M1 / M3

Display units for 1 or 2 air gages

USER'S MANUAL

Firmware 2.0

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ONE YEAR LIMITED GUARANTEE FOR MULTIVISION

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.

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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.

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.

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 M1 and M3 display units allow making dimensional control using 1 or 2 air gages. Depending on the version it is possible to make simple measurement (with one air gage), 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 gages requires 2 masters for calibration.

3.2. VERSIONS

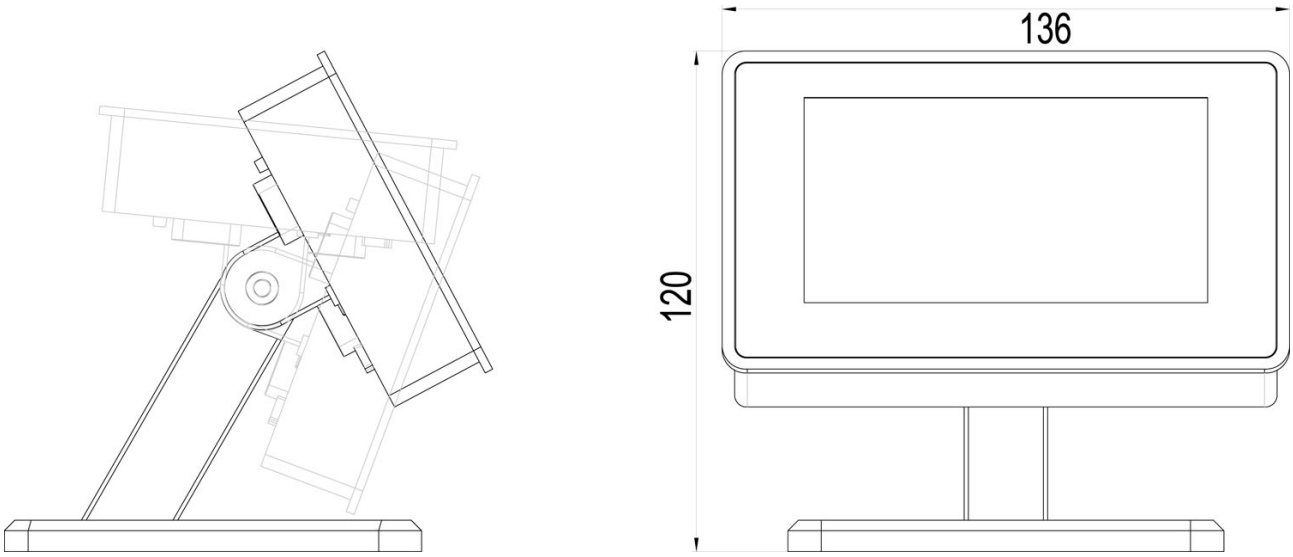
REF	Description
11040	Display unit M1 for 1 air gage
13040	Display unit M3 for 2 air gages or 1 air gage with 2 measuring levels

3.3. CHARACTERISTICS

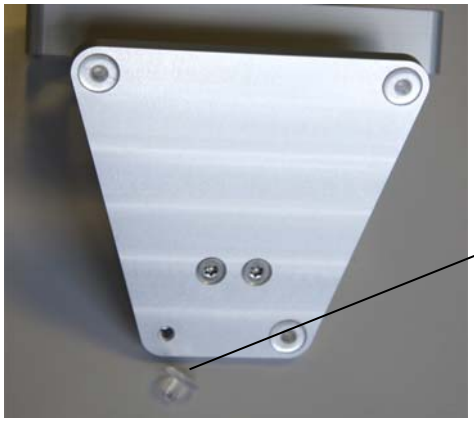
3.3.1. Main technical characteristics

- 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 gage or by touching the screen.
- Relative or absolute display
- Display resolution (up to 0.1µm)
- Metric (mm or µm) or Imperial (Inches) measurement
- 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



The M3 is fitted with 4 thread M5 allowing to attach it. To access to these threads, it is necessary to remove the 4 antiskid plastic parts.



Remove the antiskid parts to attach it on the table

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

Pneumatic connections (see also chap.4) :


Air gage 2
6mm tube
Y connection for 8 to 6mm tube
Air gage 1
6mm tube
8mm tube
3 BAR (0.3Mpa)
5BAR (0.5Mpa)
8mm tube
FESTO

3.3.3. Contains of the packaging

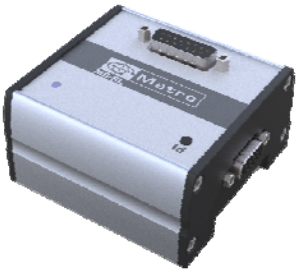
The M1/3 package includes :

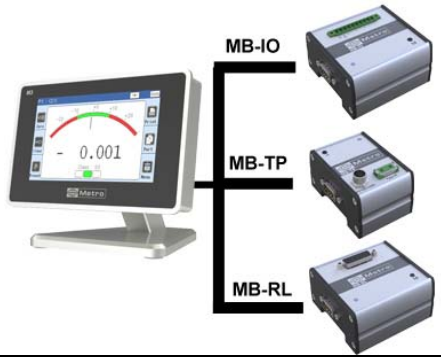
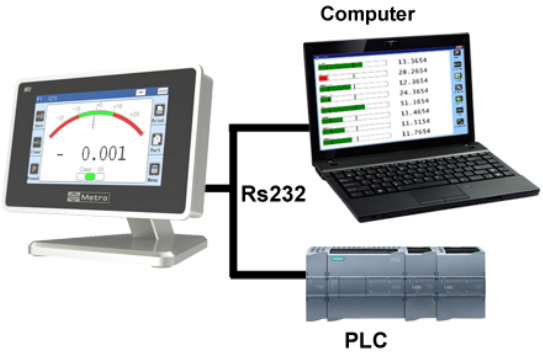
- 1 M1/3 display mounted on an orientable stand
- 1 USB cable, (length =1.8m) for power supply and/or data transfer
- 1 USB main adaptor for the display power supply. The M3 can also be powered by a computer when connected to it with the USB.
- 1 Mini-CD containing the user manual.

3.3.4. Accessories

Reference	Description	Picture
ACS-PNE-003	Air preparation unit : It is mandatory to use a precision regulation system, otherwise the measurements will not be stable. We can supply the adapted air preparation unit from SMC, including stop valve, filter and regulator + precision regulator. The precision regulator must be adjusted at 3 BARS (0.3MPa)	
ACS-PNE-008	For M3 displays. 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.	
ACS-PNE-006	Soft polyurethane tubes 6*4mm : The M1 / M3 are fitted with 2 connectors for air tube with 6mm external diameter and 4mm internal diameter. 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.	
ACS-PNE-007	Soft polyurethane tubes 8*5mm : The air preparation unit is fitted with a connexion for 8mm tubes (external diameter)	

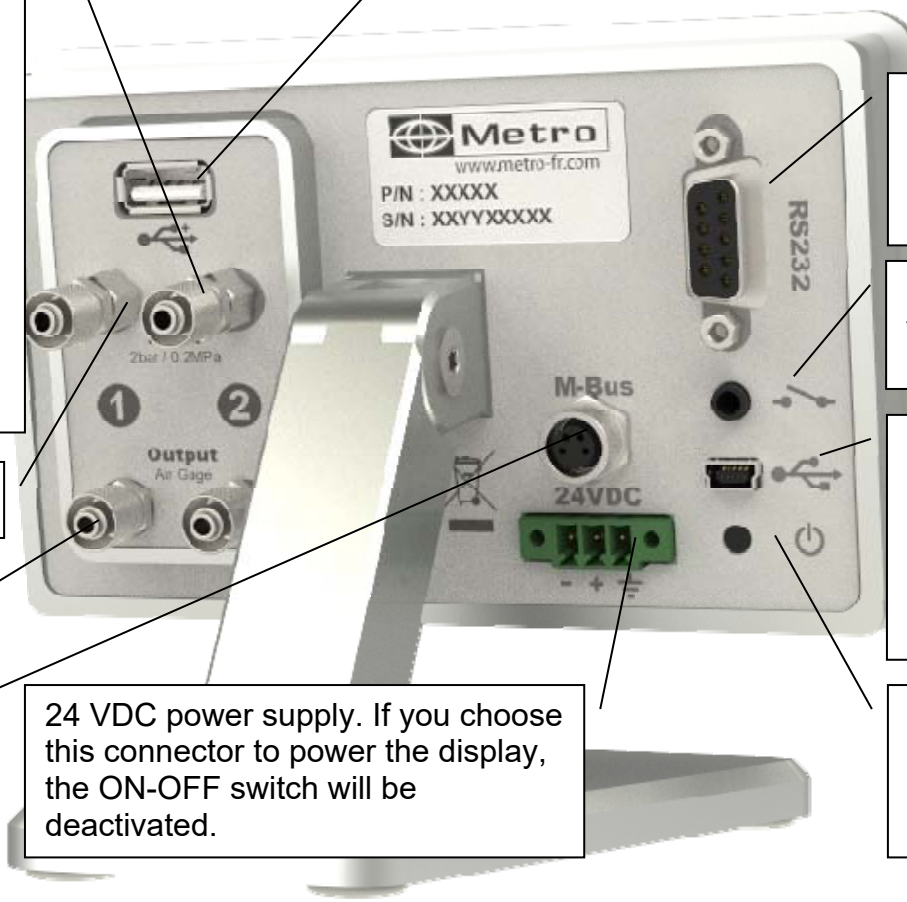
3.3.5. Options / cables

Reference	Description	Picture
18020	Footswitch : This footswitch with a robust construction can be configured in different ways: preset, measurement transmission, start dynamic measurement etc...	
ACS-AFF-001	Accessory for panel mounting. To be installed instead of the stand. 	
MB-IO	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 mounted	
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 To remote control the display. This MB-RL module is wired exactly like the #24136 optional board for Monocote displays. It allows then to replace a Monocote by a M3 without changing the machine wiring.	

81213-1.5	M-Bus câble for M3 : This cable allows to connect the compatible M-Bus modules on a M3 display unit. Length 1.5m 	
45160	RS232 cable This cable allows to connect a M1//M3 display to a computer or a PLC. 	
18193	This cable allows to connect a M1 /M3 display to a Multiplexer Mux from Metro, and to the DP1 printer from Mitutoyo 	

45173	RS232/USB cable converter : This cable allows a M1/M3 display to communicate with a computer. It creates a virtual COM port on the computer. It is delivered with a driver on a CD.  	
ACS-AFF-002 + 45179	Tickets printer Allows to print the displayed value of the M1/M3 Requires cable ref 45179 to be connected to the M1 / M3	

3.3.6. Connectors



2 input for AIR at 3BAR (0.2Mpa) (air filtered at 5µm and regulated at 0.1BAR / 0.01MPA). NEVER OVERPASS 4BAR/0.4MPA. It is very recommended to use the FRL (Air preparation set) from Metro ref ACS-PNE-003. See details on the chap. 3.3.4

USB Stick connector for data saving on a CSV file.

RS232 connector for connection to a PC

Multi-function footswitch connector

Mini-USB connector for power supply and measurement transfer to a PC

On/Off switch (press 2s. for shutting down)

Restrictor

Output to the Air gage

To connect m-bus modules (optional)

24 VDC power supply. If you choose this connector to power the display, the ON-OFF switch will be deactivated.

3.3.7. Standard cabling – restrictor choice

The M1 or M3 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.
If you order a turnkey solution at Metro, we will deliver the display with the adapted restrictor. But if you want to use the M1 / M3 display together with your existing air gage, you will have to use the adapted restrictor by your own.

It is advised to contact Metro or one of its distributors for advices or confirmation around this subject.

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

link to the video

Or scan the QR code :

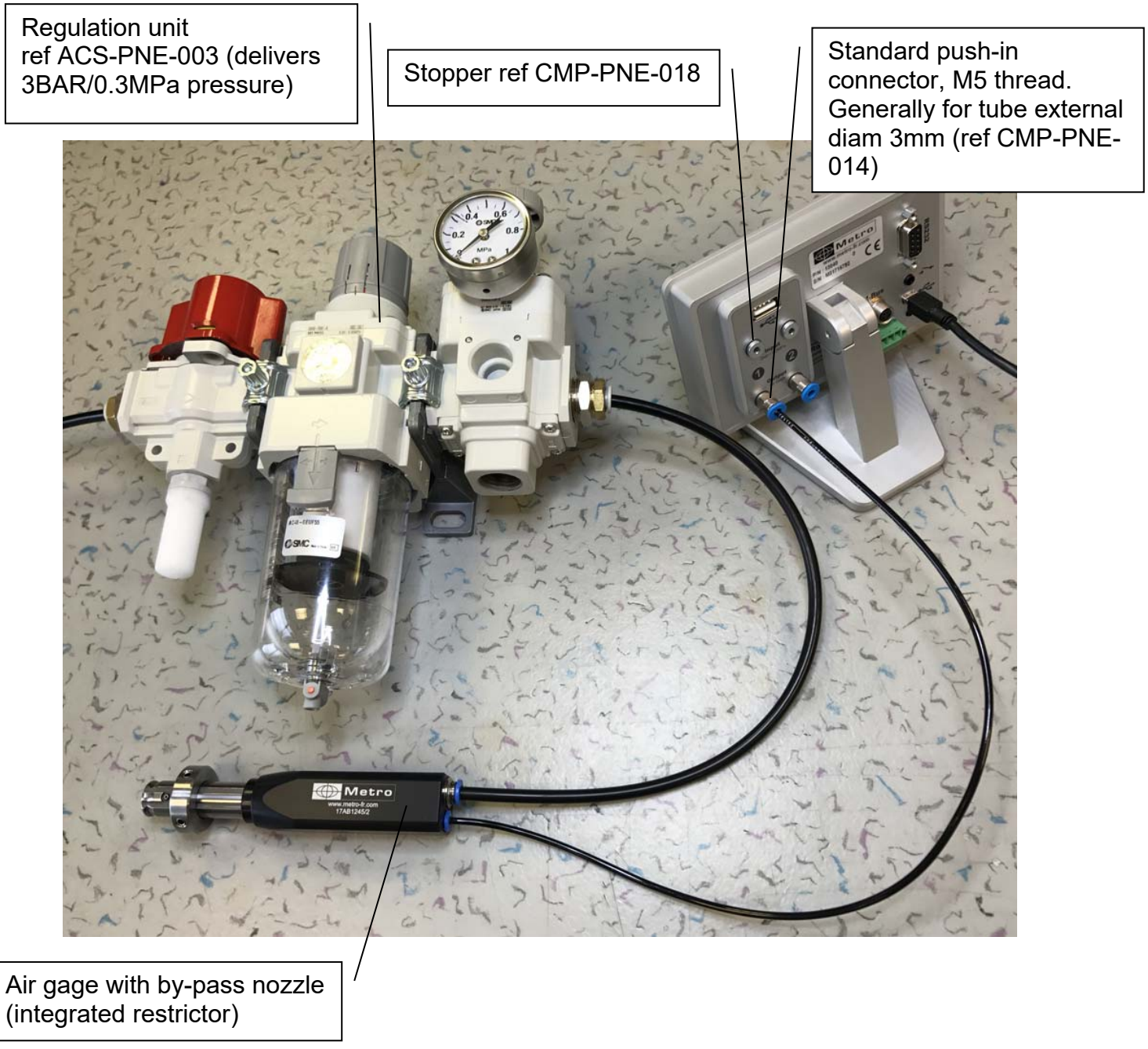
Nozzle diameter in mm	number of nozzles	total flow surface in mm²	Restrictor
0,3	2	0,14	0,3
0,4	2	0,25	0,4
0,5	2	0,39	0,4
0,6	2	0,57	0,5
1	2	1,57	0,7
2,07	2	6,73	0,9
0,3	3	0,21	0,3
0,4	3	0,38	0,4
0,5	3	0,59	0,5
0,6	3	0,85	0,5
1	3	2,36	0,7
0,3	4	0,28	0,4
0,4	4	0,50	0,4
0,5	4	0,79	0,5
0,6	4	1,13	0,5
1	4	3,14	0,7

Example :


Diameter 0.6mm
2 nozzles of 0.6mm
= 0.5 Restrictor

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

Some air gages are delivered with a by-pass nozzle (or integrated restrictor). It means that the restrictor is integrated inside the air gage 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.
If you order a turn key solution at Metro, it will generally be delivered according to this principle.
The cabling schema is the following:



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.

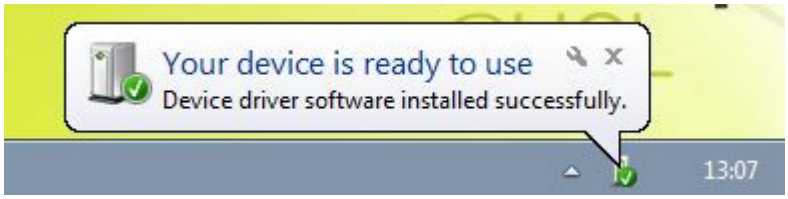
Pin	*Signal*	*Direction*	*Description*
1			Not used
2	RX	Input	Reception of data
3	TX	Output	Transfer of data
4	IN1	Input	Do not use. Only for firmware update
5	Gnd	-	Ground
6			Not used
7	IN2	Input	Do not use. Only for firmware update
8 &9			Not used

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 M3 to a PC, the PC will detect and install automatically the M3 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 M1/M3 has been correctly installed:



3.3.11. The 24VDC connector

It is advised to use this power supply when the M3 is panel mounted.

Using this power supply instead of the mini-USB will deactivate the ON-OFF switch. Therefore, when the M3 is powered, it will start automatically.

3.3.12. The USB stick connector

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.

3.3.12. The footswitch connector

This connector is used to connect the Metro footswitch ref 18020.
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.

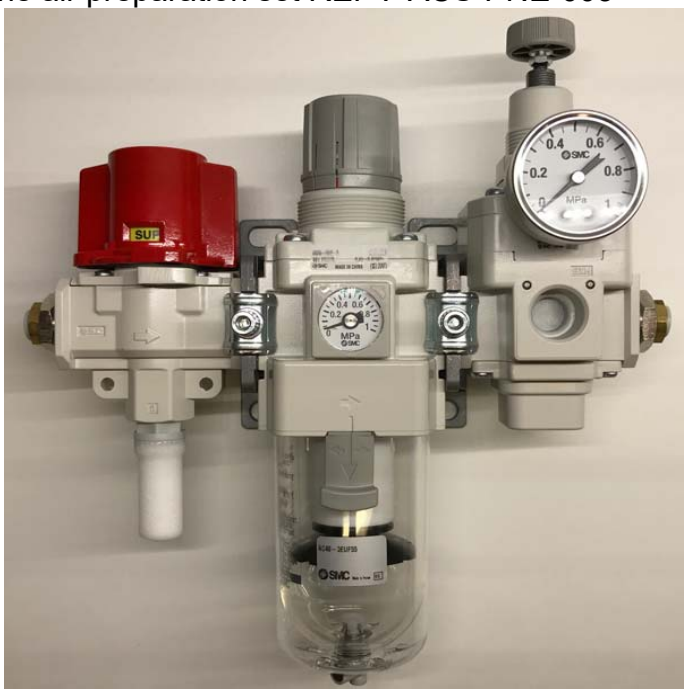
- Transfert the measurement
- Preset
- Start a dynamic measurement
- Zero
- Change the displayed part reference
- Hold (freezes the display) In this case, the button “CLEAR” in the measuring screen becomes yellow: 

4. AIR PREPARATION UNIT – AIR PIPES

4.1. Air preparation unit

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

Metro can supply the air preparation set REF : ACS-PNE-003



The air supply set delivered from Metro for the M1/M3 display consist of:

- 1 push in connector for 8mm ext. tubes
- 1 shut off valve
- 1 regulator adjusted at 3 BAR (0.3 MPa) with a 5µm filter
- 1 precision regulator adjusted at 3 BAR (0.3MPa)
- 1 push in connector for 8mm ext. tubes

4.2. Air pipes

The M1/M3 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 recommend 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 to use flexible pipes that prevent risk of fall or tilt over of the display due to the orientation of the pipes. See the following picture.


Air gage 2
6mm tube
Y connection for 8 to 6mm tube
Air gage 1
6mm tube
8mm tube
3 BAR (0.3Mpa)
5BAR (0.5Mpa)
8mm tube

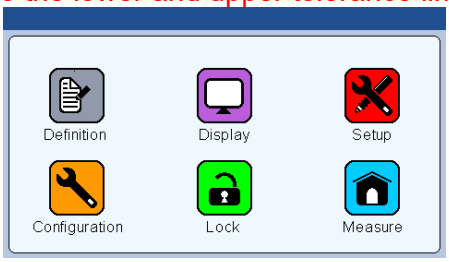
5. QUICK START

1 – Connect the air input to the air preparation unit ref Metro ACS-PNE-003. 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 gage 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 min master in the case of external diameter measurement, and to use the MAX master in the case of internal diameter measurement. 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.

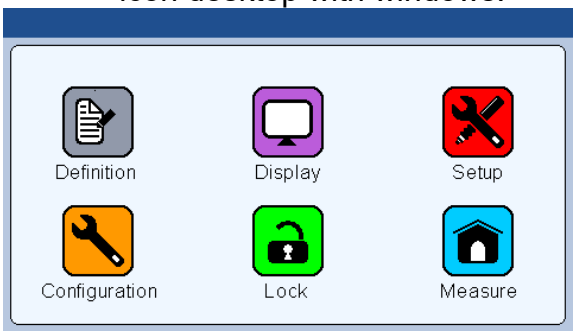
6. GRAPHICAL INTERFACE

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

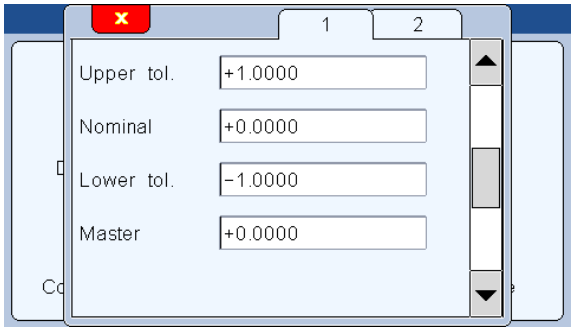
6.1. 2 MAIN PARTS

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



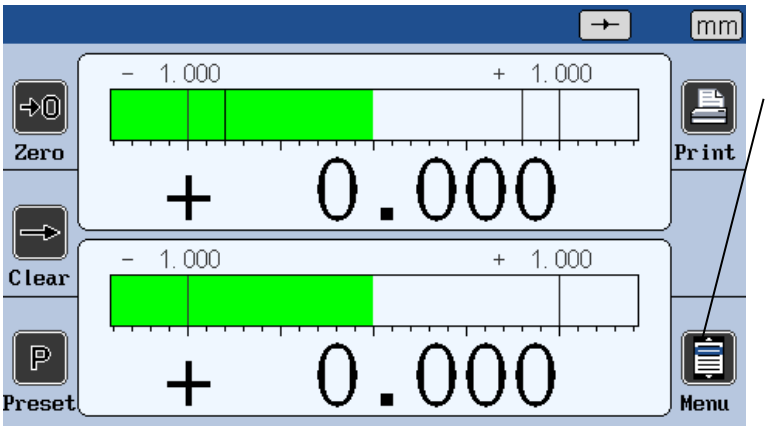
Icon desktop with configuration windows

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

button

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 

button

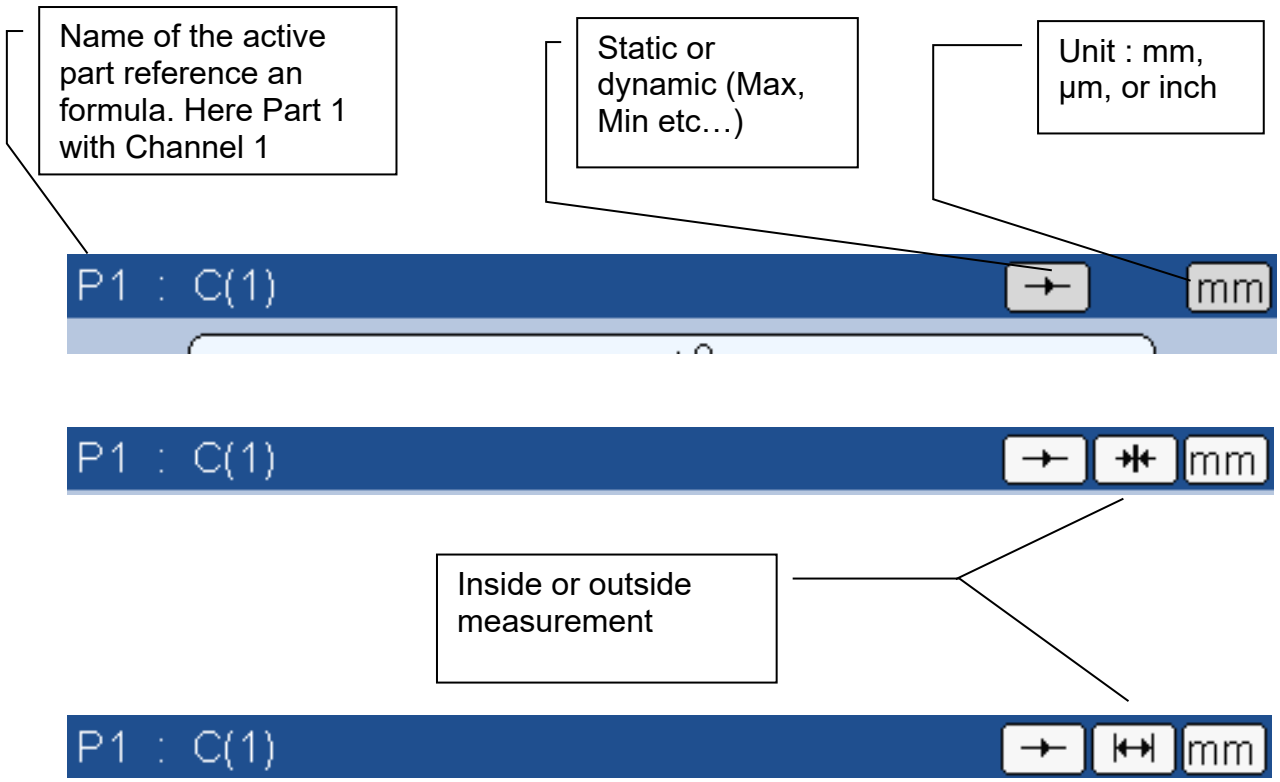


Press on this icon to reach the main icon desktop for configuring your device

Example of measuring screen

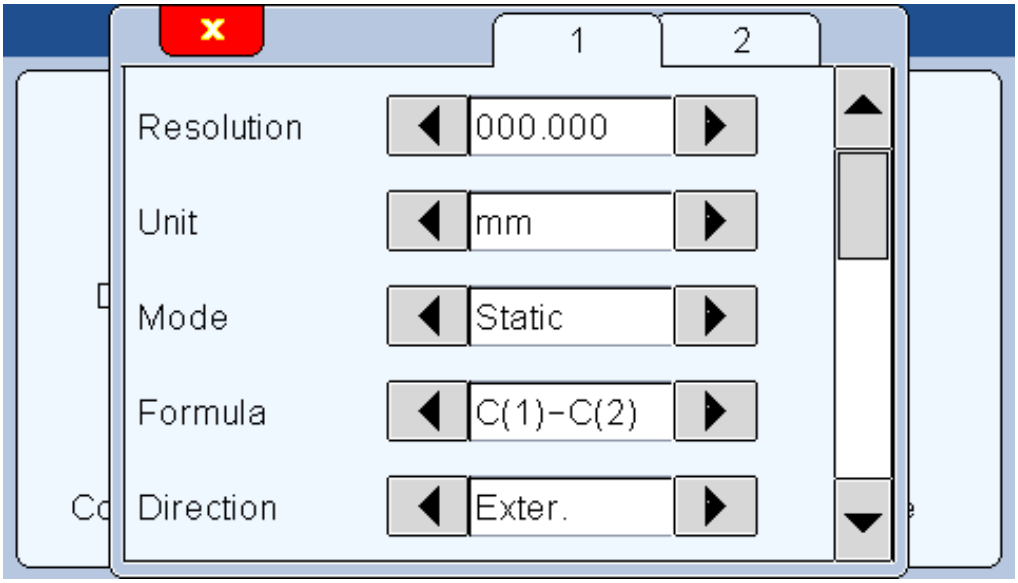
6.2. GENERALITIES

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



6.3. CONFIGURATION WINDOWS

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

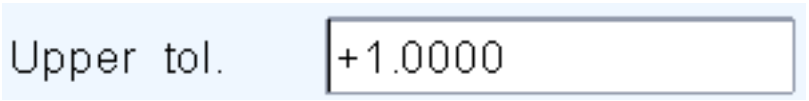


Example of configuration windows

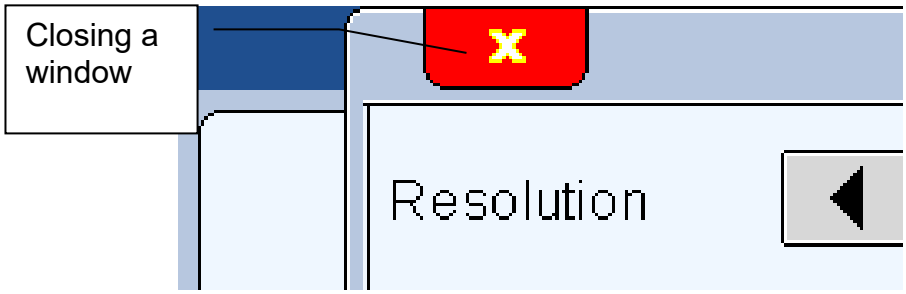
Data are typed by different ways and **are saved after validating while quitting the window**.
Here after are the different ways to input data:

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

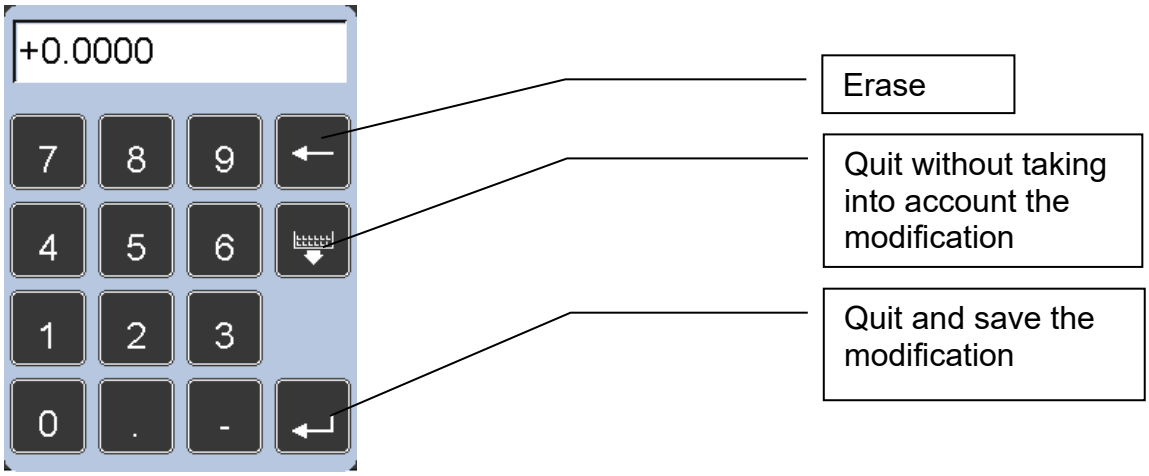
- Edit box. A virtual keyboard appears after clicking on the edit box.



- 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.



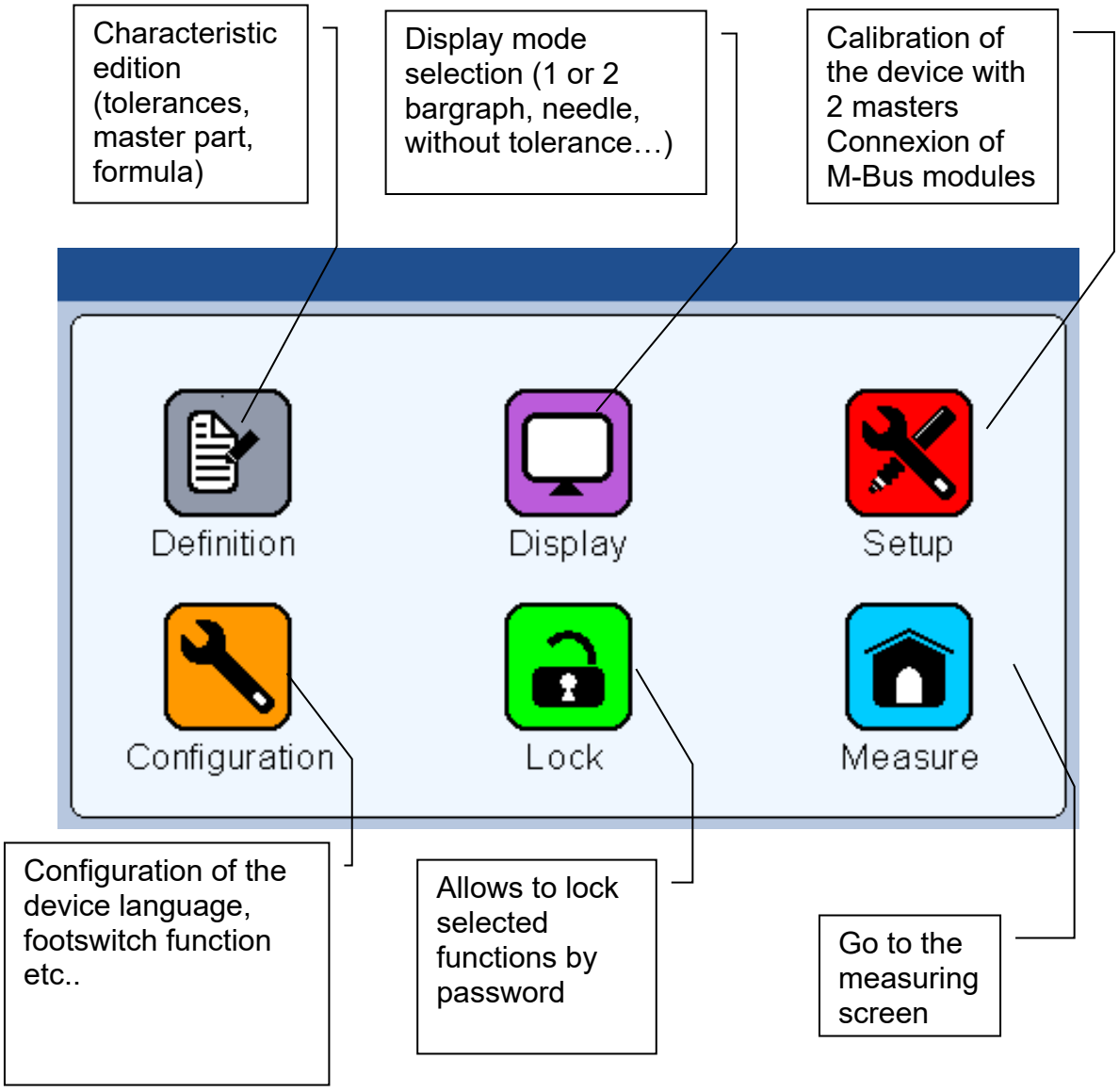
6.4. VIRTUAL KEYBOARD



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.

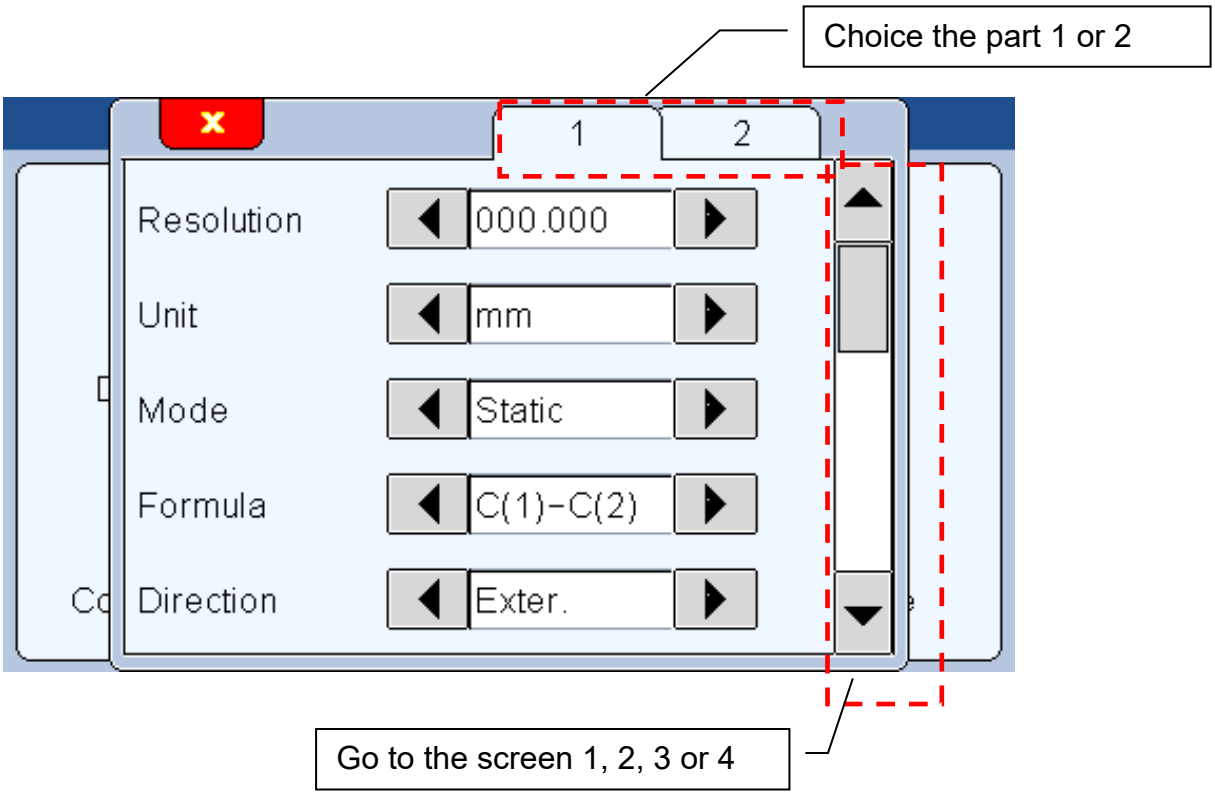


The 6 following sections describe the 6 icons of this screen.

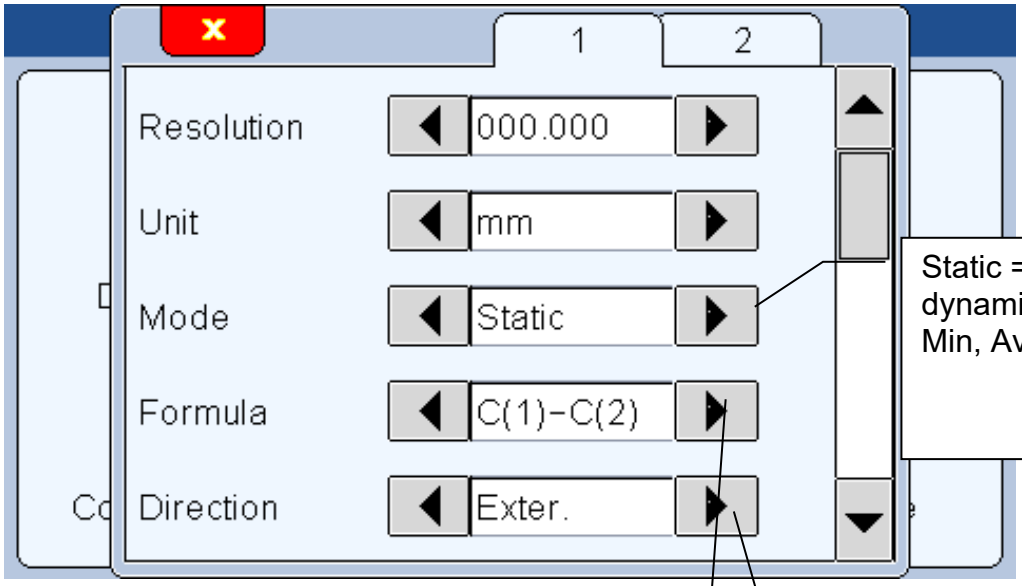
7.1. DEFINITION

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



Static = direct reading or dynamic : Max, Min, Max-Min, Average or Median

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

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

Resolution

000.000 = micron
00.0000 = 0.1 micron

Unit

mm : millimeters
In : inches
Deg = decimal degrees (automatic choice when the formula is set as Taper)

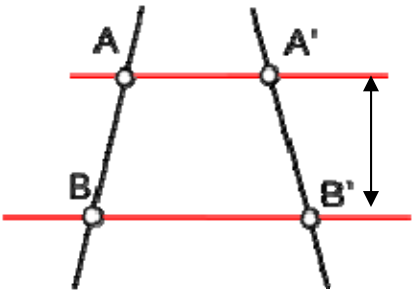
Mode

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)

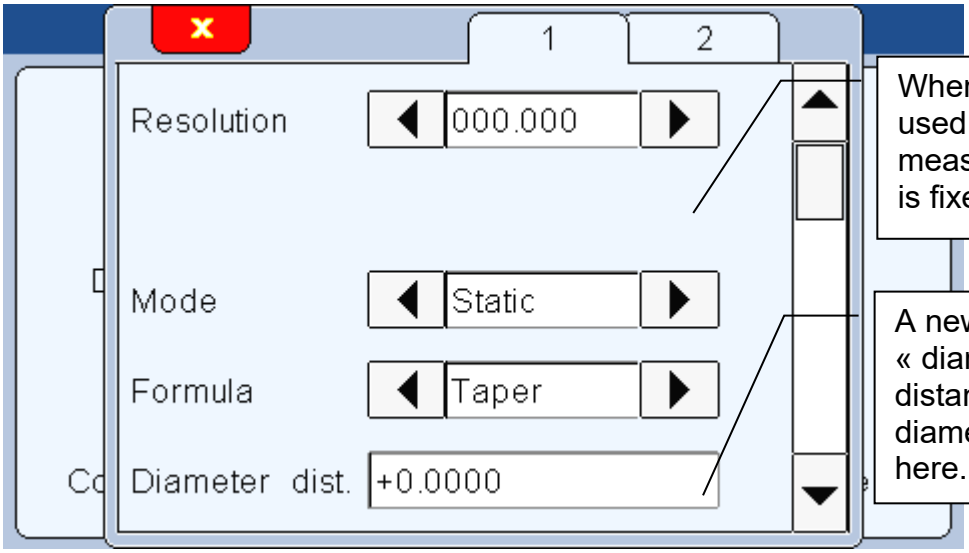
- Max
- Min
- Max-Min
- Average
- Median = (max+min)/2

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.



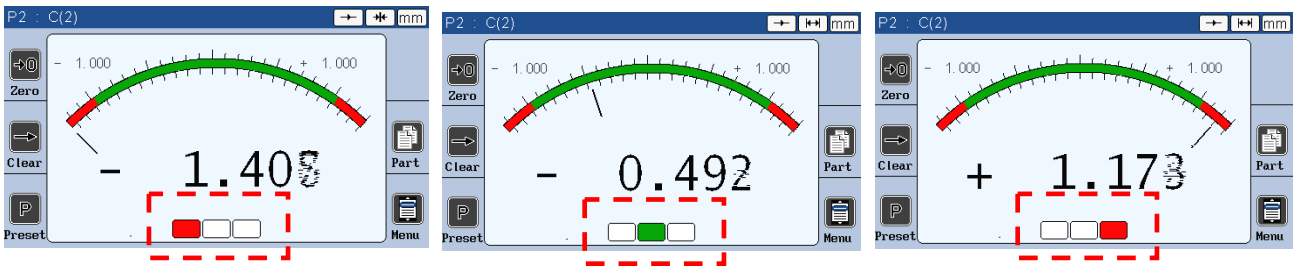
When the “taper mode” is used, the choice of the unit of measurement disappears, and is fixed to “degree”

A new choice appears: « diameter distance ». The distance between the 2 diameters must be written here.

Direction

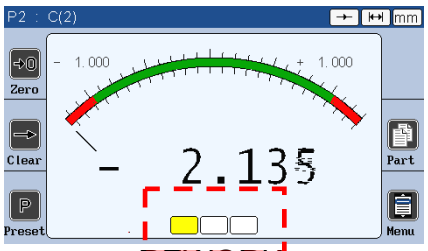
Direction: none

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

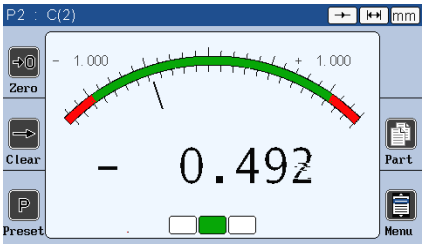


Direction: Internal diameter

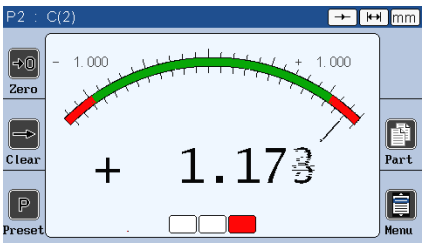
The direction of measurement is used to measure internal or external diameters. The difference between these two modes is that according to the part, the part might still be rework. For example, the size of a bore in a part: if the bore is too big, there is no way to rework the part, so the indicator 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)



REWORK



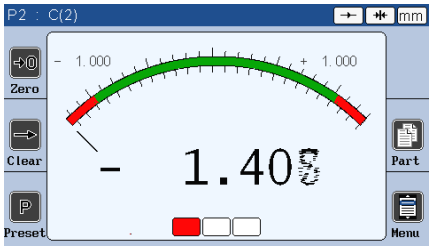
PASS



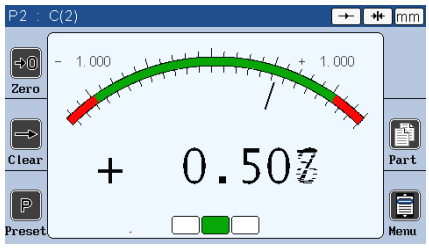
REJECT

Direction: External diameter

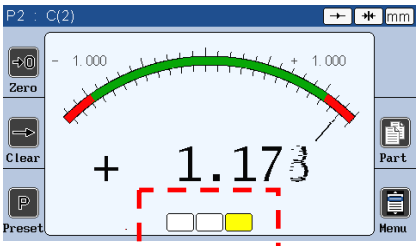
The opposite phenomena happens for the external diameter.



REJECT



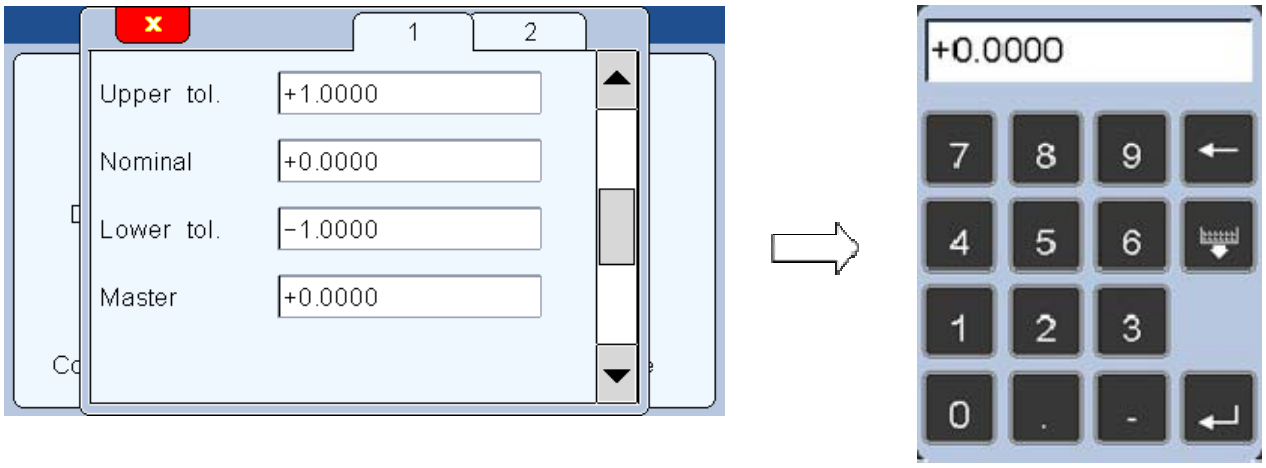
PASS



REWORK

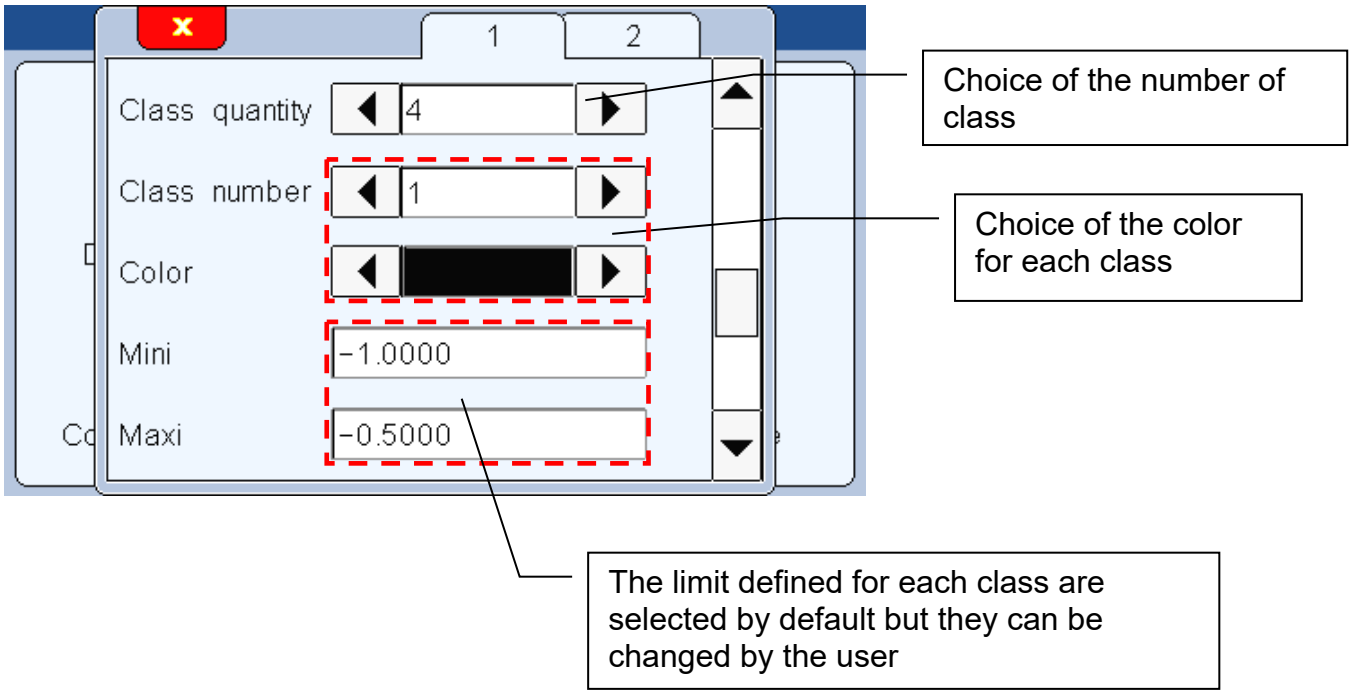
7.1.2. Part 2

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.

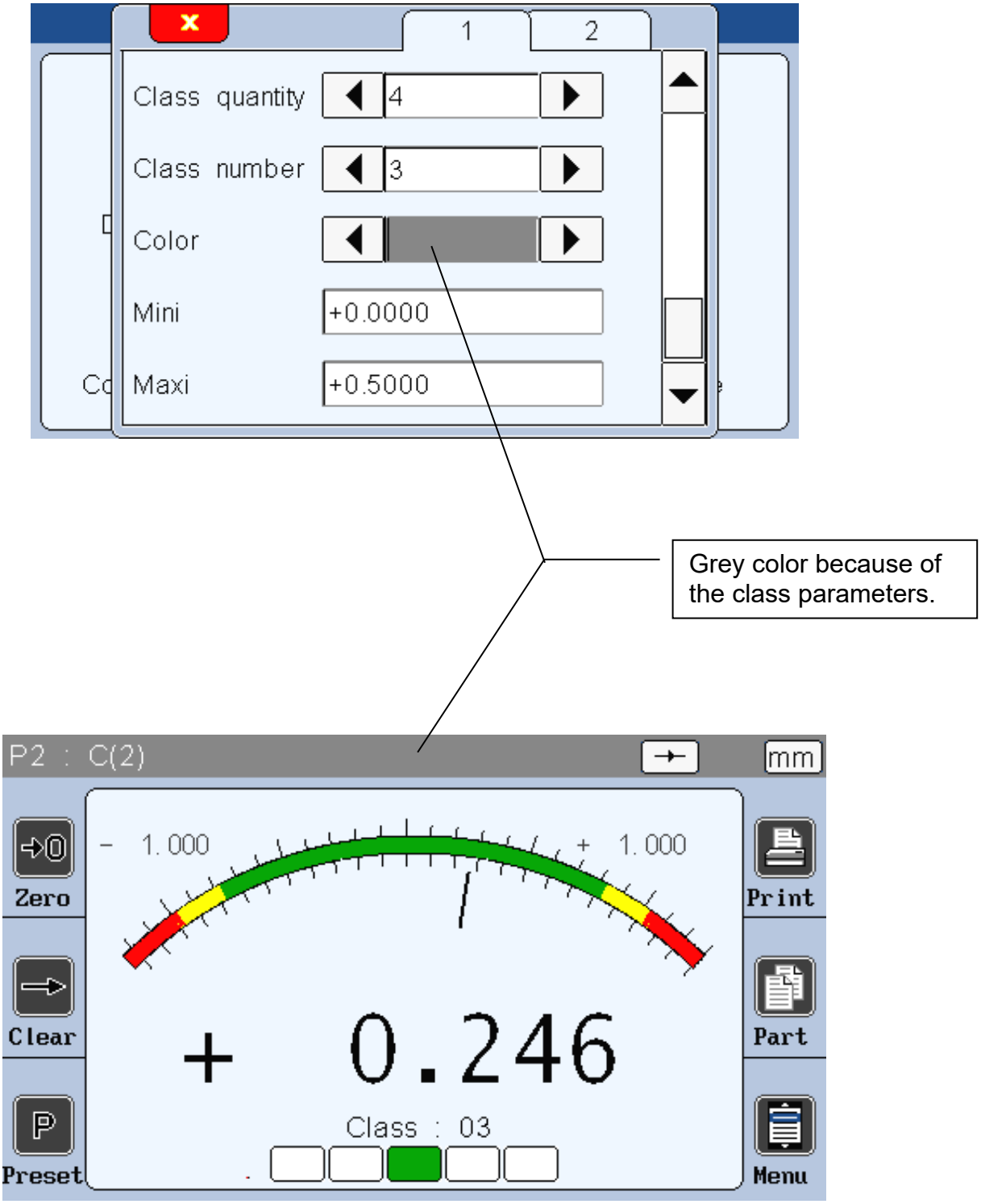


7.1.3. Part 3 - class

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

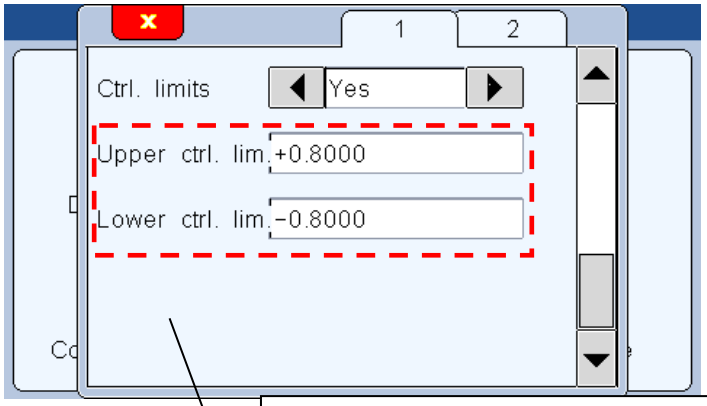


The class has an important utility, because it allows the user to sort the parts according to their position in the tolerance interval. The top bar of the display, which is normally blue is grey on the picture bellow, because grey is the color which was defined for this interval of measurement.


1
2
Class quantity
4
Class number
3
Color
Mini
+0.0000
Maxi
+0.5000
Grey color because of the class parameters.
P2 : C(2)
mm
- 1.000
+ 1.000
Zero
Print
Clear
Part
+ 0.246
Class : 03
Preset
Menu

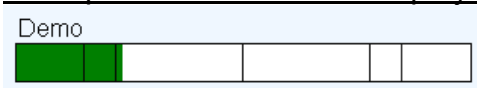
7.1.4. Part 3 control limit

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)

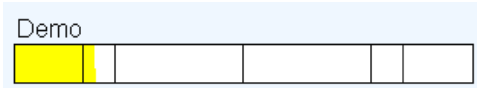


This part is hidden if « no » has been selected

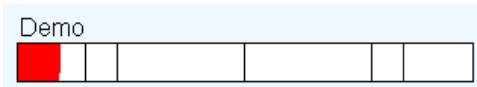
Example of characteristic displayed with control limits



Part OK



Part OK with warning

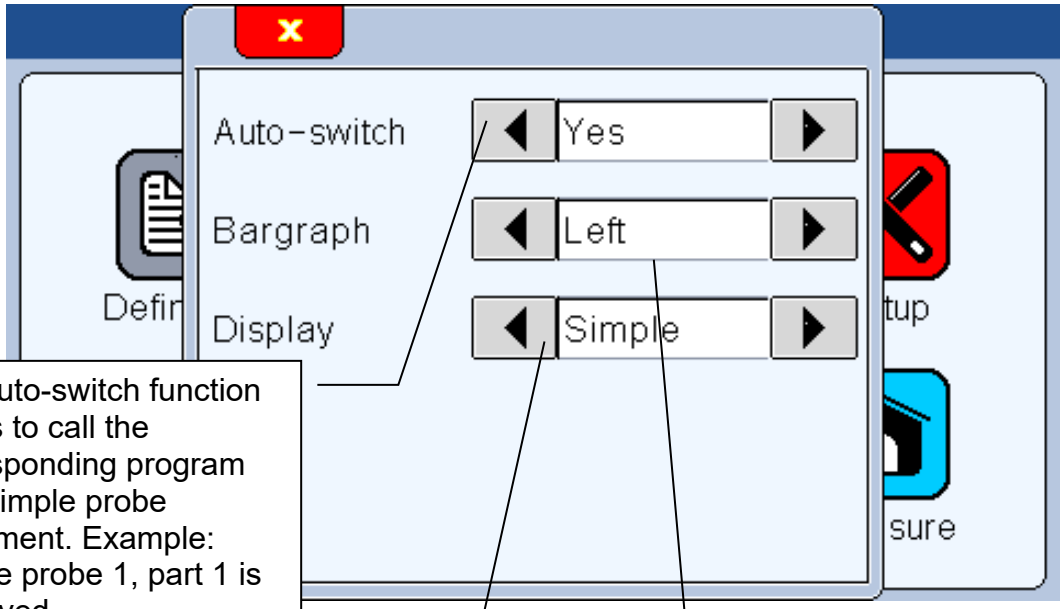


Part Not OK

7.2. DISPLAY

After clicking on this button, the below window appears.

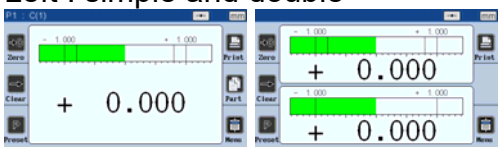
This window allows to define if 1 or 2 measure are displayed on the screen and on which format. (Needle = galva, horiziontal bargraph or value only)



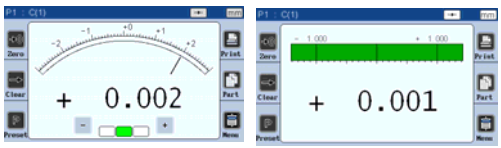
The auto-switch function allows to call the corresponding program by a simple probe movement. Example:
- Move probe 1, part 1 is displayed.
- Move probe 2, part 2 is displayed.

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

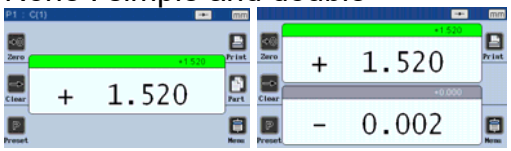
Left : simple and double

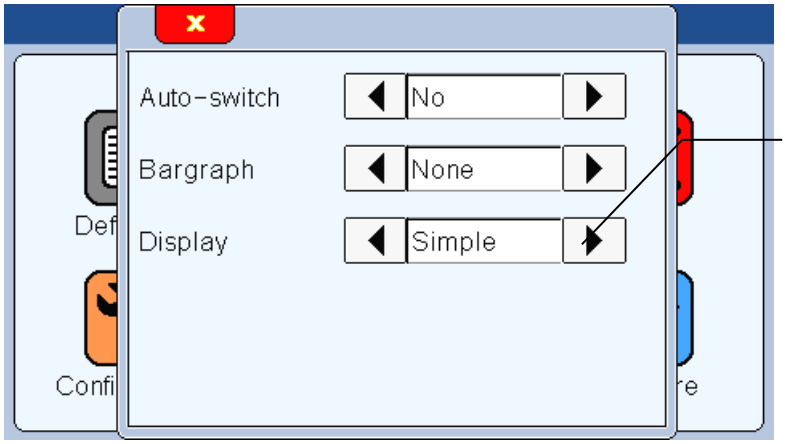


Galva : cursor :

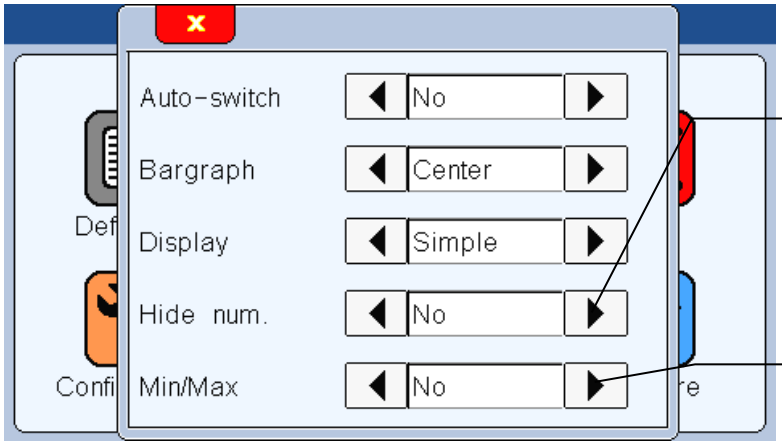


None : simple and double



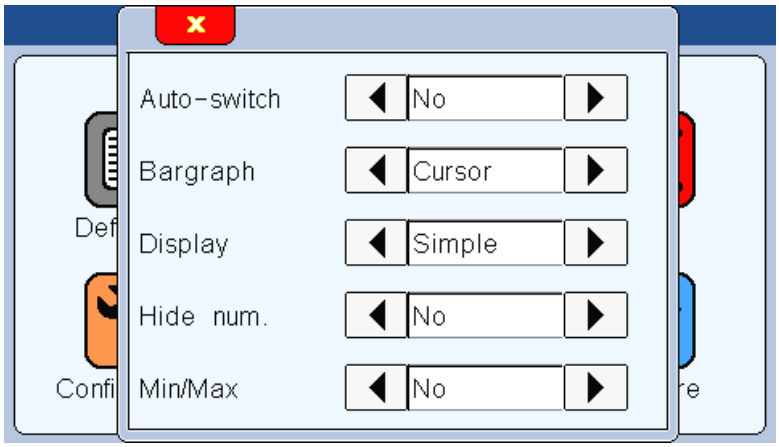


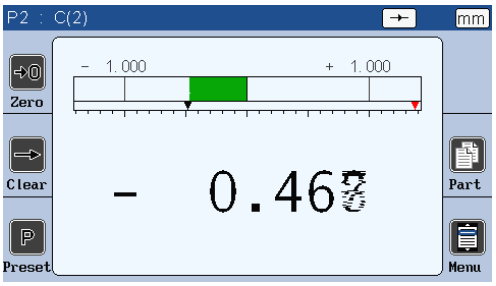
Allows to display 2 probe on the measuring screen (except in GALVA mode)

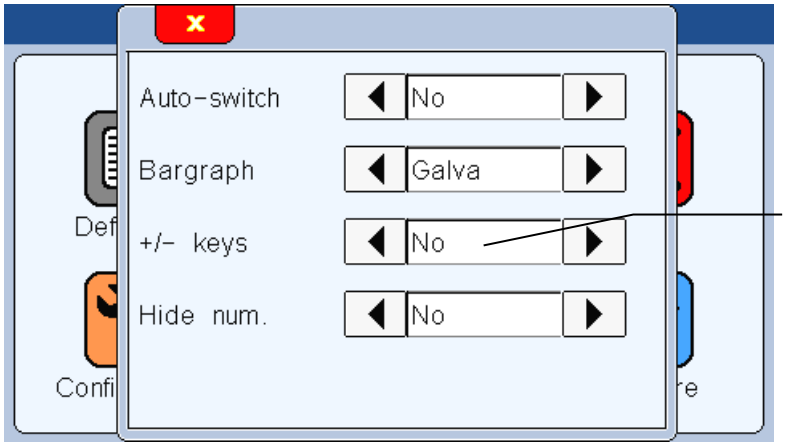


Allows to remove the value of the measurement on the measuring screen, only the bargraph appears.

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



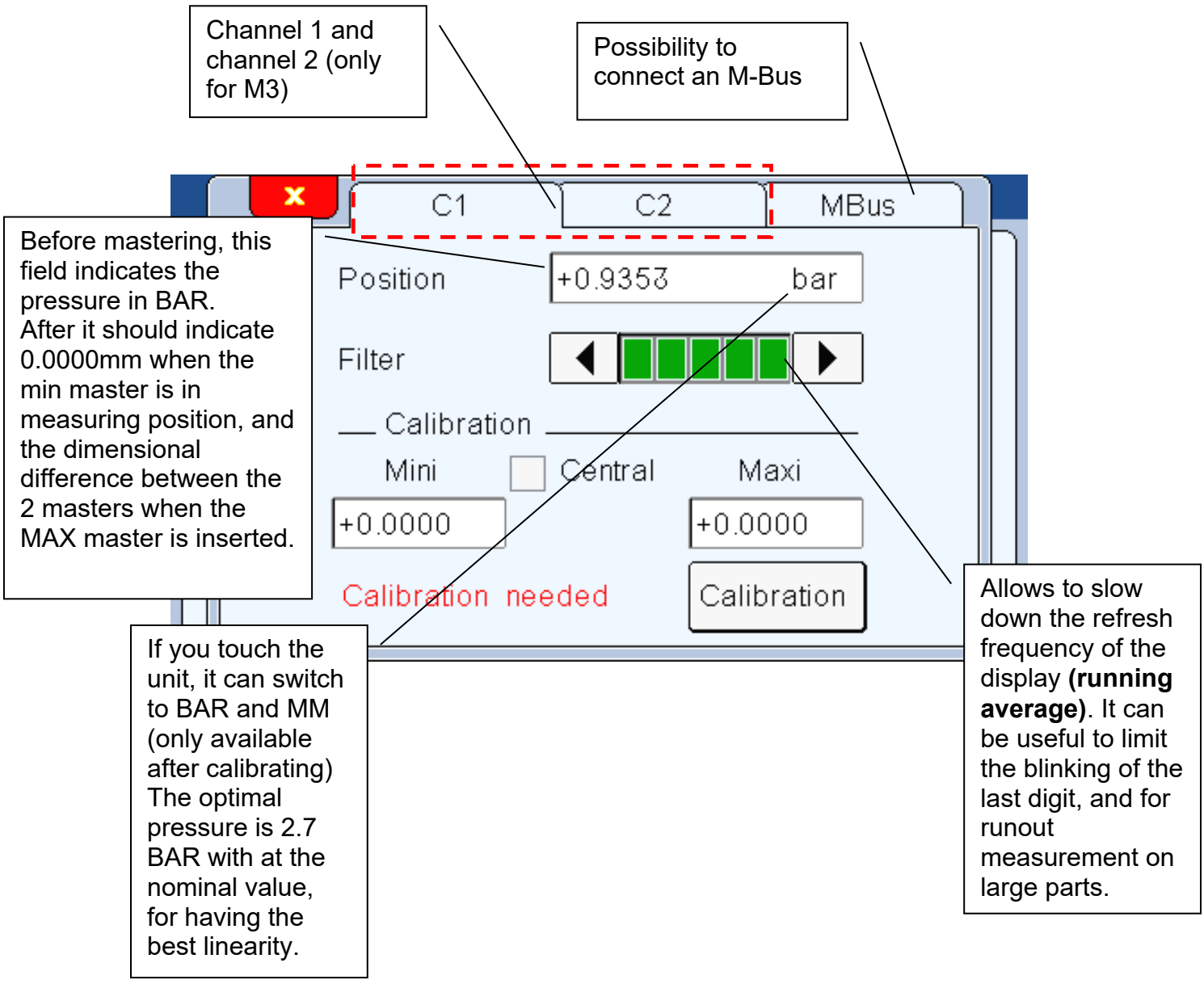




Allows to move the needle like with the screw on an old analogue display.

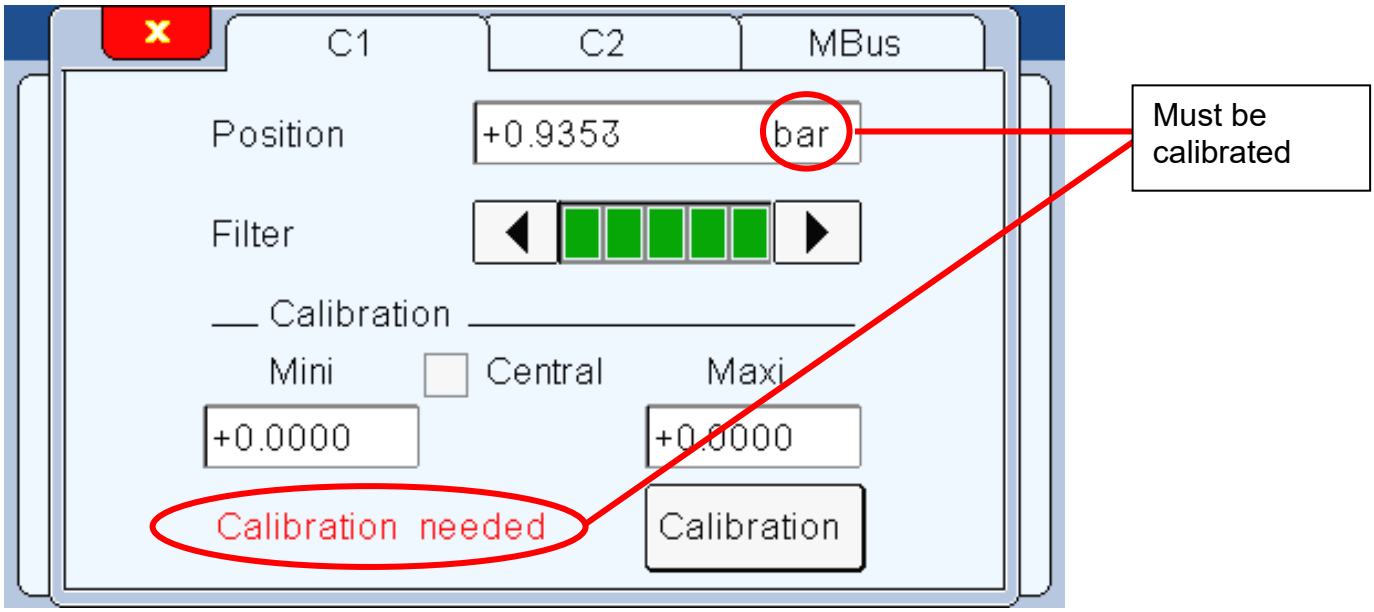
7.3. SETUP

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 maters).

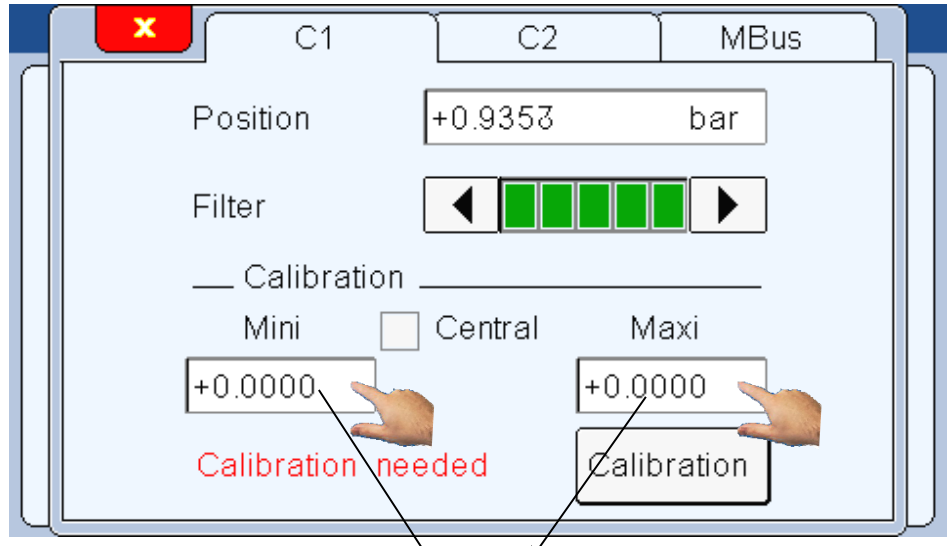


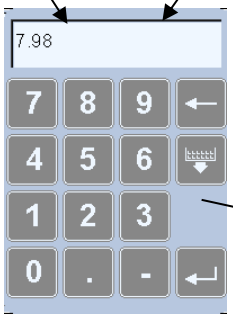
7.3.1. Calibration of the air gage

7.3.1.1. Calibration in 2 points



The air gage 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.

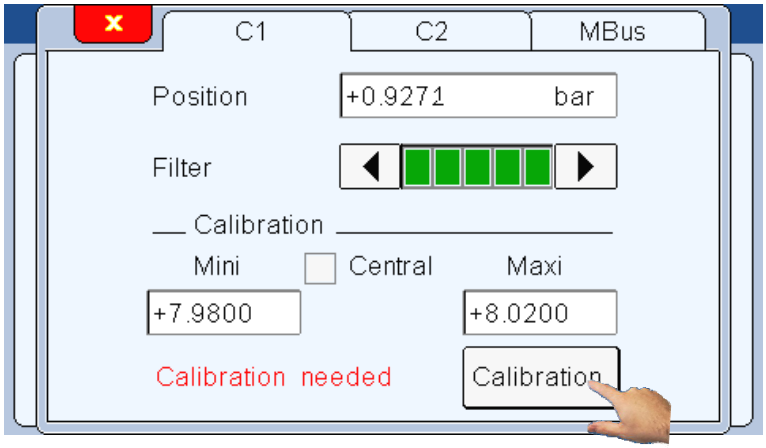


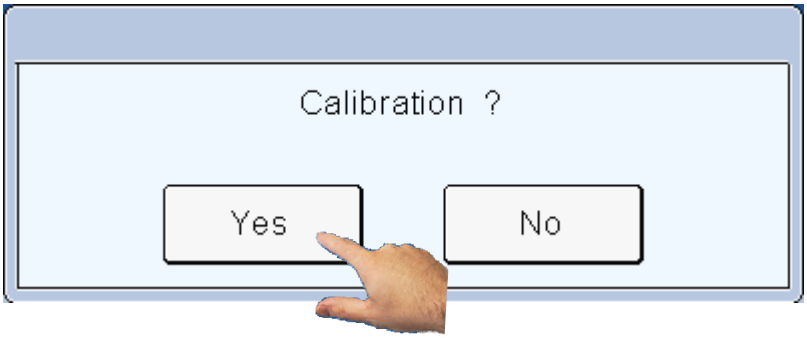


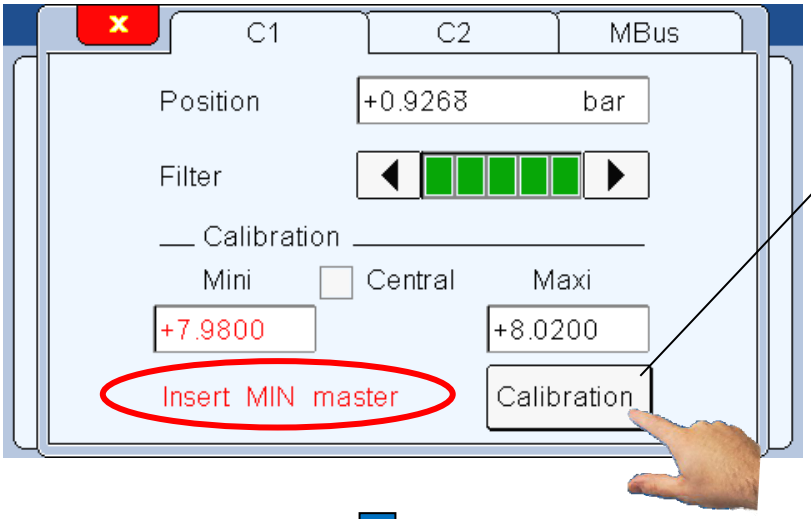
7.98

8.02

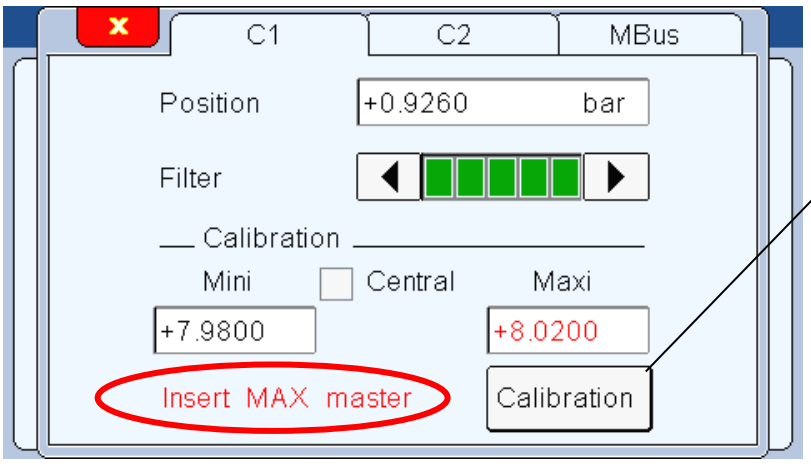
Write here the 2 calibration values which will be used.



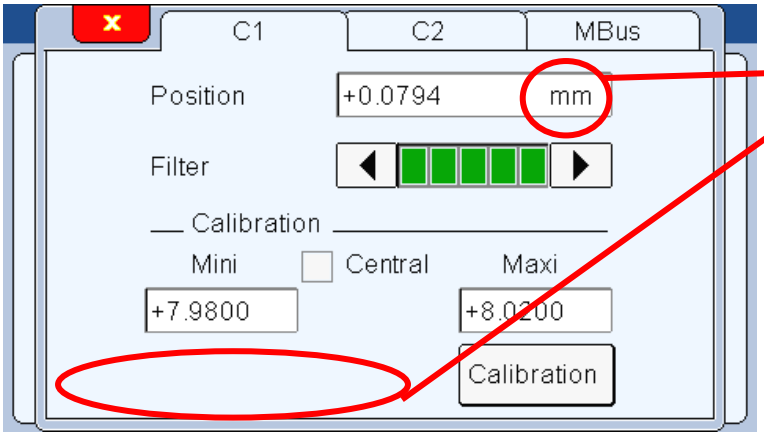




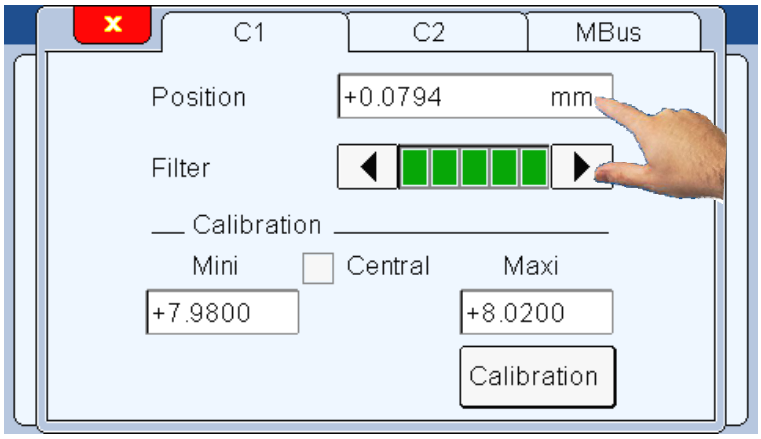
After placing the min master, push « calibration »



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



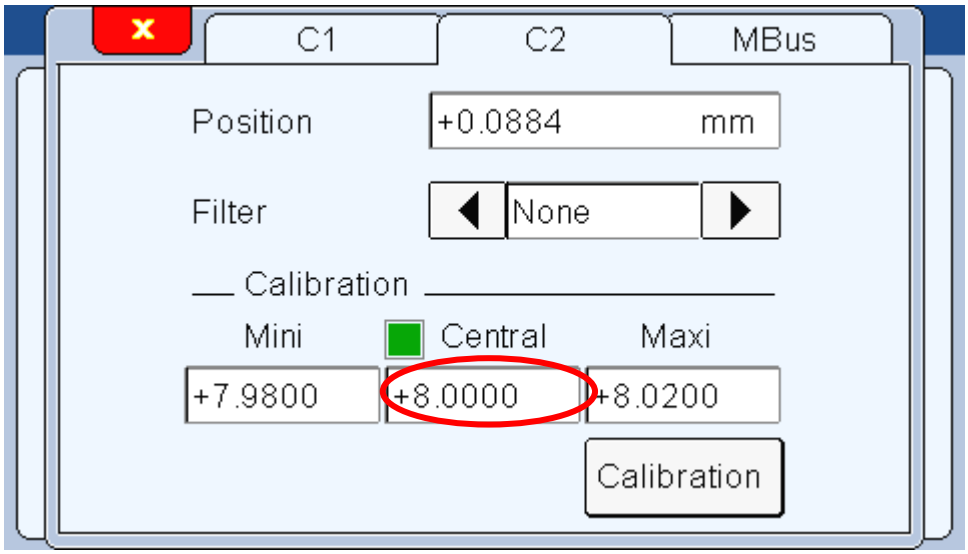
The probe is now calibrated



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 interesting when controlling a part with large tolerances.

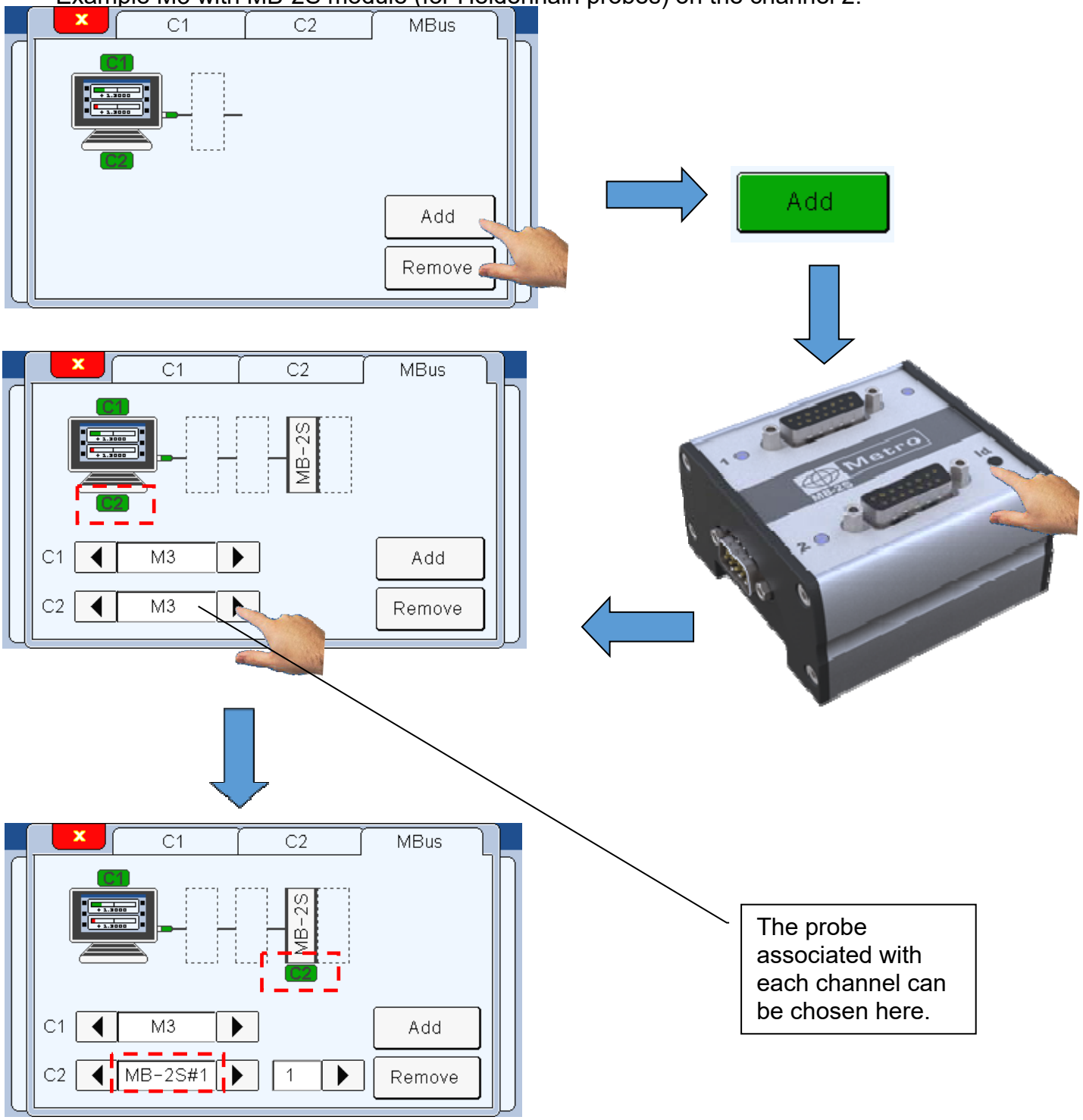


7.3.2. M-Bus modules

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.



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, chapter 5.3 to 5.3.6 for air gage.

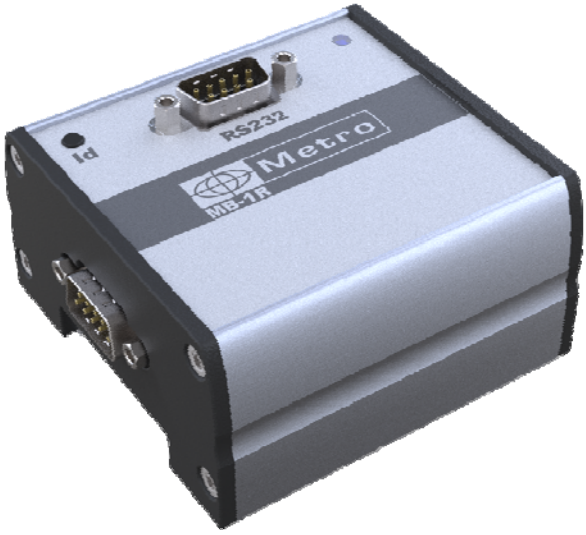
MB-2S module,
Heidenhain

MB-2T module,
TTL

MB-AG Module
Air Gage

MB-8I Module
Inductif

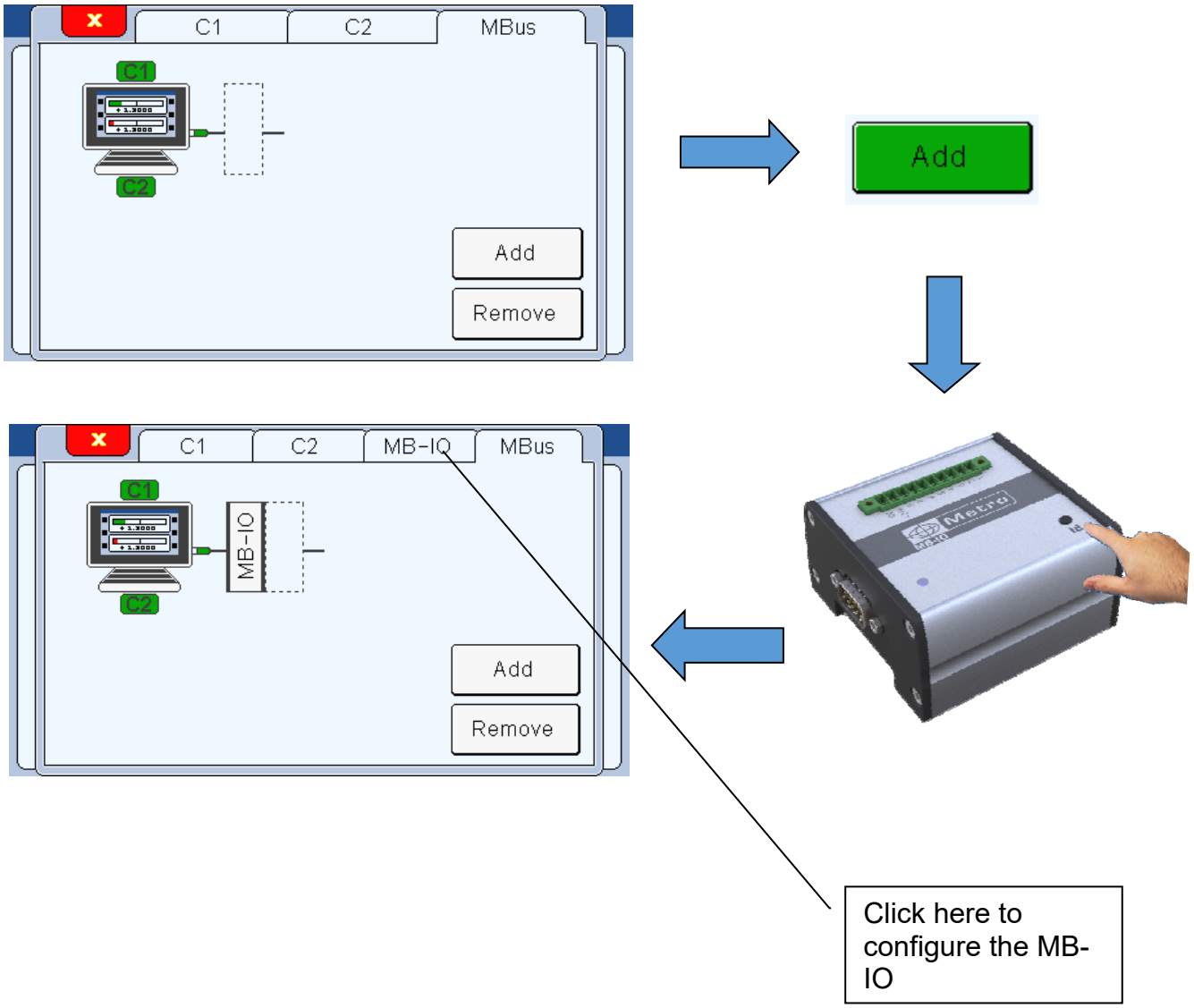
MB-4D Module
For Digimatic
insturments



MB-1R Module
RS232

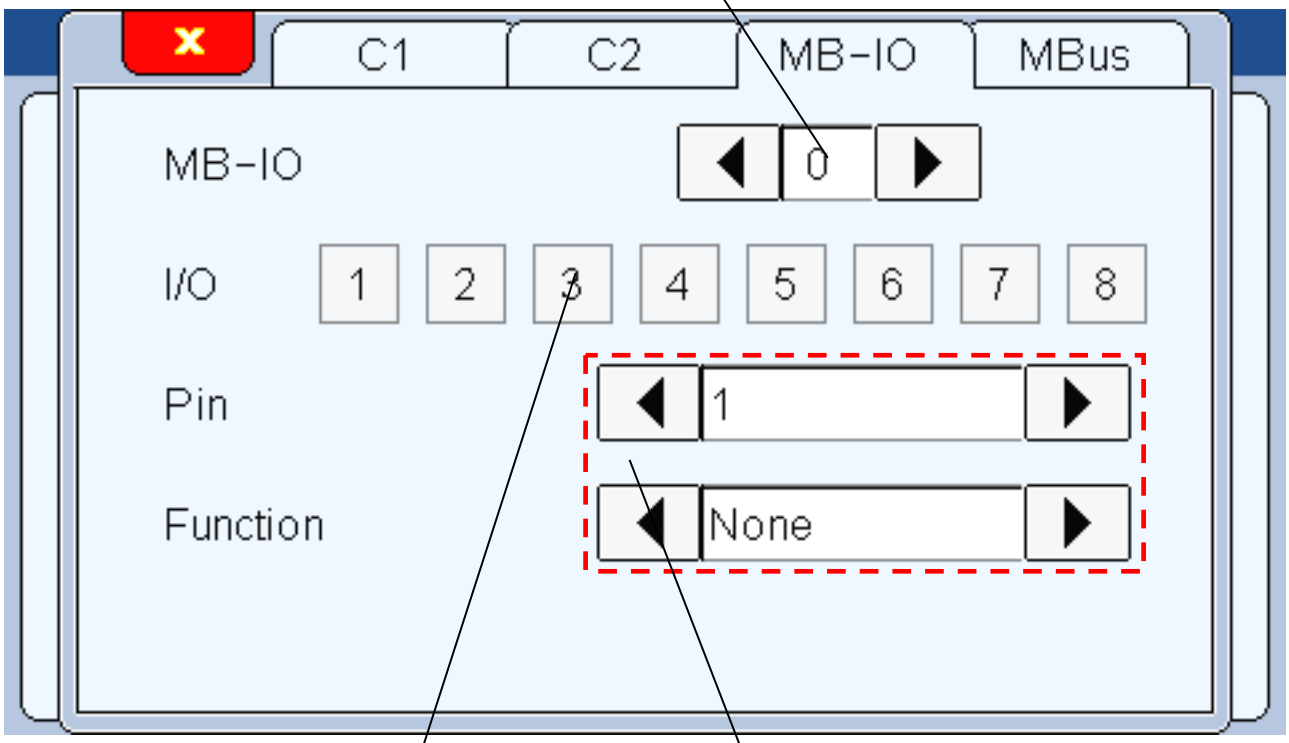
Input/output modules

The connection of an input/output module is made with the same way than a multiplexer.
Up to 4 MB-IO can be connected.
Example: connection of a MB-IO module on the M3.



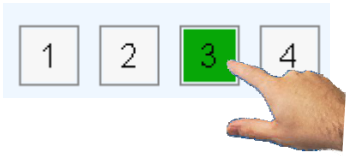
The different options for the MB-IO configuration are displayed bellow.

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.



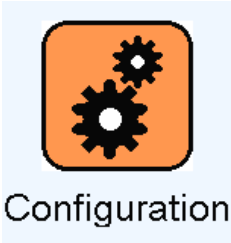
The function of each port of the MB-IO can be set with this 2 menus. The first one is for the number of the Pin, the second one defines the associated function

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

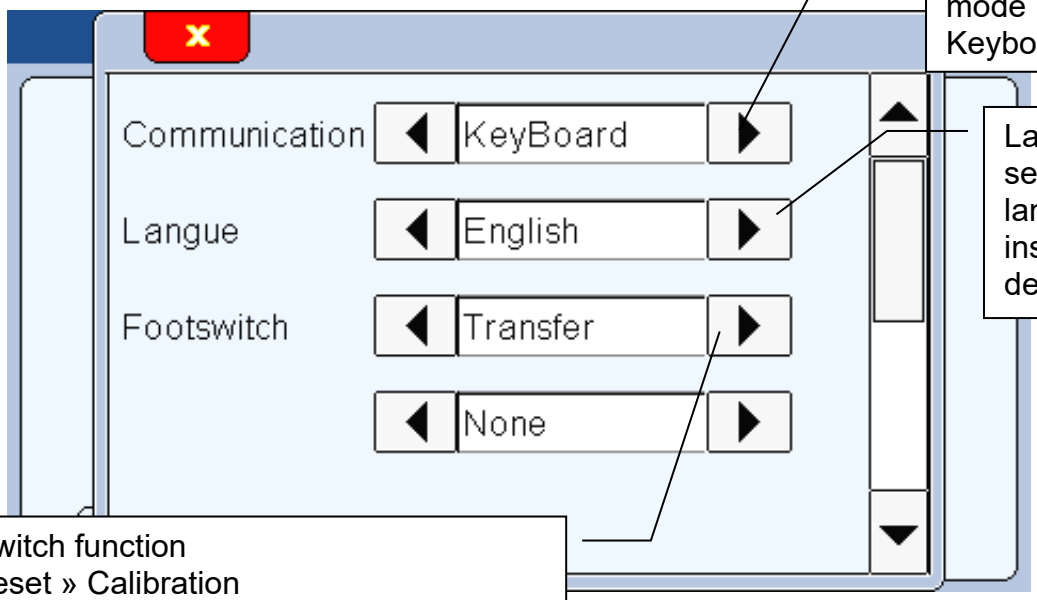
- Transfer : (Input) Transfer the measure to the computer (need a USB or RS232 link)
- Preset : (Input) set the current measured value to the master value
- Zero : (Input) set the current measured value to 0 (relative mode)

- 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

7.4. CONFIGURATION



After clicking on this button, the below window appears.
This window allows configuring the general settings of your M3



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

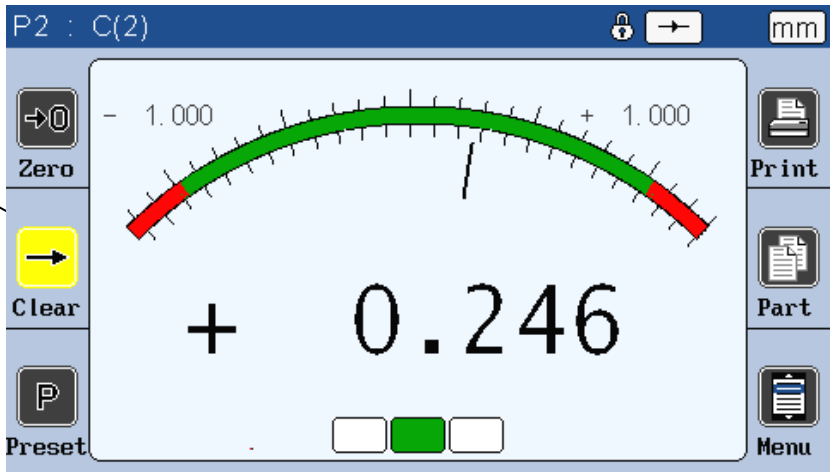
When 2 functions are programed, a pressure on the pedal makes them happen one after each other.

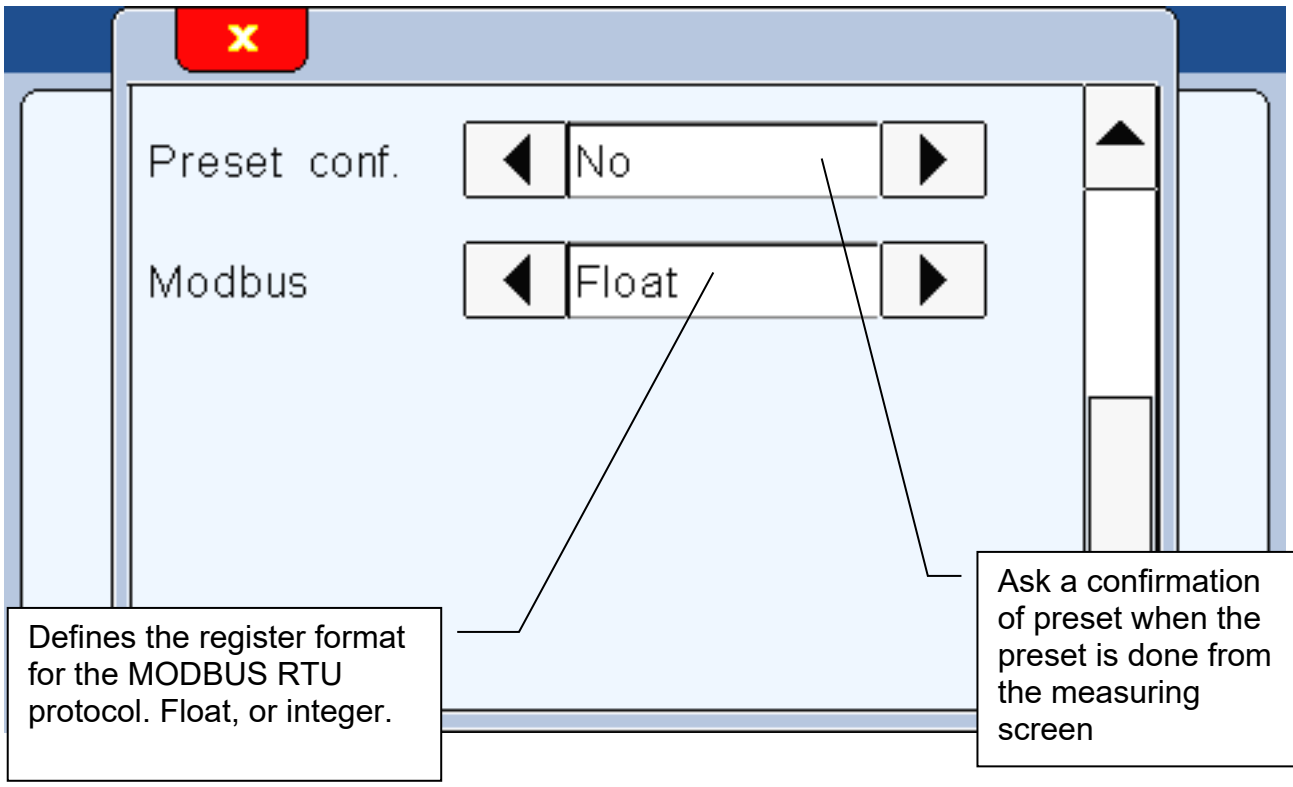
* If you select communication→keyboard, the M1/M3 will be detected as a keyboard when connected to a computer with an USB link, without installing a specific driver or software.

Then when you transfer the measure (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.

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

« clear » button, colored in yellow because of the « hold » function of the pedal



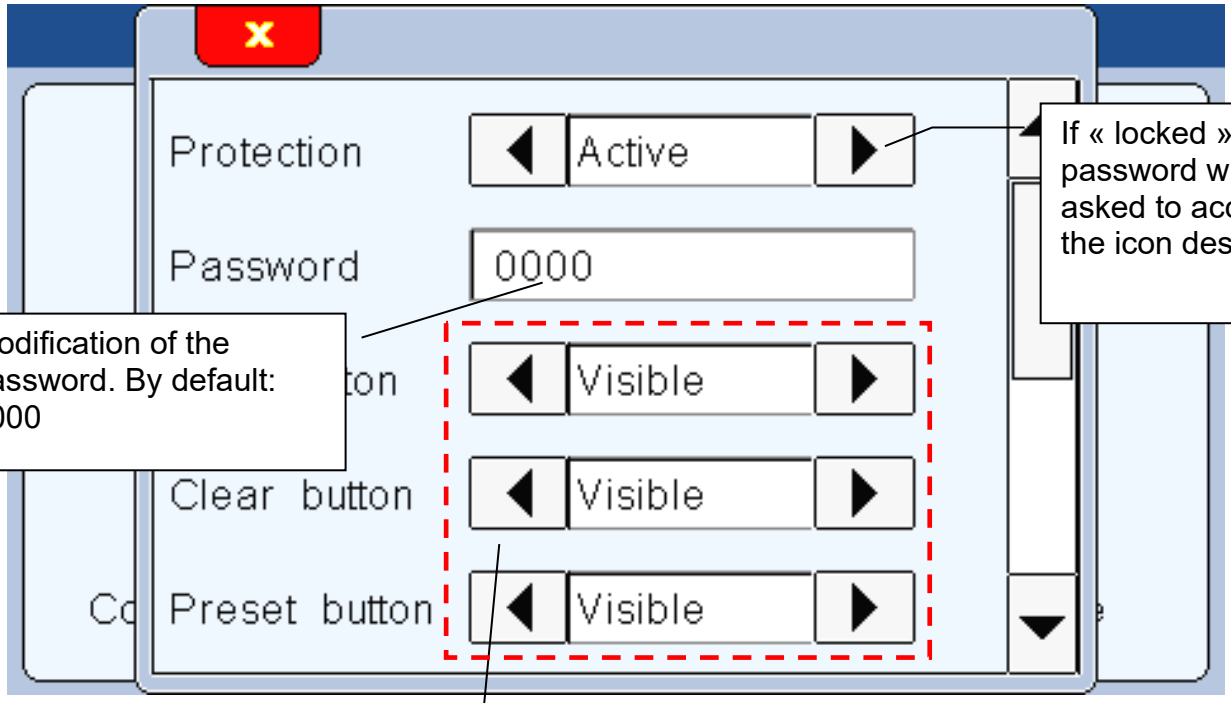


Defines the register format for the MODBUS RTU protocol. Float, or integer.

Ask a confirmation of preset when the preset is done from the measuring screen

7.5. LOCK

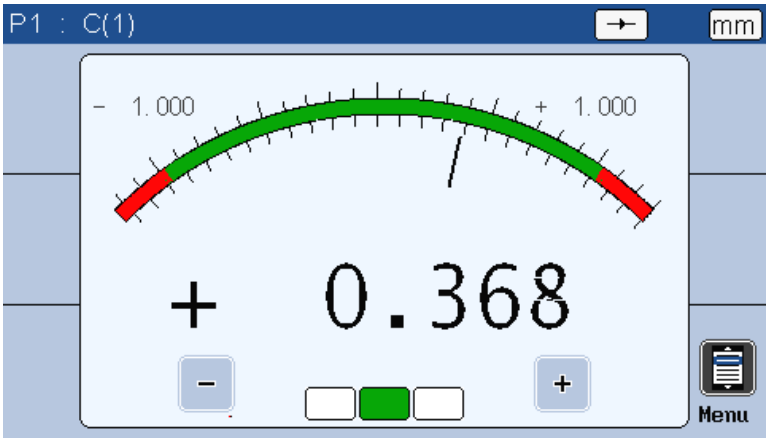
After clicking on this button, the below window appears.
This screen allows to lock by password some functions of the M3



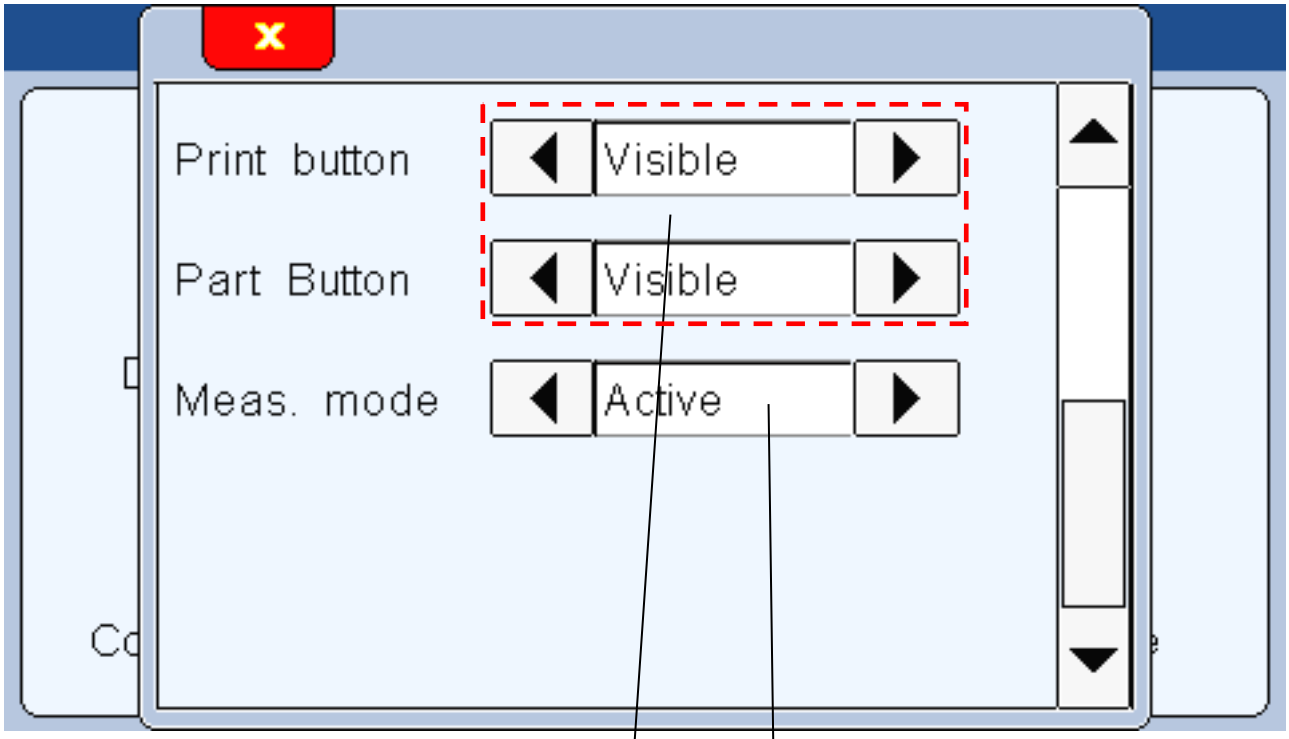
If « locked », a password will be asked to access to the icon desktop

Modification of the password. By default: 0000

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...)

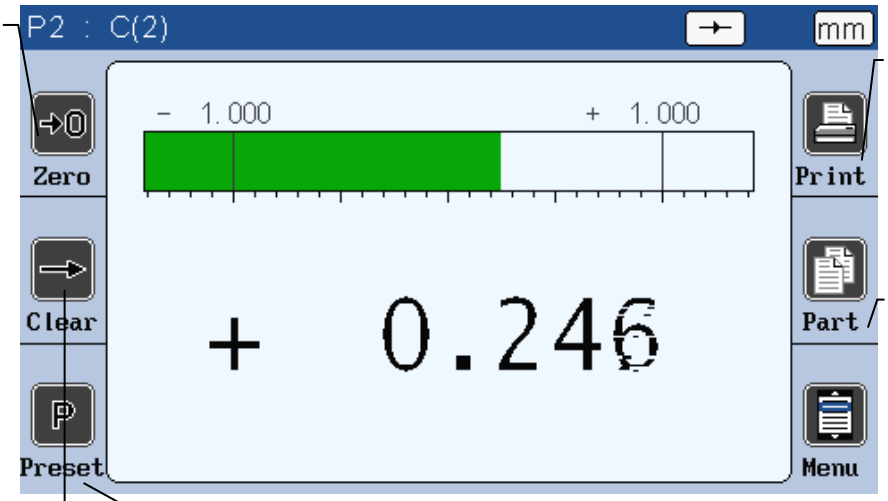
7.6. MEASURE

After clicking on this button, the measuring screen appears.
Please read the chapter 6 for the presentation of the measuring screen.

8. MEASURING SCREEN

The M3 starts on this screen.
The measuring screen allows seeing the characteristics of the part that has to be controlled. A needle/bargraph indicator allows seeing the characteristic in function of the tolerance of the part (see chap. 4.1 for tolerances modification).

8.1. LATERAL BUTTON FUNCTIONS



Absolute or relative mode (allows to make a « zéro » at a defined position. If the relative mode is selected, the button become red

To come back to the absolute mode, press on the « clear » button

Measurement transfert (RS232 or USB)

Change manually the active part (part 1 or part 2)

Go to the icon desktop

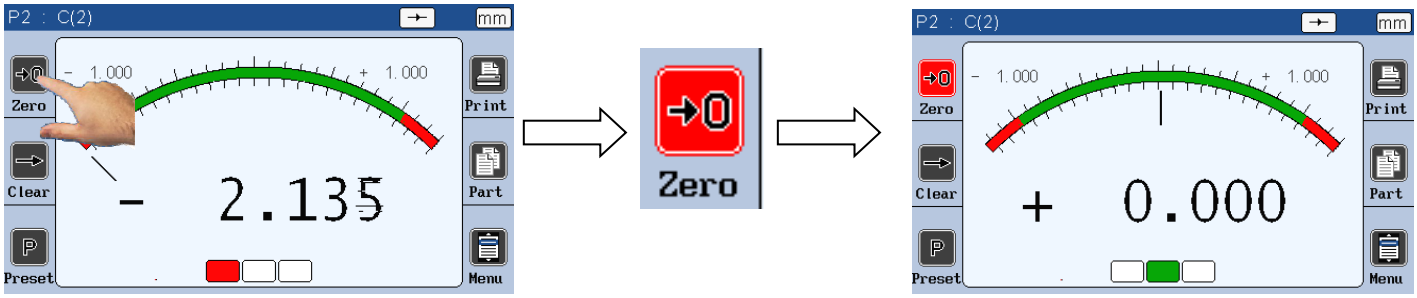
Calibration/Preset. After pressing this button, the displayed value will take the master value.

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)

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

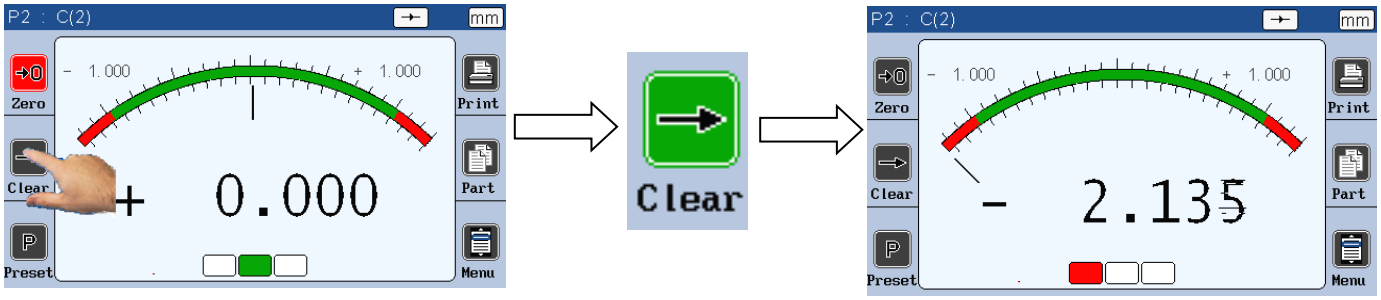
Zero : 

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



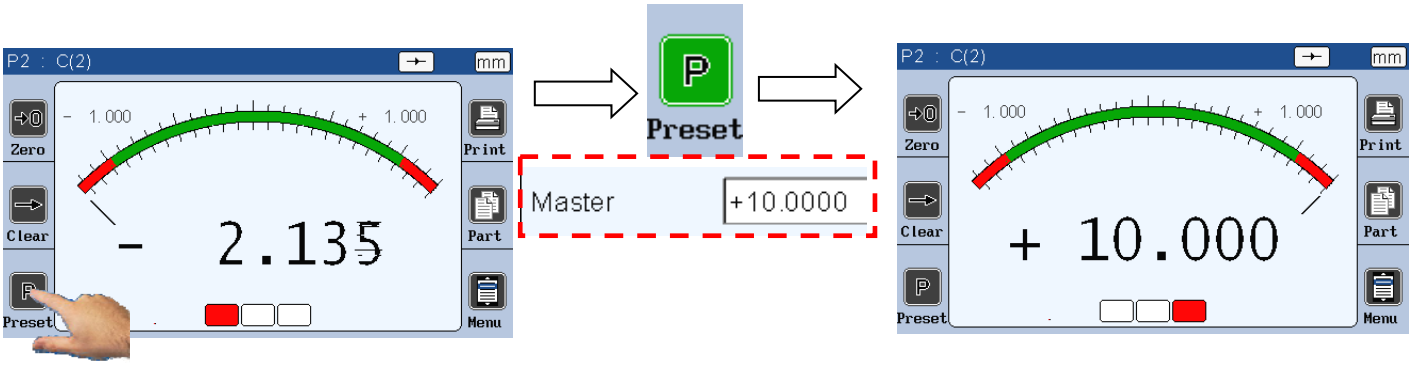
Clear : 

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



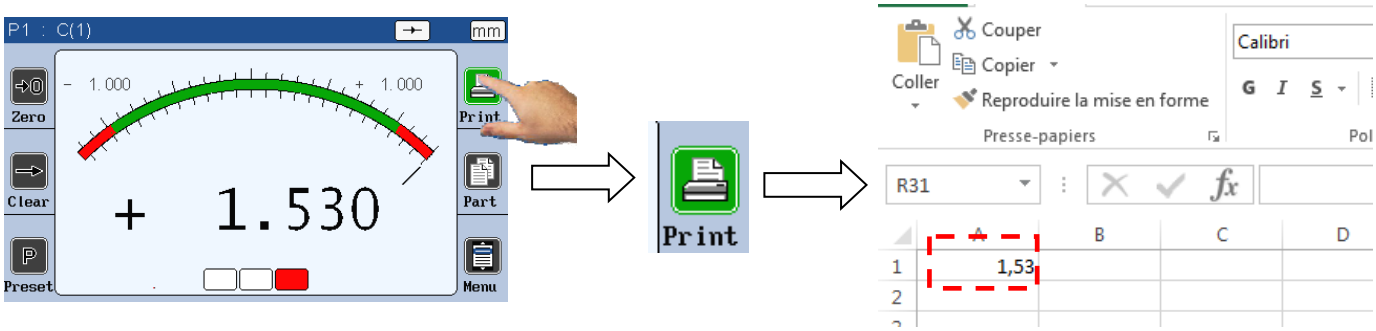
Preset : 

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



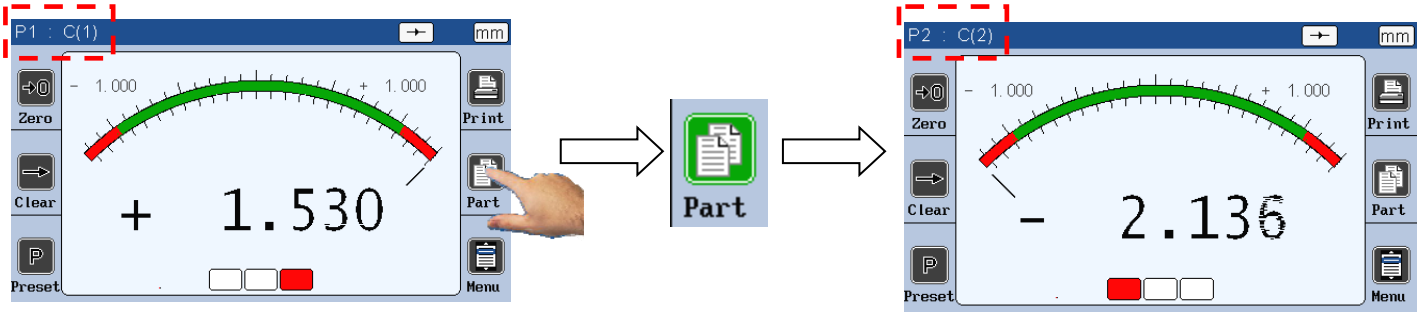
Print ; 

The print function allows to transfer the measured value to a computer.



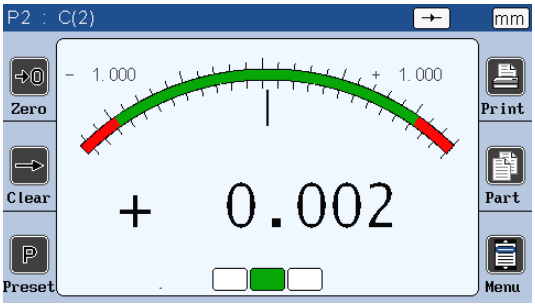
Part : 

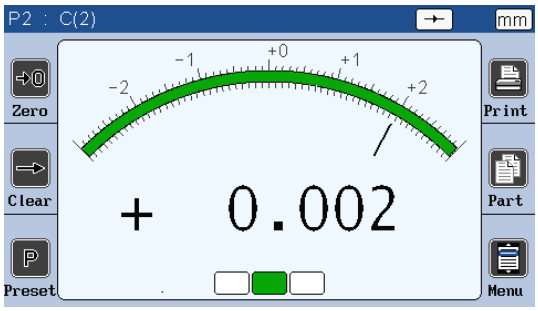
This function is used to change the displayed part



8.2. CHOICE OF THE NEEDLE INDICATOR STYLE

If the M3 is configured with the needle indicator (mode Galva, see chap. 7.2), it is possible to change manually the type of scale.



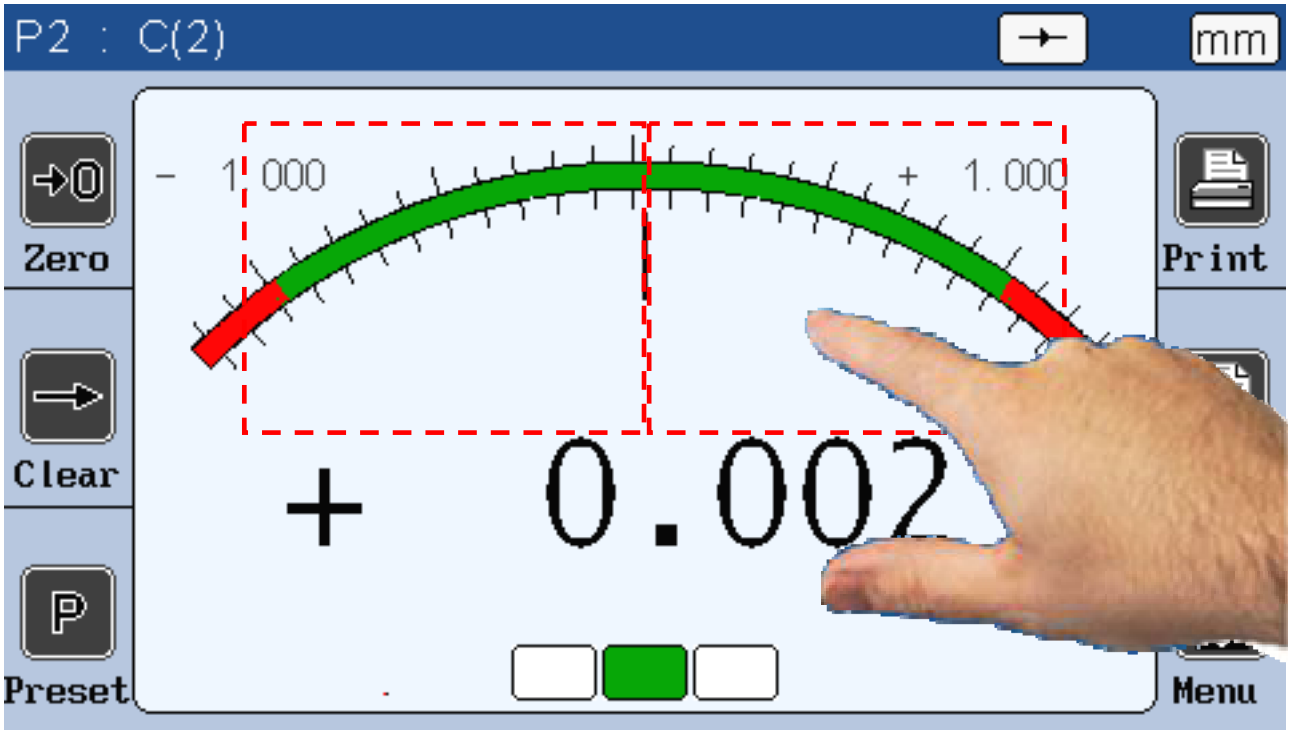


Automatic Manual

The automatic needle scale adapts automatically with the part tolerances.

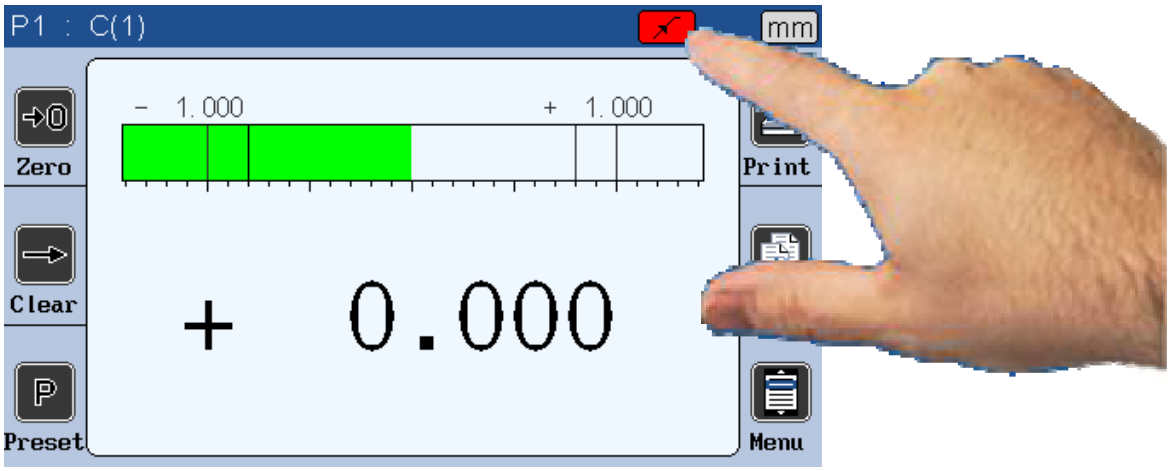
The manual needle has fixed scales and allows to use the +/- option (see chap 5.2)

You can change the scale type by touching the area as on the picture bellow **during 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 (adapté pour une mesure automatique)
 Median The displayed value is calculated with the formula (MAX-MIN)/2.

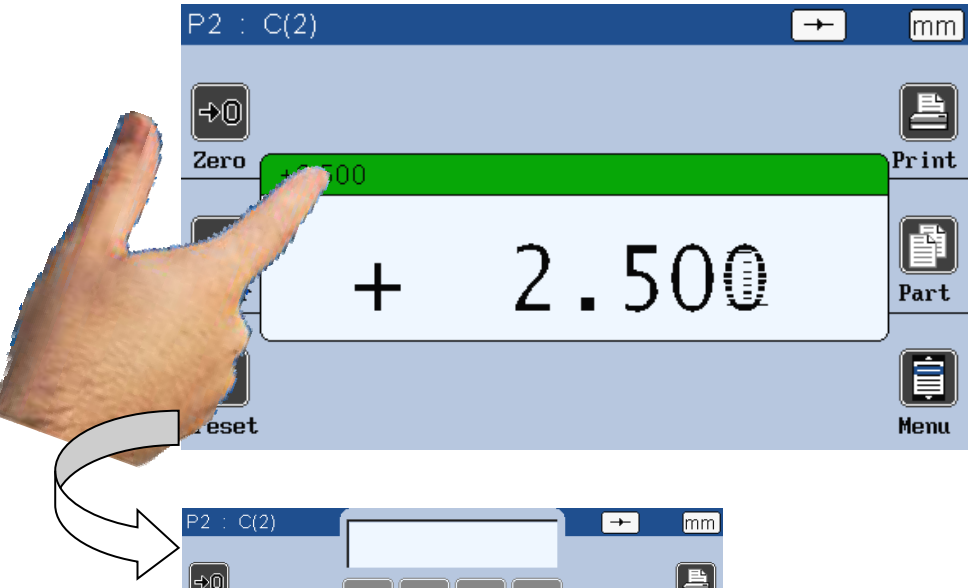
When a dynamic mode has been selected, press on the 

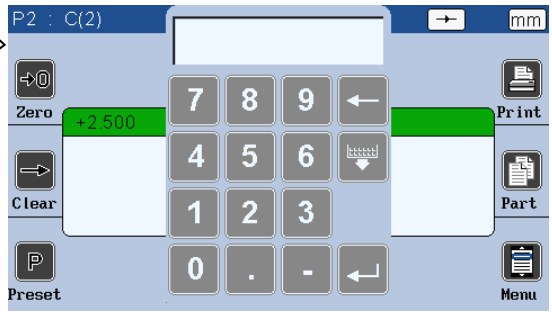
button or on the footswitch (if configured as « init dyn » (see chap 7.4)) to start recording.

8.4. Display mode without tolerance

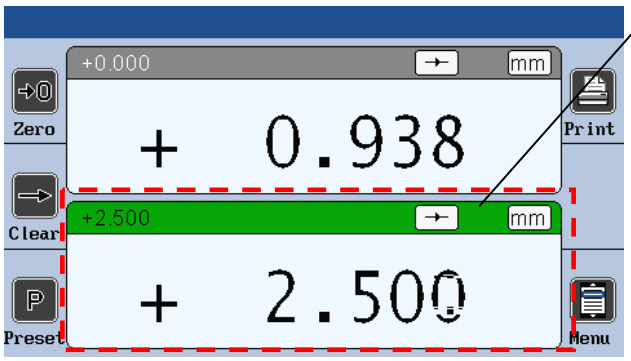
This mode (see chap. 5.2) allows to display only the numerical value, without tolerance indication.

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.



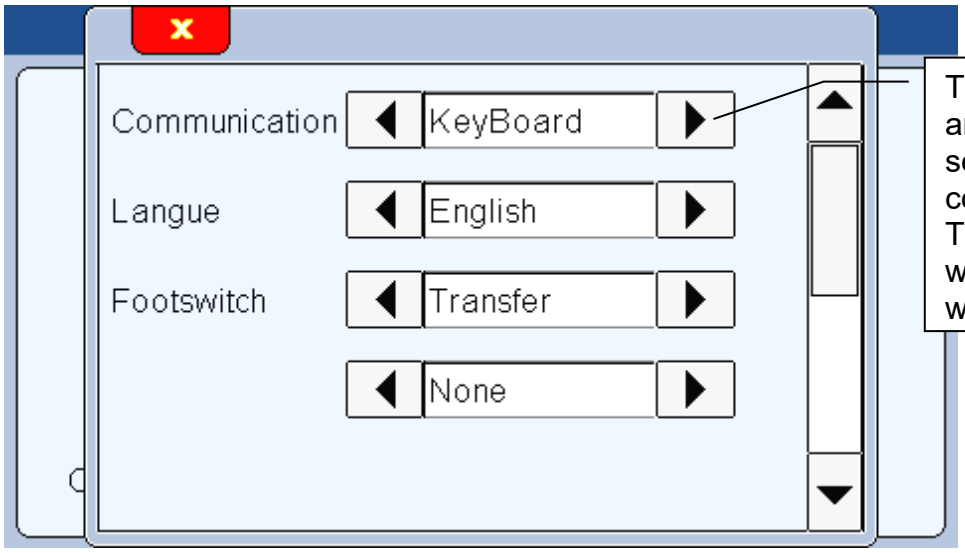


If the double display mode is selected, the 2 characteristics can move together, but only 1 is active.
The lateral buttons have an effect only on the active characteristic.
For selecting the active characteristic, press on it and the top of the box will become green.



The lateral button have an effect only on the active characteristic

9. USB COMMUNICATION



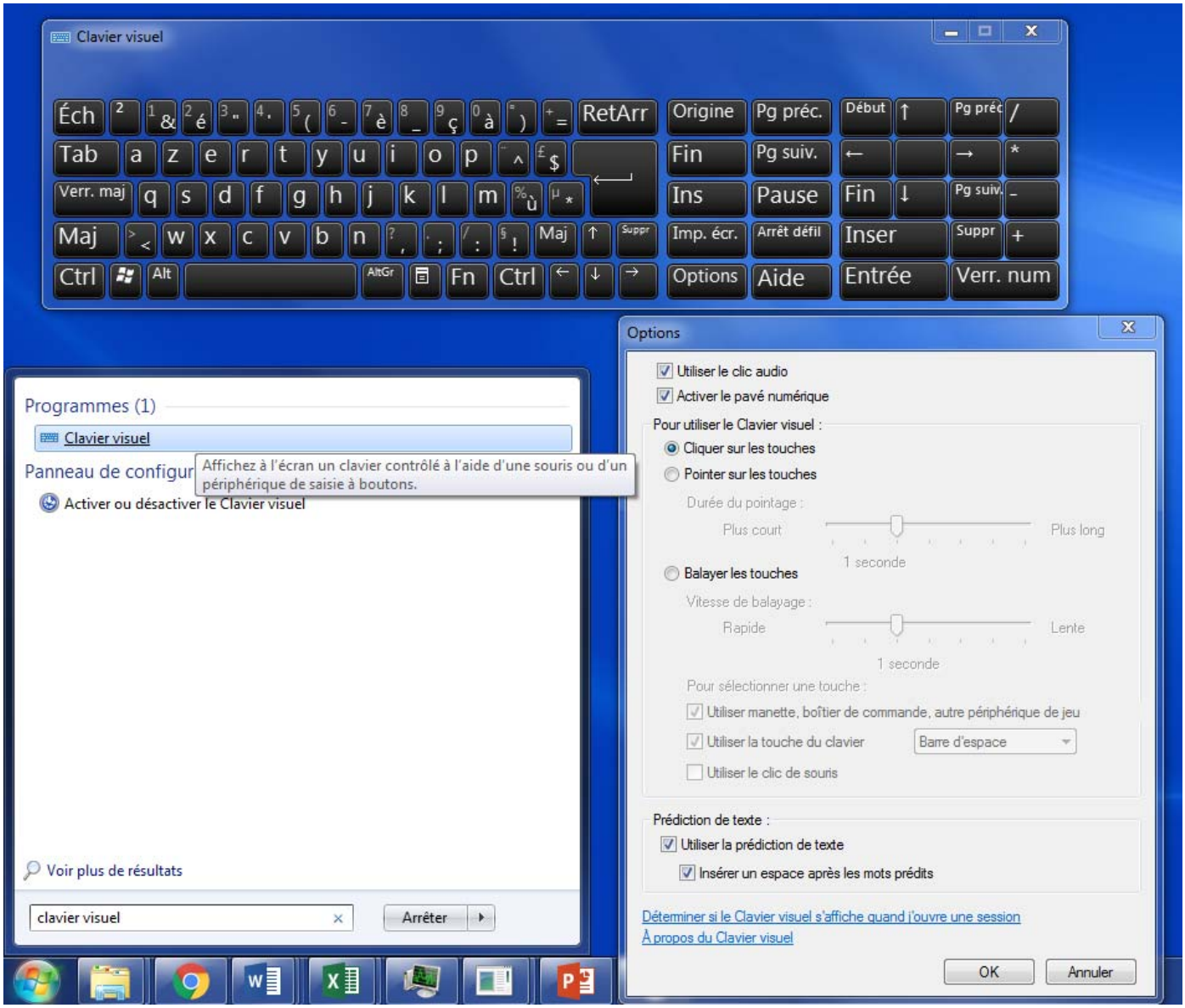
The communication with an USB cable is made by selectioning « KeyBoard » communuication type.
The M3 will communicate with the computer as would a key board do

If you select the “Keyboard/USB” communication, the M3 will be detected has a keyboard when connected to a computer, without 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.

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

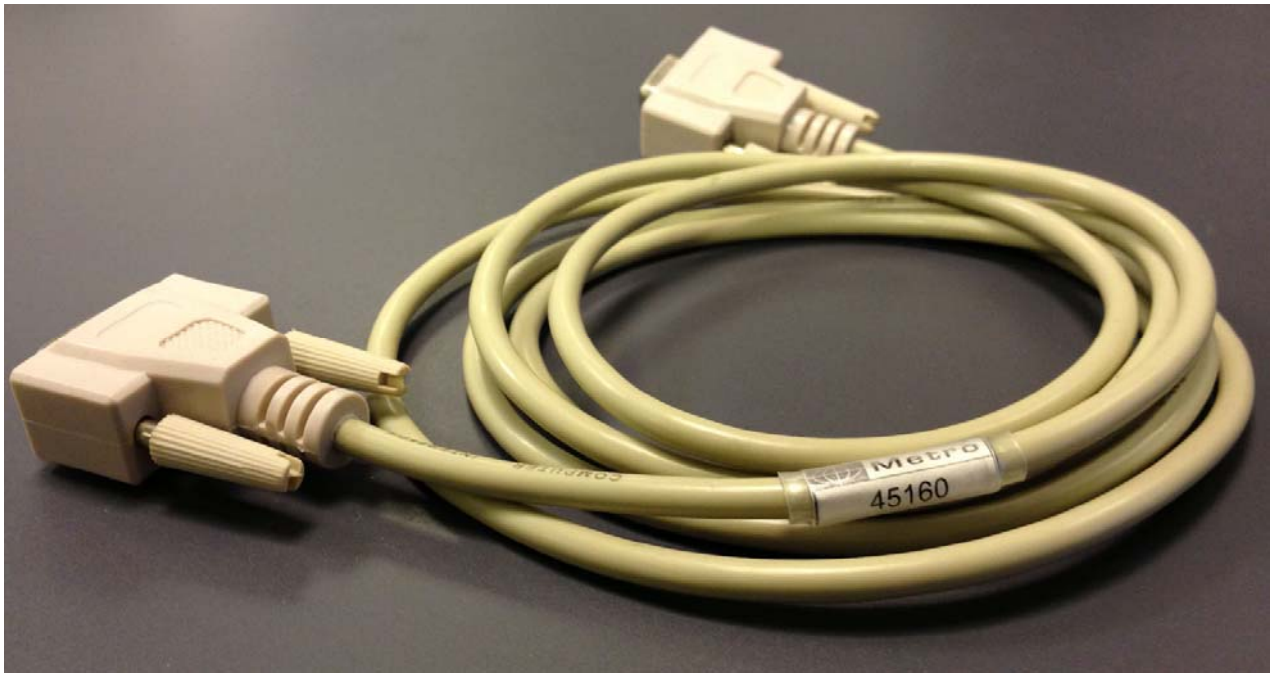
Example of a table completed by the M3

A problem appears sometimes while the data is transferring with a USB cable. The M3 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 Metro ref 45160, sold separately.



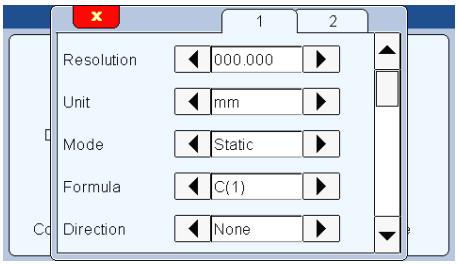
10.1. Commands

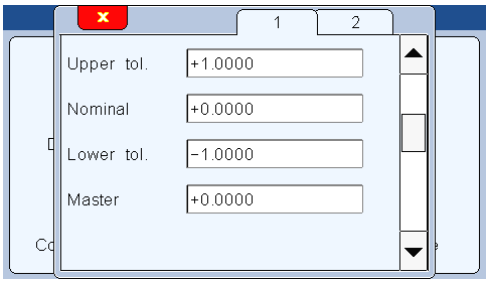
10.1.1. Generalities

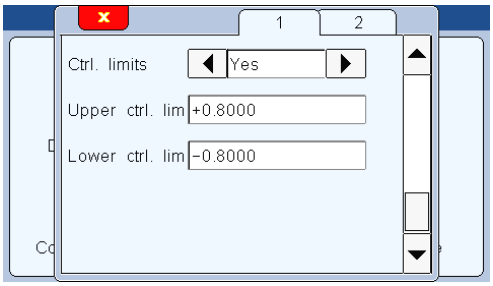
All the commands must be ended by a « CR » character. (ASCII code 13/ $0D).
The commands can be sent grouped by separating with a « ; » (max 500 characters).
The display is refreshed only once after reception of the « CR » character.

10.1.2. Command list

10.1.2.1. Window PART

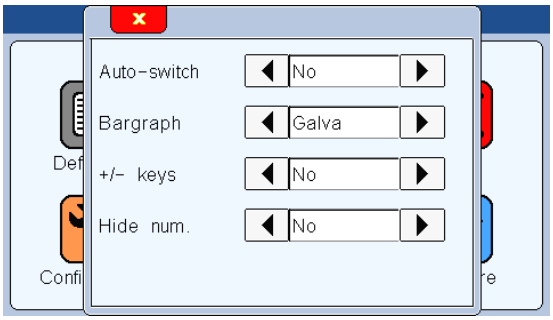


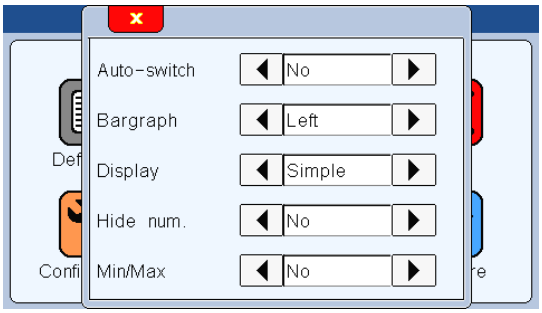




Window « Part »	(Command by characteristic with "n" = 1 or 2 (number of the characteristic))		
Rubric	Read. command	Write command	Comment
Resolution	nRES?	nRES=x	x=1 to 5 (number of decimals)
Unit	nUNIT?	nUNIT=x	x=0(mm)
			x=1 (inch)
			x=2 (µm)
Dynamic mode	nDYN?	nDYN=x	x=0 (static)
			x=1 (maxi)
			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)
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	
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=xxxxxxxx	xxxxxxxx = part ref

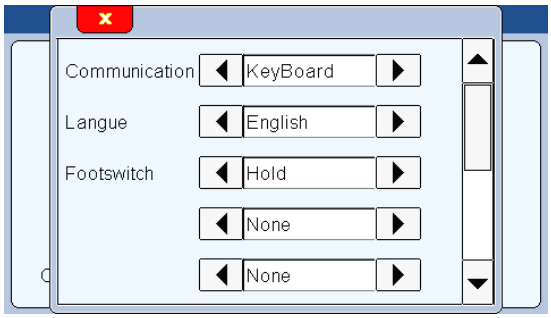
10.1.2.1. Window DISPLAY

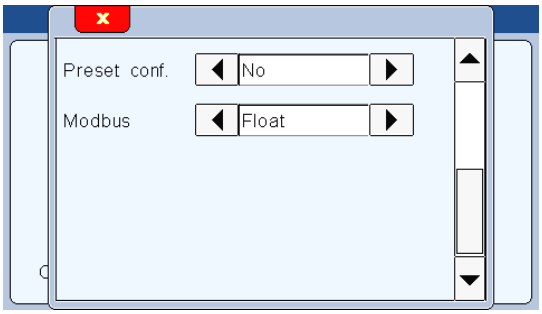




Window "display"			
Rubric	Read. command	Write command	Comment
Auto switch	AUTO?	AUTO=x	x=0 (manual)
			x=1 (auto)
Bargraph	BAR?	BAR=x	x=0 (horiz. Bar origin left)
			x=1 (horiz. Bar origin center)
			x=2 (needle)
			x=3 (non = value only, no tolerance)
Display	DISPL?	DISPL=x	x=1 (display 1 characteristic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

10.1.2.2. Window CONFIGURATION

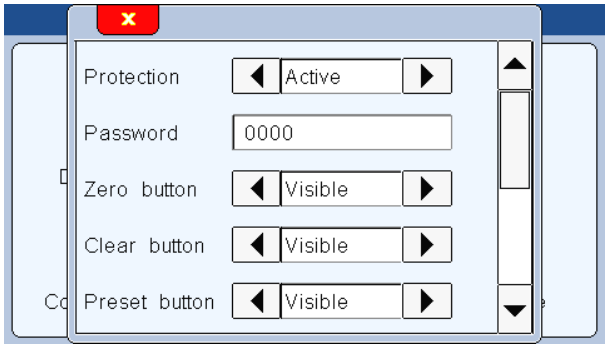


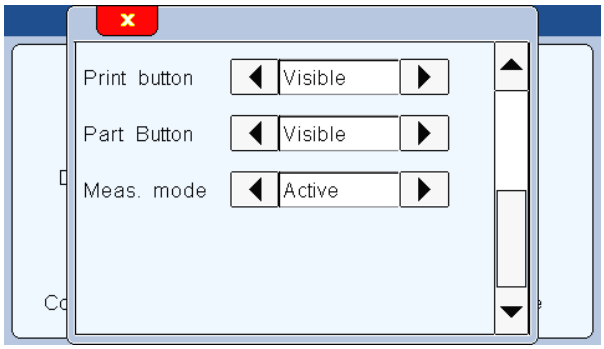


Window "Configuration"			
Rubric	Read. command	Write command	Comment
Transfert	PRINT?	PRINT=x	x=0 (USB)
			x=1 (RS232)
Langue	LANG?	LANG=x	x=0 (French)
			x=1 (English)
			x=2 (German)
			x=3 (Spain)
			x=4 (Italian)
			x=5 (Hungarian)
			x=6 (Czech)
			x=7 (Swedish)
			x=8 (Portugaise)
Footswitch	FOOT?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

			x=3 (change Part reference)
			x=4 (start dynamic measurement)

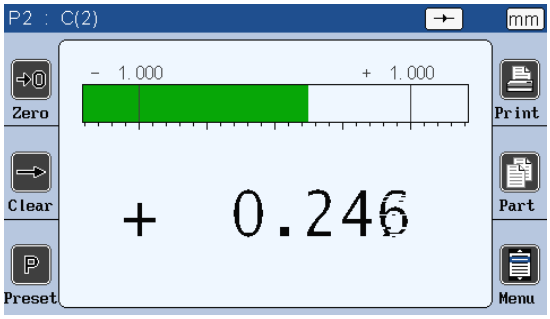
10.1.2.3. Window « Lock »





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 transfert : If 1 characteristic mode, transfert the value with the format :+000.00000<CR> If double characteristic mode, transfert the value with format : +000.00000,+000.00000<CR>
		1	Transfert the characteristic 1, format = +000.00000<CR>
		2	Transfert the characteristic 2, format = +000.00000<CR>
Part		G1	Part 1
		G2	Part 2
M3 power off		OFF	Shut down the M3

11. MODBUS RTU Protocol

This process allows to connect the M3 to an compatible and programmable automate.
This process allows to control all the functionality of the M3thanks to a lot of register.
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 to1
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
Active programm (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 dinamical 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 = µm
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	

12. OPTIONNAL I/O MODULE

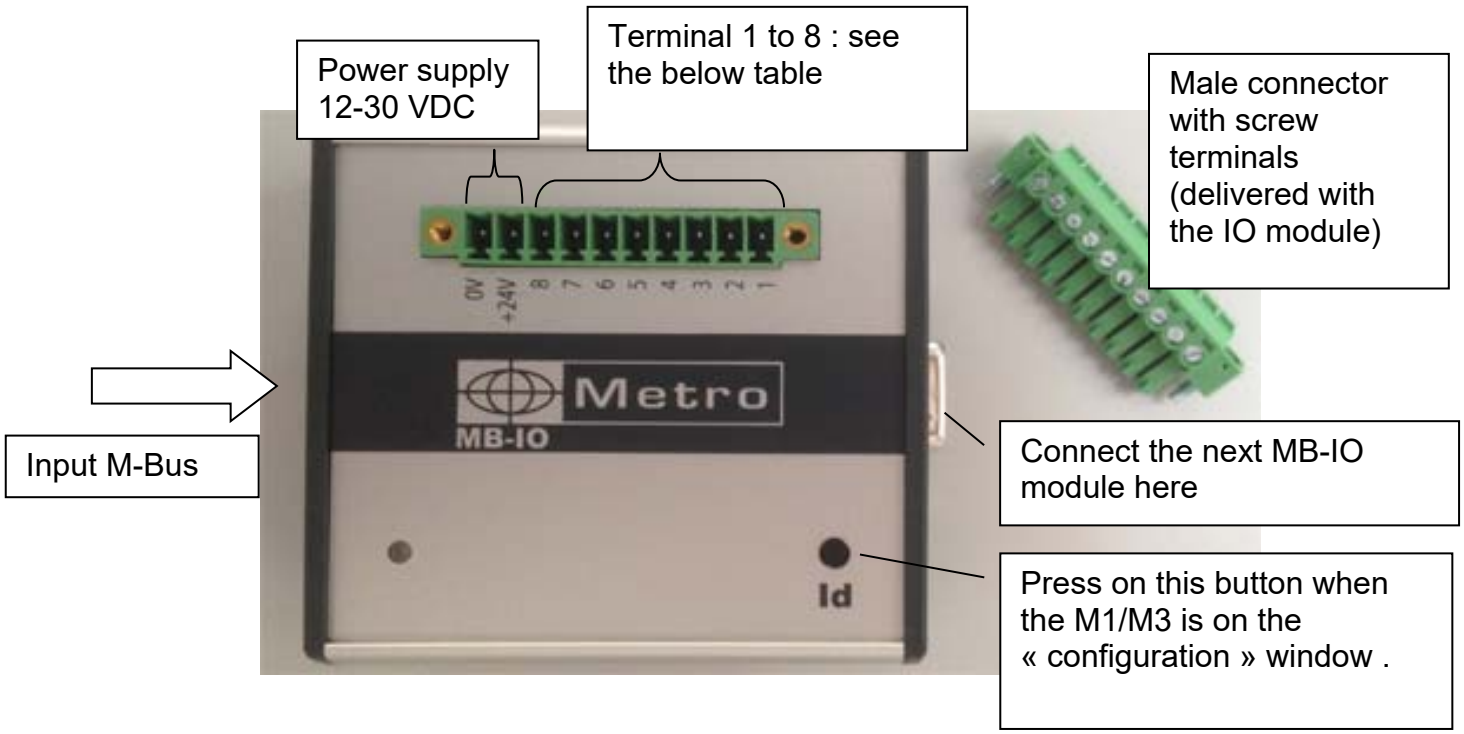
12.1. MB-IO module

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.

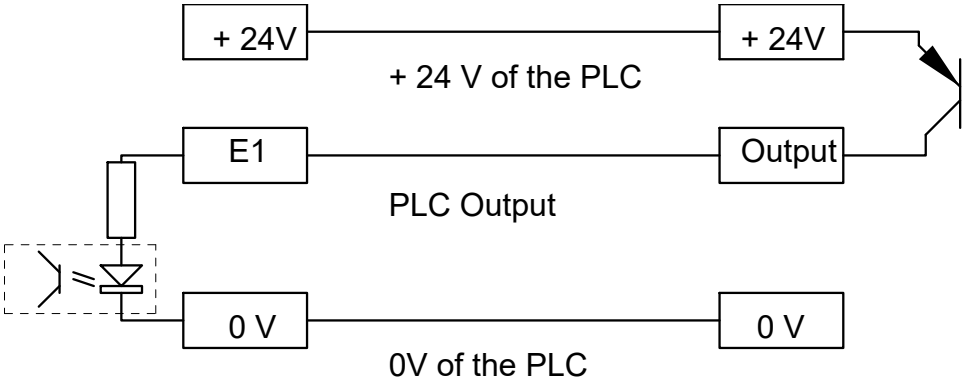
Refer to chapter 7.3 (setup) to connect a MB-IO module

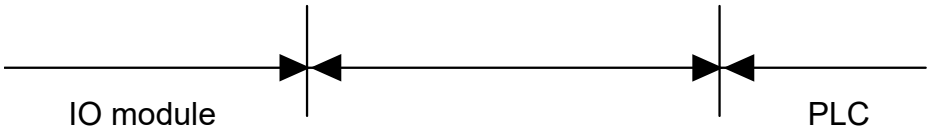


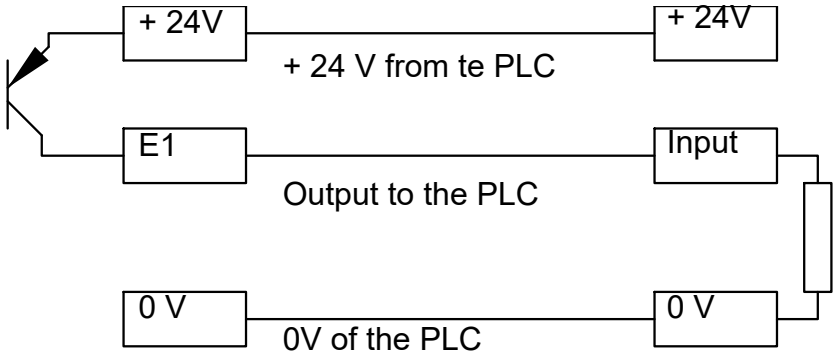
List of available functions :

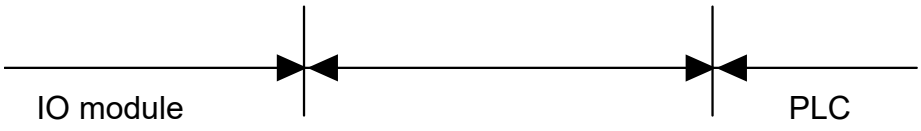
Transfer	Print, transfer the measured value
Preset	Set the display value to the master value
Zero	Set the display value to 0
Clear	Reset the dynamical measure
Init Dyn	Start a dynamical measure
State characteristic	Output a signal if the characteristic is in the tolerance
Lower control limit	Output a 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

Connection example between a M3 and a PLC



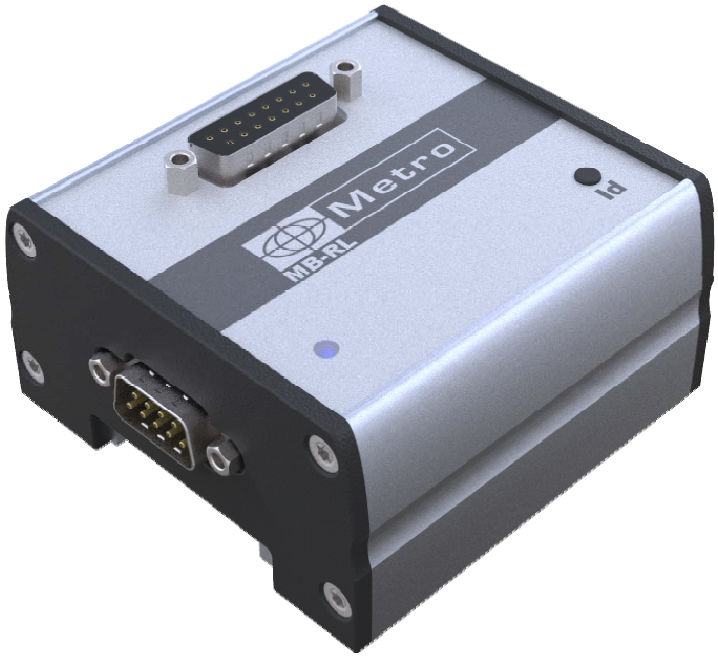






12.2. MB-RL module

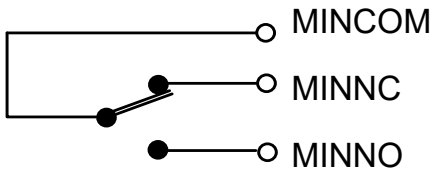
Please refer to the chapter 7.3 (Setup) to connect a M-Bus module



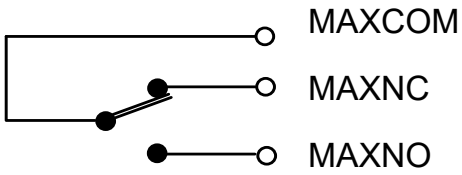
The MB-RL module has been designed for retrofitting old Monocote displays equipped with the optional relay board.

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.

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

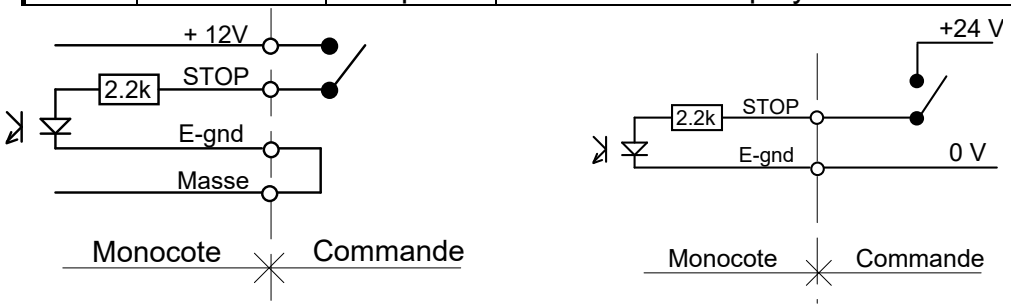
- PRINT : This input controls the sending onto the communication port of the displayed measured value. This command has the same function as the button “PRINT” of the measuring screen

- 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

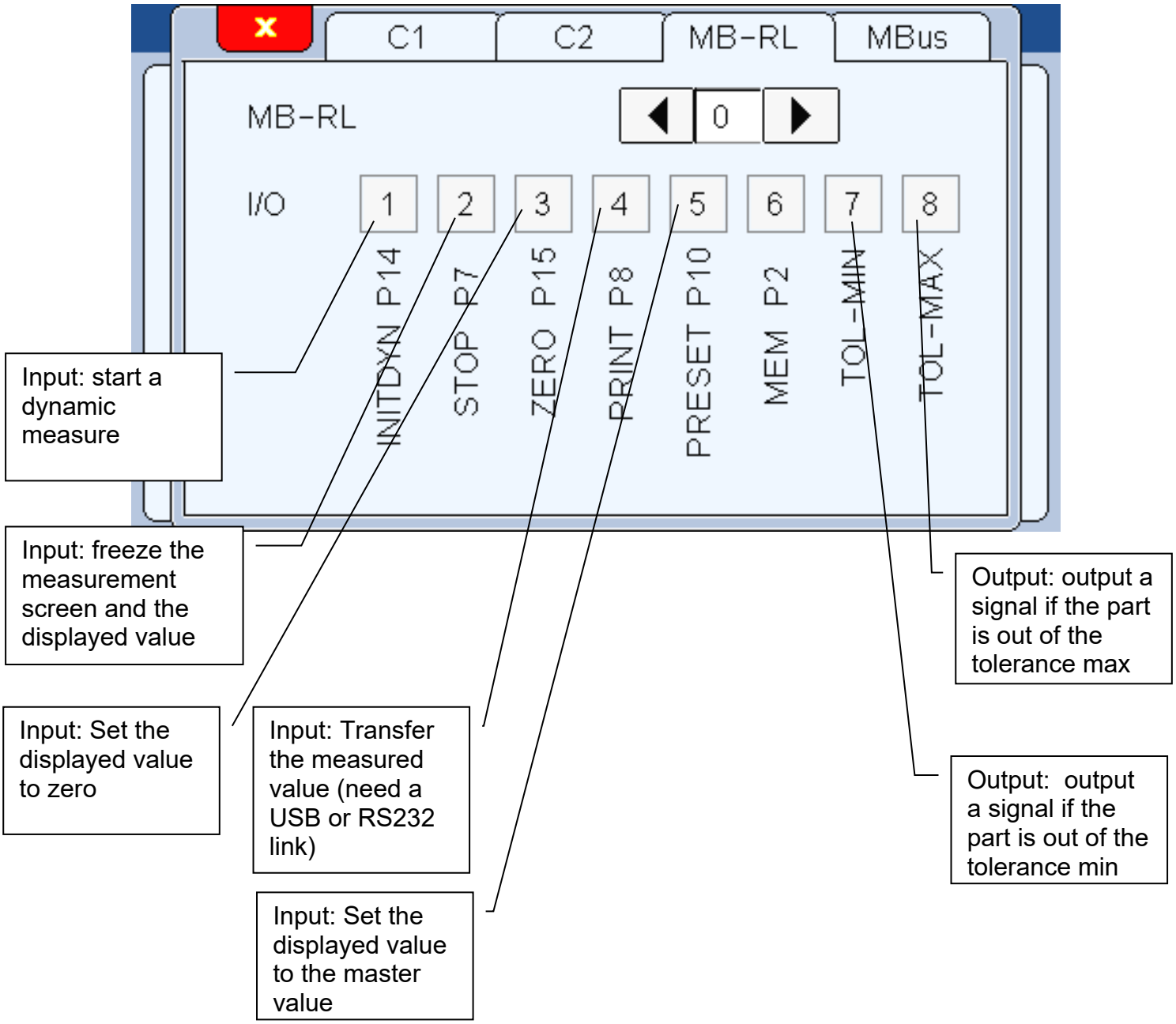
Borne	*Signal*	*Sens*	*Description*
1	+5 V	output	Power supply to activate the inputs
2	Not connected		
3	MINNC	-	Mini tolerance relay contact 1A 48V
4	MINCOM	-	Common of mini tolerance contacts

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).

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.



12.3. MB-TP Module – for temperature compensation

Using this module allows to use a special firmware version.
A special hardware with the Type K thermocouple integrated is also available.
Please contact Metro for further information.

13. FACTORY RESET

This function allows to come back to the factory setting.

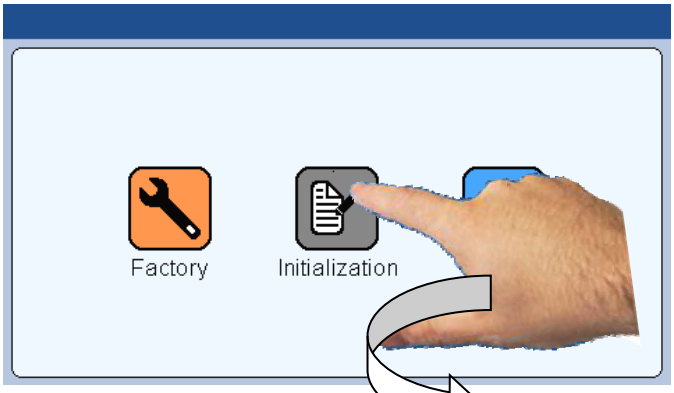
Warning: At the end of this procedure, all the parameters of your M3 will be reset (tolerances, masters, formulas…)

To Reset the M3 to its factory settings, please follow the process bellow.

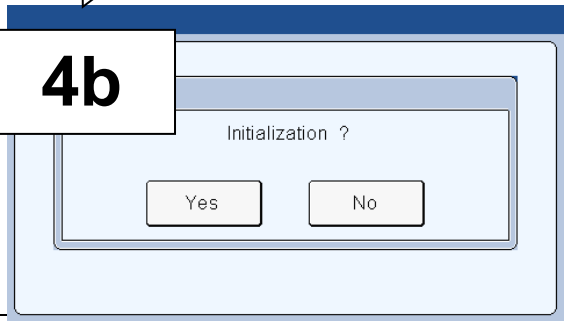
1 – Shut down the M3
2 – Start the M3
3 – When the splash screen appears, press on the Metro logo
4 – A desktop with 3 icons appear.
    4a – Press on « initialization »
    4b – Confirm YES or cancel NO
5 – Press Home to come back to the measuring screen

3

4a



4b

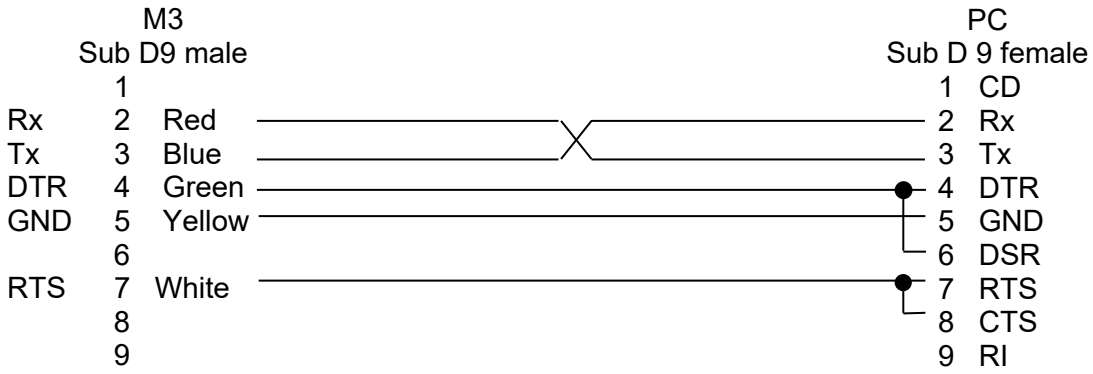


14. FIRMWARE UPDATE

It is possible to update the M3 firmware

For this you need a RS232 cable ref 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 Metro cable ref 18060, you can make your own cable by following this schematic

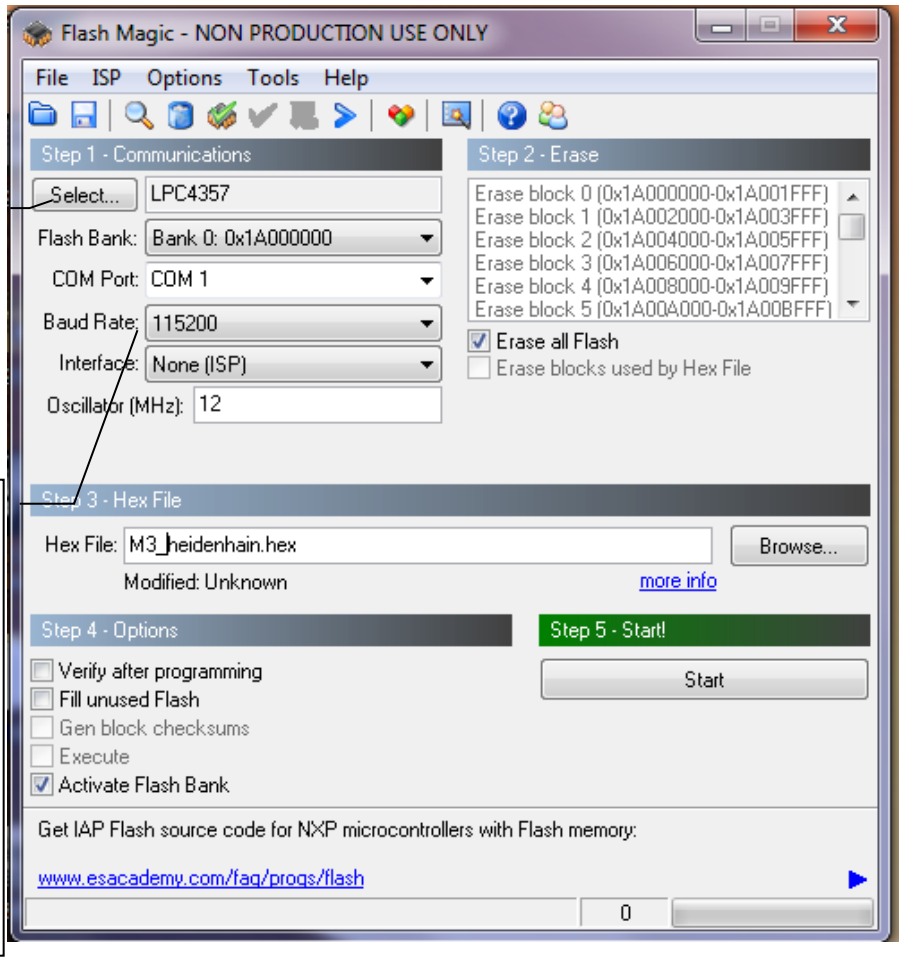


The firmware update requires to use the « flash magic » software that can be download (free) from this address:
www.flashmagictools.com

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 the M3 with the cable Metro ref 18060 to the computer
2 – Start the M3
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 M3 restart automatically when it is finished.

6- Reset the M3 by following the procedure on the chapter 11.

Parallelism X= C(1) –C(2)