User manual

Multi gauging display unit

04430021: TT100



Version 1, July 2024
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ME44.77055

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1. INTRODUCTION

1.1 Acknowledgements

Dear user,
We would like to thank you for choosing TESA as your metrology partner. We appreciate the confidence you have placed in us by purchasing this high-quality display.
The entire TESA team would like to welcome you to the large family of TESA product users.

Your TESA team

1.1 Warning

All technicians and operators must have read this Quick Start Manual before setting up, using or maintaining this instrument. Failure to follow certain instructions or recommendations may result in malfunctions or taking the device out of service.

1.2 Copyright (document)

The contents of this document are subject to change without notice. All rights reserved TESA and/or its subsidiaries and qualified representatives.
The French version is the reference language. All other language versions are only translations.

1.3 Icons

Different types of icons are used in this manual. They indicate important information that must be taken into account to operate this measuring instrument correctly.

Position	Meaning
	Failure to follow these instructions may lead to incorrect results.
	Indicates help for more efficient use.

2. SPECIFICATIONS

2.1 Specifications

- Normal operating conditions:
  20 °C ± 1 °C, relative humidity 40 < RH < 65 %, non-condensing.
- Limiting operating conditions:
  10 °C < T° < 40 °C, humidity < 80 %, non-condensing.
- Storage conditions:
  -10 °C < T° < 60 °C, humidity < 80 %, non-condensing.
- Dimensions (mm):
  200 x 130 x 145
- Weight (kg):
  1.2
- IP protection level (IEC 529):
  IP65 for the front panel, IP20 for the rest
- Input : 100 - 240 V/50 - 60 Hz, 3,6 A
  Output : 24 VDC/0,75 A (18 W)
  5 W without instruments connected

3. PRESENTATION

3.1 General description



No.	Designation
1	ON/OFF switch
2	7” touch screen
3	1 x TESA BUS port D-sub 9S
4	2x plug, jack Ø 2.5 port for foot switch
5	1 x RS 232 serial port D-sub 9S
6	1x USB-B ‘device’ (HID keyboard output + firmware update)
7	1x USB-B ‘virtual COM port’ (ASCII protocol + Modbus RTU, driver required)
8	1x USB-A ‘host’ for peripherals (keyboard, USB stick, QR code reader)
9	Connector for 24 V power supply

3.2 Delivery contents

Qty.	Designation
1x	Display
1x	Power supply
1x	Power supply cable
4x	Power cable connectors: 1xEU, 1xUSA, 1xCH, 1xUK
1x	Self-test report
1x	Certificate of conformity
2x	Packaging foams

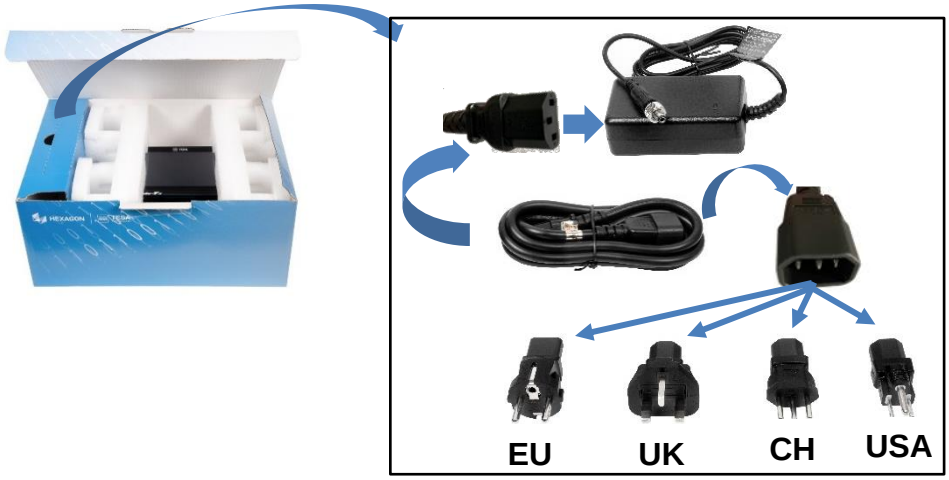
3.3 Main technical features

- Up to 32 characteristics displayed on the screen
- Management of up to 99 instruments connected via TESA-MODUL
- Resolution of up to 0.1 µm
- 7” screen
- Creation of measuring programs
- Statistical functions (PLC machine)
- 3 different types of display (bar graph, analog indicator, numerical indicator)
- Storage of up to 30,000 values in internal memory
- Save up to 128 part references in internal memory
- Management of up to 32 fixtures (fixtures = pages in the TT100)
- Automatic detection possible by sensor movement
- Static and dynamic measurements (mini, maxi, maxi-mini, average, median)
- Trigonometric measurement
- Calibration, calibration check, calibration validity
- Measurement transfer via USB or RS-232
- Data storage in internal memory (up to 1,000 measurements per part reference) or on a USB stick
- Connection for programming PLCs via TESA MODUL IO-8

4. UNPACKING

We recommend keeping the original packaging in case of shipment to another site to avoid any damage.

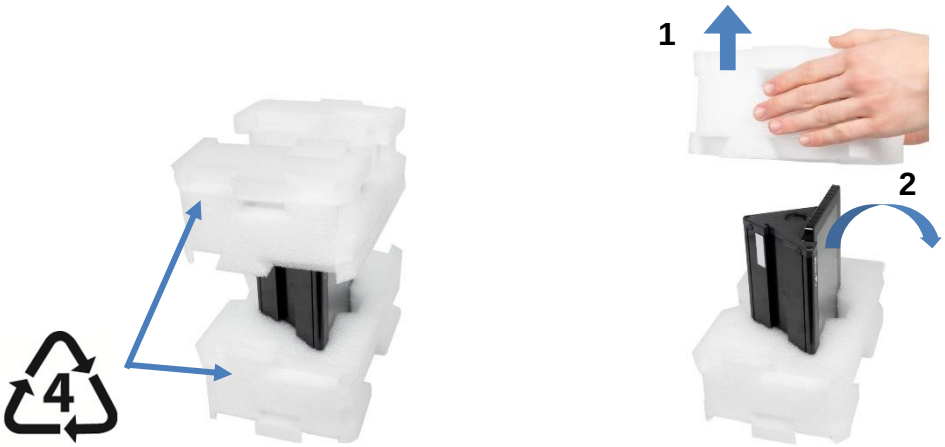
4.1 Step 1



4.2 Step 2



4.3 Step 3



LDPE (low density polyethylene)

We recommend keeping the original packaging to avoid damage in case you need to send the product to another location.

5. INSTALLATION, SAFETY AND MAINTENANCE

5.1 Thermal stability

The display should be switched on 30 minutes before starting measurement.

5.2 Cleaning

Use a dry, lint-free cloth only to clean the instrument. Do not use aggressive solvents.

5.3 Unauthorised intervention on the device

The warranty period is automatically invalidated if the device is opened by an unauthorised person.

5.4 Recycling

Do not dispose of this type of equipment in household waste. Follow the regulations for end-of-life electronic equipment.

5.5 Compatibility

- **USB-A host for the outputs (item 8 on page 6), compatible with:**
  - QR code reader (from Datalogic Heron HD3430, configured as USA keyboard, others to be checked)
  - USB keys (Verbatim StoreN'Go 32 GB or TOSHIBA transmemory U301 OK, others to be checked)
  - Keyboards (QWERTY and AZERTY)

- **Ø 2.5 jack plug (item 4 on page 6), compatible with:**
  - USB foot switch (TESA article 04768001)

1.1 Panel mounting

The stand can be removed for mounting the display on a panel.
To remove the display from its stand, please unscrew the two screws on either side of the display stand.
The wall mounting set is available with part code 04460023.
The wall cut to integrate the display is 195x125 mm.
Minimum wall thickness is 2 mm.



Illustration picture of the wall mounting fixation on a TT100 display

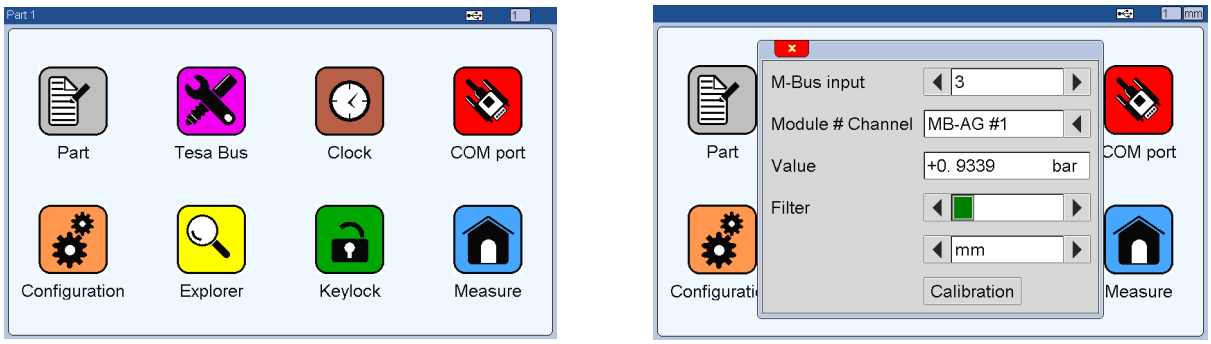
6. GRAPHICAL USER INTERFACE

This section provides an overview of the different screens and controls available.

6.1 Main parts

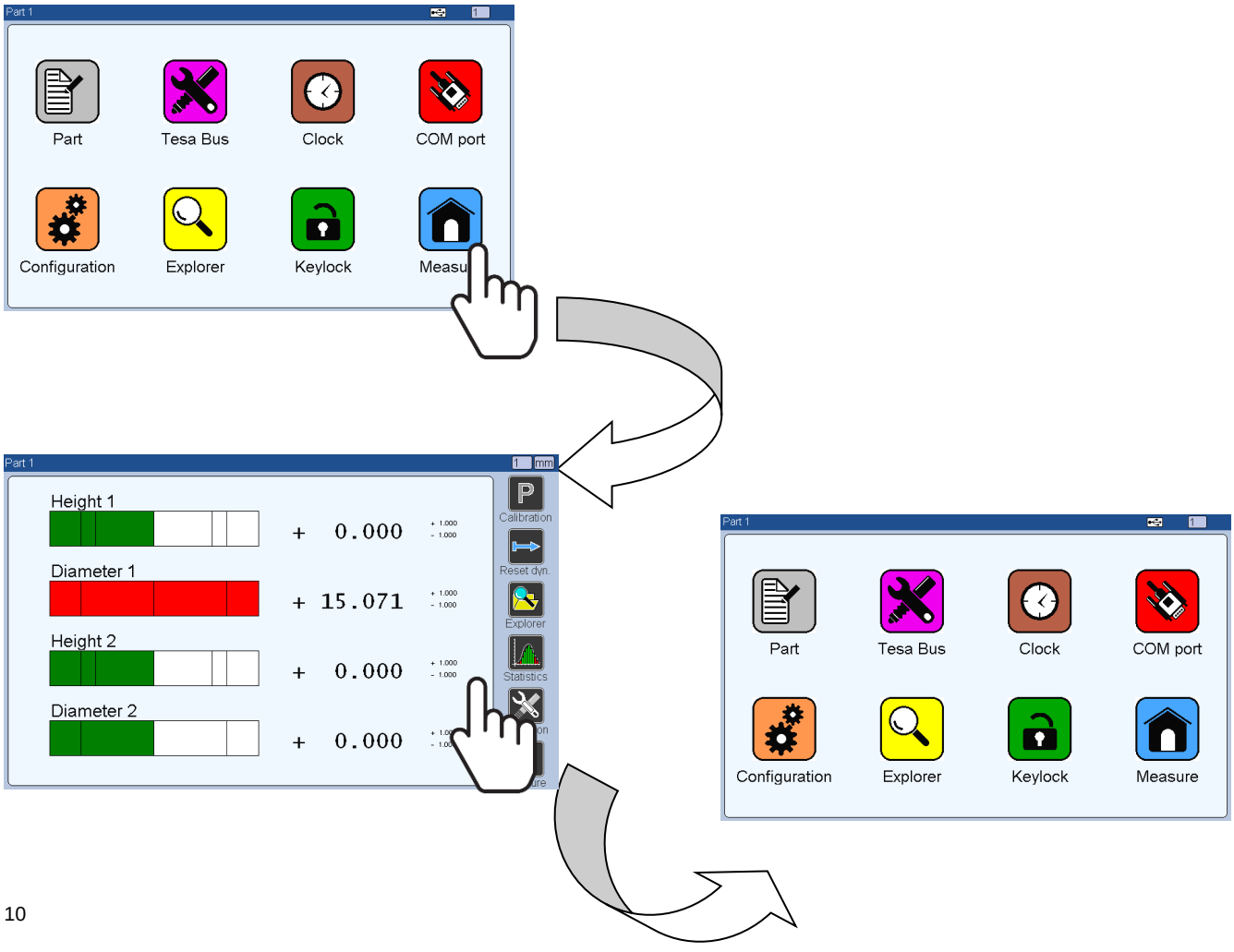
The graphical user interface of your TT100 is divided into 2 main parts:

The first part enables configuration of the device and the measurement. It consists of a home screen with configuration windows.



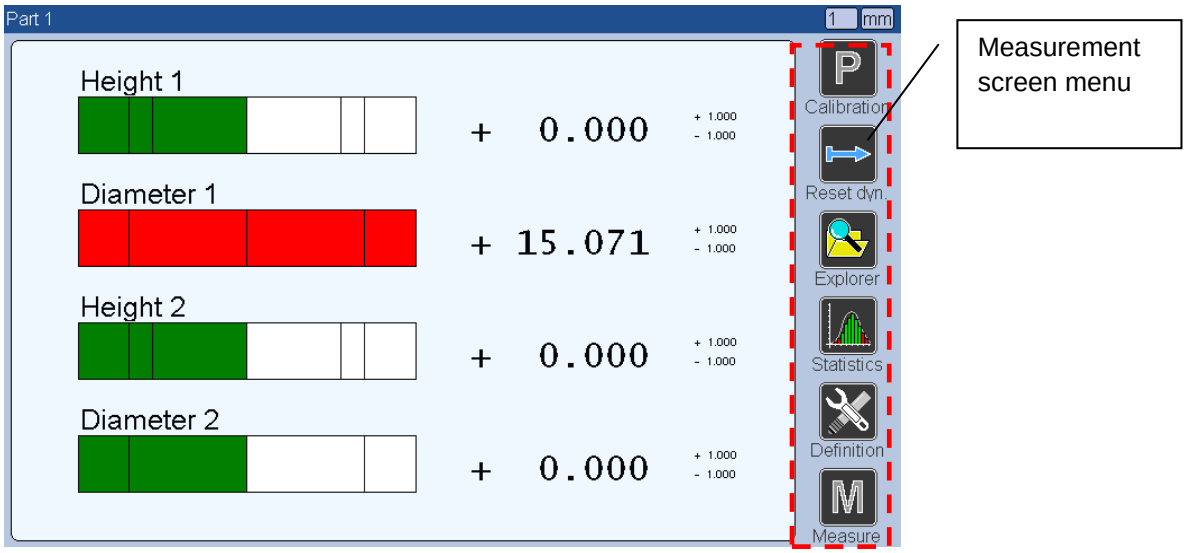
Home screen with configuration window

The second part is the measurement screen. It can be reached by pressing the ‘Measure’ button.



The measurement screen enables the measurement results to be viewed and used. The TT100 starts on this screen. To reach the home screen, press the 

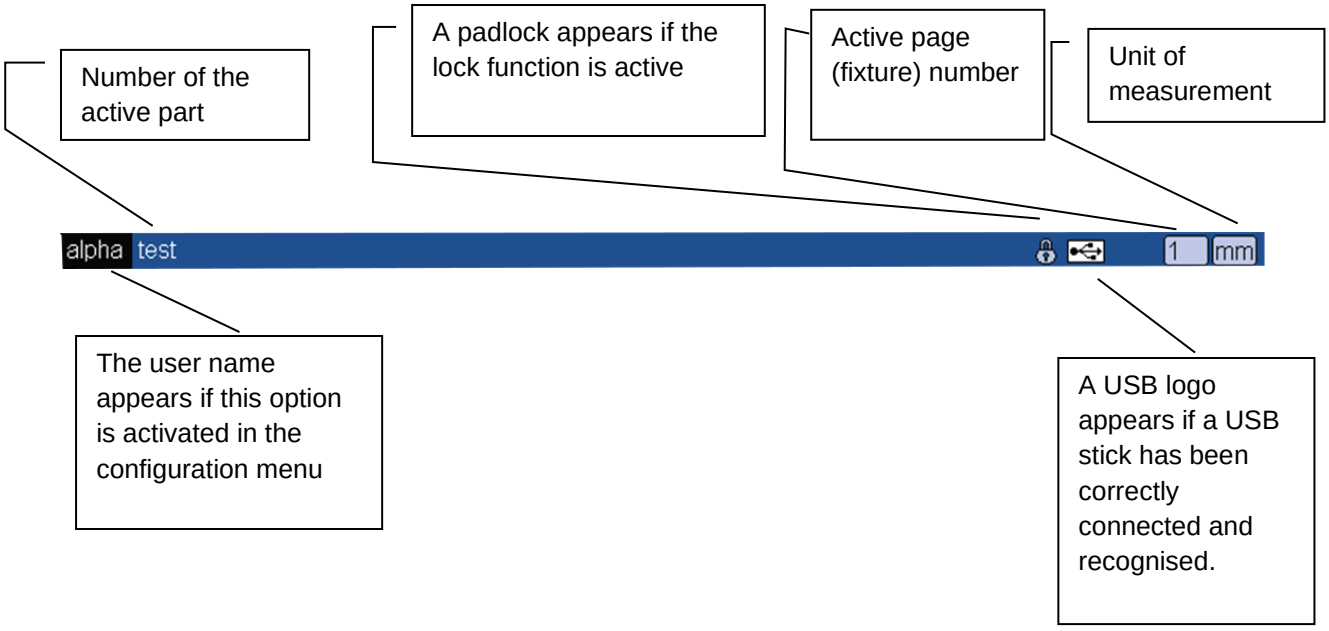
button.



Measurement screen

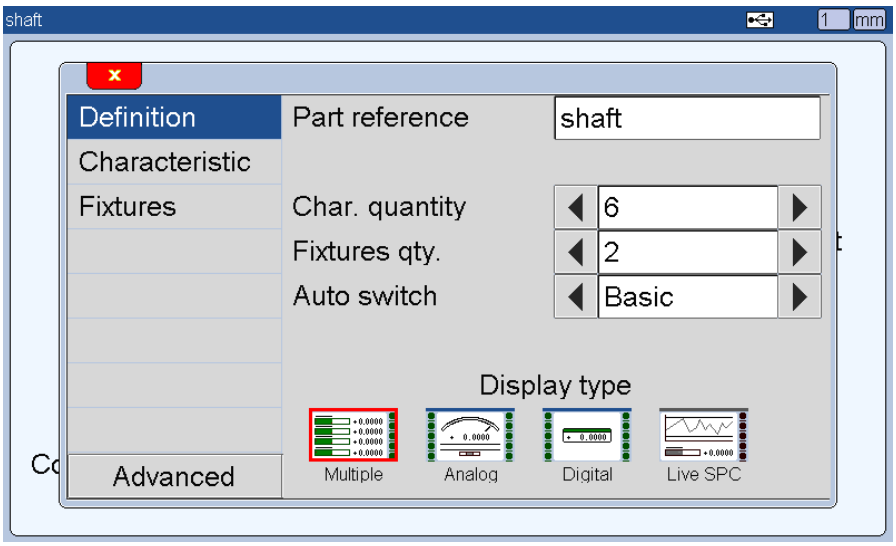
6.2 General information

The following information can be seen on the upper part of the screen.



6.3 Configuration window

The configuration windows open after pressing the icons on the home screen.



Example of a configuration window

Data is entered in different ways and saved after exiting the window by pressing the white cross on a red background.

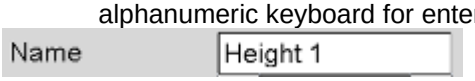
After exiting the configuration window, a confirmation message appears to confirm that the changes have been saved.

The different ways of entering the data are as follows:

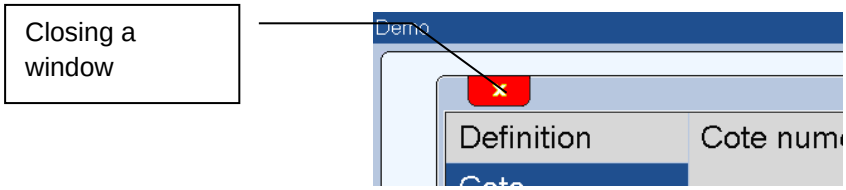
- Multiple selection box: Press the black arrows to change the predefined value.



- Edit box: After clicking on the edit box, a virtual keyboard appears. Several types of virtual keyboards are available and the one that is needed will appear. (Example is a numeric keyboard for entering the tolerance or an alphanumeric keyboard for entering the part name.)



- Closing a window: All windows can be closed by clicking on the white cross on a red background in the top left corner of each window.



7. CONFIGURATION OF THE DEVICE AND THE MEASUREMENT

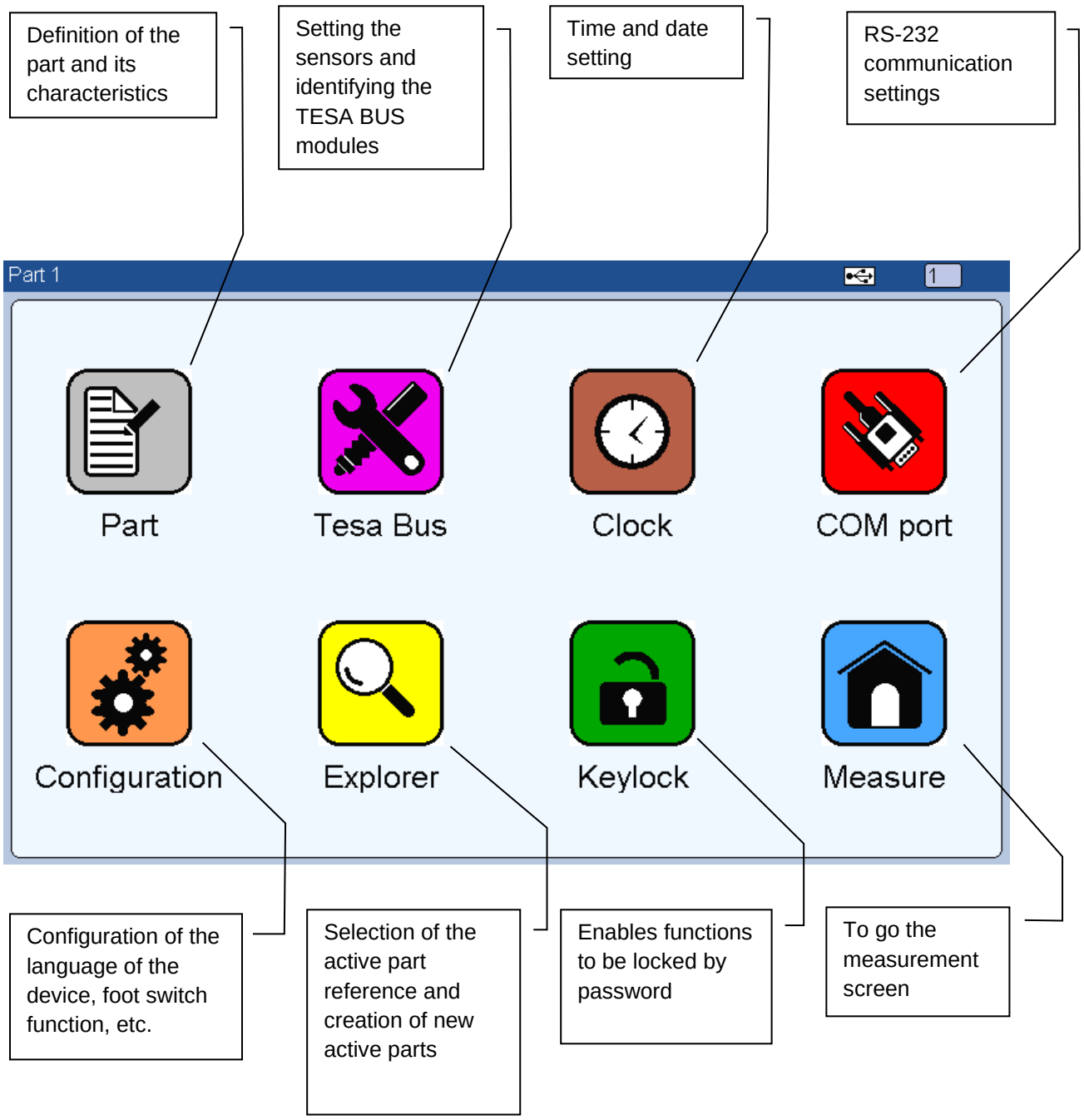
This section describes the various windows that can be accessed from the home screen.

From the measurement screen, the home screen can be accessed by clicking the 

button.

Your TT100 can be fully configured (language, IP addresses, communication, etc.) from this window.

The measurement (part reference definition, tolerances, dimensions, etc.) is also configured from this window.



7.1 Part

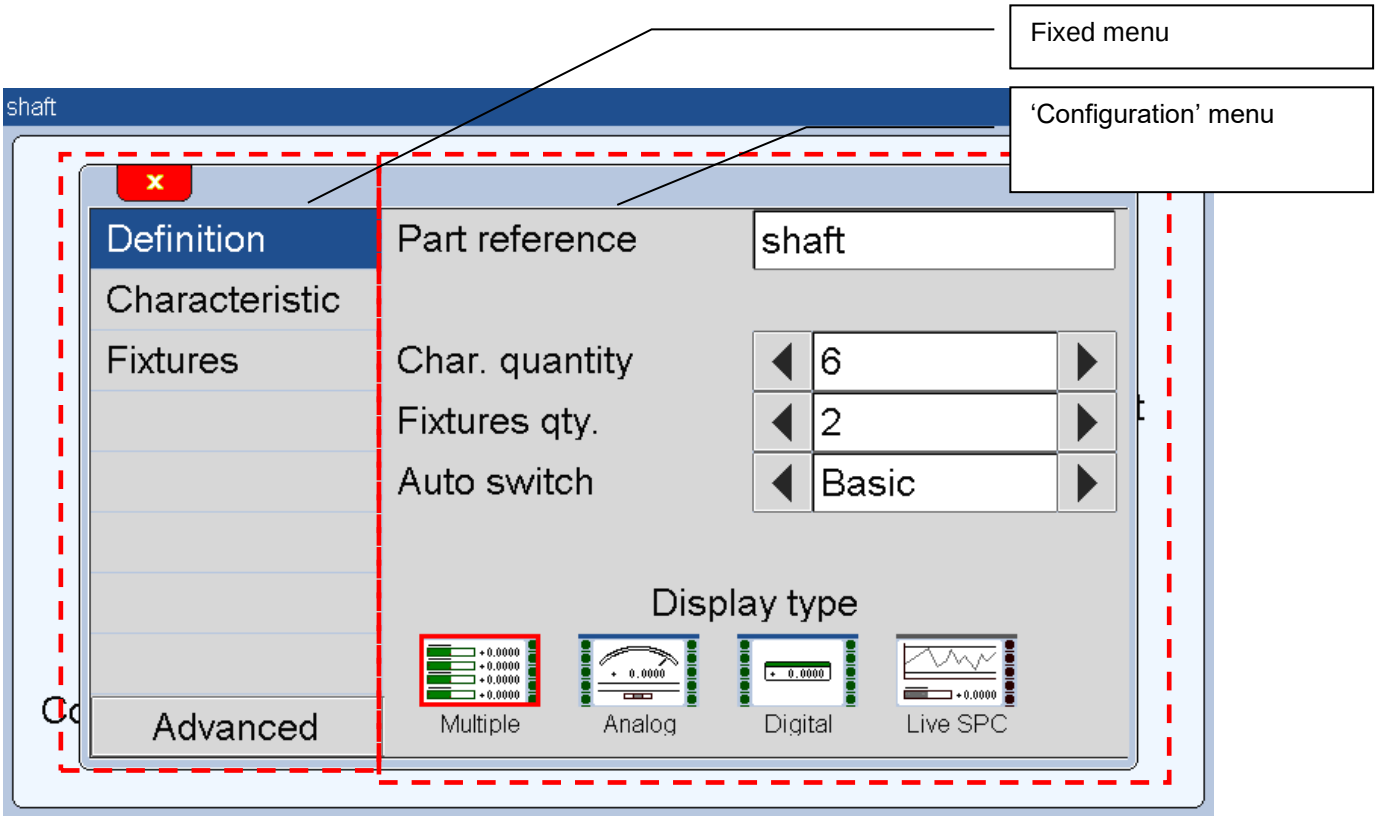


It is possible to define all characteristics of the active part reference.

This window is divided into 2 areas:

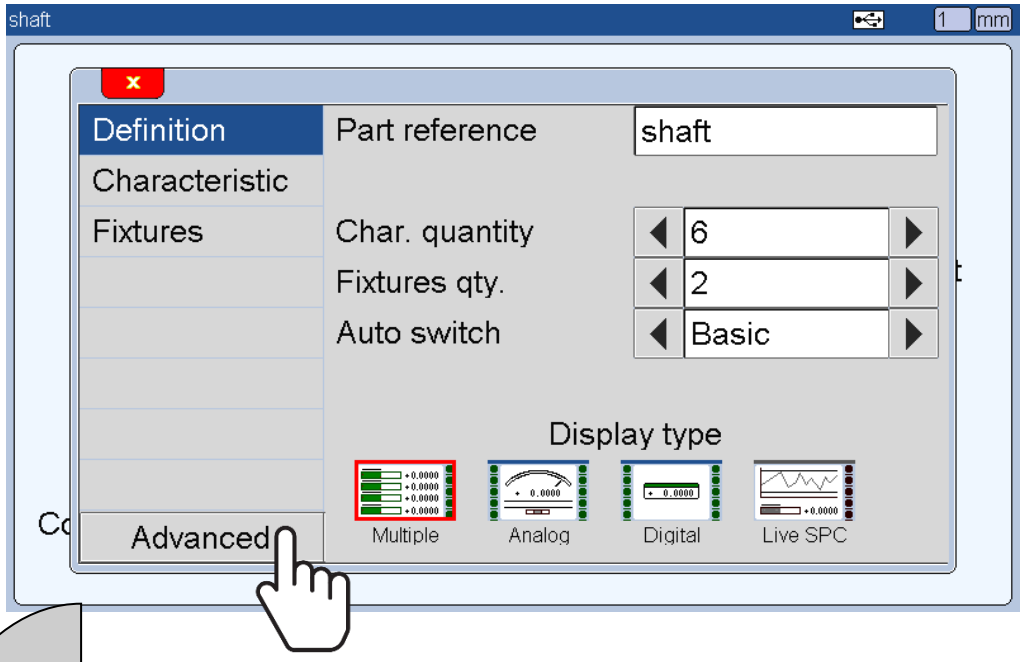
• A fixed menu area (on the left of the window). The active menu is displayed on a blue background

• An input area changes according to the active menu.



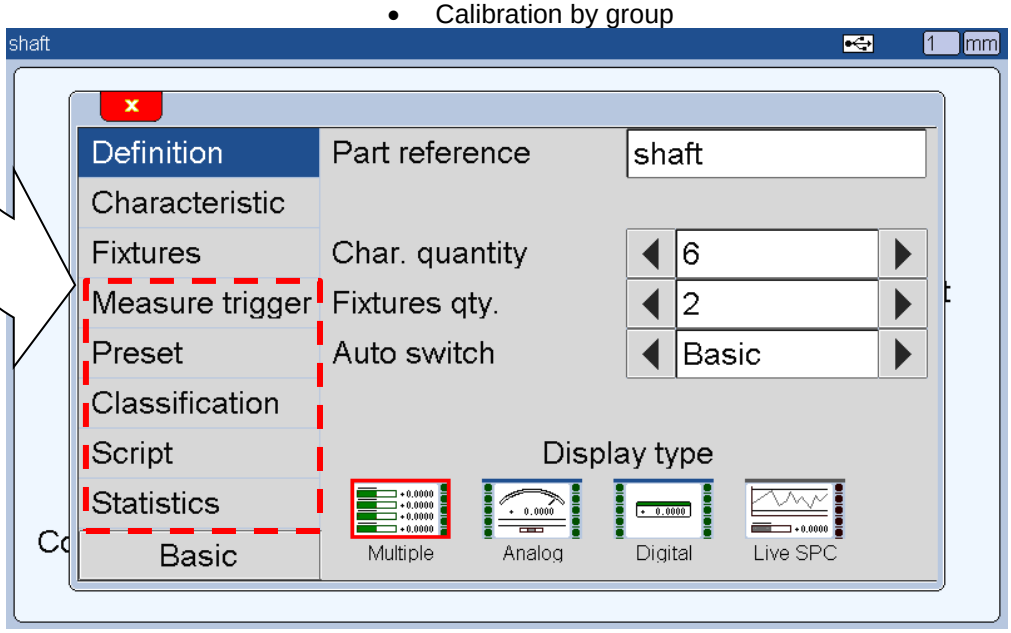
7.1.1 'Basic' mode/'Advanced' mode

The TT100 has two configuration modes: 'Basic' and 'Advanced'. Most of the applications can be configured from 'Basic' mode,



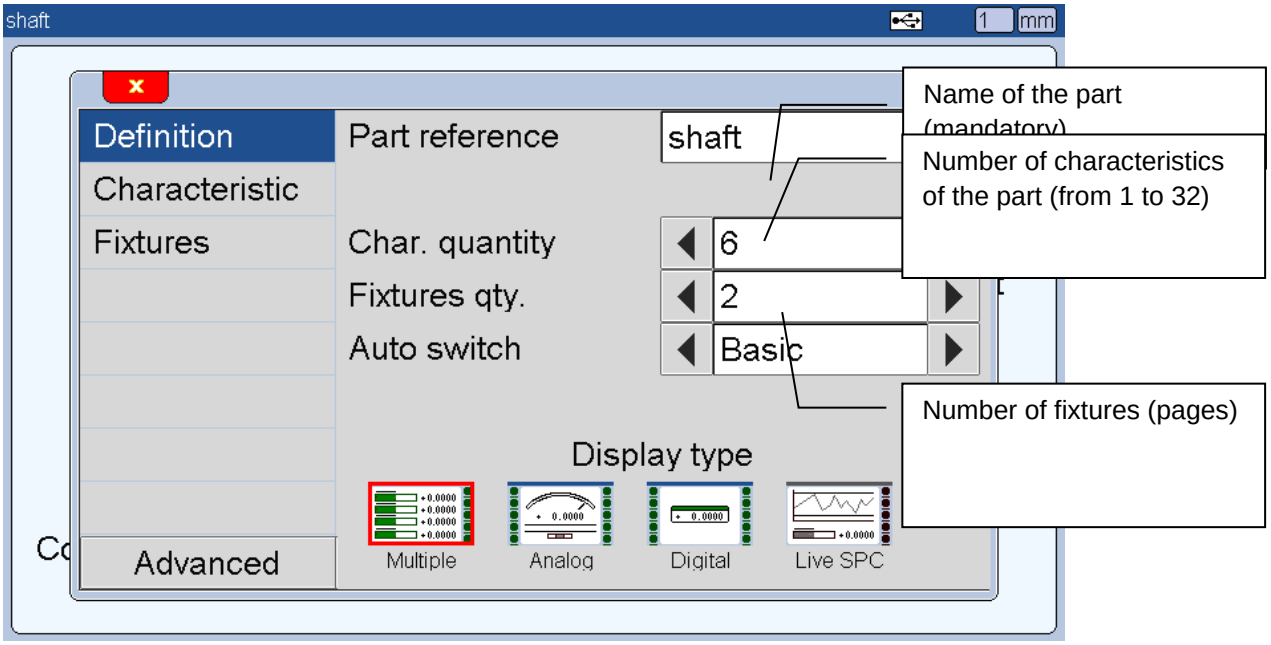
but some functions are only available in 'Advanced' mode.

- Calibration control
- Sorting into classes
  - SPC
  - SPC scripts
- Calibration by group



The following 2 chapters describe these 2 modes.

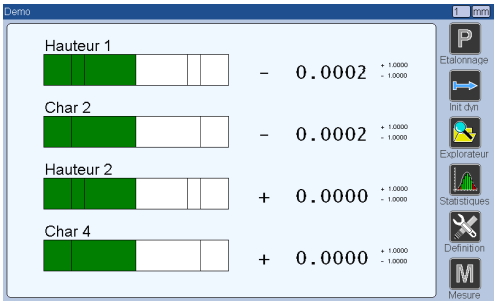
7.1.2 'Basic' mode – Definition



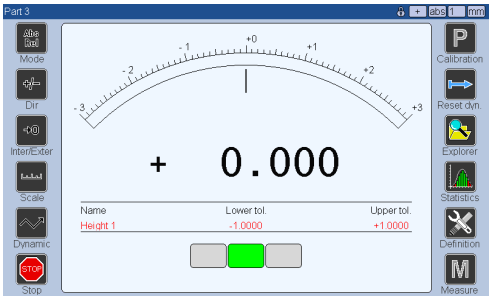
The part reference will be visible from the explorer (128 part references can be stored) and will have the name of the export file by default ('Configuration' menu → function1= transfer / transfer =USB)

Overview of display types:

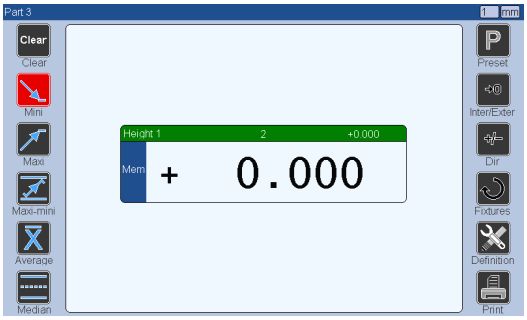
Multiple: (up to 32 characteristics per screen)



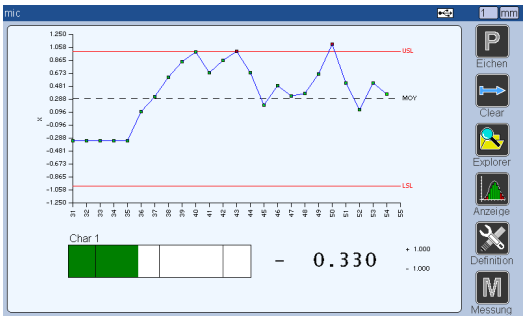
Analogue (only 1 characteristic at a time):



Digital: (without tolerance indications, max. 8 characteristics per screen)

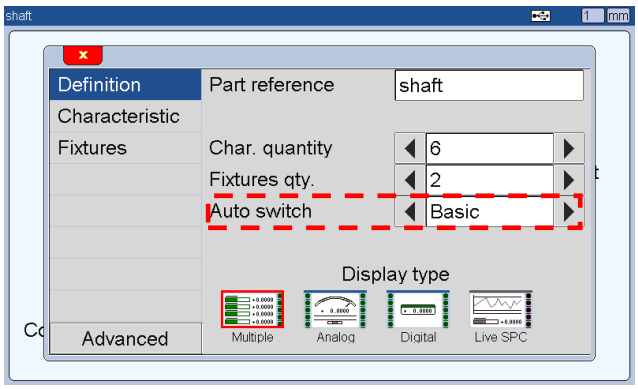


Live SPC ('Advanced' mode)



To distribute your characteristics in several fixtures (this means several pages on the TT100), the number of fixtures must be increased. When the number of fixtures is > 1, a new menu appears: ‘Auto switch’.

This makes it possible to define whether the page (fixture) change is manual (‘no’) or automatic and if so how this automatic change occurs (‘basic’ or ‘range’)

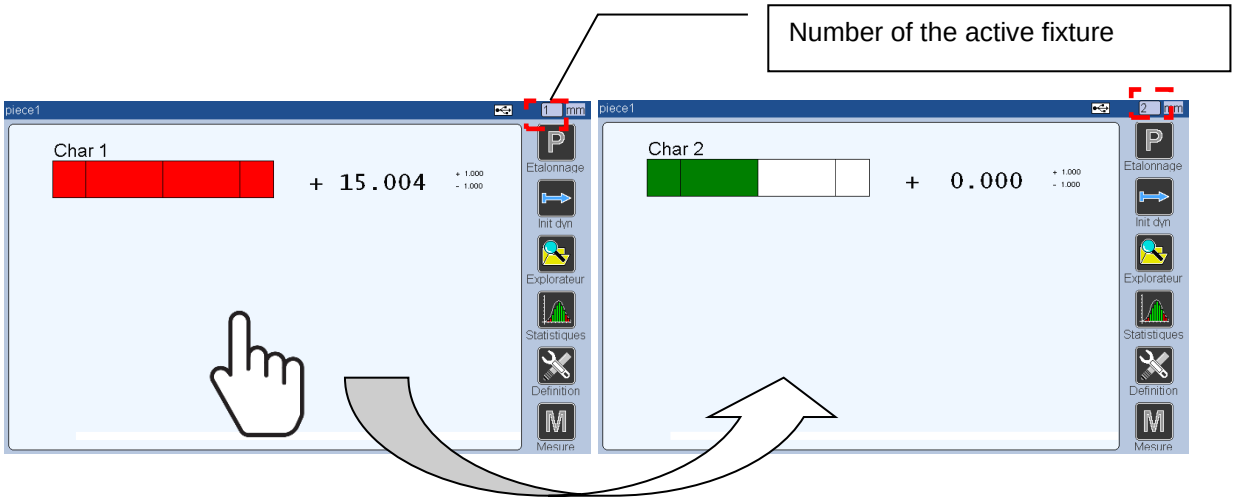


The following chapter describes how the changeover works.

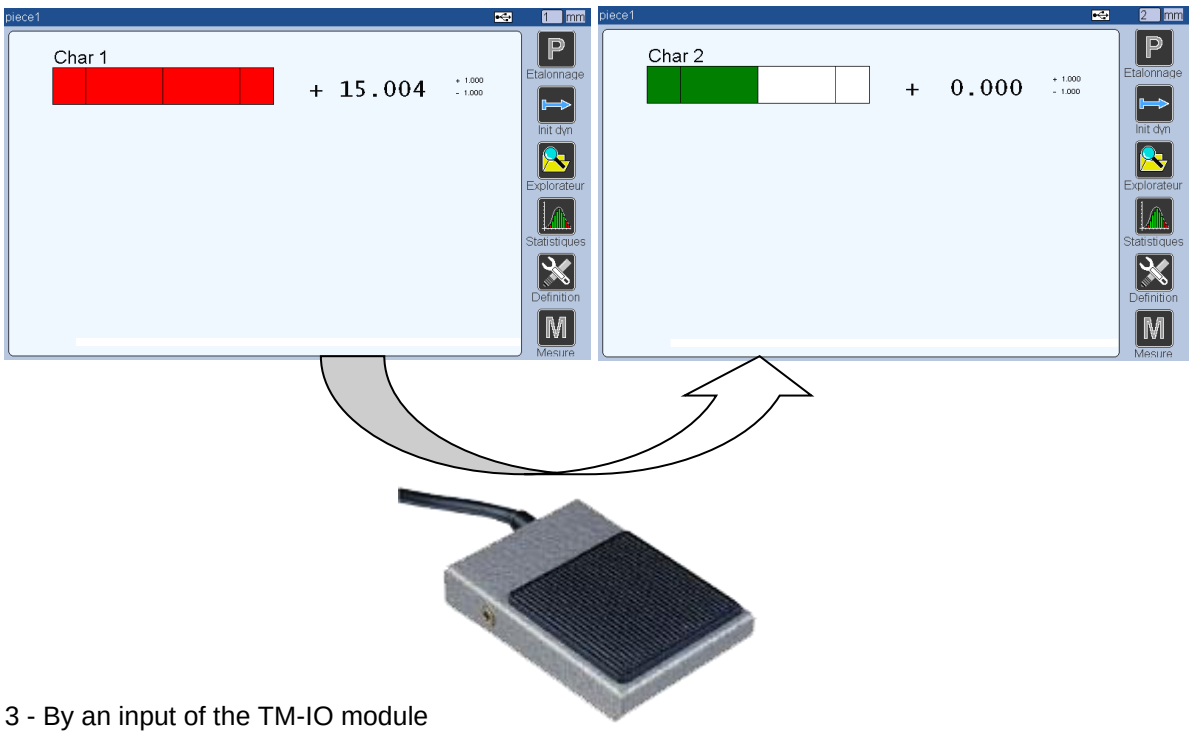
7.1.2.1 Configuration of fixture changeovers

- **NO (=manual changeover):** The page (fixture) changeover is manual. Several options are available for changing over the page:

1 - By pressing the bar graph display area:



2 - By pressing the foot switch: (‘Configuration’ menu→Foot switch function = FIXTURE)



3 - By an input of the TM-IO module

4 - By the MODBUS protocol

- **BASIC**: The page (fixture) changeover is performed automatically as soon as a variation in a characteristic is detected.

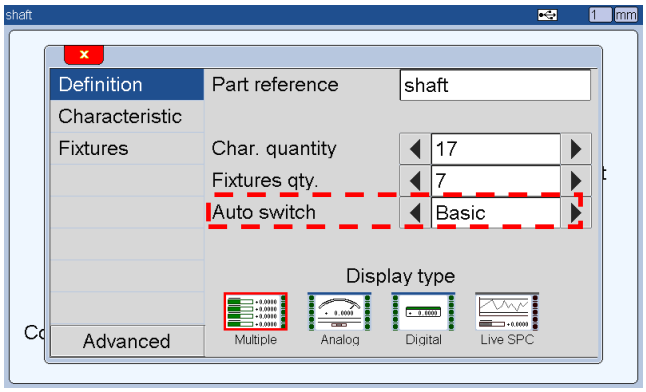
- **RANGE**: The page (fixture) changeover is performed automatically as soon as a characteristic enters a defined range.

This allows, for example, the use of a single sensor or instrument to monitor different dimensions spread over different pages (fixtures).

This is often used with long stroke sensors such as those from HEIDENHAIN, but also with callipers or comparators.

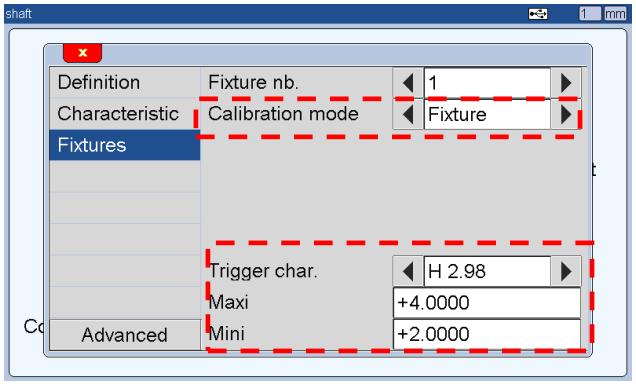
Example: A measuring station is used to check 3 different heights (i.e. with different tolerances and nominal characteristics, allowing a ‘good/bad’ indication to be obtained for each characteristic) with the same instrument.

The aim is to automatically display the page corresponding to the characteristic being measured. Since the same instrument is being used, the ‘Basic’ mode cannot be used, so the ‘Range’ mode is used.

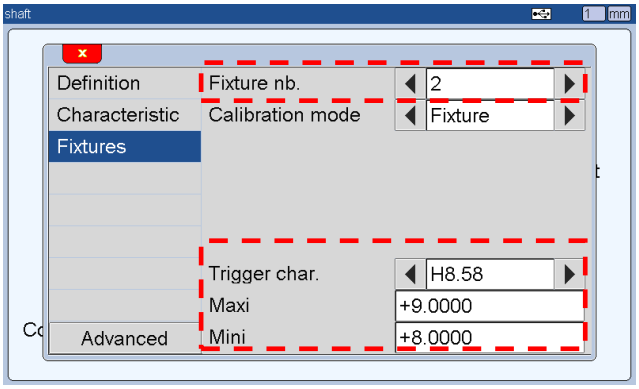


Choose the 'Auto switch' mode

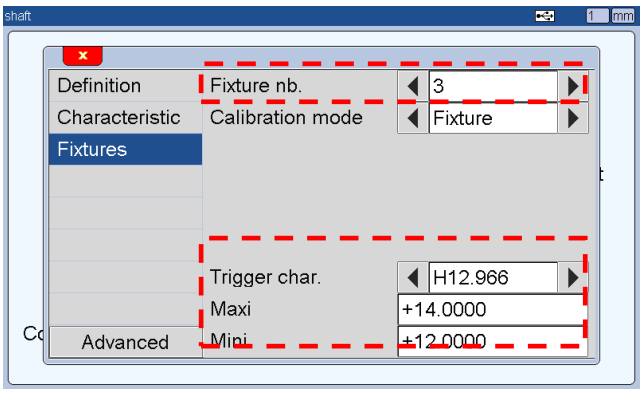
On the Fixtures tab, each fixture has to be assigned a triggering characteristic and a range within this characteristic.



On the screen opposite, fixture 1 is defined to appear when the characteristic 'H2.98' passes through the range between 1 and 4 mm

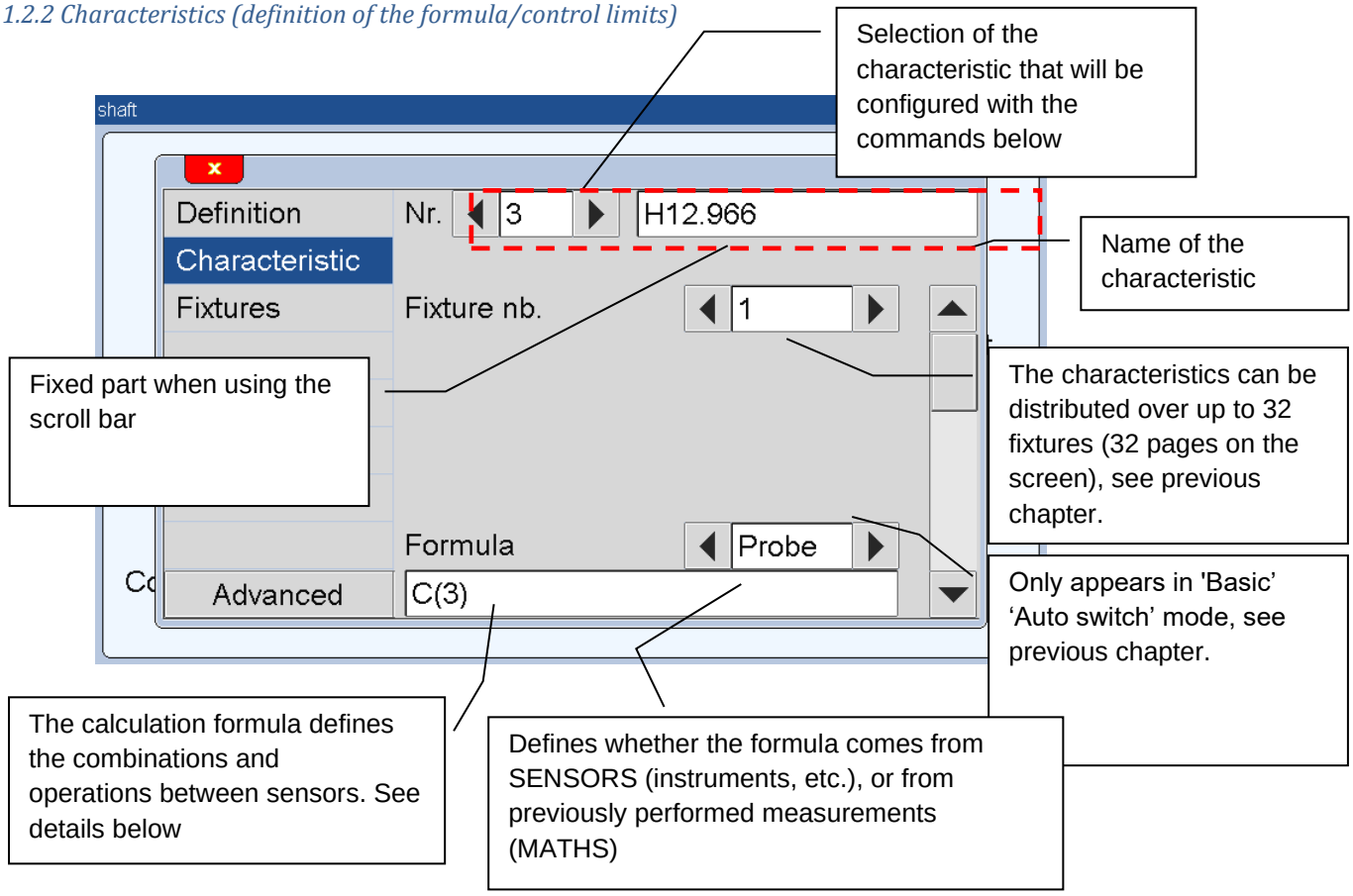


On the screen opposite, fixture 2 is defined to appear when the characteristic 'H8.58' passes in the range between 7 and 10 mm

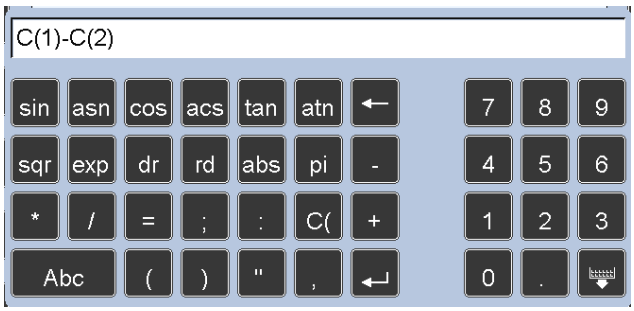


On the screen opposite, fixture 3 is defined to appear when the characteristic 'H12.966' passes in the range between 11 and 14 mm

7.1.2.2 Characteristics (definition of the formula/control limits)



After clicking on the formula area, a formula keyboard is displayed:



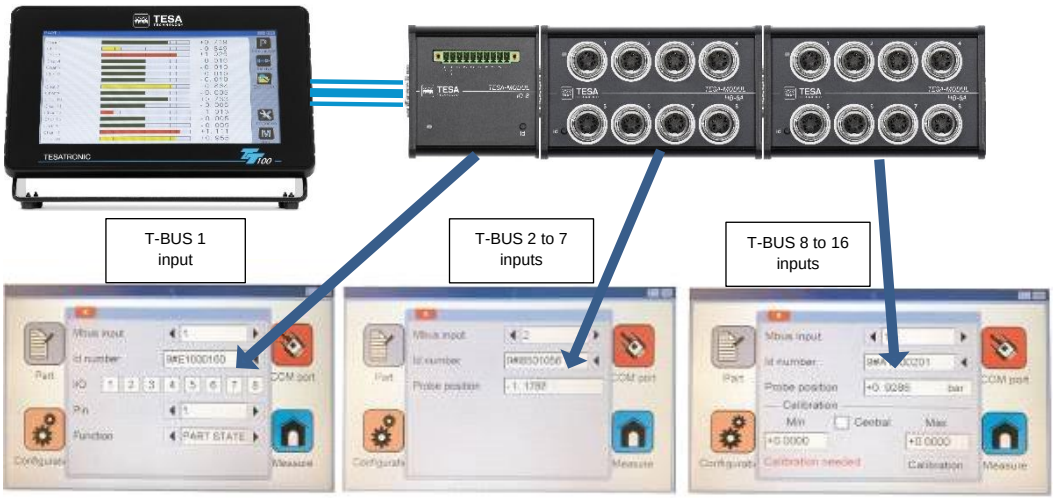
The TT100 has 4 types of data input.

2 types of variables can be used depending on the measurement source:

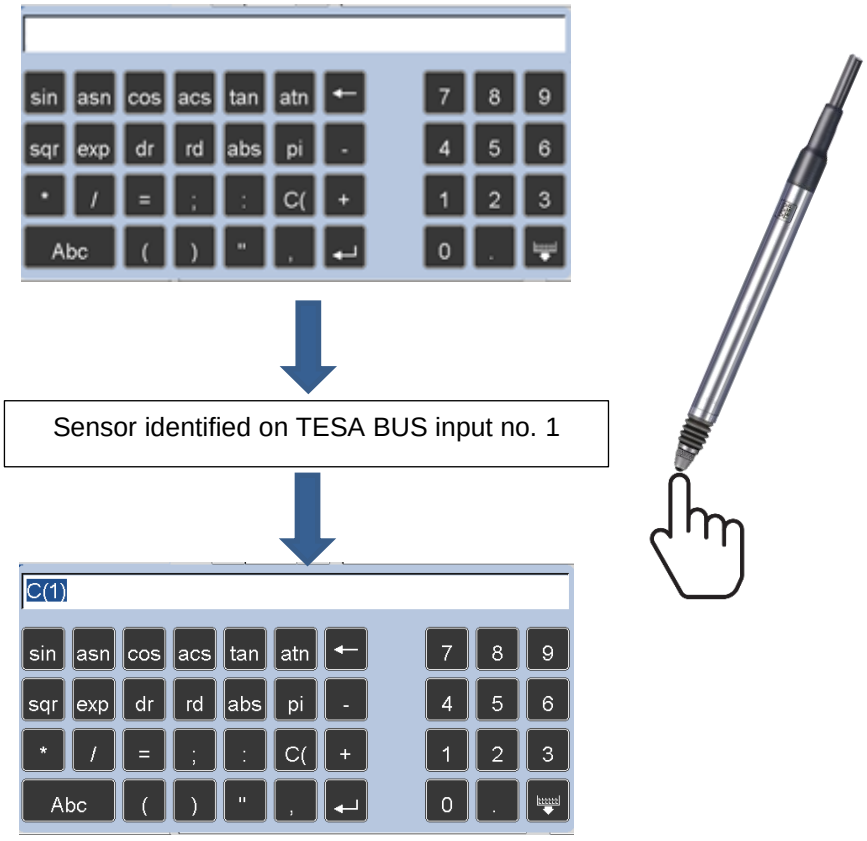
- **Sensor type formula (TESA BUS channel)**:

C (n) where 'n' is the sensor number (n * 99)

The sensor number corresponds to its TESA BUS ID number, as follows:



Either ‘C(1)’ can be written with the formula keyboard or it is written automatically simply by pressing the corresponding sensor and the value ‘C(1)’ on the field.
This is very useful when there are many sensors in a set-up.



Only works with C() type characteristics.

Maths type formulae:

M (n) where ‘n’ is the characteristic number (result of a previously calculated characteristic) (1 < n < 32). To use M (n), the origin of the characteristic must be declared as ‘Maths’ in the ‘Characteristics’ menu

A formula defines the combination of sensors and the necessary calculations (see examples of sensor combinations).

The sequence of calculations is as follows:

- Measured characteristic from a TESA BUS input: C(x)
- Dimensions calculated with other characteristics: M(x)

For each origin, the calculations are performed in chronological order (e.g. characteristic 1, then characteristic 2, etc.)

Mathematical operations

The following operations are allowed in calculations: + - * / ( )

as well as:

SIN(x)	= sine of x
COS(x)	= cosine of x
TAN(x)	= tangent of x
ASIN(x)	= arc sine of x
ACOS(x)	= arc cosine of x
ATAN(x)	= arc tangent of x
SQR(x)	= square root of x
EXP(x)	= e (2.7182818) to the power of x
y**x	= y to the power of x
LN(x)	= natural logarithm of x
LOG(x)	= logarithm of x to base 10
ABS(x)	= absolute value of x
PI	= 3.1415926
RD	= conversion factor radians -> degrees (180/PI)
DG	= conversion factor degrees -> radians (PI/180)

- For trigonometric functions, ‘x’ is expressed in radians
- It is possible to use integer or real coefficients that can be expressed in scientific notation.
- It is not recommended to use a trigonometric function directly on a sensor value. Ex. COS(C(1))

Precedence of operations

The hierarchy of operations in calculations is as follows:

1. Brackets ( )

2. EX(x)

3. Negation -

4. Multiplication and division * /

5. Addition and subtraction + -

Syntax error

1. Missing one or more opening brackets. Ex. COS(25* C(2) +5))

2. Missing one or more closing brackets. Ex. COS(25*M(2)+5

3. One or more letters too many. Ex. C(5)-COS 2/PI

4. Writing error around an exponent. Ex. -25E++5 or 5.E2

5. Missing one or more operations. Ex. C(2)5 or C(1)C(2)

6. One or more functions without arguments. Ex. COS() or C()

7. One or more operations without arguments. Ex. C(2)+

8. Misused gap (several declared or not declared within a table). Ex. C(1..3) + M(1..2) or COS(1..2) NB. The - sign is allowed before the gap.

9. Non-integer value in a table. Ex. C(+1.2)

Calculation impossible

1. Non-conforming argument. Ex. C(0) or M(5)

2. First term of an array greater than or equal to the second. Ex. M(2..1)

Combination to be reviewed

1. If other characteristic + dynamic, gaps are mandatory. Bad: M(1), Good: M(1..3)

Example: Flatness measurement with 12 inductive sensors

Equipment:

- 1x TT100 display
- 1x TESA-MODUL HB-8A
- 1x TESA-MODUL HB-4A
- 12x inductive probe

Step 1:

Connect the modules to the TESA BUS and identify them.

HB-8A on T-BUS inputs 1 to 8

HB-4A on T-BUS inputs 9 to 12

Step 2:

Creating the 13 characteristics in multi-functional mode: The first 12 characteristics for each probe to be measured and the 13th characteristic will display the MAX-MIN of the first 12 characteristics.

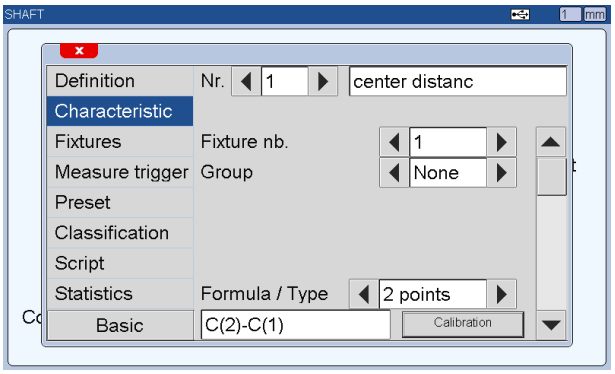
It is possible to display only the result of the flatness.

The first 12 characteristics relative to the 12 sensor positions must be configured as ‘intermediate = YES’. This means that the characteristics are calculated but not displayed.

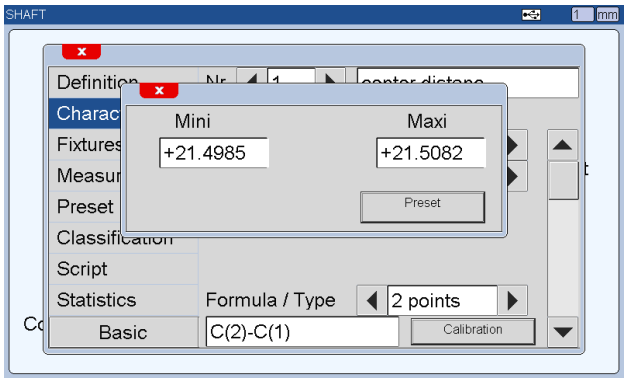
Name of the characteristic	Origin	Formula	Mode	Characteristic displayed (advanced mode only)
Sensor 1	Sensor	C(1)	Static	NO
Sensor 2	Sensor	C(2)	Static	NO
Sensor 3	Sensor	C(3)	Static	NO
Sensor 4	Sensor	C(4)	Static	NO
Sensor 5	Sensor	C(5)	Static	NO
Sensor 6	Sensor	C(6)	Static	NO
Sensor 7	Sensor	C(7)	Static	NO
Sensor 8	Sensor	C(8)	Static	NO
Sensor 9	Sensor	C(9)	Static	NO
Sensor 10	Sensor	C(10)	Static	NO
Sensor 11	Sensor	C(11)	Static	NO
Sensor 12	Sensor	C(12)	Static	NO
FLATNESS	Maths	M(1..12)	MAX-MIN	YES

2-point formula:

This type of formula enables a dimension to be calibrated in 2 points (with 2 standards)



A ‘Calibration’ button is available below the formula field. Select it to enter the min. and max. values of the standard in the window that appears.



When the 2-point calibration procedure is complete, enter the tolerances and standard values as normal, like any other characteristic.

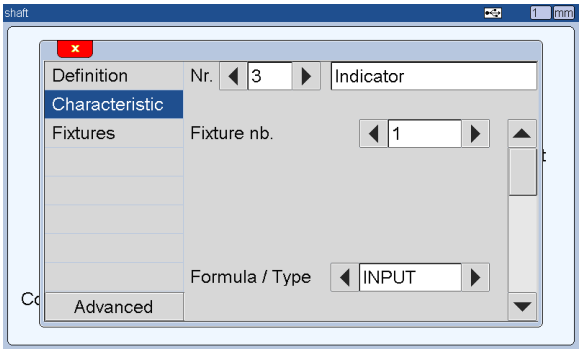
Example of 2-point formula: Measuring on a ‘V’ with two inductive probes:

When the measured part is placed on a ‘V’, with the probe mounted vertically, the displacement of the probe is not the same as the diameter variation.

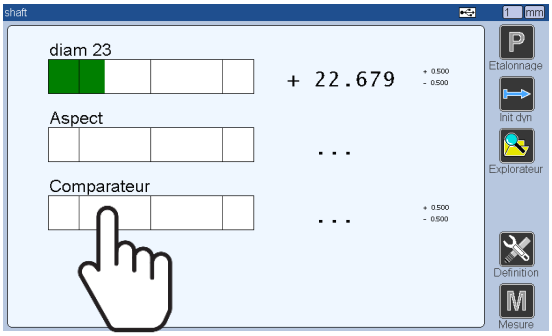
It is therefore necessary to use 2 standards, min. and max.

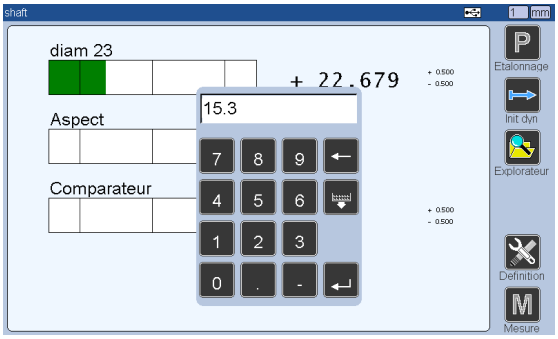
Input type formula:

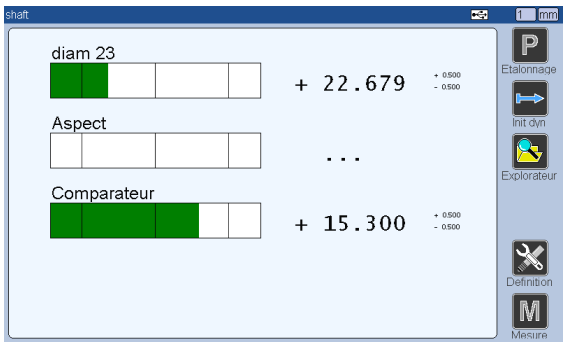
Choosing this type of characteristic allows a characteristic to be entered manually on the screen. Tolerances and nominal characteristics must always be defined. These formulae are accessible in all display modes except 'Numeric' mode



To enter the characteristic, simply click on the bar graph.

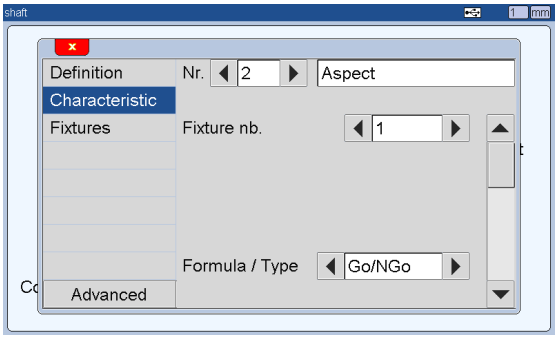


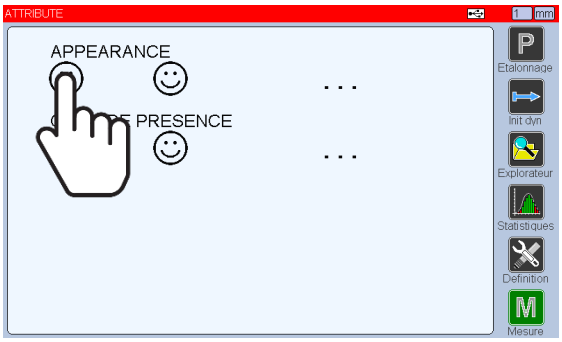


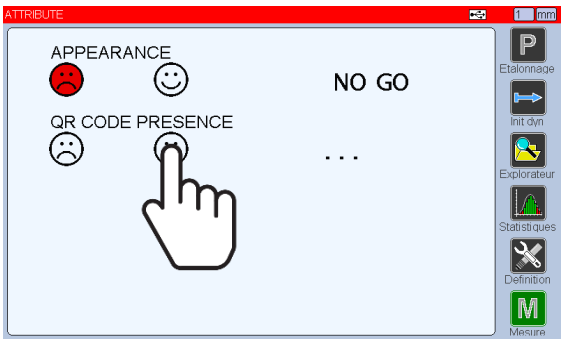


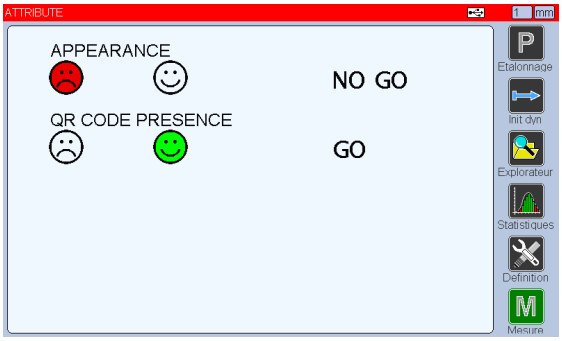
Type Go NoGo (control to attributes):

Choosing this type of characteristic allows a choice to be entered in a manual and binary manner. The entry of standard, tolerance and nominal characteristics is suppressed in the menus. These formulae are accessible in all display modes except ‘Numeric’ mode.





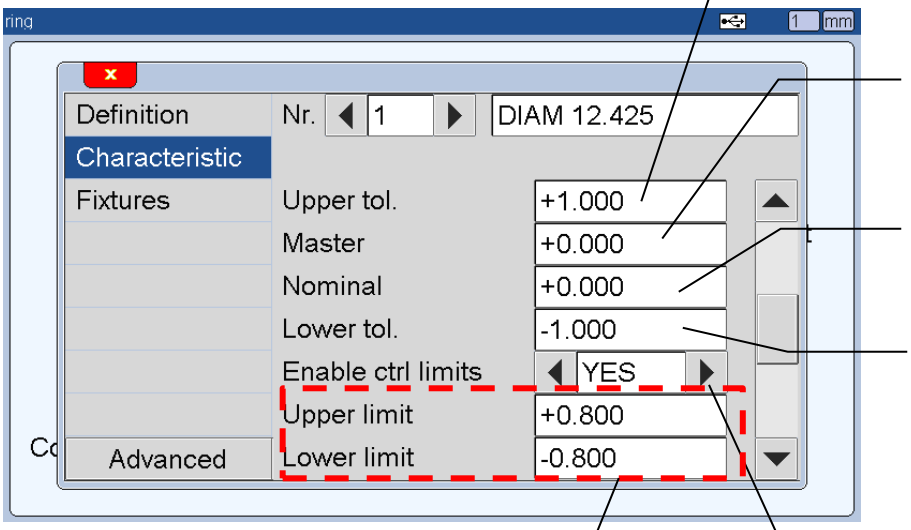




Control limits:

Control limits are warnings that are activated when the value is close to the tolerance limits.

Please move the cursor down to the right of the screen to access the control limit option.



Definition of the upper tolerance of the selected characteristic. Relative to nominal

Definition of the standard value, according to certificate

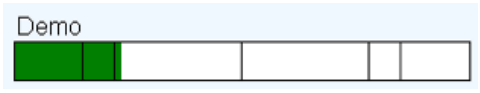
Definition of the nominal characteristic

Definition of the lower tolerance of the selected characteristic. Relative to nominal

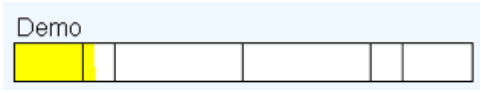
Activation of the control limits

Definition of limit values for warnings

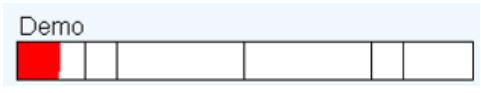
Example of a displayed characteristic with control limits:



Characteristic good



Characteristic good with warning



Characteristic bad

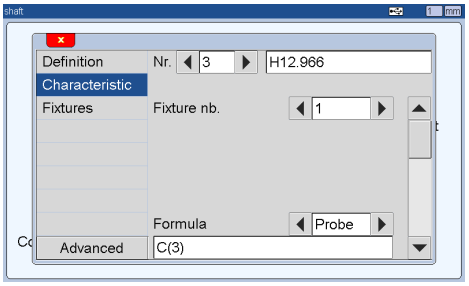
7.1.2.3 Fixtures (pages) and calibrations

Depending on the complexity of the part being measured, it is sometimes necessary to use several fixtures (pages) to check a part.

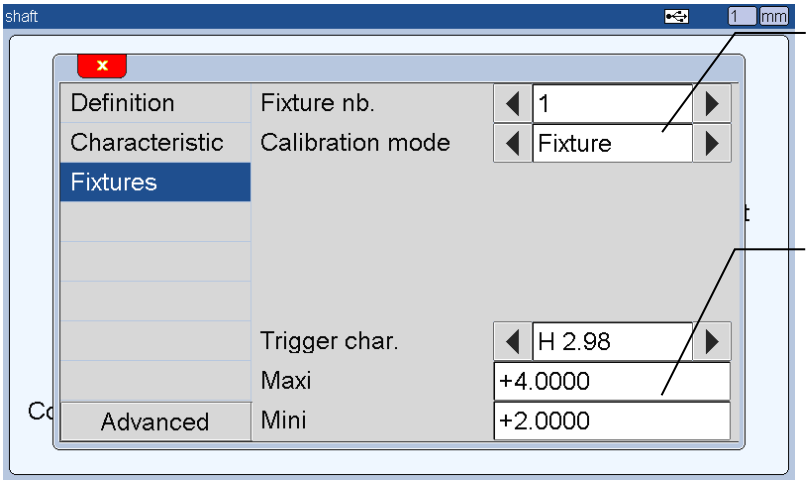
Up to 32 pages per reference can be defined. On the TT100, fixture = page.

Pages are scrolled by pressing on the middle of the measurement screen, by a foot switch action, by the I/O or automatically by sensor movement detection. *This is described in chapter 7.1.2.1*

The characteristics in a fixture are assigned from the Characteristic tab.



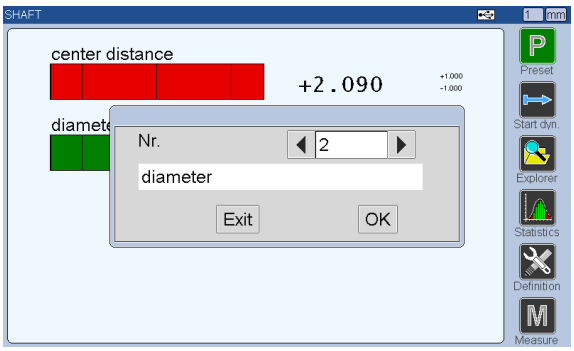
The Fixtures screen allows the definition of which type of calibration is to be assigned to the fixture:



Choice of calibration mode: Fixture, Characteristic, Group (in 'Advanced' mode) or Characteristic selection

This menu is only displayed if Auto switch = range field is selected in the definition menu. This allows the automatic switching ranges to be selected. *See 7.1.2.1.*

- **FIXTURES:** When calibration is started, all the characteristics of the fixture are calibrated at the same time.
- **GROUP:** Allows the characteristics to divided into groups, and to calibrate group by group (only in 'Advanced' mode, see chapter on advanced mode).
- **CHARACTERISTICS:** When the calibration procedure is started, the characteristics are calibrated one by one.
- **CHARACTERISTIC SELECTION:** Selects the characteristic to be calibrated. On the measurement screen, after selecting the calibration button, a window opens asking for the characteristic to be entered.

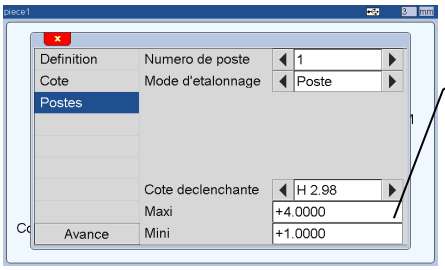


Therefore, for the same part, it is possible to have fixtures from the ‘Characteristic’ mode and others from the ‘Fixtures’ mode

Calibration can be started as follows:

- **By pressing the CALIBRATION button on the right of the measurement screen.**
- **By a foot switch action (‘Configuration’ menu → Foot switch function = PRESET)**
- **By a pulse on an input of the IO-8 module**
- **By writing in a MODBUS register**

It is possible not to apply a preset to a measurement by selecting ‘Calibratable: NO’ in the ‘Characteristic’ menu (‘Advanced’ mode). This is interesting and recommended in instruments with a display (callipers, comparators, etc.) to avoid any deviation between the displayed value and the measured value.



When using the ‘Auto switch’ = range mode, the Fixtures tab allows the automatic switch ranges to be selected. *This is described* in chapter 7.1.2.1.

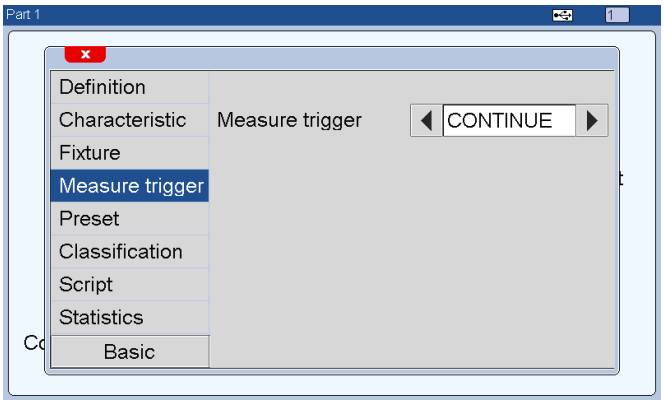
7.1.3 'Advanced' mode – Definition

'Advanced' mode enables the use of all the functions of the TT100. In addition to 'Basic' mode, it is possible to carry out configuration in this mode:

- SPC functions
- Automation scripts/Sequence scripts
- Calibration group management
- Calibration control and calibration test
- Sorting into classes.

7.1.3.1 Operation – Triggering measurements

By default, the TT100 measures continuously. This means that the characteristic values are continuously updated, and the fixtures are scrolled one after the other in the same order.

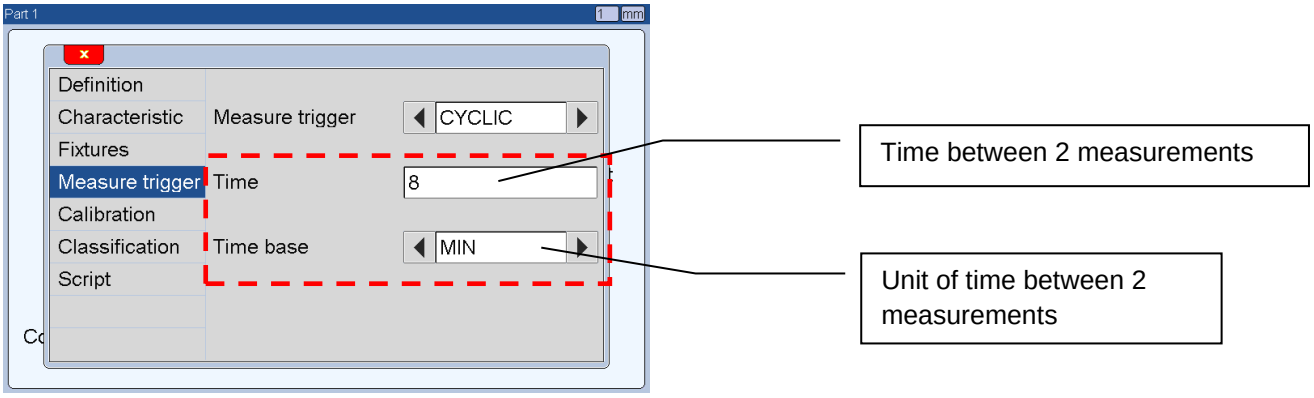


When a sensor moves, the corresponding bar graph moves.

However, measurements can be triggered in 3 other ways:

'Cyclic' mode

This mode allows the viewing of the evolution of one or more measurements over time.



If this mode is chosen, it is also necessary to configure the 'Configuration' menu either in transfer (USB or keyboard) or in MEM (backup).

Then from the measurement screen, press the 'Measure' button.



It turns green.



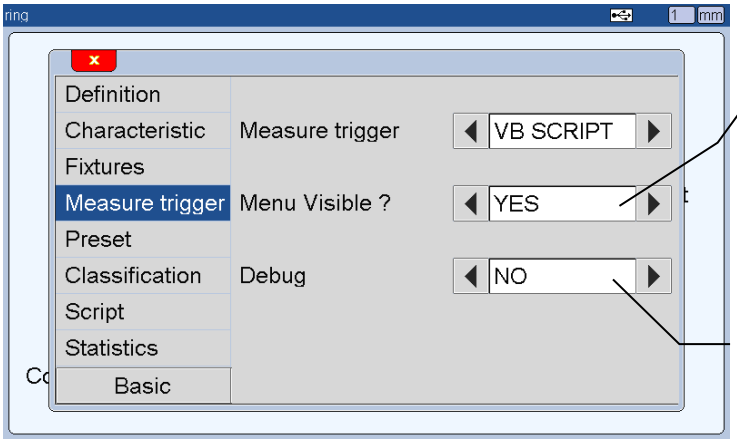
From here, the measurements are either transferred or saved according to the mode defined in the 'Configuration' menu. The measurements are then taken at the predefined frequency. To stop the process, press the 'M' button again; it turns black.

From here, the measurements are either transferred or saved according to the mode defined in the 'Configuration' menu. The measurements are then taken at the predefined frequency. To stop the process, press the 'M' button again; it turns black.

'VB script' mode

This mode is dedicated to experienced users only

'VB script' mode allows the execution of an automated script that can be written either in the 'Automatisms' menu or via the TT100 display manager software.



Allows the right-hand bar of the measurement screen to be hidden. This means that, in automated machines, no one can interrupt the measurement.

If 'Yes' is selected, the program lines appear in the top bar for debugging purposes.

Important: If the 'Keyboard' → 'No' option has been selected, when returning to the measurement screen, it is not possible to return to the definition screen, as the 'Definition' button is not displayed.

Therefore, it is recommended to only use this function at the time of commissioning.

To display the menu again, follow this procedure:

1 - Switch off the TT100

2 - Switch on the TT100

3 - When the 'TESA' logo and the 'Loading xx%' indication appear, press the TESA logo.

4 - Click on 'Disable VB Script'.

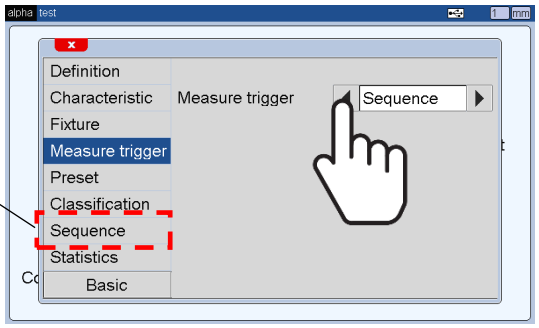
Sequence mode

Definition and configuration of the mode:

This mode allows more flexibility in the use of the TT100 through the creation of a graphical scripting system (function execution) inspired by grafcet. The programmed functions follow one another and facilitate automatic execution for the operator.

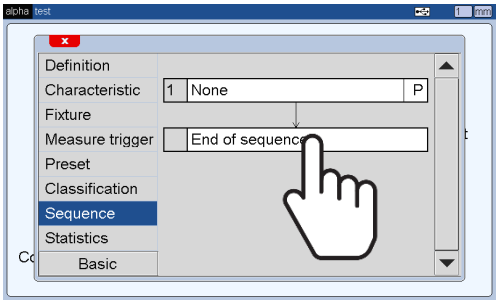
When ‘Sequence’ mode is activated, the left-side menu changes:

The sequence editor can be accessed by pressing ‘Sequence’



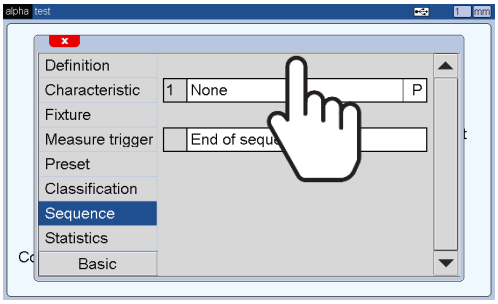
Using the sequence editor:

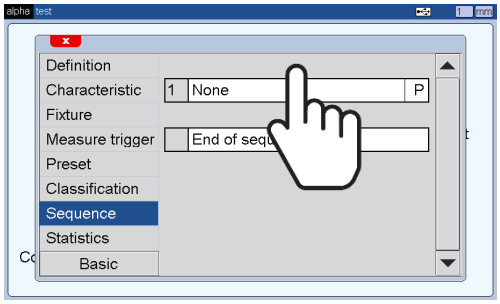
Functions can be inserted or modified in the following ways:



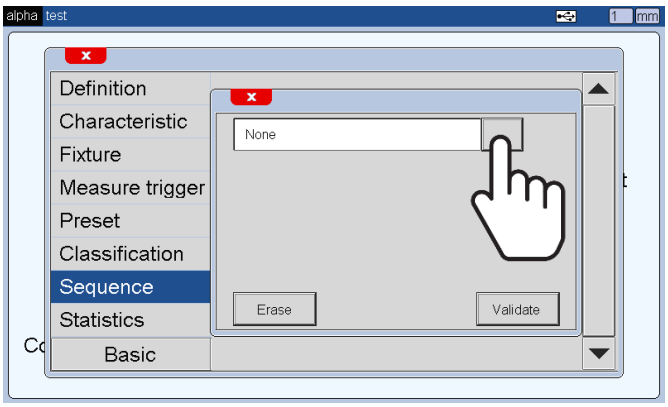
Press the function to **Select** or **Modify** the function to be executed.

Press on the arrow for 2 s to **insert** the function to be executed between 2 steps.



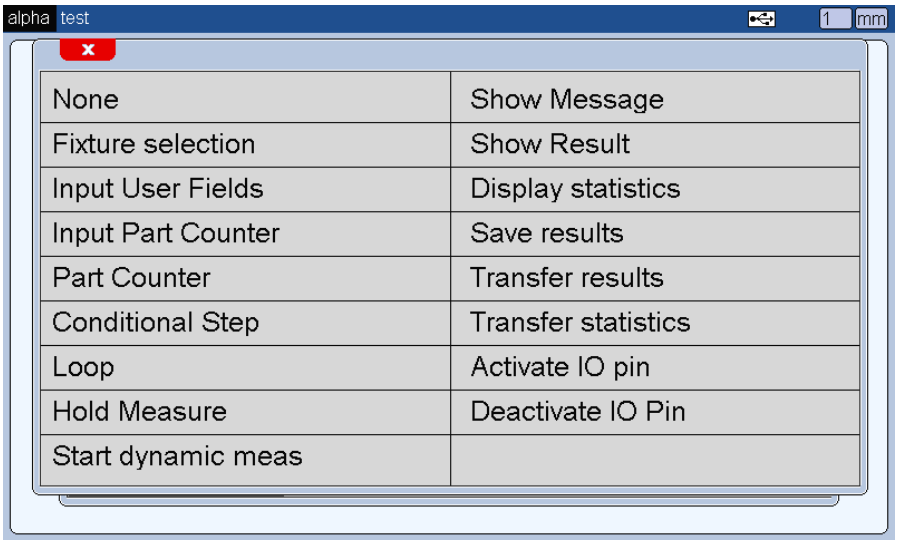


Press above the first step for 2 s to **insert** the function to be executed at the top of the sequence.



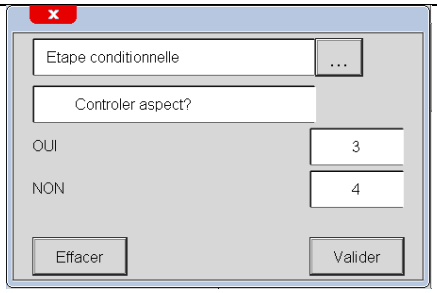
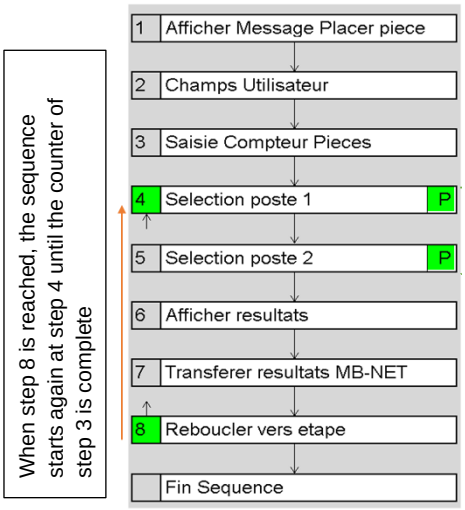
Press the dotted line to display the available functions.

The following window appears:



Description

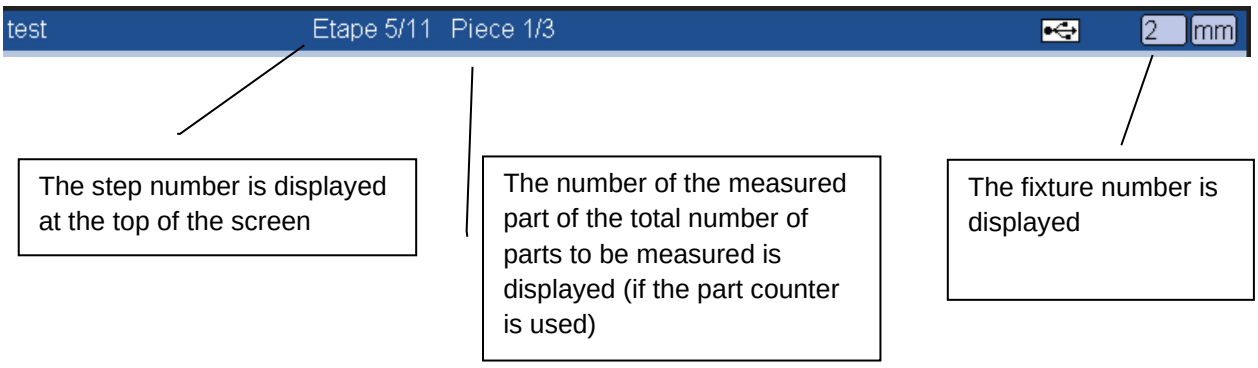
Title	Description	Parameter or comment
NONE	No function assigned	Can be used as a timer if required
Fixture selection	Select the fixture (page) to be displayed	Fixture number (1 to 32)
Input User Fields	Displays the input window for user fields (configured in the 'Statistics' menu)	The number and title of each field is defined in the 'Statistics' menu
Input Part Counter	Displays an input window for the user to define the number of parts to be measured in the batch.	Requires the use of a loop ('Loop' function). When the counter reaches the end, the loop is exited and the sequence ends.
Part Counter	Defines the number of parts in a batch. The value is set in the editing of the sequence and not by the user.	- Requires the use of a loop ('Loop back to step' function). When the counter reaches the end, the loop is exited and the sequence ends. - By default, the value is 'inf' for infinite. To get out of this infinite loop, add an 'End of batch' button in a 'Show Result' step
Conditional Step	This step asks a question and redirects the sequence to one of the 2 steps to be defined according to the answer. The default text 'Question?' must be replaced by the question that makes it possible to redirect the sequence.	Example:

	Then the number of the step to be reached must be entered according to the answer 'Yes' or 'No'.	 The answer 'YES' directs the sequence to step 3 and the answer 'NO' directs to step 4.
Loop	This function keeps the sequence in a loop until the part counter is complete. The loop turns between the step defined in parameter and the instruction 'Loop to step', the 2 steps in question have a green square on their identifier.	Example: 
Hold Measure	This function makes it possible to freeze the measurement at the time of the change of step in a sequence, thus taking into account this measurement in the remainder of the sequence. **If two 'fixture selection' steps are linked, it is not necessary to use this function because the measurement is taken into account when changing the fixture.**	Example of a sequence where the freeze measurement function is required: 1 Fixture selection 1 2 Show message 3 Fixture selection 2 4 Show results 5 End of sequence This sequence can cause problems because, in step 2, (display message) the TT100 is still at Fixture 1, but the part has probably been removed, so the characteristic in the background is no longer correct. By going to step 3, this (incorrect) characteristic value is taken into account and then displayed in the summary in step 4. To avoid this, the sequence should be written as follows: 1 Fixture selection 1 2 Freeze measurement 3 Show message 4 Fixture selection 2 5 Show summary 6 End of sequence
Start dynamic measurement	Starts the dynamic measurement automatically when arriving at the step	This implies that the part is already in position. If this is not possible, an 'init dyn' button should be added to the

		measurement screen from the set-up menu in order to start the dynamic measurement at the required time.
Show Message	Allows a message to be displayed on the screen.	It is possible to display it either on full screen (default choice) or in a pop-up window
Show Result	Shows the results of the measurement of the sequence	As a parameter to this function, an 'End of batch' button can be added to allow the ending of an 'Infinite' counter (see 'Part counter' instruction above). It is also possible to choose to authorise the characteristics in error (e.g. a characteristic of a conditional step, which was not measured). Pressing the 'OK' button in this window in measurement mode automatically moves to the next step in the sequence.
Display statistics	Displays the statistics related to the sequence	It is possible to display the statistics related to a particular characteristic or a particular function of the statistics (e.g. histogram or pareto)
Save results	Saves the measurements in the internal memory of the TT100 for visualisation in the statistics.	
Transfer results	Transfers the results to the chosen medium (USB stick, RS-232, keyboard, …)	In this parameter, the user can choose whether the NOGO transfer (non-conforming parts) is possible.
Transfer statistics	Transfers the statistics (values only) to the chosen medium (USB stick, RS-232, keyboard, …)	In this parameter, the user can choose whether the NOGO transfer (non-conforming parts) is possible.
Activate TESA-MODUL IO-8 terminal	Select the TESA-MODUL IO-8 terminal(s) to be activated	
Deactivate TESA-MODUL IO-8 terminal	Deactivate the selected TESA-MODUL IO-8 terminal(s)	

Status bar of the measurement screen:

At each step of the sequence running on the measurement screen, the status bar shows all the information related to the step of the sequence



Example of writing a sequence:

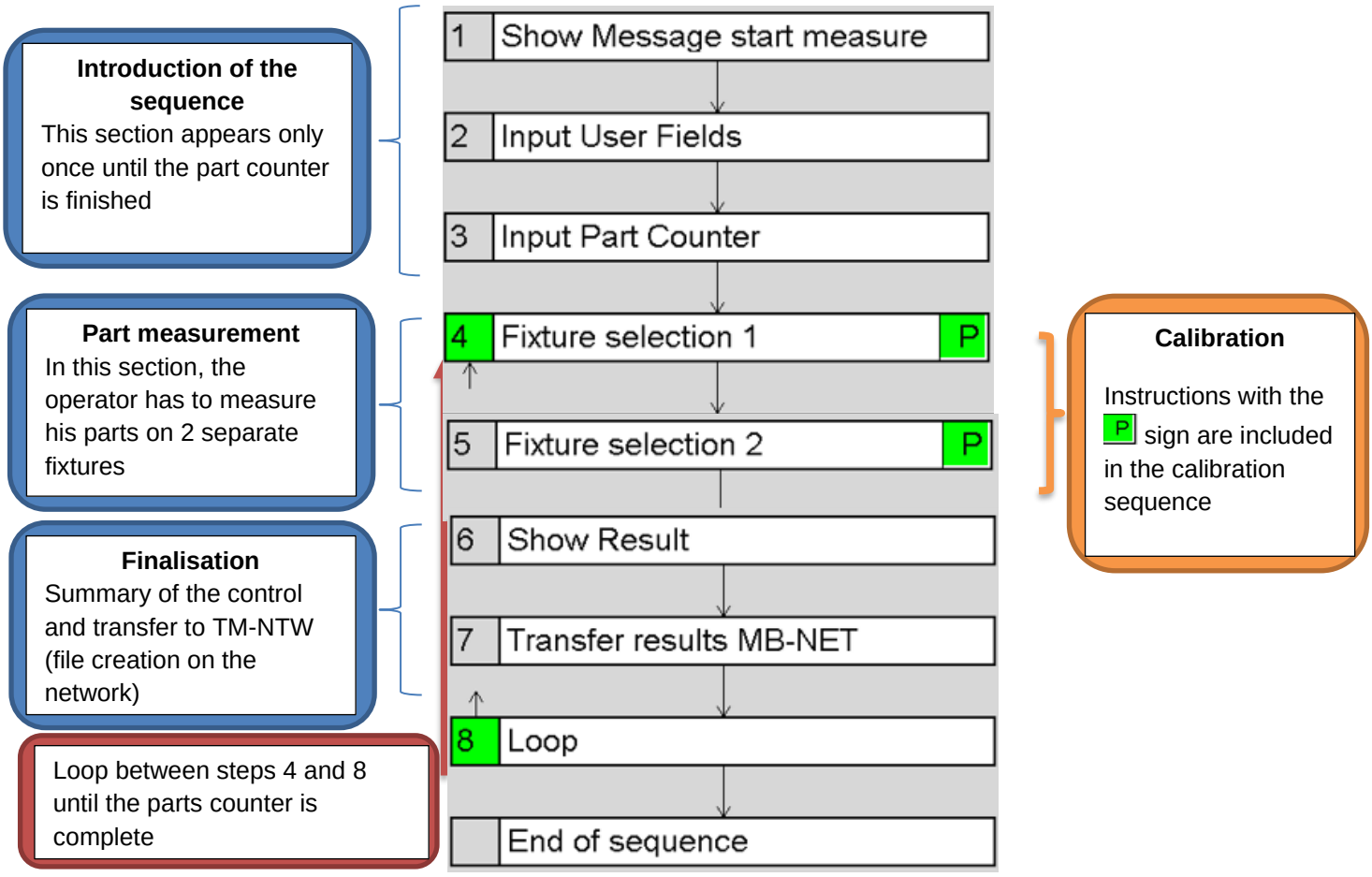
In the example below, the operator must measure 2 characteristics on batches of parts.

A follow-up is required, so the operator must identify the batch number using a barcode scan.

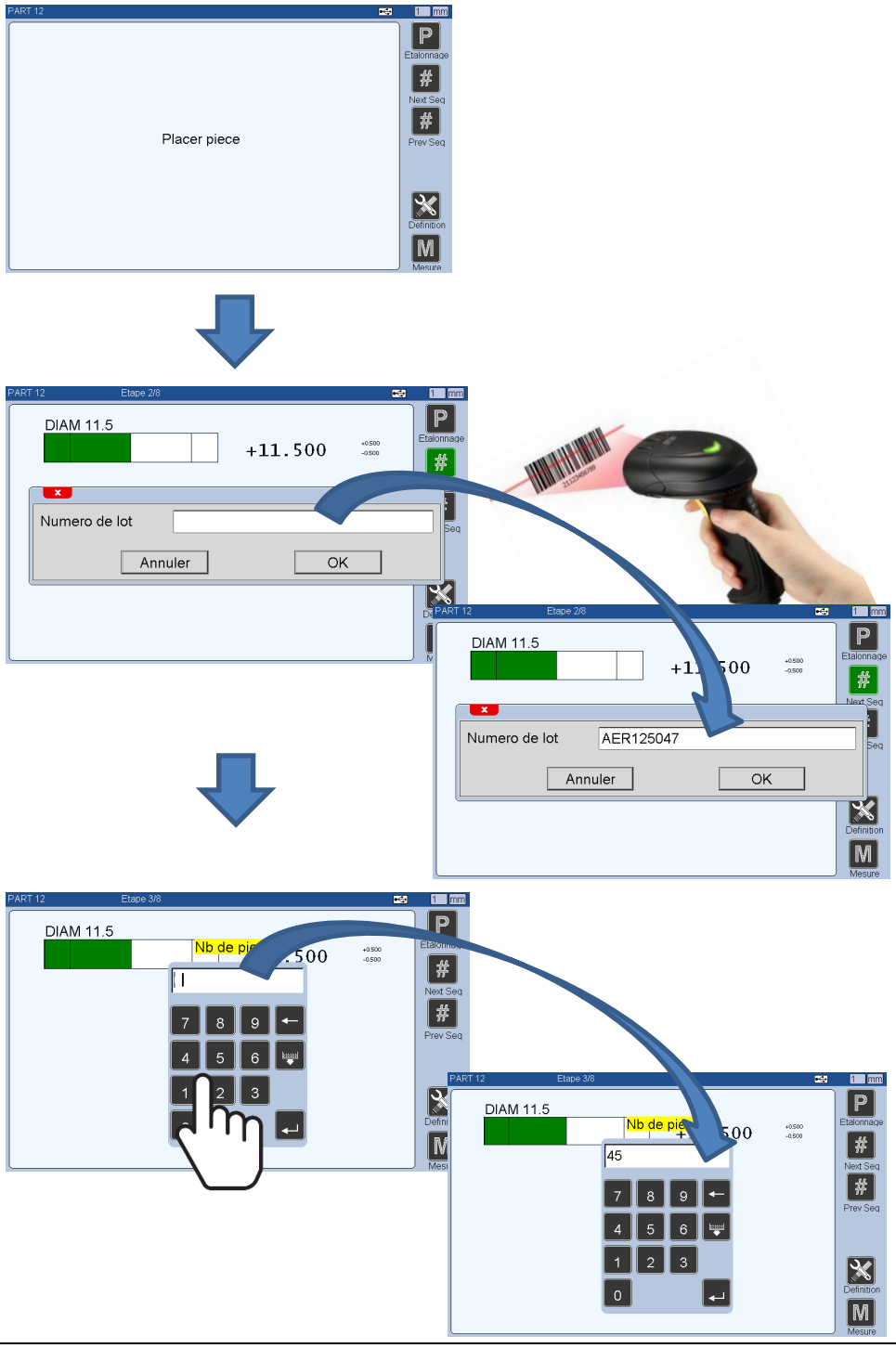
The operator also needs to enter the number of parts in the batch, At the end of the batch, a tracking file is generated via TM-NTW on the company's server.

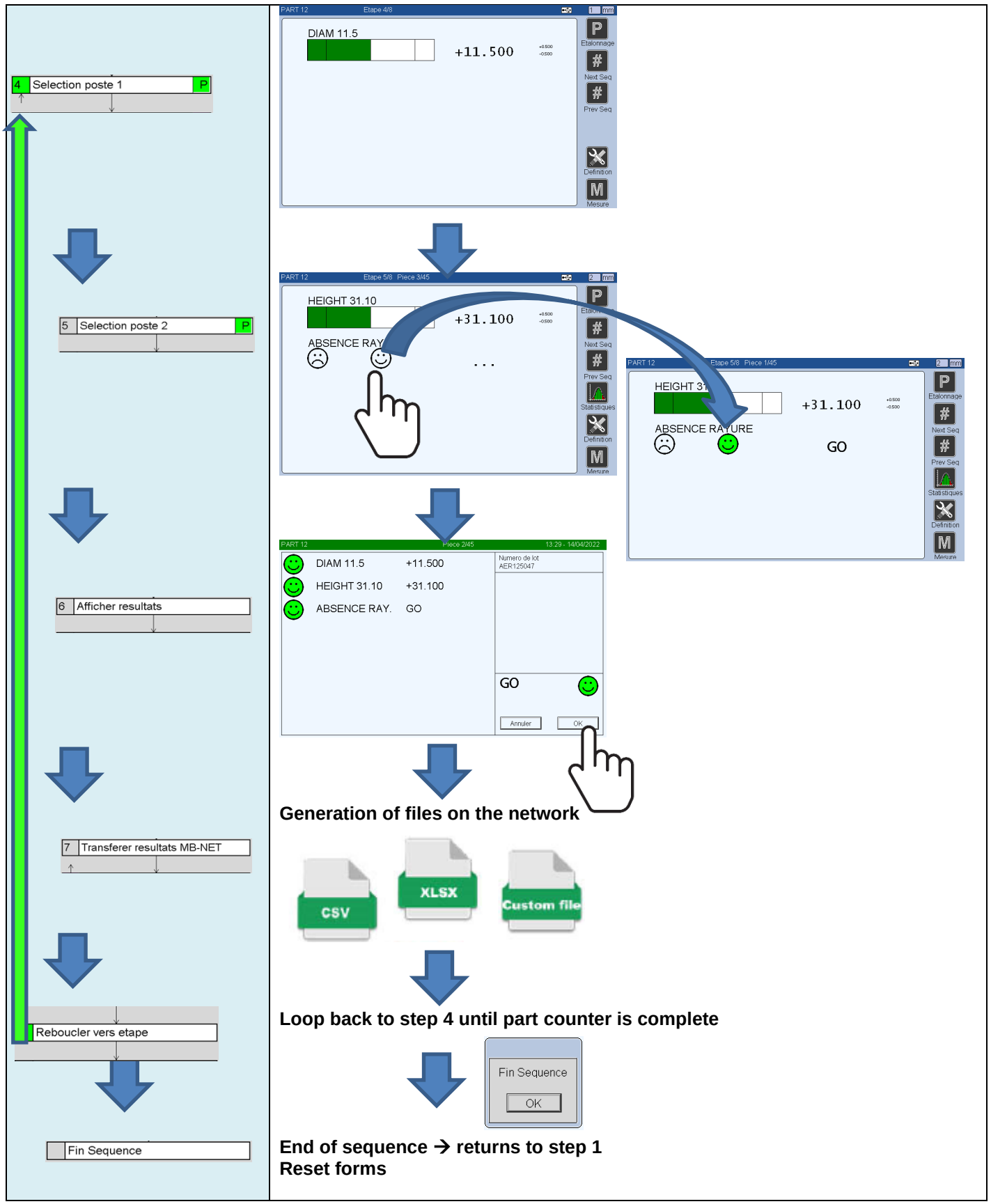
In 'Sequence' mode, it is recommended to customise the side button bar of the measurement screen to include a 'Next Seq' button (go to the next step in a sequence ('Configuration' menu)) or using a foot switch with the same function. It is also recommended to add the 'Prev Seq' button to go back to the previous step.

➔ **From the editor, the sequence looks as follows:**



➔ **In 'Measurement' mode, the sequence is as follows:**

Configuration part	Part measurement
1 Afficher Message Placer piece 2 Champs Utilisateur 3 Saisie Compteur Pieces	

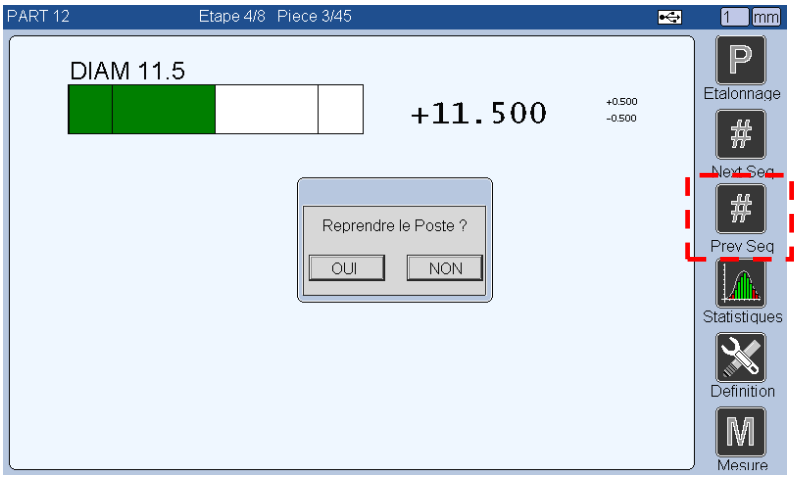


Generation of files on the network

Loop back to step 4 until part counter is complete

End of sequence → returns to step 1
Reset forms

'Prev seq' button on the right-side menu of the measurement screen



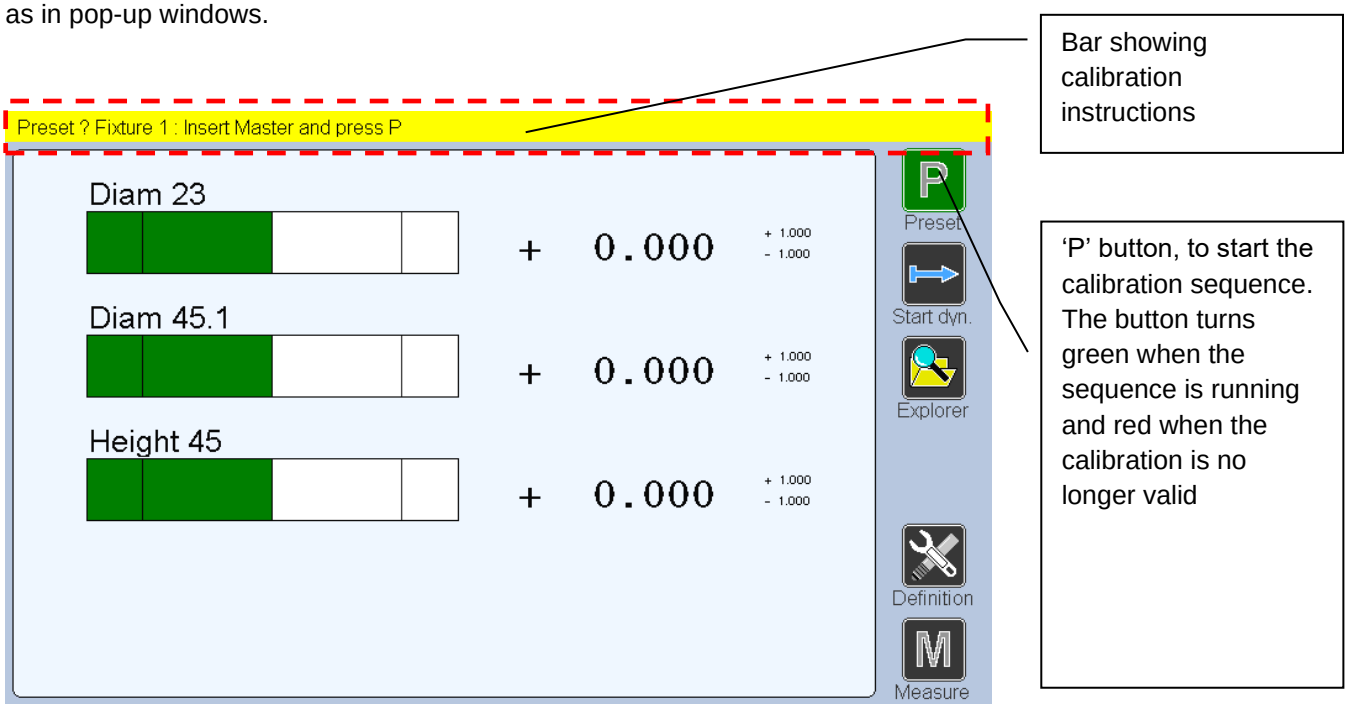
During the sequence, to go back, press the 'Prev Seq' button. A pop-up appears to confirm returning to the previous step. Press 'Yes' to measure again, for example; otherwise, the device will not change the fixture and measurement will not be possible.

7.1.3.2 Calibration and calibration control

In most cases, before starting measurement, the dimensions (preset) need to be calibrated.
The values of the characteristic calibration are defined in the 'PART → CHARACTERISTICS' menu.

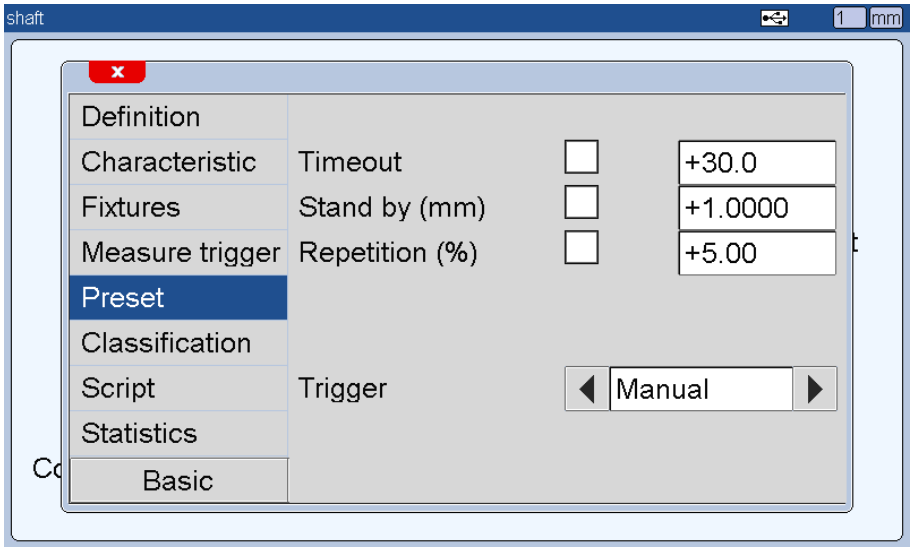
The TT100 enables the performance of a simple calibration but also the running of some tests to make sure that the calibration has been carried out correctly.

In all cases, in manual mode, the calibration sequence is initiated by pressing the 'P-Calibration' button on the measurement screen. Depending on the options chosen, instructions appear in the top bar of the screen as well as in pop-up windows.



Simple calibration:

The default setting of the TT100 is set for a simple calibration.

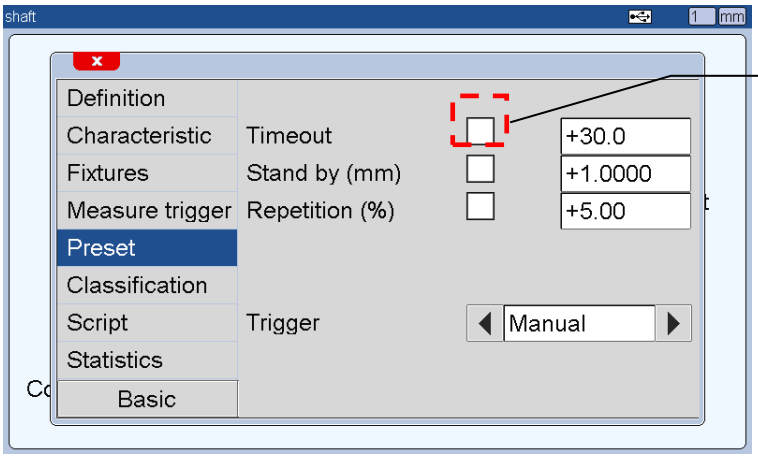


Default settings

To start the procedure, press the ‘P’ button; a pop-up window appears to confirm the start of the procedure.

Then simply follow the instructions shown in the yellow bar at the top of the screen.

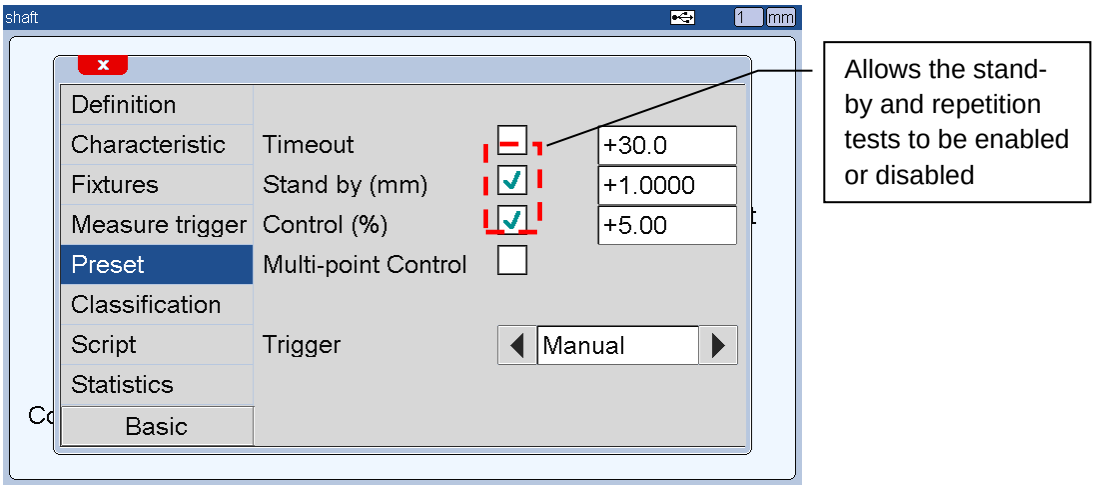
In the simple case, it is advisable to insert the standard and to validate it by pressing the ‘P’ button.



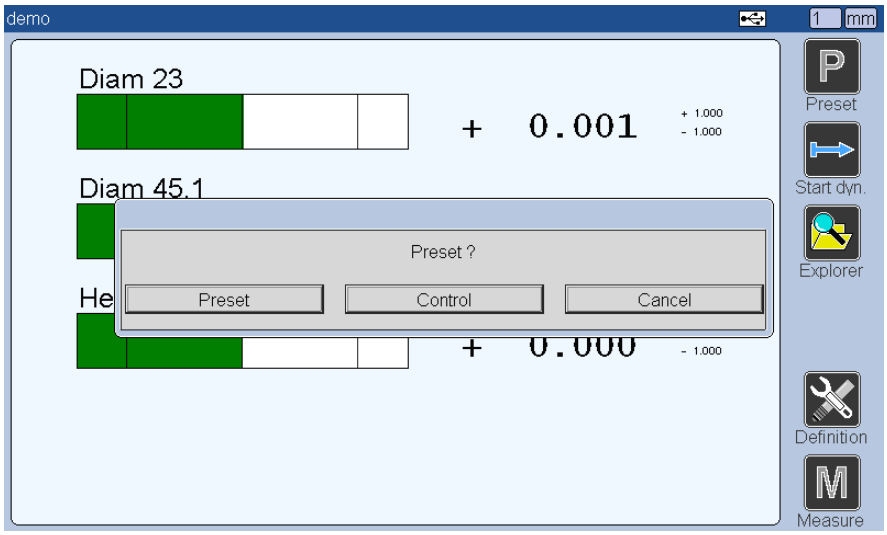
Activated box: define a time limit for the calibration or control. If the time limit is exceeded, the sequence is interrupted.

Calibration with stand-by and repetition tests:

It is possible to check that the calibration is compliant by using 2 tests:



If one or both options is/are enabled, when starting the calibration cycle, the TT100 asks whether it should recalibrate or just check the calibration.



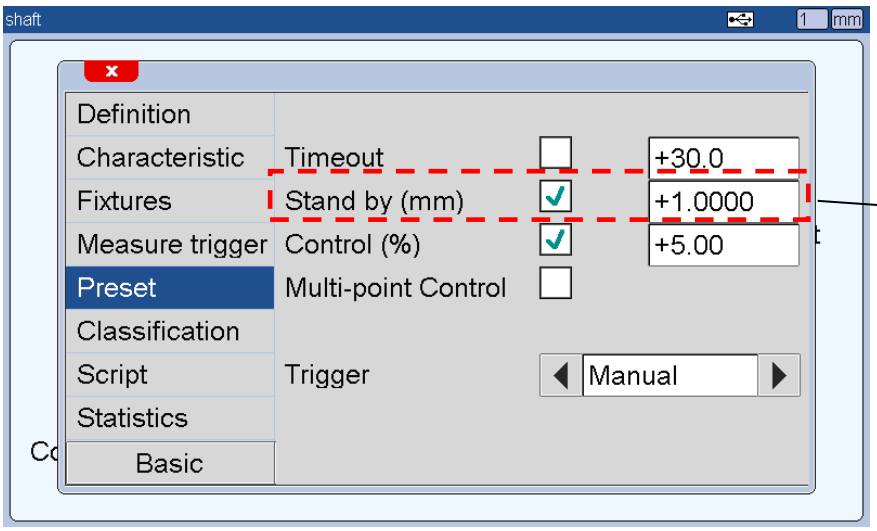
Choose 'Calibration' to carry out the procedure and replace the standard value by a new one. Choose 'Check' to overwrite the standard value, but the TT100 tests that it has not drifted.

A description of the 2 possible tests appears below:

Stand-by test:

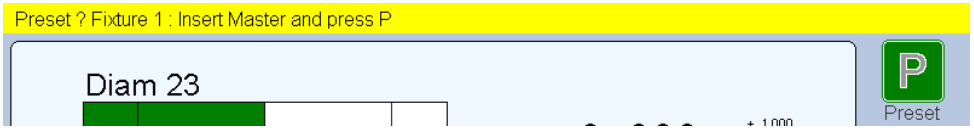
The stand-by test is used to check the measurement conditions and the position of the sensors. When this option is enabled, during calibration, the TT100 compares the position of the sensor with and without the standard and checks that the difference between the two is greater than the stand-by value.

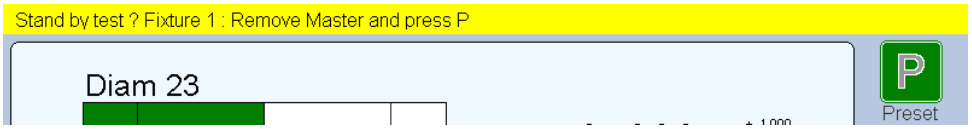
For example, if the two values are the same, this would mean that the sensor is not touching the part, is not connected or is damaged.



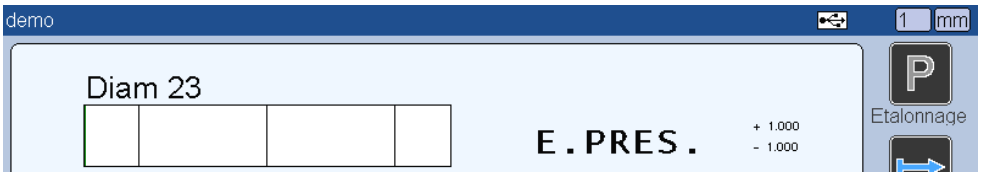
To pass the stand-by test, the sensor(s) involved in the measurement need to move at least 1 mm

As with the simple calibration, simply follow the instructions in the yellow bar.





If the value of the sensor(s) of the characteristic in question has changed by at least the value of the 'stand-by' field, the procedure ends; otherwise, the value of the characteristic is replaced by the text 'E.PRES.'

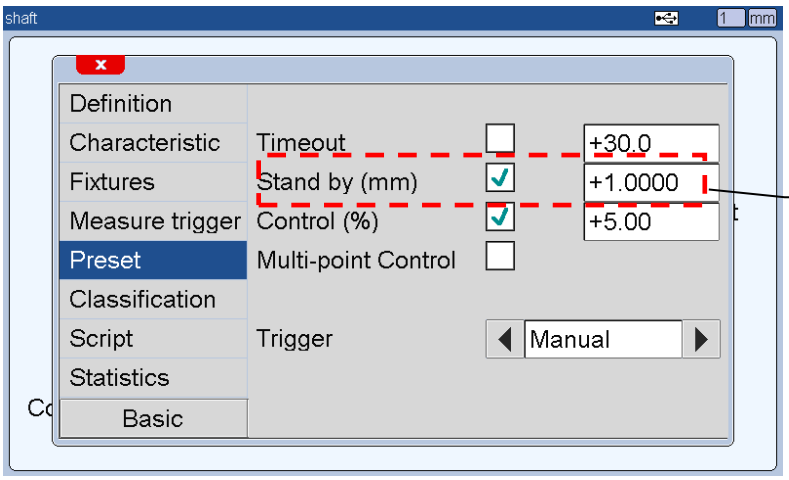


Repetition test (check):

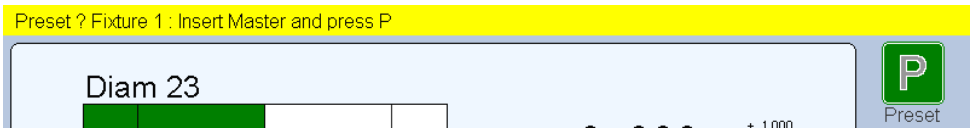
The purpose of this test is to check the position of the standard during calibration as well as the condition of the system (e.g. to check that no chip is stuck between the standard and the sensor).

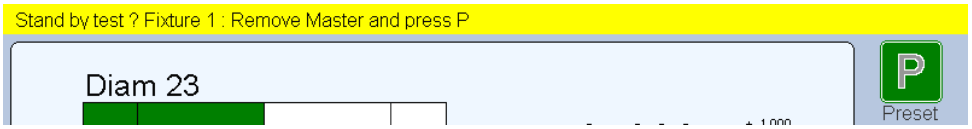
The standard is measured twice and the TT100 checks that the difference between the measurements does not exceed the repetition value.

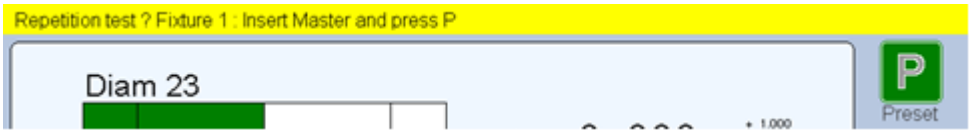
This value is a percentage (max. 25 %) of the tolerance interval. This value is therefore different for each characteristic.



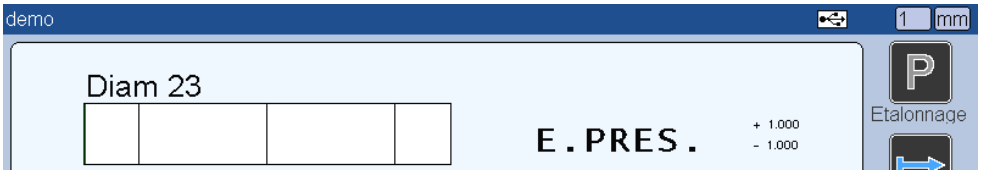
To pass the repetition test, the characteristic must not vary by more than 5 % of the tolerance interval defined between the two positions of the part in the 'CHARACTERISTIC' menu.





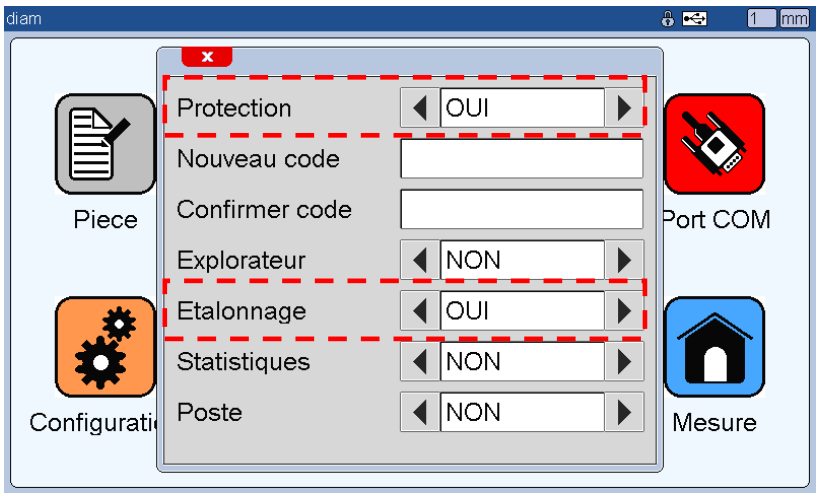


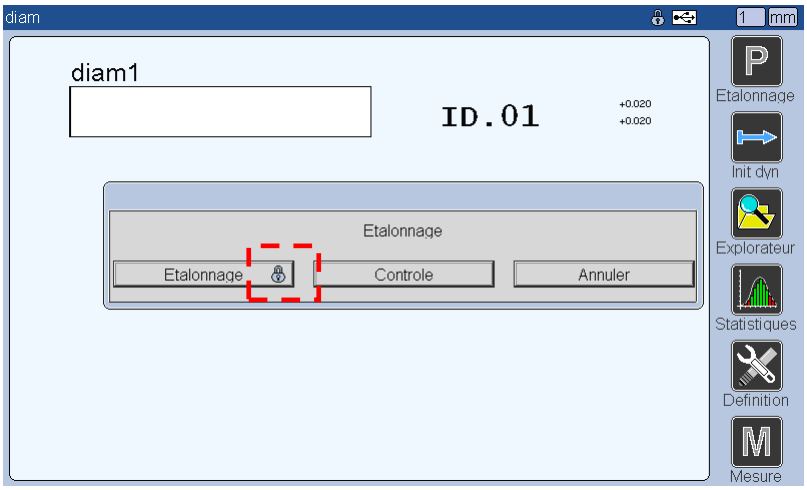
If the value of the sensor(s) of the characteristic in question has changed by at least the value of the 'stand-by' field, the procedure ends; otherwise, the value of the characteristic is replaced by the text 'E.PRES.'



If the 'Calibration' function is protected by a password in the 'Lock' menu, the preset sequence will only open in 'Control' mode. To override the previously preset value, a password is required.

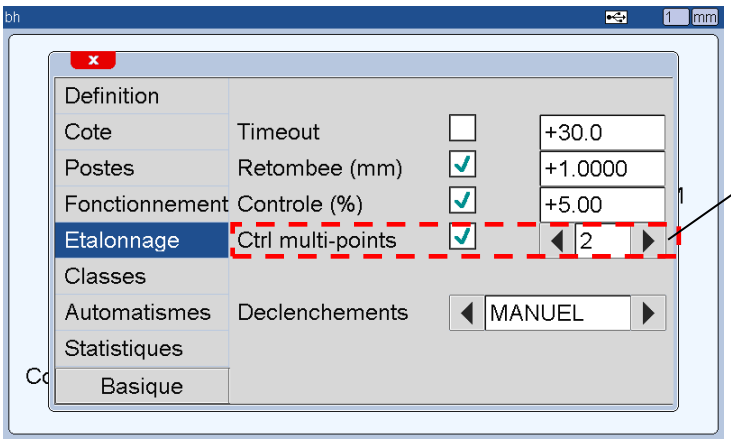
The 'Preset' button is supplemented with a lock icon as shown below.





Multi-point repetition test:

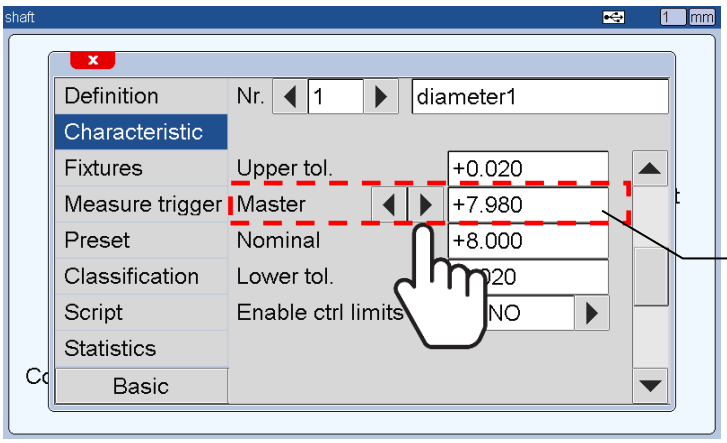
If the stand-by and repetition tests are enabled, the ‘Multi-point control’ field appears and allows the performance of multi-point tests.



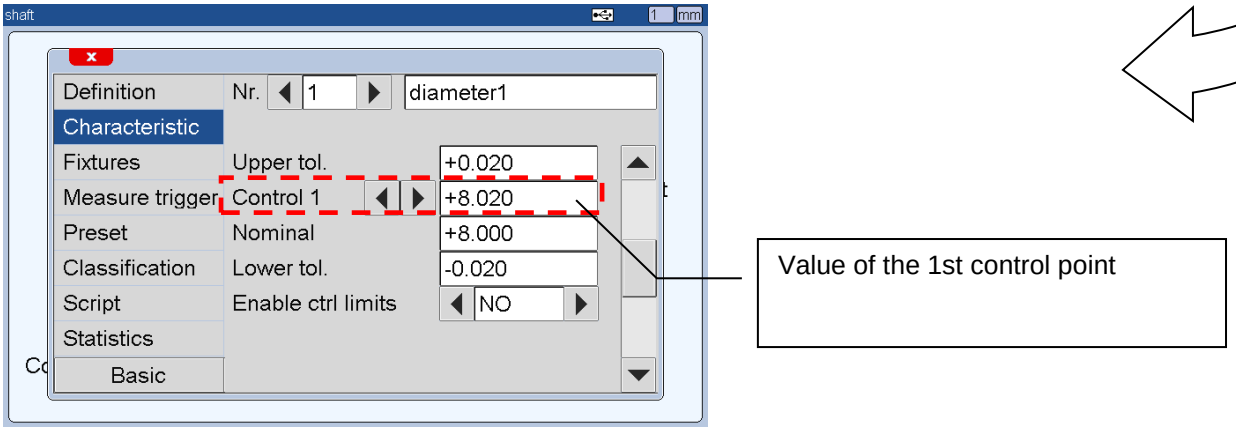
Selection of 2 or 3 points

If this function is disabled, only 1 point (the standard) is used

By choosing ‘Multi-point control’, the ‘Part->Characteristic’ menu is modified. It is possible to insert the values of 1 or 2 control standards in addition to the basic standard.

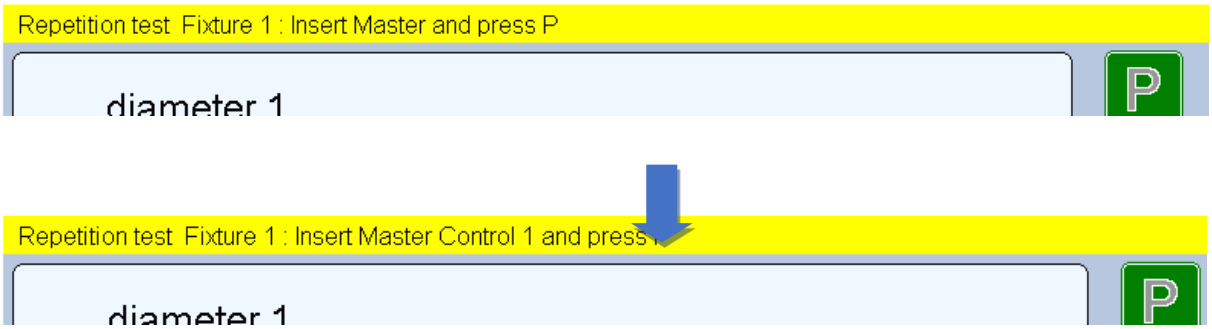


Press the arrow to enter the value 1 for the control standard and then the value 2.



From the measurement screen, a 2 or 3-point verification can be performed.
This allows a check of the linearity of the system.

As with the simple calibration, simply follow the instructions in the yellow bar.



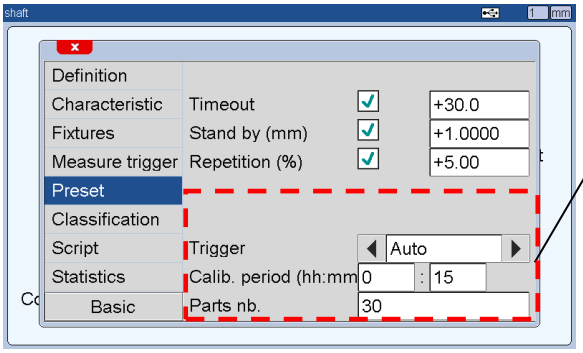
Calibration validity:

A calibration validity period can be defined, or a number of pieces before recalibration.

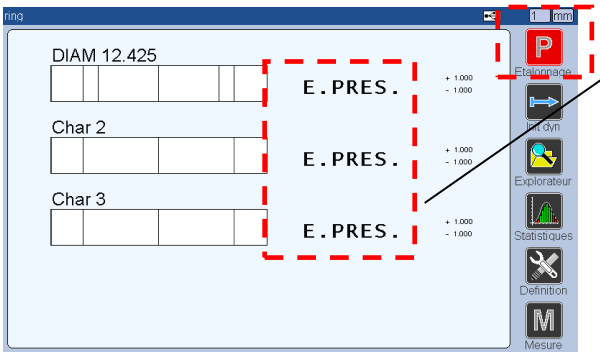
Performing regular calibrations is recommended to limit the effects of temperature, pressure (air pressure), etc. on the measurement.

Once a duration or a part count has been entered in the ‘PART → CALIBRATION’ menu and after calibrating for the first time, the ‘Preset’ button turns red and the message ‘PRESET ERROR’ is displayed instead of the characteristics. The situation returns to normal after calibration.

To use the part counter, activate the ‘MEM’ function in the ‘Configuration’ menu of the ‘M’ button or the foot switch.



In this case, the calibration is requested automatically after either 1 hour or 30 parts.



When the calibration is no longer valid, the message ‘E.PRES’ appears. Simply restart the procedure by pressing the ‘P’ button

7.1.4 Classification

The TT100 offers the possibility of sorting a characteristic by dimensional classes.

To use this function, enter the number of classes (up to 16) and the characteristic on which the class sorting is performed.

When a display with N classes is chosen, each class has the tolerance interval divided by the number of classes. For example, a tolerance interval [-1; +1] divided into 4 classes is carried out as follows:

-Class 1 [-1; -0.5]

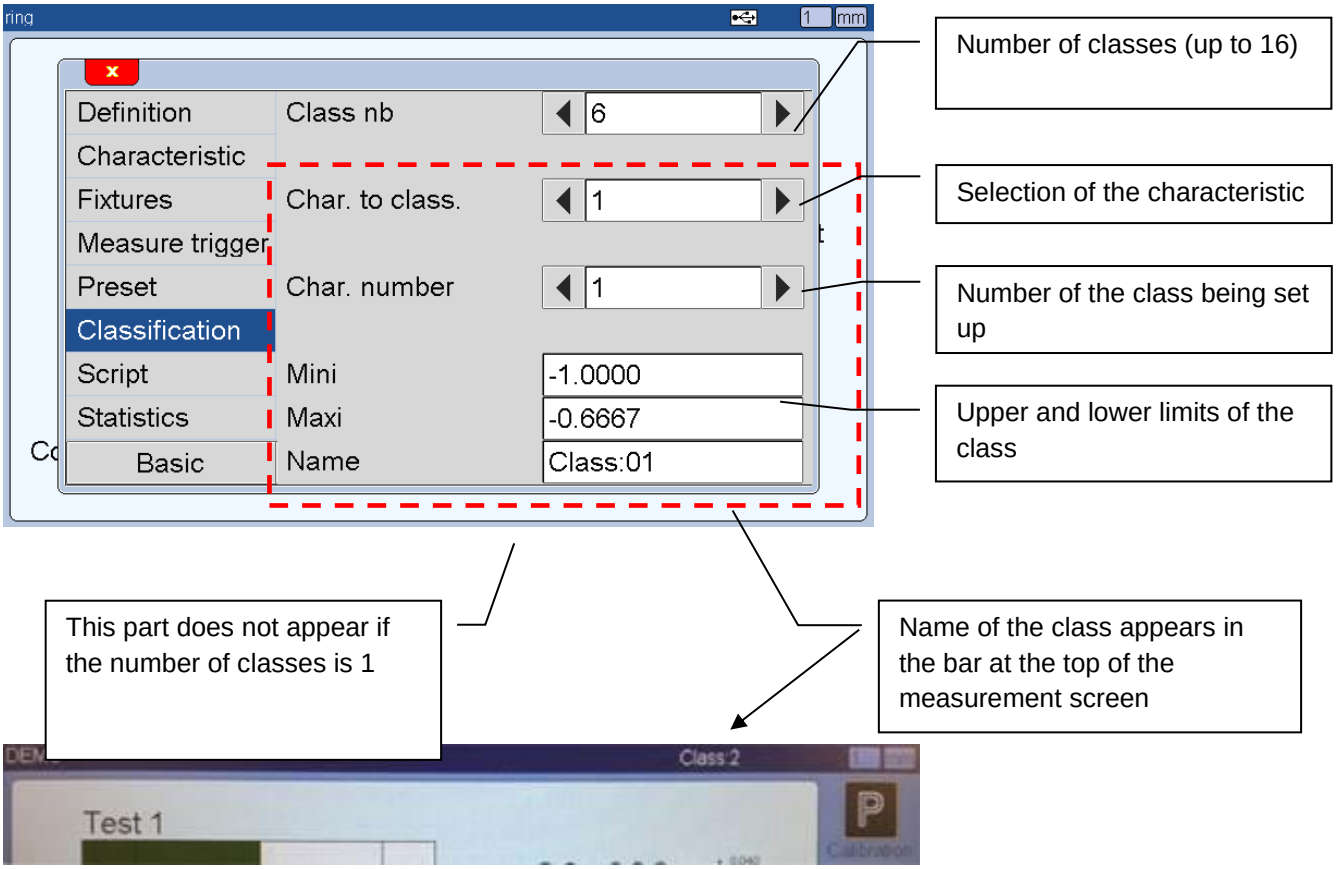
-Class 2 [-0.5; 0]

-Class 3 [0; 0.5]

-Class 4 [0.5; 1]

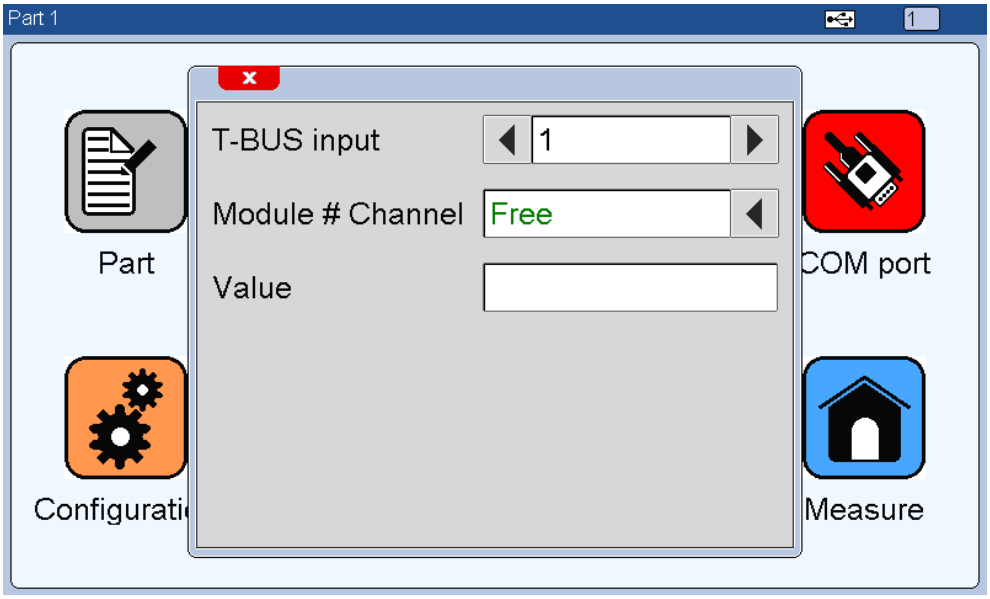
The class boundaries can be delimited manually.

The classes can also be sent to a TESA-MODUL IO-8 for each measurement made on a characteristic.



7.2 TESA-BUS





This window identifies a TESA-MODUL on the TESA BUS for connection of the sensors and displays the value of the sensor to verify its status or adjust its position.

Digital sensors and TESA BUS modules are connected on a bus. It is therefore necessary to identify them.

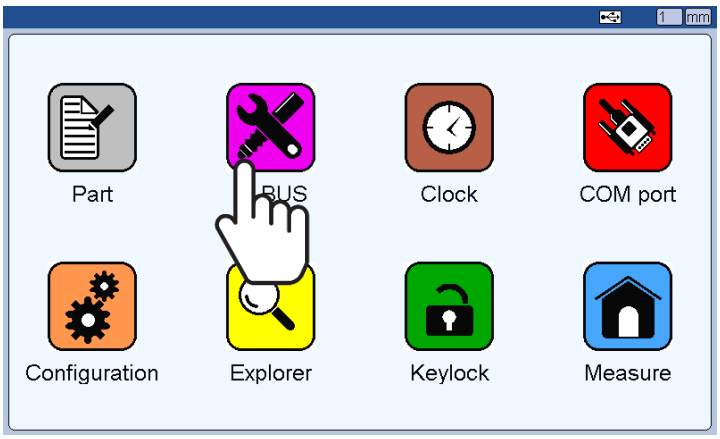
7.2.1 Adding a module

All TESA-MODULs are connected according to the following procedure.

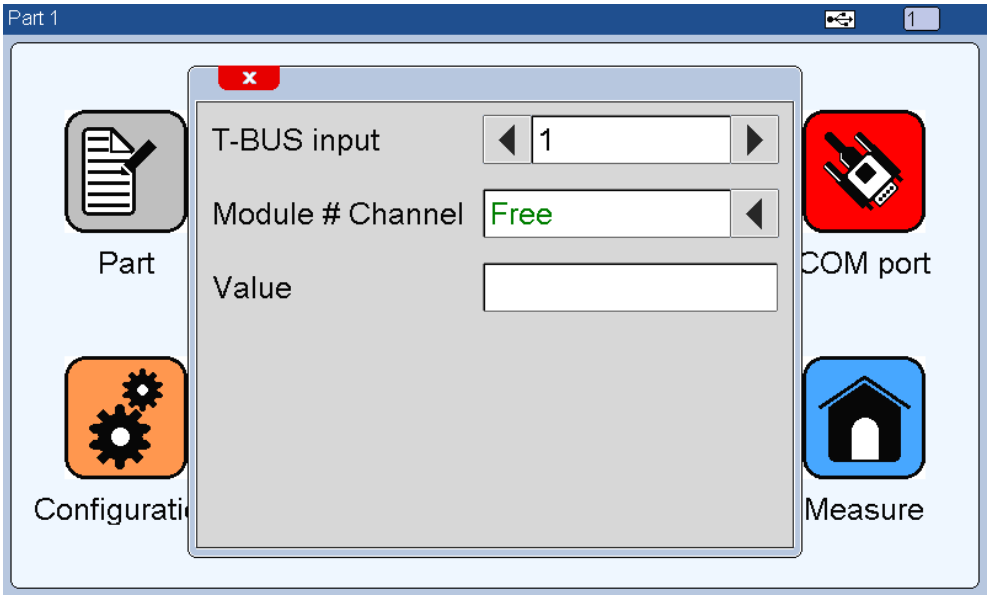
1. With the TT100 switched off, please connect the first module to the TT100 via the TESA BUS cable D-sub 9p/f to D-sub 9p/m (04761052).
2. Start the TT100
3. The LED on the module flashes.
4. The TT100 starts on the measurement screen. Go to the configuration screen by pressing the ‘Definition’ button.



5. The icon desktop appears:



6. This window appears, no module is identified:



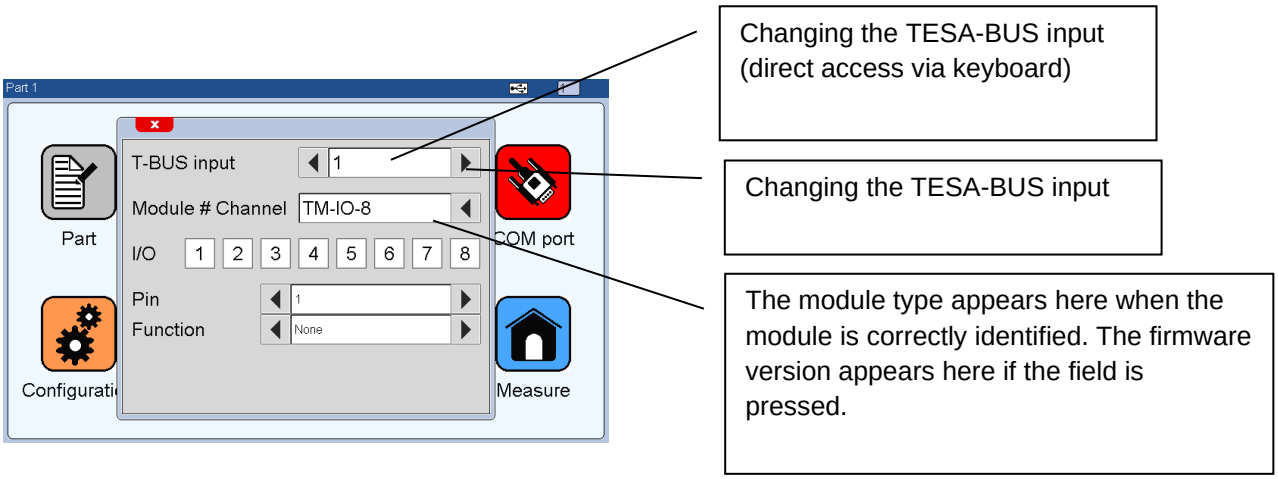
If instead of 'Free' the indication 'Absent' or a TESA-BUS module reference appears (e.g. TM-8I#1), this means respectively that a module had been identified but is not connected (indication 'Absent') or that a module is identified and connected (display of the module reference, e.g. TM-8I#1)

7. To identify the module, press the 'ID' button on the module.



8. Once identified, the module LED stops flashing and lights up permanently.

9. The module type is displayed, and each channel of the module is automatically detected and identified. For example, if you identify a TM-8I (module for 8 inductive sensors), it is only necessary to select the first input and press the ID button to identify all 8 channels, even if not all channels are used. This means that if you identify a module after the TM-8I, it can be identified from input no. 9.



10. To identify the next module, select the next free TESA BUS input (e.g. input no. 9 if the first module was a TM-8I for 8 inputs) and identify it.

11. Each channel of this second module is now identified.

12. Sensors or instruments can now be used. To use input no. 1 on a measurement, the formula is C (1) on the formula editor.

7.2.2 Deleting a module

As each module has a unique identification number, it is necessary to deactivate a module if it needs to be replaced or removed.

1 - Switch off the TT100

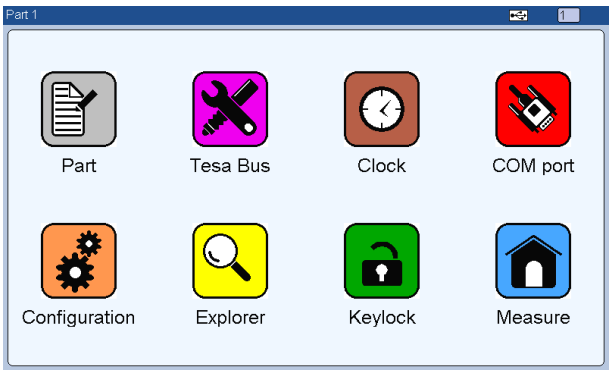
2 - Remove the T-BUS module

3 - Switch on the TT100

4 - The TT100 starts on the measurement screen. Access the configuration screen by pressing the ‘Definition’ button.



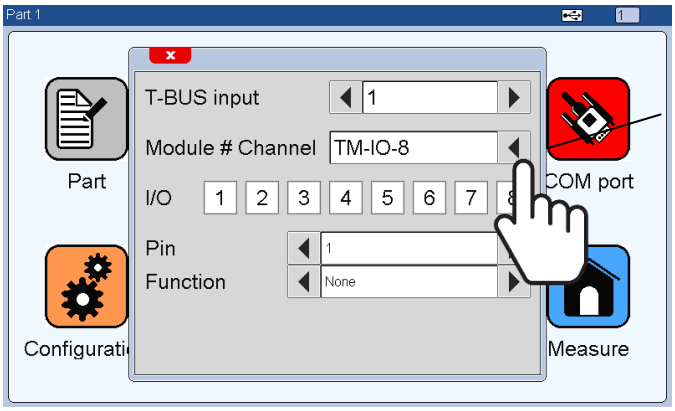
5 - The desktop icon appears



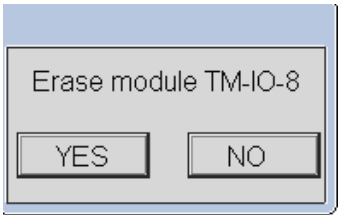
Press the ‘T-Bus’ button

6 - Select the module input to be deleted.

7 - Press the arrow on the right of the identification number. A message of the following form appears ‘Delete module TM-8I?’. After pressing ‘Yes’, the ID numbers of all module inputs disappear.



Press this arrow to deactivate the corresponding module. The confirmation message appears.

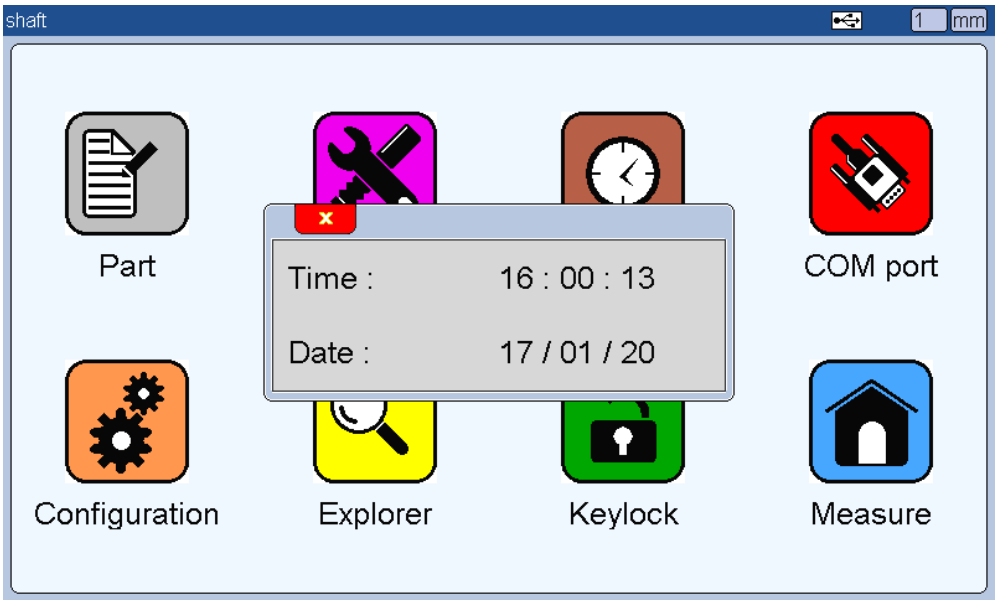


7.3 Clock



This menu enables the time to be set.

Simply touch the time or date and enter a new value on the keypad to change it.



7.4 COM port



Select this icon to configure the communication settings of the TT100.

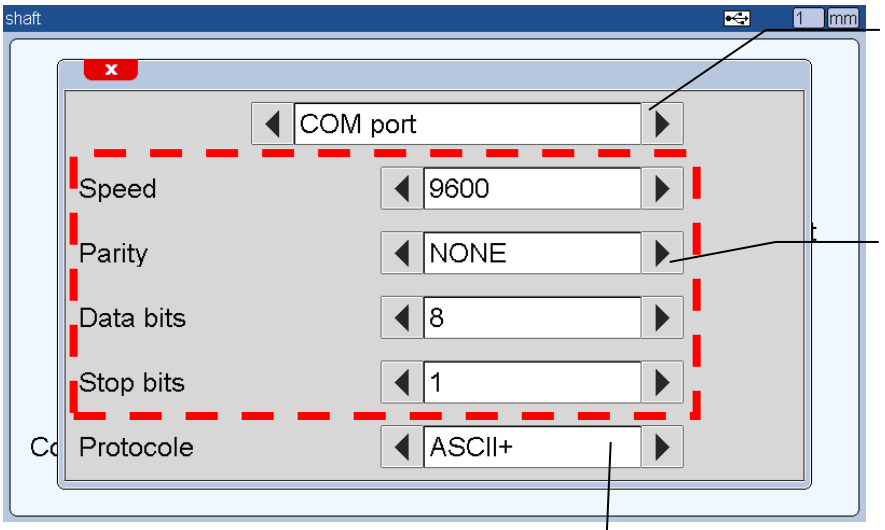
The TT100 is equipped with a standard D-sub 9p COM port and a virtual USB-A COM port. They are identified with the designation RS-232.

Use of the virtual COM port may require installation of the FTDI chip VCP driver.

Here is the download link: https://ftdichip.com/drivers/vcp-drivers/

The ‘COM port’ menu allows the configuration of both D-sub 9p COM ports and the USB-A virtual COM port.

Both ports can be used simultaneously.



Select the COM port to be configured: D-SUB9 or USB virtual COM port

RS232 settings

Selection of the RS-232 communication protocol

- ASCII or ASCII+
- MODBUS RTU
- DMX16 (Mitutoyo)
- Mux-AM

ASCII protocol description

Four ASCII protocols are available. The following are examples of the data transmission results for each protocol.

In the following example, 4 characteristics are programmed on 1 fixture.

ASCII

+0.5850000,+0.5900000,+0.5860000,+0.5860000,<CR>

DMX 16

01 MW +0.5850000<CR><LF>

02 MW +0.5900000<CR><LF>

03 MW +0.5860000<CR><LF>

04 MW +0.5860000<CR><LF>

ASCII+

PART=SHAFT,FIXTURE=1,FIXTURE_STATE=GO<CR>

CH[1]:Char 1=+0.585000,STATE=GO,LTL=-1.000000,NOM=+0.000000,UTL=+1.000000,<CR>

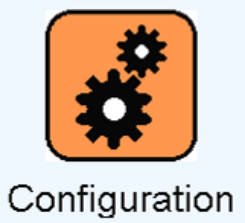
CH[2]:Char 2=+0.590000,STATE=GO,LTL=-1.000000,NOM=+0.000000,UTL=+1.000000,<CR>

CH[3]:Char 3=+0.586000,STATE=GO,LTL=-1.000000,NOM=+0.000000,UTL=+1.000000,<CR>

CH[4]:Char 4=+0.586000,STATE=GO,LTL=-1.000000,NOM=+0.000000,UTL=+1.000000,<CR>

DATE=21/02/05,TIME=18:02:04<CR><LF>

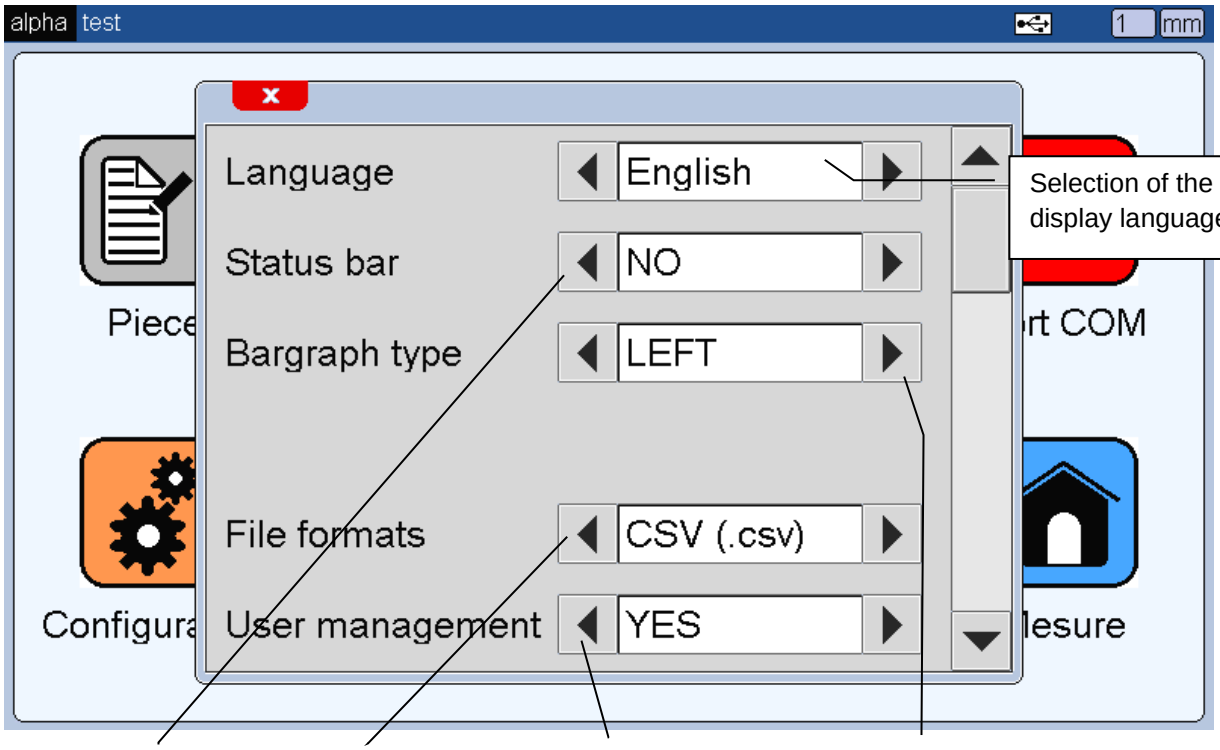
7.5 Configuration



This menu allows the configuration of the general parameters of your TT100 (languages, etc.) but also the function of the foot switch and the 'M' button of the measurement screen.

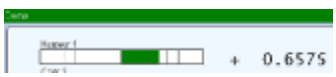
This window is divided into 4 pages.

7.5.1 Page 1, General settings

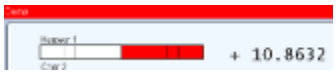


The title bar can be changed to green or red if all the characteristics of a fixture are good or not.

Fixture OK:



Fixture NOK:

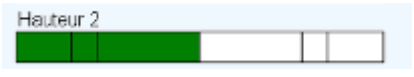


Selection of the file format for USB export: CSV or QDAS (.dqf)

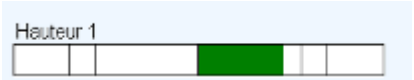
Enables the user name to be entered at the start of the measurements or when the TT100 is switched on. This data is transferred to the TM-NTW

Graph type for multiple measurements

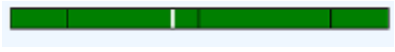
Left:



Centre:

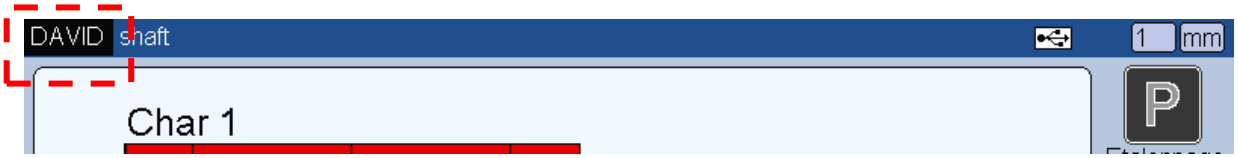


Cursor:

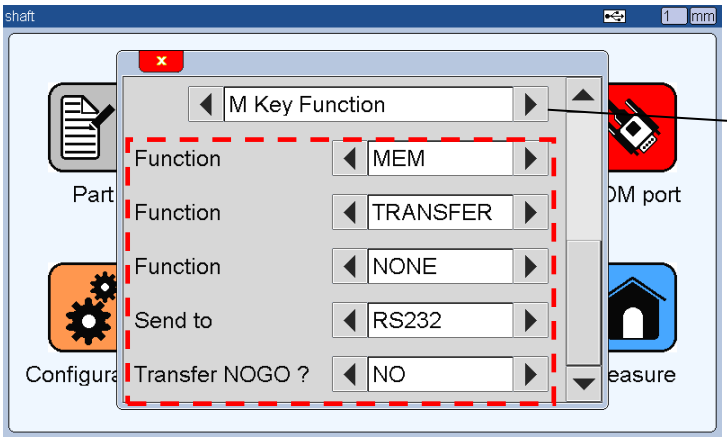


If user management is selected in the ‘P1 configuration’ menu when starting the TT100 or measurements, this screen appears for entering the user name.

Then the user name appears in the corner; to change the user, press the user name.



7.5.2 Page 2, General settings



Allows the choice of whether the functions in the red area apply to a foot switch action or a press of the ‘M’ button on the measurement screen



In the first menu, the user must choose whether to configure the functions (or the sequence of functions) by pressing on the ‘M’ button of the measurement screen or following a press of the foot switch.

Up to three functions can be selected per actuator (i.e. 3 foot switch functions and 3 ‘M’ button functions).

Following a foot switch or ‘M’ button action, the functions are executed one after the other.

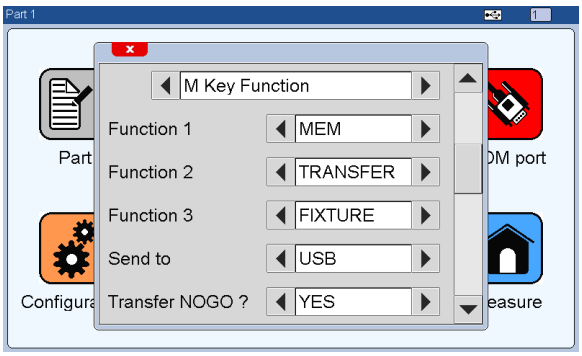
Example:

After pressing on the ‘M’ button, the configuration below makes it possible to:

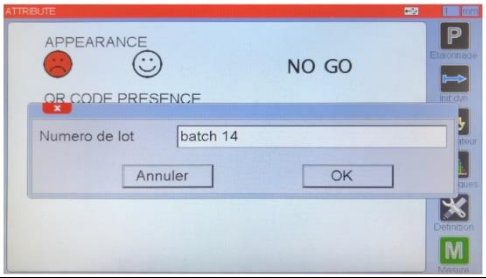
- save the measurement in the TT100 memory to display the curves

- then transfer the measurement to a USB key

- then change the fixture to go to the next characteristic

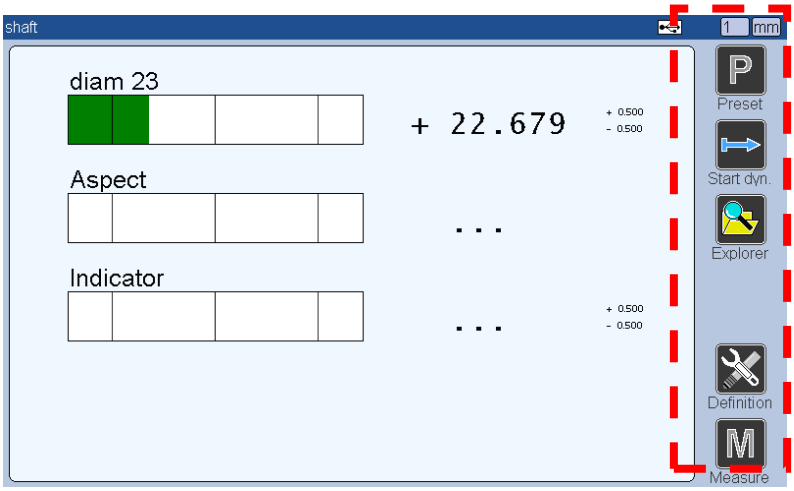


List of available functions:

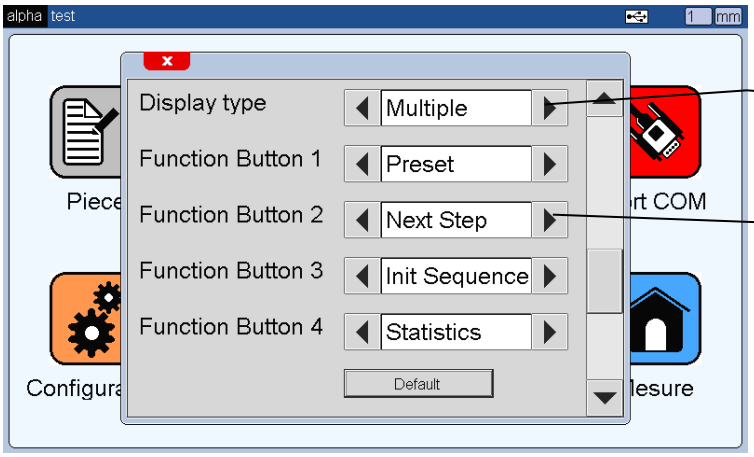
Title	Description	Parameter or comment
NONE	No function is assigned	
INIT DYN	Start of dynamic measurement (max-min, etc.)	
FIXTURE	Displays the next fixture (page)	
Transfer	Transfer the displayed value(s) to RS232, USB key or USB (keyboard emulation)	Choice between - RS-232 - Keyboard - USB stick - TM-NTW → See the 'DATA EXPORT' chapter for more information on this subject. It is also possible not to transfer the parts out of tolerance (NOGO transfer = YES)
Xfer+Popup	When at least one field has been filled in the 'PARTS-STATISTICS' menu, a pop-up window appears asking for the field(s) to be filled in before the data transfer.  	Choice between - RS-232 - Keyboard - USB stick - TM-NTW → See the 'DATA EXPORT' chapter for more information on this subject. It is also possible not to transfer the parts out of tolerance (NOGO transfer = YES)
PRESET	Calibrates the characteristics of the active fixture according to the calibration mode chosen in the 'PART-FIXTURE' menu (complete fixture, characteristic/characteristic or group/group)	
CALIB FIXTURE	Calibrates all the characteristics of the active fixture, regardless of the calibration mode chosen in the 'PART-FIXTURE' menu	
MEM	Saves the characteristics in the internal memory of the TT100 (limited to about 1000 parts per part reference).	
SCREENSHOT	Creates a BMP file on the USB stick (screenshot)	
CORRECTOR	Displays the deviation of the displayed characteristics from the nominal, multiplied by a factor that appears in the 'PART-CHARACTERISTIC' menu when this function is selected. When this mode is activated, the characteristics are displayed in red	<u>Example:</u> Nominal characteristic = 8.00 mm Displayed characteristic = 8.02 mm Corrector = 0.5 By activating the function, the displayed characteristic becomes: 0.010 (8.02-8.00)*0.5 If this function is selected, the other functions are deactivated.

7.5.3 Page 3, configuration of the side menu on the measurement screen

It is possible to customise the interface according to the type of measurement screen display.



The configuration is made from page 3 of the 'Configuration' menu:



Selection of the measurement display format (analog, SPC, multi-functional, digital)

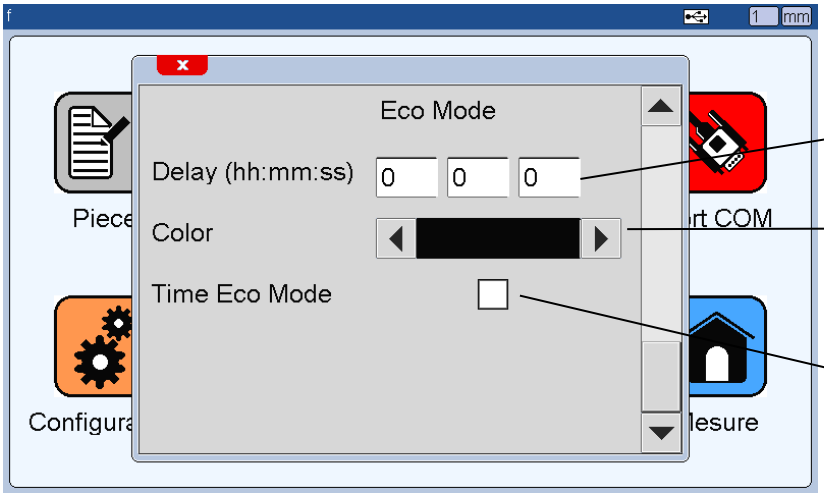
The 4 buttons are defined by default but can be configured according to the selections in the following table. They appear in the right-side menu of the measurement screen (see Chapter 7.3)

List of available buttons:

Title	Description
None	No icon appears
Calibration	Before starting measurement, the TT100 must be calibrated. Place a standard part under your sensor and press this button. If 'Calibration control' mode has been selected, the control test is performed immediately after calibration.
INIT DYN	Starts the dynamic measurement (max-min, mini, maxi, average, median)
Raz	Displays value changes to 0 (only in 'Analog display' mode)
Num	Opens the pop-up for entering user fields (depending on the fields defined in the 'PARTS>Statistics' menu)
Next fixture	Displays the next fixture (page)
Next Seq	Starts the following function/step in the programmed sequence
Prev Seq	Returns to the previous function/step
Init Seq	Start of the programmed sequence
Stop	Allows the measurement to be temporarily frozen. When active, the background colour changes to red.
Explorer	Displays the explorer and enables the selection of another part reference (to delete, copy or create a part reference, go to the explorer of the icon desktop)
Statistics	Accesses the statistics functions. This button is only displayed if the statistics from the 'PART' menu has been activated ('Advanced' mode).

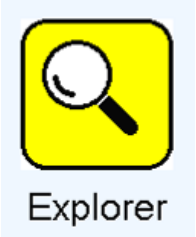
7.5.4 Page 4, 'ECO' mode

Configuration of 'Screen saving' mode



'Screen saving' mode is exited by a sensor movement or by touching the screen.

7.6 Explorer



The ‘Explorer’ menu makes it possible to select/copy/paste/delete a part reference

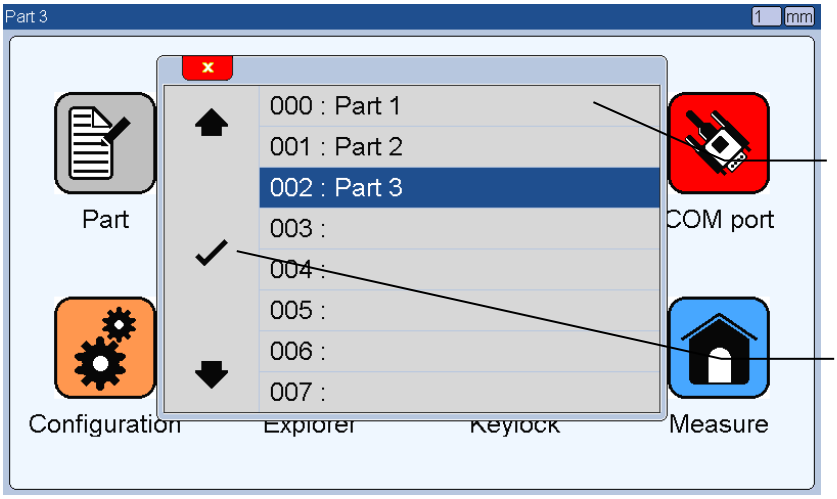
Up to 128 part references can be stored on the TT100.

The name of the reference is entered in the ‘PART → DEFINITION’ menu

There is another ‘Explorer’ icon on the measurement screen. This is only used to select the active part reference, not to create or delete other part references.

7.6.1 Part reference selection

To select a part reference (change part), simply select it from the list and confirm by pressing the button

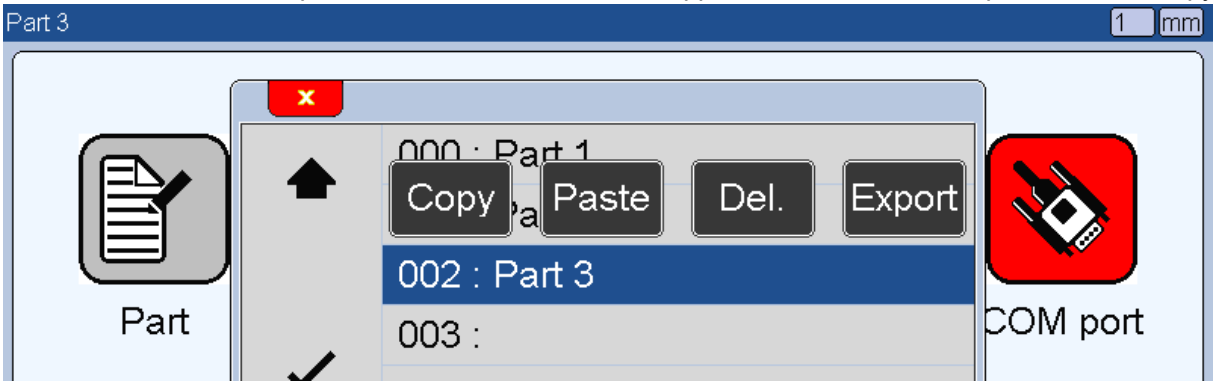


Select the part number by clicking on its name

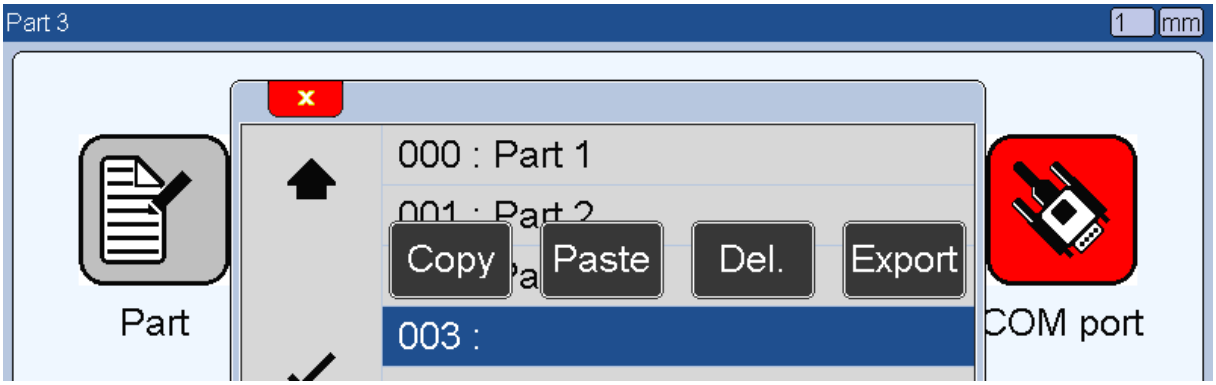
Validate the part reference and exit the window

7.6.2 Copy/paste of part references

1. Click for 2 seconds on the part reference ‘Part 3’. Buttons appear with the available options. Press ‘Copy’.



2. Select a free space, press for 2 seconds and then press ‘Paste’ on the button that appears.



3. A new reference has been created with the same name

   To change the name, go to the ‘PART → DEFINITION’ menu

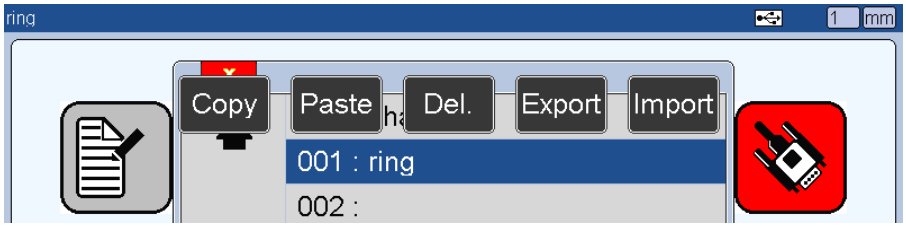
7.6.3 Deleting part references

1. Press the part reference for 2 seconds and a menu with the available options will appear.
2. Press on ‘DELETE’

7.6.4 Import/export of part references from USB stick

Export procedure:

1. Connect a USB stick. Check that it is detected by the presence of a USB icon in the top bar of the screen
2. Press the part reference for 2 seconds. A menu with the available options appears.
3. Press ‘Export’.

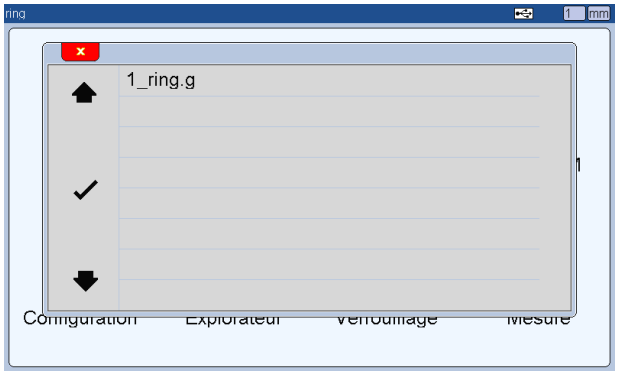


4. A file called ‘refpiece.g’ is created in the TT100_Part directory of the USB stick.

This function is only possible with 2 TT100s with the same software version.

Import procedure:

1. Connect a USB stick. Check that it is detected by the presence of a USB icon in the top bar of the screen
2. Press for 2 seconds on a blank reference line. A menu with the available options appears.
3. Press ‘Import’.
4. A window appears with the list of available parts on the USB stick.



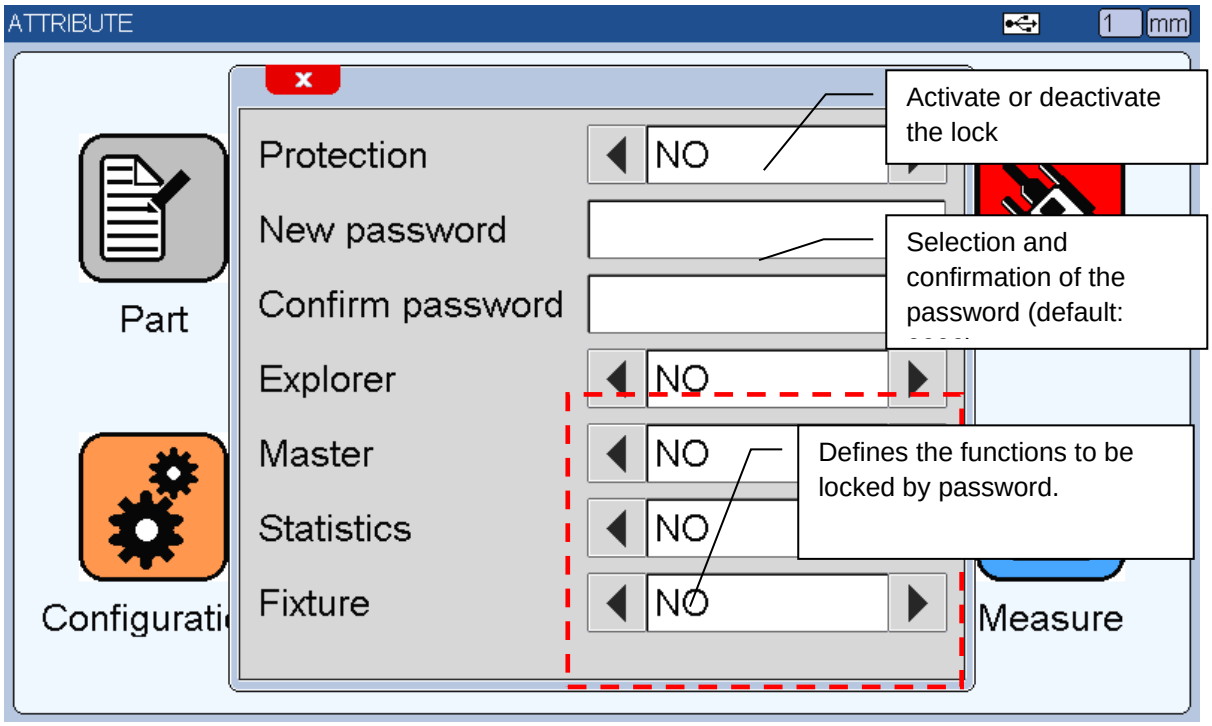
5. Select the programme and validate by pressing the button



7.7 Locking



After clicking on this button, the window below appears.
This screen enables certain functions of the TT100 to be locked with a password.



When the lock is active, a padlock appears in the top bar



If the password is lost, there is a generic password.
This is '74' + the last 2 digits of the firmware version number.
For example: for firmware version 2.00, the generic password will be 7400; for firmware V2.12, the password will be 7412

7.8 Measuring



This button is used to go to the measurement screen.

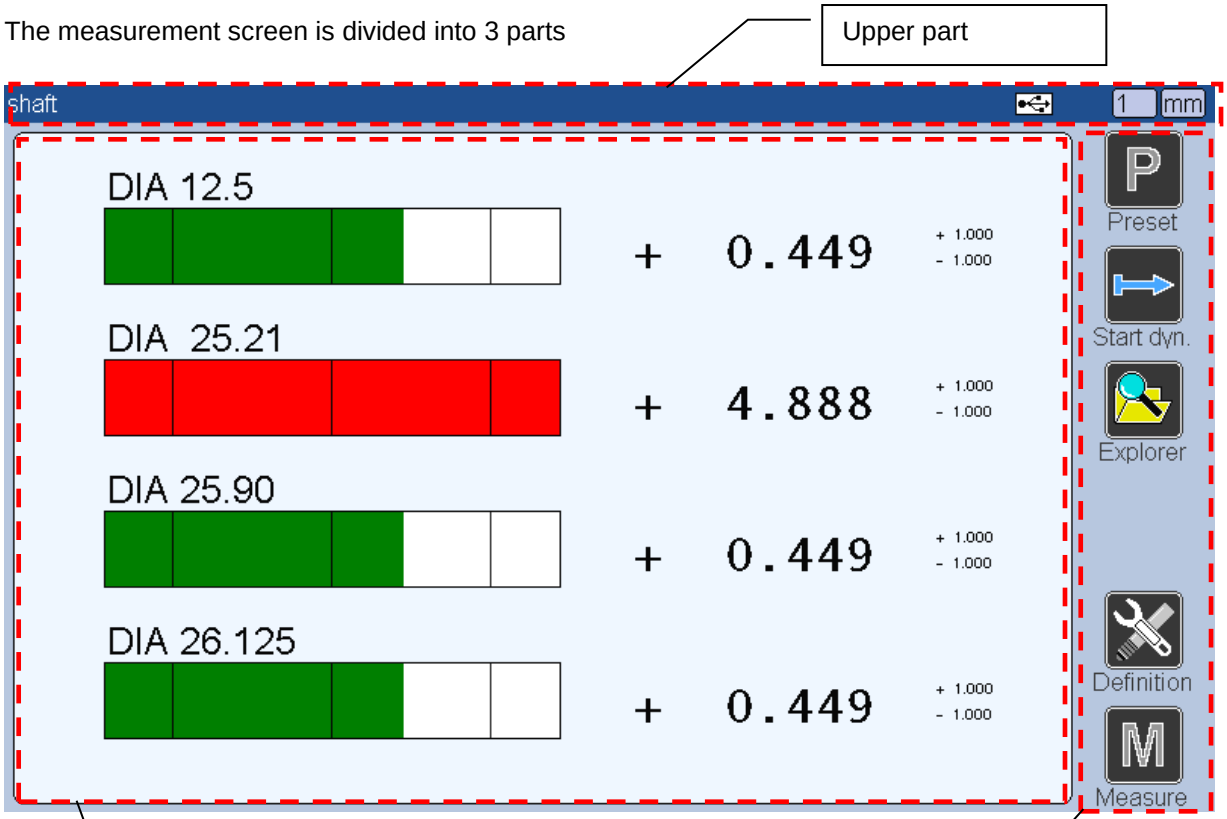
Please see the following chapter for an overview of the measurement screen.

8. MEASUREMENT SCREEN

The TT100 starts on this screen.
The measurement screen enables the characteristics of the part to be viewed and the statistical functions to be accessed.

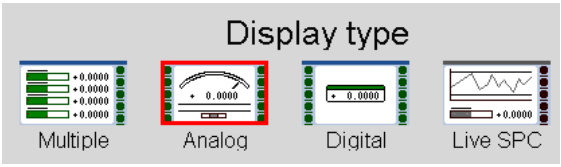
8.1 Measurement screen display

The measurement screen is divided into 3 parts

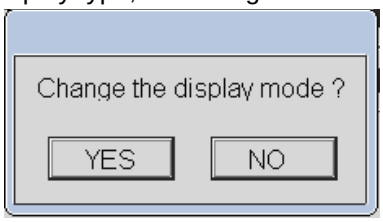


8.2 Type of display

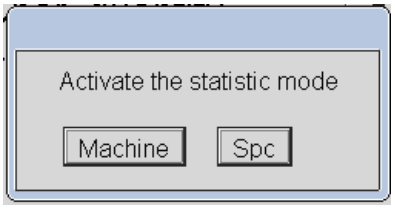
The TT100 has 4 display modes. 2 simple characteristics and 2 multi-functions.
(A multi-functional mode enables multiple characteristics to be displayed at the same time)
The selection of the 'Display' mode is made from the 'PART-DEFINITION' menu:



Before validating the change of the display type, a message asks the user to confirm.



To use the 'Live SPC' display mode, a window appears asking which type of statistics are to be used (Machine or SPC).



On the other hand, this choice activates the 'Advanced' mode of the PART menu by default.

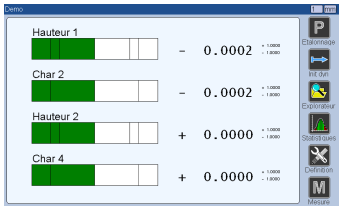
When the display mode is changed, this may change the configuration.
If, for example, a multi-functional fixture has been configured with 8 characteristics for a single fixture and the display mode is switched to 'Analog' allowing just 1 characteristic to be displayed per fixture, 8 fixtures with 1 characteristic are created.

8.2.1 'Multi-gauging' mode

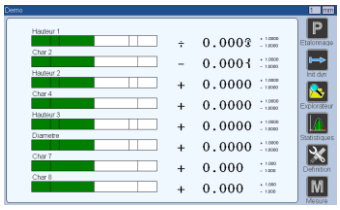
This mode enables between 1 and 32 characteristics to be displayed on the same screen.
The characteristics are displayed as a coloured bar graph according to the value of the characteristic in relation to the tolerance limits entered in the 'PART-CHARACTERISTIC' menu

The size of the bar graph changes according to the number of characteristics:

From 1 to 4 characteristics:

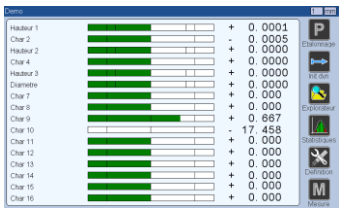


From 5 to 8 characteristics:



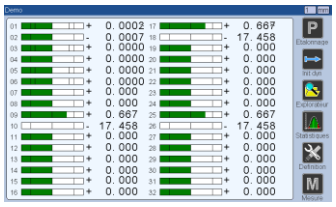
Up to 8 characteristics per screen, the tolerances are shown on the right-hand side of the characteristic.

From 9 to 16 characteristics:



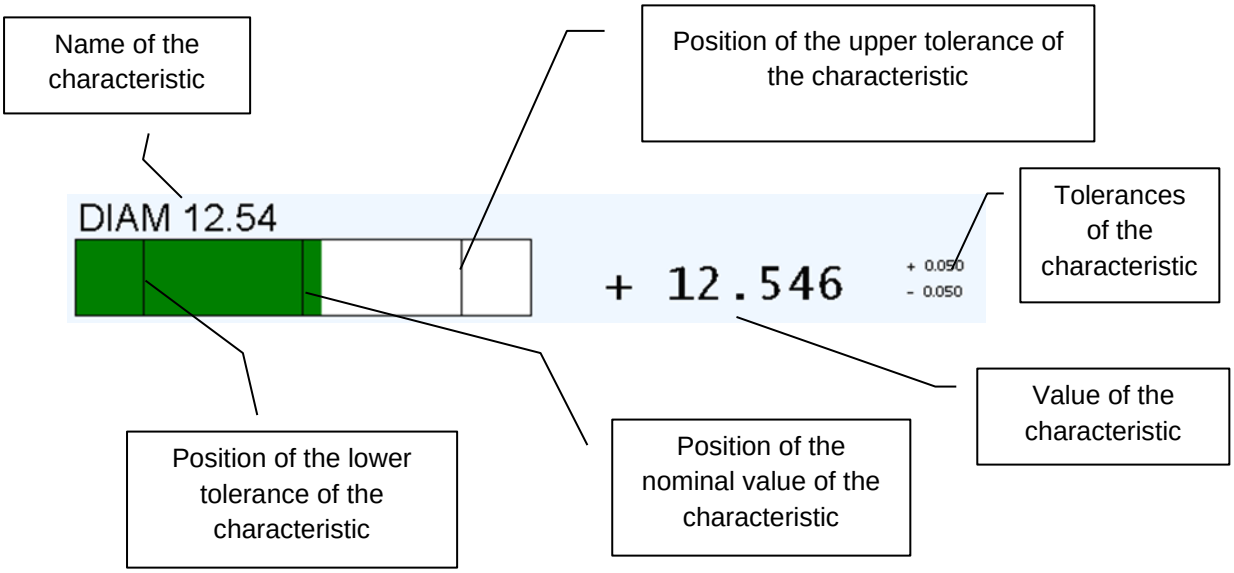
Up to 16 characteristics per screen, the part name is written on the left side of the bar graph.
Tolerance values are no longer displayed

From 17 to 32 characteristics:



With more than 16 characteristics, only the characteristic number is displayed.

Bar graph construction:



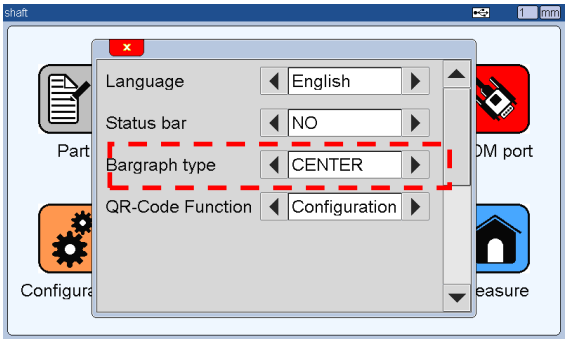
When the value of the characteristic exceeds the tolerance values, the bar graph turns red:



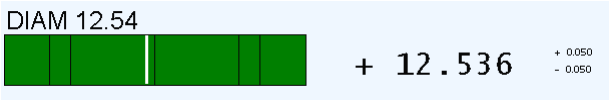
If control limits (‘PART□CHARACTERISTIC’ menu) are used, the bar graph can also turn yellow:



From the ‘Configuration’ menu, it is also possible to change the appearance of the bar graph (see ‘Configuration’ menu chapter).



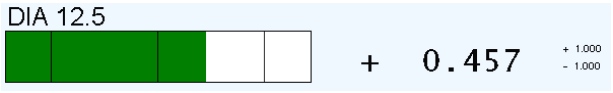
Cursor: The bar graph is completely GREEN, YELLOW or RED and the position of the characteristic is represented by a vertical white bar.



Centre: the origin of the bar graph is in the centre

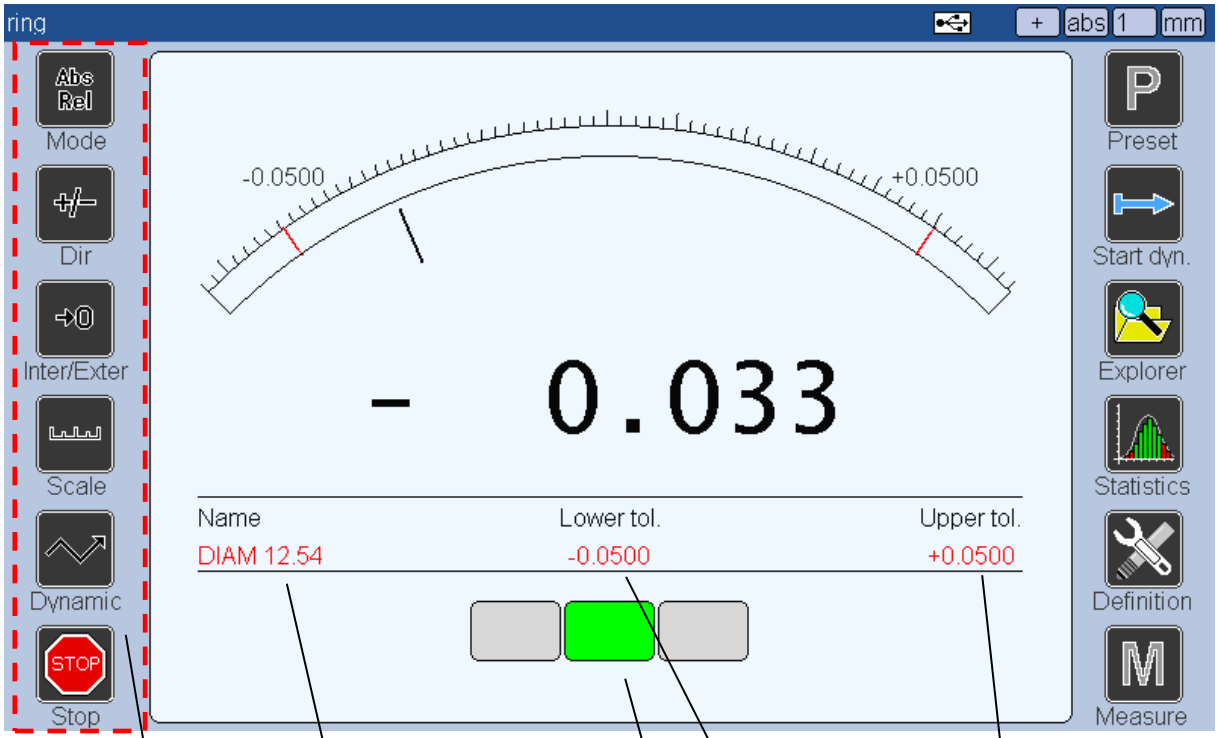


Left: the origin of the bar graph is on the left



8.2.2 'Analog' mode (characteristic by characteristic mode)

In this mode, only one characteristic is displayed on the screen and its position is represented by a needle.
Special functions are then available in the left-hand menu. See the next page for more details.



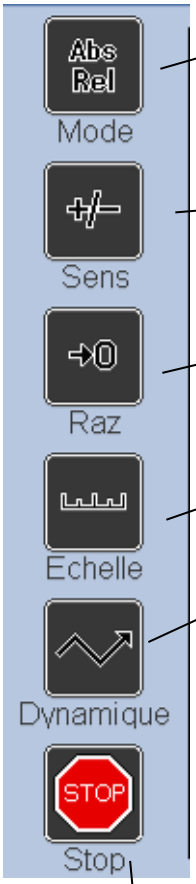
Name of the characteristic

Tolerance values

Access to the functions of the 'Characteristic by characteristic' mode. See the following pages for details

Coloured Go/No Go indicator

'Analog' mode functions



Relative or absolute mode. Enables a reference to be created at a certain position.

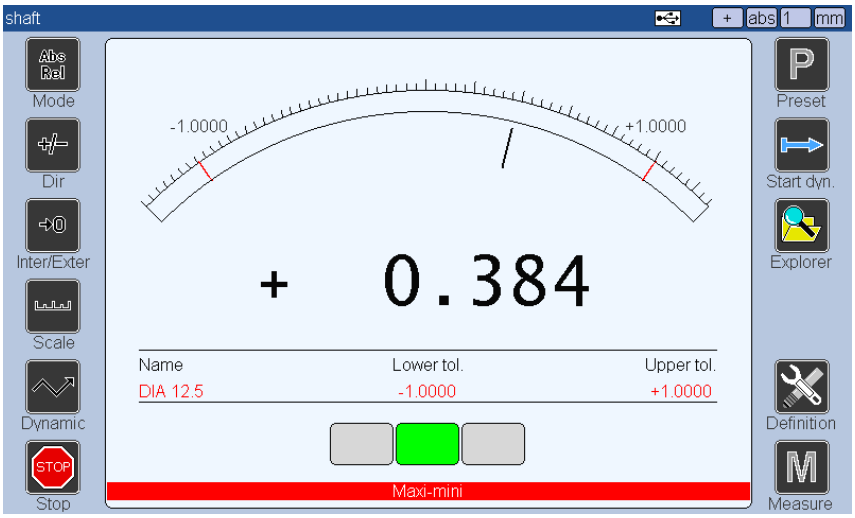
Reverses the direction of measurement.

Sets the displayed value to 0.

To change the scale of the galvanometer

Allows temporary access to dynamic measurement modes.

Each push button selects either max, min, max-min or average. The mode is indicated by a red bar at the bottom of the screen.

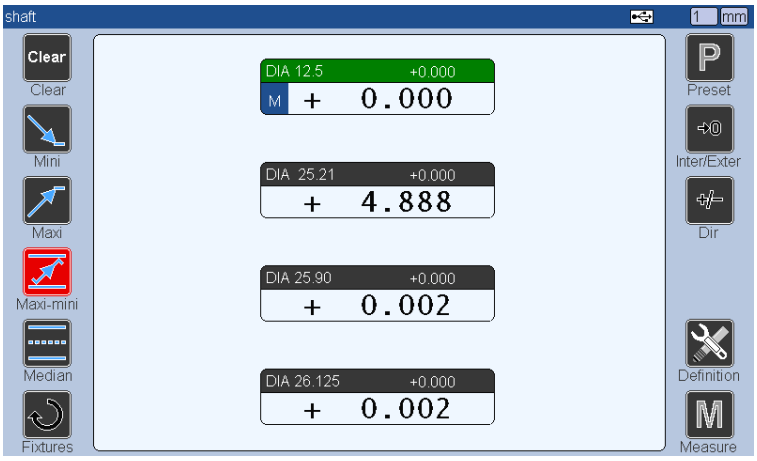


Allows the measurement to be temporarily frozen. When active, the background colour changes to red.

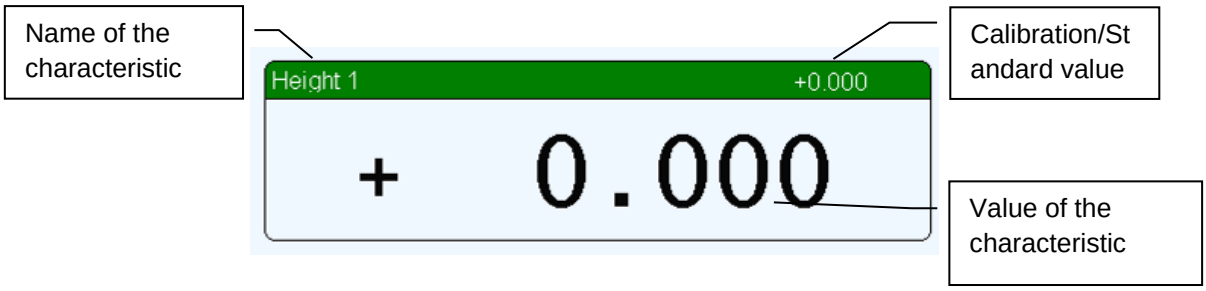


8.2.3 Numerical indicator (without tolerance indications)

This display mode allows one or more characteristics to be displayed at the same time.
This mode is well suited to the inspection of small series of parts



Each characteristic is displayed in an area containing the following information:

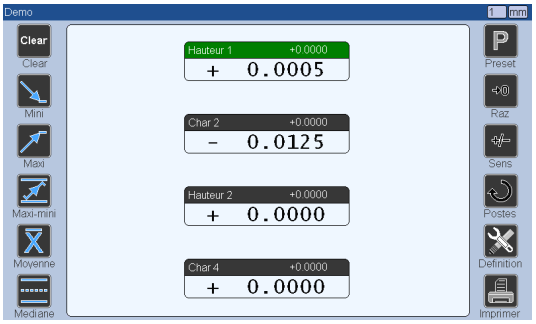


Up to 12 characteristics can be displayed on the same screen and up to 32 characteristics in total, shared between different fixtures (max. 32 fixtures)

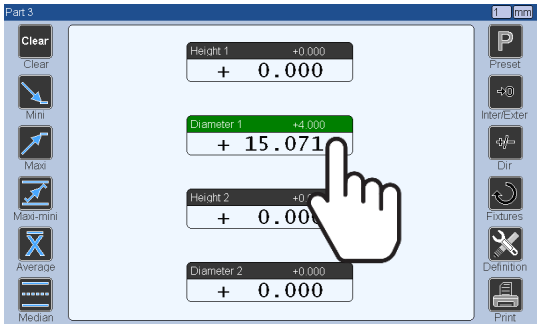
If several characteristics are displayed simultaneously, it is possible to make dynamic measurements (min, max ...) on a single characteristic. To do this, it is necessary to select the characteristic by clicking on its box. The selected box has a green bar on its upper part

Example:

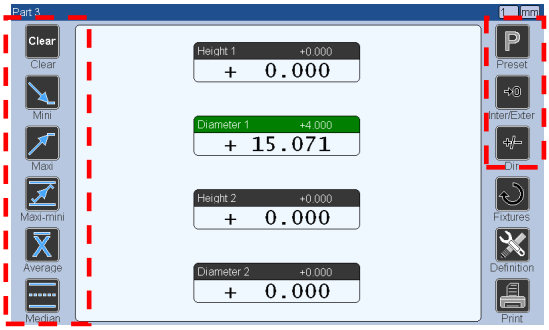
1. Characteristic 1 is selected.



2. Click on the number of characteristic 2. The upper part of the box turns green.



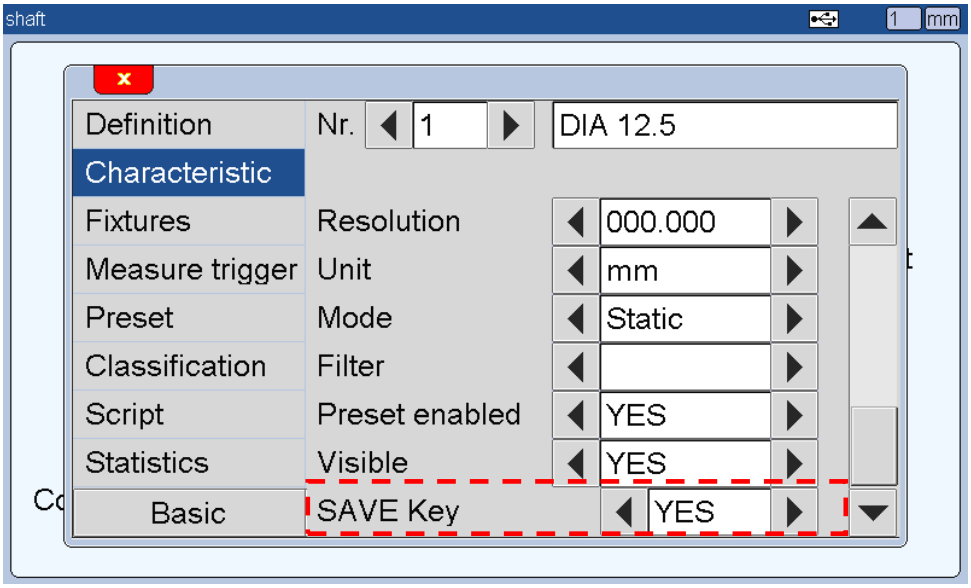
3. The following functions are now available for characteristic no. 2



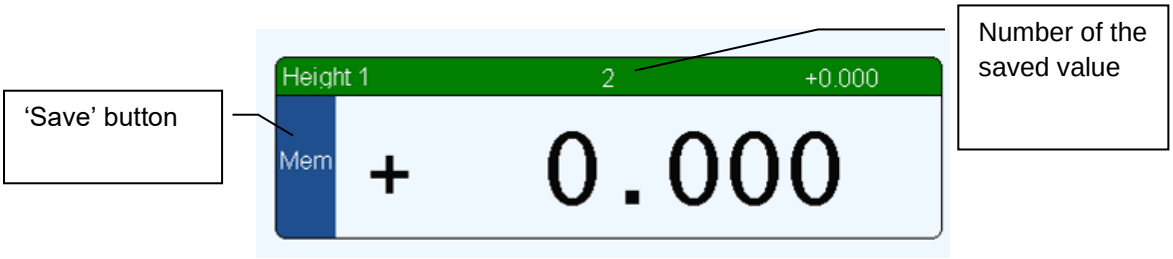
8.2.3.1 The 'MEM' (Memory) button

It is possible to add a blue button to save measurement points (up to 256) and use them for dynamic functions. The 'Advanced' mode of the 'PART' menu must be activated.

To have this button on a characteristic box, select 'Yes' in the 'PART → CHARACTERISTIC' → menu, 'MEM' button.



Each time the blue box is clicked, the stored value counter will increment. Then a function can be selected in the menu on the left.

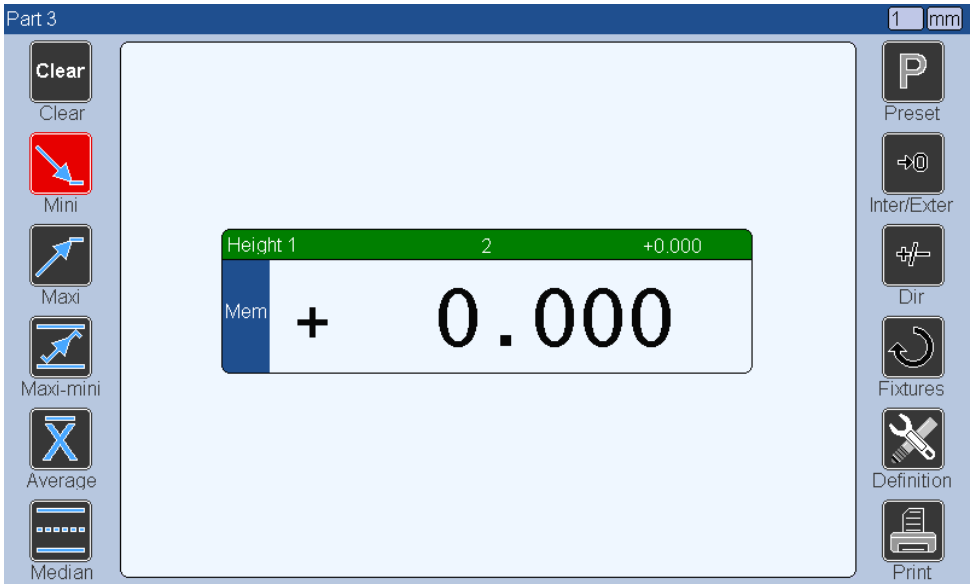


Characteristic box with saving activated

Example:
2 measurements are made and saved.

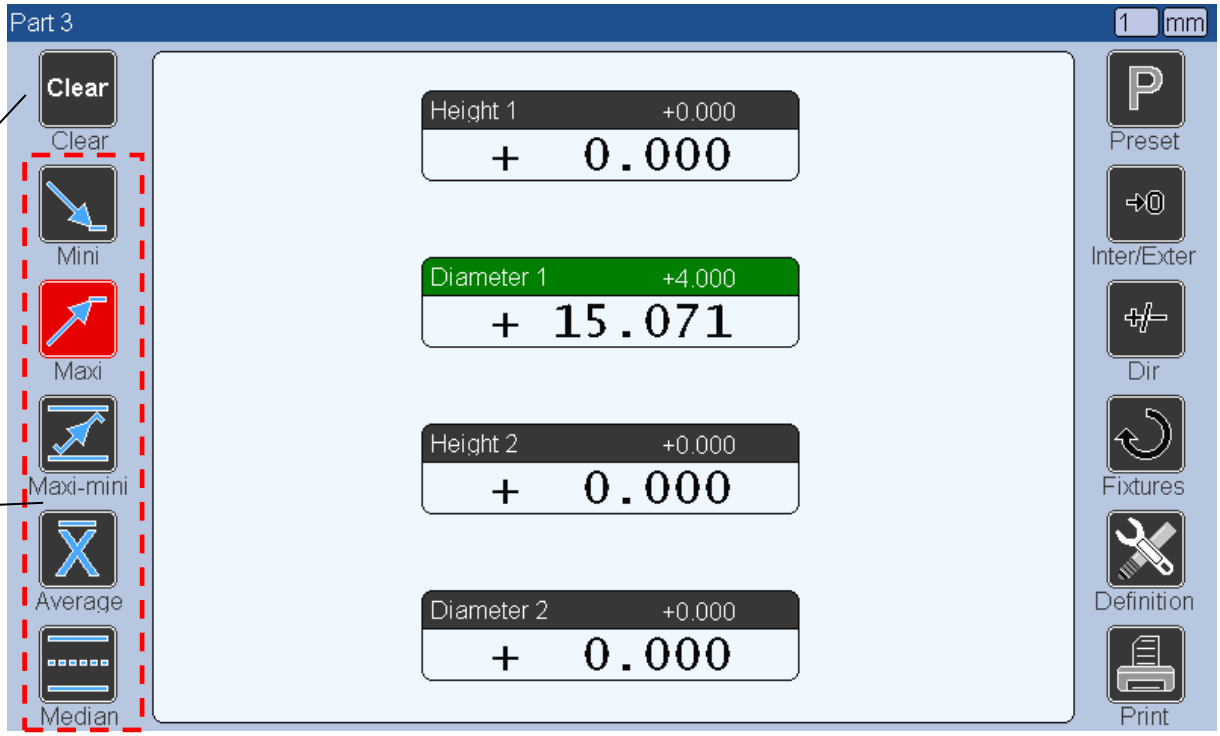
Recorded value 1 = 0.000 mm
Recorded value 2 = 4.000 mm

After saving the 2nd value, press the ‘Mini’ button.
The minimum value between the 2 saved values appears in the box.



To restart, click on the ‘Clear’ button and the counter value restarts.
To deselect a mode, click on it again or select another mode.

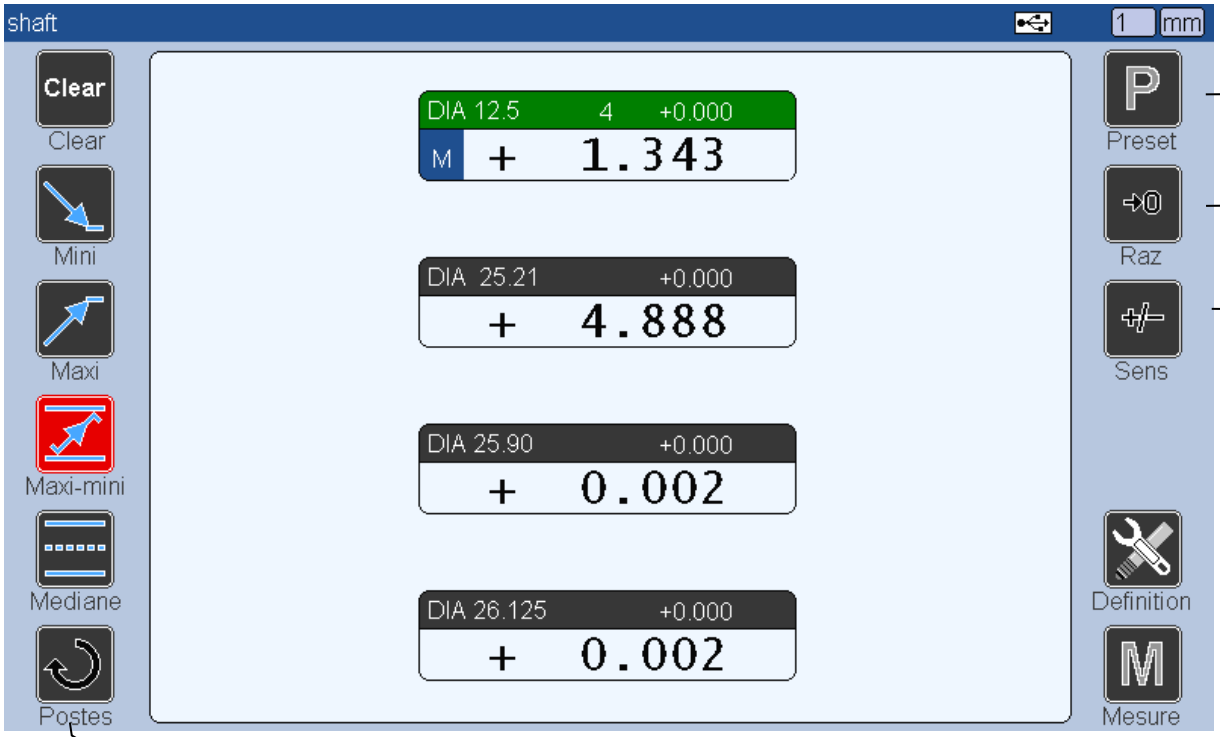
8.2.3.2 Temporary dynamic measurement mode



Dynamic measurement modes. The active mode turns red. To deselect a mode, click on it again or select another mode.

Press here to start a dynamic measurement.

8.2.3.3 Other functions



Changes the active fixture

Changes the direction of measurement

The displayed value changes to 0

Calibrates the active characteristic



Click here to change the name of the characteristic

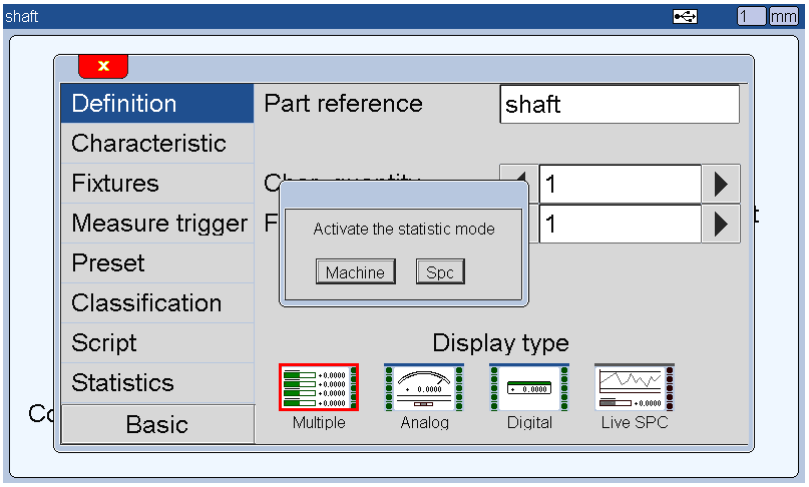
Click here to change the value of the standard

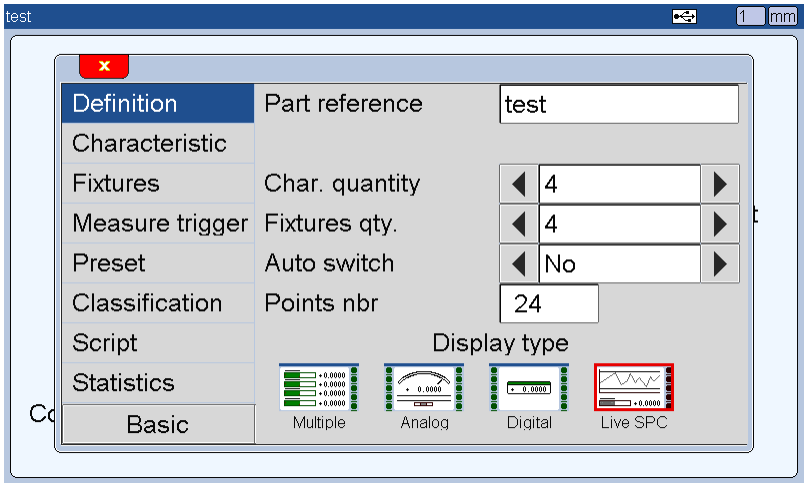
8.2.4 'Live SPC' mode (single characteristic + curve)

This display mode allows a characteristic to be displayed as a bar graph and, at the same time, the last recorded characteristics to be seen as a curve.

As this display mode is linked to statistics, when it is selected, the TT100 asks which type of statistics should be activated.

On the other hand, choosing this mode will automatically activate 'Advanced' mode.

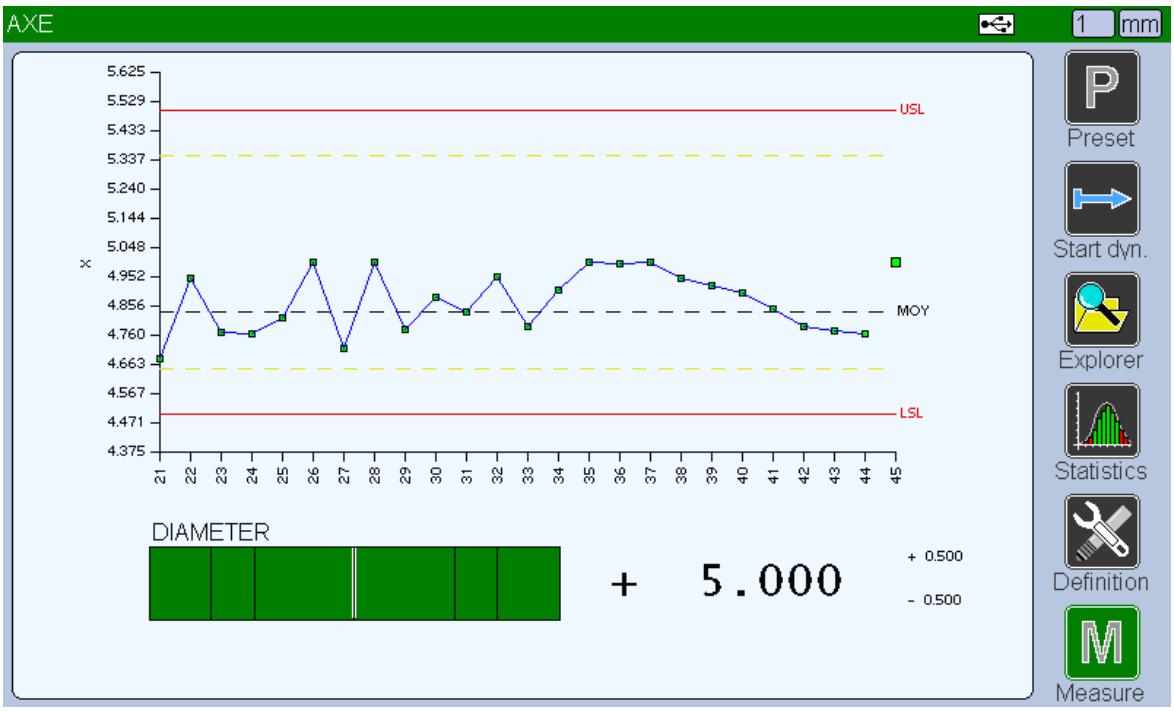




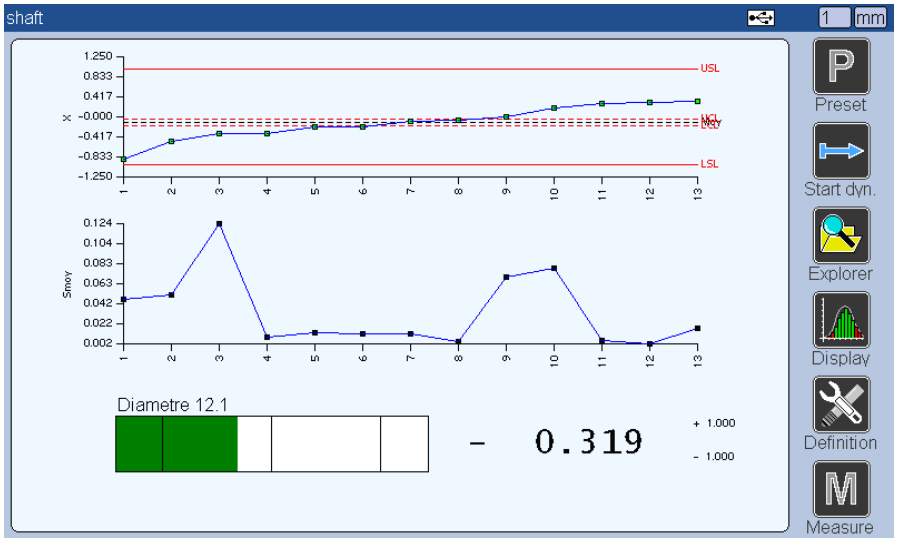
A new menu appears where the number of points on the graph (between 10 and 100) can be chosen.

To save the measurements and obtain curves, configure the 'Configuration' menu ('M' key or foot switch) with the function: Save.

Each press on 'M' or the foot switch adds a point to the curve. The other statistical functions remain accessible.

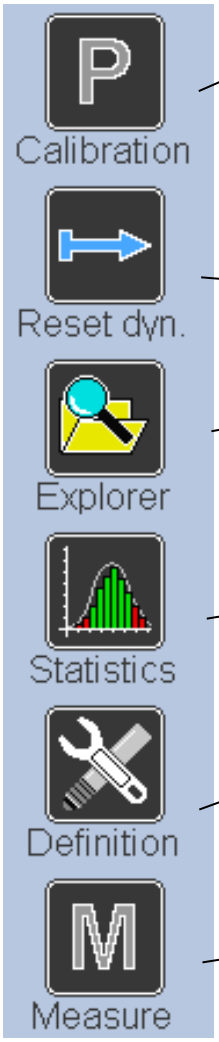


Measurement screen in 'Machine statistics' mode



Measurement screen in 'SPC statistics' mode

8.3 Measurement screen menu



Before starting measurement, the TT100 must be calibrated. Place a standard part under your sensor and press this button. If ‘Calibration control’ mode has been selected, the control test is performed immediately after calibration.

Start a dynamic measurement (mini, maxi, maxi-mini, average, median)

Enables the display of the explorer and selection of another part reference (to delete, copy or create a part reference, go to the explorer on the icon desktop)

Allows access to the statistics functions. This button is only displayed if the statistics from the ‘PART’ menu has been activated (‘Advanced’ mode).

Access the icon desktop for device and part configuration.

Button configurable from the ‘CONFIGURATION’ menu

9. DATA EXPORT

The TT100 allows the measurement data to be saved and/or exported according to several possibilities described below:

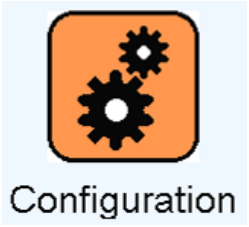
9.1 Export with USB keyboard type (keyboard emulation)

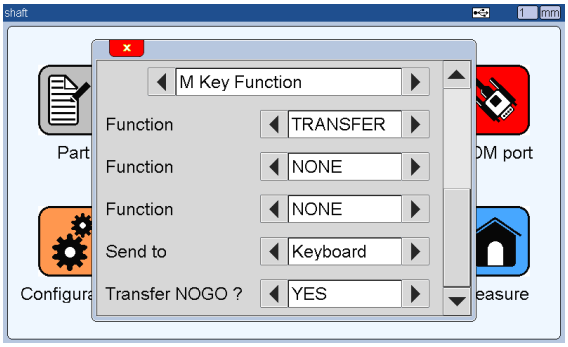
This method is the simplest to perform.

No special drivers or software are required.

Connect the TT100 to the USB device on your computer using a standard USB-A/USB-B cable (04760151).

From the ‘Configuration’ menu:





Select using either the ‘M’ button or the foot switch

- Function 1: ‘Transfer’

- Transfer: keyboard

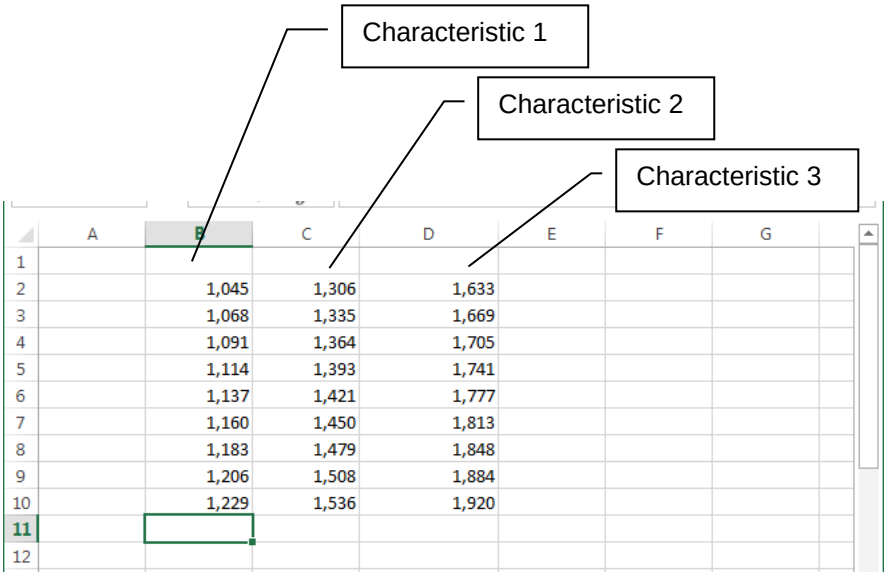
Close this window and return to the measurement screen. The TT100 measurements are ready to be transferred.

Open an Excel sheet or other software that allows keyboard input.

Place the cursor on the computer where the data is to be transferred.

Press the ‘M’ button on the measurement screen or press the foot pedal depending on what you have configured in the ‘Configuration’ menu.

The measurement(s) appear on the computer in the column:

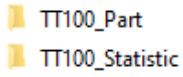


From the configuration windows, select ‘Function 2: MEM’ to save the same data in the TT100 memory (see chapter 10)

For each characteristic, it is possible to choose whether to transfer it or not. This must be defined in the menu: Part → Characteristics → Transfer → Yes or No

9.2 Saving directly to a USB stick (CSV file)

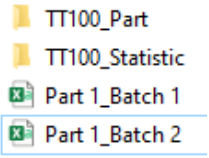
When a USB stick is connected to the TT100, 2 folders are created:



TT100_Part: On this folder, a copy of the part reference is saved if it was copied from the explorer menu (file with extension *.g)

TT100_Statistics: In this folder, the CSV file is generated if the measurements are exported from TT100 memory to the USB stick.

On the **root of the USB stick**: the CSV file is generated if an export directly to the stick is chosen without going through the internal memory of the TT100 (Configuration->Transfer->USB stick), as well as the screenshots.



9.2.1 USB key use case

It is possible to save the measurements directly to a USB stick. Therefore, this is no longer limited by the memory of the TT100 but by the capacity of the USB stick.

The use of an empty USB stick or one with a minimum of files is recommended.

A USB stick with a lot of files would take longer to be detected or would fail to be detected in some cases.

The TT100 does not support USB drives with multiple partitions

The TT100 supports FAT-32 or FAT-16 formatted USB drives.

Connect the USB stick to the USB connector of the TT100.

A USB logo appears in the information bar, confirming that the USB stick has been correctly installed.



The USB logo appears when the USB stick has been detected.

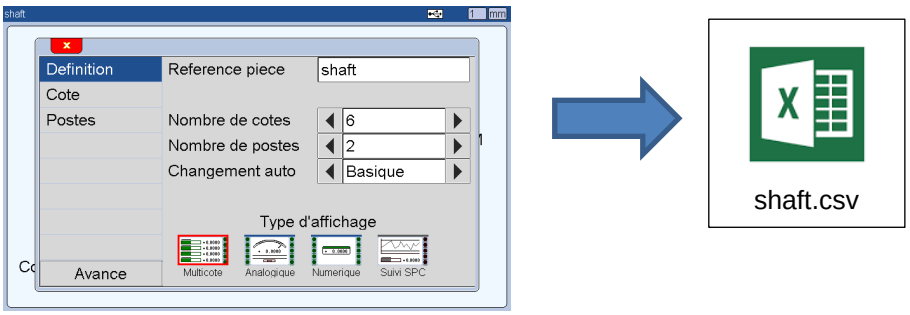
Then, set up the ‘Configuration’ menu as follows:

- Function (‘M’ button or foot switch): ‘Transfer’
- Transfer: USB

Close this window and return to the measurement screen. The TT100 is ready to save the measurement to the USB stick.

Press the ‘M’ button on the measurement screen or press the foot pedal.

A CSV file is created (partreference.csv) on the USB stick



Each time the ‘M’ button or the foot pedal is pressed, a line is added to this file. The ‘M’ button briefly turns green when the data is saved.

From the ‘Configuration’ windows, select ‘Function 2: MEM’ to save the same data to the TT100 memory. This means that data can be saved to a USB stick and to the TT100 memory at the same time in order to access the SPC curves.

The standard CSV export file has the following form:

Characteristic	1	2	3	4			
Name	DIA 12.5	DIA 25.21	DIA 14.56	DIA 26.125			
Upper tol.	0.05	0.05	0.02	0.08			
Nominal	12.5	25.21	14.56	26.125			
Lower tol.	-0.05	-0.05	-0.05	-0.08			
Measure	12.539	25.215	14.56	26.124	08:30:45	23/01/2020	GO
Measure	12.543	25.211	14.561	26.125	08:30:49	23/01/2020	GO
Measure	12.546	25.208	14.562	26.126	08:30:52	23/01/2020	GO
Measure	12.614	25.14	14.579	26.151	08:30:58	23/01/2020	NG
Measure	12.547	25.207	14.562	26.127	08:30:59	23/01/2020	GO
Measure	12.544	25.21	14.561	26.125	08:31:00	23/01/2020	GO
Measure	12.535	25.219	14.559	26.122	08:31:02	23/01/2020	GO

Note: A *.csv (comma-separated value) file saves table data (number and text) as plain text. Each line of the file is one data record. Each record consists of one or more fields separated by commas.

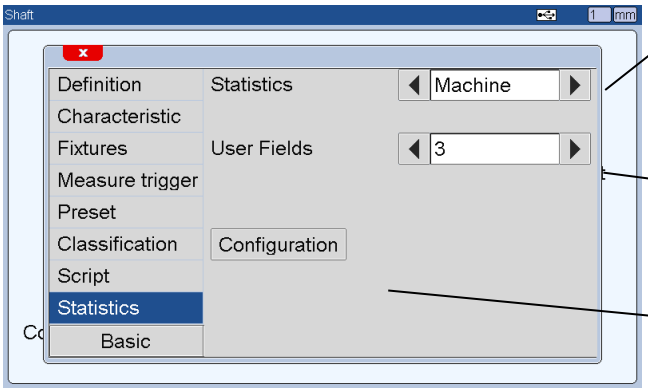
This file can be opened easily in Excel or any other spreadsheet program.

In Excel, open the file, select the values (all values are in the same cell), then choose Data→Convert. In the window, select 'delimited' and ';' as the separator.

9.2.2 CSV export with additional fields

It is possible to enter up to 6 configurable fields (batch number, operator name, etc.) to complete the CSV file.

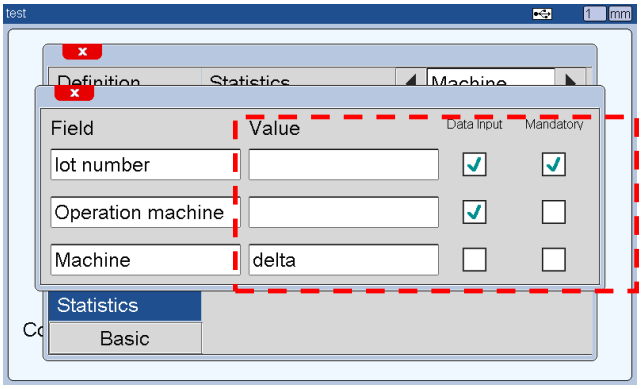
From the 'Part' menu, activate the 'Advance' menu to access the 'Statistics' menu.



Selecting the 'Statistics' mode

Selection of the number of fields to be entered

Configuration of the fields: fixed, input, mandatory input



On the screen above:

- The batch number must be filled during the measurement; otherwise, the window cannot be validated. The fields that must be entered are displayed in red.

- The 'Operation machine' field is proposed for entry but is not mandatory

- The 'Machine' field is fixed data.

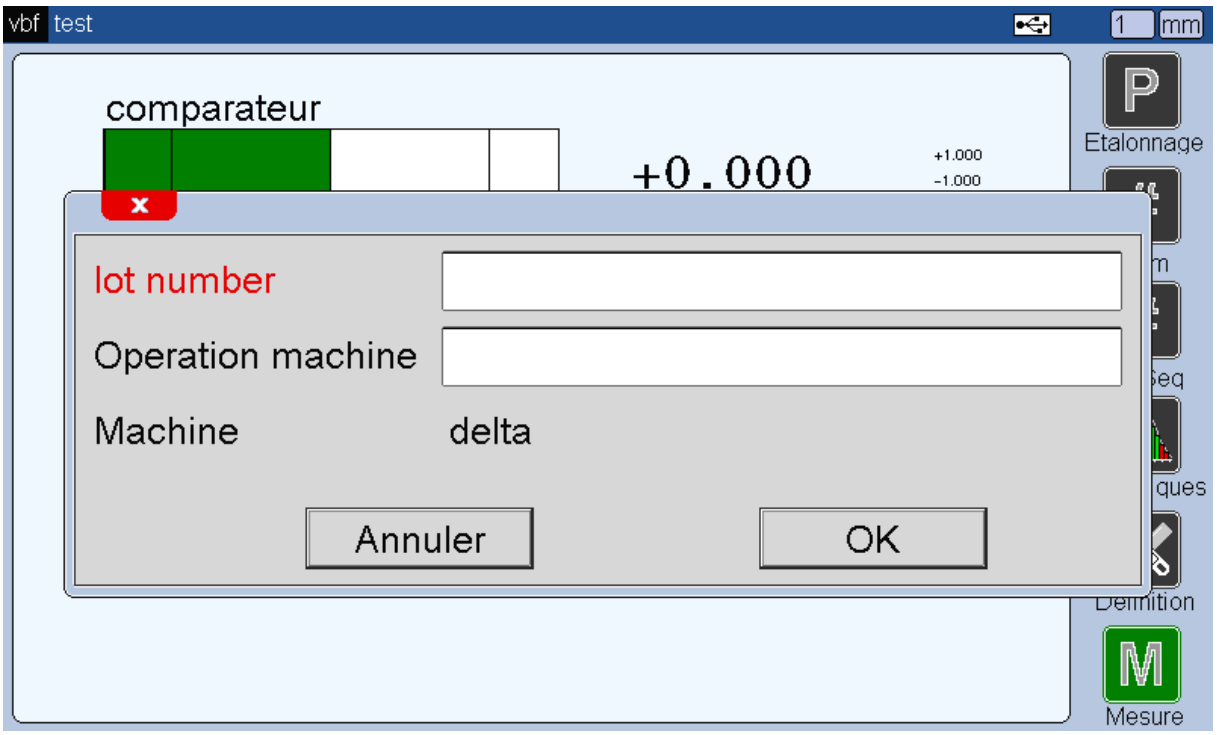
These three pieces of information are transferred to the CSV file and the third cannot be modified.

The batch number is entered from the measurement screen.

After activating the management of the reference/batch number (but with statistics deactivated), an additional icon appears for entering the batch number.

Example of entry screen from the measurement screen, the field displayed in red is a mandatory entry, the 'Machine' field is fixed.

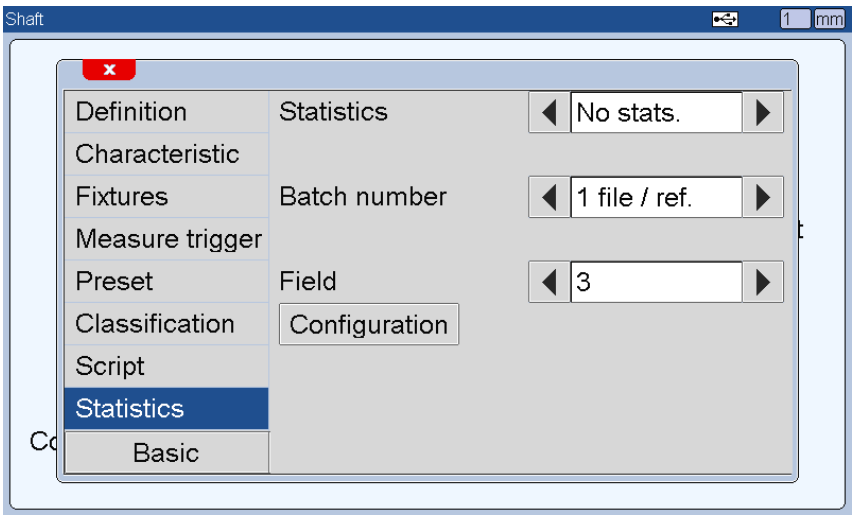




From the PART→STATISTICS menu, activate the reference management.

Depending on whether the statistics are activated or not, the choice differs:

9.2.2.1 Without statistics enabled



2 selections are then possible:

- 1 file / ref: This means that each time the number is changed from the measurement screen, a new file is created with the following name

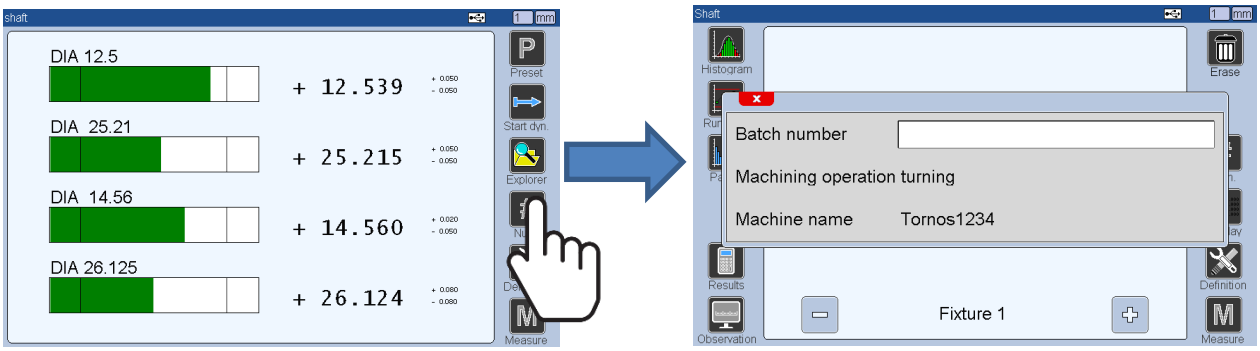
Partreference_Number.CSV

- Single file: In this case, the CSV file is given the name of the part reference as in the general case and a new column appears with the number of the entered batch. The output file looks as follows:

Name	DIA 12.5	DIA 25.21	DIA 14.56				
Upper tol.	0.05	0.05	0.02				
Nominal	12.5	25.21	14.56				
Lower tol.	-0.05	-0.05	-0.05				
Measure	12.539	25.215	14.56	08:30:45	23/01/2020	GO	Batch1
Measure	12.543	25.211	14.561	08:30:49	23/01/2020	GO	Batch1
Measure	12.546	25.208	14.562	08:30:52	23/01/2020	GO	Batch2
Measure	12.614	25.14	14.579	08:30:58	23/01/2020	NG	Batch2
Measure	12.547	25.207	14.562	08:30:59	23/01/2020	GO	Batch2
Measure	12.544	25.21	14.561	08:31:00	23/01/2020	GO	Batch2
Measure	12.535	25.219	14.559	08:31:02	23/01/2020	GO	Batch3

The batch number is entered from the measurement screen.

After activating the management of the reference/batch number (but with statistics deactivated), an additional icon appears for entering the batch number.



The input can also be made with a barcode or QR code reader.

The barcode reader must be set to ‘USB keyboard’ mode.

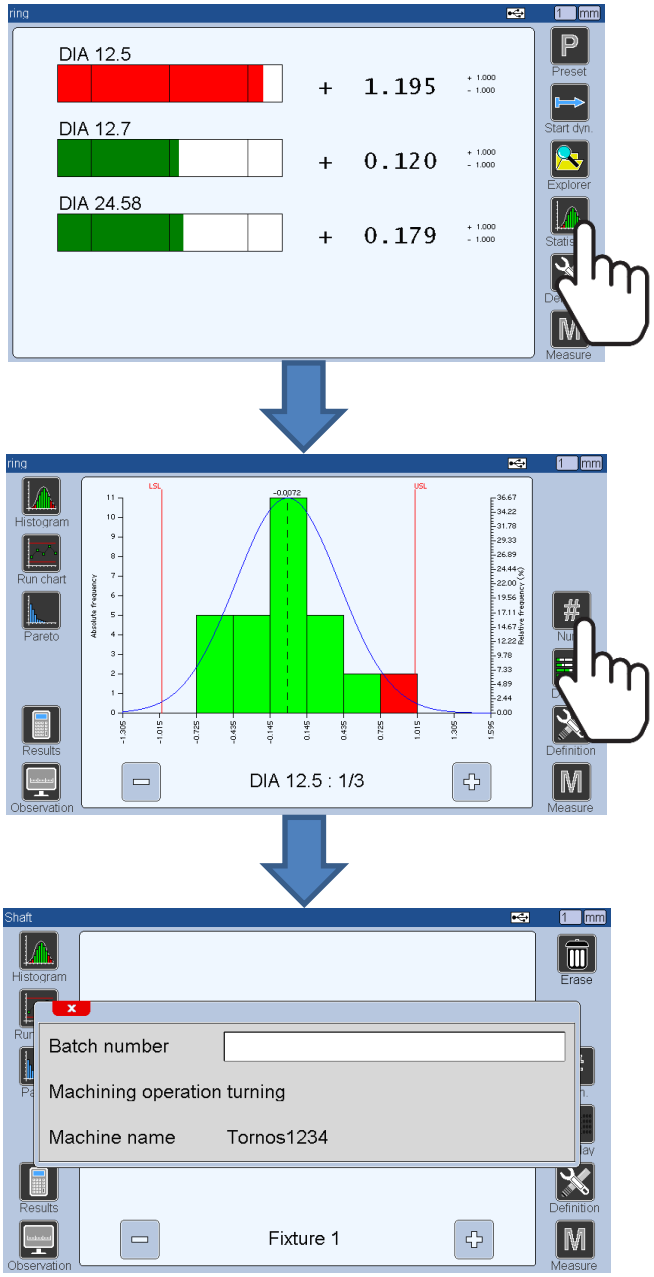
A foot switch can be configured to open the pop-up window to enter additional information (batch …): ‘Configuration’-> ‘Foot switch’ function or ‘M’ key->Xfer button + pop-up



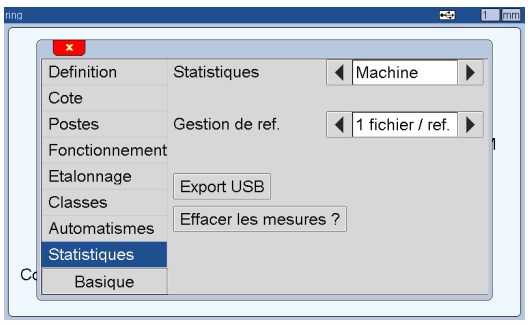
9.2.2.1 With statistics activated

If statistics are activated, only the '1 file per reference' option is available.

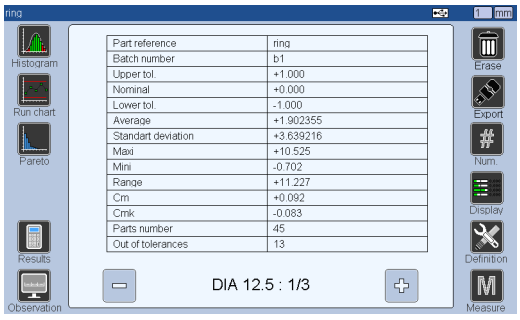
The batch number can be entered via any statistics screen that can be reached by clicking on the 'Statistics' icon on the measurement screen.



The measurements saved in the TT100 can be exported to a USB stick. If the batch number option is enabled and no batch number is entered, the TT100 issues a prompt before the export.



or



From the ‘Part’ → ‘Statistics’ menu From the statistics screen → Results

10. STATISTICS

10.1 Introduction to statistics and configuration

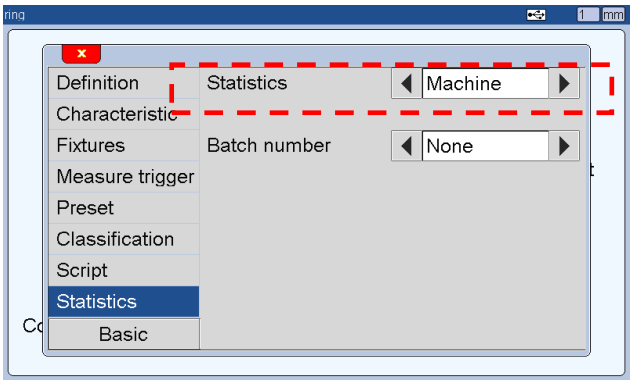
The TT100 can store up to approx. 1000 measurements per part reference (up to 128 part references can be saved on the TT100).

These measurements can then be processed locally for statistical analysis.

The TT100 cannot be compared to full SPC software on a computer.
It should be considered as a local tool alongside the line. It provides information that can be useful for adjusting the machine.
The calculations are carried out and have been successfully tested to FORD QS9000 standards.
For advanced statistical analysis, it is recommended to use the TM-NTW that generates measurement files on the network, which can be compatible with most commercial SPC software.

10.2 Machine statistics

Activate ‘Advanced’ mode and select the ‘Machine’ parameter in the ‘Part→Definition→Statistics’ menu



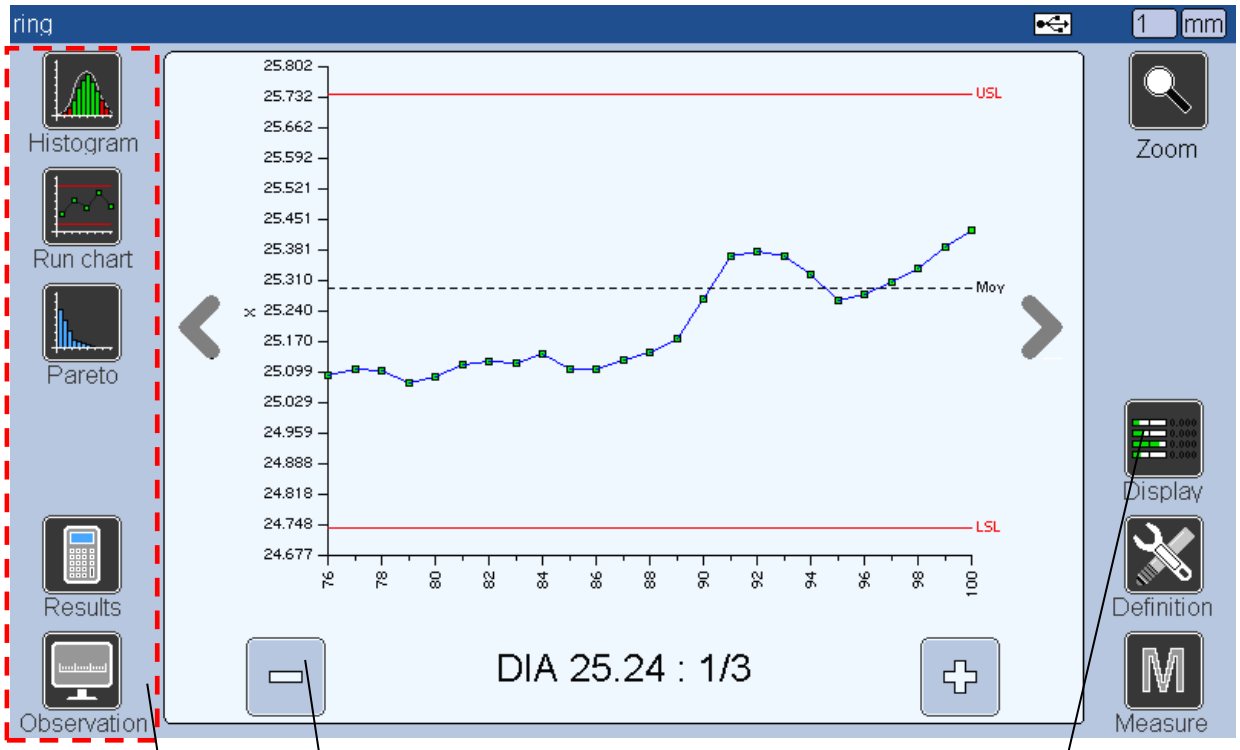
The statistics screens can then be accessed by clicking on the



(located on the measurement screen)

Several screens are then available and are described in the following chapters:

10.2.1 General presentation of the statistics screen

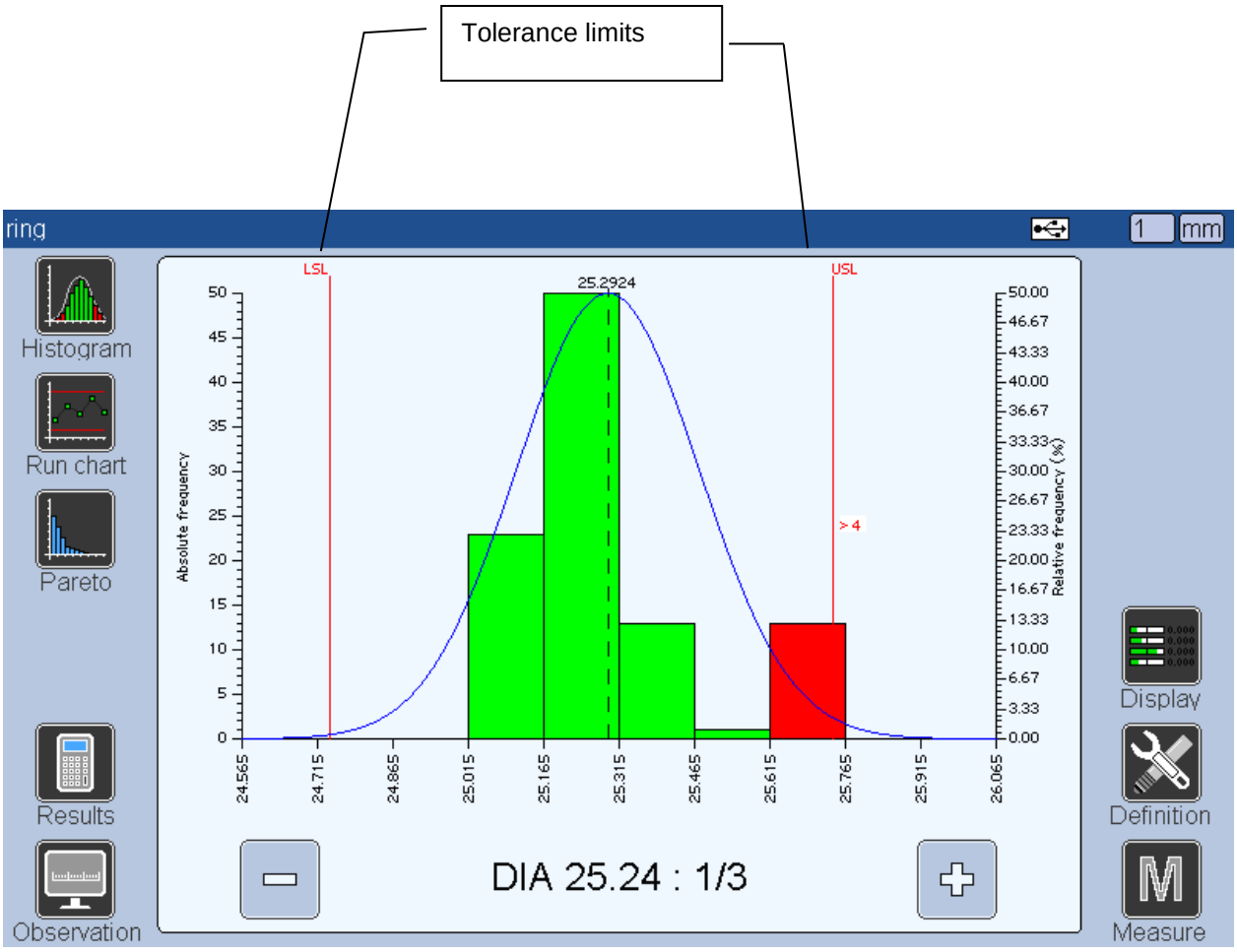


Changes the characteristic

Returns to the measurement screen

Selection of the different statistics screens. See the next chapter for more details.

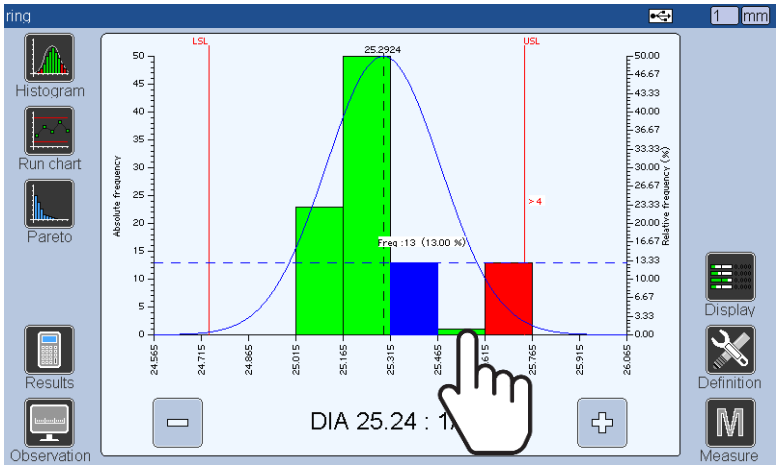
10.2.2 Histograms with Gaussian curve



The number of bars in the histogram is the square root of the number of samples.

The measured parts are then sorted on a histogram according to their position in the tolerance interval.

The curve shows if the distribution is Gaussian and shows the relative frequency in percent. The bars are clickable and show this frequency, as shown in the following image.

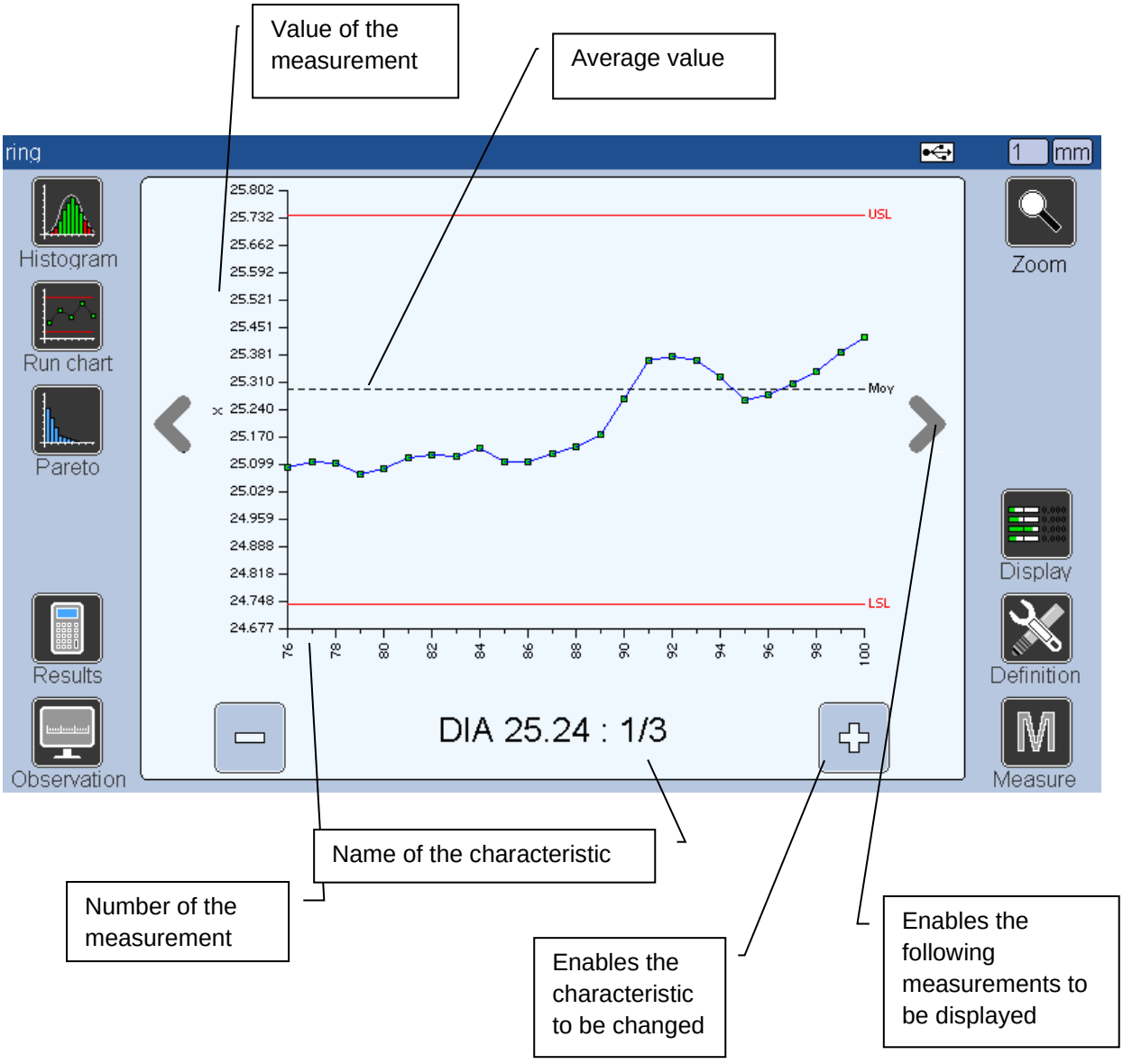


10.2.3 Run chart

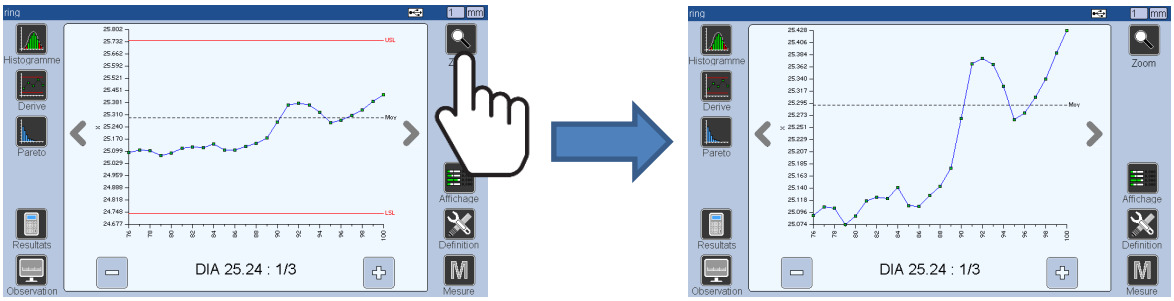
This screen allows the evolution of a dimension to be seen over time and its position seen from its tolerances.

The tolerance limits are represented by red lines.

Each measurement is represented by a square that turns red, yellow or green depending on its value in relation to its tolerances.



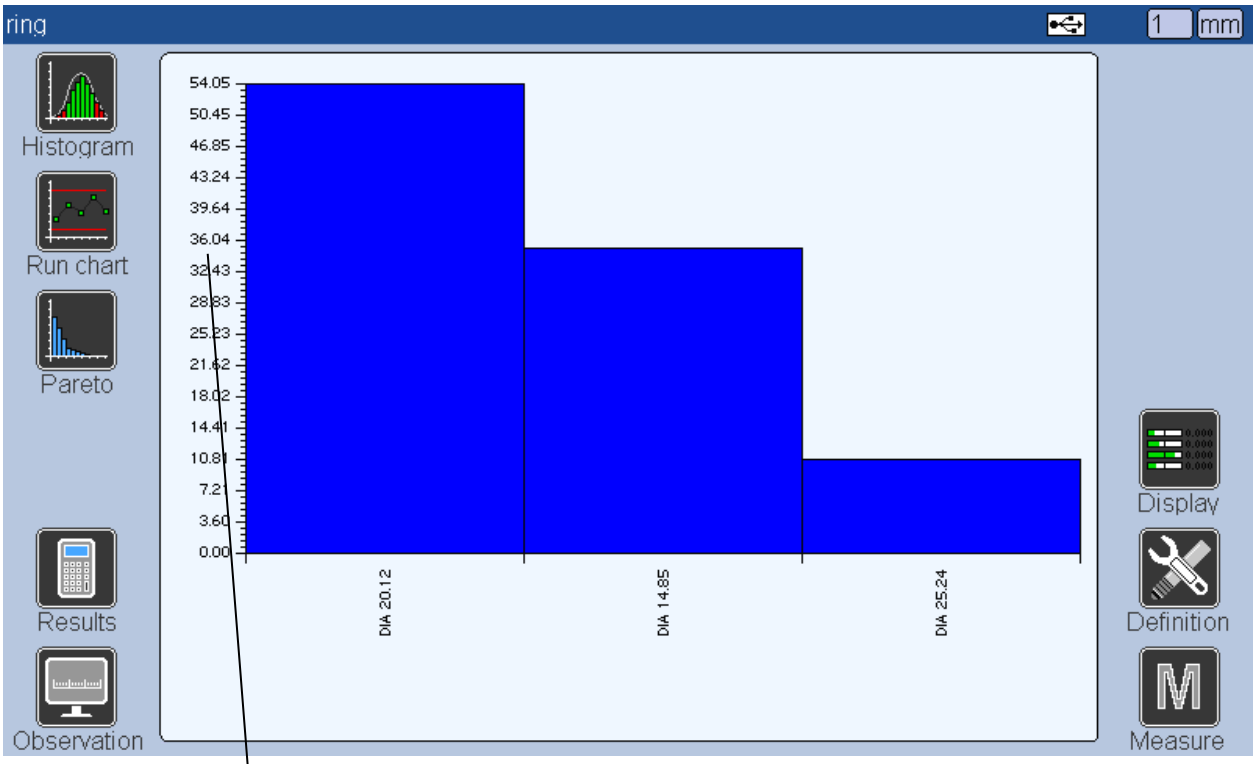
It is possible to zoom in on the curve since the screen is centred on the tolerances by default.



10.2.4 Pareto analysis

Pareto analysis is a statistical technique used to select a limited number of tasks that produce a significant overall effect. It uses the Pareto principle – the idea that a large majority of problems (80 %) are produced by a few key causes (20 %)

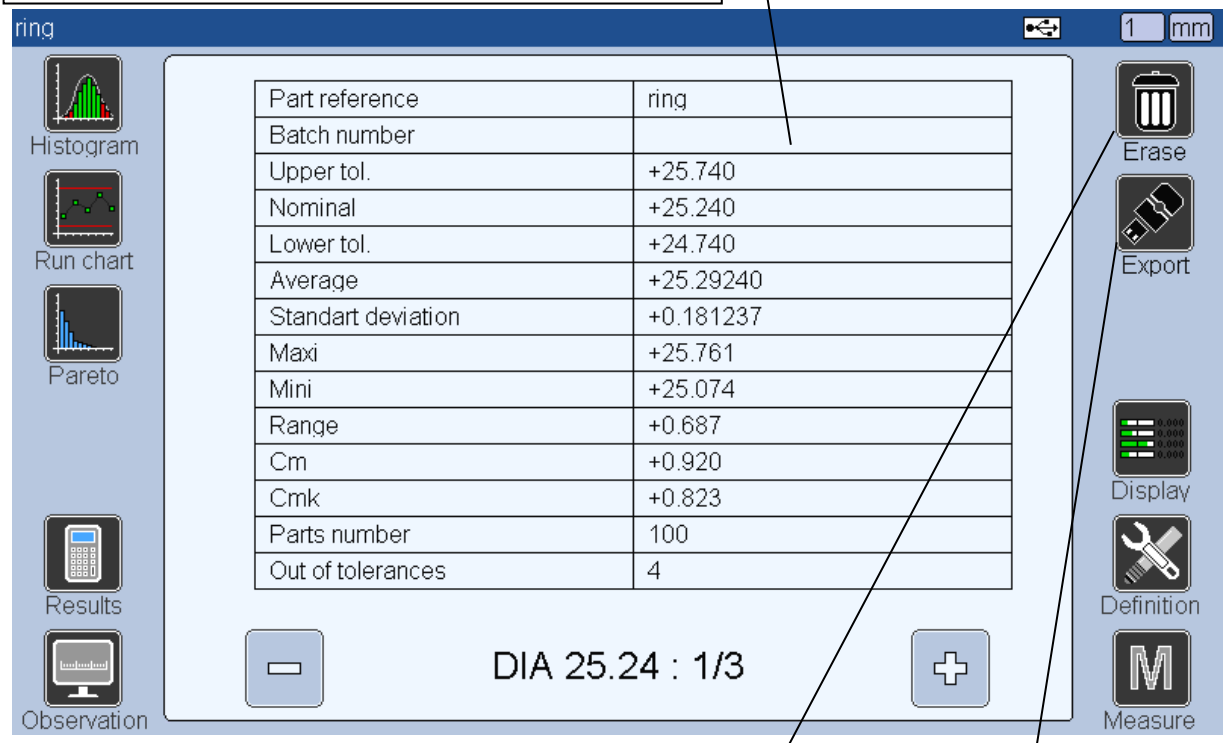
For our dimensional control applications, this chart is used to sort characteristics by frequency of occurrence in the out-of-tolerance zone. This method makes it possible to know which characteristic generates the most problems on a part, therefore facilitating the most effective corrective actions.



10.2.5 Results

This screen allows the viewing of measurement results by characteristics.

If a batch number has been entered, it appears here.



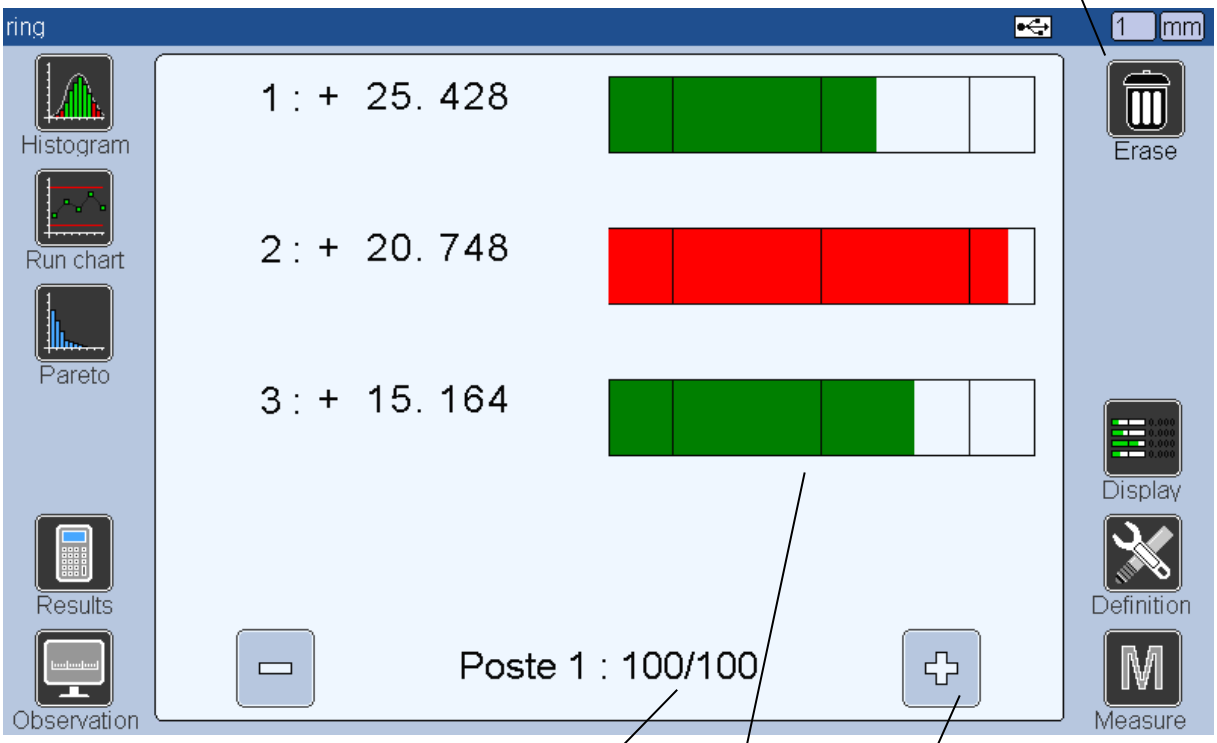
Press here to delete all measurements. To specifically delete one or more measures, go to the observation screen

This button allows the measurements to be exported to a CSV file. Please note that these measurements are not time-stamped. If a file with a time stamp is required, make a transfer to the key while going along. The file will be visible in the directory TT100_Statistic→Part reference

Characteristic	1	2	3
Name	DIA 25.24	DIA 20.12	DIA 14.85
Upper tol.	25.740	20.620	15.350
Nominal	25.240	20.120	14.850
Lower tol.	24.740	19.620	14.350
#P 1	25.177	19.911	14.746

10.2.5 Observation

This screen enables the visualisation of the registration history.



Deletes the displayed measurement only; to delete all measurements, go to the results screen

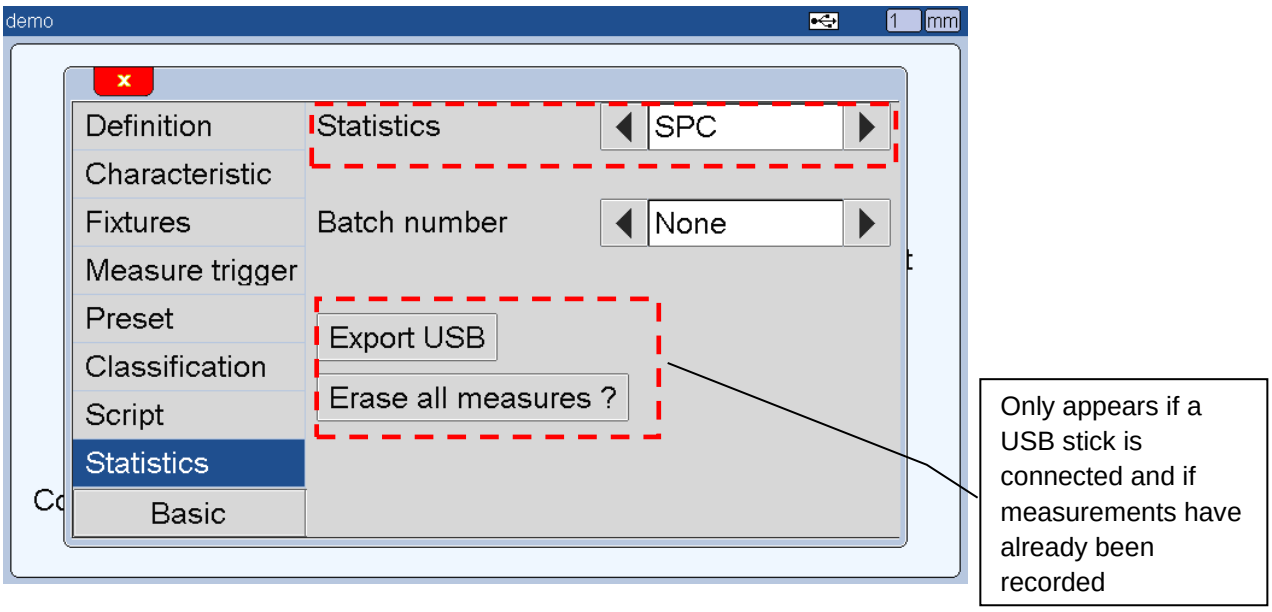
Number of the measurement

If there are several fixtures, simply touch the screen to change the fixture

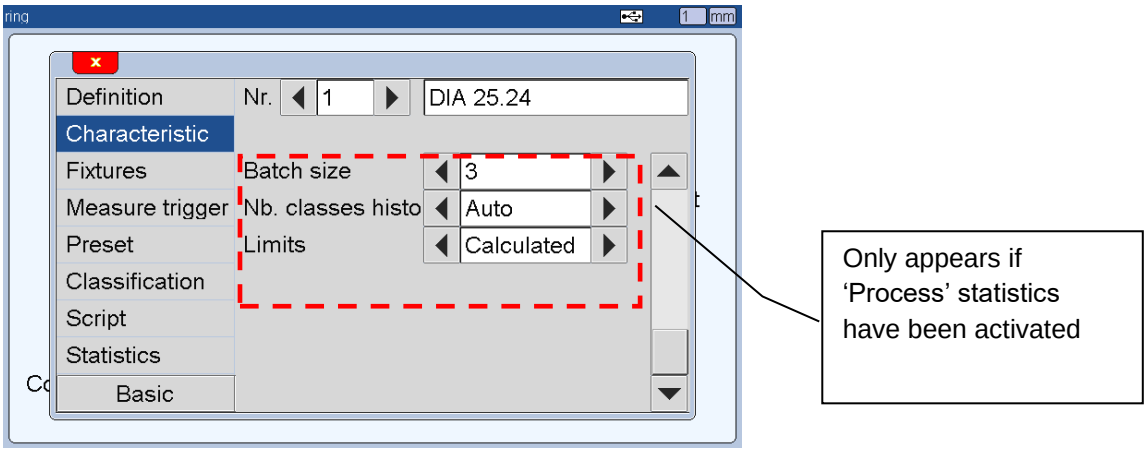
Move to the next measurement

10.3 SPC statistics

First set the 'Part → Definition → Statistics' menu with the 'Process' parameter

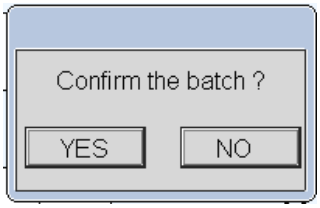


Then a sample size (number of samples) must be defined on the 'Part → Characteristic' menu



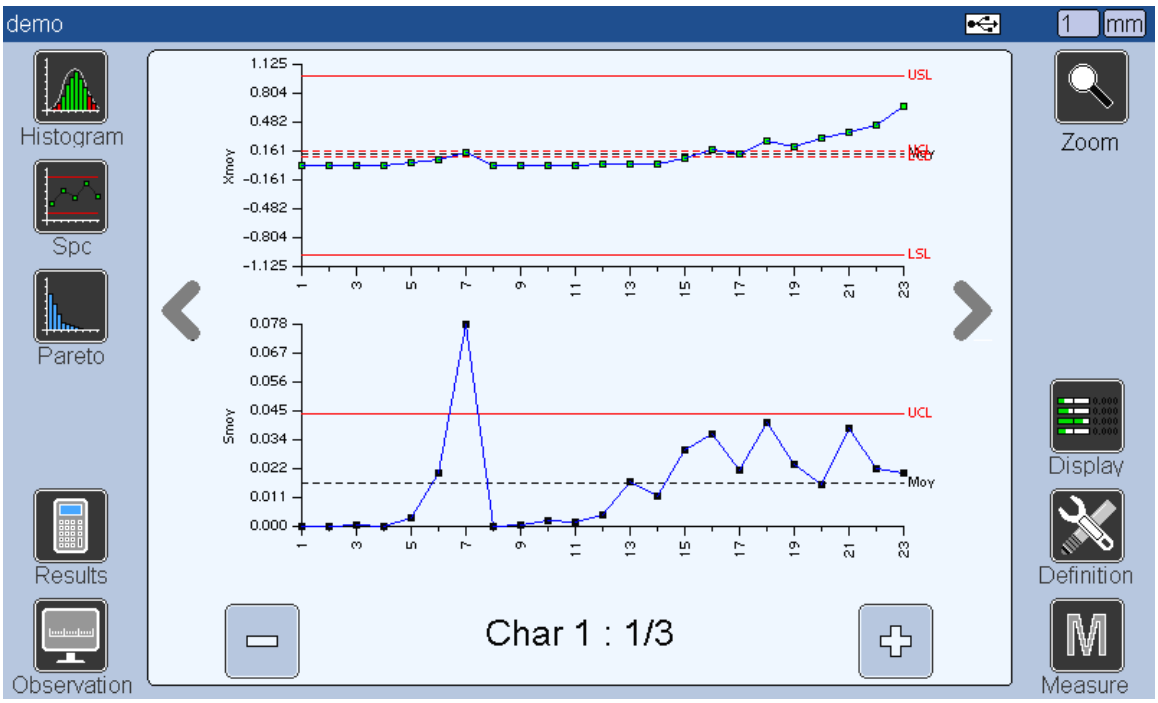
To record a sample, from the measurement screen, press the 'M' button or the foot switch depending on the configuration chosen in the 'Configuration' menu.

After reaching the set number of samples, a message appears to confirm that this batch has been saved in the TT100 memory.

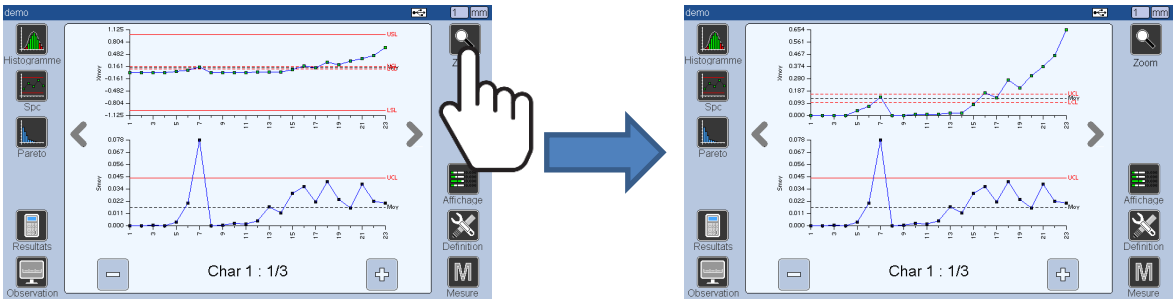


The same screens as for the 'Machine' statistics described in the previous chapter are available for the display except for the run chart that is replaced by the SPC screen:

This screen allows the viewing of the mean/range and mean/standard deviation maps.



It is possible to zoom in on the curve since the screen is centred on the tolerances by default.



11. COMMUNICATION

11.1 ASCII protocol (RS-232)

The list of registers is available on request. Please contact TESA.Service@hexagon.com

The ASCII communication protocol on the RS-232 output enables the display to be interrogated by commands.

The following functionalities are available:

- Instant reading of the displayed characteristics
- Initialisation of the dynamic value
- Changing the unit

TESA protocol characteristics:

- Transmission speed: 4800 baud
- Character output: 7-bit ASCII code
- Start bit: 1
- Stop bit: 2
- Parity: even

All commands end with <CR><LF>.

11.1 Configuration/control of the TT100 with QR codes

The TT100 can be configured via a QR code scan.

It is sufficient to generate a QR code with an ASCII instruction described in the previous paragraph.

Examples of QR codes:

Description	Instruction	Code
Selection part 1	A24 0	
Selection part 2	A24 1	

11.3 MODBUS protocol

The list of registers is available on request. Please contact TESA.Service@hexagon.com

Modbus is a communication protocol for connecting to PLCs. This protocol is based on a master/slave architecture. Modbus allows simple, reliable and fast communication between the PLC and the display.

This protocol allows control of all TT100 functionality with many registers. (Up to 256 registers can be read per Modbus register)

The following functionalities are available:

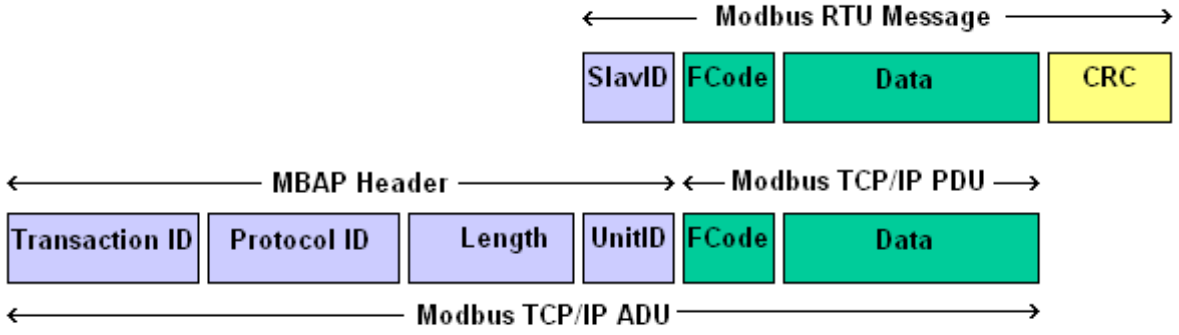
- Reading the position of the 99 sensors
- Instant reading of the value of the 32 characteristics
- Calibration
- Reading/programming of tolerance, standard, formula ...

Connection:

1. USB to D-SUB 9P connection cable, TESA article 04761063. Connect to the **RS 232** port
2. Setting the TT100 parameters:
    a. Enter the ‘COM port’ menu
    b. In the ‘Protocol’ field, select the ‘Modbus’ mode.
3. Restart the display to take the new settings into account.

Communication settings:

- Writing codes: 3, 6 and 16
- SLAVE ID = 1
- Serial port connection type
- 9600 baud/8 bits/No parity/1 stop bit
- Response time: 1000 ms
- Delay between pulses: 20 ms
- The data is in Big-Endian format (high weightings at top)
- Register based on 0



12. RESET TO FACTORY SETTINGS

This function returns the TT100 to its factory setting.

After this procedure, the identification numbers of the T-BUS modules and the part reference parameters are deleted.

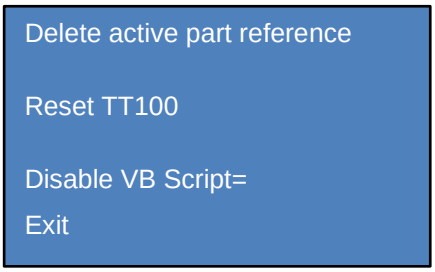
Follow the procedure below:

1 - Switch off the TT100

2 - Switch on the TT100

3 - When the text ‘Loading: xx%’ appears, press the top left corner of the screen

4 - A blue screen appears:



5a - To cancel, press Exit

5b - To reset just the current part reference, press ‘Delete active part number’?

5c - To carry out a factory reset, press ‘Reset TT100?’ The procedure takes about 5 minutes.

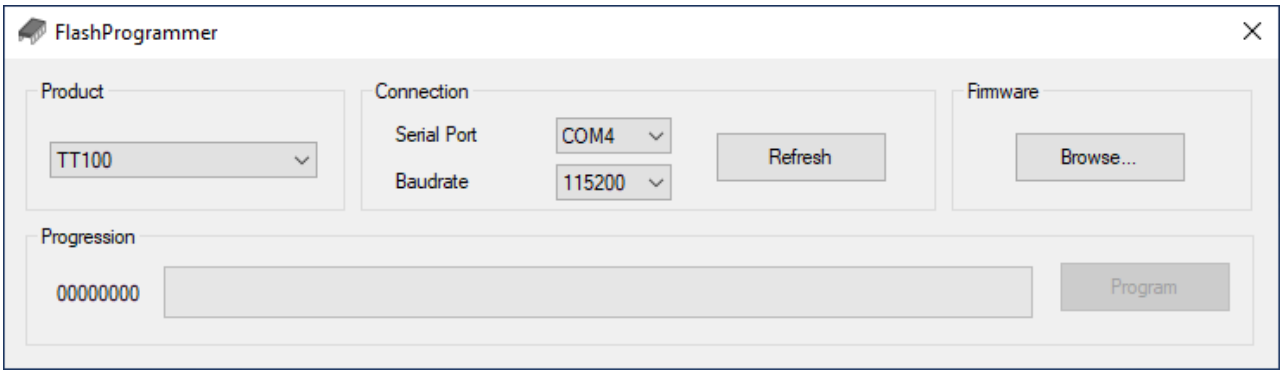
13. FIRMWARE UPDATE

In case of improvements to the instrument's functionality, the firmware can be made available by the TESA Service team if required.

To upgrate the firmware, use the TEA Flash Programmer software, available on our website in the download section.

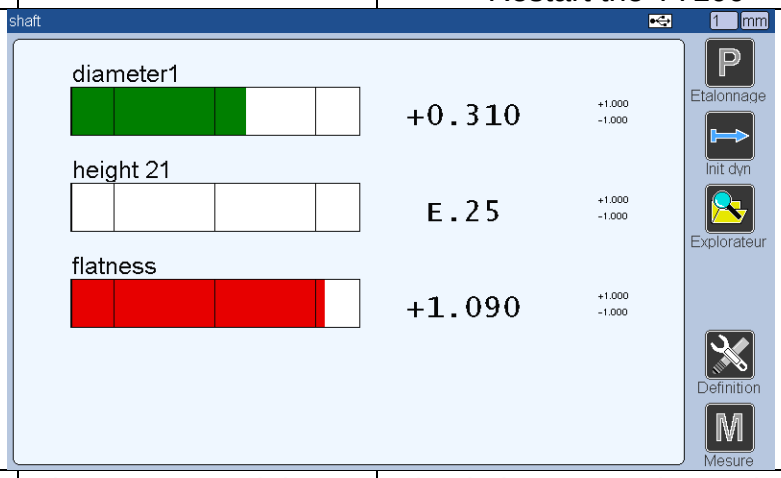
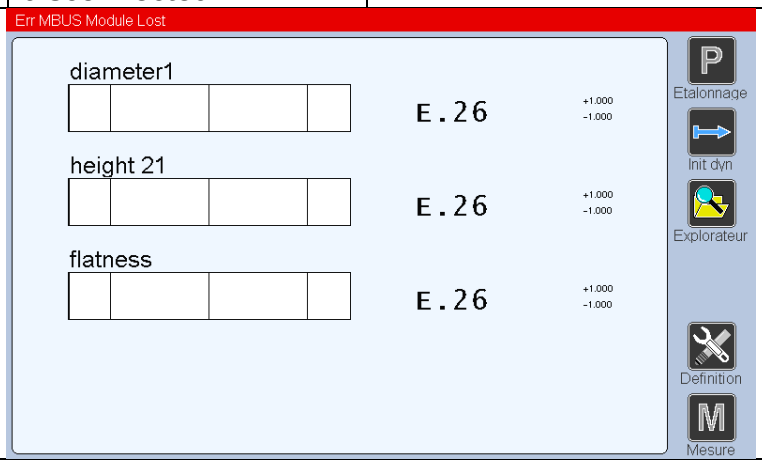
Follow the procedure below:

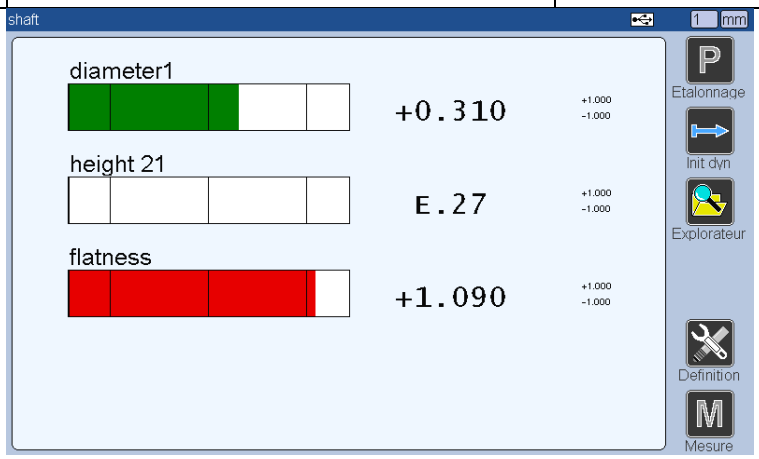
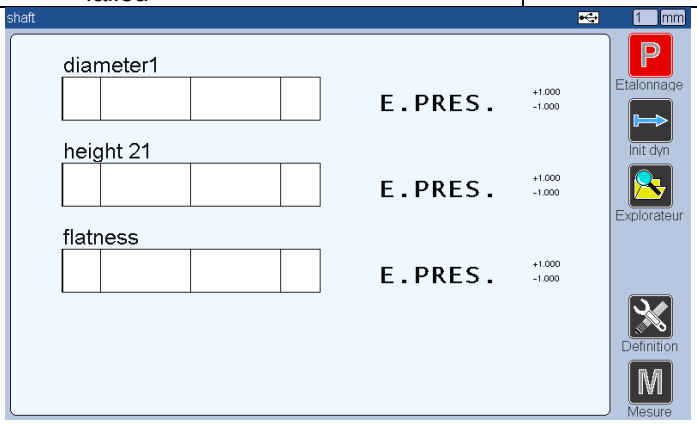
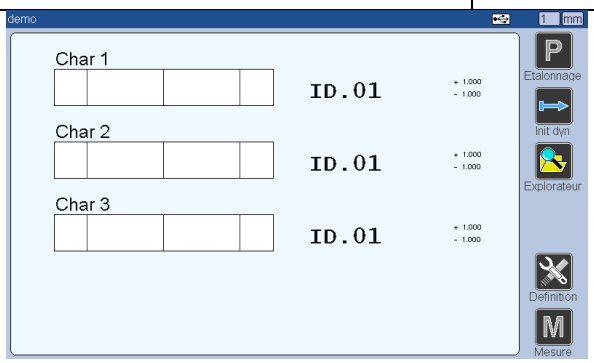
1. Opren the software TESA Flash Programmer
2. Click on "Browse…" to select the file .hex to update with the latest firmware version.



3. Connect the display the main power
4. Connect the USB-RS232 cable (04761063) between the output RS232 from the display and your computer.
5. Connect the jack footswitch (04768001)
6. Press and hold the jack footswitch.
7. While holding down the footswitch,start the display with the main switch to enter the update mode.
   The footswitch can now be released
   The display is frozen
8. Click n the "Program" button to start the update. A progress bar shows the time remaining.
9. When the update is complete, disconnect the USB cable and restart the display.
10. To verify the update, restart the display. The splash screen will display the current firmware version.

14. ERROR CODES

Code	Description	Solution
E25	A TESA compatible sensor is on a formula but not connected to a TM-4I/8I module	The TESA sensors must be connected to the TM-4I/8I module when the TT100 is switched on - Check that the connected sensor is TESA compatible (M8xx) - Check that the formula matches the connected sensor - Restart the TT100
		
E26 (+ message on the status bar)	The T-BUS module linked to the faulty characteristic is disconnected	Check the connection of the T-BUS modules
		

E27	The T-BUS module linked to the characteristic is a TM-IO-8 module.	A TM-IO-8 module cannot be used in a formula. Correct the formula.
		
E. PRES.	Calibration error: - The number of parts tested or the time elapsed since the last calibration. - Calibration or calibration control failed	Perform a calibration or calibration control procedure.
		
ID.xx	If the ID x is displayed instead of the characteristics => the formula linked to the characteristic corresponds to a free T-BUS input	Therefore, either change your formula or identify the T-BUS module in the right place.
		

15. FAQ

15.1 Automatic switching does not work

If using the ‘BASIC auto switch’ mode, the automatic switching threshold in the ‘PART□CHARACTERISTIC’ menu must be adapted. The default setting is 0.1 mm. This value is sometimes too low, especially in the case of measurements with air buffers.

15.2 Measurement with an inductive sensor is not linear

Inductive sensors perform well when used for comparative measurement. It is important to use a standard that is within the tolerance range of the part. There are other types of sensors if there is not a standard dimensionally close to the part

15.3 E25 message appears instead of the score

The message E25 appears instead of the score when:

a non-TESA sensor has been connected to a TESA sensor module. The TESA sensors have a memory containing the stroke and linearisation information. Therefore, use a T-BUS module suitable for the sensor.

or

- The TESA sensor was connected after switching on the TT100. This is because TESA sensors cannot be hot-plugged.

or

- Check the connection of the T-BUS cable between the T-BUS modules and the TT100.

However, if the cable has become disconnected, the TT100 must be switched off, the T-BUS cable reconnected and the TT100 switched on again

15.4 There is a discrepancy between the value indicated by my instrument and the value indicated on the TT100

If an instrument with a built-in display is used (such as a calliper, dial indicator, micrometer) connected to a TM-1D or TM-4D module, it is strongly recommended to disable the ‘calibratable’ function in the menu PART → CHARACTERISTIC (in ‘Advanced’ mode). This is because if a benchmark is applied to the TT100, it is not reflected in the instrument.

To solve this problem, it would be possible to set a TT100 standard value to 0, zero the instrument and then calibrate the TT100 so that the two values match. Then, deactivate the ‘calibratable’ function in the ‘PART → CHARACTERISTIC’ menu (in ‘Advanced’ mode).

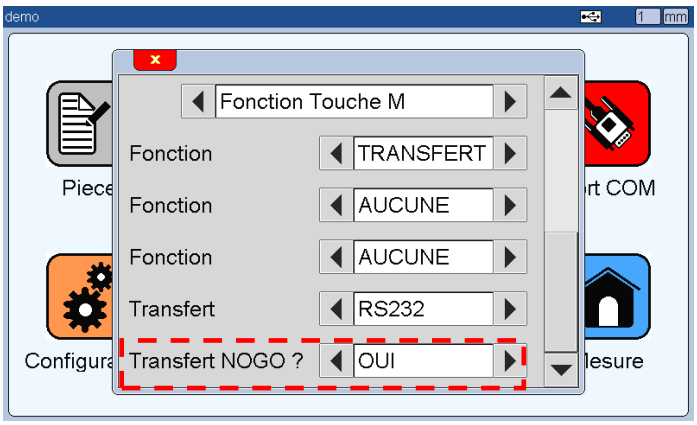
15.5 The TESA-BUS modules are not detected

Check that the TESA-BUS cable is connected to the TESA-BUS port of the TT100. In fact, 2 identical connectors (RS-232 and T-BUS) are next to each other, so an error is possible.

15.6 Some characteristics are not transferred

Check that the characteristics are set to be transferable from the menu ‘PART → CHARACTERISTIC’ → Transfer = Yes (‘Advanced’ mode)

- From the ‘CONFIGURATION’ menu, it is possible to define that parts out of tolerance are not transferred. Check this setting.


demo
1
mm
Fonction Touche M
Fonction
TRANSFERT
Fonction
AUCUNE
Fonction
AUCUNE
Transfert
RS232
Transfert NOGO ?
OUI

16. DECLARATION OF CONFORMITY

We hereby certify that this equipment has been manufactured and tested in our workshops. We declare under our sole responsibility that this equipment is in conformity with the standards and technical specifications indicated in our commercial documents (start-up manual, website).
We also certify that the metrology equipment used to control this equipment meets the requirements of the national reference standards. The traceability of the measured values is guaranteed by our quality assurance system.

Complies with: CE UKCA
Quality assurance

17. WARRANTY

TESA undertakes to remedy any malfunction resulting from a manufacturing defect, within the limits of the provisions below. The normal warranty covers a period of one year from the date of sale.

In justified cases of warranty, TESA will provide one of the following services at its discretion:

– free repair by TESA or an authorised TESA service workshop, or

– free replacement, or

– credit note for the product that is the subject of the complaint.

Any other benefit or compensation under the warranty is excluded.

The warranty does not cover damage caused by incorrect, incompetent or negligent use, lack of maintenance, external influences, non-observance of the operating instructions or any other circumstances as well as force majeure.

(Extract from our general conditions of sale, 2023 edition)

ANNEX C: ASCII COMMANDS

PxxE000 R/W Name of characteristic [1..32]:

	Reading	Writing
PC => TT100	P01E000?\r	P01E000=Diam 1\r The name of characteristic 1 is 'Char 1'
TT100 => PC	P01E000=Char 1\r The name of characteristic 1 is 'Char 1'	P01E000=1\r Acknowledgement OK

PxxE001 R/W Characteristic [1..32] Resolution:

Resolution [0..5] = {0.0, 0.00, 0.000, 0.0000, 0.00000, 0.000000}

	Reading	Writing
PC => TT100	P01E001?\r	P01E001=2\r Change the resolution of characteristic 1 to 0.000
TT100 => PC	P01E001=3\r Characteristic 1 resolution 0.0000	P01E001=1\r Acknowledgement OK

PxxE002 R/W Hide characteristic

	Reading	Writing
PC => TT100	P01E002?\r	P01E002=0\r Does not mask characteristic 1
TT100 => PC	P01E002=0\r Display characteristic 1	P01E002=1\r Acknowledgement OK

PxxE003 R/W Characteristic origin

Origin [0..4] = {Sensor, Math, Manual, GoNoGo, 2 pts}

	Reading	Writing
PC => TT100	P01E003?\r	P01E003=0\r Characteristic 1 sensor
TT100 => PC	P01E003=0\r Characteristic 1 sensor	P01E003=1\r Acknowledgement OK

PxxE004 R/W Characteristic mode

Mode [0..5] = {Static, Mini, Maxi, Maxi-Mini, Average, Median}

	Reading	Writing
PC => TT100	P01E004?\r	P01E004=5\r Run Characteristic 1 in Median mode
TT100 => PC	P01E004=5\r Characteristic 1 in Median mode	P01E004=1\r Acknowledgement OK

PxxE005 R/W Characteristic filter

Filter level [0..5]

	Reading	Writing
PC => TT100	P01E005?\r	P01E005=0\r Filter 0 for characteristic 1
TT100 => PC	P01E005=5\r Max. filter	P01E005=1\r Acknowledgement OK

PxxE006 R/W Characteristic limit enable

	Reading	Writing
PC => TT100	P01E006?\r	P01E006=1\r Characteristic 1 On limit
TT100 => PC	P01E006=0\r Characteristic 1 Off limit	P01E006=1\r Acknowledgement OK

PxxE007 R/W Characteristic unit

Unit [0..3] = {mm,in,dms,deg}

	Reading	Writing
PC => TT100	P01E007?\r	P01E007=0\r Characteristic 1 in mm
TT100 => PC	P01E007=2\r Characteristic 1 in dms	P01E007=1\r Acknowledgement OK

PxxE008 R/W Characteristic formula

	Reading	Writing
PC => TT100	P01E008?\r	P01E008=C(4)\r Characteristic 1 formula: 'C(4)'
TT100 => PC	P01E008=C(2)\r Characteristic 1 formula: 'C(2)'	P01E008=1\r Acknowledgement OK

PxxE009 R/W Current part reference

Xx => not important

	Reading	Writing
PC => TT100	P01E009?\r	P01E009=RangeY\r Current part reference 'RangeY’
TT100 => PC	P01E009=RangeX\r Current part reference 'RangeX’	P01E009=1\r Acknowledgement OK

PxxE011 R/W User Input value [1..6]

Xx => Number of the field to be read between 1..6

	Reading	Writing
PC => TT100	P01E011?<CR>	P01E011=Value1<CR> The value of field 1 is 'Value1'
TT100 => PC	P01E011=lv1<CR> The value of field 1 is 'lv1'	P01E011=1<CR> Acknowledgement OK

PxxE012 R/W Name of characteristic

Xx => not important

	Reading	Writing
PC => TT100	P00E012?<CR>	P00E012=8<CR> Runs the number of characteristics in the range to 8
TT100 => PC	P00E012=2<CR> The range has two characteristics	P00E012=1<CR> Acknowledgement OK

PxxE013 R/ Active fixture

Xx => not important

	Reading (fixture number)	Writing (fixture index)
PC => TT100	P00E013?<CR>	P00E013 = 0<CR> Activates fixture 1 (index 0)
TT100 => PC	P00E013=1<CR> Fixture 1 is active	P00E013 = 1<CR> Acknowledgement OK P00E013 = 0<CR> Acknowledgement NOK, either fixture inaccessible or fixture already active

PxxE017 R/W Class number

Xx => not important

Class number starts at 0

	Reading	Writing
PC => TT100	P00E017?<CR>	P00E017=15<CR> 16 classes
TT100 => PC	P00E017=0<CR>	

	Classes are deactivated P00E017=15<CR> 16 classes	P00E017=1<CR> Acknowledgement OK

PxxE018 R/W Characteristic class index

Xx => not important

0 represents characteristic 1

	Reading	Writing
PC => TT100	P00E018?<CR>	P00E018=1<CR> Characteristic 2 is the class characteristic
TT100 => PC	P00E018=1<CR> Characteristic 2 is the class characteristic	P00E018=1<CR> Acknowledgement OK

PxxE020 R/W Triggering manual/auto calibration

Xx => not important

0/1 => Manual/auto

	Reading	Writing
PC => TT100	P00E020?<CR>	P00E020=1<CR> Auto
TT100 => PC	P00E020=0<CR> Manual P00E020=1<CR> Auto	P00E020=1<CR> Acknowledgement OK

PxxE021 R/W Minute between calibrations

Xx => not important

	Reading	Writing
PC => TT100	P00E021?<CR>	P00E021=3<CR> 3 minutes
TT100 => PC	P00E021=2<CR> 2 minutes	P00E021=1<CR> Acknowledgement OK

PxxE022 R/W Hour between calibrations

Xx => not important

	Reading	Writing
PC => TT100	P00E022?<CR>	P00E022=2<CR> 2 hours
TT100 => PC	P00E022=2<CR> 2 hours	P00E022=1<CR> Acknowledgement OK

PxxE023 R/W Parts between calibrations

Xx => not important

	Reading	Writing
PC => TT100	P00E023?<CR>	P00E023=2<CR> 2 parts
TT100 => PC	P00E023=2<CR> 2 parts	P00E023=1<CR> Acknowledgement OK

PxxE024 R/W Number of fixture -1

Xx => not important

Number of fixture - 1

	Reading	Writing
PC => TT100	P00E024?<CR>	
TT100 => PC	P00E024 = 1<CR> 2 fixtures	Acknowledgement OK

PxxE025 R/W Assignment of characteristic in fixture [1..32]

Xx => Number of characteristic [1..32]

Number of characteristic starts at 1

Number of fixture starts at 0

	Reading	Writing
PC => TT100	P01E025?<CR> Fixture characteristic 1?	P01E025=1<CR> Assigns characteristic 1 to fixture 2
TT100 => PC	P01E025=1<CR> Characteristic 1 is in fixture 2	P01E025=1<CR> Acknowledgement OK

PxxE027 R/W Operating mode

Xx => not important

Mode [0..3] = {Continue, VBScript, Cyclical, Sequence}

	Reading	Writing
PC => TT100	P00E027?<CR>	P00E027=1<CR> VBScript mode
TT100 => PC	P00E027=1<CR> VBScript mode	Acknowledgement OK

PxxE028 R/W Cycle mode time

Xx => not important

	Reading	Writing
PC => TT100	P00E028?<CR>	P00E028=30<CR> 30 * time base
TT100 => PC	P00E028=30<CR> 30 * time base	Acknowledgement OK

PxxE029 R/W Cyclic mode time base

Xx => not important

Time base [0..2] = {Second, Minute, Hour}

	Reading	Writing
PC => TT100	P00E029?<CR>	P00E029=1<CR> Time base in minutes
TT100 => PC	P00E029=1<CR> Time base in minutes	Acknowledgement OK

PxxE030 R/W Auto switch, characteristic triggering fixture[1..32]

Xx => Number of fixture, starts at 1

	Reading	Writing
PC => TT100	P01E030?<CR>	P01E030=5<CR> The characteristic that triggers fixture 1 and characteristic 5
TT100 => PC	P01E030=5<CR> The characteristic that triggers fixture 1 and characteristic 5	Acknowledgement OK

PxxE032 R/W Stop

Xx => not important

	Reading	Writing
PC => TT100	P01E032?<CR>	P01E032=1<CR> Active mode stop
TT100 => PC	P01E032=1<CR> Stop mode On	P01E032=1<CR> Acknowledgement OK

PxxE033 R Calibration error on active fixture?

Xx => not important

	Reading	~~Writing~~
PC => TT100	P00E033?<CR>	
TT100 => PC	P00E033=0<CR> No calibration error on the active station	

PxxE034 R/W Display mode

Xx => not important

Mode [0..5] = {Multi-function, Analog, Clock, Force distance, Gear, SPC}

Force, distance and gear modes are deactivated on the standard version

	Reading	Writing
PC => TT100	P00E034?<CR>	P00E034=2<CR> Clock display mode
TT100 => PC	P00E034=2<CR> Clock display mode	Acknowledgement OK

PxxE036 R/W Class message

Xx => Class index

	Reading	Writing
PC => TT100	P01E036?<CR>	P01E036=Class 1<CR>
TT100 => PC	P01E036=Class 1<CR>	Acknowledgement OK

PxxE037 R/W Automatic fixture change

Xx => not important

Switch mode [0..2] = {No, Basic, Range}

	Reading	Writing
PC => TT100	P01E037?<CR>	P01E037=1<CR> Basic switch fixture mode

TT100 => PC	P01E037=1<CR> Basic switch fixture mode	Acknowledgement OK

PxxE038 R/W VB Script display menu?

Xx => not important

Off/On = {0,1}

	Reading	Writing
PC => TT100	P01E038?<CR>	P01E038=1<CR> VB script, display menu ON
TT100 => PC	P01E038=1<CR> VB script, display menu ON	Acknowledgement OK

PxxE039 R/W VB Script display debug?

Xx => not important

Off/On = {0,1}

	Reading	Writing
PC => TT100	P01E039?<CR>	P01E039=1<CR> VB script, display debug ON
TT100 => PC	P01E039=1<CR> VB script, display debug ON	Acknowledgement OK

PxxE040 R Characteristic status

Xx => Number of characteristic, starts at 1

Characteristic status:

0 OK

1 Lower tolerance

2 Upper tolerance

3 Lower limit

4 Upper limit

5 Error

6 Lower tolerance 2

7 Upper tolerance 2

	Reading	~~Writing~~
PC => TT100	P01E040?<CR>	
TT100 => PC	P01E040=0<CR> Characteristic in the IT	

PxxE041 R Active fixture status

Xx => not important

Fixture status [0..2] = {OK, Limit, NOK}

	Reading	~~Writing~~
PC => TT100	P00E041?<CR>	
TT100 => PC	P00E041=0<CR> Any fixture characteristic in IT	

PxxE043 W RTC Write serial number

Internal use

PxxE044 R TT100 Active flag

Xx => not important

	Reading	~~Writing~~
PC => TT100	P00E044?<CR>	
TT100 => PC	P00E044=0<CR> The TT100 is not measuring	

PxxE047 W TT100 Write current range to

Xx => Memory location index

	~~Reading~~	Writing
PC => TT100		P00E047=0<CR>
TT100 => PC		P00E047=1<CR>

PxxE049 W TT100 Load current range from

Xx => Memory location index

	~~Reading~~	Writing
PC => TT100		P00E049=0<CR>
TT100 => PC		P00E049=1<CR>

PxxE045 R/W Basic script line

Xx => Number of line

	Reading	Writing
PC => TT100	P01E045?<CR>	P01E045=display<CR>
TT100 => PC	P01E045=display<CR> The first line of the script is 'display'	P01E045=1<CR> Acknowledgement OK

PxxE046 R/W Number of script line

Xx => not important

	Reading	Writing
PC => TT100	P00E046?<CR>	P00E046=00<CR> Delete the script
TT100 => PC	P00E046=25<CR> The script is 25 lines long	Acknowledgement OK

PxxE048 R Calibration error on active fixture

Xx => not important

	Reading	~~Writing~~
PC => TT100	P00E048?<CR>	
TT100 => PC	P00E048=1<CR> At least one characteristic of the active fixture has a calibration error	

PxxE051 R Active program index

Xx => not important

	Reading	~~Writing~~
PC => TT100	P00E051?<CR>	
TT100 => PC	P00E051=0<CR> The active program is 0	

PxxE052 R/W Keyboard lock

Xx => not important

	Reading	Writing
PC => TT100	P00E052 ?<CR>	P00E052=0<CR> Keypad lock is off
TT100 => PC	P00E052=0<CR> Keypad lock is off	P00E052=1<CR>

PxxE053 R/W Statistics of number of measurements in memory

Xx => Number of characteristic

	Reading	~~Writing~~
PC => TT100	P01E053 ?<CR>	
TT100 => PC	P01E053=0<CR> 0 measurements in memory for characteristic 1	

PxxE054 R/W Statistics of number of samples

Xx => Number of characteristic

	Reading	~~Writing~~
PC => TT100	P01E054 ?<CR>	
TT100 => PC	P01E054=0<CR> 0 samples in memory for characteristic 1	

PxxE055 R/W Statistics mode

Xx => not important

Mode [0..2] = {off, machine, procedure}

	Reading	Writing
PC => TT100	P00E055 ?<CR>	P00E055=2<CR> The machine statistics are activated
TT100 => PC	P00E055=0<CR> Statistics are deactivated	P00E055=1<CR>

PxxE056 R/W Statistics of number of class histogram

Xx => Number of characteristic

Max. 38 histogram classes. By default 0, i.e. number of automatic class.

This setting is not accessible via the TT100 interface.

	Reading	Writing
PC => TT100	P01E056 ?<CR>	P01E056=8<CR>
TT100 => PC	P01E056=0<CR>	P01E056=1<CR>

PxxE057 R/W Statistics of sampling size

Xx => Number of characteristic

Caution: Changing the sample size deletes the measurements from memory

	Reading	Writing
PC => TT100	P00E057 ?<CR>	P01E057=0<CR>
TT100 => PC	P01E057=0<CR>	P01E057=1<CR>

PxxE058 R/W Statistics of auto/manual limit

Xx => Number of characteristic

0 => Auto

1 => Manual

	Reading	Writing
PC => TT100	P01E058 ?<CR>	P01E058=1<CR>
TT100 => PC	P01E058=1<CR>	P01E058=1<CR>

PxxE060 R/W Characteristic calibratable

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01E060 ?<CR>	P01E060=1<CR> Characteristic 1 is calibratable
TT100 => PC	P01E060=1<CR> Characteristic 1 is calibratable	P01E060=1<CR>

PxxE061 R/W Characteristic transfer

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01E061 ?<CR>	P01E060=1<CR>
TT100 => PC	P01E061=1<CR>	P01E060=1<CR>

PxxE062 R/W Fixture calibration mode

Xx => Number of fixture

Mode [0..3] = {Fixture, Characteristic, Group, Select characteristic}

	Reading	Writing
PC => TT100	P01E062 ?<CR>	P01E062=0<CR> Fixture 1 is in fixture calibration mode
TT100 => PC	P01E062=0<CR> Fixture 1 is in fixture calibration mode	

PxxE063 R Screen calibration

Xx => not important

Starts the touch screen calibration

	Reading	~~Writing~~
PC => TT100	P00E063 ?<CR>	
TT100 => PC		

PxxE065 R/W Characteristic group

Xx => Number of fixture

	Reading	Writing
PC => TT100	P01E065 ?<CR>	P01E065=1<CR> Assigns characteristic 1 is in Group 1
TT100 => PC	P01E065=0<CR> Characteristic 1 is not in any group	P01E065=1<CR>

PxxE066 R Software version

Xx => not important

	Reading	~~Writing~~
PC => TT100	P00E066 ?<CR>	
TT100 => PC	P00E066 =3.30<CR>	

PxxE067 R Hardware version

Xx => not important

	Reading	~~Writing~~
PC => TT100	P00E067 ?<CR>	
TT100 => PC	P00E067=4<CR> V4 hardware	

PxxE071 R/W Control of stand-by calibration

Xx => not important

	Reading	Writing
PC => TT100	P00E071 ?<CR>	P00E071=0<CR> Deactivate control of stand-by
TT100 => PC	P00E071=1<CR> The stand-by control is active	

PxxE072 R/W Control of repetition calibration

Xx => not important

	Reading	Writing
PC => TT100	P00E072 ?<CR>	P00E072=1?<CR> Deactivates the repetition control is active
TT100 => PC	P00E072=1?<CR> Repetition control is active	

PxxE073 R/W Temperature module address to be used by the characteristic

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01E073 ?<CR>	P01E073=3<CR> Characteristic 1 uses TMTP at address TMUS 3
TT100 => PC	P01E073=3<CR> Characteristic 1 uses TMTP at address TMUS 3	P01E073=1<CR>

PxxE074 R/W Show no. batch

Xx => not important

	Reading	Writing
PC => TT100	P00E074 ?<CR>	P00E074=1<CR>
TT100 => PC	P00E074=1<CR>	P00E074=1<CR>

PxxE075 R/W Calibration time

Xx => not important

	Reading	Writing
PC => TT100	P00E075 ?<CR>	P00E075=1<CR> Calibration timer active
TT100 => PC	P00E075=1<CR> Calibration timer active	P00E075=1<CR>

PxxE076 R/W User input title[1..6]

Xx => [1..6] Number of field

	Reading	Writing
PC => TT100	P01E076 ?<CR>	P01E076= TitleA<CR> The title of user field 1 is 'TitleA'
TT100 => PC	P01E076= Title1<CR> The title of user field 1 is 'Title1'	P01E076= 1<CR> The title of user field 1 is 'Title1'

PxxE077 R/W User input allow edit [1..6]

Xx => [1..6] Number of field

	Reading	Writing
PC => TT100	P01E077 ?<CR>	P01E077=1<CR> Mark user field input option 1
TT100 => PC	P01E077=1<CR> Mark user field input option 1	P01E077=1<CR>

PxxE078 R/W User input number

Xx => not important

	Reading	Writing
PC => TT100	P00E078 ?<CR>	P00E078=3<CR> 3 user fields
TT100 => PC	P00E078=3<CR> 3 user fields	P00E078=1<CR>

PxxE079 R/W User input value [1..x]

Xx => [1..x] Number of field

The number of fields available depends on the version of the TT100

6 fields before 3.40, 12 fields after.

	Reading	Writing
PC => TT100	P01E079 ?<CR>	P01E079=Value1<CR> The value of user field 1 is 'Value1'
TT100 => PC	P01E079=Value1<CR> The value of user field 1 is 'Value1'	P01E079=1<CR>

PxxE080 R/W RTC hour

Xx => not important

Date in format HH:MM:SS DD/MM/YY

	Reading	Writing
PC => TT100	P01E080 ?<CR>	P01E080=15 :22 :54 31/02/22<CR>
TT100 => PC	P01E080=15 :22 :54 31/02/22<CR>	P01E080=1<CR>

PxxE081 R/W Sequence

Internal use

PxxE082 R/W Characteristic transferable [1..x]

Xx => [1..32] Number of characteristic

	Reading	Writing
PC => TT100	P01E082 ?<CR>	P01E082=1<CR>
TT100 => PC	P01E082=1<CR> The characteristic is transferable	P01E081=1<CR> Writing OK

PxxE083 R/W Standard 2 On/Off

Xx => [1..32] Number of characteristic

	Reading	Writing
PC => TT100	P01E083 ?<CR>	P01E083=1<CR>
TT100 => PC	P01E083=1<CR> Standard 2 active (multipoint ctrl)	P01E083=1<CR> Multi-point control active

PxxE084 R/W Standard 3 On/Off

Xx => [1..32] Number of characteristic

	Reading	Writing
PC => TT100	P01E082 ?<CR>	P01E082=1<CR>
TT100 => PC	P01E082=1<CR> Standard 3 active	P01E081=1<CR> Standard 3 active (requires standard 2 active also)

PxxR000 R/W Upper tolerance

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R000 ?<CR>	P01R000=0.5<CR>
TT100 => PC	P01R000 =0.5<CR>	P01R000 =1<CR>

PxxR001 R/W Lower tolerance

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R001 ?<CR>	P01R001 =-0.5<CR>
TT100 => PC	P01R001 =0.5<CR>	P01R001=1<CR>

PxxR002 R/W Upper limit

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R002 ?<CR>	P01R002 =0.25<CR>
TT100 => PC	P01R002 =0.5<CR>	P01R002=1<CR>

PxxR003 R/W Lower limit

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R003 ?<CR>	P01R003=-0.25<CR>
TT100 => PC	P01R003 =0.5<CR>	P01R003=1<CR>

PxxR004 R/W Main standard

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R004 ?<CR>	P01R004 =0.1<CR>
TT100 => PC	P01R004 =0.5<CR>	P01R004=1<CR>

PxxR005 R/W Nominal

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R005 ?<CR>	P01R005 =0.12<CR>
TT100 => PC	P01R005 =0.5<CR>	P01R005=1<CR>

PxxR006 R/W Min. class

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R000 ?<CR>	P01R006 =0.5<CR>
TT100 => PC	P01R006=0.5<CR>	P01R006=1<CR>

PxxR007 R/W Max. class

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R007 ?<CR>	P01R007=-0.5<CR>
TT100 => PC	P01R007 =0.5<CR>	P01R007=1<CR>

PxxR008 R/W Min. fixture threshold

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R008 ?<CR>	P01R008 =-0.5<CR>
TT100 => PC	P01R008 =0.5<CR>	P01R008=1<CR>

PxxR009 R/W Max. fixture threshold

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R009 ?<CR>	P01R009 =0.5<CR>
TT100 => PC	P01R009=0.5<CR>	P01R009=1<CR>

PxxR010 R/W Stand-by

Xx => Number of characteristic

Threshold for the stand-by test during a calibration. Express in mm

	Reading	Writing
PC => TT100	P01R010 ?<CR>	P01R010 =1.0<CR>
TT100 => PC	P01R010 =0.5<CR>	P01R010=1<CR>

PxxR011 R/W Repetition

Xx => Number of characteristic

Express in %

	Reading	Writing
PC => TT100	P01R011 ?<CR>	P01R011 =5<CR>
TT100 => PC	P01R011 =0.5<CR>	P01R011=1<CR>

PxxR018

PxxR020 R/W Dilation coefficient characteristic

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R018 ?<CR>	P01R018 =12<CR>
TT100 => PC	P01R018=0.5<CR>	P01R018=1<CR>

PxxR021 R/W Coefficient adjustment mode

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R021 ?<CR>	P01R021 =1<CR>
TT100 => PC	P01R021 =0.5<CR>	P01R021=1<CR>

PxxR022 R/W Auto trigger threshold

Xx => Number of characteristic

	Reading	Writing
PC => TT100	P01R022 ?<CR>	P01R022 =0.5<CR>
TT100 => PC	P01R022 =0.5<CR>	P01R022=1<CR>

PxxR023 R/W Dilation coefficient standard

Xx => not important

	Reading	Writing
PC => TT100	P01R023 ?<CR>	P01R023 =12<CR>
TT100 => PC	P01R023 =0.5<CR>	P01R023=1<CR>

PxxR024 R/W Calibration timeout

Xx => not important

	Reading	Writing
PC => TT100	P01R024 ?<CR>	P01R024 =0.5<CR>
TT100 => PC	P01R024 =0.5<CR>	P01R024=1<CR>

PxxR029 R/W Standard 3 value

	Reading	Writing
PC => TT100	P01R029 ?<CR>	P01R029 =0.5<CR>
TT100 => PC	P01R029 =0.5<CR>	P01R029=1<CR>

A01: Action Init Dyn

Starts Init Dyn function on all characteristics

PC => TT100	A01<CR>
TT100 => PC	A01=1<CR>

A02 'Characteristic': Init Dyn characteristic

Starts Init Dyn function on the characteristic parameter

PC => TT100	A02 1<CR>
TT100 => PC	A02=1<CR>

A03 'Group': Init Dyn group

Starts Init Dyn function on the group of characteristics parameter

PC => TT100	A03 1<CR
TT100 => PC	A03=1<CR>

A04 'Fixture': Set fixture active

Change fixture

PC => TT100	A04 1<CR>
TT100 => PC	A04=1<CR>

A05 'Fixture': Fixture calibration active

Starts a calibration on the active fixture

PC => TT100	A05 1<CR>
TT100 => PC	A05=1<CR>

A06 'Characteristic': Characteristic calibration

Starts a calibration on the characteristic parameter

PC => TT100	A06 1<CR>
TT100 => PC	A06=1<CR>

A07 'Group': Characteristic group calibration

Starts a calibration on the characteristic group parameter

PC => TT100	A07 1<CR>
TT100 => PC	A07=1<CR>

A08: Control stand-by fixture active

Starts the ‘Control of stand-by’ function on the active fixture

PC => TT100	A08<CR>
TT100 => PC	A08=1<CR>

A09 ‘Characteristic’: Control of stand-by characteristic

Starts the stand-by control function on the characteristic in argument

PC => TT100	A09 1<CR>
TT100 => PC	A09=1<CR>

A10 ‘Group’: Control of stand-by group

Starts the stand-by control function on the characteristic group in argument

PC => TT100	A10 1<CR>
TT100 => PC	A10=1<CR>

A11 ‘Fixture’: Control of fixture calibration

Starts the ‘Calibration control of fixture’ function

PC => TT100	A11 1<CR>
TT100 => PC	A11=1<CR>

A12 ‘Characteristic’: Control of characteristic calibration

Starts ‘Calibration control’ function on the characteristic in argument

PC => TT100	A12 1<CR>
TT100 => PC	A12=1<CR>

A13 ‘Group’: Control of group calibration

Starts ‘Calibration control’ function on the group in argument

PC => TT100	A13 1<CR>
TT100 => PC	A13=1<CR>

A14 ‘Ctrl’: Calibration sequence

Plays the calibration sequence, equivalent to pressing the P button on the screen

PC => TT100	A14 1<CR> Starts the calibration sequence, the yellow bar gives the instruction to place the standard and press P
TT100 => PC	A14=1<CR>
PC => TT100	A14 1<CR> Equivalent to pressing P
TT100 => PC	A14=1<CR>
PC => TT100	A14 0<CR> The current calibration sequence can be cancelled at any time by sending 0
TT100 => PC	A14=1<CR>

A16 ‘Message’: Config tool update

Displays the white update screen

The first message is used as a title, subsequent messages are added to the line.

To finish, send the command with empty message

PC => TT100	A16 TEST<CR> Opens the white config tool menu
TT100 => PC	A16 TEST=1<CR>
PC => TT100	A16 MSG<CR> Adds a line of ‘MSG’ text
TT100 => PC	A16 MSG=1<CR>
PC => TT100	A16<CR> Closes the white config tool menu
TT100 => PC	A16=1<CR>

A25: Display desktop

Displays the desktop

PC => TT100	A25<CR>
TT100 => PC	A25=1<CR>

A17: Delete measurement

Deletes all measurements in memory

PC => TT100	A17<CR>
TT100 => PC	A17=1<CR>

A23: Tracking the screen

Tracking/update the screen

PC => TT100	A23<CR>
TT100 => PC	A23=1<CR>

A24: Change active range

Change of range

PC => TT100	A24 3<CR> Loads range 3
TT100 => PC	A24=1<CR>

A26: Saves the active range

Copy the current range to MRAM, to be done after modifying the current range

PC => TT100	A26<CR>
TT100 => PC	A26=1<CR>

A27: Switches to measurement mode

Displays the measurement mode

PC => TT100	A27<CR>
TT100 => PC	A27=1<CR>