1. Before taking out the insert probe a reference surface of centreline and activate the probe holder change mode.  
The button changes its appearance and the probe change symbol blinks in the status bar.



2. Mount the probe on the other probe holder.
3. Probe the same surface again, or reference centreline.

4. Press the key again. The display stores the last value and the measurements can continue.



Note:

In the case where the reference is a centreline distance, the program requires a new measurement of the probe constant before probing the new reference point.

## 7.15 Shrinking Factor

A shrinking factor can be entered here, for example for measuring injection moulds. This function allows in general "distending" or "shrinking" the measuring system by a defined factor.

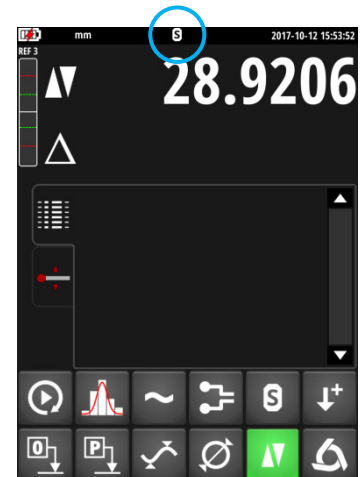
1. To enter a shrinking factor, press the key shown alongside for 2 seconds. Enter the desired factor (value between 0.7 and 1.2).



2. Validate with the OK key.  
To exit without saving the changes, press the Cancel key.



When the shrinking factor is different from 1, the following symbol appears at the top of the main display.



When a value other than 1 is recorded, the shrinkage factor function can be activated/deactivated just by pressing the key shown alongside.

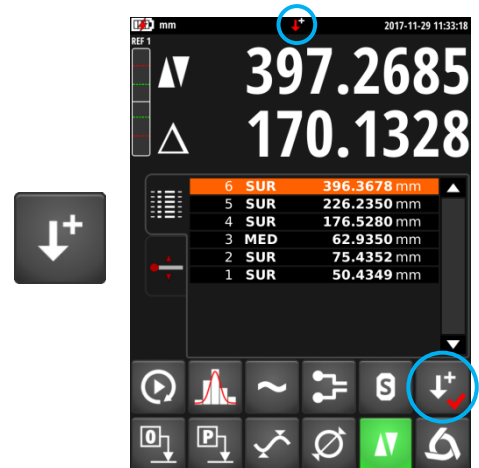


## 7.16 Inversion of the Measuring Direction

It is possible to invert the measuring direction to obtain positive measuring values downwards. This function is mainly used when the part to be measured is higher than the measuring range of the instrument.

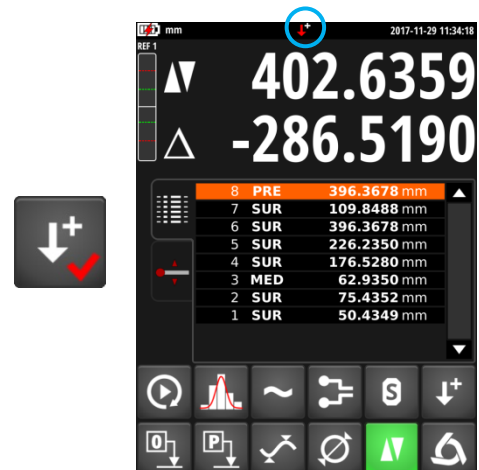
Procedure:

1. When the limit of the measuring range is close, probe a reference surface or a centerline distance and activate the function of measuring direction inversion. The button changes appearance and the corresponding symbol flashes in the status bar.



2. Turn the part and probe the same surface or centreline again.

3. Again press on the measuring direction inversion button. Now the instrument measures positive values downwards and measurements can continue to be taken.



### Exit

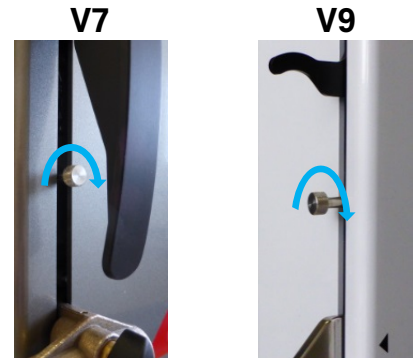
Quit the function of inversion of the measuring direction by pressing once again the key.





# 8. PERPENDICULARITY MEASUREMENTS

Before taking any perpendicularity measurements, the carriage must be blocked.



## 8.1 With Test Indicator

1. Place a test indicator in the probe holder.
2. Lightly press the lever of the indicator against the side to be measured and set the zero.
3. Move the instrument's carriage vertically to check the perpendicularity of the side.



To get optimum measuring precision, the instrument base must be **completely parallel to the side to be measured.**

## 8.2 With Electronic Probe

The perpendicularity measurement is given with the help of 4 values represented in the diagram alongside:



Distance



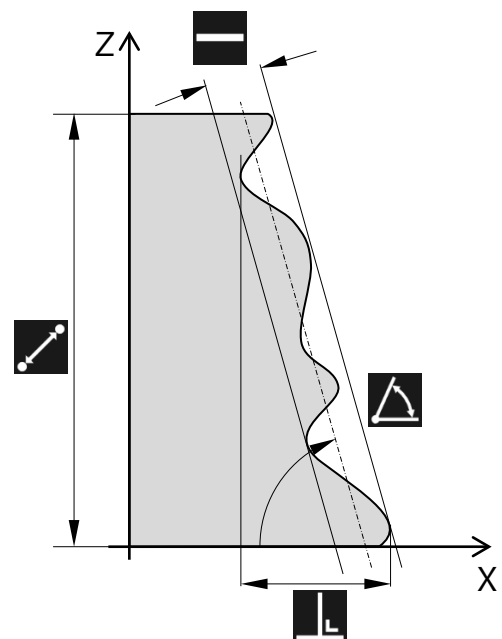
Perpendicularity



Inclination



Rectitude



The required accessories are:

**Perpendicularity probe**

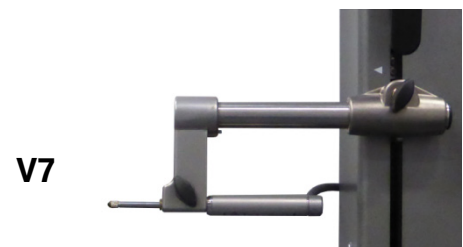
- V7-400, V7-700, V9-400 and V9-700: TA-MS-101 (ref. 276 940001 001)
- V7-1100 and V9-1100: TA-MS-102 (ref. 276 940001 002)
- V7-1800: TA-MS-104 (ref. 609 02 021)

**Holder for perpendicularity probe**

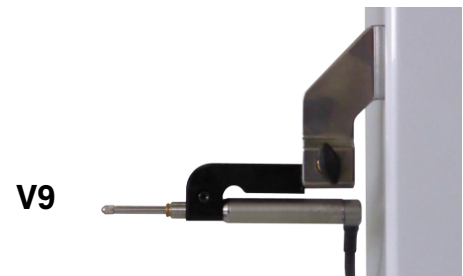
- V7: TA-MS-104 (ref. 609 02 021)
- V9: TA-IH-136 (ref. 612 11 073)

Procedure:

1. Mount the electronic perpendicularity probe in its holder.



2. Connect the perpendicularity probe to the column



3. Place the part to be measured against the probe such that the entire portion to be measured is in contact with it. Bring the carriage to its starting position.



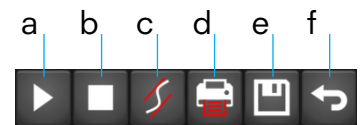
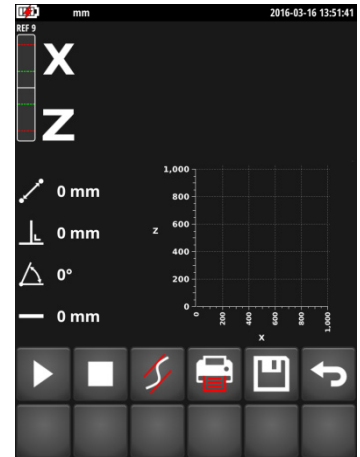
To get optimum measuring precision, the instrument base must be **completely parallel to the side to be measured**.

Pay attention that the cable of the probe does not create any stress on the probe holder.

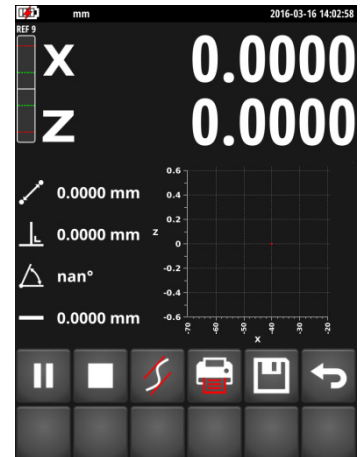
- Call the perpendicularity measurement function by pressing on the key shown alongside.

The following menu is displayed:

- Start/Pause
- Stop
- Display trend curves
- Print data
- Save data
- Exit



- To start the perpendicularity measurement, press the **Start** key.  
The probe measurement (X) appears on the first line of the display. The measured height (Z) is displayed on the second line. These two values are initialised to 0 at start-up.



- Slowly move the probe along the side to be measured. While moving, the X (horizontal axis) and Z (vertical axis) values as well as the perpendicularity curve and its parameters (distance, perpendicularity, inclination and rectitude) are directly displayed.

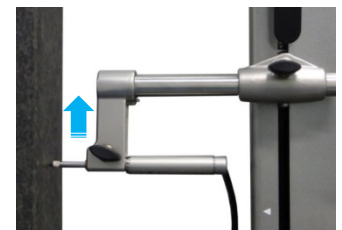
Note 1:

In motorised mode, the carriage will start moving immediately after having pressed the **Start** key.

Note 2:

In motorized mode it is possible to move the probe from a predefined distance. To do this, press the **Start** key for 2 seconds and enter the desired distance (positive value = upward movement, negative value = downward movement).

The move starts directly after confirmation.



> 2s



- When displacement ends, press on the **Stop** key. The display freezes and shows the perpendicularity (**X**) on the first line of the display and the distance (**Z**) on the second line.

Note:

In motorised mode, the carriage will stop moving as soon as the **Stop** key will be pressed.



To perform another perpendicularity measurement, go back to point 5.



To exit the perpendicularity measurement, press Exit.



### 8.2.1 Graphical Display of the Limit Values

The function shown alongside displays the rectitude (green lines) and inclination (blue line) limits.

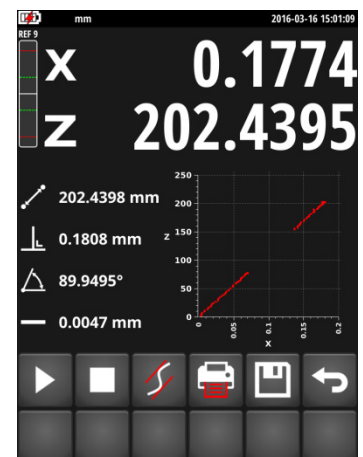


### 8.2.2 Pause Function

If the side to be measured has obstacles or cannot be measured in a single pass, it is possible to temporarily interrupt the measurement. To do this press the **Pause** button. The probe can then be moved to the point at which the measurement must be taken again. To restart the measurement, again press the Pause button.

Note:

While moving the probe in "Pause" mode, ensure that the instrument and the part are completely immobile.



### 8.2.3 Printing the Perpendicularity Curve

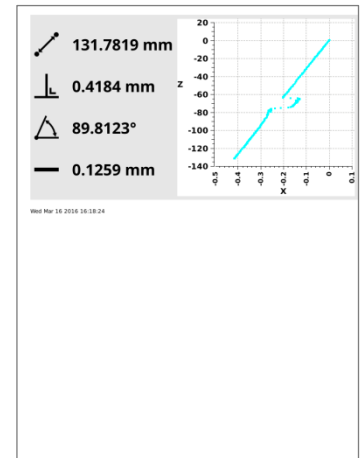
#### Serial printing and PC

When serial and PC printing is enabled, the X and Z values are sent simultaneously via the USB and RS232 ports each time the Print key is pressed. When automatic transfer of data is enabled, X and Z values are sent in series throughout the measurement.

#### USB printer

When the USB printer is selected, the perpendicularity curve can be printed on a USB printer by pressing the Print button.

For more details on data transfer configuration, refer to § 12.



### 8.2.4 Saving the perpendicularity curve

The perpendicularity file can be saved in 2 ways:

1. Save the measured points as a file with extension **.perp**. This file can be easily edited with an Excel spreadsheet. The values are separated by a semicolon ";":  
=> Simple press on the save key.

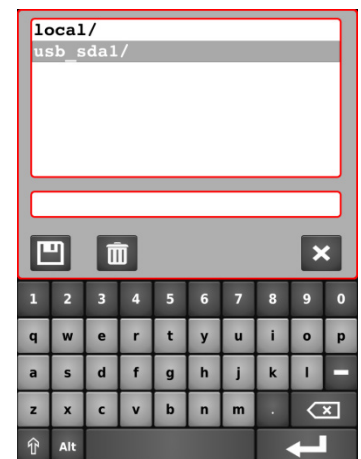


2. Saving the perpendicularity curve as a **.png** file:  
=> Long press the save key.



>2 s

Insert a USB stick into one of the ports on the display. Now select the directory where the perpendicularity file must be stored and enter a file name.

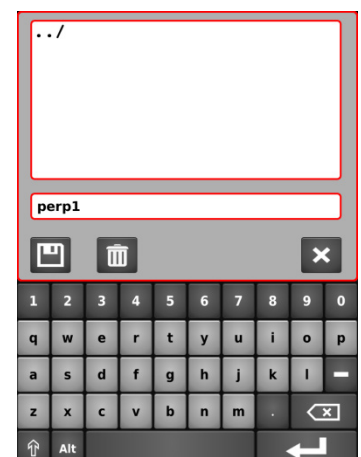


Save with the following key.



Note:

If a file with the same name already exists, it will be overwritten.



To delete a file, use the key alongside.



To exit without saving, press the Cancel key.

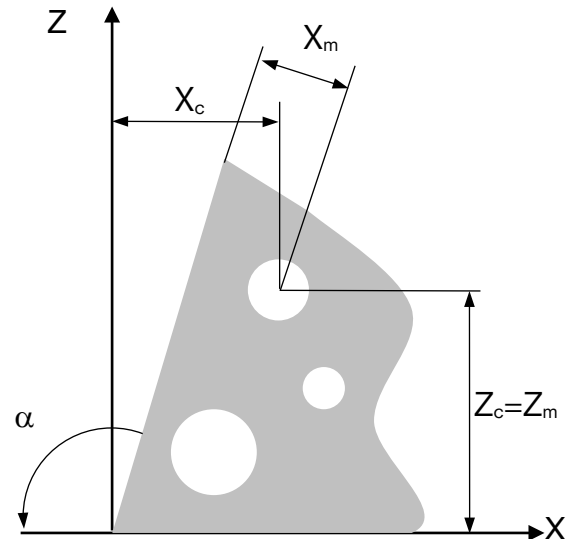


# 9. 2-COORDINATE MEASUREMENTS (2D)

This function offers 2D measurements of bores or shafts placed on one surface. The position is determined in the drawing of the measured parts based on a Cartesian or Polar reference system along with their diameters.

Between the measurements along the Z-axis and those along the X-axis, the part is tilted in an anti-clockwise direction, seen from the instrument. The angle of inclination is between 45° and 135°.

In the diagram alongside,  $Z_m$  and  $X_m$  respectively represent the values measured before and after the tilting.  $Z_c$  and  $X_c$  represent the values returned in a 90° Cartesian system. These are the values considered for calculations.

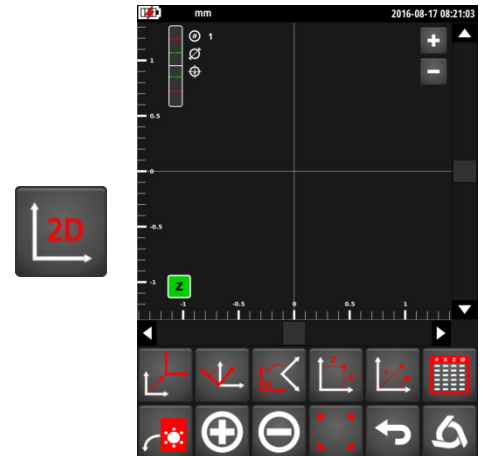


## 9.1 Getting Started

To begin a 2-coordinate measurement, press the **2D** button from the main menu. The following screen is displayed.

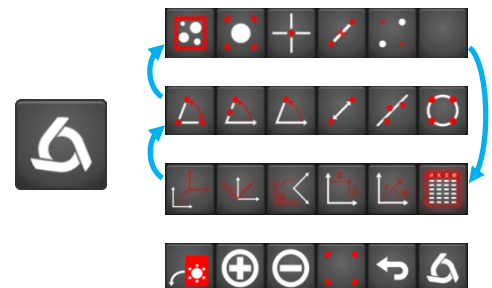
Note:

The bores should already have been numbered, the inclination angle determined and the required reference positions acquired.



The lower functions menu line is the main line. It is static.

The upper function line is scrolling. A press on the *Logo* key scrolls the other function lines.

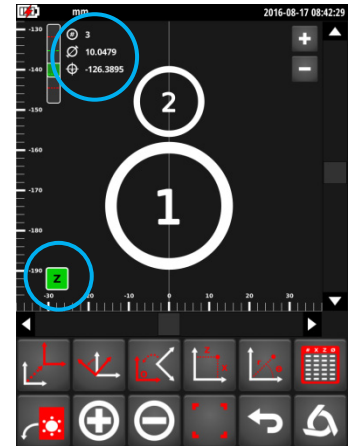


## 9.2 Acquisition of Points

### Acquisition along Z-axis

Directly after starting-up, measure the bores in the order of numbering according to the diameter and centreline measurement procedure.

All the bores are displayed along the Z-axis. Its symbol is displayed in green to the bottom left of the axes system. During measurement, the number of the bore as well as its diameter and centreline are displayed on the top left of the display.



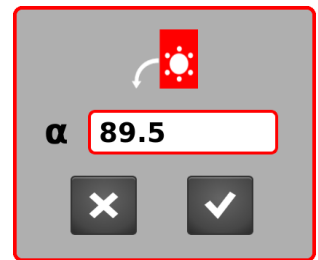
### Tilting the part at 90°

After measurements along the Z-axis are completed, press on the tilting key. A short press on this key implies a 90° tilt.



### Tilting the part at an angle other than 90°

When the desired angle of tilting is other than 90°, press the same key for 2 seconds. It is possible to assign a value between 45° and 135°.



OK

Validate the inclination with the OK key.

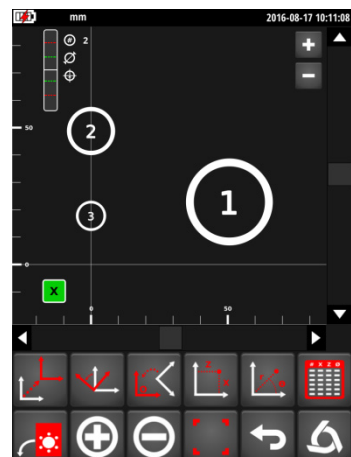
To cancel the inclination, press the Cancel key.



Cancel

### Acquisition along X-axis

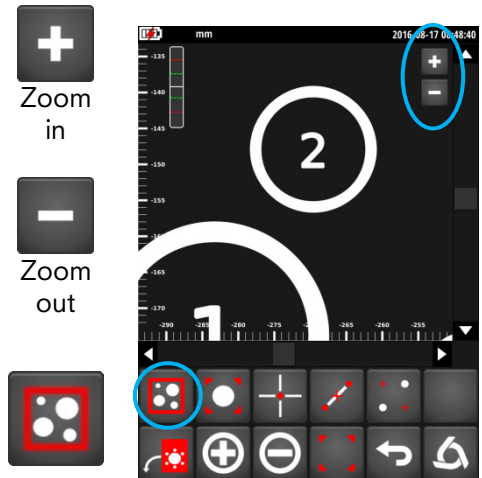
When the part has been tilted, enter the bores in the same order as was done along the Z-axis. The position of the bores on the screen is updated after each measurement. During acquisition, the X symbol is displayed in green to the bottom left of the axes system.



## 9.3 Display Management

### 9.3.1 Zoom

The buttons located on the top right hand side of the axis system are used for zooming in and zooming out.



The following function is used to redefine all the bores on the screen.

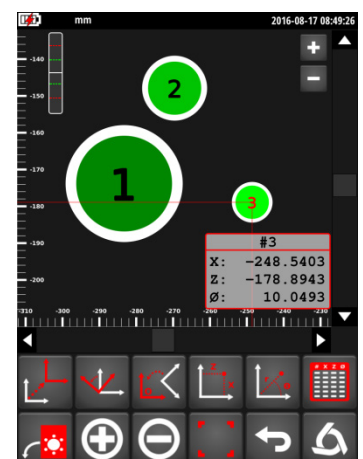
### 9.3.2 Displacement Within the Plane

There are 2 possibilities of moving within the plane:

1. With the help of scrollbars located at the bottom and to the right of the axes system.
2. By sliding one's finger on the screen in the desired direction.

### 9.3.3 Selection of Bores

Each bore can be selected by pressing on the touchscreen. The selected bores are marked in green. The first selected bore is displayed in the darkest green; in contrast, the last selected bore is displayed in the lightest green. Coordinates and diameter of the last selected bore are displayed along with their projections on the 2 axes.



To deselect all the bores, press the key shown alongside:





## 9.4 Transformations of the Axis System

### 9.4.1 Translation of the System of Coordinates

#### Translation of the origin to the centre of a bore

1. Select the bore
2. Press the translation key

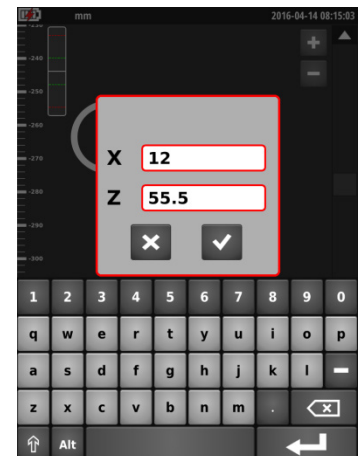
Note:

Each change in the axis system is marked by a  $O_x$  symbol located under the zoom buttons. The index number of the  $O$  represents the number of transformations made.



#### Translation of the origin to the X and Z coordinates

1. Deselect all the bores
2. Press the translation key
3. Enter coordinates of the new axis system
4. Confirm with the OK key



### 9.4.2 Alignment / Rotation of the System of Coordinates

#### Alignment of X-axis on 1 bore centre

1. Select the bore
2. Press the translation key



#### Alignment of Z-axis on 1 bore centre

1. Select the bore
2. Press the translation key for 2 seconds



>2 s

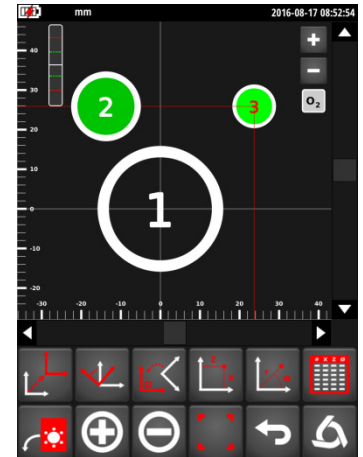


### Alignment of X-axis on 2 bore centres

1. Select the 2 bores with which the X-axis should be aligned
2. Press the rotation key

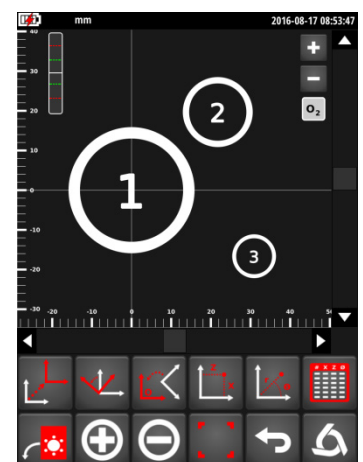
### Alignment of Z-axis on 2 bore centres

1. Select the 2 bores with which the X-axis should be aligned
2. Press the rotation key for 2 seconds



### Rotation of plane along a given angle

1. Deselect all the bores
2. Press the rotation key
3. Enter the desired rotation angle
4. Confirm with the OK key



## 9.4.3 Return to the Original System

To go back from a transformation, press the key shown alongside:

To return to the original system, press the same key for 2 seconds.



## 9.4.4 Cartesian or Polar Coordinate System

Coordinates of points can be displayed based on a Cartesian (default system) or polar axis system. To change from one mode to another, press the corresponding key:



Cartesian



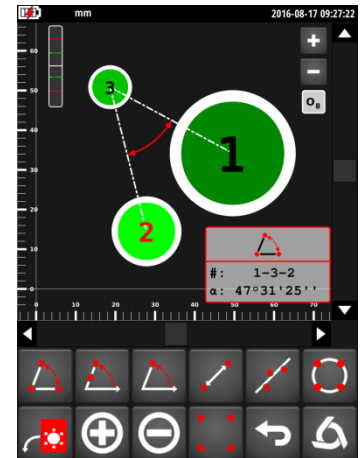
Polar

## 9.5 Measurements and Analyses

### 9.5.1 Measurements of Angles

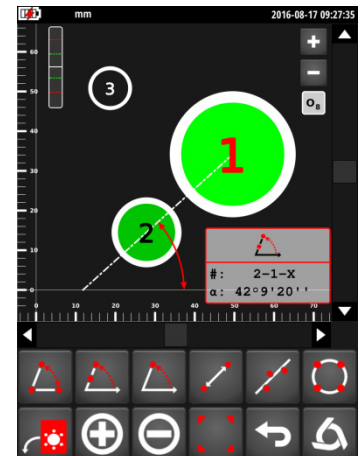
#### Angle between 3 points

1. Select the 3 bores (in the order desired!)
2. Press the 3-point angle key
3. The angle is displayed on the screen
  - #: No. of points
  - L: Angle



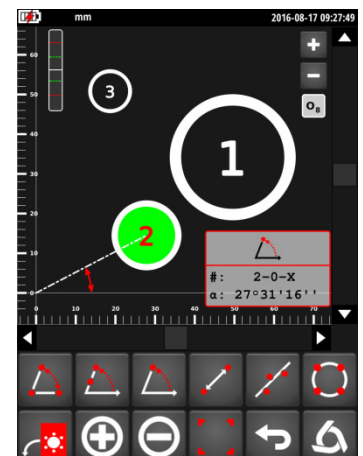
#### Angle between 2 points and the X-axis

1. Select 2 bores (in the order desired!)
2. Press the 2-point angle key
3. The angle is displayed on the screen
  - #: No. of points
  - L: Angle



#### Angle between 1 point, the origin and the X-axis

1. Select a bore
2. Press the 1-point angle key
3. The angle is displayed on the screen
  - #: No. of points
  - L: Angle



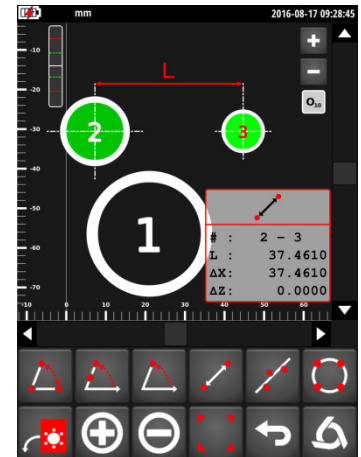
Note:

For each function above, the complementary angle can be displayed by pressing on the correspondent function key for 2 seconds.

> 2 s

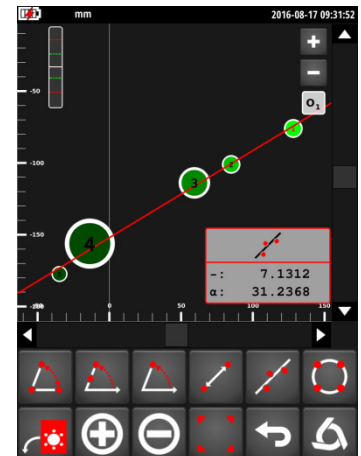
### 9.5.2 Distance Between 2 Points

1. Select 2 bores
2. Press the distance measurement key
3. Distance between the two points is displayed on the screen
  - #: No. of points
  - L: Straight line distance
  - $\Delta X$ : Distance projected on X
  - $\Delta Z$ : Distance projected on Z



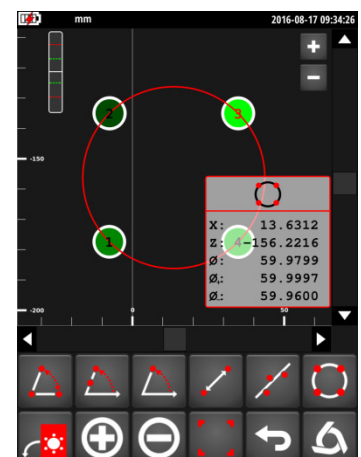
### 9.5.3 Alignment of Points

1. Select the points whose alignment must be measured
2. Press the alignment key
3. Alignment of the points is displayed:
  - : Rectitude
  - $\alpha$ : Regression line angle

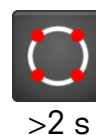


### 9.5.4 Regression Circle (PCD)

1. Select points of the regression circle
2. Press the PCD key
3. The PCD is displayed:
  - X: X coordinate of the centre
  - Z: Z coordinate of the centre
  - $\emptyset$ : Diameter of the regression circle
  - $\emptyset_+$ : Maximum diameter
  - $\emptyset_-$ : Minimum diameter



By pressing on the same button during more than 2 seconds, a construction point is created at the centre of the PCD.



## 9.6 Editing, Adding and Deleting Points

### 9.6.1 Adding a Measured Point

To add one or more points press the key shown alongside. The Z symbol is displayed in green to the bottom left of the axes system.

New points are acquired in the same manner as described in § 9.2.

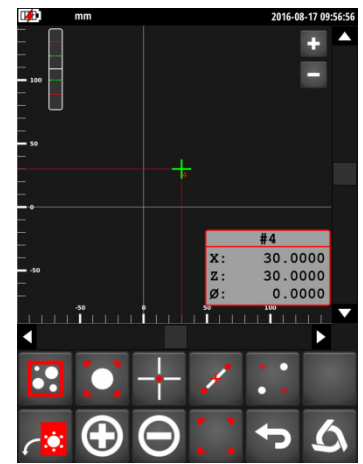


### 9.6.2 Adding a Construction Point

#### Single construction point

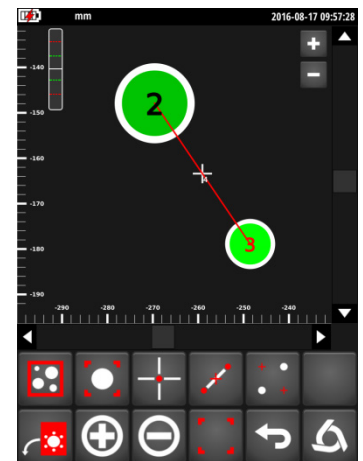
It is possible to add a construction point through its coordinates. It can also be assigned a number and a diameter. To do this, press the key shown alongside and enter the requested numeric values.

If the point does not contain diameter, it is represented by a cross, else as a standard bore.



#### Median construction point

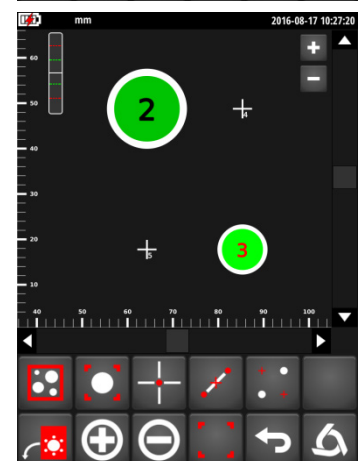
To add a median construction point, select the 2 bores between which this point must be located and press the key shown alongside.



#### Orthogonal projection points

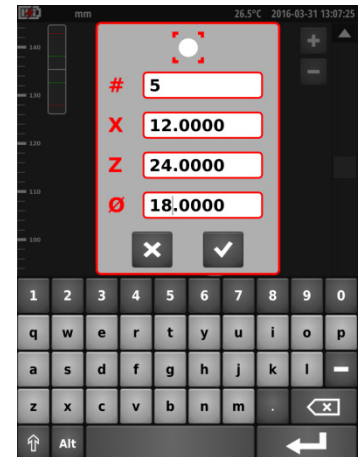
This function helps to create 2 orthogonal projection points in relation to 2 selected bores.

To do this, select 2 bores and press the key shown alongside:



### 9.6.3 Editing a Point

The function shown alongside helps in editing the last selected point, i.e. it can modify its no., its coordinates and its diameter.



### 9.6.4 Deleting a Point

To delete one or more points, select the point(s) to be deleted and press the key shown alongside.



OK



Cancel

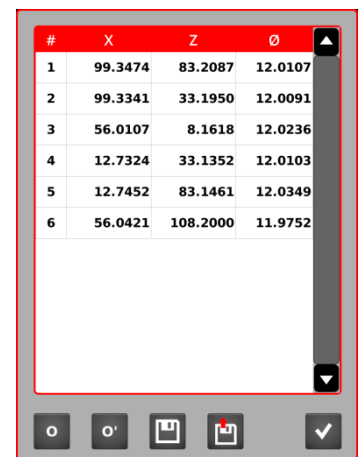


Validate with the OK key or cancel with the Cancel key.

### 9.6.5 Table of Points

#### Displaying the points

Coordinates of the points can be displayed. To do this, press the key shown alongside.

#	X	Z	Ø
1	99.3474	83.2087	12.0107
2	99.3341	33.1950	12.0091
3	56.0107	8.1618	12.0236
4	12.7324	33.1352	12.0103
5	12.7452	83.1461	12.0349
6	56.0421	108.2000	11.9752

#### Displaying points before and after transformation

Coordinates of the bores are displayed by default based on the last transformation of the system of axes. These points can also be displayed based on the original system of axes by pressing the *O* key. To return to the last reference, press the *O'* key.



Current system



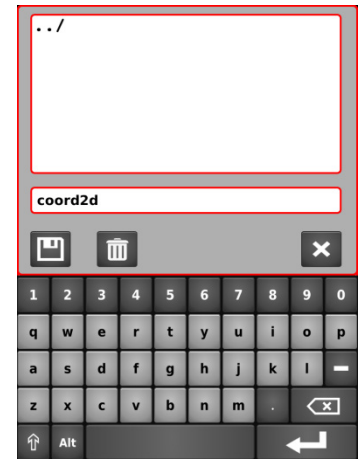
Original system

### Backing up the data

Coordinates of the bores can be backed up in a USB key. To do this, press the symbol shown alongside and connect the USB key to one of the ports of the display. Now select the directory where the perpendicularity file must be stored and enter a file name. Save with the same key.

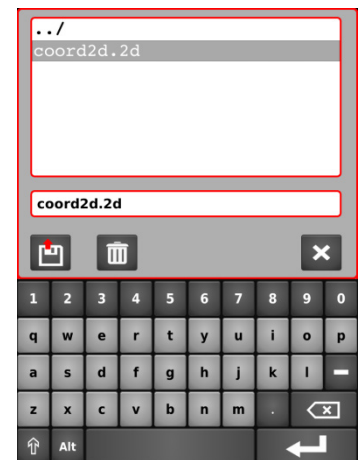
Note:

The data is backed up as a file with *.2d* extension. Values are separated by a semi-colon ";". This file can be easily edited with an Excel type spreadsheet. If a file with the same name already exists, it will be overwritten.



### Loading points from a file

It is possible to load a 2D coordinate file from the USB key. Select a file and press the load key. Function key. The current values in the plane will be replaced by those of the selected file.



To delete a file, use the key alongside.



To exit the backup/load menu, press the Cancel key.



To exit the table of points, press the key shown alongside:



## 9.7 Quit the 2D mode

To quit the 2D mode, press the following key.



# 10. MEASUREMENT SEQUENCES

A measurement sequence is a series of programmed actions that allow the measurement of parts in series. Heights, diameters and centerline distances can be tolerated. The operating principle is as follows:

## Programming

The first part is measured normally (heights, diameters, centerline distances, reference points, etc ...). All these actions are stored.

## Execution

The following parts of the same series are then measured in the programmed order. The instrument tells the user what function to perform.

## Batch Management

The results of the measurements of a sequence can be recorded in a batch. This grouping allows the statistical analysis of the batch (§ 11).

## 10.1 Start

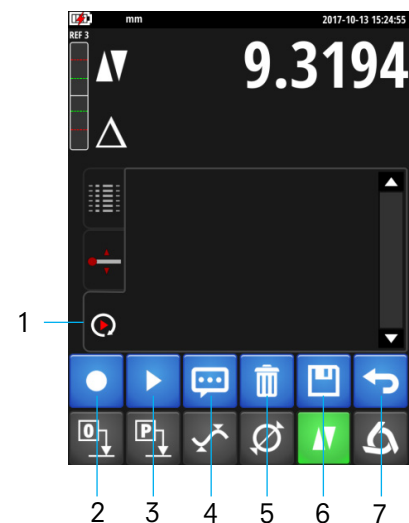
The measurement sequence menu opens by pressing the following symbol:



A drop-down menu with a blue background appears with the functions specific to the programming mode. Furthermore, an additional display mode with the steps of the program (1) is added to the two existing modes (Buffer and graphic help):

The functions available are:

1. Program step list
2. Starting the teach mode
3. Replay of a measurement sequence
4. Add a comment
5. Delete a step from the program
6. Save a program
7. Exit programming mode





## 10.2 Programming a Sequence

Programming a new measurement sequence starts with pressing the next button.



Then just make the measurements exactly as if the instrument was used normally. Each action is stored and displayed as a program step.

In programming mode the menu displays new functions:

1. Stop - terminate programming
2. Position - Sends the carriage to a target position
3. Pause - Temporarily stops the program (eg to allow part positioning)

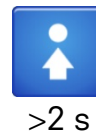


### 10.2.1 Moving to a Target Position

This function sets the current position as "target". When running the program in motorized mode, the instrument will move to this position.



By pressing the same key for 2 seconds, it is possible to manually enter the position at which the probe is to be positioned.



### 10.2.2 Comments

Each program step can be commented to guide the user in the measurements to be made.

1. Select a line in the programming buffer before which a comment is to be inserted.
2. Press the key opposite and enter the comment (up to 50 characters).
3. After confirmation, the comment appears above the selected line.



### 10.2.3 Deleting a Step from the Sequence

At any time a program line can be erased. To do this, select the line to be displayed and press the following button.



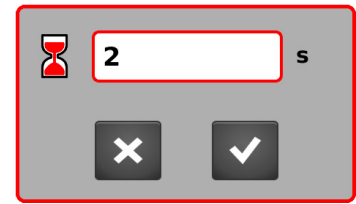
### 10.2.4 Waiting Time and Hold-Point

#### Standard waiting time between measurements

When executing a sequence in motorized mode, the movement pauses between measurements. This waiting time can be set by pressing the next key for 2 seconds. The time entered is valid for the entire program as well as for future programs.



>2 s



#### Hold-point

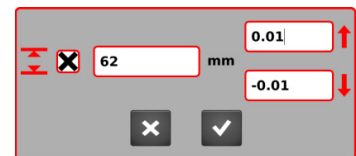
The following function inserts a hold-point in a sequence. A hold-point allows you to temporarily stop the program to move the part for example. To continue, press the *Play* key.



### 10.2.5 Tolerances

A tolerance can be assigned to each measurement made in programming mode (heights, diameters, min, max). To do this, double-click on the line concerned to open the tolerance menu.

By activating the checkbox it is possible to enter a nominal value and its tolerances. When the sequence is executed, the values will be displayed in colour as described in chapter 7.12.

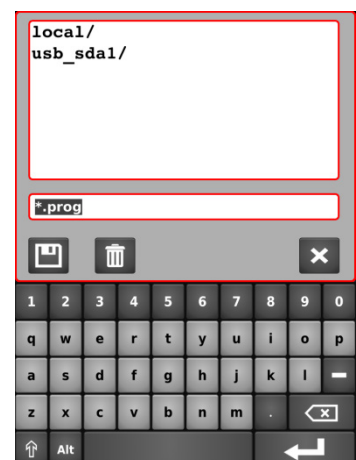


### 10.2.6 End of Programming

To complete the programming, press the following button.



A backup menu is displayed. To save the sequence, enter a location (local or USB) and a program name, then confirm with the save key.



To exit without saving the sequence, press the following key.



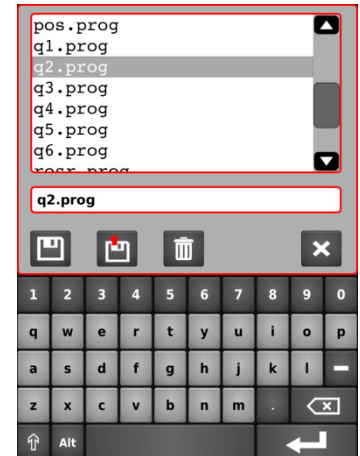
## 10.3 Running a Sequence

### 10.3.1 Loading

To load a previously recorded sequence, press the next key.



Select the sequence to execute in the list and confirm with the load key.



Note:

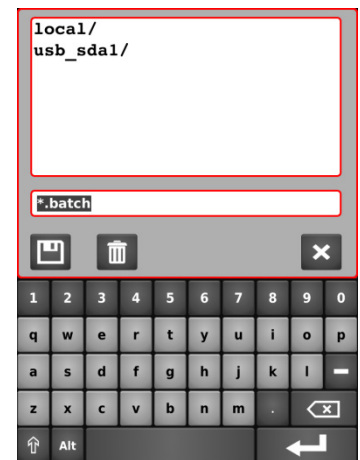
If a sequence has just been created, this step can be ignored. Skip directly to startup (below).

### 10.3.2 Start

The execution of a measurement sequence starts by pressing the **Start** key.



The program asks whether the measurement results should be saved in a batch (.batch file) so that they can be analyzed later in the statistics menu.



If yes:

Enter a file name or select an existing file, ensuring that it contains only results from the same program.



If not:

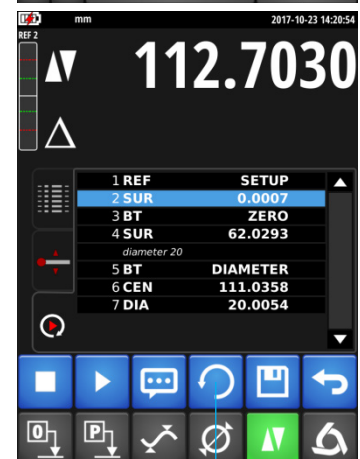
Exit the menu by pressing the cancel key.



The sequence starts immediately.

The current step is indicated in blue in the buffer.

Just follow each step. In motorized mode the instrument moves alone.



In run mode the menu displays a new function:

1. Go back one step

### 10.3.3 End of Measurement Cycle

At the end of the sequence it is asked to validate or not the results.

Pressing the *OK* key saves the results in the active batch.



Pressing the *Cancel* button does not save the results.



### 10.3.4 New Measurement

A new measurement cycle is restarted by pressing the *Start* key.



It is also possible to repeat the measurements without confirmation between each cycle. To do this, press the Start key for 2 seconds.



If a batch was saved at startup, the measurements will be saved each cycle.

>2 s

## 10.4 Special Features of the Programming Mode

When programming a measurement sequence, a long press on the *Preset* button automatically assigns the value of the last probing to the next reference.



>2 s

## 10.5 Quit the Measurement Sequence Mode

To exit the measurement sequence mode press the following key.



# 11. STATISTICAL ANALYSIS OF RESULTS

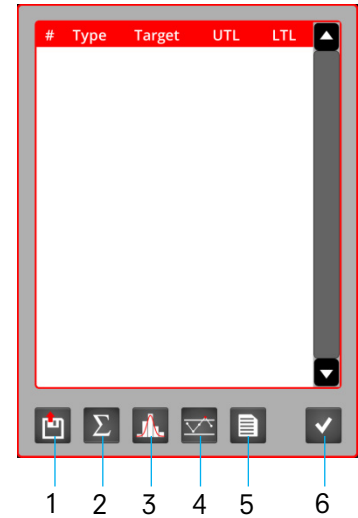
## 11.1 Start

Statistical analysis is based on the results of a batch recorded during a measurement sequence.

To analyse a batch, call the statistical analysis menu by pressing the following button.

The functions available are:

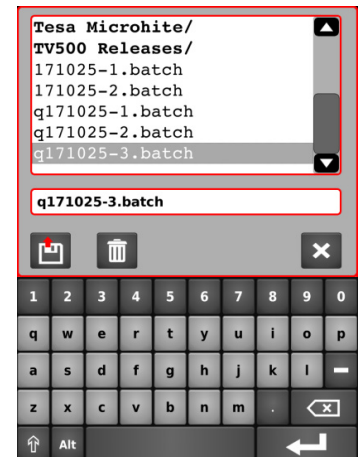
1. Opening a batch
2. Statistical values
3. Histogram
4. Control card
5. Export results in .csv format
6. Exit



## 11.2 Batch Analysis

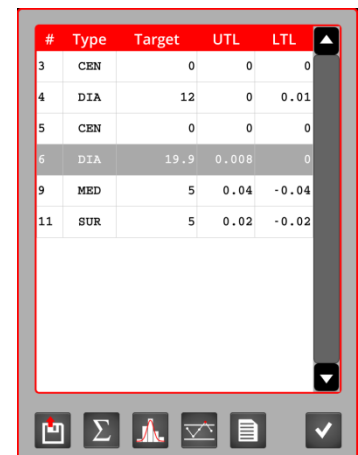
### 11.2.1 Open a Batch

Open the list of batches (files with extension .batch) and select the one to be analysed and confirm.

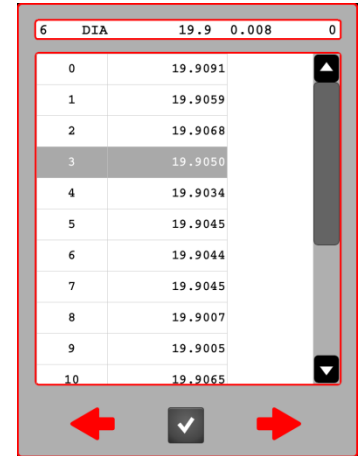


Each batch can only contain the results of one program.

A batch is composed of the different nominal values defined by the sequence (visible in the list opposite). At each nominal value correspond as many results as the sequence has been executed.



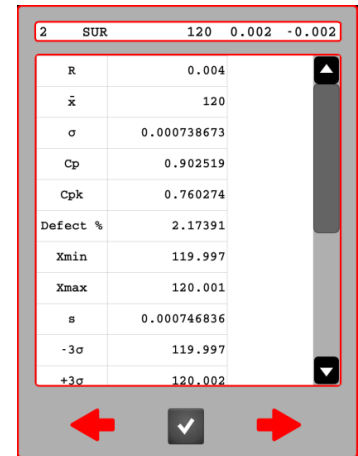
By double clicking on a batch line (nominal value), it is possible to view the results of all recorded measurements.



### 11.2.2 Statistical Values

The statistical values are displayed for each nominal value of the batch. These are displayed as page header with their tolerance (UTL & LTL).

To navigate between the nominal values, use the red arrows.



The statistical values based on the results of each nominal value are as follows:

Number of memorized results

$$N$$

Range

$$R \quad X_{max} - X_{min}$$

Arithmetic mean value

$$\bar{X} \quad \frac{\sum_{i=1}^N X_i}{N}$$

Standard deviation

$$\sigma \quad \sqrt{\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N}}$$

Process capability

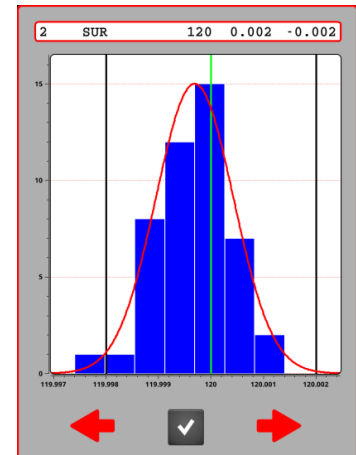
$$C_p \quad \frac{UTL - LTL}{6\sigma}$$

Process center capability index	$C_{pk}$	$\frac{(NOM + UTL) - \bar{X}}{3\sigma}$ ou $\frac{\bar{X} - (NOM + LTL)}{3\sigma}$
Percentage of faulty parts	$\% Def$	$\frac{(-NG) + (+NG)}{N} \times 100$
Minimum value stored	$X_{min}$	
Maximum value stored	$X_{max}$	
Standard deviation (based on a sample)	$s$	$\sqrt{\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N - 1}}$
Lower control or influence limit	$-3\sigma$	$\bar{X} - 3\sigma$
Upper control or influence limit	$+3\sigma$	$\bar{X} + 3\sigma$
Machine capability	$C_m$	$\frac{UTL - LTL}{6s}$
Machine process capability index	$C_{mk}$	$\frac{(NOM + UTL) - \bar{X}}{3s}$ ou $\frac{\bar{X} - (NOM + LTL)}{3s}$
Number of value below the lower tolerance limit	$-NG$	
Number of values above the upper tolerance limit	$+NG$	
Number of classes of the histogram	$N_{Class}$	$\approx \sqrt{N}$
Class width of the histogram	$W_{Class}$	

### 11.2.3 Histogram

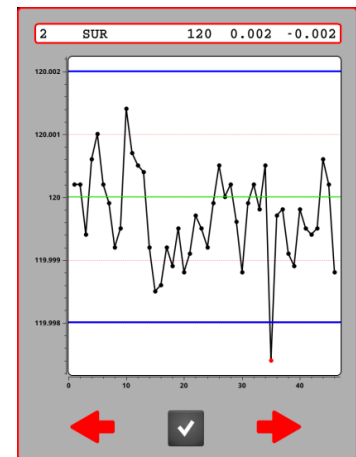
Presentation of the results by nominal value in the form of a histogram.

It is admitted that the values are distributed according to the normal law. This allows the drawing of the probability density curve (also called Gauss curve).



### 11.2.4 Control Chart

The control chart represents the evolution of the results according to the nominal value and its tolerances.



### 11.2.5 Exporting results in .csv format

It is possible to export a batch in .csv format. To do this open the following menu, select a directory and enter a file name.



Confirm with the save key.



## 11.3 Quit the Statistic Analysis Mode

To exit the statistics mode press the following key from the start menu.





# 12. SENDING DATA AND PRINTING

## 12.1 Connectors

The instrument offers the following communication ports:

### 1 x USB B

This connector is placed at the back of the display unit. It allows connection to a PC for the transmission of data.



### 4 x USB A

These connectors are placed at the back of the display unit. They allow connection to peripherals such as USB key or USB printer.



### 1 x RJ45 Ethernet

This connector is placed at the back of the display unit. It allows the configuration of USB printers.



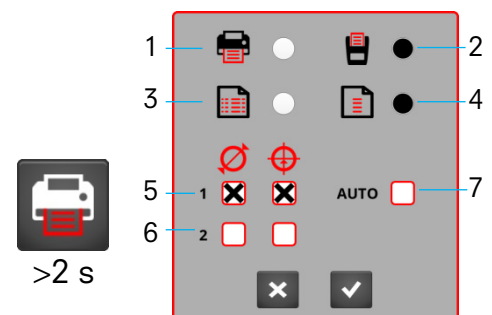
### 1 x RS232

This connector is placed at the back of the height gauge. It allows a classic connection with external devices equipped with RS232 interfaces, such as printer or PC.



## 12.2 Configuring the Printing and the Data Transfer

1. Activation/selection of the USB printer (for configuring the printer, refer to § 12.5.1)
2. Activation of serial printing and PC (Simultaneous transfer on the RS232 and USB B ports)
3. Data transfer with line no., function and unit
4. Data transfer with numeric value only
5. Diameter and centreline distances:  
Select the value (s) to be sent when the *Data transfer key* is pressed for the first time.
6. Diameter and centreline distances:  
Select the value (s) to be sent when the *Data transfer key* is pressed for the second time.



Factory configuration of the printing

7. Box checked: Automatic transfer of data after each probe.

Note:

When **AUTO** is checked, only the value (s) selected for the first press of the **Data transfer key** is active. This option is not available for transfer to a USB printer.

## 12.3 Data Transfer via USB B

### Connection to a PC

A USB A-B cable is required for the connection to a PC, as well as the TrimosDataTransfer communication software.

### Cable

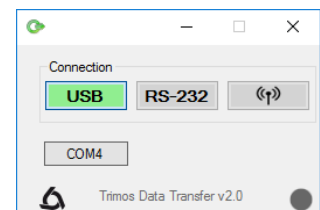
USB A-B connection cable: TA-EL-013 (ref. 332 02 0001)

### Software

The TrimosDataTransfer software is freely available on [www.trimos.com](http://www.trimos.com), in the corresponding product section.

### Data transfer procedure

1. Start TrimosDataTransfer
2. Connect the instrument to the PC with TA-EL-013 cable and wait for the connection to be established
3. Click on the application to which the data has to be transferred.
4. Press **Data transfer key**. The value is displayed at the place having the focus. The data can also be sent automatically after each probing (§ 12.2).



### Format

Numerical value (as on display) in ASCII characters.  
In diameter/centreline mode, if 2 values are sent simultaneously, they are separated by a LF (Line Feed).

## 12.4 Data Transfer via RS232

### Connection to a serial printer

Printer TA-EL-033 (Ref. 756 0020).

The RS232 cable, the charger and a support to fix the printer to the instrument are included.



### Connection to a PC with RS232 cable

Cable TA-EL-112



### Wireless connection to a PC

Wireless data transmission system TA-EL-022



### Software

The TrimosDataTransfer software is available free of charge at [www.trimos.com](http://www.trimos.com) in the relevant product section.

Any other RS232 communication software (Vmux, Hyperterminal, WinWedge etc.) can be used.



### Data transfer procedure

1. Connect the printer, the RS232 cable or Wireless Transmission System to the serial port of the instrument.
2. Start and configure the communication software.
3. Press the Data Send Key. The data can also be sent automatically after each probing (§ 12.2).

### Data transmission (according to Opto-RS)

- Speed: 4800 baud
- ASCII code: 7 bits
- Parity: pair
- Stop bits: 1
- Handshake: without



### Format

The format of the value sent corresponds to the numeric value of the display in ASCII characters.

In diameter / centerline mode, if 2 values are sent simultaneously, they are separated by an EOT (End Of Transmission).

## 12.5 Data Transfer to a USB Printer

### 12.5.1 Data Transfer to a USB Printer

#### Connection to a USB printer

Connection to a USB printer allows printing the buffer, the perpendicularity curve or the table of coordinates of a 2D measurement.

#### Cable

USB A-B connection cable: TA-EL-013 (ref. 332 02 0001)

#### Configuration

Before printing, it is necessary to configure the communication between the instrument and the printer. The procedure is described in § 12.5.2.

#### Data transfer procedure

1. Connect the printer to the instrument with the help of the TA-EL-013 cable.
2. Press *Data transfer key*.

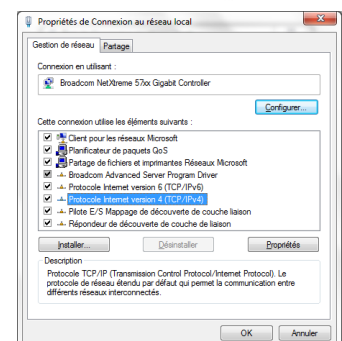


### 12.5.2 Configuration of the Printer

Majority of USB printers can be configured with a PC in accordance with the procedure given below.

1. Start the printer and the instrument. Connect the printer to a USB A port of the instrument with a USB A-B cable (TA-EL-013).
2. Connect the instrument to a PC (of which you must be the administrator) with the help of A RJ45 Ethernet cable.
3. In the configuration panel, select "Network and Internet" then "Network Centre and sharing" and finally "Modify the mapping parameters".

In "Connection to the local network", open "Parameters" and select "Internet Protocol version 4 (TCP/IPv4)".



- In "Properties", select "Use the IP address as given alongside".  
Enter the IP address: **192.168.100.4** then confirm with the Tab key.

Confirm with OK and close

- Open a Web browser and then enter the IP address of the instrument. **192.168.100.3:631**.

In the "Administration" tab, click on "Add a printer".  
Select the printer in the list then click on "Continue".

- On the next page, click on "Continue".

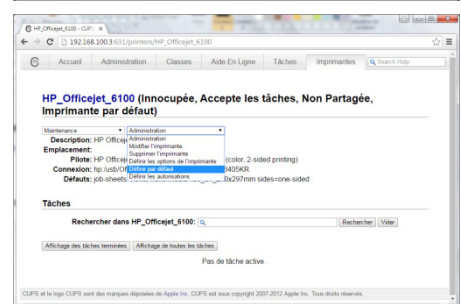
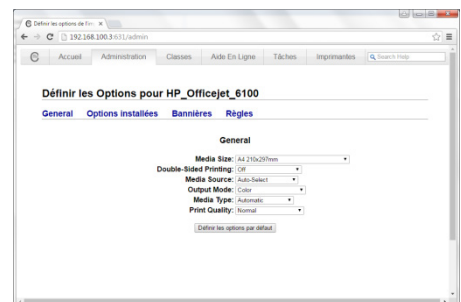
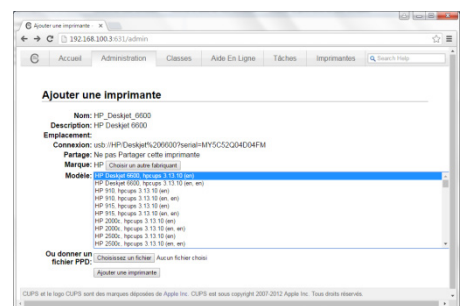
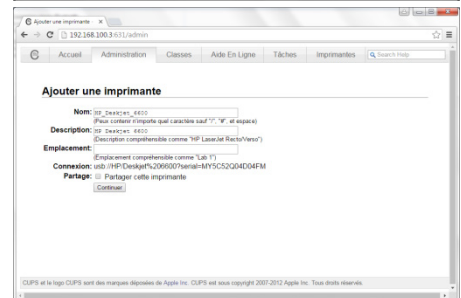
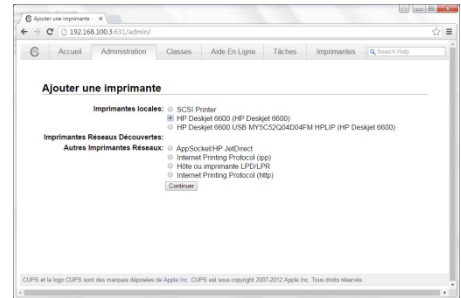
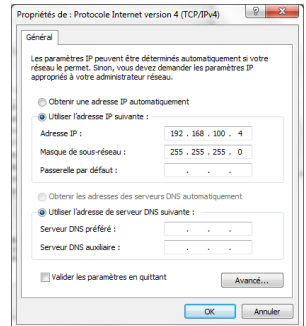
- Select a printer in the "Model" list.  
If the connected printer does not show in this list, click on "Choose another manufacturer" and select another make. Select the make or "Generic" if the connected printer does not match any proposed make. Click on "Continue" to confirm.

Continue by clicking on "Add a printer".

- Define the default print parameters then end by clicking on "Define the default options".

- In the "Printers" tab, select "Define by default".
- Select the printer in the print configuration menu of the instrument (§ 12.2).

The printer can now be used.



# 13. CONFIGURATION

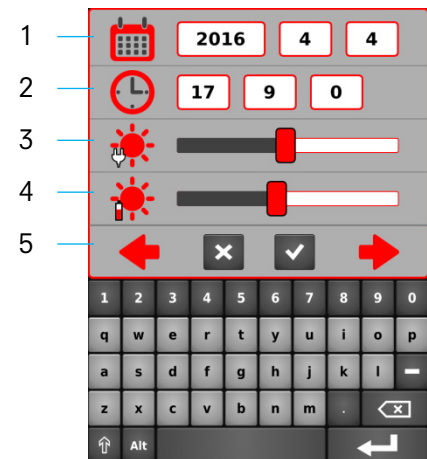
The configuration menu opens with a long press on the *Logo* key.



>2 s

## 13.1 Page 1

1. Date: Year / Month / Day
2. Time: Hours / Minutes / Seconds
3. Brightness of the screen when the charger is connected
4. Brightness of the screen when the instrument is running on batteries
5. Red arrows: Browse between pages of the configuration menu. Pressing on any of these arrows validates the changes made on the page.



To exit the menu without saving the changes, press the Cancel key.

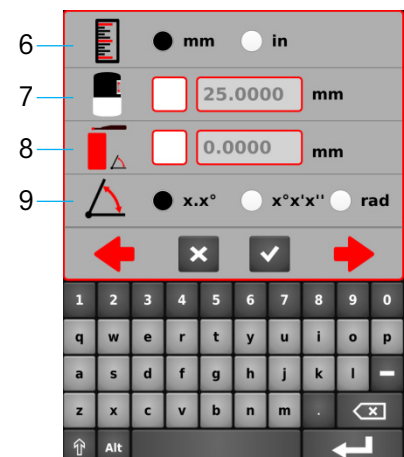


To exit the menu after saving the changes, press the key shown alongside.



## 13.2 Page 2

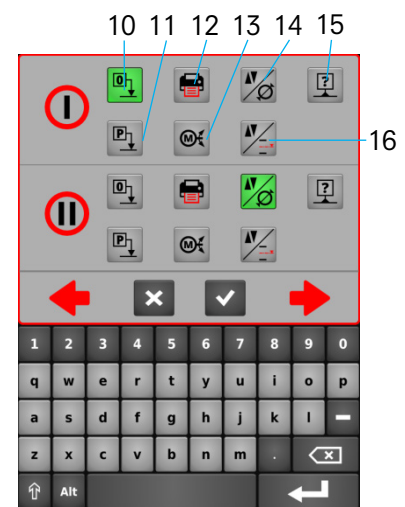
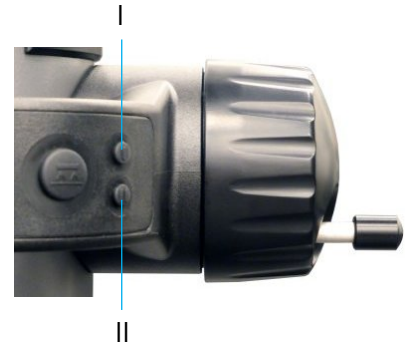
6. Unit selection *mm* or *inch*.
7. Size of setting gauge. To enter another size, click on the checkbox and enter the desired value. A zero or a negative value (=taking the probe constant on a gauge block) is possible.
8. Size of the wedge for angle measurements (see § 7.11). For a shortened measurement procedure, click on the checkbox and enter the dimension of the wedge.
9. Angle measurement unit: Decimal degrees / Degrees, minutes, seconds / Radians



### 13.3 Page 3

The buttons I and II of the displacement handle can be programmed with various measuring functions.

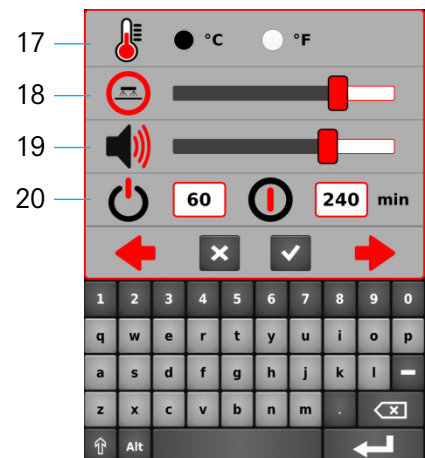
- 10. Zero setting (§ 7.1)
- 11. Preset (§ 7.2.2)
- 12. Sending data and printing (§ 12)
- 13. Button I: Motorised movement upwards  
Button II: Motorised movement downwards
- 14. Height / Diameter and centreline measurement (§ 6.1 & 6.2)
- 15. Selection of references (§ 7.2.1)
- 16. Distance and Centreline Measurement (§ 7.10)



Select the function to be assigned to each button.

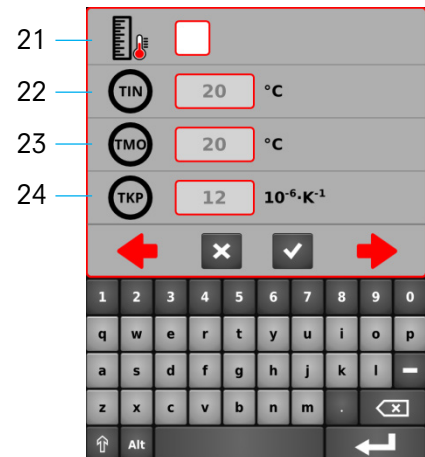
### 13.4 Page 4

- 17. Select the temperature unit °C or °F
- 18. Air cushion adjustment: Press the air cushion button and simultaneously adjust its pressure with the cursor.
- 19. Adjust the acoustic signal level: Set the intensity of the volume with the cursor.
- 20. Standby mode / Complete stop: Enter the number of minutes after which the instrument should enter into standby mode, or switch-off completely.



### 13.5 Page 5

- 21. Activation of manual temperature compensation.  
When this function is activated, the measured value is compensated according to the instrument and part temperatures and their expansion coefficient. The displayed value is brought to a temperature of 20 °C (68 °F).
- 22. Instrument temperature
- 23. Part temperature
- 24. Expansion coefficient of the part



When temperature compensation is activated, a symbol appears in the status bar of the main screen. This function can result in large measurement deviations. It should therefore be used with the greatest care!

The temperature values must be entered in degree Celsius (°C).

### 13.6 Page 6

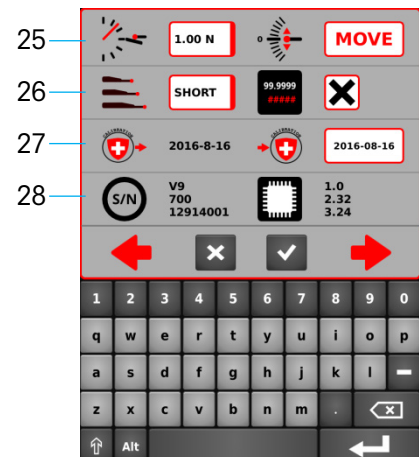
- 25. Measuring force and carriage balancing:  
The measuring force can be adjusted by clicking on the list and selecting the desired force. To adjust the balancing of the carriage, refer to § 14.1 .
- 26. Probing sensitivity and 2nd line of the display:  
Probing sensitivity can be adjusted, depending on the type of insert used :
  - SHORT: For short and stiff inserts
  - MEDIUM: For medium long
  - LONG: For long and less rigid inserts

Note:

Probing filters "MEDIUM" and "LONG" reduce the probing robustness. Precision and repeatability can differ from specifications according to the user.

In height measuring mode, the 2nd line of the display can be hidden. To do this, uncheck the check box.

- 27. Date of last and next calibration:  
The date of the next calibration can be entered manually. There is no function linked to this date, only user information.
- 28. Model, type, serial no. and firmware version





# 14. ADJUSTMENTS

## 14.1 Configuration diameter measurements "SMART REVERSE"

The Smart Reverse function facilitates the measurement of diameter and makes it more efficient and playful. By activating this function, the user is visually warned by a colour "flash" on the screen as well as by a specific acoustic signal that the reversal point has been reached. It is possible to set this function by pressing the diameter key for 2 seconds:

1. Activation box for the *Smart Reverse* function.
2. Number of passes required to validate the reversal point.
3. Surface quality of the measured diameter. This function makes it possible, during several passes of the reversal point, to ensure that this has been reached. This parameter analyses the difference between the extreme values of the reversal point and compares them to validate the measurement.
  - ROUGH: Raw surfaces rapidly measured
  - MEDIUM: Machined surfaces normally measured
  - SMOOTH: Polished surfaces delicately measured
4. Beep indicating the detection of the reversal point

Note:

Parameters 3 and 4 are only accessible when the number of passes of the reversal point (defined in point 2) is greater than 1.

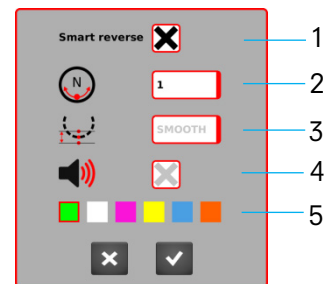
5. Colour of the flash on the screen when detecting the reversal point.

Note 1:

In diameter mode, when the Smart Reverse function is activated, the symbol of the diameter function is changed (red arrows).

Note 2:

When the graphical help is displayed, the number of detected reversal points is displayed next to the probe indicator.

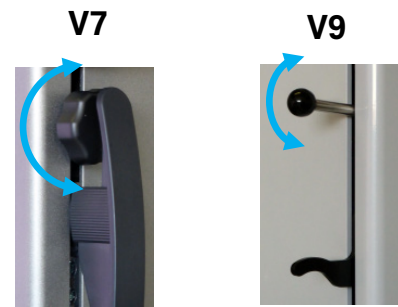


In Smart Reverse mode, the diameter measurement must start at the bottom. This is valid for internal and external measurements.

## 14.2 Adjustment of Floating Probe Suspension Balancing

In order to guarantee a constant measuring force in both directions (upwards and downwards), it is necessary to adjust the balancing of the floating probe suspension according to the probe in use.

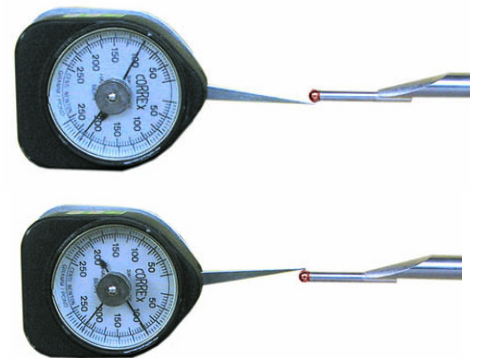
The adjustment Wheel (V7) or lever (V9) of the floating suspension (1) allows compensating the weight of the probe in use.



### 14.2.1 With Lever Dynamometer

A lever dynamometer is the most exact method of checking the floating suspension balancing.

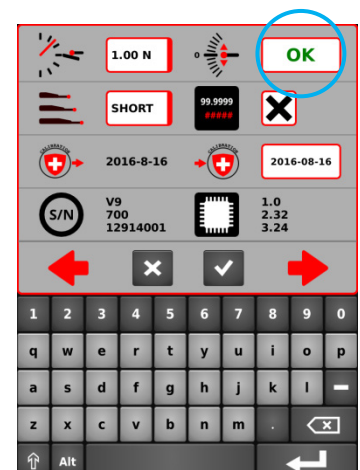
1. Press the key on the dynamometer until the acoustic signal is heard and read the displayed force.
2. Now, repeat the operation in the other measurement direction and compare the results.
3. Adjust the balancing if required.



### 14.2.2 With Function Integrated in the Instrument

The instrument offers a balancing help function.

1. Enter the configuration menu and scroll to balancing adjustment.
2. Pull the dual carriage downwards until stop and release so that it returns to its balance position. The corresponding field must display *OK*. Else, adjust the balancing.
3. Do the same by pushing the dual carriage upwards.



## 14.3 Air Cushion

The use of the air cushion facilitates the displacement of the instrument on the granite plate. The activation of the air cushion lifts the instrument at some  $\mu\text{m}$ . The air cushion is not only used for the displacement of the instrument in general but also when performing measurements (e.g. diameters). The main application is found particularly in industrial fields with large heavy parts. Small parts can be moved without activating the air cushion. This allows to significantly increase the autonomy of the instrument.



The air cushion force can be adjusted in the set-up menu (§ 13.4). It should be set on the minimum value allowing a comfortable displacement of the instrument.



When using the air cushion displacement for measurement procedures, all functions e.g. zero or preset setting of the display should be done with air cushion to take into consideration the lifting amount of the instrument.

## 14.4 Standby Mode

A single press on the On/Off button will put the instrument in standby mode.

When the instrument is in standby mode, the On/Off button flashes at a frequency of 1 Hz if it works on battery, and 0.5 Hz if the charging unit is connected.



## 14.5 Resetting of the Instrument

To reinitialise the instrument if the application is blocked, press the start-up button for 8 seconds. The instrument switches-off and can be restarted normally.



> 8s

## 14.6 Cleaning

The plastic parts, the display unit as well as the painted parts of the instrument should be cleaned using a slightly dampened (watered) fabric. Clean the air cushion pads using a clean fabric, slightly dampened with alcohol.



The use of solvents such as acetone, white spirit, trichloethylene, petrol or others for cleaning must absolutely be avoided!

# 15. AFTER SALES SERVICE

## 15.1 Replacement of Battery Block

When the instrument autonomy is not sufficient any more, the battery block must be replaced :

1. Get a battery block from your TRIMOS agent (TRIMOS ref.: 3704 0022).
2. Open the lid at the back of the display.
3. Remove the old battery block and replace it by the new one (pay attention to the connector polarity).
4. Close the lid tightly.
5. Load the new batteries.



## 15.2 Replacement of Clock Back-up Battery

If the instrument stops showing date and time after it is switched off, replace the back-up battery:

1. Get a new Lithium 3V 125-140 mAh type CR1632 button battery (ref. TRIMOS: 3705 0005)
2. Open the lid at the back of the display.
3. Remove the old button battery and replace it
4. Close the lid tightly.



## 15.3 Recycling of Electronic Components



**Disposal of Waste Electrical and Electronic Equipment (WEEE) applicable throughout the European Union and other European countries with separate collection programs**

This symbol, found on the product or its packaging, indicates that it should not be treated as household waste. It should be handed over to an official collection point for the recycling of electrical and electronic equipment. A correct recycling of this product will help to preserve the environment and the natural resources. For more detailed information about the recycling of this product, please contact your local authorities or your TRIMOS supplier.

## 15.4 Complaints / Repairs

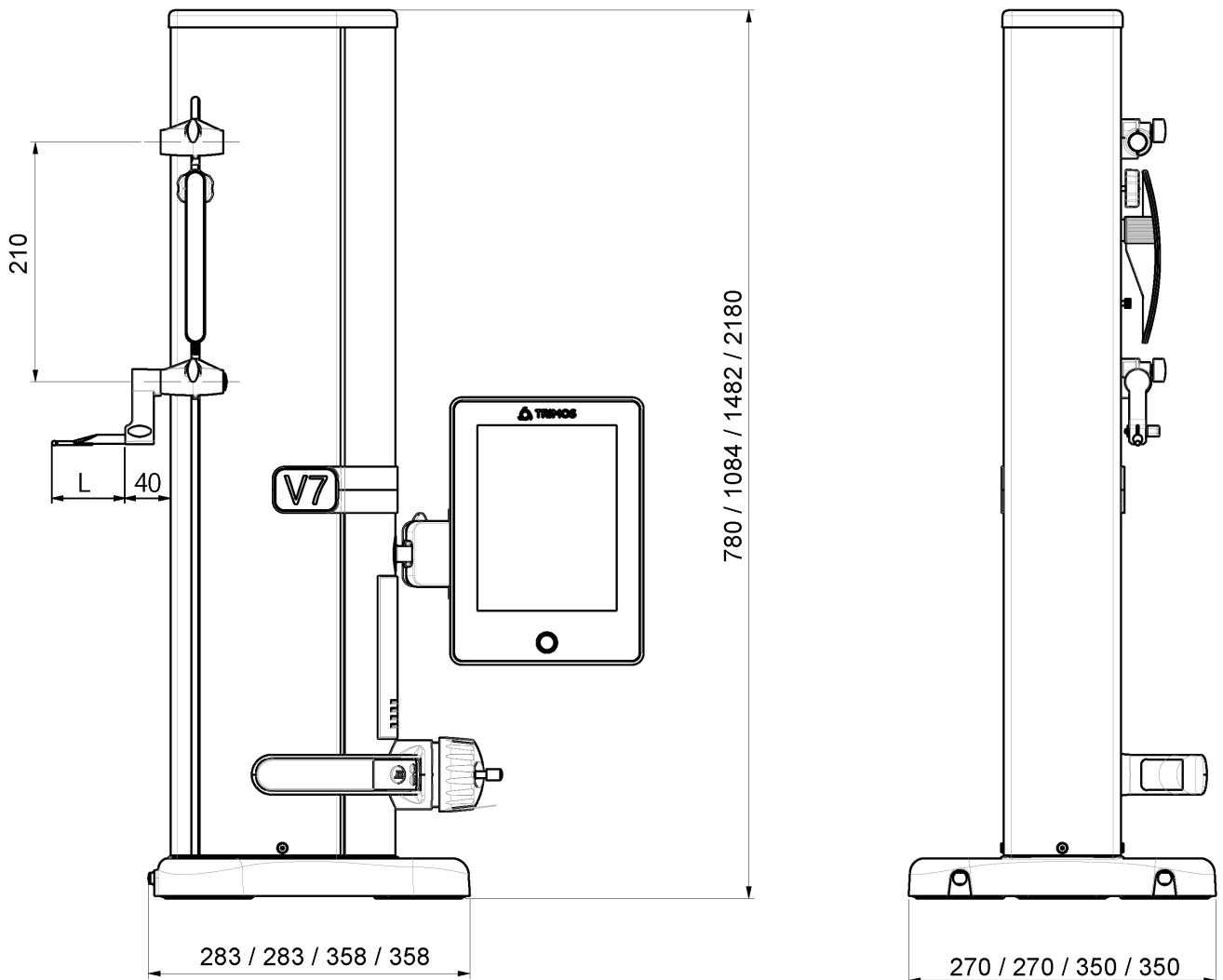
In case of problems, please contact your local TRIMOS agent.  
For any transport, use the original packing or an adequate one.

## 15.5 Agents

You can find the official TRIMOS agents list on the website [www.trimos.com](http://www.trimos.com).

# 16. TECHNICAL SPECIFICATIONS

## 16.1 V7

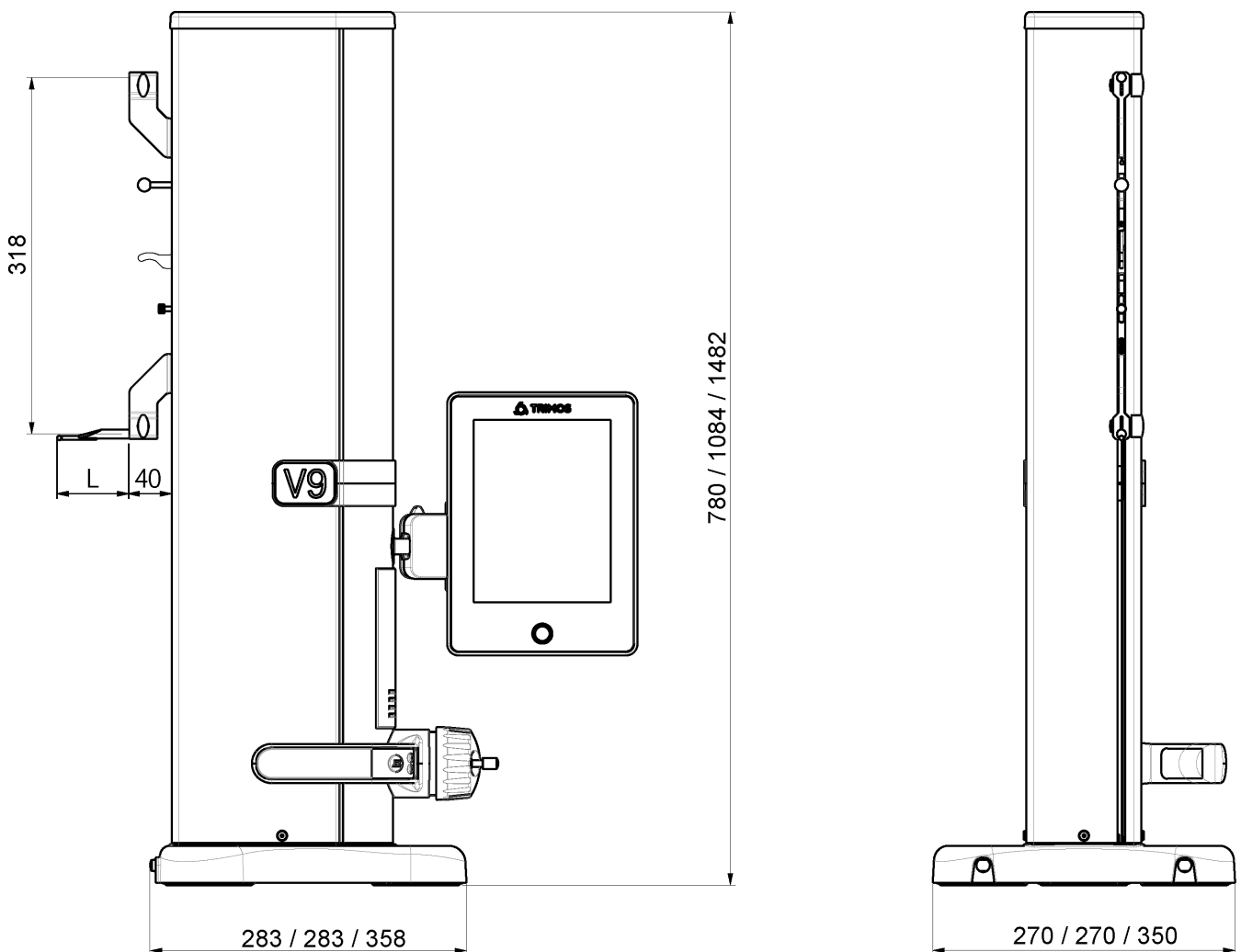


L: depends on the measuring insert used

<b>V7</b>		<b>400</b>	<b>700</b>	<b>1100</b>	<b>1800</b>
Measuring range	mm (in)	407 (16)	711 (28)	1110 (44)	1810 (71)
Application range	mm (in)	719 (28)	1023 (40)	1422 (56)	2122 (83)
Max. permissible errors, $B_{MPE}$	$\mu\text{m}$	2 + L(mm)/400			2.5 + L(mm)/300
Repeatability, $R_{MPE}$	$\mu\text{m}$	1 ( $\varnothing$ : 2)			
Max deviation from perpendicularity, $S_{MPE}$	$\mu\text{m}$	5	8	11	25
Max. resolution	mm (in)	0.0001 (0.00001)			
Measuring force	N	0.75 ÷ 1.5			
Autonomy	h	12			
Data output		USB / RS232			
Air cushion		Yes			
Protection grade of measuring system (CEI 60529)		IP40			
Weight	kg	22	25	34	41
Max. weight of measuring insert & holder	g	400			
Max. manual displacement speed	m/s	1000			
Operational temperature	$^{\circ}\text{C}$	+10 ÷ +40			
Storage temperature	$^{\circ}\text{C}$	-10 ÷ +40			
Relative humidity (operation and storage)	HR	5 ÷ 75 % (without condensation)			

The above values have been determined according to ISO 13225 with the standard probe (TA-MI-101).  $R_{MPE}$  is defined as twice the standard deviation (2s) over 20 measurements.

## 16.2 V9



L: depends on the measuring insert used



<b>V9</b>		<b>400</b>	<b>700</b>	<b>1100</b>
Measuring range	mm (in)	406 (16)	710 (28)	1109 (43)
Application range	mm (in)	724 (28)	1028 (40)	1427 (56)
Max. permissible errors, $B_{MPE}$	$\mu\text{m}$	1.2 + L(mm)/1000		
Repeatability, $R_{MPE}$	$\mu\text{m}$	0.4 ( $\varnothing$ : 1)		
Max deviation from perpendicularity, $S_{MPE}$	$\mu\text{m}$	5	8	11
Max. resolution	mm (in)	0.0001 (0.00001)		
Measuring force	N	0.75 ÷ 1.5		
Autonomy	h	12		
Data output		USB / RS232		
Air cushion		Yes		
Protection grade of measuring system (CEI 60529)		IP40		
Weight	kg	22	25	34
Max. weight of measuring insert & holder	g	150		
Max. manual displacement speed	m/s	1000		
Operational temperature	$^{\circ}\text{C}$	+10 ÷ +40		
Storage temperature	$^{\circ}\text{C}$	-10 ÷ +40		
Relative humidity (operation and storage)	HR	5 ÷ 75 % (without condensation)		

The above values have been determined according to ISO 13225 with the standard probe (TA-MI-119).  
 $R_{MPE}$  is defined as twice the standard deviation (2s) over 20 measurements.

# 17. DECLARATION OF CONFORMITY

## DECLARATION DE CONFORMITE KONFORMITÄTSERKLÄRUNG DECLARATION OF CONFORMITY



TRIMOS déclare que les instruments de mesure  
TRIMOS erklärt, dass die Messgeräte  
TRIMOS declares that the measuring instruments

### V7 & V9

sont conformes aux directives suivantes :  
mit folgenden Richtlinien übereinstimmen :  
conforms with the following directives :

CEM / EMV / EMC :                    **EN 61326-1:2013**  
                                                  **IEC 61326-1:2012 (ed2.0)**

**FCC 47, part 15, Class B**

Sécurité / Sicherheit / Safety :    **IEC 61010-1**



Patrice Kemper, CEO  
Renens, 2016-04-14

**TRIMOS SA**  
Av. de Longemalle 5  
CH - 1020 Renens  
T. + 41 21 633 01 01  
F. + 41 21 633 01 02  
www.trimos.com