

Air Meter (55-Air1/2)

Display units for 1 or 2 Air Gauges




USER'S MANUAL

Firmware 3.00



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2. FOREWORDS

ONE YEAR LIMITED GUARANTEE

MANUFACTURER'S RESPONSIBILITY

SPARE PARTS AND LABOUR.

The manufacturer commits himself to pay for repair or replacement costs (labour costs included) during a period of one year as from the date the guarantee came into force. The spare parts can be new or renovated and are guaranteed until the end of the initial guarantee period.

FIRST END-USER COVERAGE.

This guarantee applies only to the first 'end-user' of the product and is not assignable to any other subsequent purchaser or user.

RESTRICTIONS.

Any accessory or expansion item not included in the original factory packaging is not guaranteed.

The present guarantee does not cover: installation or repair costs, damages resulting from circumstances beyond the manufacturer's control like damages following acts of God, misuse, or careless mistake from the user, damages during the transport or due to a wrong installation, use or application, such as any material damage caused by the use of non supplied products, components or accessories. It also does not cover products modified without any written approval from the manufacturer, including electrical or mechanical modification, removal of serial numbers or of the manufacturer's trademarks or of any other identification.

THE SOLE RECOURSE UNDER THIS GUARANTEE SHALL BE THE REPAIR OR THE REPLACEMENT OF DEFECTIVE PARTS AS INDICATED ABOVE. UNDER NO CIRCUMSTANCES CAN THE MANUFACTURER BE HELD LIABLE FOR INDIRECT OR SPECIAL DAMAGES OR FOR DAMAGES RESULTING FROM THE USE OF THE PRODUCT, INCLUDING ANY LOSS OF DATA, BUSINESS OR PROFIT, AND WHETHER THESE DAMAGES CAN BE FORESEEN OR NOT AND WHETHER THEY ARE BASED ON A GUARANTEE VIOLATION OR NOT.

THE PRESENT GUARANTEE REPLACES ANY OTHER EXPRESSED OR IMPLIED GUARANTEE INCLUDING BUT NOT LIMITED TO ANY GUARANTEE OF MARKETING OR ADEQUACY FOR A PARTICULAR USE; AND ALL THESE GUARANTEES ARE EXPRESSLY EXCLUDED AND CANCELLED.

WARNING

The information contained in this booklet can be changed without notice.

The manufacturer makes no warranty whatsoever with respect to the warranties of commercial quality of this product or its suitability to a particular use.

M1 – M3 Display units

The manufacturer is not responsible for mistakes that could be found in this handbook and also for direct or indirect damage resulting from the equipment, its performances and the use of this product.

It is the responsibility of the user to verify the calibration of the display before measuring and it is advised to check periodically the calibration and measurement performance. This also applies to the input air pressure and selection of the restrictor. See section 3.3.6 & 3.3.7 page 15.

CLEANING

Use a soft cotton cloth slightly soaked with an ethyl alcohol based product.

DO NOT USE the following products: acetone, benzene, toluene and halogens hydrocarbons.



3. INTRODUCTION

3.1. PRODUCT PRESENTATION

The 55-AIR1 Single Channel **(M1)** and the 55-AIR2 Twin Channel **(M3)** display units allow making dimensional control using 1 or 2 air gauges. This can either be the connect air gauges or a mixture of measuring tools via M-Bus. See section 7.3.2

Depending on the version, it is possible to make simple measurement (with one air gauge), or display 2 characteristics on the screen and can make static measurement or dynamic (Max, Min, Max-Min...)

The M1-M3 can be connected to a PC thanks to its RS232 or USB connection.

A footswitch can be connected in order to transfer measurements.

The M1 / M3 displays for air gauges requires a minimum of 2 masters for calibration. There is also the option to use 3 masters, see section 7.3.1.1

3.2. VERSIONS

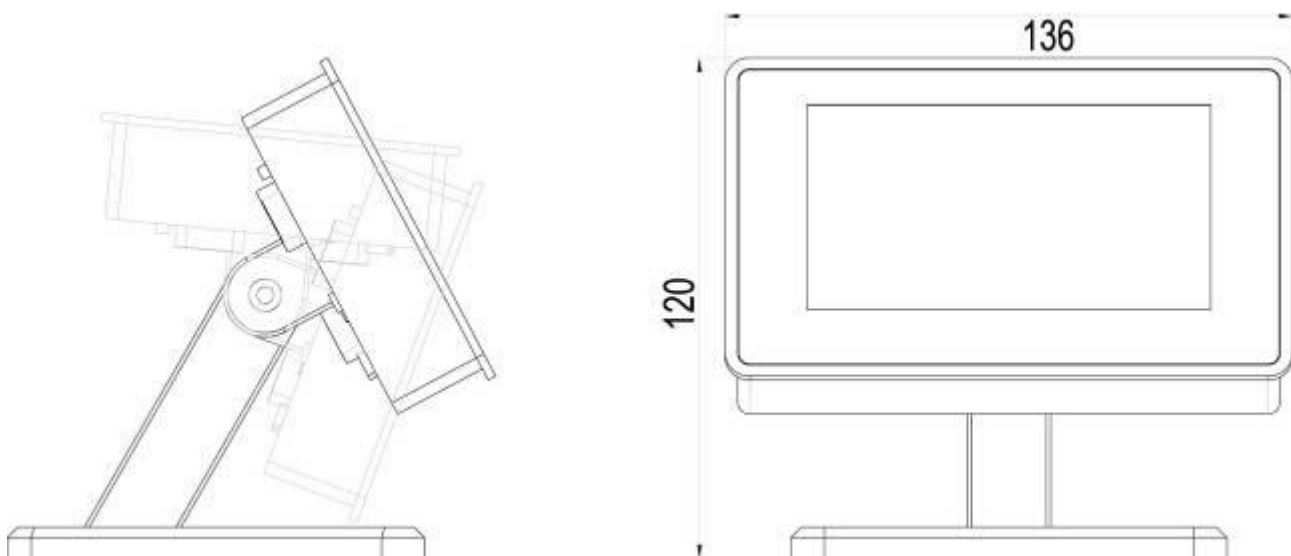
REF	Description
55-AIR1	Display unit M1 for 1 air gauge
55-AIR2	Display unit M3 for 2 air gauges or 1 air gauge with 2 measuring levels. Particularly useful for match gauging or taper measurement, see page 35

3.3. CHARACTERISTICS

3.3.1. Main technical characteristics

- TFT colour touch screen display 4,3", resolution 480x272.
- Static or dynamic measurements (Max, Min, Max-Min, Average, Median)
- Analogue or digital display
- 1 or 2 measurement configurations (2 characteristics)
- Possibility to select automatically the characteristic by using the air gauge or by touching the screen.
- Relative or absolute display
- Display resolution (up to 0.1µm)
- Metric (mm or µm), Imperial (Inches) measurement or DMS (Degrees)
- RS232 port for communication with a PC
- USB port for communication and/or power supply
- USB Stick for data saving on a CSV file
- Optional connection of M-Bus modules
- Measurement transfer by pressing a key, footswitch input or retro-command on the RS232 port.
- Operating temperature : : +15°C to +30°C
- Power supply from 85 to 265 VAC by using the supplied main transformer (or by connecting it directly on your PC USB port, or through the 24 VDC screw terminal.
- Relative humidity : maximum 80%
- Dimensions : width 130 mm, height 111 mm, depth 105 mm
- Mass : 600 grams (700g with the power supply)

3.3.2. Dimension and installation



Base fitted with 4 threads M5. To access to these threads, it is necessary to remove the 4 antiskid plastic feet.



Remove the antiskid parts to attach it on the table or on a vertical panel

It is also possible to panel mount the display, with the accessory ref 55-ACS-AFF-001. Be careful not to use longer screw than M4*16.

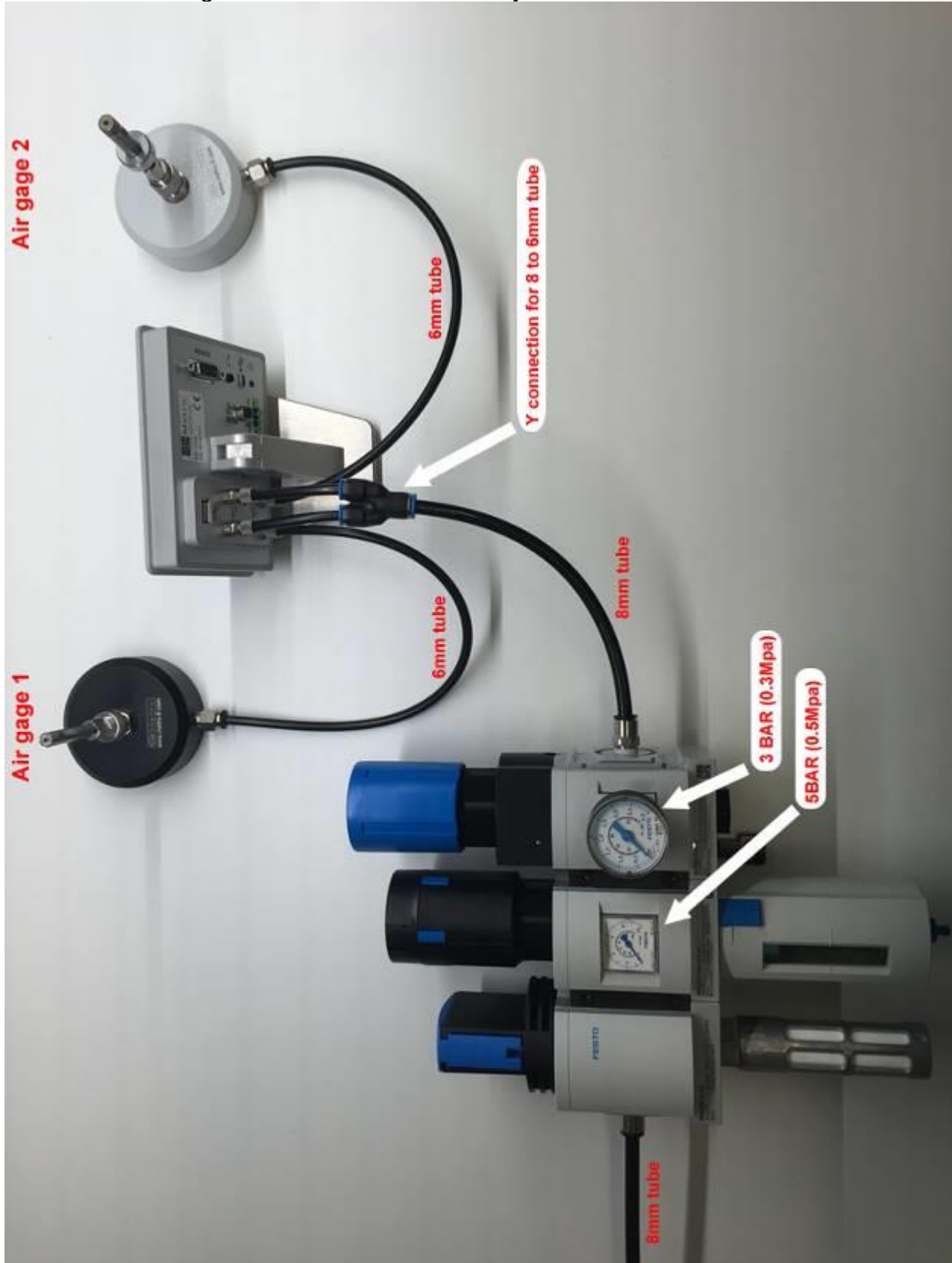


Pneumatic connections (see also chap.4) :



M1 – M3 Display units

Picture of regulator kit is for reference only.





3.3.3. Contains of the packaging

The M1/3 package includes :




- 1 M1/3 display mounted on an orientable stand
- 1 USB cable, (length =1.8m) for power supply and/or data transfer
- 1 USB main adaptor for the display power supply. Can also be powered by a computer when connected to it with the USB.
- 1 USB Flask Memory stick with user manual.

M1 – M3 Display units







3.3.4. Accessories

Reference	Description	Picture
55-MBV001	<p>Air preparation unit :</p> <p>It is mandatory to use a precision regulation system, otherwise the measurements will not be stable.</p> <p>We can supply the adapted air preparation unit including stop valve, filter and regulator + precision regulator.</p> <p>The second precision regulator must be adjusted at 3 BARS (0.3MPa) and the first to minimum 5 BARS (0.5 MPa)</p>	
N/A	<p>For M3 displays.</p> <p>It allows to divide the 8mm tube at the output of the air preparation unit into 2 tubes of 6 mm adapted for the connection on the M3 input.</p>	
N/A	<p>Soft polyurethane tubes 6*4mm :</p> <p>The M1 / M3 are fitted with 2 connectors for air tube with 6mm external diameter and 4mm internal diameter.</p> <p>We advise to use soft polyurethane tubes from SMC, because their flexibility prevent the display to knock over due to the pressure of the tubes on the table.</p>	
N/A	<p>Soft polyurethane tubes 8*5mm :</p> <p>The air preparation unit is fitted with a connexion for 8mm tubes (external diameter)</p>	

3.3.5. Options / cables

Reference	Description	Picture
30-904-4102	Footswitch : This footswitch with a robust construction can be configured in different ways: preset, measurement transmission, start dynamic measurement etc...	
N/A	Handswitch This footswitch with a robust construction can be configured in different ways: preset, measurement transmission, start dynamic measurement etc...	
55-ACS-AFF-001	Accessory for panel mounting. To be installed instead of the stand. 	
30-804-2130	This M-Bus module is fitted with 8 input/outputs isolated with optocouplers allowing to get additional functionalities, for example: output for Go/noGo, input for preset or start dynamic measurement... The M-Bus modules are mounted on an aluminum profile allowing to mount them on a standard DIN rail. Up to 4 modules can be coupled	
55-MB-RL	The optional MB-RL module is fitted with 2 independent relays min and max, free of potential that indicate the position of the measure according to the part tolerances. The module is also fitted with 6 inputs allowing remote control the display. This MB-RL module is wired exactly like the optional board for Monocote displays. It allows then to replace a Monocote by a display without changing the machine wiring.	

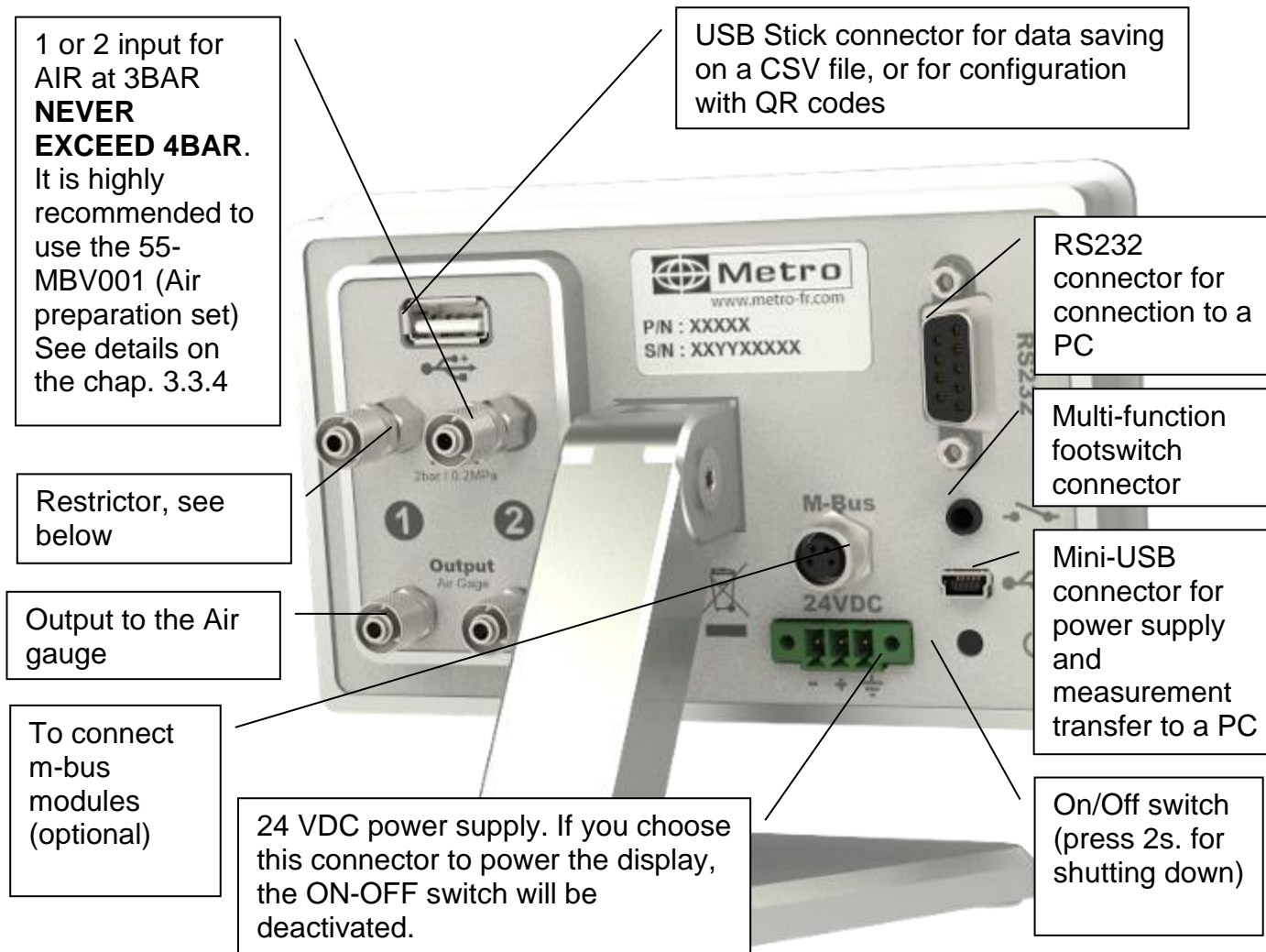
M1 – M3 Display units

<p>55-81213-1.5</p>	<p>M-Bus cable This cable allows to connect the compatible M-Bus modules on a display unit. Length 1.5m</p> 	
<p>55-45160</p>	<p>RS232 cable This cable allows to connect a display to a computer or a PLC.</p> 	
<p>30-926-8116</p>	<p>This cable allows to connect a display to a Multiplexer Mux, and to the DP1 printer from Mitutoyo</p> 	

<p>20-USB</p>	<p>RS232/USB cable converter :</p> <p>This cable allows a display to communicate with a computer. It creates a virtual COM port on the computer. It is delivered with a driver on a CD.</p> 	
<p>55-AP1310</p>	<p>Tickets printer</p> <p>Allows to print the displayed</p> <p>Requires cable to be connected to the display</p>	
<p>55-HD3430-BKK1B</p>	<p>QR code reader for Metro displays.</p> <p>2 main functions :</p> <ul style="list-style-type: none"> - Allow to send a configuration on the display (part definition, tolerance, display type, calibration of the air gage, etc...) - Send a Manufacturing order number. The export file will take the name of the number entered. 	
<p>N/A</p>	<p>Air cut-off footswitch</p> <p>Allows to simply cut off the air supply, for stopping the air flow when the air gage is not used.</p>	

M1 – M3 Display units

3.3.6. Connectors

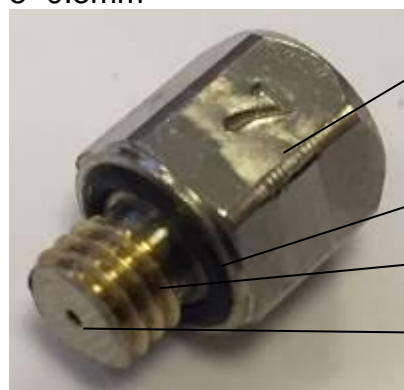


3.3.7. Standard cabling – restrictor choice

The displays are delivered with 1 or 2 restrictors of 0.5mm on the air input + 1 or 2 0.7mm restrictors as spare parts. The value of the restrictor is indicated as below:

7 = 0.7mm

5 = 0.5mm



Value of the restrictor
7=0.7mm

O ring

M5 thread

Restrictor

The following table shows some frequent cases to define which restrictor will be the most adapted to your application. **In order to get the best linearity, the most important is to get 2.7 BAR** at the nominal (pressure indicated on the Setup menu, it is a relative pressure from the atmospheric pressure, while the 3 BAR at the output of the regulator is absolute)

If you order a turnkey solution at Bowers, we will deliver the display with the adapted restrictor, or with an integrated restrictor (see chap 3.3.8). But if you want to use the M1 / M3 display together with your existing air gauge, you will have to use the adapted restrictor by your own.

It is advised to contact Bowers for advice or confirmation on this subject.

Check this video for understanding the influence of the restrictor on the linearity :

[link to the video](#)



Or scan the QR code :



Nozzle diameter in mm	number of nozzles	total flow surface in mm ²	Restrictor
0,3	2	0,14	0,3
0,4	2	0,25	0,4
0,5	2	0,39	0,4
0,6	2	0,57	0,5
1	2	1,57	0,7
2,07	2	6,73	0,9
0,3	3	0,21	0,3
0,4	3	0,38	0,4
0,5	3	0,59	0,5
0,6	3	0,85	0,5
1	3	2,36	0,7
0,3	4	0,28	0,4
0,4	4	0,50	0,4
0,5	4	0,79	0,5
0,6	4	1,13	0,5
1	4	3,14	0,7

M1 – M3 Display units

Example :



3.3.8. Cabling with by-pass nozzle (integrated restrictor)

Some air gauges are delivered with a by-pass nozzle (or integrated restrictor). It means that the restrictor is integrated inside the air gauge itself, and there is no need to install it on the display.

NO RESTRICTOR ON THE DISPLAY.

This configuration allows to have a faster the reaction time and makes the installation easier by removing the need to choose the adapted restrictor.

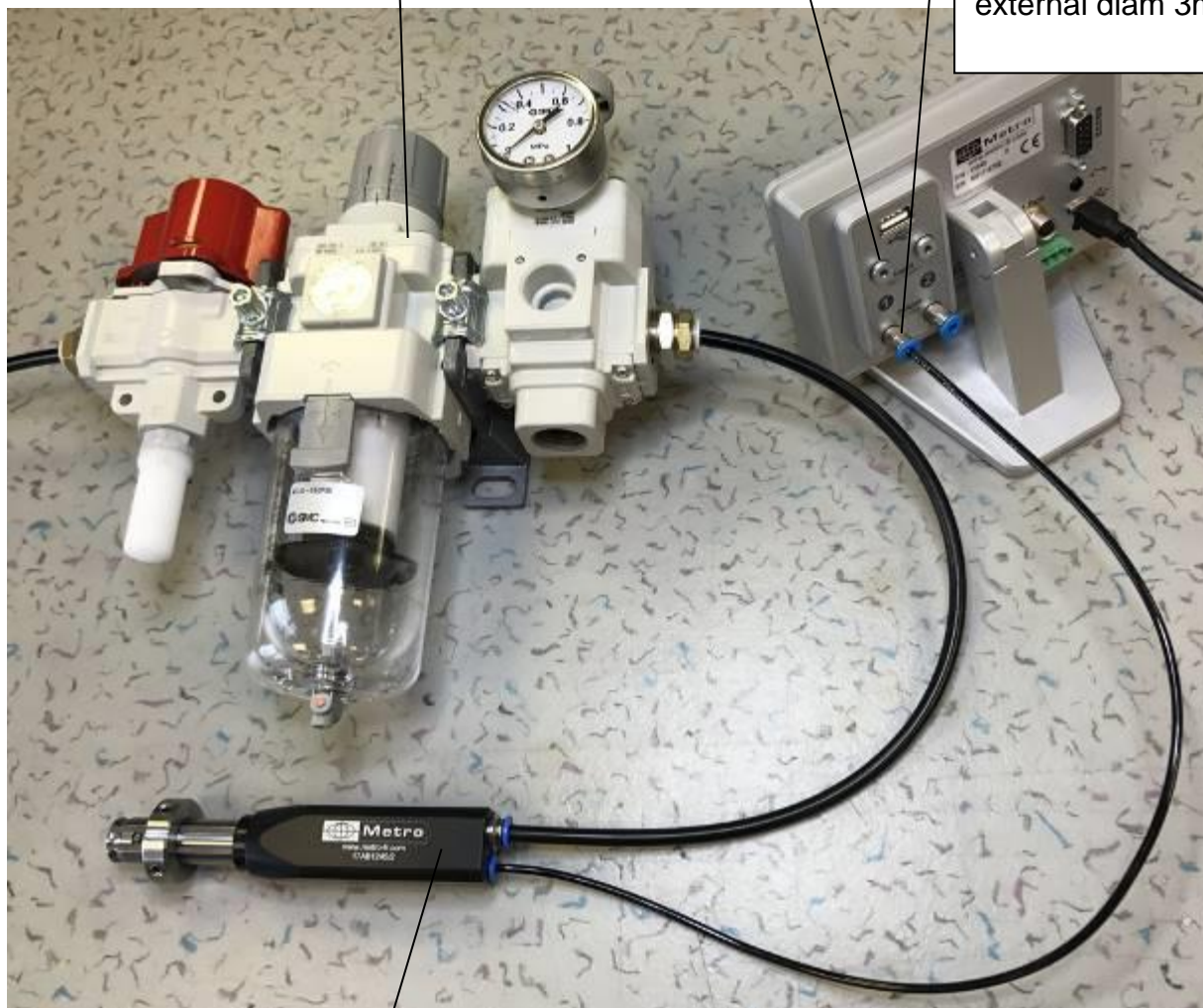
Please contact Bowers for more information.

The cabling layout is the following:

Regulation unit
ref 55-MBV001 (delivers
3BAR/0.3MPa pressure)

Stopper

Standard push-in
connector, M5 thread.
Generally, for tube
external diam 3mm



Air gauge with by-pass
nozzle (integrated restrictor)

3.3.9. THE RS232 COMMUNICATION PORT

The M3 is fitted with a RS232 port. It allows linking the M1/M3 to PC or an external system. The configuration is as following

9600 bauds, 8 bits, 1 stop bit, no parity

CONNECTOR PINOUT

It is fitted with a SUBD 9 pins female connector.

<i>Pin</i>	<i>Signal</i>	<i>Direction</i>	<i>Description</i>
1			Not used
2	RX	Input	Reception of data
3	TX	Output	Transfer of data
4	IN1	Input	Do not use. Only for firmware update
5	Gnd	-	Ground
6			Not used
7	IN2	Input	Do not use. Only for firmware update
8 & 9			Not used

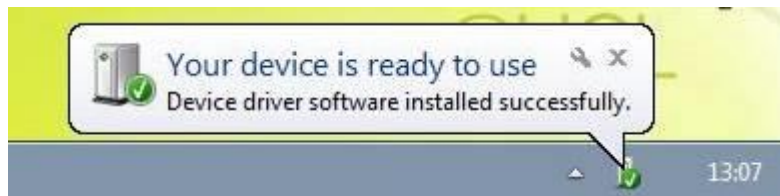
3.3.10. MINI-USB connector

The mini-USB connector has 2 functions

1. Power supply through a wall mounted transformer. This transformer supplies a regulated 5V/1A DC voltage.
2. Measurement transmission. If you connect your display to a PC, the PC will detect and install automatically as a standard USB keyboard with the standard drivers of your operating system (Windows, Mac OS etc..). When you will send the measurement, the value will be written on your PC screen where your cursor is, in the same way as it would have been typed with a keyboard.



Message that appears when the display has been correctly installed:



3.3.11. The 24VDC connector

It is advised to use this power supply when panel mounted.



Using this power supply instead of the mini-USB will deactivate the ON-OFF switch. Therefore, when the display is powered, it will start automatically.

3.3.12. The USB stick connector



This connector allows to connect USB sticks and USB bar code readers (see chapter 12). It is possible to connect both at the same time using a USB hub.

It is possible to save measurements on a CSV file.

In this case the display must be set the following way:

Configuration→ Transfer→ USB key

Then once the user either press on the « PRINT » button of the measuring screen or on the footswitch, one line will be added on the CSV file. (a « output.csv » file is created when the operator transfers the data for the first time).

When the USB stick has been correctly detected, a USB logo will appear on top bar.

If the USB stick is not connected when the operator transfers the measurement, an error message will pop up.

USB sticks with partitions are not supported.

3.3.13. The footswitch connector

This connector is used to connect the footswitch.

This is a JACK MONO 3.5mm (dry contact)



The footswitch can then be used for several functions: please refer yourself to the chapter 5.4 for further information.

- Transfer the measurement
- Preset
- Init dyn : Start a dynamic measurement

- Zero
- Change the displayed part reference
- Hold (freezes the display) In this case, the button “CLEAR” in the measuring screen



becomes yellow:

- Screenshot : require to have a footswitch connected + a USB stick inserted. It creates a BMP file (screenshot) in the USB stick.

4. AIR PREPARATION UNIT – AIR PIPES

4.1. Air preparation unit

Air gauging is a measurement of pressure variation.

The variation of pressure must be due to the variation of distance between the gauge and the part being measured. Therefore, it is vital to have a high stability air input, in order not to have variation of pressure due to air input variation.

Bowers supply the air preparation set 55-MBV001

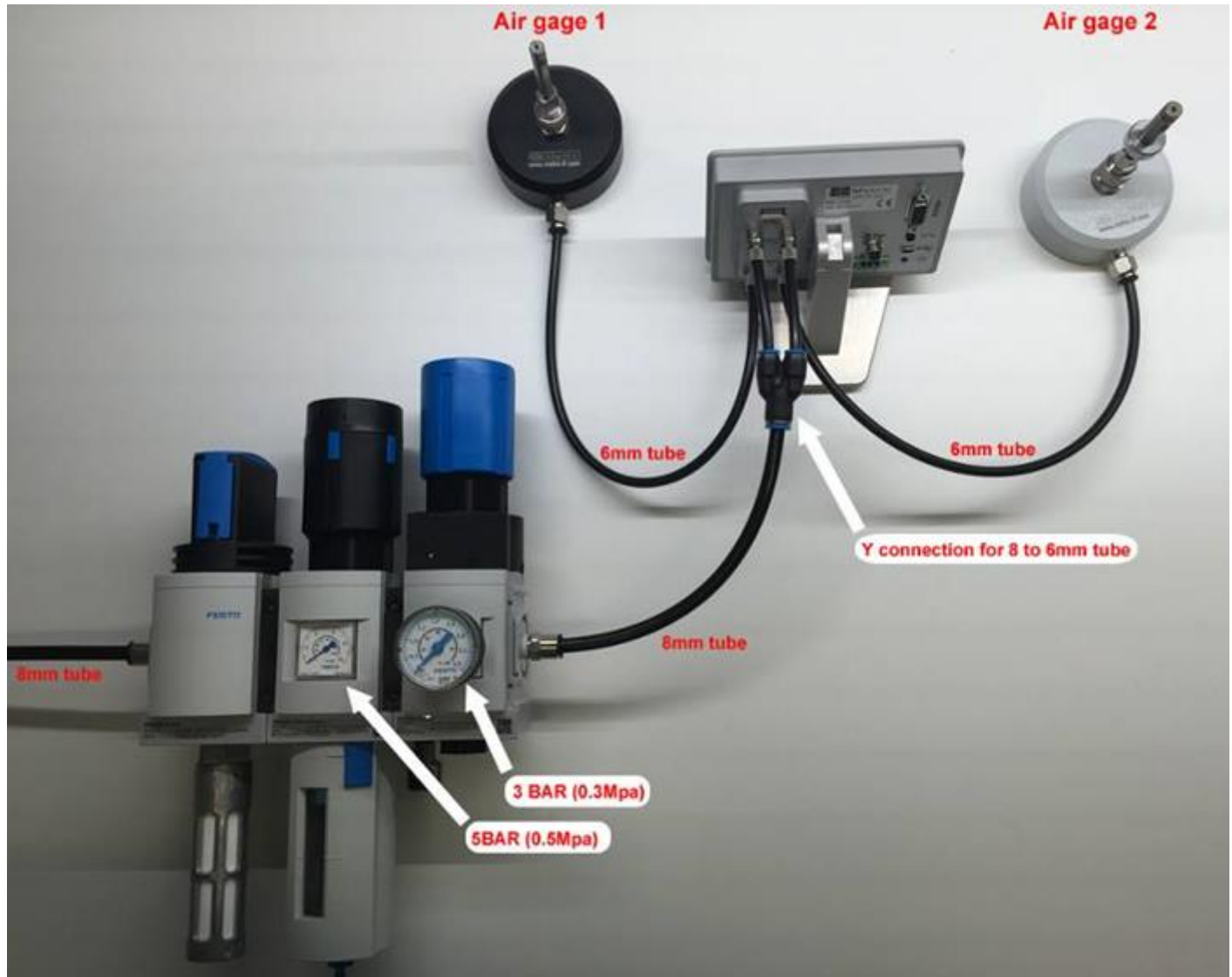


4.2. Air pipes

The air displays are fitted with air connectors adapted to connected pipes with 6mm external diameter and 4mm internal diameter.

In the case of the M3, it is however recommended to use an 8mm ext. tube from the output of the air preparation unit to a Y connection/reduction to 6mm to the display.

We recommend using flexible pipes that prevent risk of fall or tilt over of the display due to the orientation of the pipes. See the following picture.

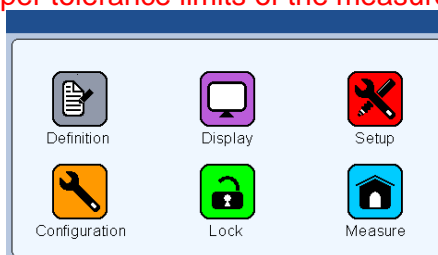


5. QUICK START

- 1 – Connect the air input to the air preparation unit ref 55-MBV001. The air pressure should be at 3 BAR (0.3Mpa) and **never exceed 4 BAR (0.4MPA)**. It is advised to lock the pressure adjustment in order not to let someone change the pressure value after having calibrated the display.
- 2 – Connect your air gauge on the output « OUTPUT – AIR GAGE »
- 3 – Power the M1/M3 either with the mini USB or with the 24VDC terminal.
- 4 – Turn on the M1/M3 by pressing the ON-OFF switch.

5 – Calibration of the device:

- ➔ To be done the first time, and can be done or verified again periodically (wear of the master or the gage)
- ➔ **The M1/M3 requires 2 masters for the calibration. The MIN and MAX masters should respectively correspond to the lower and upper tolerance limits of the measured part.**



A – From the « SETUP » icon, write the master values according to your calibration certificate. The display need 2 masters MIN and MAX to be used.

B – Place your MIN master in measuring position and press on the « calibration » button. The button becomes green for a couple of seconds.

C – Repeat the step B for the MAX master.

D – You can check by placing again the MIN master. The value on the « position » field must be at 0.0000, then by placing the MAX master, the « position » field must indicate the dimensional difference between the 2 masters.

6 – Configuration of the part to be measured. (From the Icon « definition »)

A – Use the scroll bar to reach the 2nd screen.

B – Write the value of MIN and MAX tolerances (that should correspond to your MIN and MAX masters). The tolerance must be written relative from the nominal value. For example if your part has a nominal diameter of 10mm +/-0.005, you must write in the Upper tolerance 0.005 and lower tolerance -0.005, and in the nominal field: 10.

It is then advised to use the MAX master in the case of external diameter measurement, and to use the MIN master in the case of internal diameter measurement (in order to have fewer positioning problems). So you need to fill the « Master » field with the adapted value.

C – Close the window, and come back to the measuring screen by pressing the « measure » icon.

7 – Preset

A – Place your Min or MAX master according to what you have defined in 6-B.

B – Press on the « PRESET » button. The value must change to the master value. You can now check with the 2 masters if the values are correct.

You are now ready to measure.

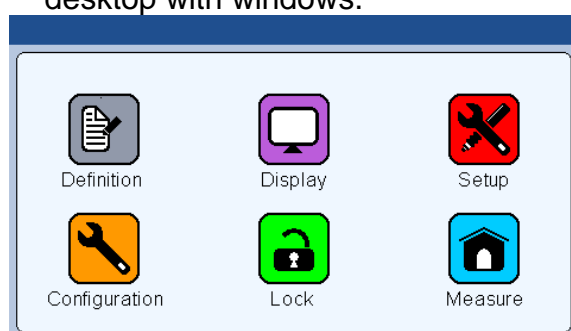
6. GRAPHICAL INTERFACE

The graphical interface of the M1/M3 has been designed to be easy to use and intuitive. This section gives you a preview of the different screens and commands available

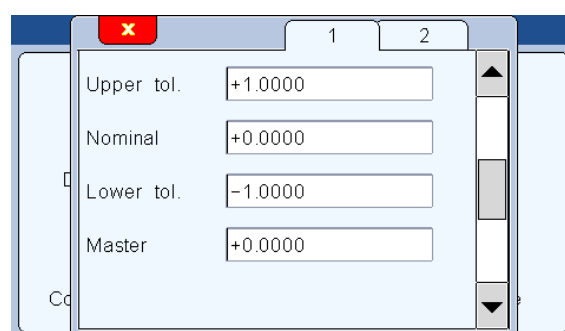
6.1.2 MAIN PARTS

The graphical interface of your M3 is divided in 2 main parts:

1. A part that allows configuring the device and the measure. It consists of an icon desktop with windows.



Icon desktop



Icon desktop with configuration windows



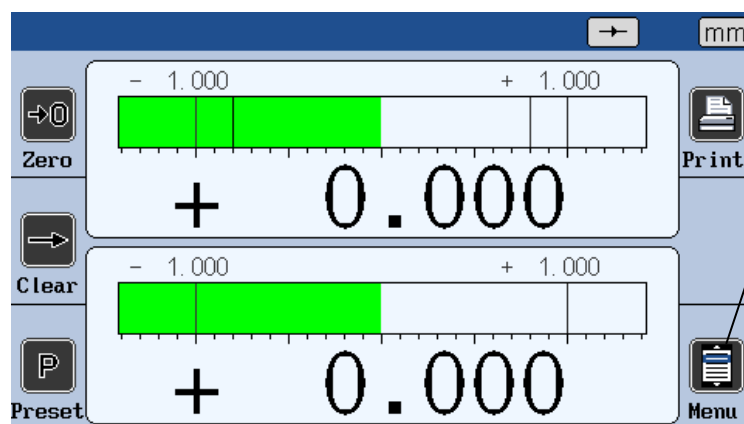
Measure button

The second part (measuring screen) can be reached by pressing the

2. This part allows to see the measurement result and to use them. The M3 starts on this



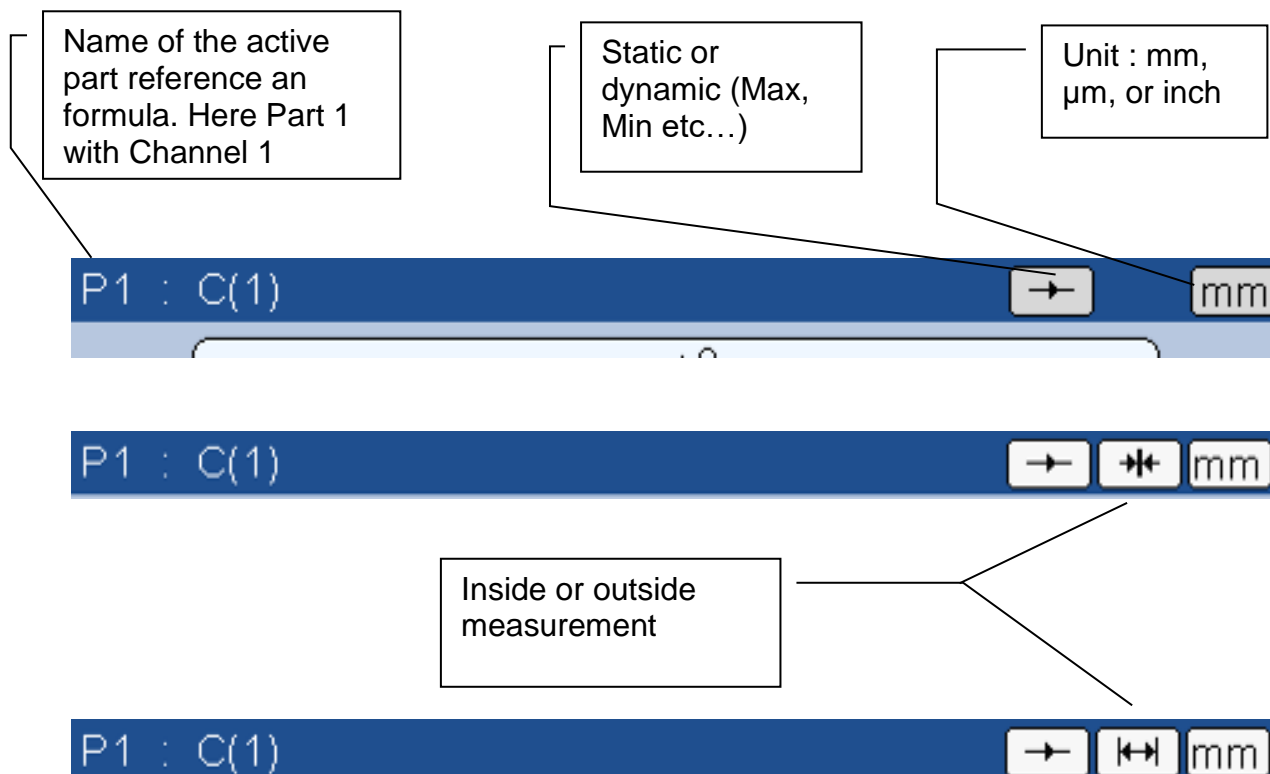
screen. For reaching the configuration screens, press on the



Press on this icon to reach the main icon desktop for configuring your device

6.2. GENERALITIES

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



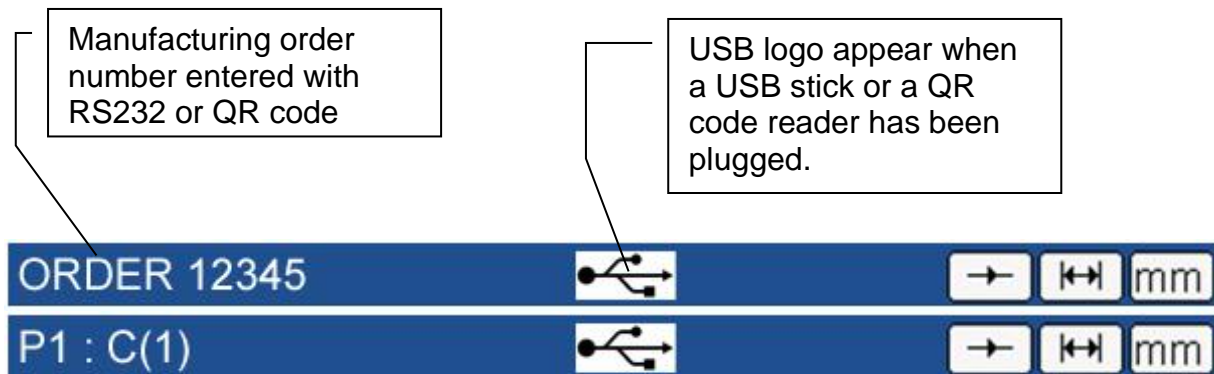
Advanced functions:

It is possible to enter a characteristic name, either with an RS232 command, or by scanning a QR code.

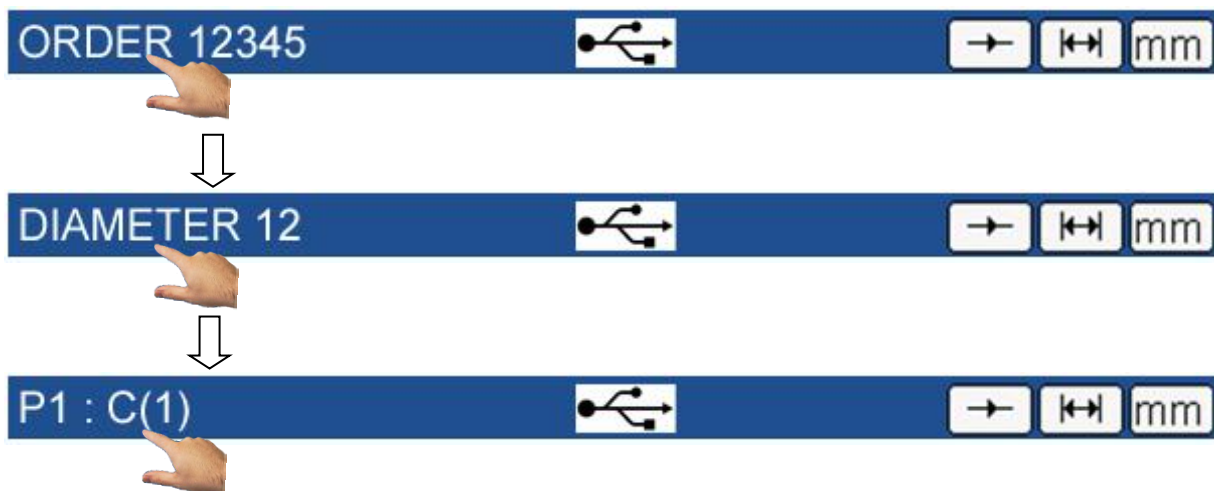
After this, the characteristic name is written instead of P1 : C(1).



In the same way it is also possible to input a manufacturer order either with an RS232 command, or by scanning a QR code :

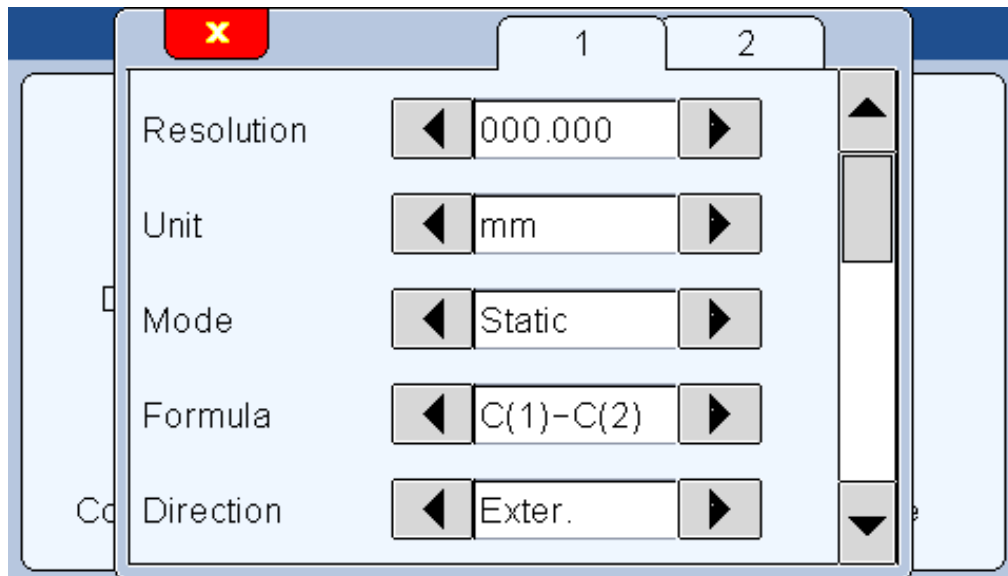


Note : When either a characteristic name or a manufacturing order name has been entered, only 1 information appear on the blue bar. However, the information display can be changed by touching the area :



6.3. CONFIGURATION WINDOWS

Configuration windows opens after pressing on the icons of the configuration screen



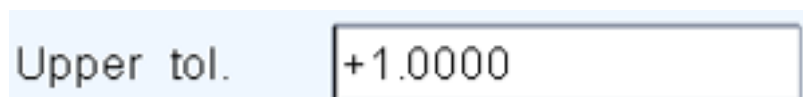
Example of configuration windows

Data are typed by different ways and **are saved after validating while quitting the window**. Here after are the different ways to input data:

- Multiple selection box. Press on the black arrows to change the pre-defined value.



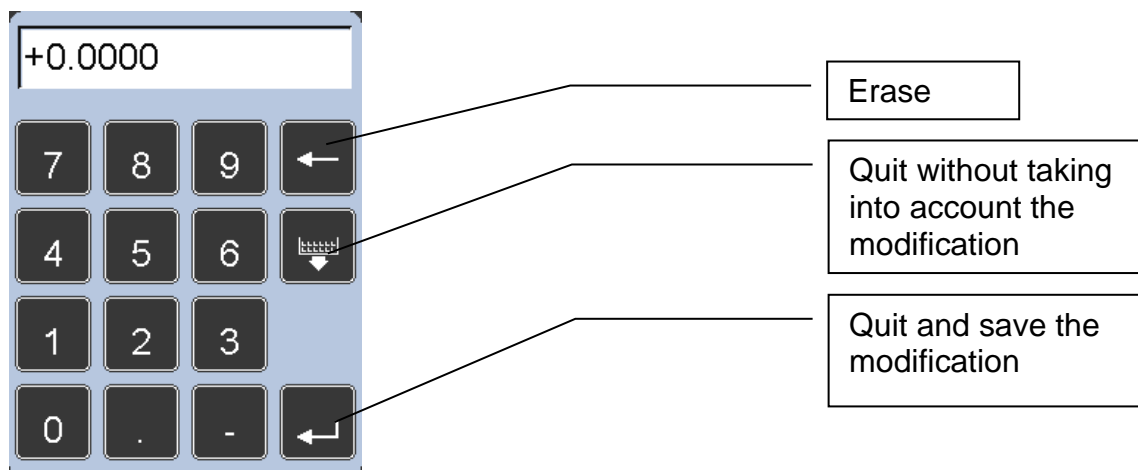
- Edit box. A virtual keyboard appears after clicking on the edit box.



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



6.4. VIRTUAL KEYBOARD



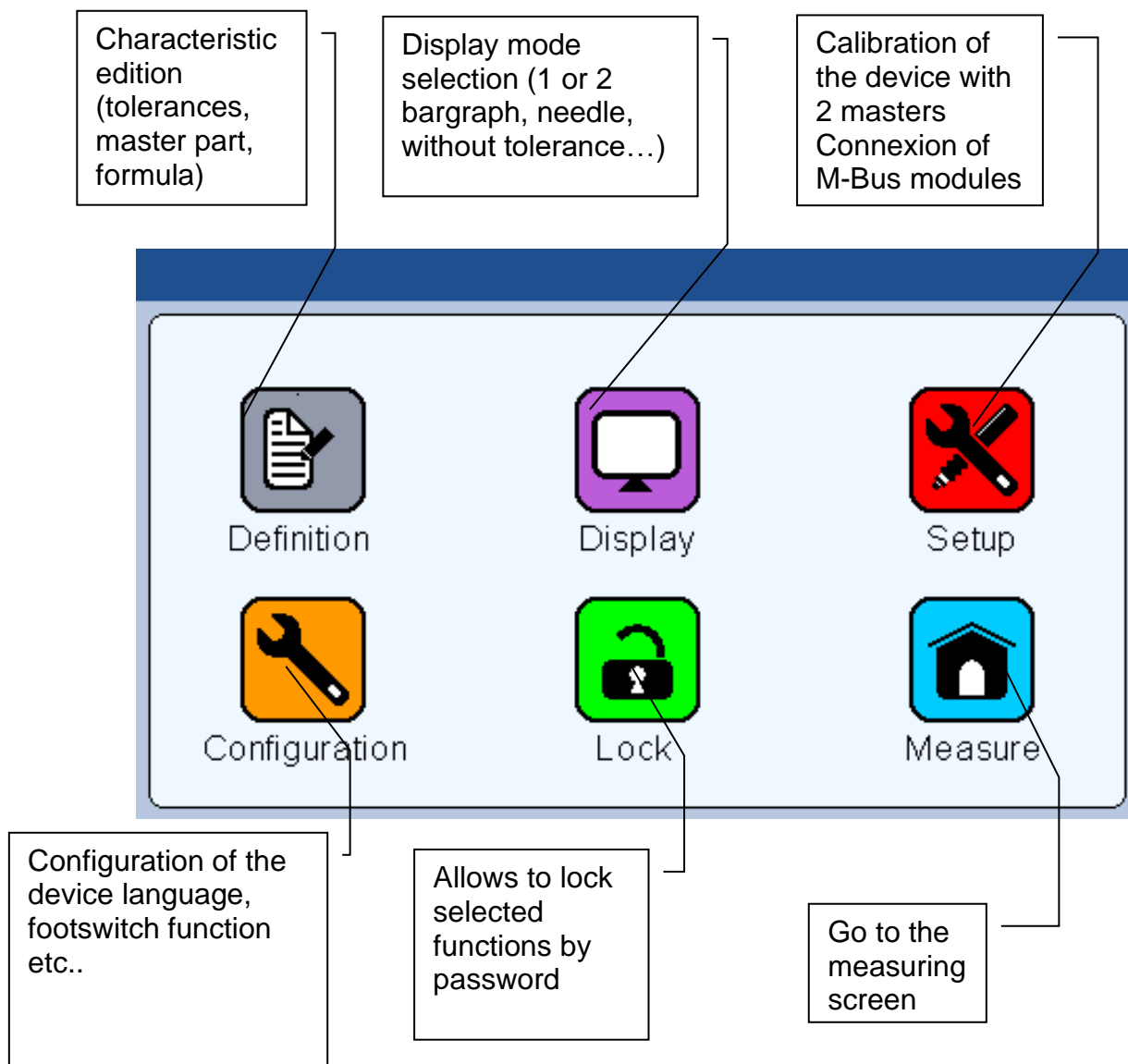
7. CONFIGURATION OF THE DEVICE AND THE MEASURE

This section describes the different windows that are accessible from the icon desktop.



If you are on the measuring screen, you can reach the icon desktop by pressing on the button.

Your M3 can be entirely configured (language, communication etc...) from this window. The measure (tolerances, characteristics etc...) is also configured from this window.



The 6 following sections describe the 6 icons of this screen.

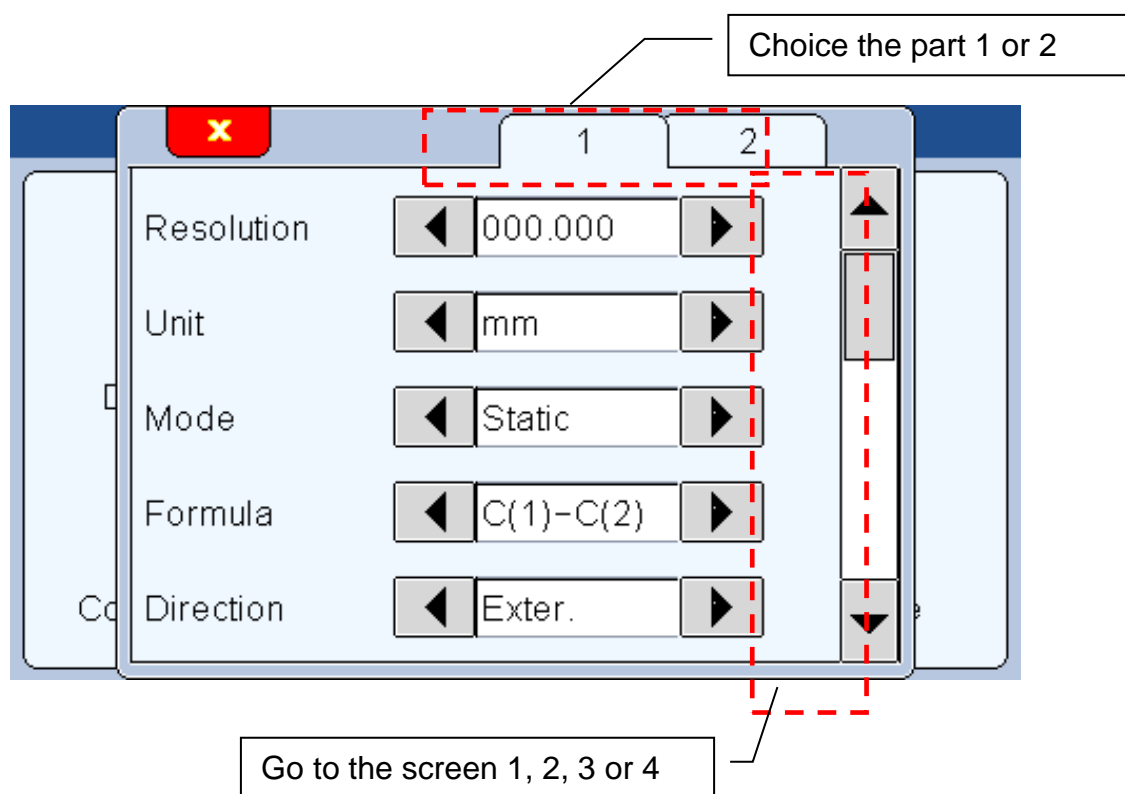
7.1. DEFINITION



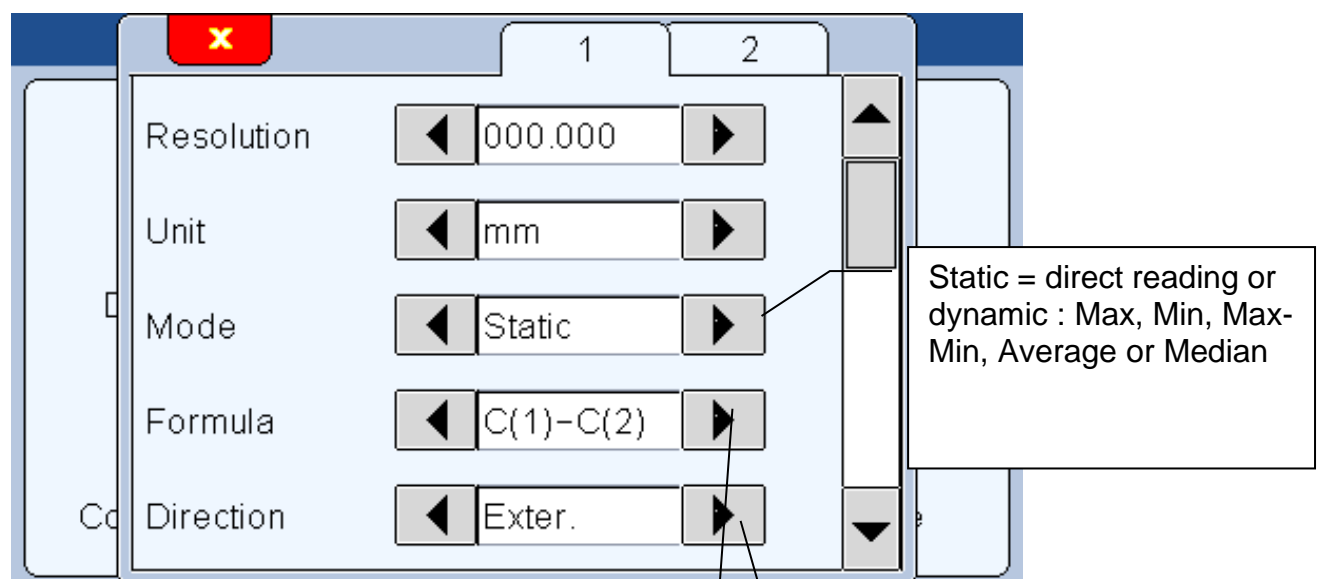
After pressing on this icon, the bellow window appears:

It gives the possibility to define the tolerances, the master, the master part characteristic, the resolution of each of the 2 available measurement configurations.

→ This window is divided in 2 parts for the configuration of the 2 measurement configurations.



7.1.1. Part 1



Choice of the calculation formula:

- C(1)
- C(2)
- C(1) + C(2)
- C(1) - C(2)
- -C(1)
- -C(2)
- -C(1)+C(2)
- Taper

« C » means « Channel »

It is possible to give a coefficient for each probe from the menu



Setup

For measuring internal or external diameters. It defines the indicators colour, and gives information to the user if the part can be used again.

Resolution

000.000 = micron

00.0000 = 0.1 micron

Unit

mm : millimeters

In : inches

Um = Microns

Deg = decimal degrees (automatic choice when the formula is set as Taper)

DMS = Degrees / Minutes / Seconds

Mode

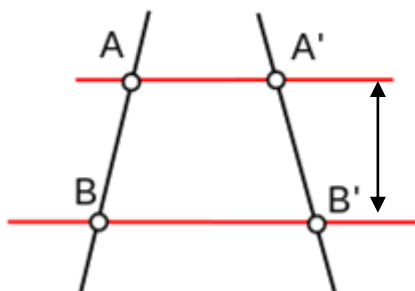
Static = direct reading: The display is refreshed together with the probe is moving.

Dynamic : The following mode starts after pressing on the “clear” button of the measuring screen.
(or through a I/O or footswitch command)

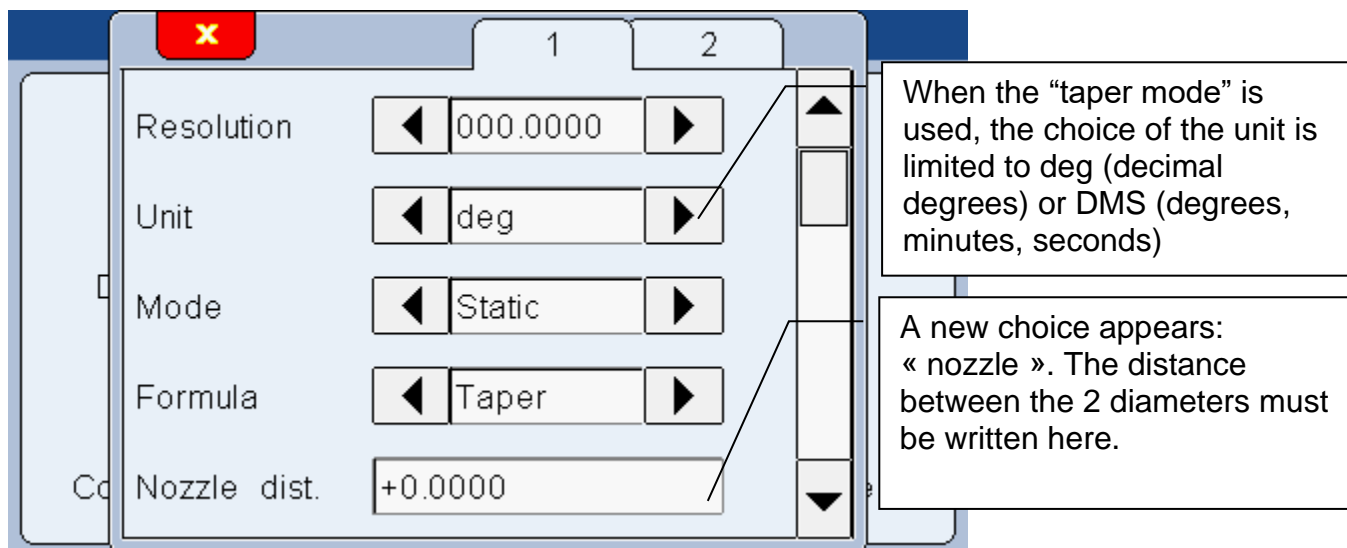
- Max
- Min
- Max-Min
- Average
- Median = $(\text{max} + \text{min}) / 2$

Formula : Taper

This mode is used to calculate an angle of a taper.



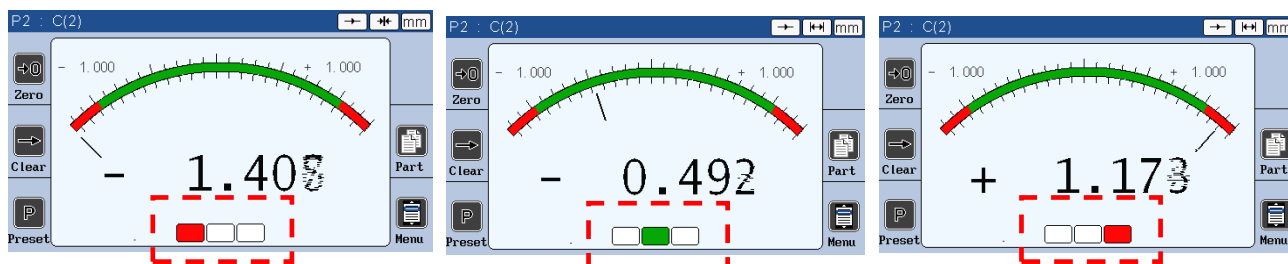
To measure the angle, you require an air gage with 2 level. The distance between each diameter has to be entered on the parameters.



Direction

Direction: none

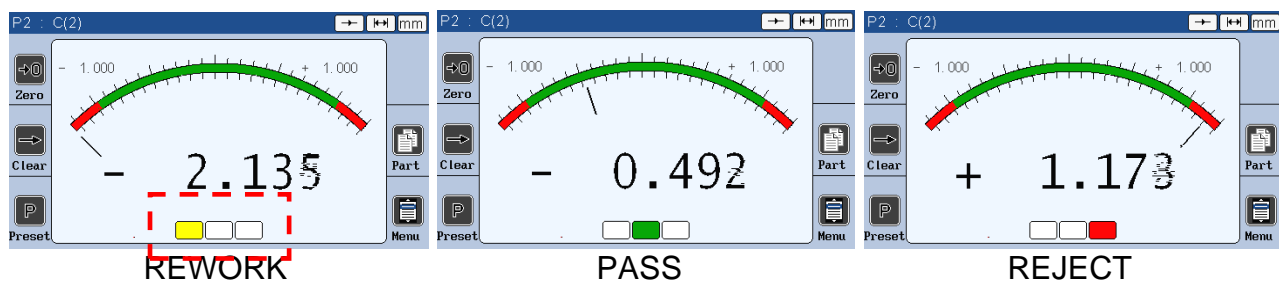
With this direction of measurement, any measure outside of the tolerance limits will appears in red. All the good measure will be in green.



Direction: Internal diameter

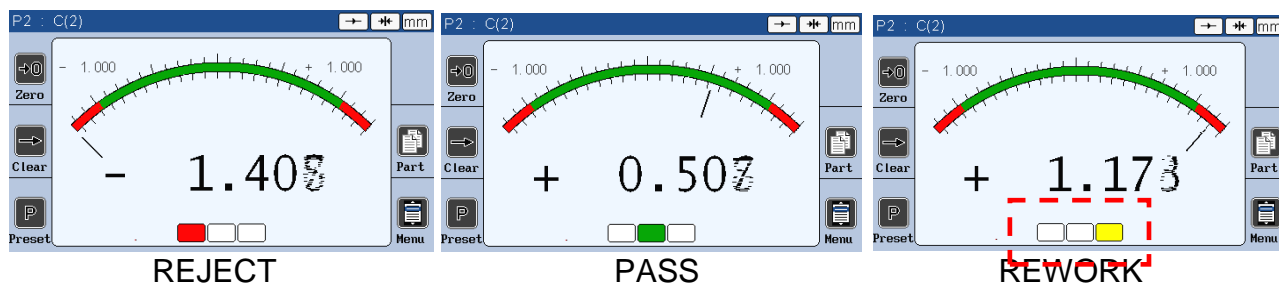
The direction of measurement is used to measure internal or external diameters. The difference between these two modes is that according to the part, the part might still be rework. For example, the size of a bore in a part: if the bore is too big, there is no way to rework the part, so the indicator is RED. However, if the bore is too small, it can still be increased, and then the part could fit in the tolerance interval, so the indicator is YELLOW. In this case, the internal diameter is used, as on the pictures bellow.

On the measuring screen, a yellow indicator shows when the part is too small (so possible to rework), and a red indicator if the part is too big (rejected)



Direction: External diameter

The opposite phenomena happens for the external diameter.



7.1.2. Part 2

This screen allows to input tolerances and the characteristics (nominal and master)

Just press on the corresponding edit box to input the needed values.

The tolerances are in relative from the nominal.

Example : diameter 8mm +/-20µm

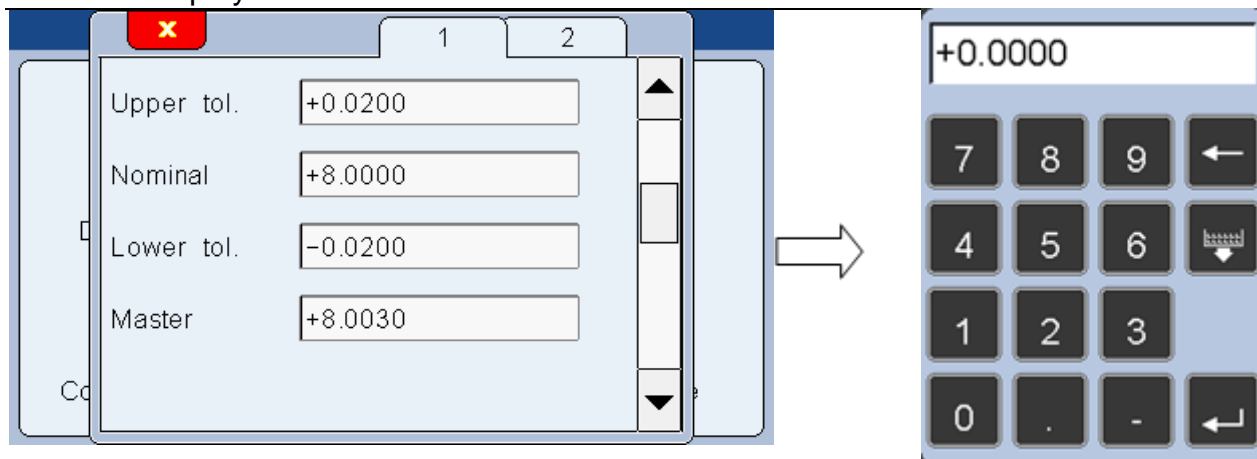
→ upper tol : 0.020

→ nominal : 8

→ lower tol :-0.020

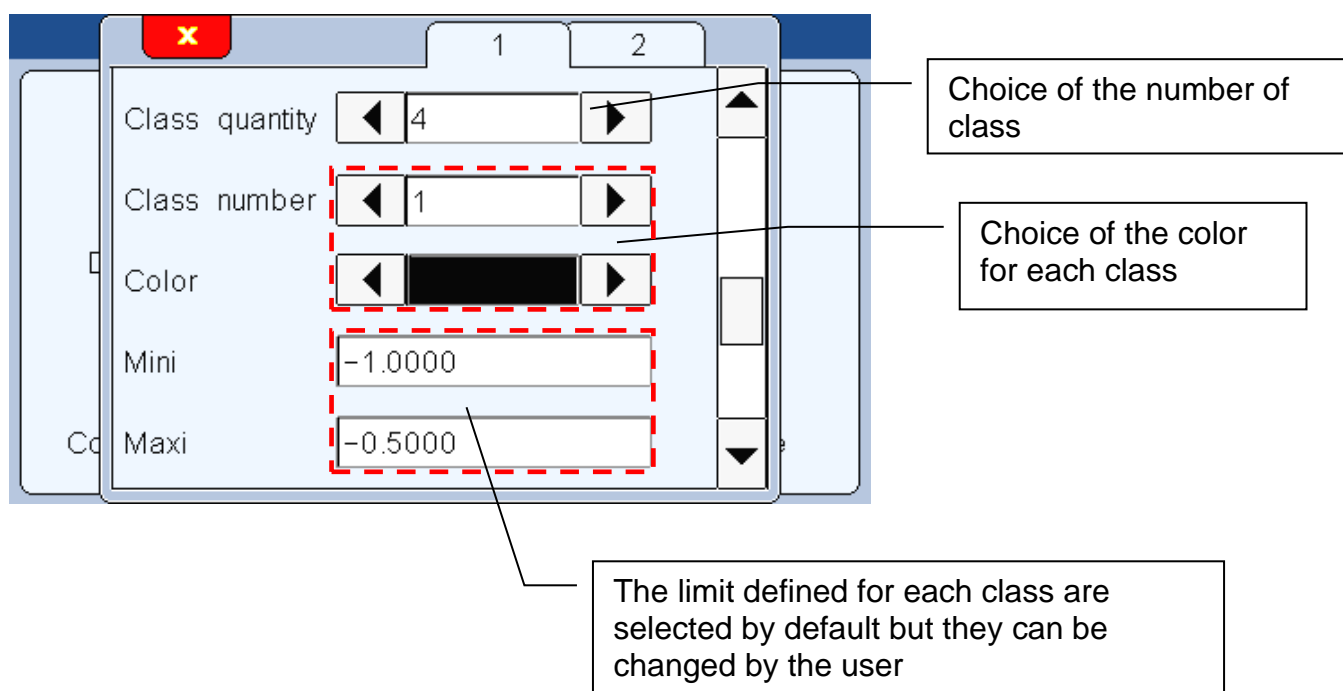
→ master : real value according to the calibration certificate, example 8.003

M1 – M3 Display units

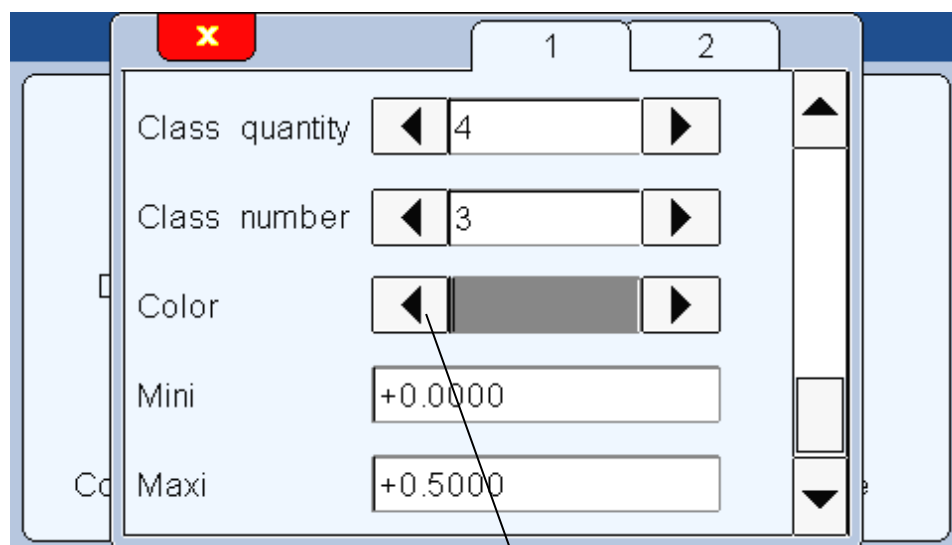


7.1.3. Part 3 - class

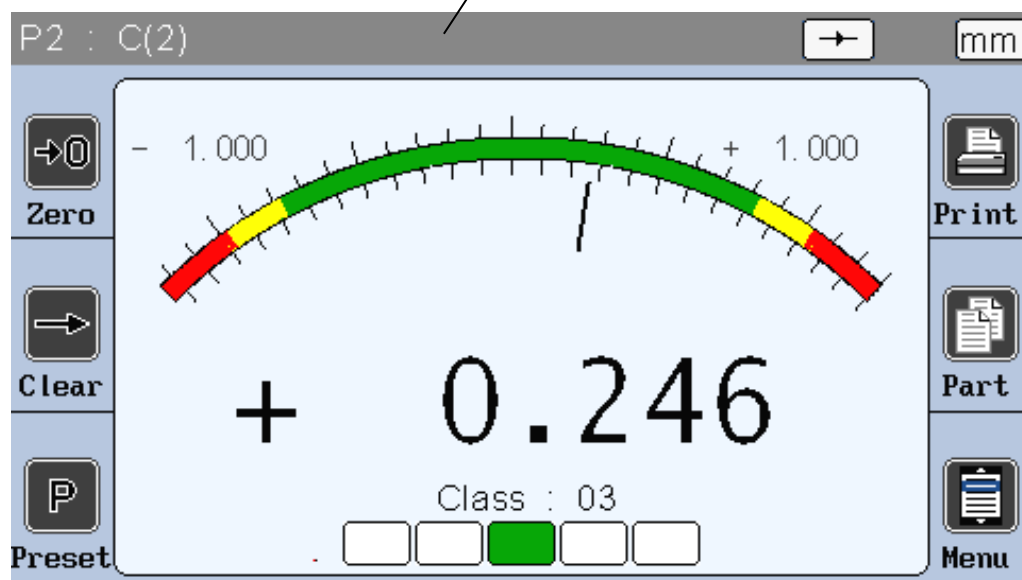
This screen allows to set up a sorting of the part according to their size. Up to 16 class can be programmed



The class has an important utility, because it allows the user to sort the parts according to their position in the tolerance interval. The top bar of the display, which is normally blue is grey on the picture bellow, because grey is the colour which was defined for this interval of measurement.

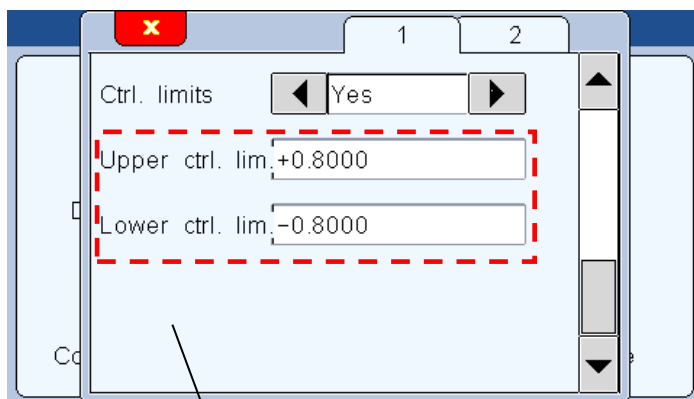


Grey colour because of the class parameters.



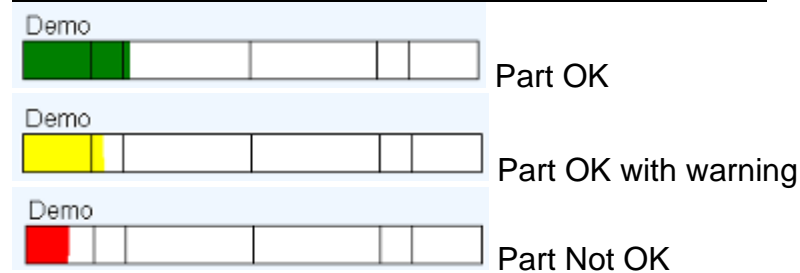
7.1.4. Part 3 control limit

This screen allows to display or not the control limits (warnings) and to define them. Control limits are warning that informs the user is the measure becomes too close to the tolerances limits. (Yellow colour on the bargraph)



This part is hidden if « no » has been selected

Example of characteristic displayed with control limits

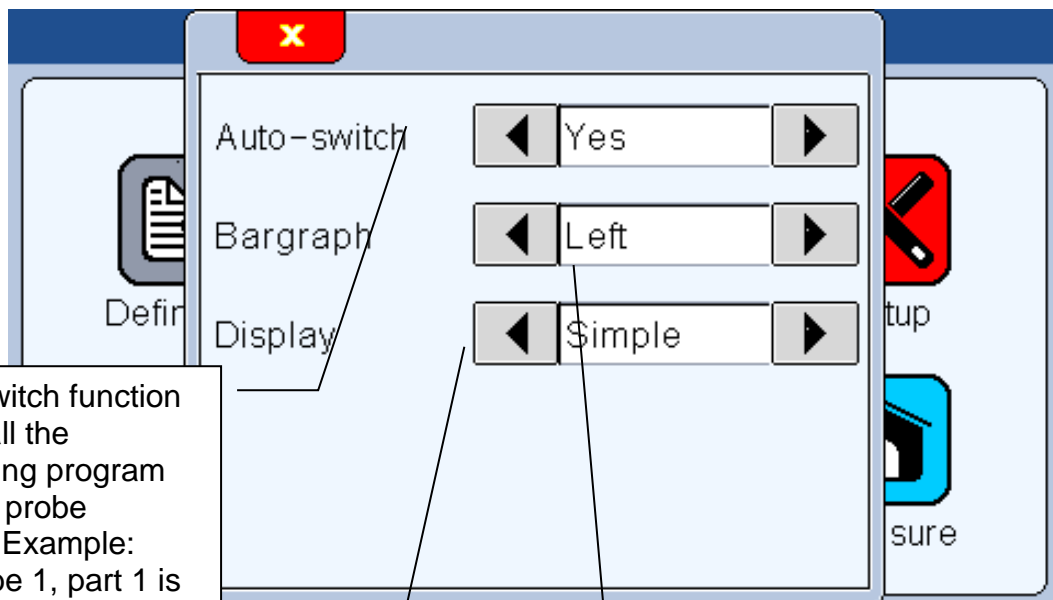


7.2. DISPLAY



After clicking on this button, the below window appears.

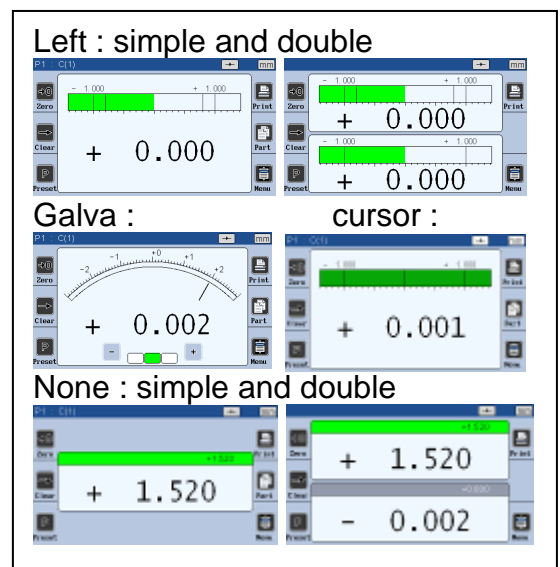
This window allows to define if 1 or 2 measure are displayed on the screen and on which format. (Needle = galva, horizontal bargraph or value only)



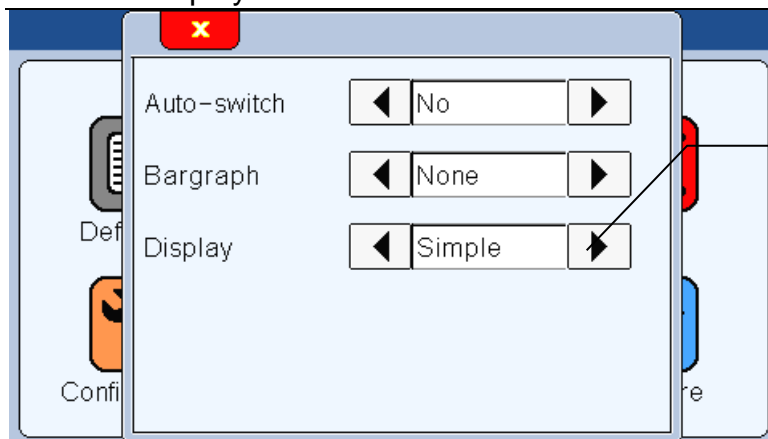
The auto-switch function allows to call the corresponding program by a simple probe movement. Example:

- Move probe 1, part 1 is displayed.
- Move probe 2, part 2 is displayed.

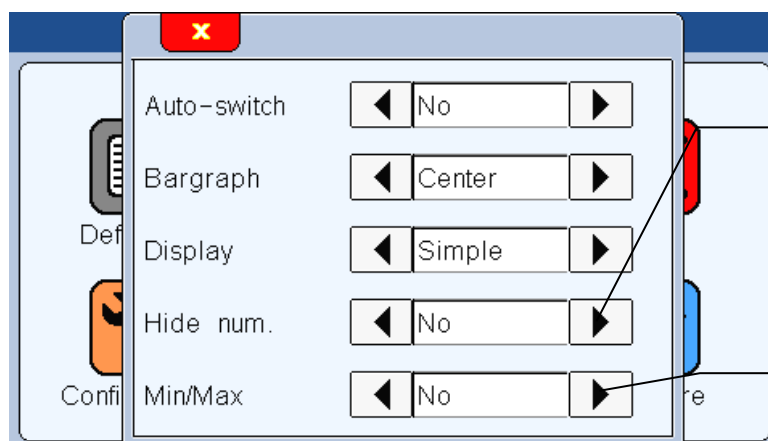
The +/- keys appears on the needle indicator (galva) and allow to move the needle like with the screw on an old analogue display.



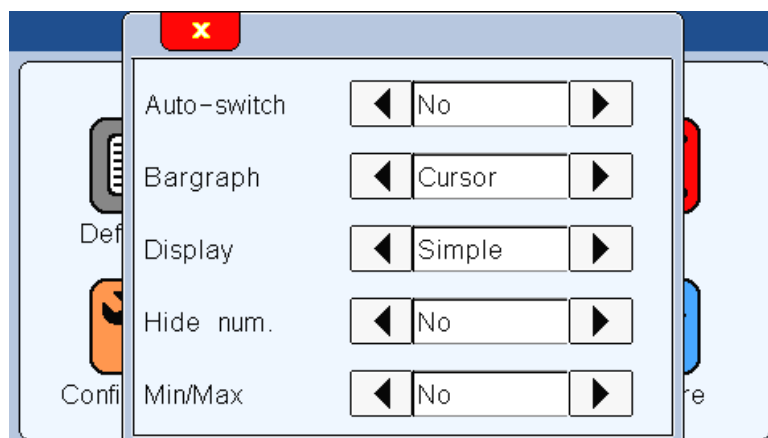
M1 – M3 Display units



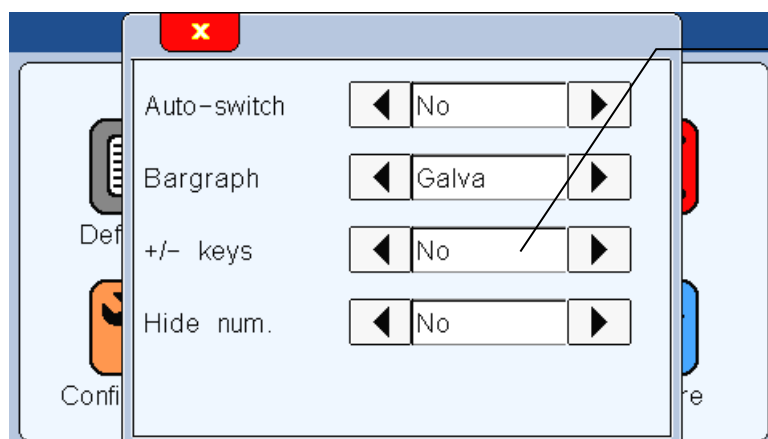
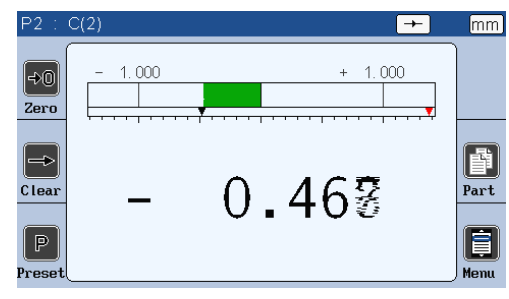
Allows to display 2 probe on the measuring screen (except in GALVA mode)



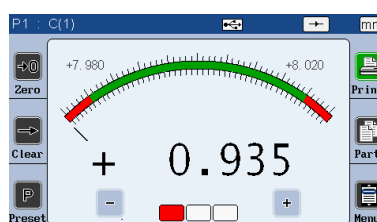
Allows to remove the value of the measurement on the measuring screen, only the bargraph appears.



Displays small indicators (triangles) on the measuring screen to show the maximum and minimum value measured



Allows to move the needle like with the screw on an old analogue display.

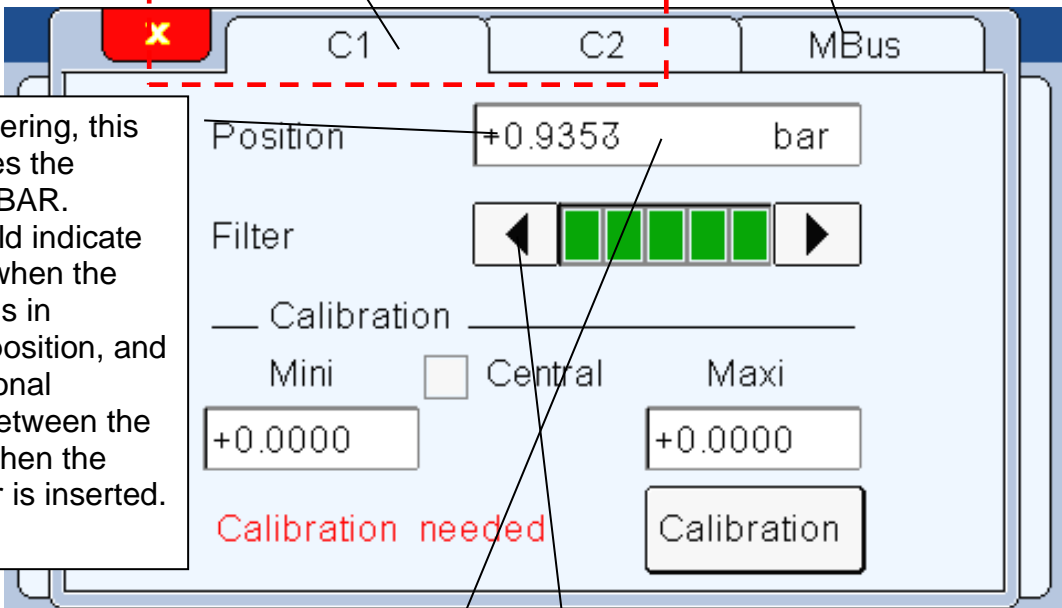


7.3. SETUP



After clicking on this button, the below window appears.

From this windows you can calibrate each channel. (the M1/M3 must be calibrated with 2 masters).



Channel 1 and channel 2 (only for M3)

Possibility to connect an M-Bus

Before mastering, this field indicates the pressure in BAR. After it should indicate 0.0000mm when the min master is in measuring position, and the dimensional difference between the 2 masters when the MAX master is inserted.

Position: +0.9353 bar

Filter: [Left Arrow] [5 Green Bars] [Right Arrow]

Calibration

Mini: +0.0000

Central: ☐

Maxi: +0.0000

Calibration needed

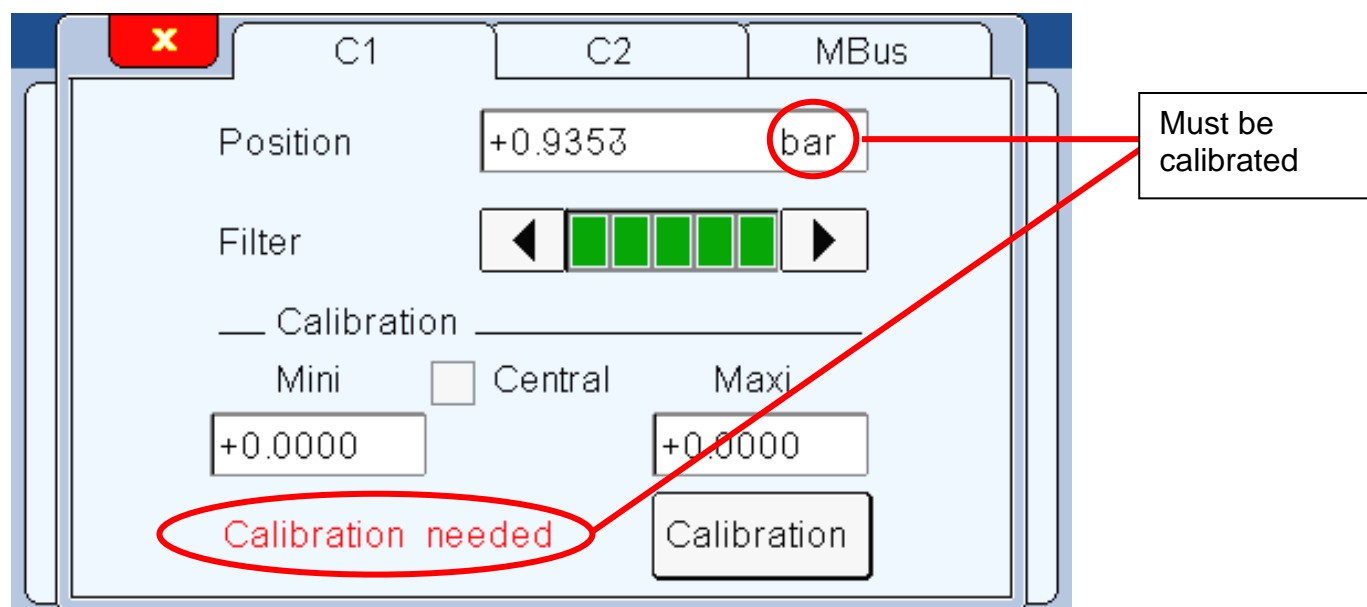
Calibration

If you touch the unit, it can switch to BAR and MM (only available after calibrating)
The optimal pressure is 2.7 BAR with at the nominal value, for having the best linearity.

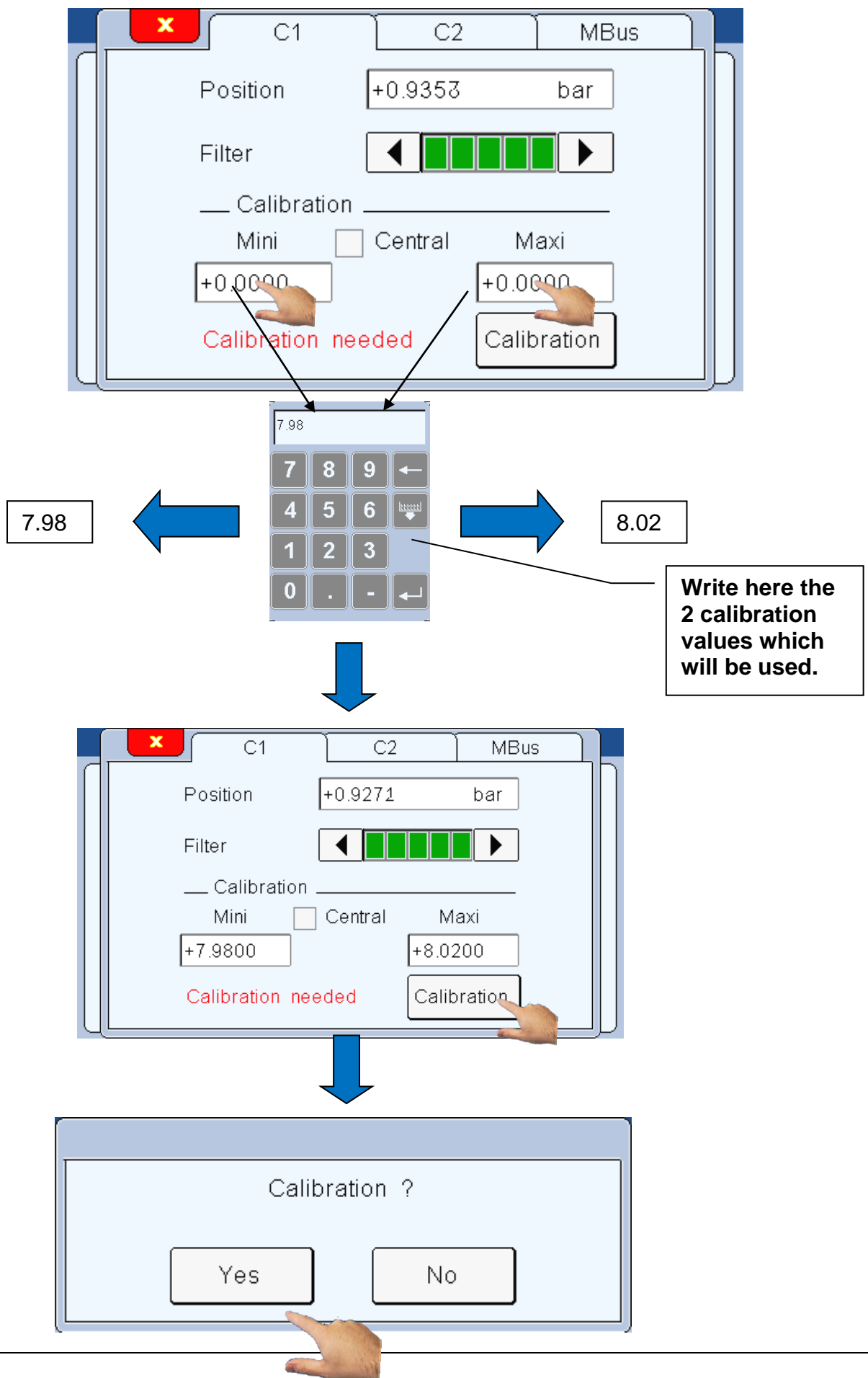
Allows to slow down the refresh frequency of the display (**running average**). It can be useful to limit the blinking of the last digit, and for runout measurement on large parts.

7.3.1. Calibration of the air gage

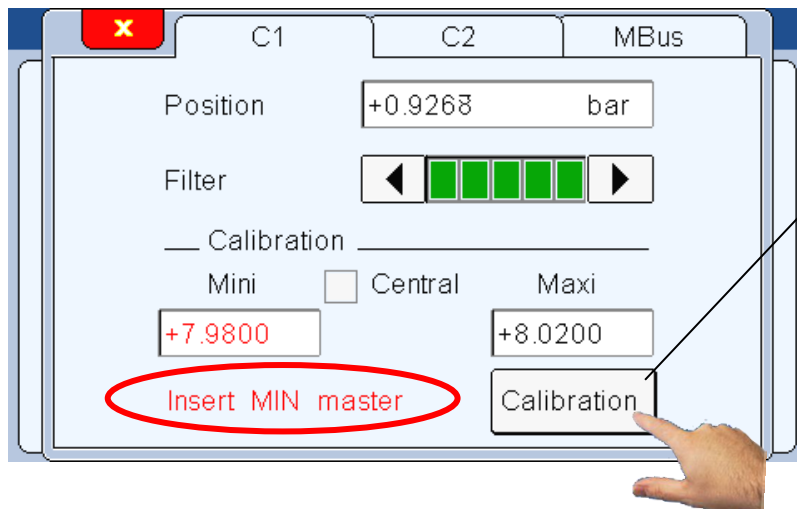
7.3.1.1. Calibration in 2 points



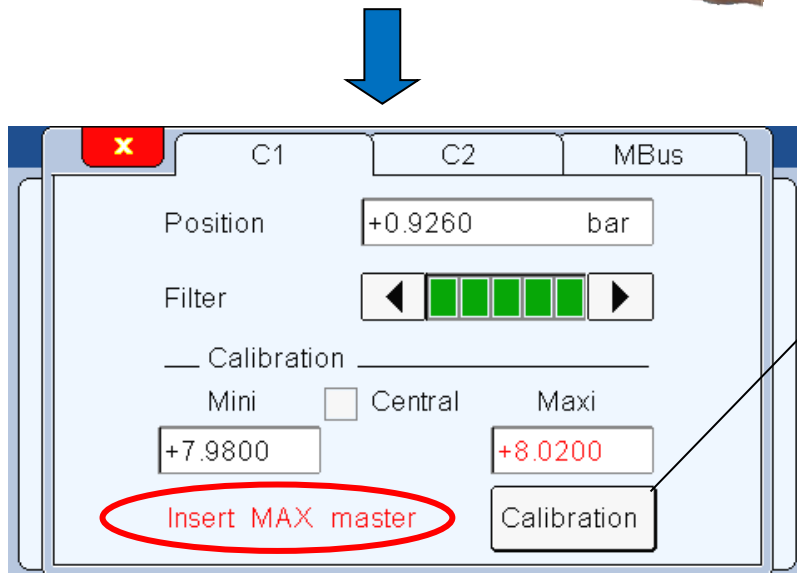
The air gauge probes cannot be used without a special calibration. This calibration requires at least 2 master sample of the size of the tolerance limit for the part to measure.



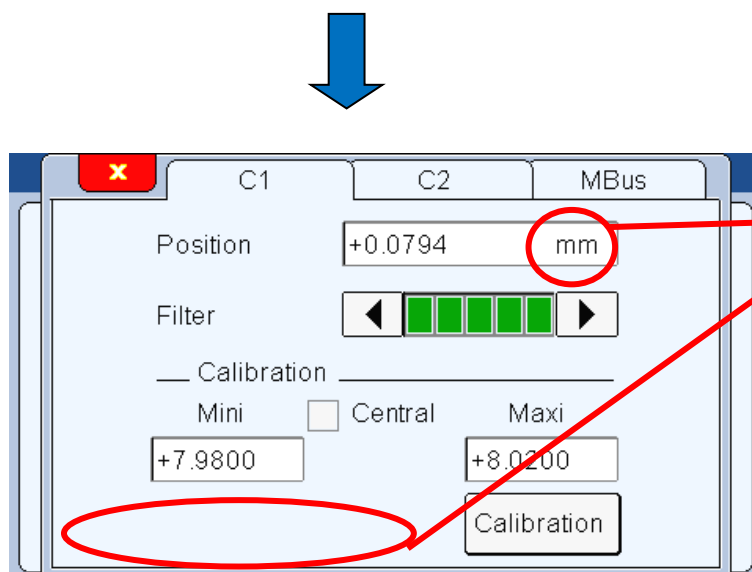
M1 – M3 Display units



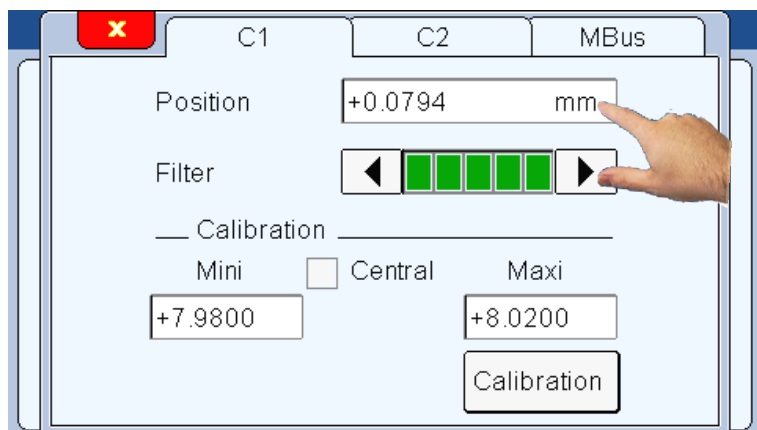
After placing the min master, push « calibration »



The same manipulation is done here, but with the max master, and the final push on « calibration »



The probe is now calibrated



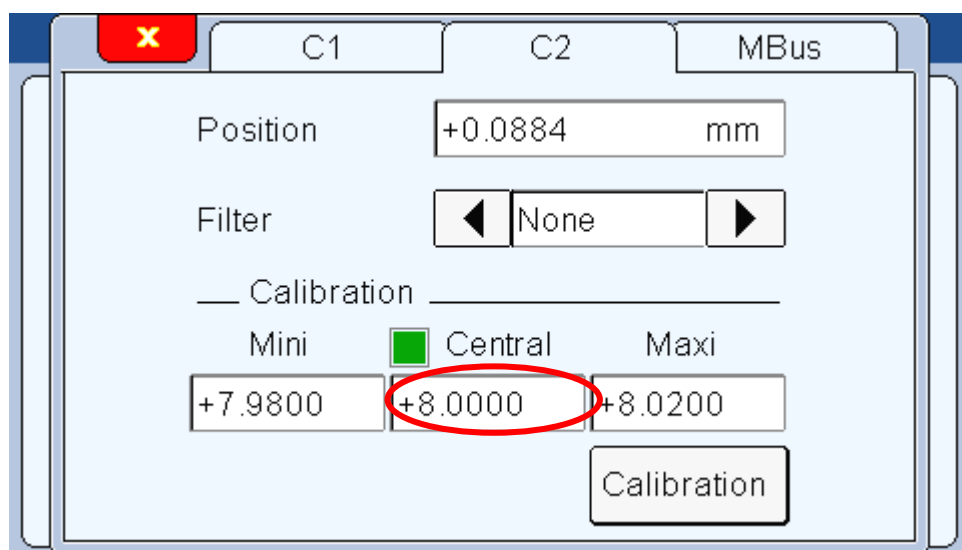
After calibration is it possible to check the pressure. For this you need to click on the unit “mm”, the unit will then become BAR for few seconds.

This feature allows for example to check if the restrictor installed on the air input is the right one. The ideal pressure at the nominal should be 2.7 BAR. If you are too far from this value, for example 1.5 BAR, you should change the restrictor for a bigger one. Using the wrong restrictor affects the linearity. For a simple sorting Go/NoGo, the results will be correct, but if you need to have the real value and/or to use the class sorting functionality, you need to use the most adapted restrictor. (see chap 3.3.1).

7.3.1.2. Calibration in 3 points

There is the possibility to use 3 points to calibrate the measure. When the button “central” is selected, a third master point is asked. The calibration process stays the same, with one manipulation added.

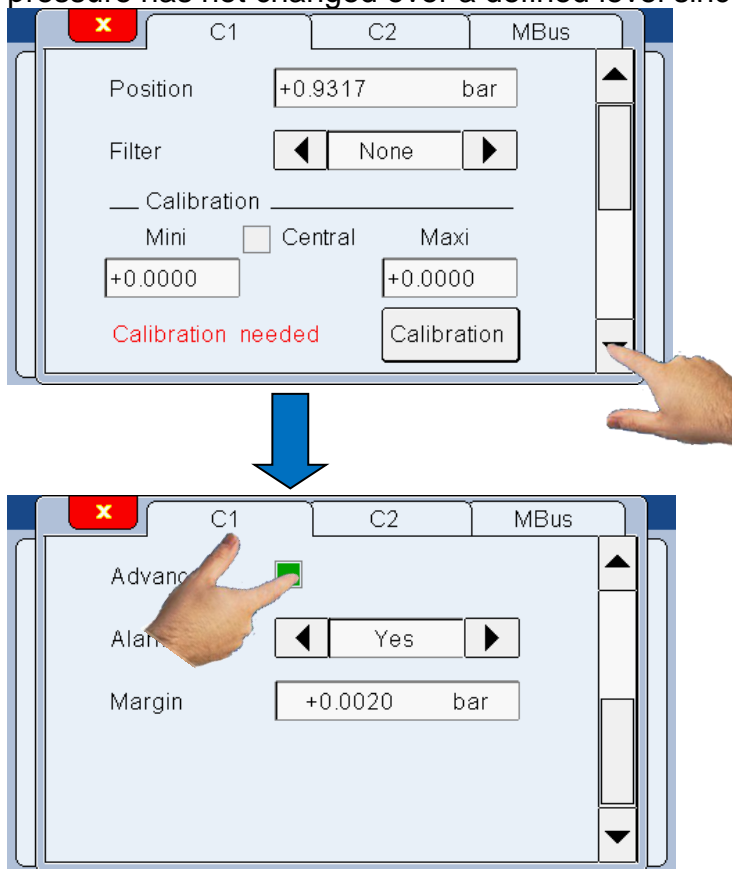
This feature can be useful when controlling a part with large tolerances.



M1 – M3 Display units

7.3.1.3. Advanced mode

The advanced mode of the calibration menu allows to control the pressure and verify if the input pressure has not changed over a defined level since the calibration.



In measuring mode, if the input pressure has changed over the limit, a popup windows appear informing the operator, and asking the recalibrate, or check the air network.

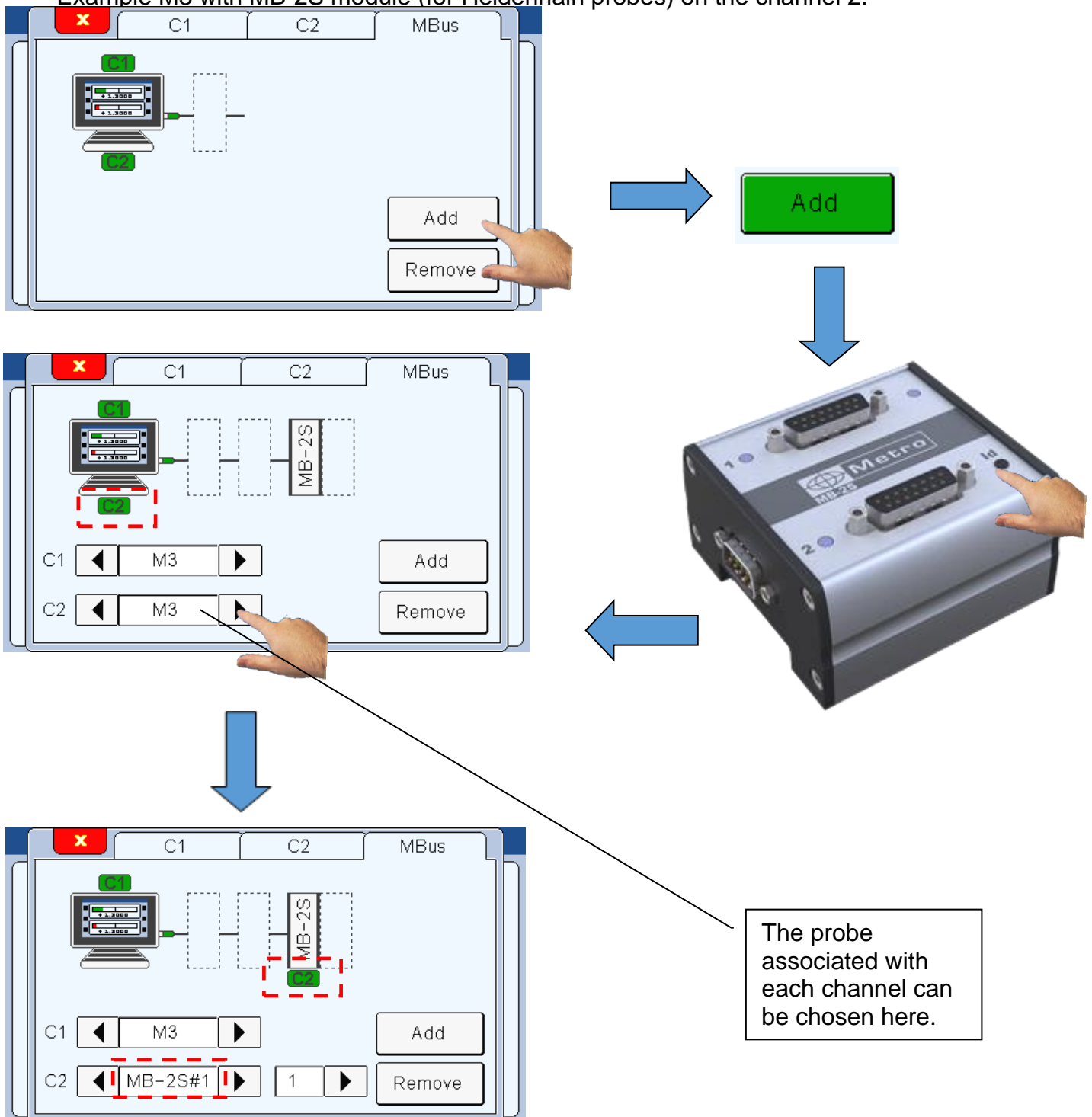
7.3.2. M-Bus modules

External M-Bus modules can be connected to the M3 thanks to the following screen. It allows to mix 2 different probes on the same display with the multiplexer modules, or to use input/output modules.

Multiplexer modules

The same process is made to connect all the multiplexer modules

Example M3 with MB-2S module (for Heidenhain probes) on the channel 2.



M1 – M3 Display units

After being connected, A Multiplexer module must be configured from the C1 or C2 pages of the setup menu (according to the channel with which the probe is linked). Please refer to the example for each probe.



MB-2S module,
Heidenhain



MB-2T module,
TTL



MB-AG Module
Air Gauge



MB-8I Module
Inductive



MB-4D Module
For Digimatic
instruments

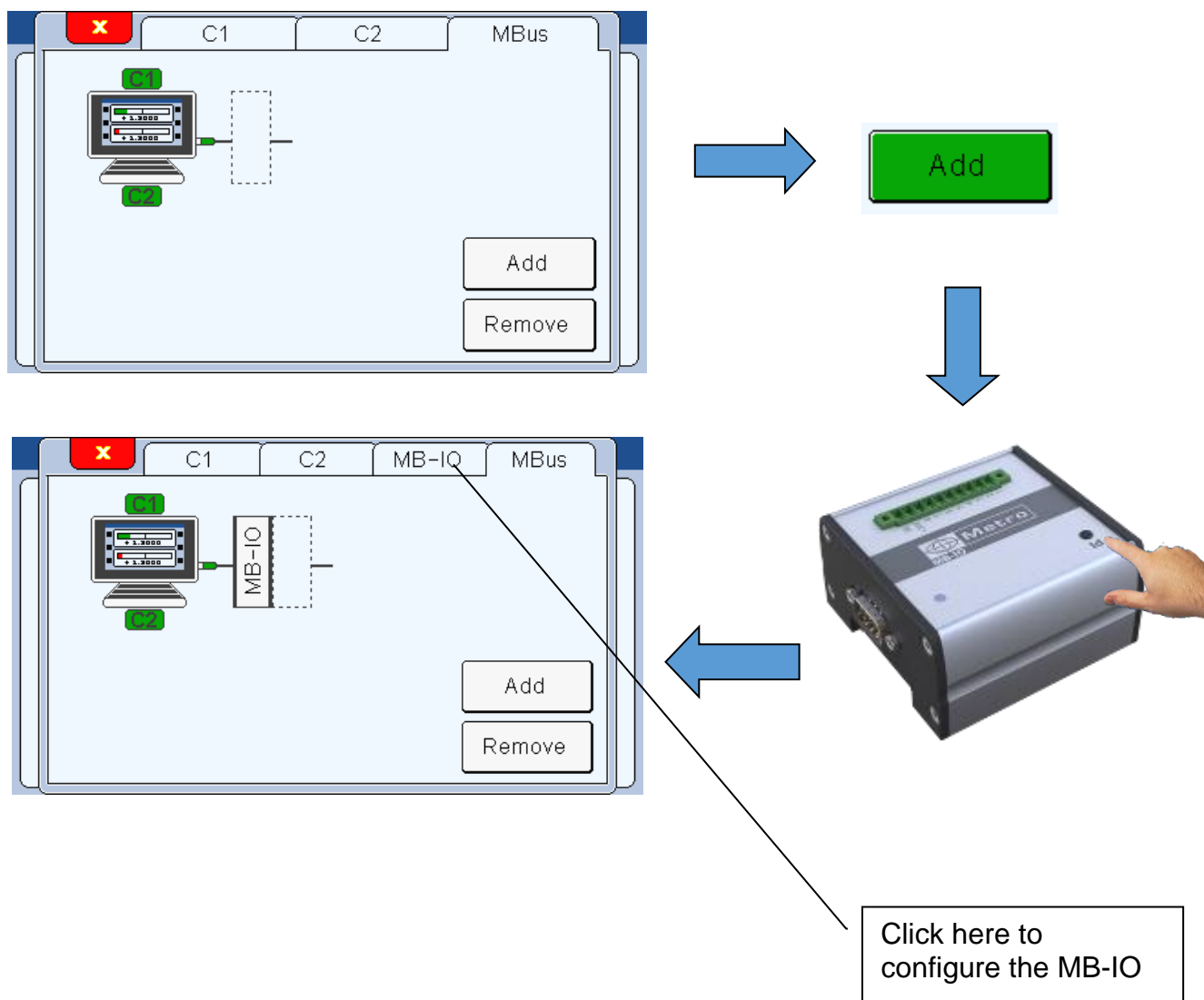


MB-1R Module
RS232

Input/output modules

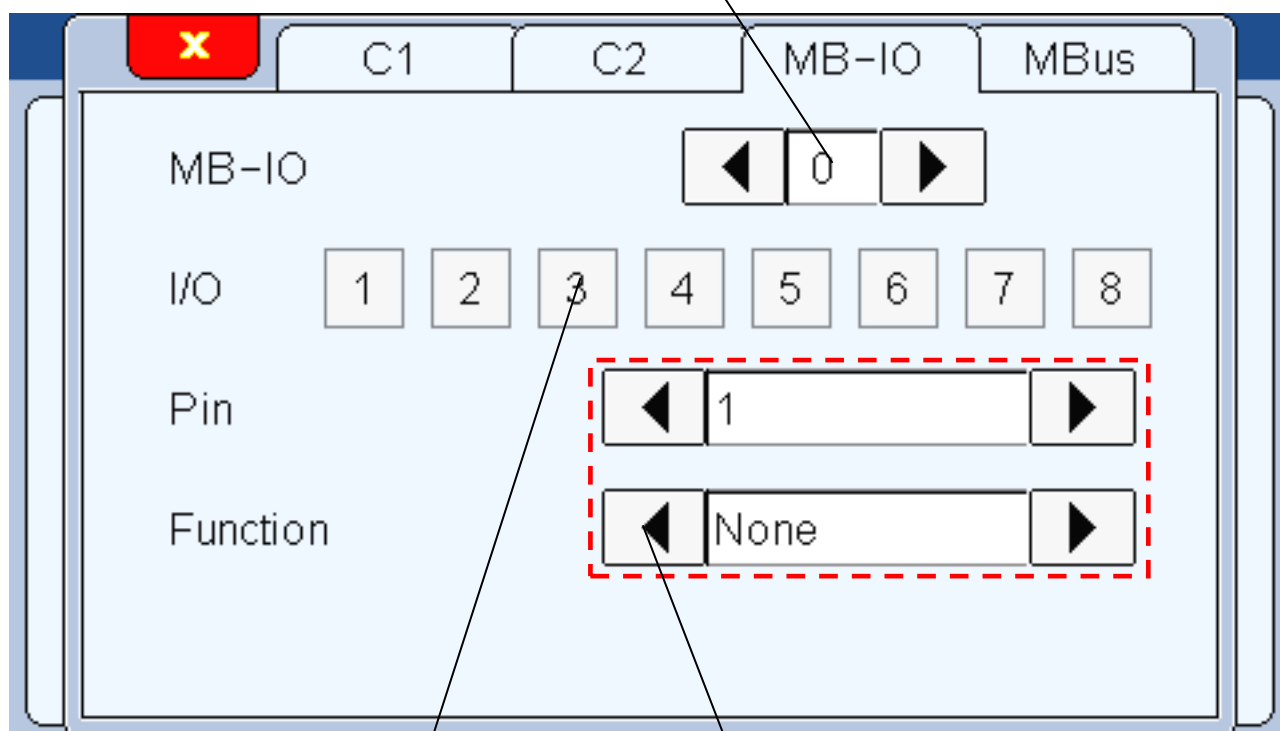
The connection of an input/output module is made with the same way than a multiplexer.
Up to 4 MB-IO modules can be connected.

Example: connection of a MB-IO module on the M3.



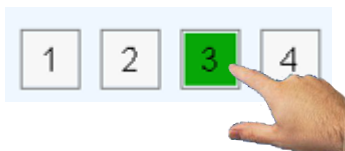
The different options for the MB-IO configuration are displayed below.

The number of the MB-IO is written here and can be changed if more than one is connected



These buttons are used to output a 24VDC signal on specific port of the MB-IO to check the installation.

At the opposite, if you input a 24VDC on a terminal, the corresponding button becomes green.



The function of each port of the MB-IO can be set with these 2 menus. The first one is for the number of the Pin, the second one defines the associated function

The different functions available for the MB-IO are listed below:

- Transfer : (Input) Transfer the measure to the computer (need a USB or RS232 link)
- Preset : (Input) set the current measured value to the master value

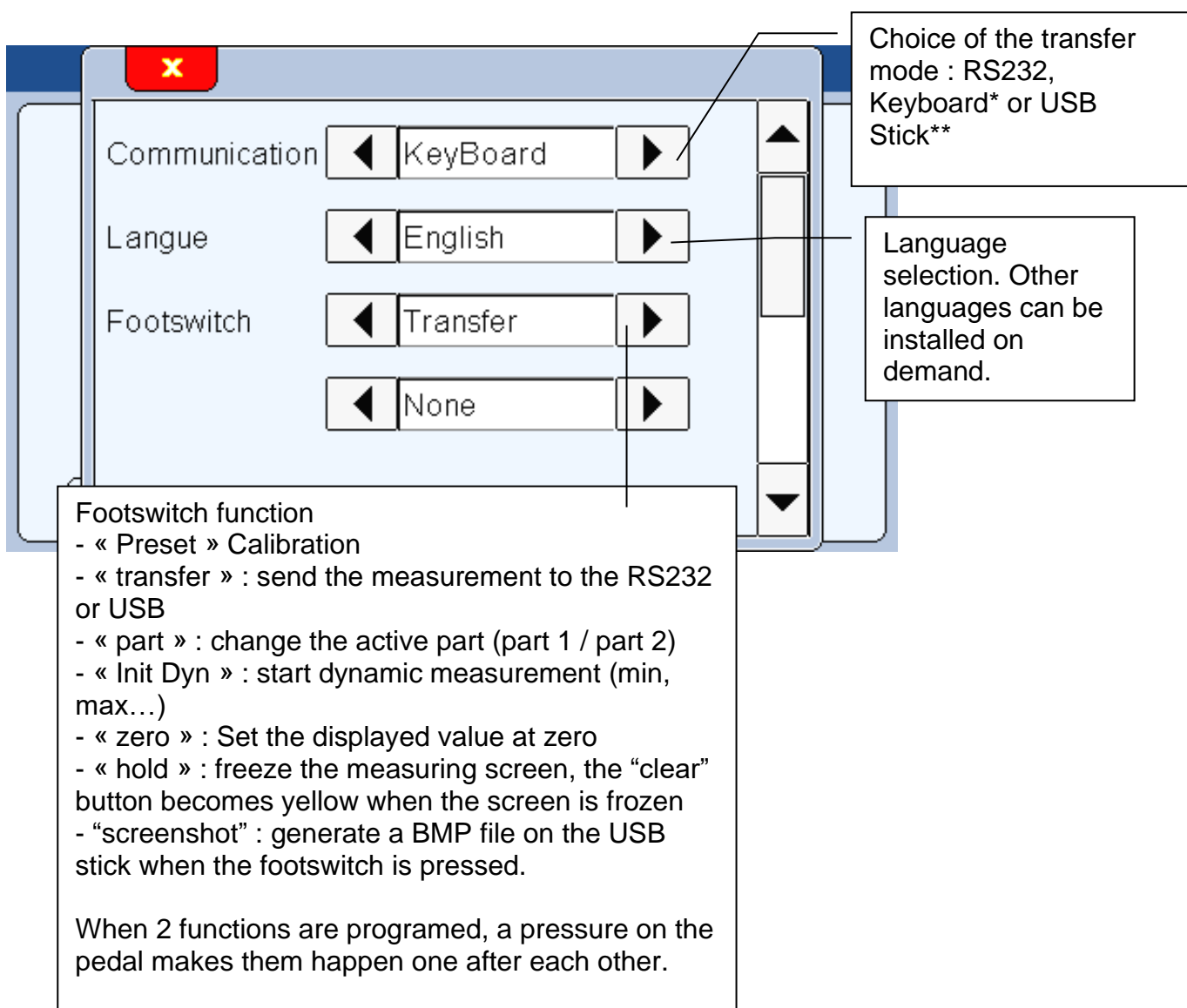
M1 – M3 Display units

- Zero : (Input) set the current measured value to 0 (relative mode)
- Clear : (Input) reset the 0 mode (come back to absolute mode)
- Init dyn : (Input) start a dynamic measure
- Characteristic status : (output) output a signal if the characteristics are ok
- Ctrl limit - : (output) output a signal if the part is in the lower control limit
- Ctrl limit + : (output) output a signal if the part is in the upper control limit
- - No Go : (output) output a signal if the part is out of the lower tolerance limit
- + No Go : (output) output a signal if the part is out of the upper tolerance limit
- Part status: (output) output a signal if the whole part (the 2 probes) respects the tolerance limit.
- Class : (output) output a signal if the part is in the selected class
- Hold: (Input) freeze the screen to display the previous measure as long as the input signal stay.
- Characteristic : (output) changes the displayed screen in the measuring screen
- Touchscreen : disconnect the touch screen function. Useful when connected to a PLC, so that no one can use the touch screen without the permission of the PLC.

7.4. CONFIGURATION



After clicking on this button, the below window appears.
This window allows configuring the general settings of your display



Choice of the transfer mode : RS232, Keyboard* or USB Stick**

Language selection. Other languages can be installed on demand.

Footswitch function

- « Preset » Calibration
- « transfer » : send the measurement to the RS232 or USB
- « part » : change the active part (part 1 / part 2)
- « Init Dyn » : start dynamic measurement (min, max...)
- « zero » : Set the displayed value at zero
- « hold » : freeze the measuring screen, the “clear” button becomes yellow when the screen is frozen
- “screenshot” : generate a BMP file on the USB stick when the footswitch is pressed.

When 2 functions are programmed, a pressure on the pedal makes them happen one after each other.

* If you select communication→keyboard, the display will be detected as a keyboard when connected to a computer with an USB link, without installing a specific driver or software.

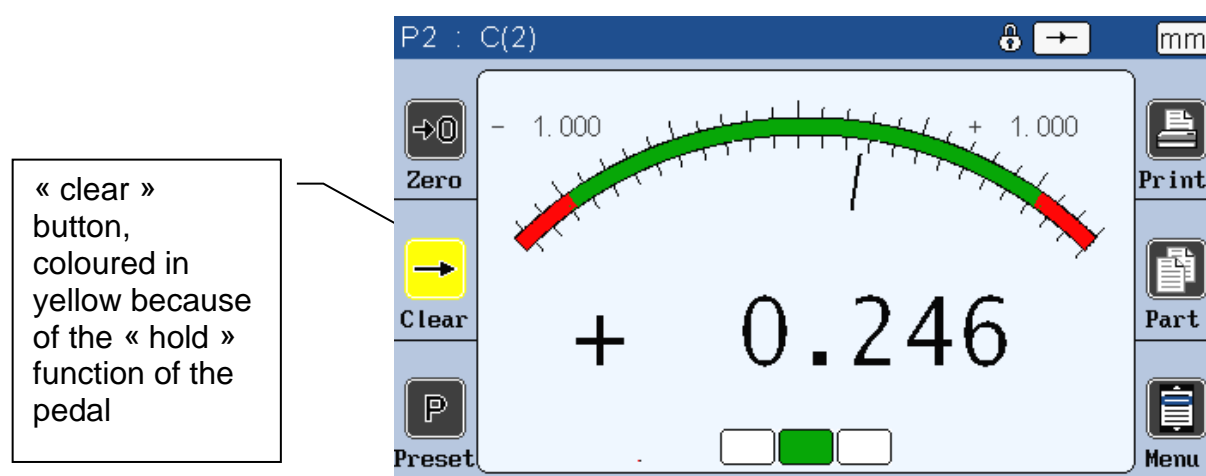
M1 – M3 Display units

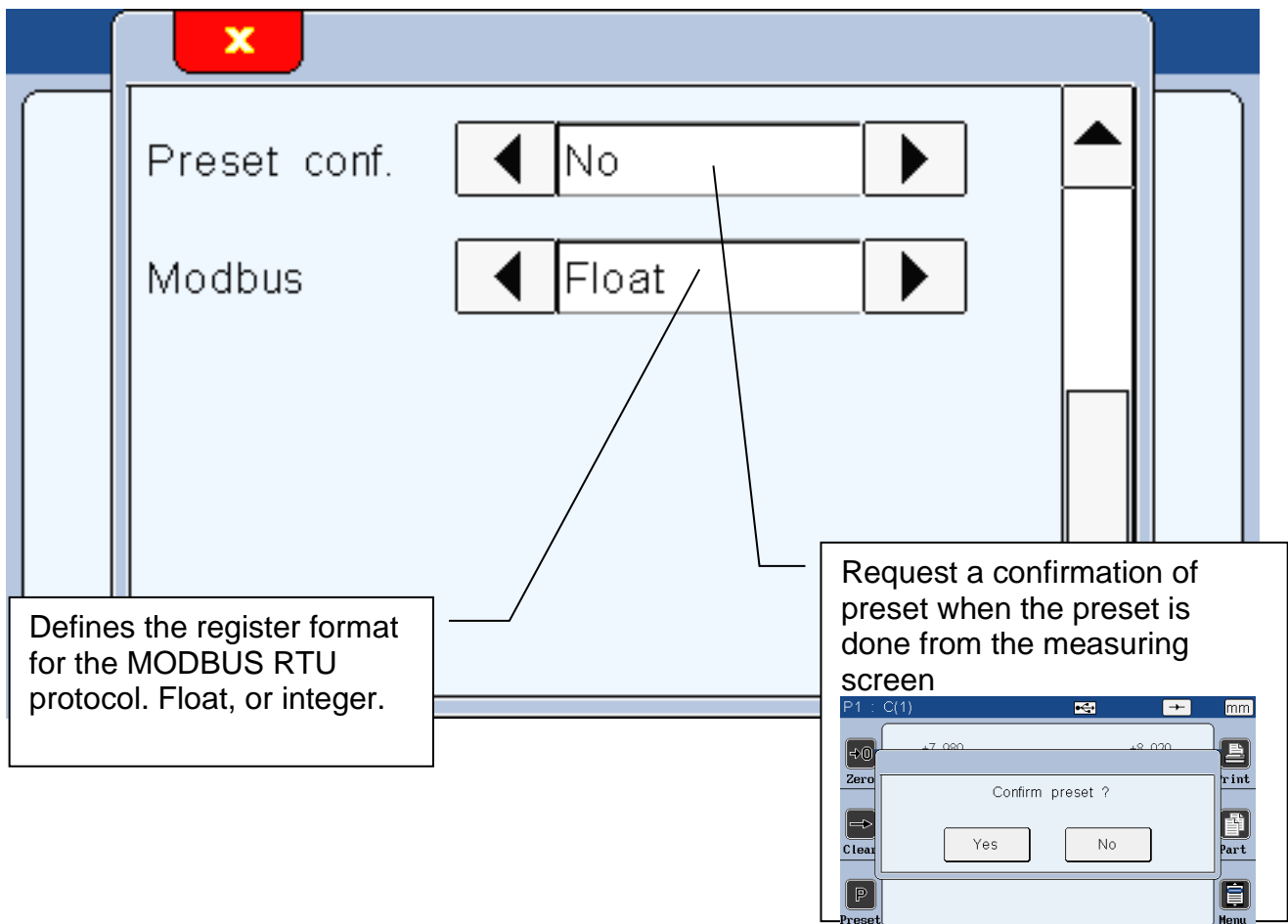
Then when you transfer the measurement (with screen, IO or footswitch), the displayed value will appear on your PC where your cursor is (for example on an Excel cell), in the same way than you would have typed with your standard keyboard.

** If you select transfer→USB Stick, a “output.csv” file will be created on the connected USB stick, and each time you press the “Print” button of the measuring screen, a line will be added on the file.

If you use a QR code reader to input a manufacturing order number, the “OUTPUT.CSV” file takes the name becomes “manufacturingordernumber.csv”

The “clear” icon is yellow while the hold function is activated:

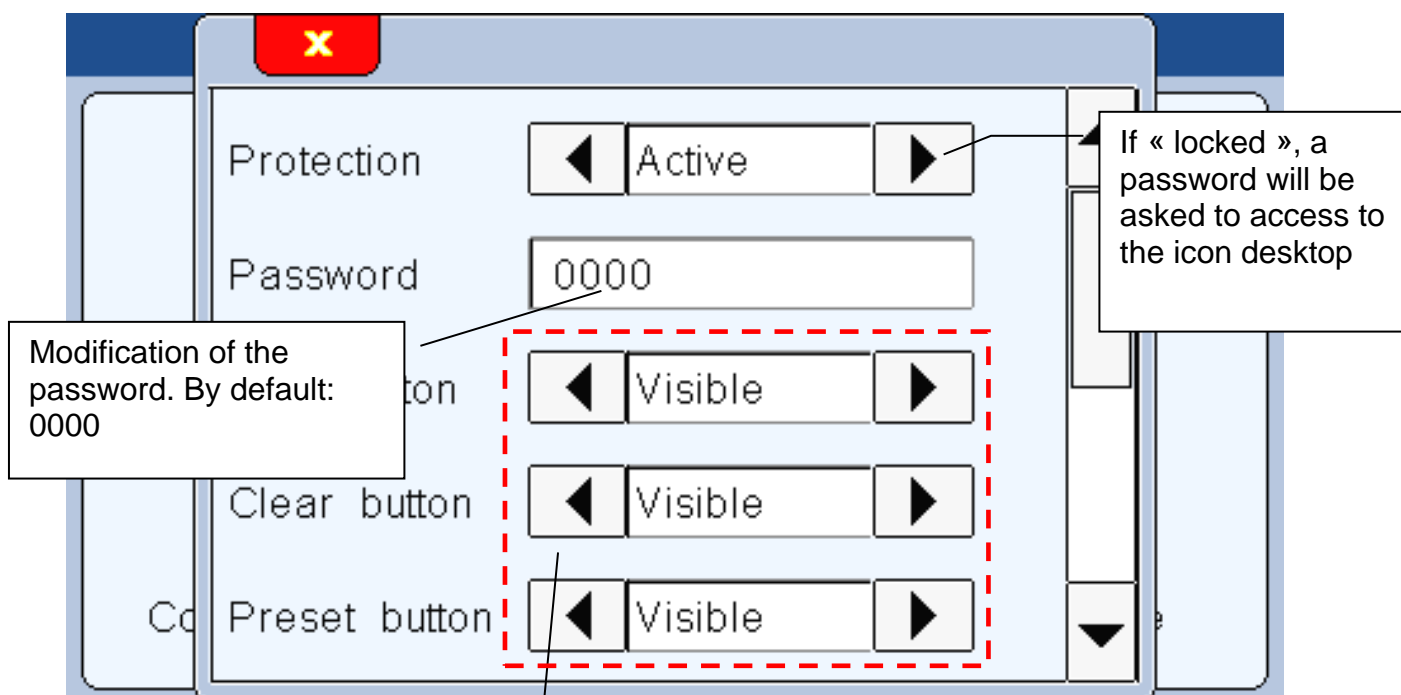




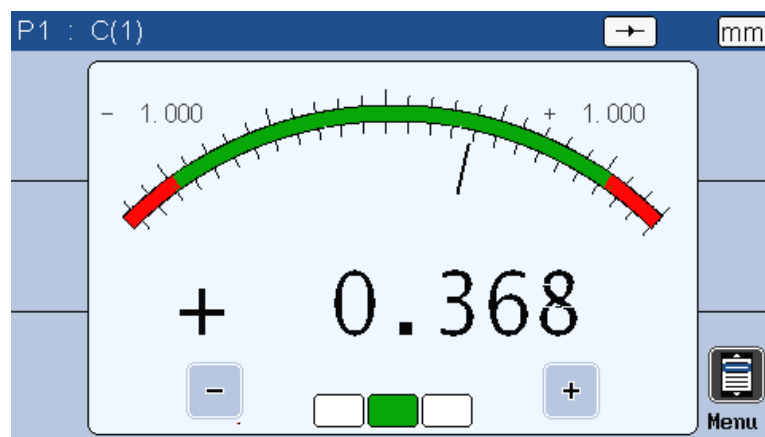
7.5. LOCK



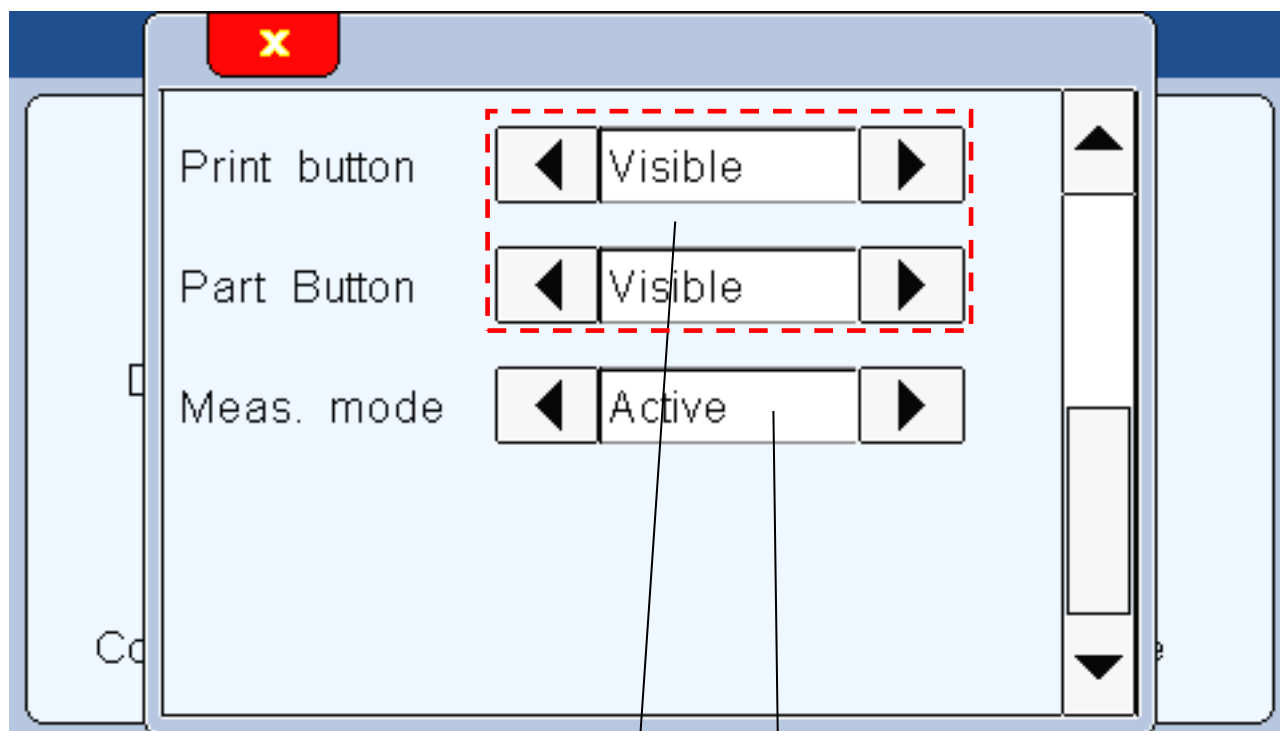
After clicking on this button, the below window appears.
This screen allows to lock by password some functions of the M3



Allows to remove the corresponding buttons from the measuring screen.
It is recommended to remove the button to make the interface as easy as possible for the user



Example of a measuring screen without all the buttons.



Allows to remove the corresponding buttons from the measuring screen.

Allows to lock the measuring mode (maxi, mini, maxi-mini, average...)



7.6. MEASURE



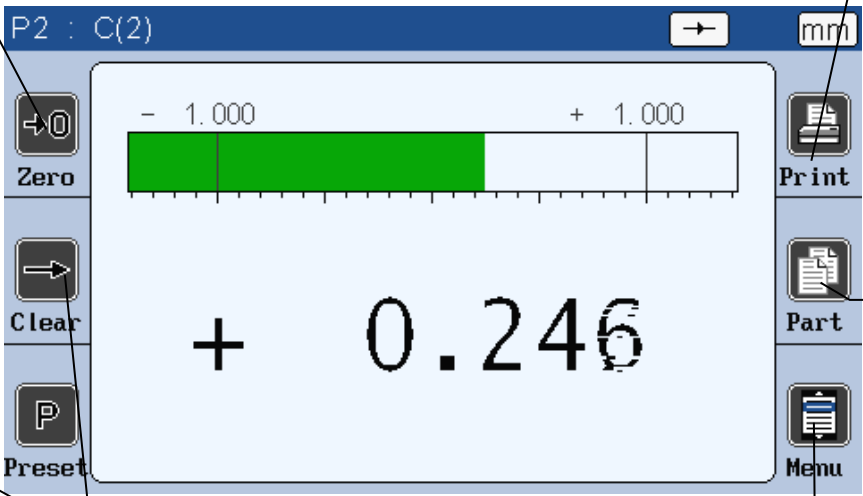
After clicking on this button, the measuring screen appears.
Please read the chapter 8 for the presentation of the measuring screen.

8. MEASURING SCREEN







The display starts on this screen.

The measuring screen allows seeing the characteristics of the part that has to be controlled. A needle/bargraph indicator displays the characteristic in function of the tolerance of the part (see chap. 4.1 for tolerances modification).

8.1. LATERAL BUTTON FUNCTIONS



The diagram shows the measuring screen interface with the following callouts:

- Absolute or relative mode (allows to make a « zéro » at a defined position. If the relative mode is selected, the button become red)**
 -  **Zero**
 - To come back to the absolute mode, press on the « clear » button
- Calibration/Preset. After pressing this button, the displayed value will take the master value.**
 -  **Preset**
- Start dynamic measurement (Min, Max...) clear the zero function**
 - This icon can become yellow in case of a hold function (refer to 3.3.9, the footswitch connector)
 -  **Clear**
- Measurement transfer (RS232 or USB or USB stick)**
 -  **Print**
- Change manually the active part (part 1 or part 2)**
 -  **Part**
- Go to the icon desktop**
 -  **Menu**

The screen displays: P2 : C(2), - 1.000, + 1.000, and + 0.246.

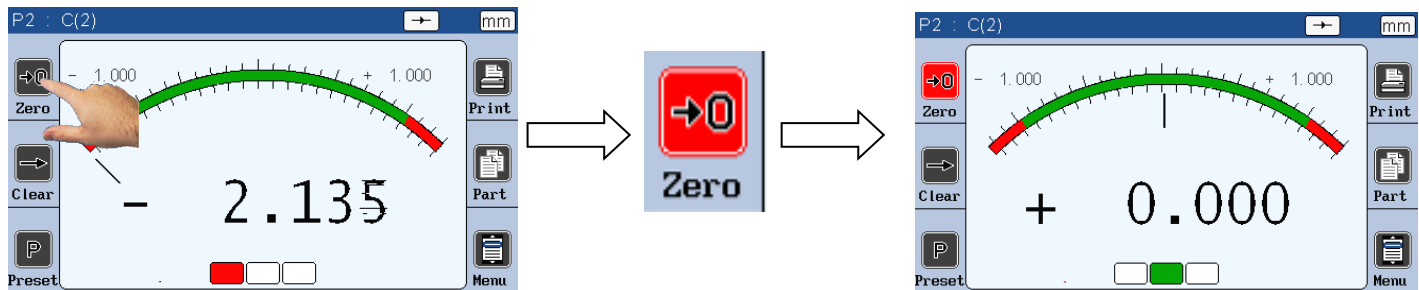
When they are pushed, the button becomes green for one second:

M1 – M3 Display units

Zero :



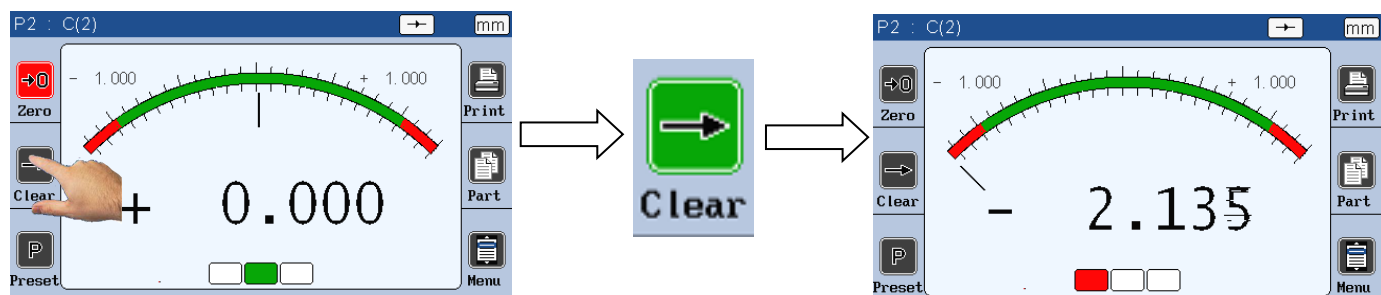
This button is used to set the current measured value to 0, it's the relative mode



Clear :



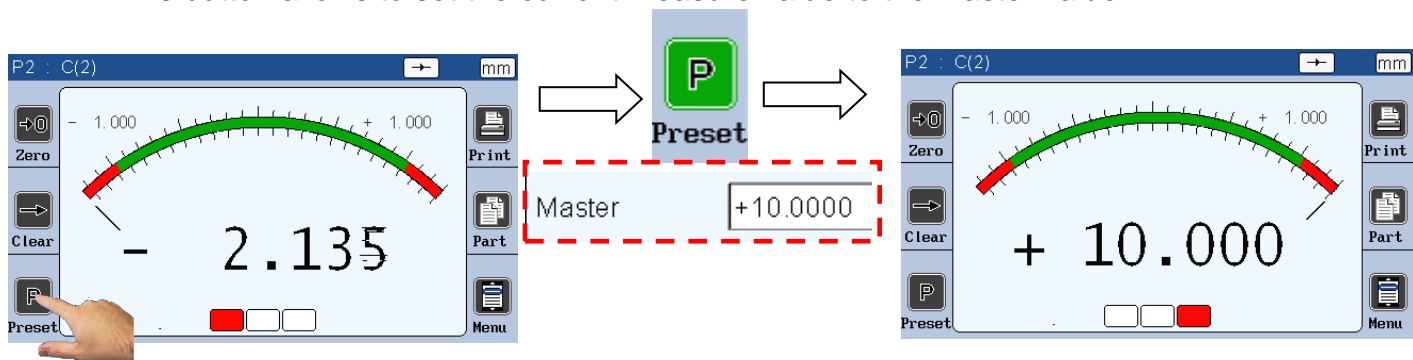
This button allows to cancel the zero button, and to switch again to absolute mode



Preset :



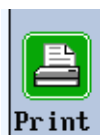
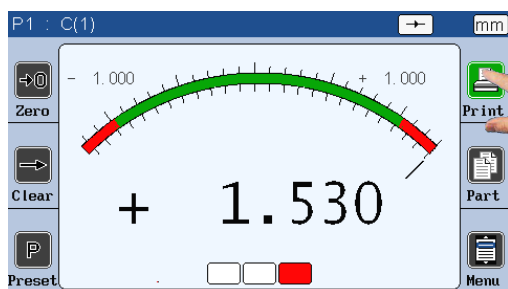
This button allows to set the current measure value to the master value



Print;



The print function transfers the measured value to a computer.

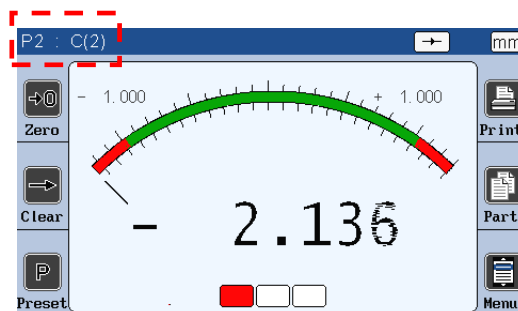
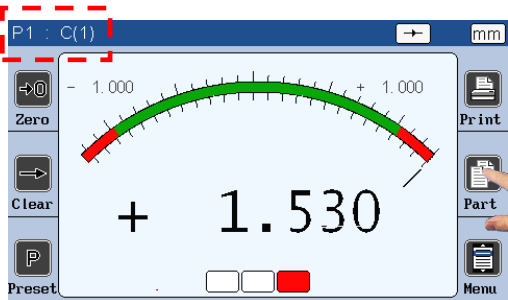


Couper				
Copier				
Reproduire la mise en forme				
Presse-papiers				
R31				
1	A	B	C	D
2	1,53			

Part:

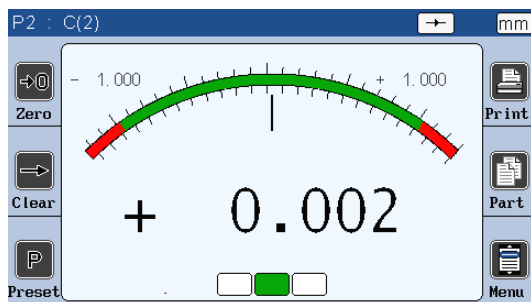


This function is used to change the displayed part

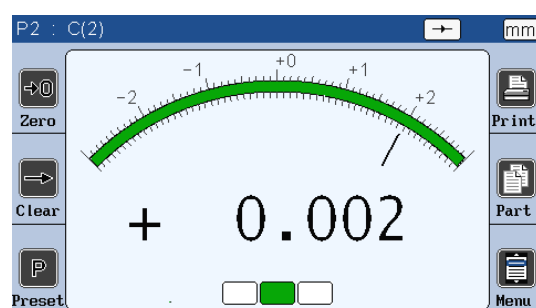


8.2. CHOICE OF THE NEEDLE INDICATOR STYLE

If the display is configured with the needle indicator (mode Galva, see chap. 7.2), it is possible to change manually the scaling.



Automatic

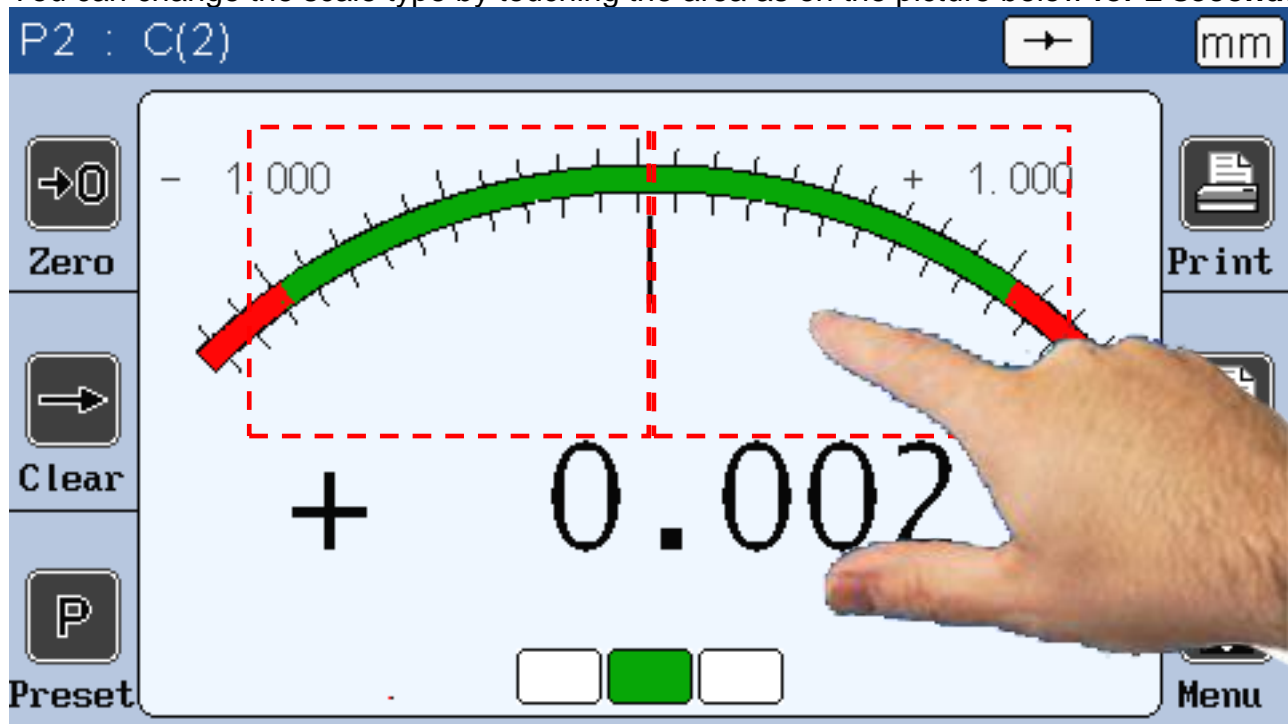


Manual

The automatic needle scale adapts automatically with the part tolerances.

The manual needle has fixed scales and allows to use the +/- option (see chap 5.2)

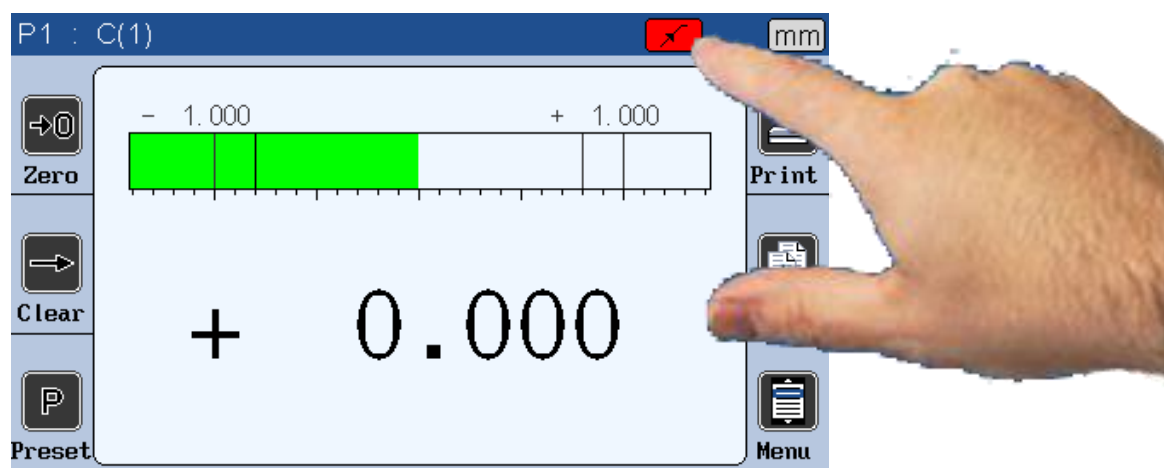
You can change the scale type by touching the area as on the picture below **for 2 seconds**.









8.3. Temporary dynamic mode

As explained on the chapter 5.1, the characteristic is defined either as « static » (direct) or « dynamic » (Max, Min ...)

If a characteristic has been adjusted as static, it is nevertheless possible to change temporarily to a dynamic mode, directly from the measuring screen.



To change the measuring mode, press on the icon as shown on the above picture.

	Static	
	Max	
	Min	
	Max-Min	
	Average	(only adapted on an automatic fixture)
	Median	The displayed value is calculated with the formula (MAX-MIN)/2.

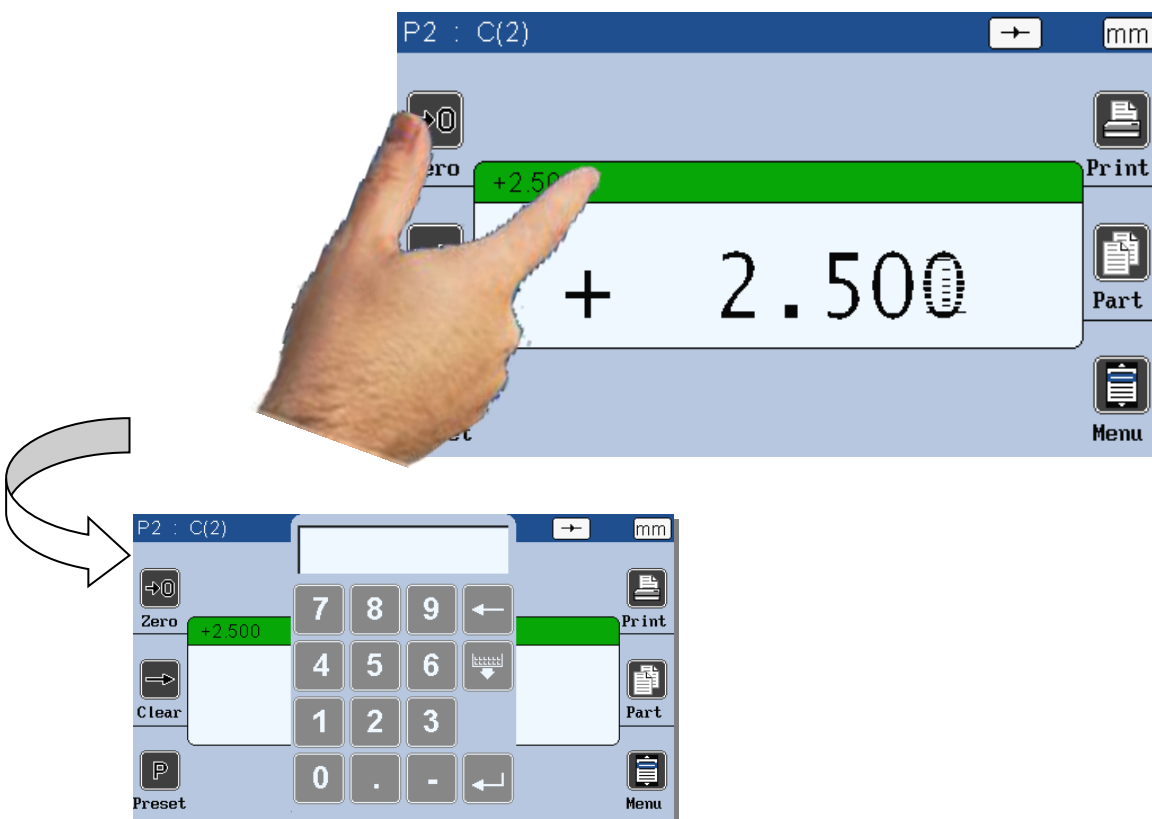


When a dynamic mode has been selected, press on the **Clear** button or on the footswitch (if configured as « init dyn » (see chap 7.4)) to start recording.

8.4. Display mode without tolerance

This mode (see chap. 5.2) allows to display only the numerical value, without tolerance indication.

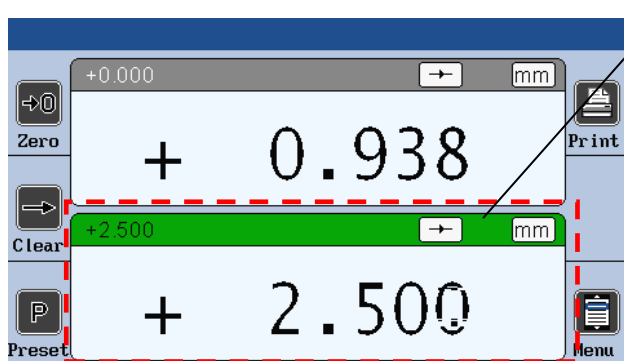
It is also possible to change the preset value (calibration) directly from this screen. Press on the value as shown on the below picture, an input the new value with the keyboard.



If the double display mode is selected, the 2 characteristics can move together, but only 1 is active.

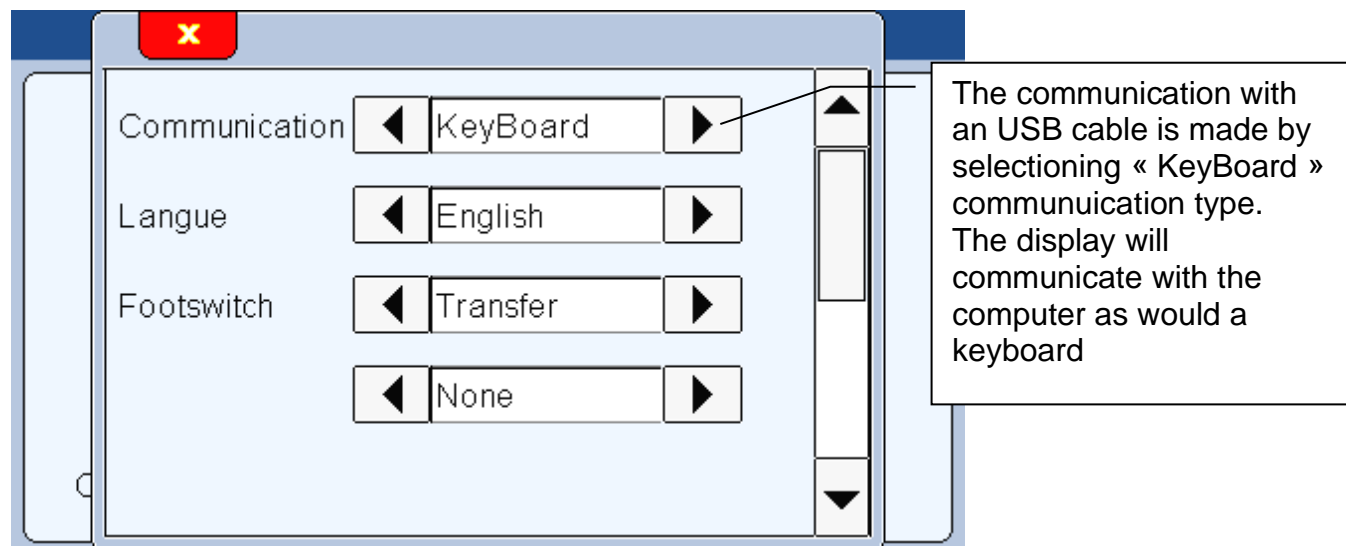
The lateral buttons have an effect only on the active characteristic.

For selecting the active characteristic, press on it and the top of the box will become green.



The lateral button have an effect only on the active characteristic

9. USB COMMUNICATION



If you select the “Keyboard/USB” communication, the display will be detected as a keyboard when connected to a computer, without having to installing a specific driver or software. Then when you transfer the measure (with screen, through IO or footswitch), the displayed value will appear on your PC when your cursor is. (For example on an Excel cell), in the same way than you would have typed with your standard keyboard.

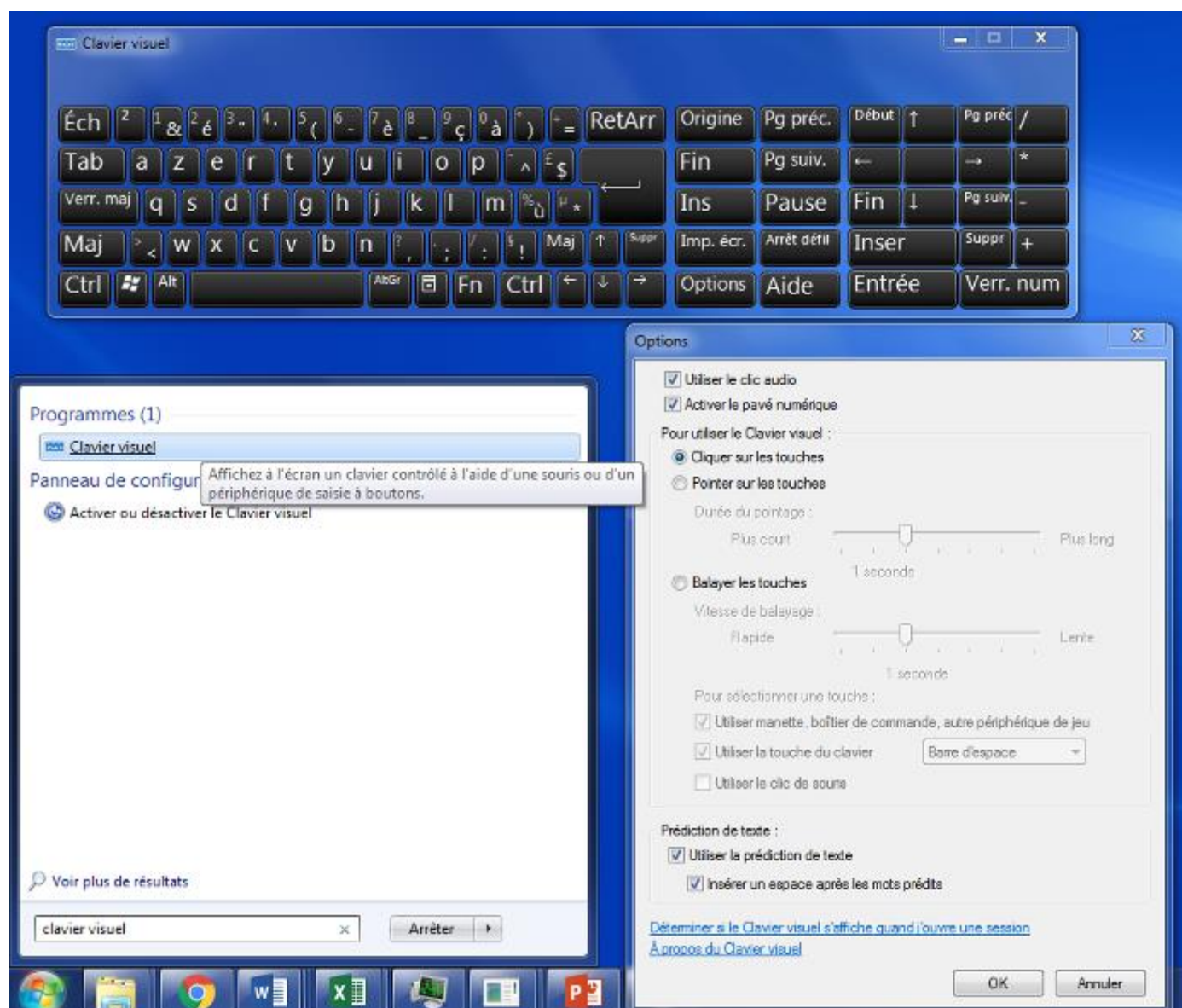


M1 – M3 Display units

1	5,13	
2	5,09	
3	5,07	
4	5,06	
5	5,16	
6	5,12	
7	5,19	

Example of a table completed

A problem appears sometimes while the data is transferring with a USB cable. The display acts like a keyboard, so, in order to write numbers, the “num lock” key must be activated. If your keyboard doesn’t have the “num lock” key, you can still find it by writing “visual keyboard” in the windows search bar, and activate it. If even there the “num lock” key doesn’t appear, the option key allows to access to a menu from which you can activate the “num lock”.



10. RS232 COMMUNICATION

The M3 can communicate with an ASCII protocol allowing to master and configure all the functions. For connecting the M3 to a PC or a PLC, you must use a cable 55-45160, sold separately.



10.1. Commands

10.1.1. Generalities

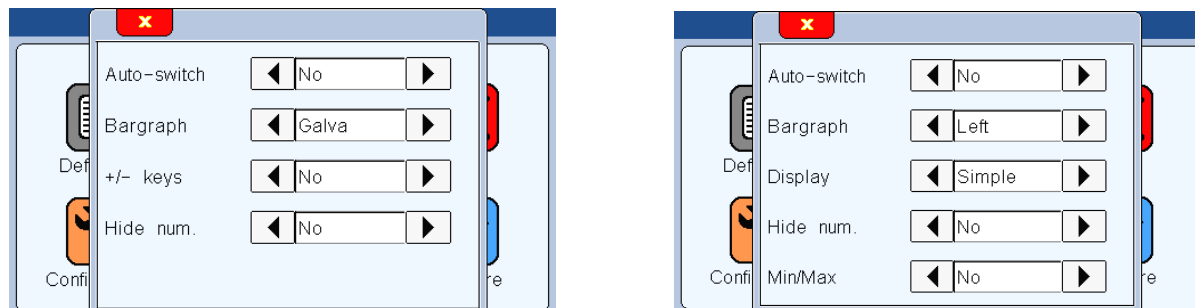
All the commands must be ended by a « CR » character. (ASCII code 13/ \$0D).
The commands can be sent grouped by separating with a « ; » (max 500 characters).
The display is refreshed only once after reception of the « CR » character.

10.1.2. Command list

10.1.2.1. Window PART

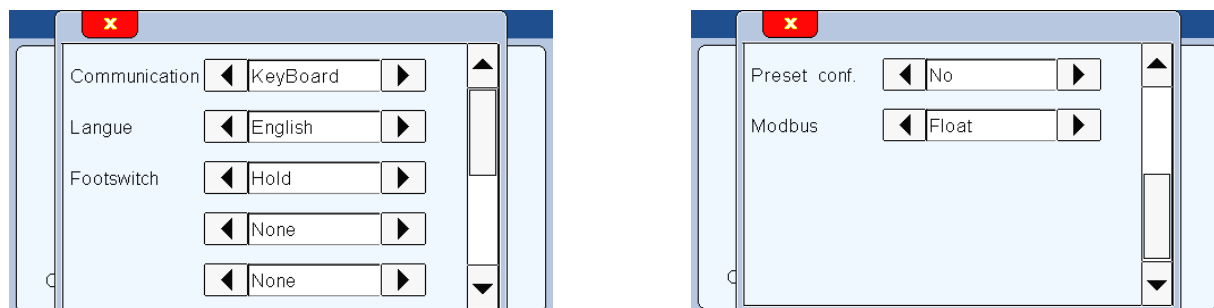
Window « Part » (Command by characteristic with "n" = 1 or 2 (number of the characteristic))			
Rubric	Read. command	Write command	Comment
Resolution	nRES?	nRES=x	x=1 to 5 (number of decimals)
Unit	nUNIT?	nUNIT=x	x=0(mm)
			x=1 (inch)
			x=2 (µm)
			x=3 (DMS) degree_min_sec
			X=4 (DEG) decimal degree
Dynamic mode	nDYN?	nDYN=x	x=0 (static)
			x=1 (maxi)
			x=2 (mini)
			x=3 (maxi-mini)
			x=4 (average)
			x=5 (median)
Formula	nFM?	nFM=x	x=0 (C1)
			x=1 (C2)
			x=2 (-C1)
			x=3 (-C2)
			x=4 (C1+C2)
			x=5 (C1-C2)
			x=6 (-C1+C2)
			x=7 (-C1-C2)
			x=8 (taper)
			X=9 (half taper)
Specific to taper mode	nND?	nND=x	X=space between nozzle (taper)
Direction	nDIR?	nDIR=x	x=0 (sans)
			x=1 (internal)
			x=2 (external)
Upper tolerance	nUT?	nUT=seee.ddddd	
Nominal	nNM?	nNM=seee.ddddd	
Lower tolerance	nLT?	nLT=seee.ddddd	
Master	nMT?	nMT=seee.ddddd	Standard case
	nM1 ? or nM2 ?	nM1=x or nM2=x	In case of dual master (for taper)
Activate control limits	nLIMIT?	nLIMIT=x	x=0 (inactive)
			x=1 (active)
Upper control limit	nUCL?	nUCL=seee.ddddd	
Lower control limit	nLCL?	nLCL=seee.ddddd	
Reference	nREF?	nREF=xxxxxxx	xxxxxxx = part ref

10.1.2.1. Window DISPLAY



Window "display"			
Rubric	Read. command	Write command	Comment
Auto switch	AUTO?	AUTO=x	x=0 (manual)
			x=1 (auto)
Bargraph	BAR?	BAR=x	x=0 (horiz. Bar origin left)
			x=1 (horiz. Bar origin center)
			x=2 (needle)
			x=3 (non = value only, no tolerance)
Display	DISPL?	DISPL=x	x=1 (display 1 characteristic on the screen)
			x=2 (display 2 characteristics on the screen)

10.1.2.2. Window CONFIGURATION

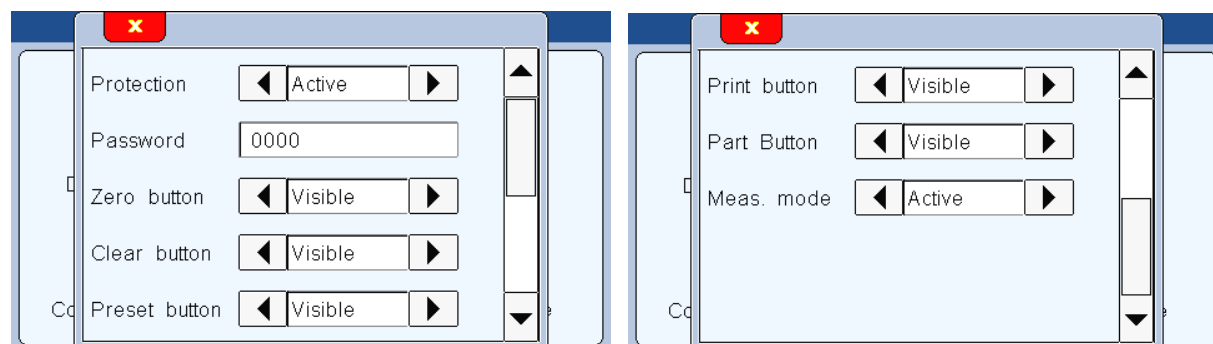


Window "Configuration"			
Rubric	Read. command	Write command	Comment
Transfert	PRINT?	PRINT=x	x=0 (USB)
			x=1 (RS232)
Langue	LANG?	LANG=x	x=0 (French)
			x=1 (English)
			x=2 (German)
			x=3 (Spain)
			x=4 (Italian)
			x=5 (Hungarian)
			x=6 (Czech)
			x=7 (Swedish)
			x=8 (Portugaise)

M1 – M3 Display units

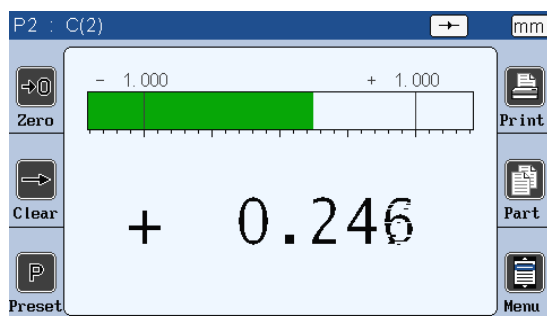
Footswitch	FOOT?	FOOT=x	x=0 (Print)
			x=1 (Preset) → calibration
			x=2 (Zero)
			x=3 (change Part reference)
			x=4 (start dynamic measurement)

10.1.2.3. Window « Lock »



Window "Lock"			
Rubric	Read. command	Write command	Comment
Protection	LOCK?	LOCK	Lock
		UNLOCK	Unlock
Code	PASS?	PASS=xxxxxx	xxxxxx = password with 6 figures

10.1.2.4. Measuring screen



Measuring screen			
Rubric	Read. command	Write command	Comment
Zero		ZERO	Zero relative
Clear		CLR	Start dynamic measurement
Preset		PRESET	Calibration
Print		?	Measurement transfer : If 1 characteristic mode, transfer the value with the format :+000.00000<CR> If double characteristic mode, transfer the value with format : +000.00000,+000.00000<CR>
		1	Transfer the characteristic 1, format = +000.00000<CR>
		2	Transfer the characteristic 2, format = +000.00000<CR>
Part		G1	Part 1
		G2	Part 2
Power off		OFF	Shut down the M3
Reset		RST	Reset the unit (remove the configuration, calibration etc)
Factory reset		FCTRST	Deep reset
Gives a manufacturing order number		OFA=xxxxxxxxxxxx	The manufacturing order number appears on the top bar of the measuring screen, and then when exporting on USB, the export file will have the name xxxxxxxxxxxx.csv. Max 12 characters

11. DATA EXPORT ON USB KEYS

The display offer various possibilities for data export.

From the software version 2.1 new functionalities have been added offering the possibility to export with advanced functions to USB keys or network.

The displays are compatible with most of the available USB keys.

However, some particular models are not compatible. It is also not compatible with USB stick having a partition.

For saving the data on the USB key, you must configure the menu CONFIGURATION → COMMUNICATION → USB Key

Then, when the transfer is triggered (by footswitch, touch of the PRINT button, by an input action or Modbus), a file will be created on the USB key.

11.1. Standard mode :

As a standard a file named “output.csv” is created on the USB key. It look likes this :

Output.csv :

Characteristic	1	2		COMMENT
Name	P1 : C(1)	P2 : C(2)		<i>Name of the characteristics (PART x – CHANNEL x)</i>
Upper tol.	+0.02100	-0.00700		<i>Upper tolerance</i>
Nominal	+20.00000	+20.00000		<i>Nominal value</i>
Lower tol.	+0.00000	-0.02000		<i>Lower tolerance</i>
Measure	+20.00012	+19.99350	GO	<i>Data #1 + indication GO</i>
Measure	+20.00011	+19.99340	GO	<i>Data #2 + indication GO</i>
Measure	+20.00010	+19.99980	NG	<i>Data #3 + indication NG</i>

11.2. Advanced mode :

It is possible to connect a QR code reader (55-HD3430-BKK1B), and to input a manufacturing order number on the display.

After scanning the QR code corresponding to the manufacturing order number, the number will appear on the top bar of the measuring screen, and the output csv file will get the name of the scanned name. Then each time you scan a new number, after saving the first part, a file is created on the USB key.

The command to encode the QR-code is : OFA=xxxxxxxxxxxxx

Example :

Standard screen before scanning manufacturing number:



After scanning the following QR code, corresponding to the command

OFA = ORDER 12345



The screens become like this:



Then when you press the PRINT button the first time, a file is created on the USB key with the name: ORDER 12345.csv

12. CONFIGURATION OF THE UNIT WITH QR CODES

The displays offer the possibility to be configured by a simple scan of QR code. You should use the QR Code reader 55-HD3430-BKK1B.

This will simplify the configuration and reduce risks of errors. It takes less than 2 seconds to configure the display with a QR code scan.

List of commands :


All the RS232 commands listed on the table chapter 10 - RS232 communication can be encoded on a QR code.

Additionally, to this, specific commands are reserved for the calibration procedure of the display.


12.1. Calibration commands:

It is possible to launch a calibration procedure with the QR code:

The QR code must be encoded according to the following layout:

Instructions	Corresponding QR Code
AGI // Initialisation AGL=1 // Configuration of input 1 AGF=1 // Filter level (from 0 to 5) AGN=20.00000 // Value of the MIN master AGC=20.01000 // value of the CENTRAL master (optional) AGA=20.02090 // Value of the MAX master AGS // End of calibration configuration + display of the configuration window	

If you want to configure 2 channels, same principle but you should insert the commands to calibrate the channel 2 :

Instructions	Corresponding QR Code
AGI // Initialisation AGL=1 // Configuration of input 1 AGF=1 // Filter level (from 0 to 5) AGN=20.00000 // Value of the MIN master AGC=20.01000 // value of the CENTRAL master (optional) AGA=20.02090 // Value of the MAX master AGL=2 // Configuration of input 2 AGF=2 // Filter level (from 0 to 5) AGN=19.9807 // Value of the MIN master AGA=19.9932 // Value of the MAX master AGS // End of calibration configuration + display of the	

12.2. Advanced configuration

The previous chapter shows how to configure the calibration.
It is possible to go further and configure the whole device.

The goal of the configuration by QR code is generally to save time and limit configuration errors when the air gauge is changed often on the display.
Before sending a new configuration to the display, it is recommended to start sending a reset command, so that all the previous parameters will be reset the default; because the QR code we only modify the encoded parameters. Other parameters will remain the same.

This command is : RST


After sending this command, you must start the configuration by the general parameters, then configuration of the characteristics, and at the end sending the calibration commands as described on the previous chapter.

12.3. Example of QR code configuration

The following example shows a complete configuration of the unit with QR code.
We use 2 air gauges (1 plug and 1 ring) mounted on a plate, for pairing (diameter 20H7 and 20g6).
We must calculate and display the difference between the diameter 20H7 and the diameter 20g6.

	<p>Air plug connected on C1: Nominal :20mm Upper tolerance : +0.021mm Lower Tolerance : 0mm Min master = 20mm Max master = 20.0209</p> <p>Air ring connected on C2 : Nominal :20mm Upper tolerance : -0.007 mm Lower Tolerance : -0.020 mm Min master = 19.9807mm Max master = 19.9932mm</p>
---	--

M1 – M3 Display units

Instructions	Corresponding QR Code
<pre> RST // Reset all the previous parameters. 1RES=4 // Change the resolution to display 4 digit (0.1µm) 1REF=PAIRING // Change the characteristic name to PAIRING 1UT=+0000.0402 // Upper tolerance 1NM=+0000.0000 // Nominal 1LT=+0000.0068 // Lower tolerance 1MT=+0000.0068 // Master value 1FM=5 // Formula = C1-C2 BAR=1 // Bargraph type = horizontal with left origin DISPL=1 // Display type = simple (only 1 bargraph) AGI // Initialisation of air gage calibration AGL=1 // Configuration of input 1 AGF=0 // Filter level (from 0 to 5) AGN=20.0000 // Value of the MIN master AGA=20.0209 // Value of the MAX master AGL=2 // Configuration of input 2 AGF=0 // Filter level (from 0 to 5) AGN=19.9807 // Value of the MIN master AGA=19.9932 // Value of the MAX master AGS // End of calibration configuration + display of the configuration window </pre>	

After this configuration, a popup window appears asking :

“DEACTIVATE CALIBRATION ?” YES / NO

Press yes and the previous calibration will be erased, then the window for calibrating the display opens. You just need to finish the calibration procedure by placing the MIN and MAX masters for C1 and C2.

Then go the measuring screen, place the master diam 20.0000 mm on C1 and diam 19.9932mm on C2, then press PRESET.

The value changes to 0.0068.

The display is ready to measure.

You can then scan a manufacturing order number if request to export the data, as describes on the chapter “DATA EXPORT ON USB KEYS”.

13. MODBUS RTU Protocol

This protocol allows to connect the display to a compatible PLC. A maximum of 256 register can be read.



Example of a RTU Modbus communication with an automate Pro-Face. This example can be download from our website www.metro-fr.com

Trame Modbus RTU	Adr	Code	Data	CRC16
------------------	-----	------	------	-------

Address: always equal to 1

Code: the M3 supports codes « 3 » by reading and « 16 » by written

Data: 1 to 256 register

CRC16: verification code on 2 octets

The following functionality are available:

- Reading of the position of 2 probes
- Instant reading of the value of 2 characteristic
- Preset
- Reading / programing of the tolerances, of the master value, the formula...

Register are compounded by one or a couple of 16 bits words.

Function	Address	Size (word)	Value
Preset (W)	0	1	1
Start a dynamic measure (W)	1	1	1

M1 – M3 Display units

Active program (R/W)	4	1	0 or 1
Life word (change each 100ms) (R)	6	1	0 or 1
Stop	7	1	1
Active M3	8	1	1 = measure 0 = Menus

Register by characteristic: from 100 to 188 for the characteristic 1 and from 200 to 288 for the characteristic 2

Formula (R/W)	100	1	0 = C1 1 = C2 2 = -C1 3 = -C2 4 = C1 + C2 5 = C1 - C2 6 = -C1 + C2 7 = -C1 - C2
Maxi of a dynamical cote (R)	101	2	
Mini of a dynamical cote (R)	103	2	
Lower control limit (R/W)	105	2	
Upper control limit (R/W)	107	2	
Active class	109	1	1 à 16
Unit	110	1	0 = mm 1 = inch 2 = μ m
Control limit activated	111	1	0 = no 1 = yes
resolution	112	1	1 to 5 (decimal)
State of the characteristic	113	1	0 = good 1 = < Mini 2 = > Maxi 3 = < lower ctrl limit 4 = > upper ctrl limit
Type of the characteristic	114	1	0 = Static 1 = Maxi 2 = Mini 3 = Maxi-Mini 4 = average 5 = Median
Nominal	115	2	
Lower tolerance	117	2	
Upper tolerance	119	2	
Master value	121	2	
Measure	123	2	Displayed value
Mini class 1	126	2	
Mini class 2	128	2	
Mini class 3	130	2	

Mini class 4	132	2	
Mini class 5	134	2	
Mini class 6	136	2	
Mini class 7	138	2	
Mini class 8	140	2	
Mini class 9	142	2	
Mini class 10	144	2	
Mini class 11	146	2	
Mini class 12	148	2	
Mini class 13	150	2	
Mini class 14	152	2	
Mini class 15	154	2	
Mini class 16	156	2	
Maxi class 1	158	2	
Maxi class 2	160	2	
Maxi class 3	162	2	
Maxi class 4	164	2	
Maxi class 5	166	2	
Maxi class 6	168	2	
Maxi class 7	170	2	
Maxi class 8	172	2	
Maxi class 9	174	2	
Maxi class 10	176	2	
Maxi class 11	178	2	
Maxi class 12	180	2	
Maxi class 13	182	2	
Maxi class 14	184	2	
Maxi class 15	186	2	
Maxi class 16	188	2	

probe 1	7000	2	
probe 2	7002	2	

14. OPTIONAL I/O MODULE

14.1. MB-IO module

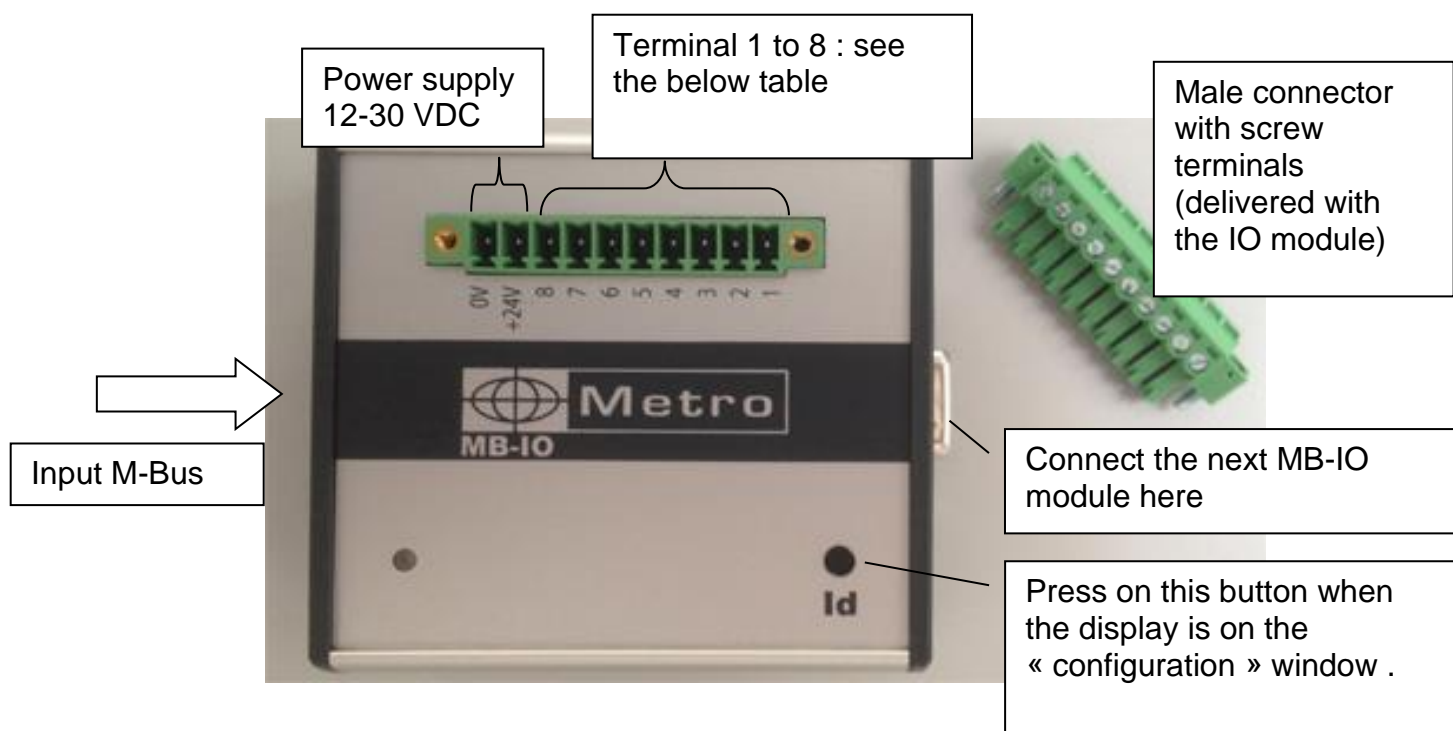
As an option, it is possible to connect up to 4 M-Bus modules with 8 inputs/output isolated by opto-coupler. (ref MB-IO)

The 8 outputs are similar to the « open collector PNP » type. They can be used with an external power supply 12 to 30 VDC maximum. The maximal output current drained by each output is 50mA

The 8 inputs represent a 2.2kOhms load connected to the 0 volt.



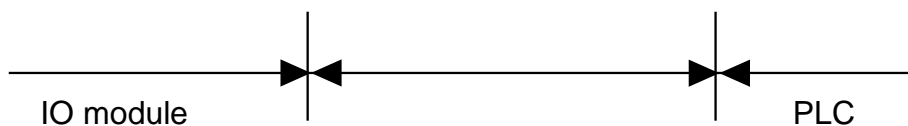
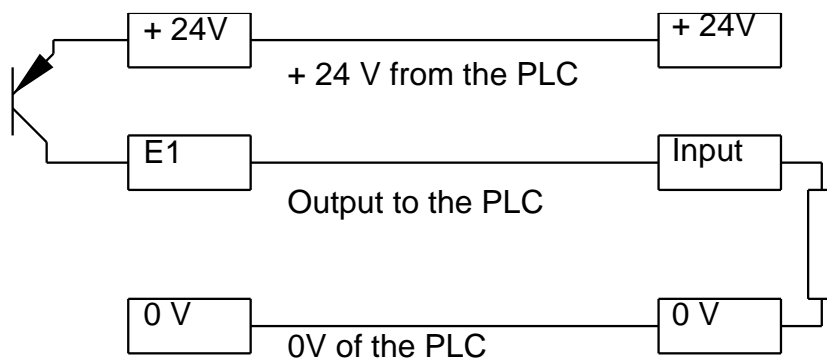
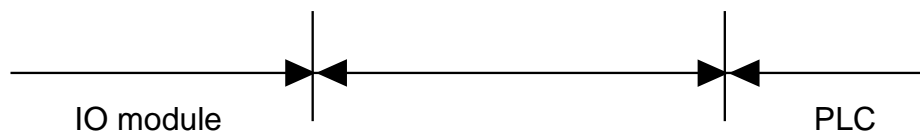
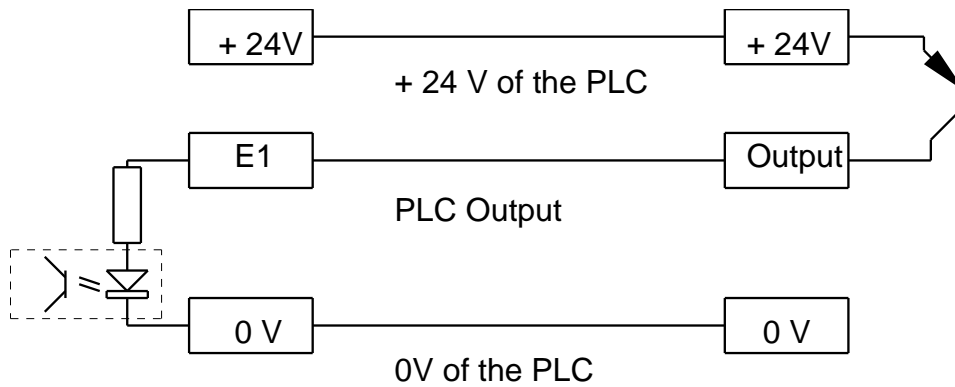
Refer to chapter 7.3 (setup) to connect a MB-IO module



List of available functions :

Transfer	Print, transfer the measured value
Preset	Set the display value to the master value
Zero	Set the display value to 0
Clear	Reset the dynamical measure
Init Dyn	Start a dynamical measure
State characteristic	Output a signal if the characteristic is in the tolerance
Lower control limit	Output a signal if the part is in the lower control limit
Upper control limit	Output a signal if the part is in the upper control limit
Out Tol -	Output a signal if the part is out lower tolerance
Out Tol +	Output a signal if the part is out upper tolerance
Part status	Output a signal if the part is in the tolerances
Class	Output a signal on a defined port for each class
Stop	Hold the measure
characteristic	Change the displayed characteristic
Touchscreen	Disable the touch screen function

Connection example between display and PLC



14.2. MB-RL module

Please refer to the chapter 7.3 (Setup) to connect a M-Bus module



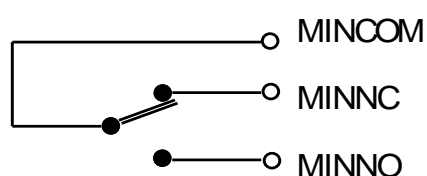
The MB-RL module has been designed for retrofitting old Monocote displays equipped with the optional relay board.



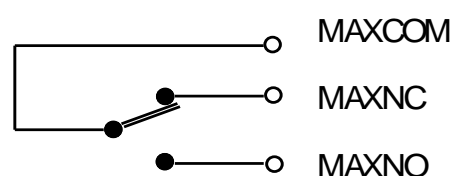
The external M-bus module has the same pinout (SUBD-15) than the relay board of the Monocote display, so there is no need to change the wiring of the existing installation.

M1 – M3 Display units

The MB-RL has two independent and isolated relays indicating the position of the displayed measurement by comparison with the tolerances. Each relay provides a contact that is normally open in case the measurement is within the tolerances (MINNO and MAXNO) and a contact that is normally closed (MINNC and MAXNC). The commons of each relay (MINCOM and MAXCOM) are independent, so that the user is as free as possible.



RELAIS TOLERANCE MINI



RELAIS TOLERANCE MAXI

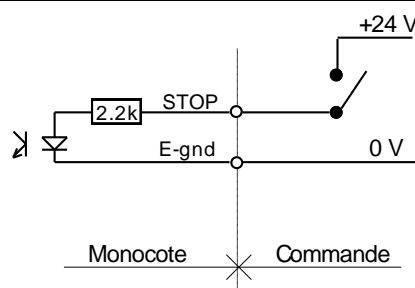
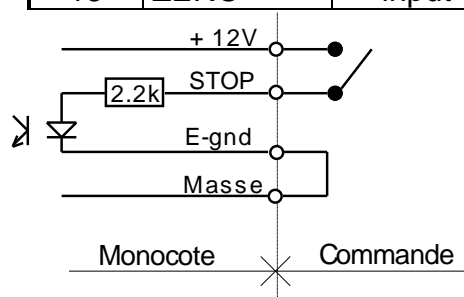
Four inputs isolated by opto-couplers enable to operate the M3 by remote control. They are active at the logical level 1 (+12 to + 24 Volts) that must be maintained at 1 for 50 milliseconds minimum. The command is effective when the input comes back to zero, except for the input STOP that stays active as long as the logical level 1 (+12 to + 24 Volts) is maintained.

- **INITDYN** : This input controls the initialisation of memories for the dynamic measurement. It must be used every time the dynamic measurement starts, when the part to be measured is already in place under the probes. This command has the same function as the button “CLEAR” of the measuring screen.
- **STOP** : This input stops the measurement (and freezes the screen) as long as it is maintained at the logical level 1.
- **ZERO** : This input controls the zero reset of the display. The display then indicates the variations of the measurement in comparison with this origin. This command has the same function as the button “ZERO” of the measuring screen
- **PRINT** : This input controls the sending onto the communication port of the displayed measured value. This command has the same function as the button “PRINT” of the measuring screen
- **PRESET** : External command of calibration according the selected working mode. This command has the same function as the button “PRESET” of the measuring screen

SUB D connector (15 pins) : pin assignment

Borne	Signal	Sens	Description
-------	--------	------	-------------

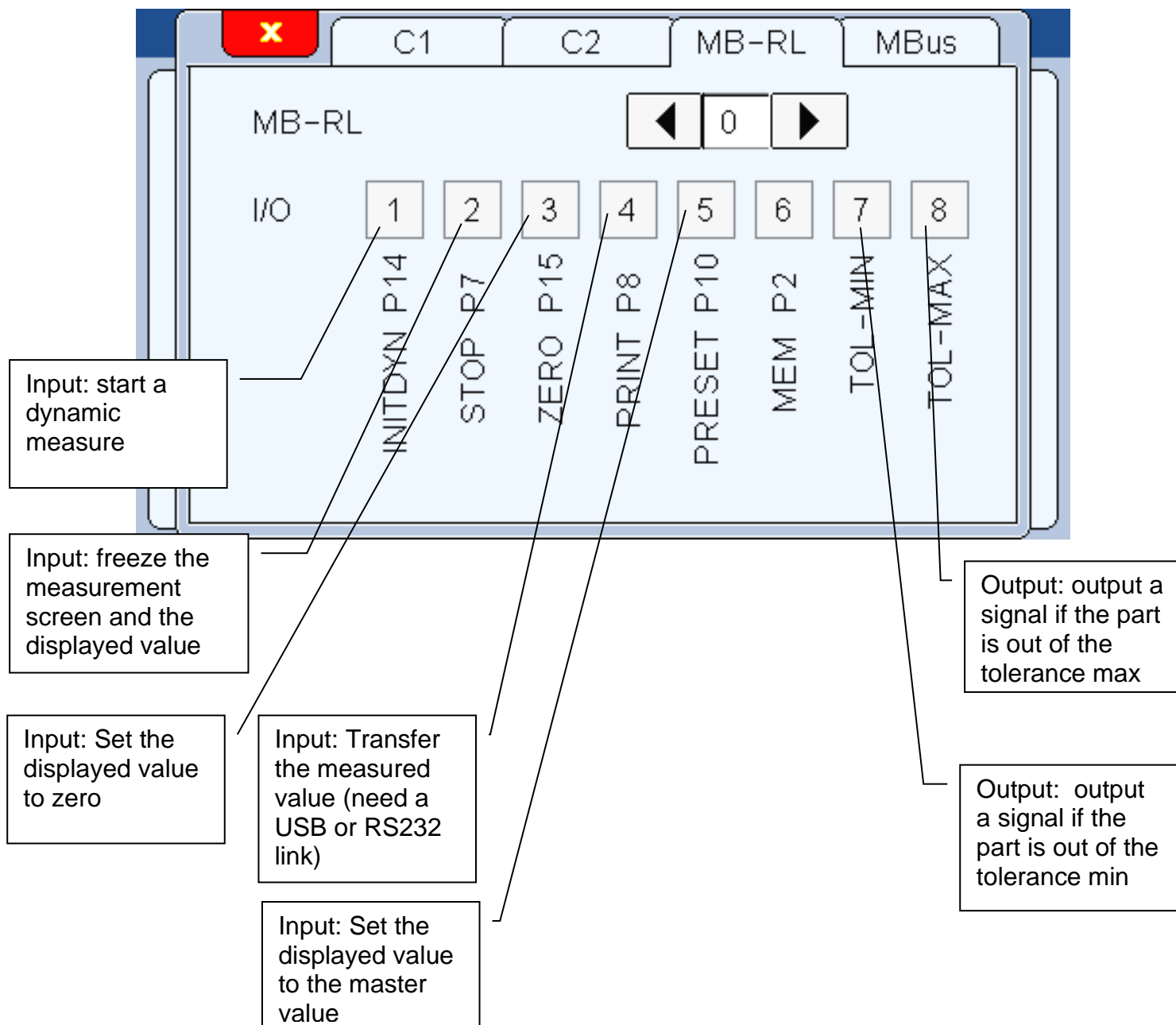
1	+5 V	output	Power supply to activate the inputs
2	Not connected		
3	MINNC	-	Mini tolerance relay contact 1A 48V
4	MINCOM	-	Common of mini tolerance contacts
5	MINNO	-	Mini tolerance relay contact 1A 48V
6	E_GND		Input ground
7	STOP	input	Command for Stop mode
8	PRINT	input	Command for measurement transfer
9	Ground	-	Supply ground
10	PRESET	input	External calibration command
11	MAXNC	-	Maxi tolerance relay contact 1A 48V
12	MAXCOM	-	Common of maxi tolerance contacts
13	MAXNO	-	Maxi tolerance relay contact 1A 48V
14	INIDYN	input	Command for measurement initialisation
15	ZERO	input	Command for display reset to zero



Command example: with internal supply (not isolated) and with an external supply (isolated).

M1 – M3 Display units

The following screen appears on the M8 when a MB-RL is connected. There is a function for each of the 8 ports, and these functions can't be changed.

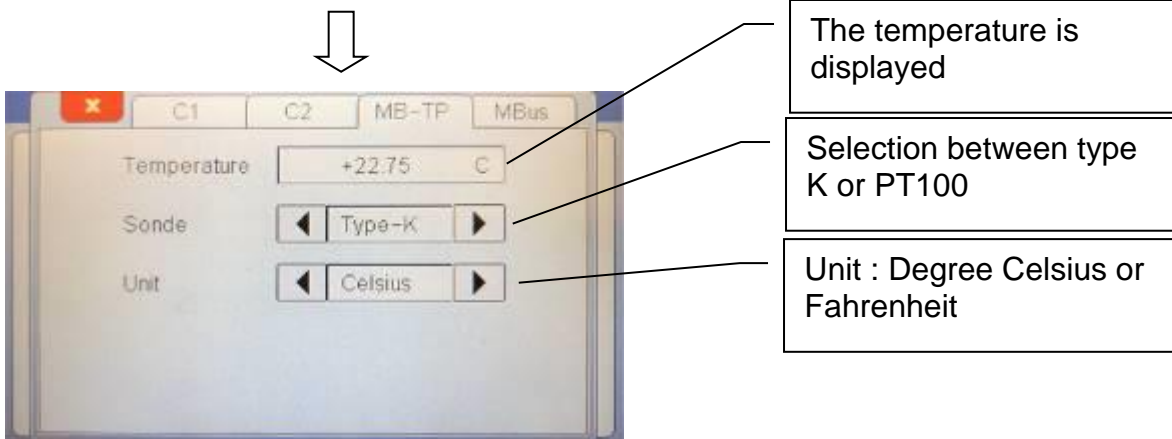
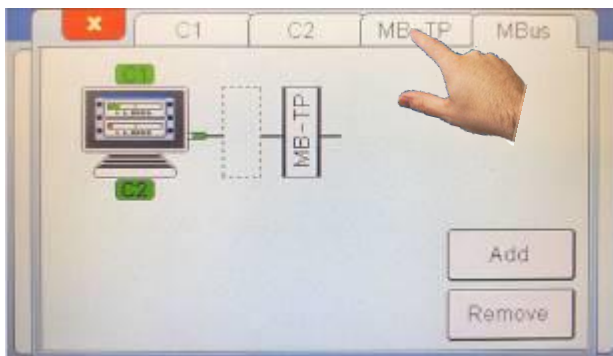


14.3. MB-TP Module – for temperature compensation

The MB-TP module allows to use an isolated thermocouple type K (hot junction) or PT100 sensor.

2 functions are then available: alarm or compensation.

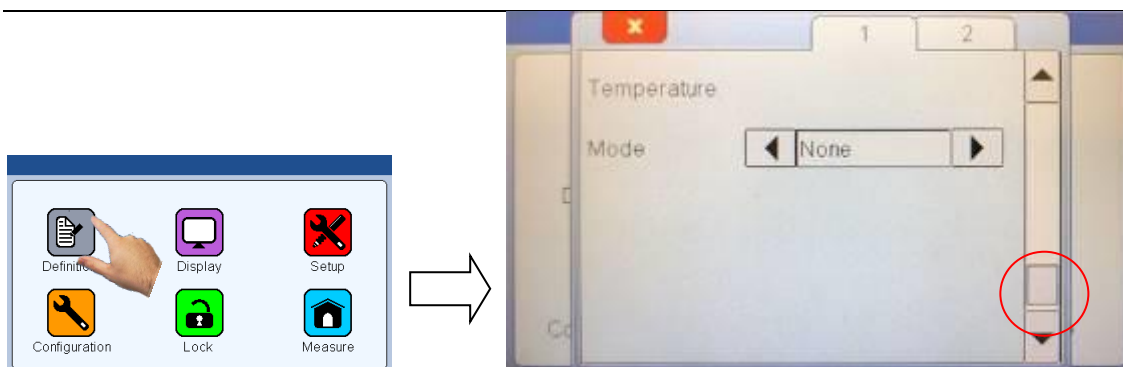
A - Identification and configuration of the Temperature module MB-TP



B - Configuration of the temperature mode

After the identification described on the previous chapter, a new window is available from the last page of the menu DEFINITION.

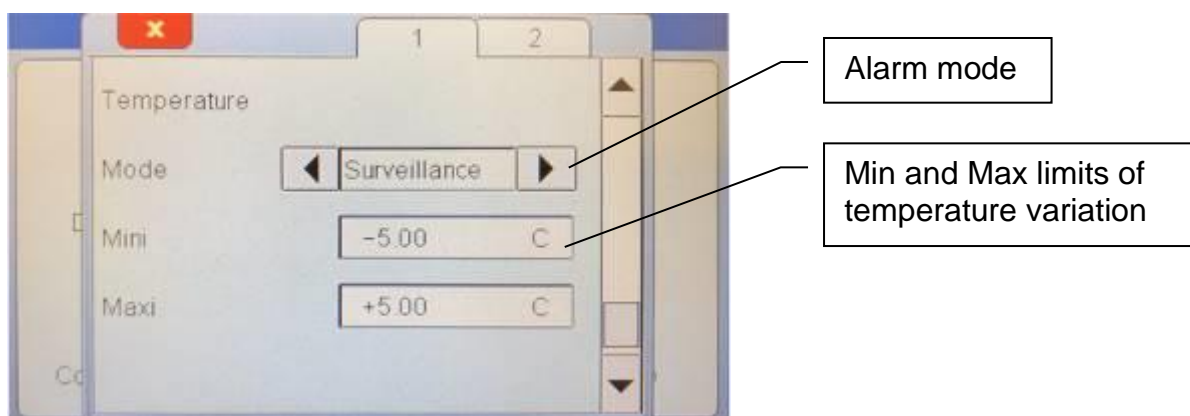
M1 – M3 Display units



As a standard, the temperature mode is deactivated.
You can now choose between:

a – Alarm mode

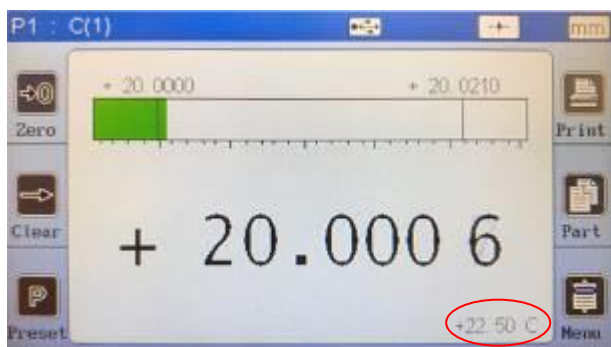
When selecting the Alarm mode, it is required to define the temperature variation acceptability, with a MIN and a MAX, in the chosen unit.



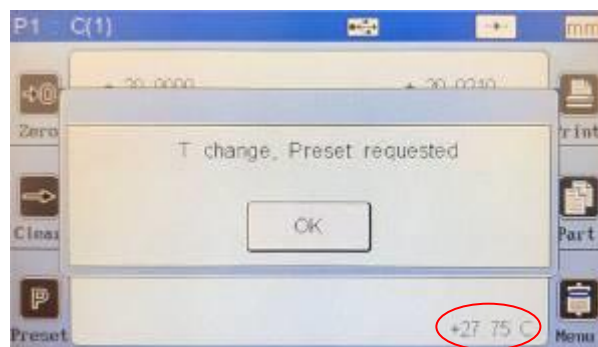
Here we selected +/- 5°C of allowed temperature variation.

Let's come back to the measure screen:

After a PRESET, the actual temperature is recorded, and the monitoring starts.

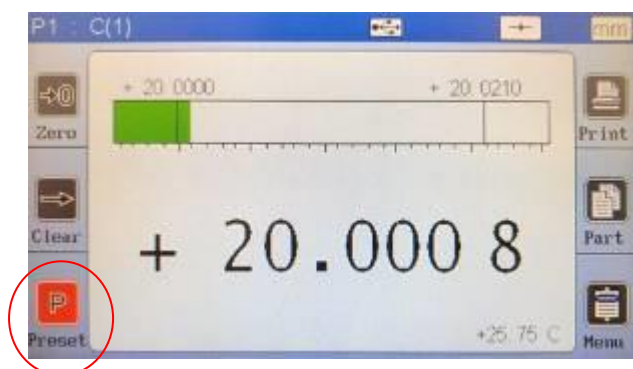


Temperature OK = no alarm



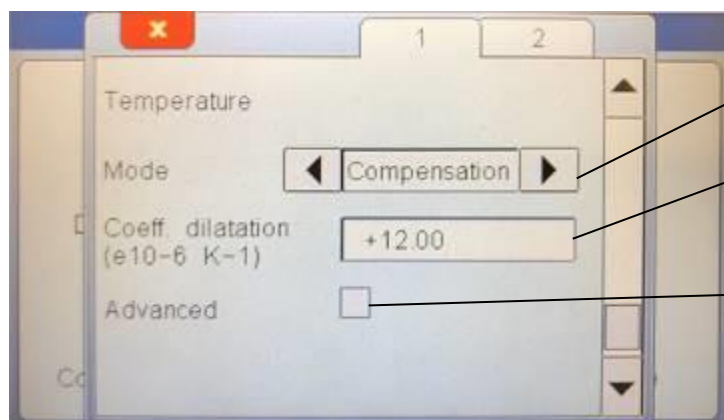
Temperature increased = alarm

After validation with the OK button, the Preset button becomes red until you made the preset :



The PRESET button become black again after pre-setting.
The new reference temperature has now been moved to the actual temperature.

b – Temperature compensation mode



Compensation mode

Expansion coefficient

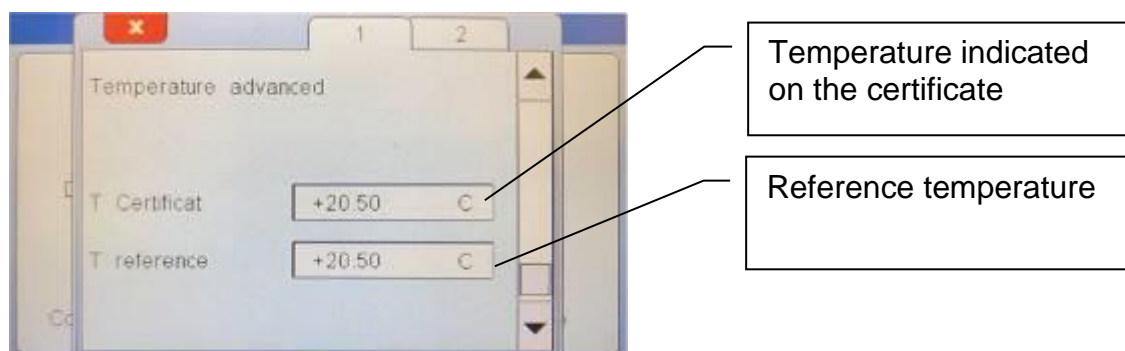
If validated (green), a new screen appears allowing to set the temperature of the master's certificate.

When the « compensation mode » is activated, it is requested to enter the expansion coefficient. As an information, on the below table you can see the coefficients of the main materials (source Wikipedia):

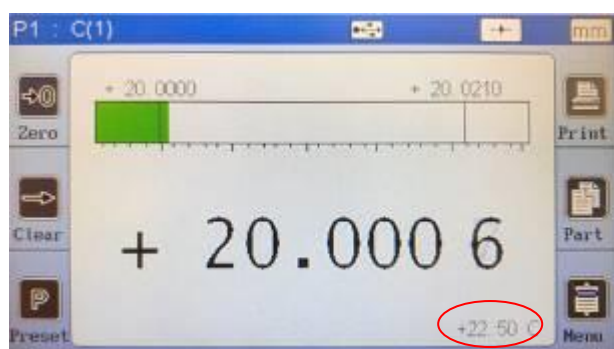
Material	α in $10^{-6}/K$ at 20 °C
Aluminium	23
Brass	19
Stainless steel	17.3
Copper	17
Gold	14
Nickel	13
Iron or Steel	11.1
Carbon steel	10.8
Glass	8.5
Tungsten	4.5

M1 – M3 Display units

The compensation is done assuming that the Master part has been measured at 20°C. If it is not the case, select the option “advanced” and a next page appear, allowing to enter the temperature of the master during the measurement according to its certificate:



When the configuration has been done, you can go to the measuring screen.



From the PRESET, the reference of temperature is done.

If the temperature increases, the part becomes bigger. With the compensation, the measurement shall not change, or at least mostly limit the temperature effect, depending on the accuracy of the defined coefficient.

If you are using the advanced mode, you need to enter the temperature of the certificate, and the reference temperature.

For example, if you enter a certificate temperature of 20° and a reference temperature of 30°, when you PRESET, the displayed value will represent the size of the master at 30°.

The temperature function is advanced functionality of M3. It is recommended to make trials and comparative measurements to validate the process before using it in production.

The MB-TP module is compatible with PT100 sensors and hot junction isolated Thermocouple type K.

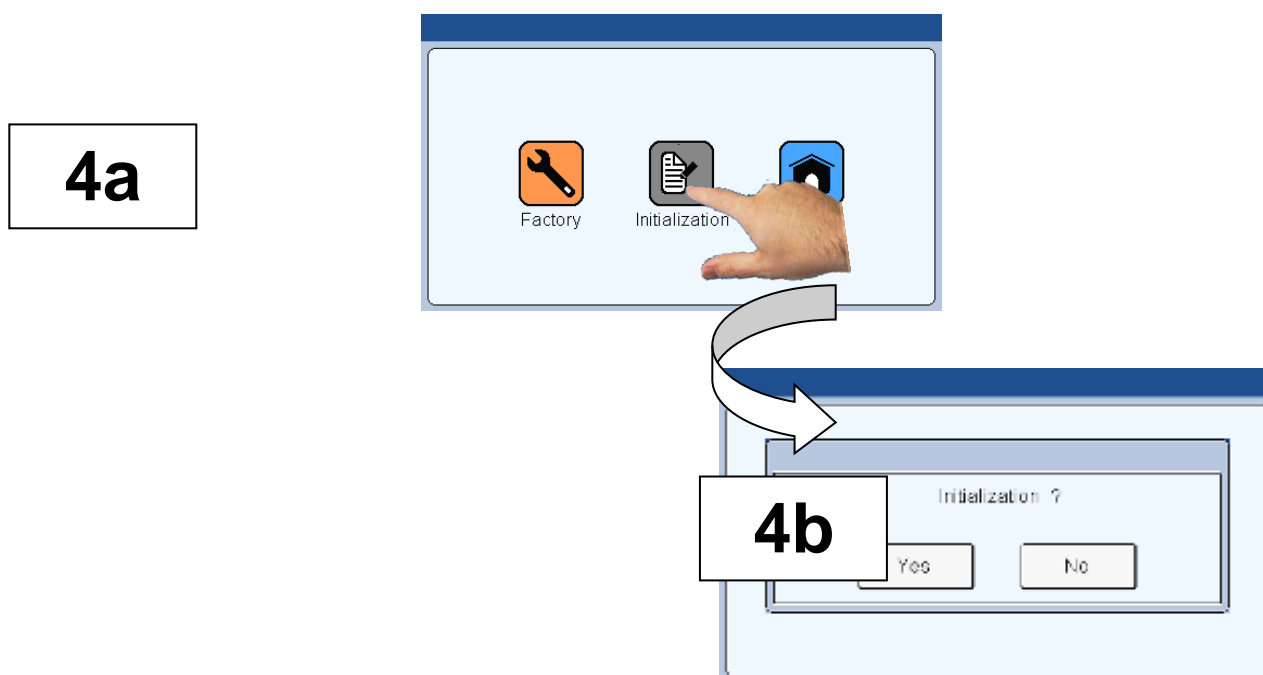
15. FACTORY RESET

This function allows to come back to the factory setting.

Warning: At the end of this procedure, all the parameters of your display will be reset (tolerances, masters, formulas...)

To Reset to factory settings, please follow the process bellow.

- 1 – Shut down
- 2 – Start
- 3 – When the splash screen appears, press on the Bowers logo
- 4 – A desktop with 3 icons appear.
 - 4a – Press on « initialization »
 - 4b – Confirm YES or cancel NO
- 5 – Press Home to come back to the measuring screen



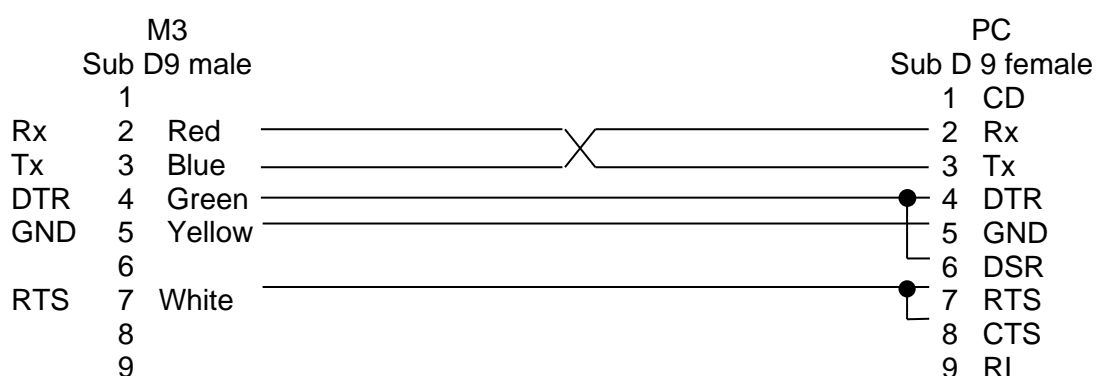
16. FIRMWARE UPDATE

It is possible to update the firmware

For this you need a RS232 cable ref 55-18060.

It is possible to use a RS232/USB convertor if your computer is not equipped with a serial port.

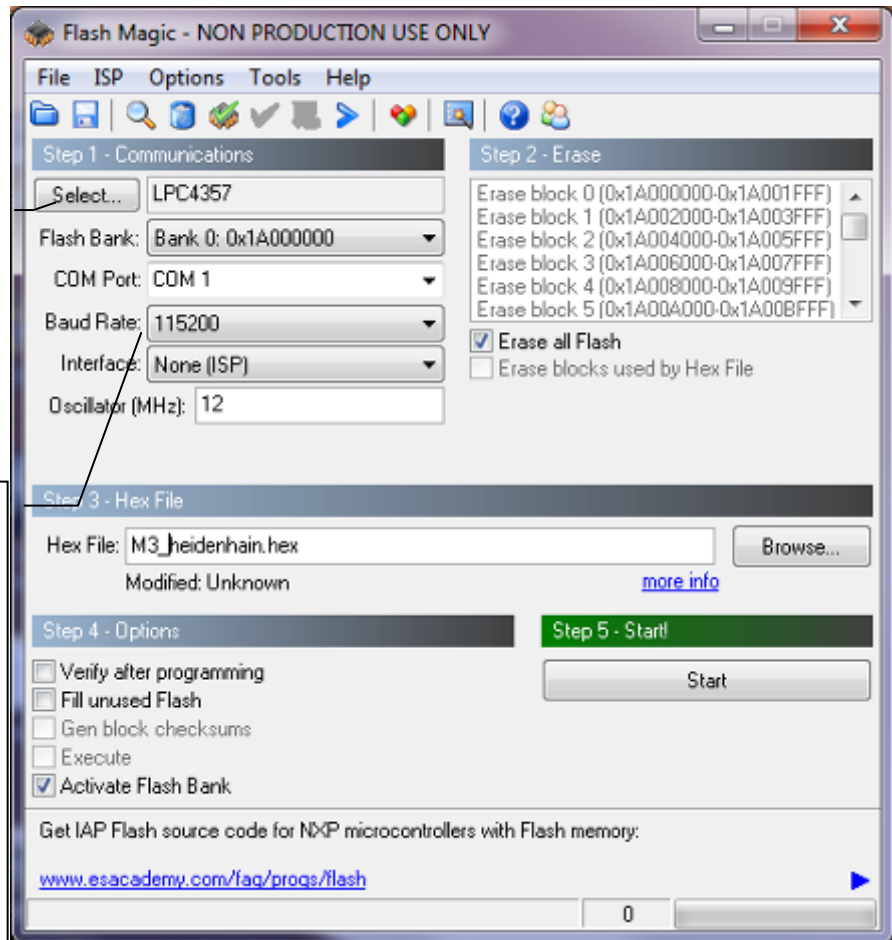
If you do not have a cable ref 55-18060, you can make your own cable by following this schematic



The firmware update requires to use the « flash magic » software that can be download (free) from this address:

www.flashmagictools.com

After installation, please configure the software on the following way:



The LPC4357 can be found on the “ARM Cortex” category after clicking on « Select ».

If you are connected directly on a serial port, you can use the baud rate 115200bauds. If you use a USB/RS232 convertor, use 38400 bauds.

Procedure:

- 1 – Connect with the cable ref 55-18060 to the computer
- 2 – Start
- 3 – Configure the flash magic software according to the above picture.
- 4 – Click on “Start”

It takes from 2 to 5 min depending on the Baud rate selected. During the update, the screen becomes blurred.

5- The display will restart automatically when it is finished.

6- Reset by following the procedure on the chapter 11.