Instruction Manual

POWER PANEL *plus* M

N° 00760220 or 00760221

Used in conjunction with the standard sets

TESA Micro-Hite plus M	350	00730063
	600	00730064
	900	00730065

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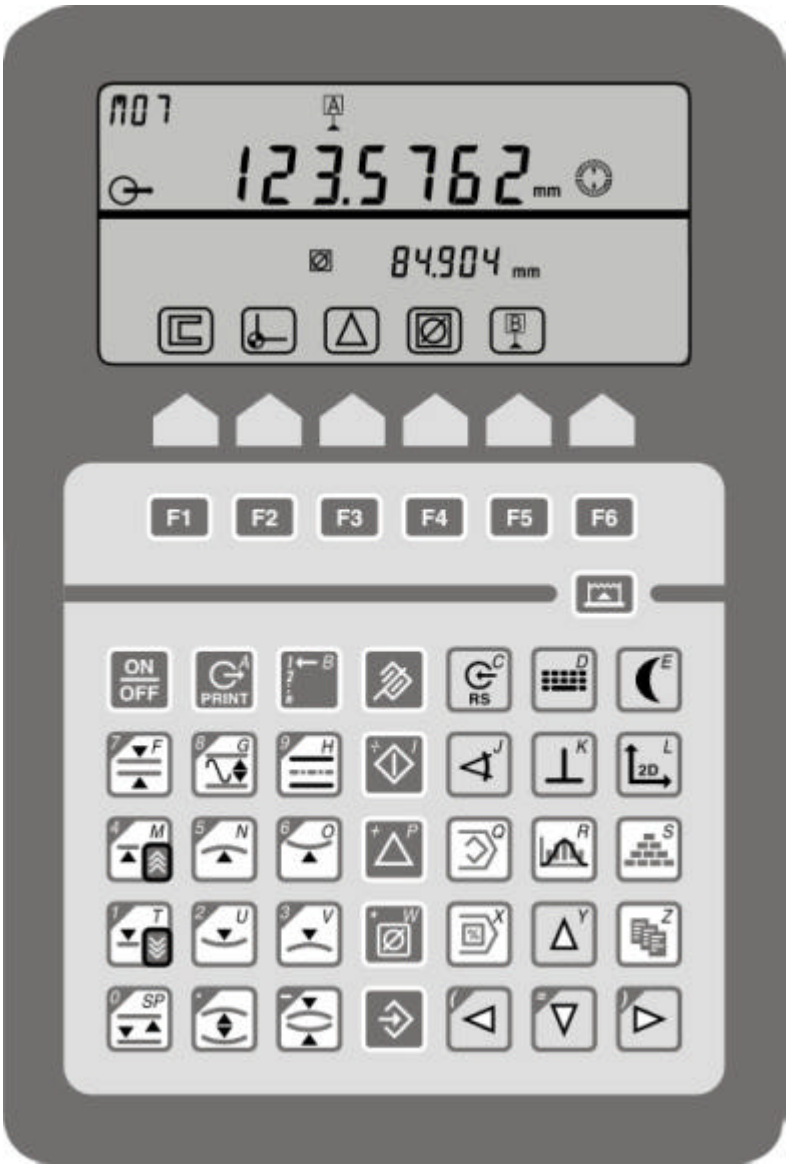
1) Main features

In the tradition of the 1D control panel, your POWER PANEL plus M provides exceptional ease of use. Based on the concept *One Key* = *One Function*, it allows a direct and easy access to the variety of measuring and analytical functions available. The measured values are displayed along with a number of icons enabling a clear interpretation of the results.
Besides 1D measurement, your POWER PANEL plus M has the following additional features and functions:

- Possible use of two references A and B.
- Possible connection of an RS type instrument.
- Angle measurement.
- Perpendicularity measurement using either a measuring instrument equipped with an RS 232 output or a TESA IG-13 digital probe. Whenever two measuring instruments are connected simultaneously, the culmination point will be automatically detected with the digital probe coming first.
- 2D measurement with graphical representation of the coordinate axes available on display along with the measured part features.
- Creation of a part programme by learning.
- Automatic edition and generation of the measurement cycles. The memory can accept up to 9999 part features distributed in several part programmes, each including as much as 999 values.
- Memory capacity for 25.000 measured values.
- SPC capabilities with output of the average, range, standard deviation, histogram, actual/effective value comparison, number of out-of-tolerances values, control limits and control charts.
- Temperature compensation.
- Possible output of reports with all measurement and statistical data in A4 format.
- Two models available (with or without built-in printer).
- Connectors on the back panel:
    - Column: SUB-D connector, 15-pin female
    - RS output: SUB-D connector, 9-pin female
    - RS input: SUB-D connector, 9-pin male
    - TESA IG-13: MINI-DIN input
    - Printer: CENTRONICS output, 25-pin
    - Power input for the foot switch
    - Power input for the battery charger whenever the control-panel is used with TESA-µHite.

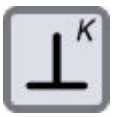
*2) **Keyboard***



F1 à F6	Function keys
	Paper feed for built-in printer
ON OFF	Switching ON or OFF. Hold this key down (> 0,6 sec.) to validate your action.

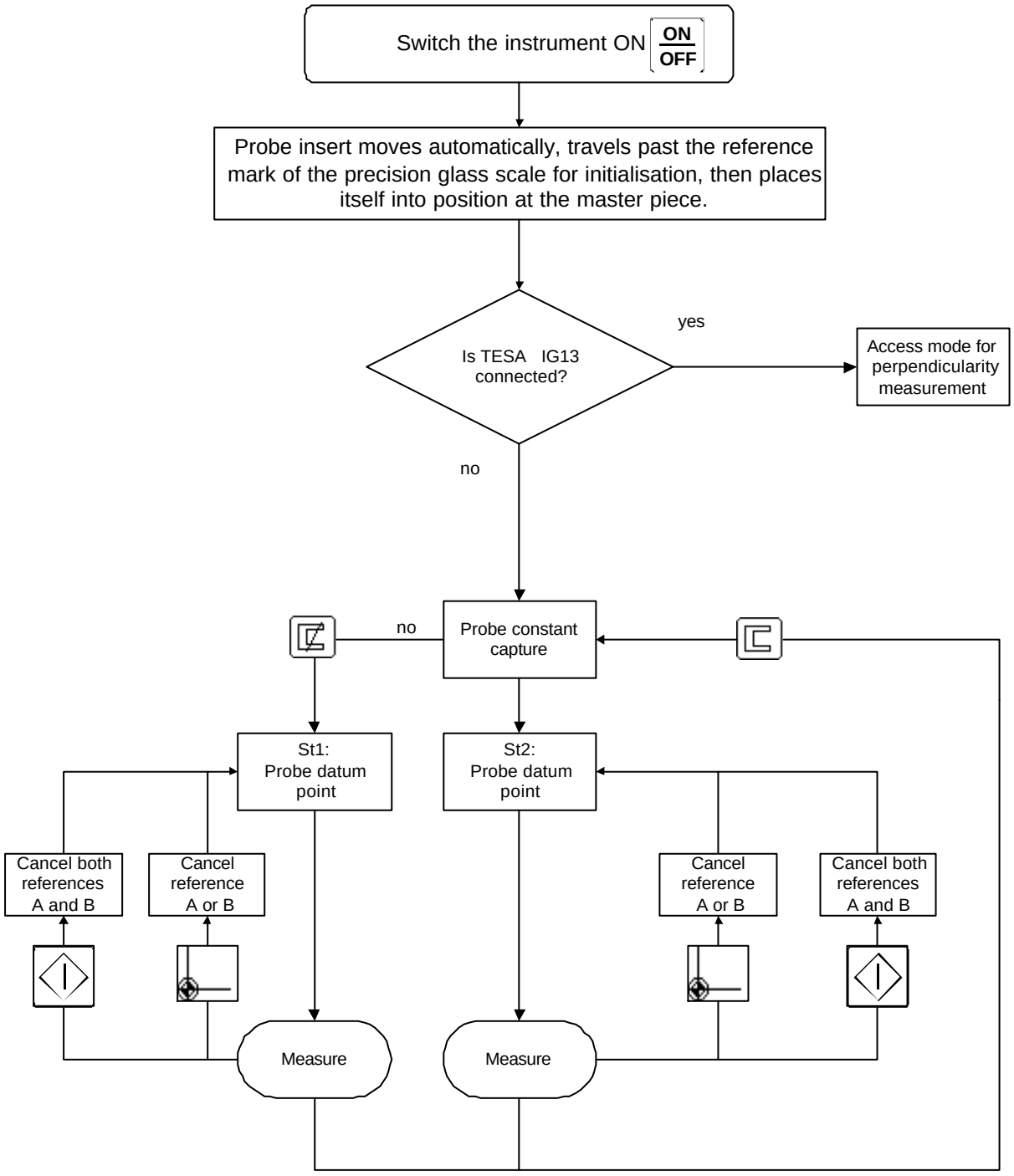
	Transferring the value shown on the main display to a peripheral device. Press shortly to have this done (< 0,6 sec.) Transferring the whole contents of the table that includes the measured values to a peripheral device. Hold the key down (> 0,6 sec.) to have this done.
	Resetting the counter to zero. If the option « Header ON » has been selected, a new header can be entered each time this key is pressed. Also allows you to reinitialise the part programme created by learning.
	Cancelling the last function or the last probe contact.
	Measuring the centre and the width of a rib.
	Measuring parallelism and runout errors.
	Calculating and further displaying the median obtained from the last two probe contacts or the last two numbered values you've selected earlier in the logbook.
	Cancelling both references A and B with return to menu St1/2 for taking a new reference A and/or B along with a new probe constant if you wish to. Also permits to reset the counter to zero and reinitialise the registration of the learn programme.
	Probing up once pressed shortly. Hold the key down to move the probe up quickly (desired speed is selected in the configuration menu). Probe will stop moving as soon as key is released.
	Probing up with detection of the highest culmination point.
	Probing up with detection of the lowest culmination point.

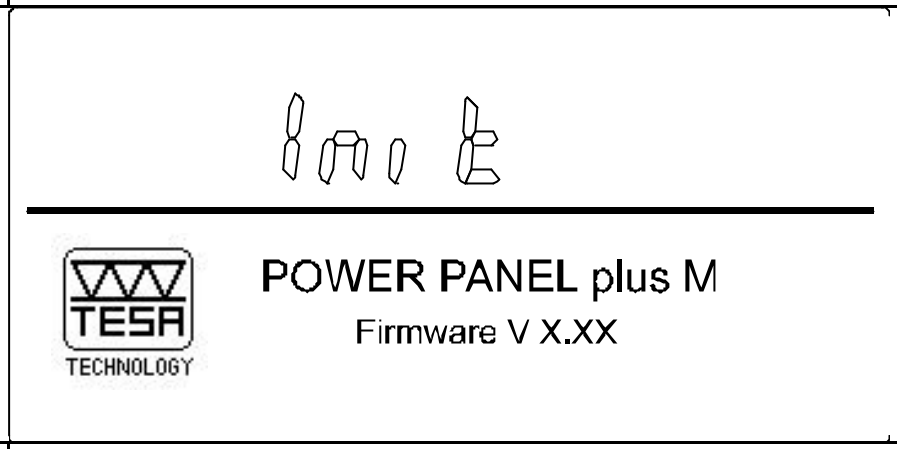
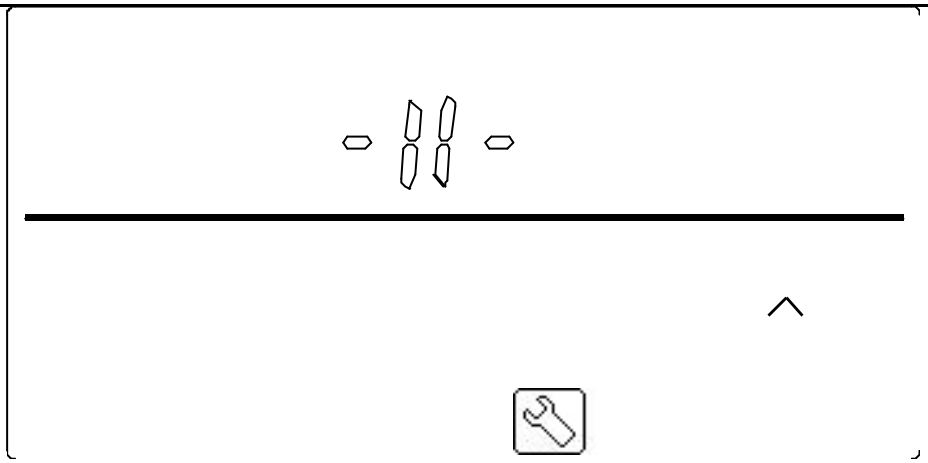
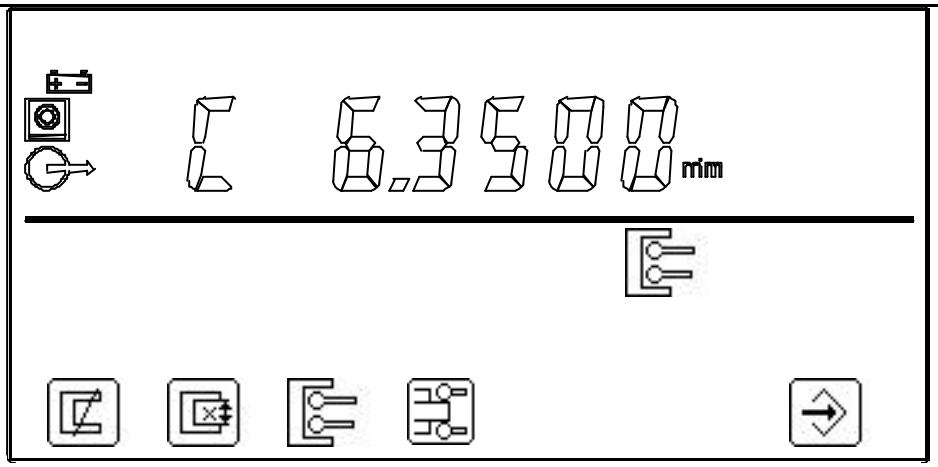
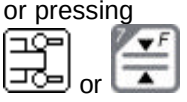
	Calculating and further displaying the difference value obtained from the last two probe contacts or the last two numbered values you've previously chosen in the logbook.
	Probing down once pressed shortly. Keep pressing this key to move the probe down quickly (for selecting the desired speed, use the configuration menu). Probe will stop moving as soon as key is released.
	Probing down with detection of the lowest culmination point.
	Probing down with detection of the highest culmination point.
	Displaying a bore or shaft diameter as well as the width of a groove or a rib whether temporarily or permanently (difference value obtained from two probe contacts).
	Measurement of the centre and the width of a groove.
	Measurement of both the centre and diameter of a bore.
	Measurement of both the centre and diameter of a shaft.
	ENTER key to validate your action.

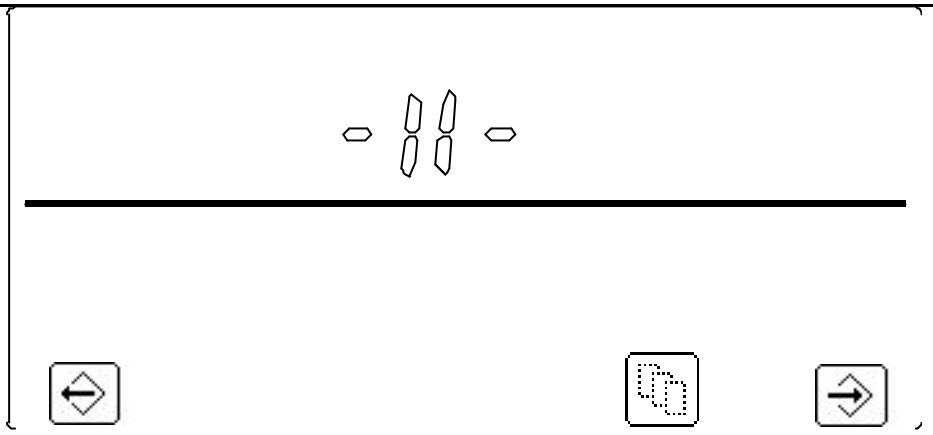
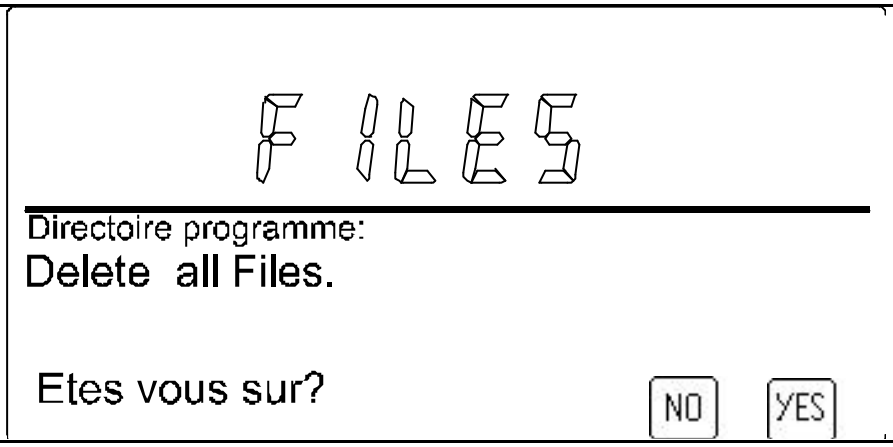
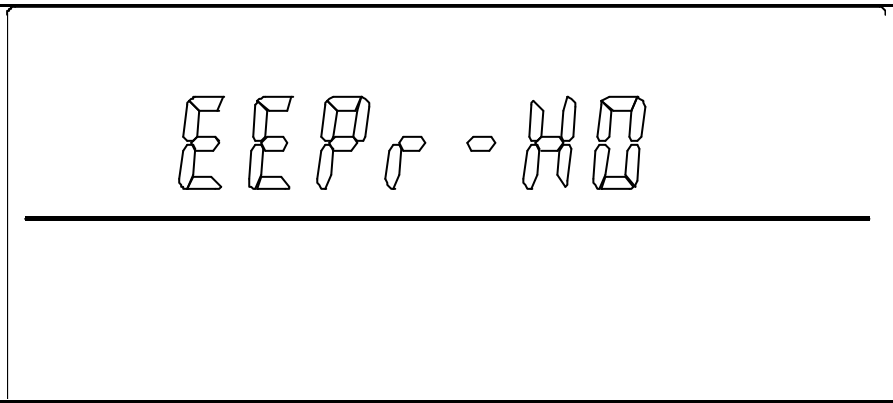
	Capturing the measured value from the tool connected to the RS 232 input.
	Entering data through the keyboard.
	PAUSE key to stop the height gauge temporarily.
	Measuring mode for angles.
	Measuring mode for perpendicularity and straightness deviations. After exiting this menu, you'll either need to take the probe constant or have it captured again.
	2D measuring mode.
	Saving a part programme created by learning.
	Statistics menu.
	Configuration menu.
	Executing a part programme.

	Moving the cursor up by one single position or one field. In mode measurement, causes the programme to access the logbook and display the four measured values coming first. The remaining values will then appear in a subsequent order while moving forward in the logbook.
	Menu for managing files including part programmes and measurement results.
	Moving the cursor to the left by one single position or one field. In mode measurement, causes the programme to display the measured values at the rate of 4 while moving back in the logbook.
	Moving the cursor down by one single position or one field. In mode measurement, causes the programme to access the logbook and have the last four measured values displayed. The remaining values will then appear subsequently while moving back in the logbook.
	Moving the cursor to the right by one single position or one field. In mode measurement, causes the programme to display the measured values at the rate of 4 while moving forward in the logbook..

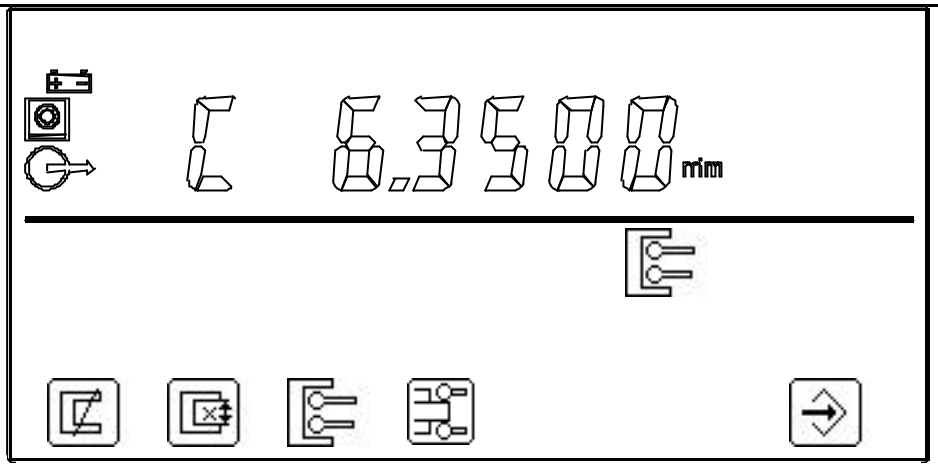
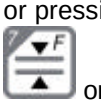
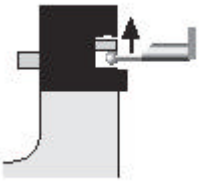
*3) **Starting up***

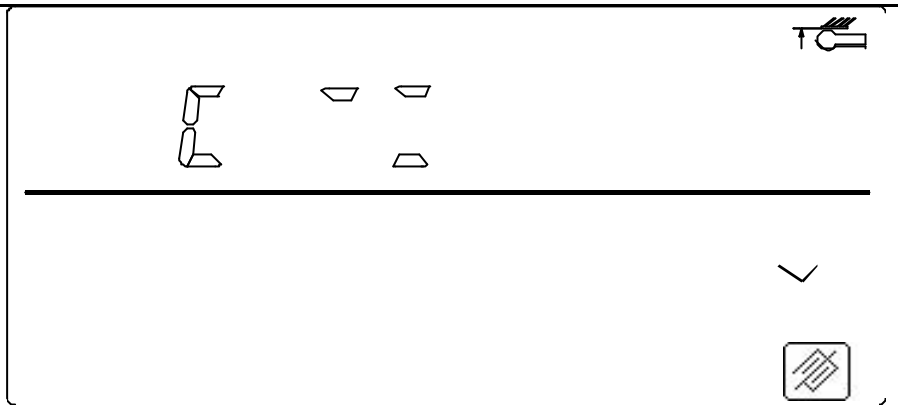
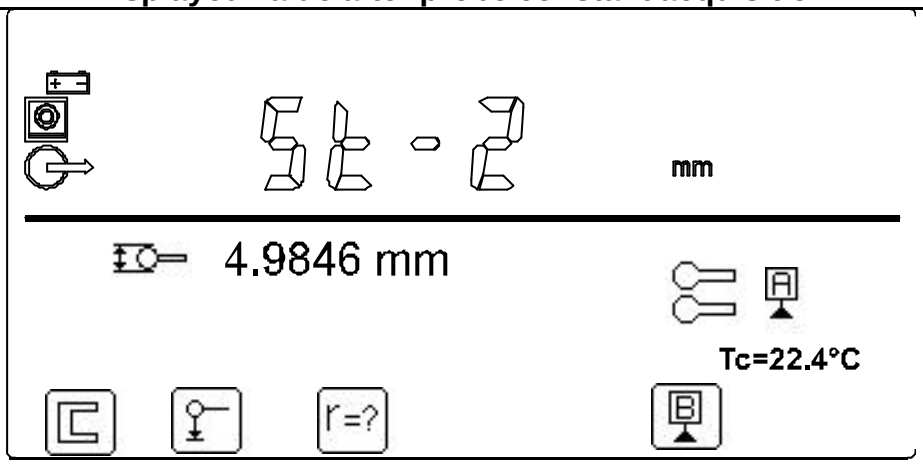


	Switching On	
ON OFF		**Press this key > 0,6 sec**. to initialise your control panel and load correction values stored in the EEPROM of the standard column used. Firmware V X.XX shows the software version.
	Searching for the reference mark	
		Move up over a distance of approx. 100 mm, or down if you can't get any value. V-shaped sign indicates the direction to which carriage moves.
	Once you've travelled past the reference mark, probe insert will automatically position itself up to the centre of the master piece	
		**Start probe constant acquisition using**  or rotating the power control by 1 click for probing internal part or pressing  for probing external part

	Accessing test menu	
		
	 : > Burn in, Moving up and down automatically  :> Cancelling all data files  :> Exiting test menu	
		If you answer yes, all data files will be deleted along with the programme files
	If no height gauge is connected when starting up: Display shows	
		Special cases 1) No communication with EEPROM
	 : Access measurement mode without correction!	

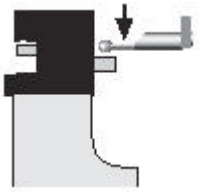
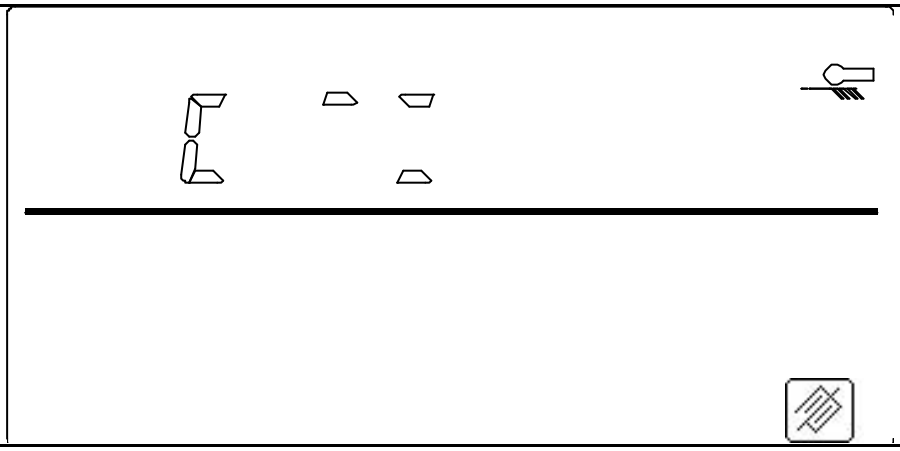
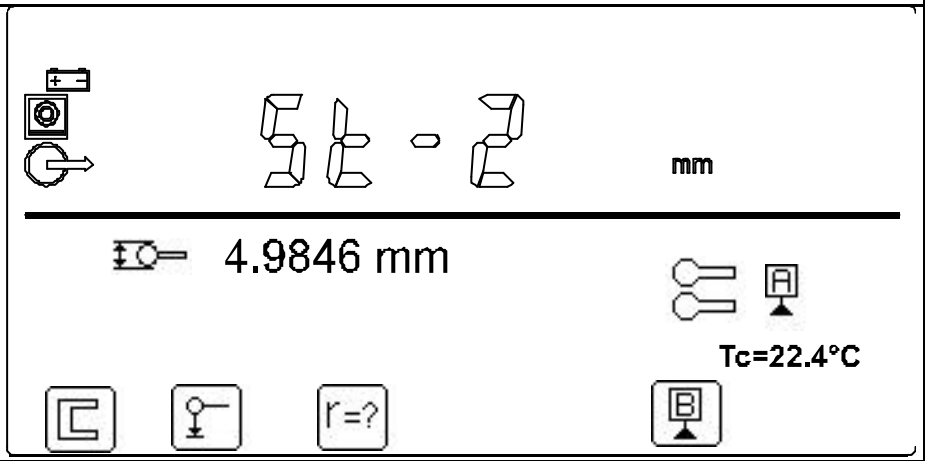
3.1) Establishing probe constant for length measurement with inversion of the probing direction

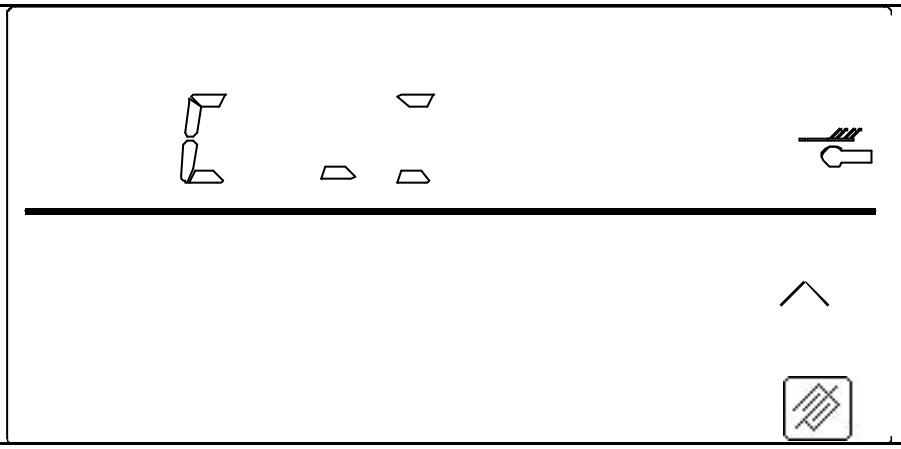
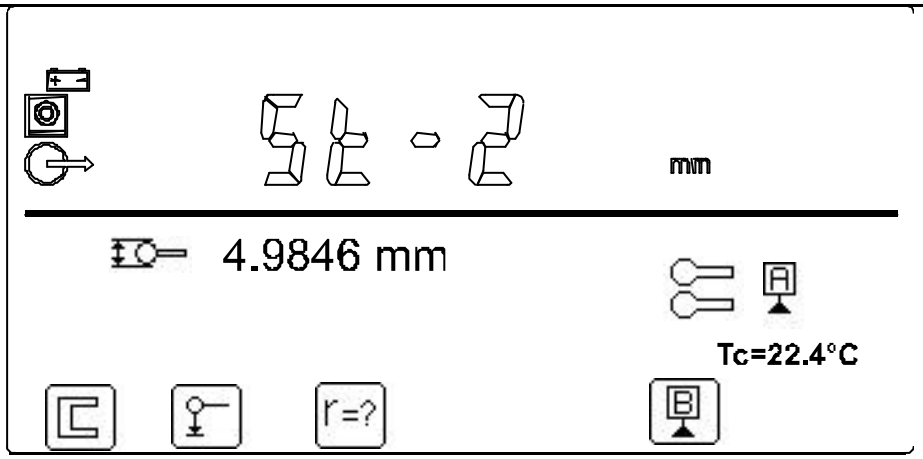
		**Start probe constant acquisition using**  or rotating the power control by 1 click for probing the master piece (internal part) or pressing  or  for probing the external part.
	Capturing probe constant on the master piece (internal part) **Probe contact 1**	Position probe insert in master piece (internal) 
 or  or  use the rotary power control		 Probe contact 1 (up). V-shaped sign shows the direction to which carriage moves when capturing relevant value  Exit constant mode
	Probe contact 2	
		 Probe contact 2 (down)  Exit constant mode

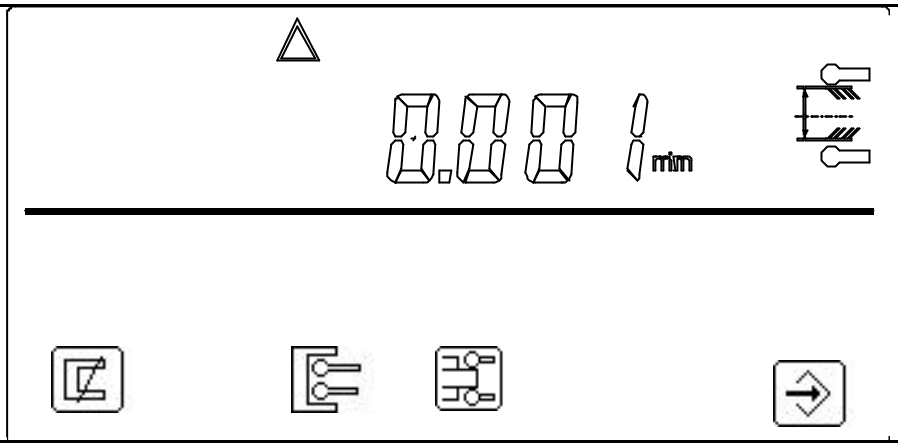
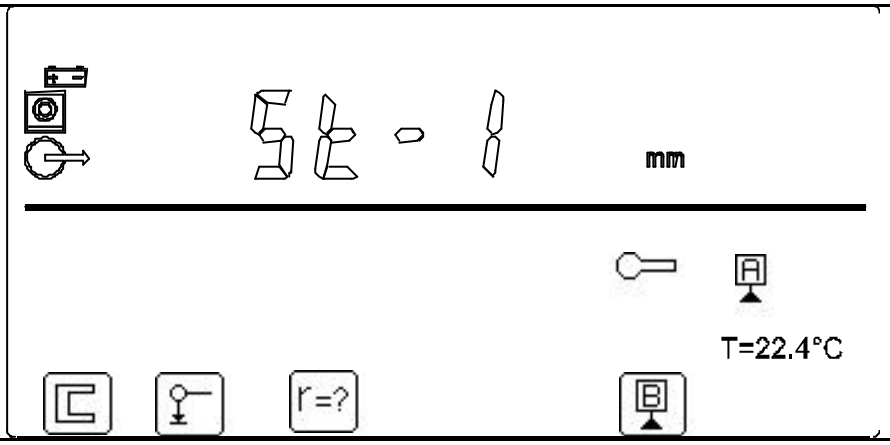
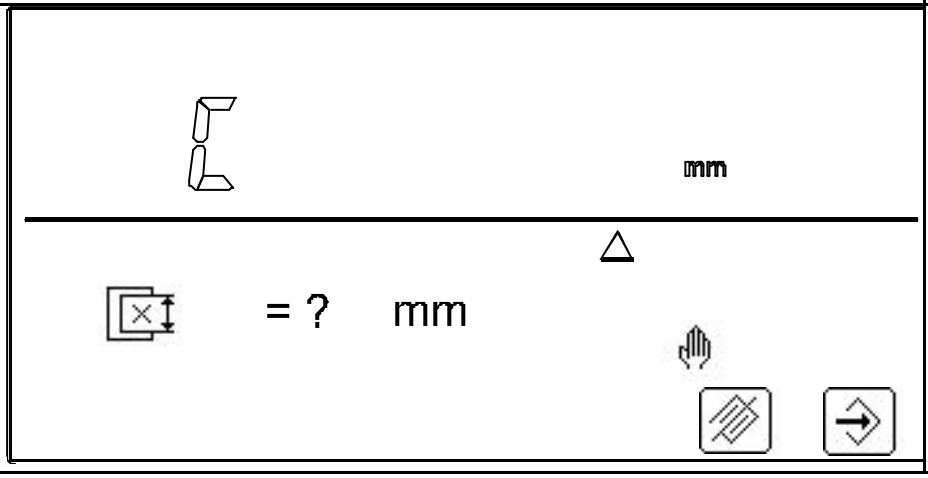
	Probe contact 3	
		 Probe contact 3 (up)  Exit constant mode
	Displayed value after probe constant acquisition	
		 Probe contact 4 (down) Ready for capturing reference value

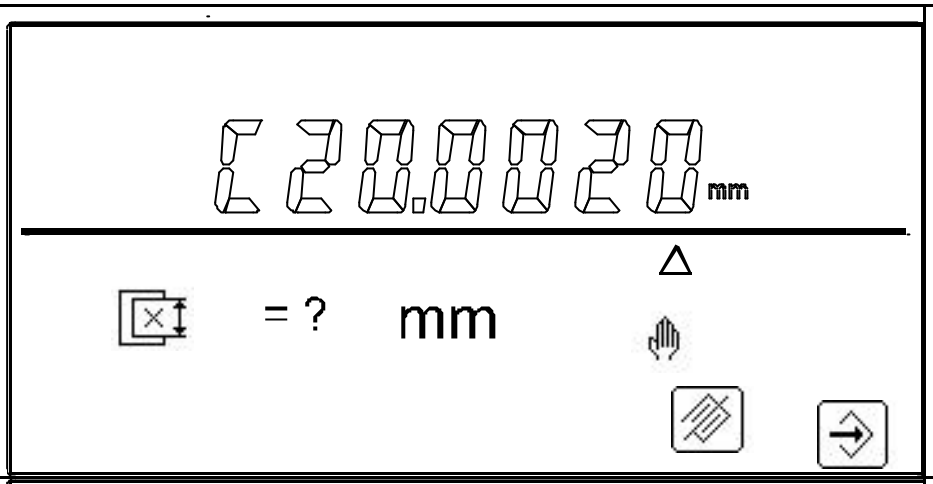
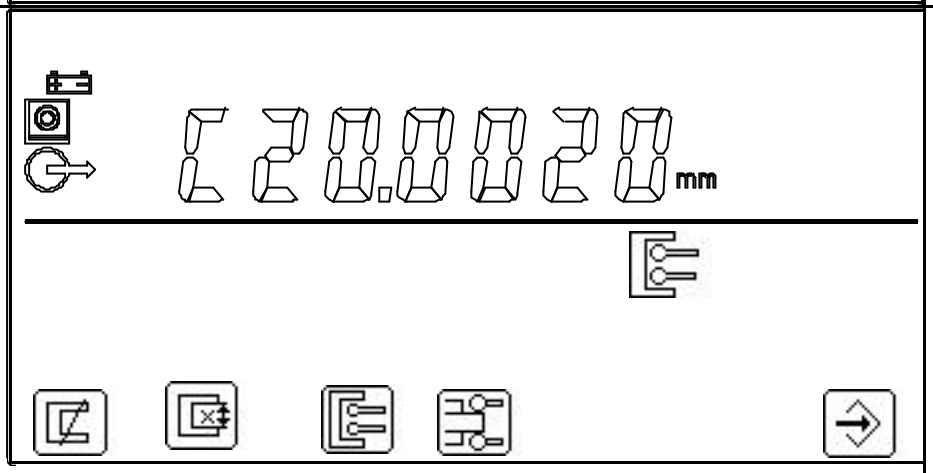
- Displayed probe diameter is usually slightly smaller than the true diameter since the probe flexure is taken into account as the probe constant is being captured.
- Tc related temperature value only appears if you've selected Temperature Compensation.

	<u>Capturing probe constant on the master piece (external part)</u> **Probe contact 1**	Position probe insert below the lower face of the master piece 
 or		Probe contact 1 (up)  Exit constant mode

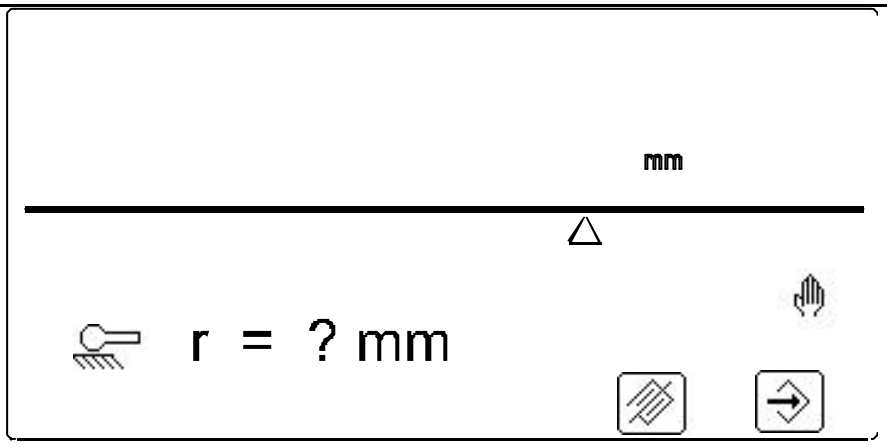
	Probe contact 2	Position probe insert above the upper face of the master piece 
or rotate the power control by one click		Probe contact 2 (down) Exit constant mode
	Probe contact 3	
		Probe contact 3 (down) Exit constant mode
	Displayed value after probe constant acquisition	
or rotate the power control by one click		Probe contact 4 (up) Ready for capturing reference value

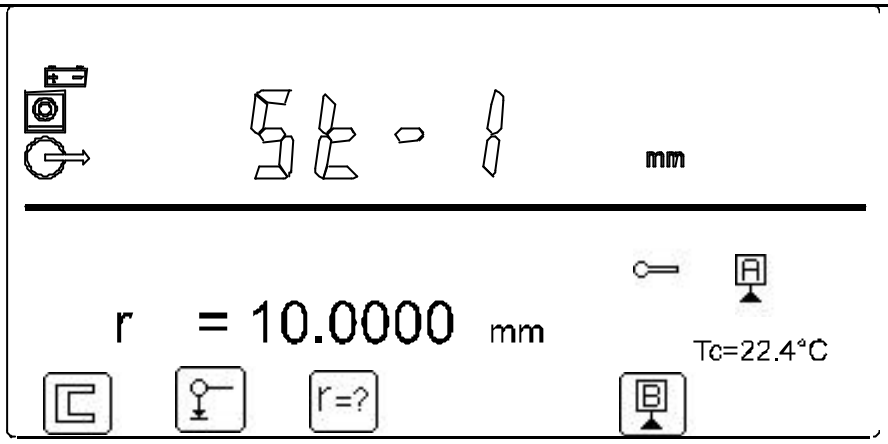
	<u>Difference between the four measured values is too high</u> **Repeatability is checked after probe contact 4 has been performed. If difference is too high, the last two probe contacts will be deleted. Probe contact 5 is then automatically executed.**	Criteria: Resolution to 0,1 µm : <0,5 µm Resolution to 1 µm : <2 µm
		Cancellation of the last two probe contacts
	Probe contact 5	
		Probe contact 5 (up) Exit constant mode
	Probe contact 6	Position probe insert above the upper face of the master piece
or rotate the power control by one click		Probe contact 6 (down) Ready for capturing reference value

	<u>Difference between the four measured values is too high</u> **Repeatability is checked again after probe contact 6 has been performed. If difference between the first and the third couple of measured values is too high, relevant value will be displayed.**	Criteria : Resolution to 0,1 µm : <0.5 µm Resolution to 1 µm : <2 µm
		**Resolution reduced to 1 µm** Alternatives: Repeat value capture by pressing either key or , Validate captured value with delta to 1 µm by pressing key
	Measuring in one coordinate direction Displayed data once you've pressed the function key	
		**Ready for capturing reference value with a single probe contact**
	<u>Changing value of the master piece</u>	
		Input new value

Assigned number = 20.0020		New value once entered
		New value is registered and remains stored in the memory even after the height gauge has been switched off.
	Ready for probe constant acquisition	

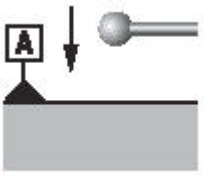
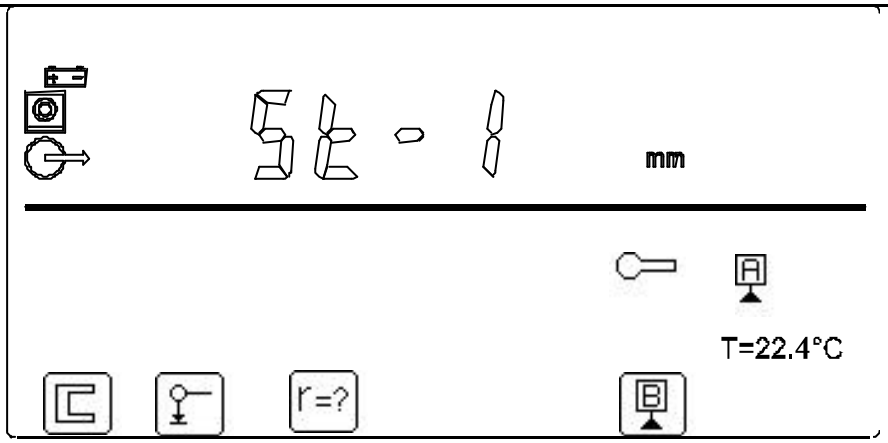
3.2) Programming the retraction travel

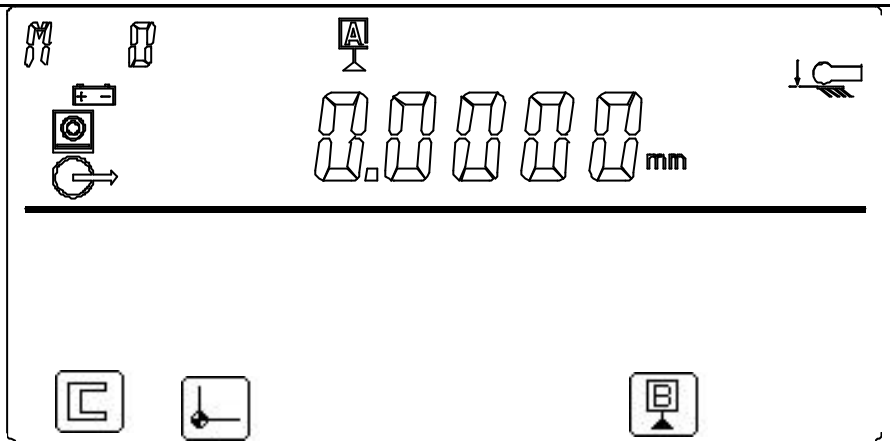
	Changing value	Default value is 3 mm
		Input new value Maximum permissible value matches the measuring travel Minimum value is 3 mm. If no retraction is required, enter zero

	New value once entered (e.g. 10 mm)	
		Ready for capturing reference value with a single probe contact

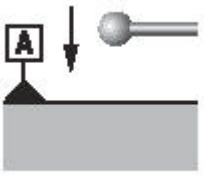
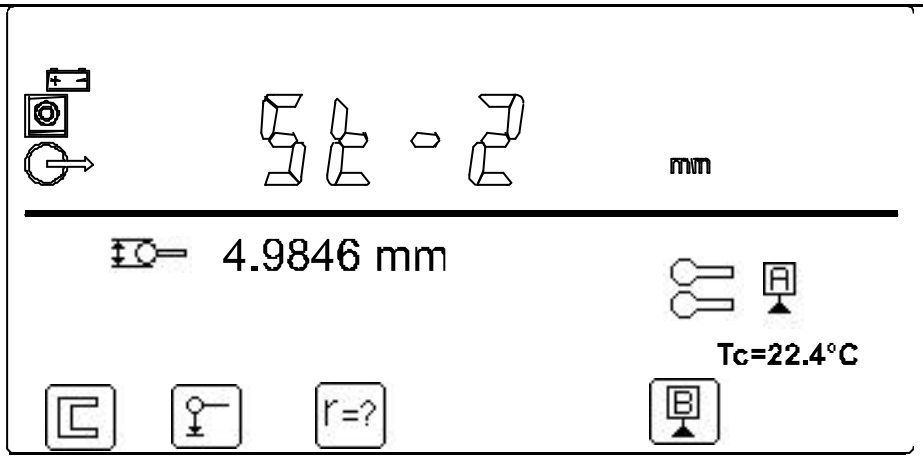
3.3) <u>Capturing a reference value</u>

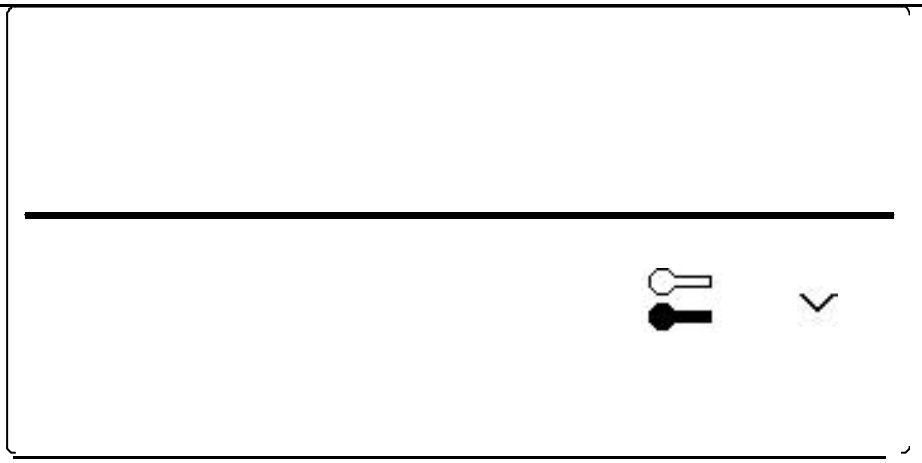
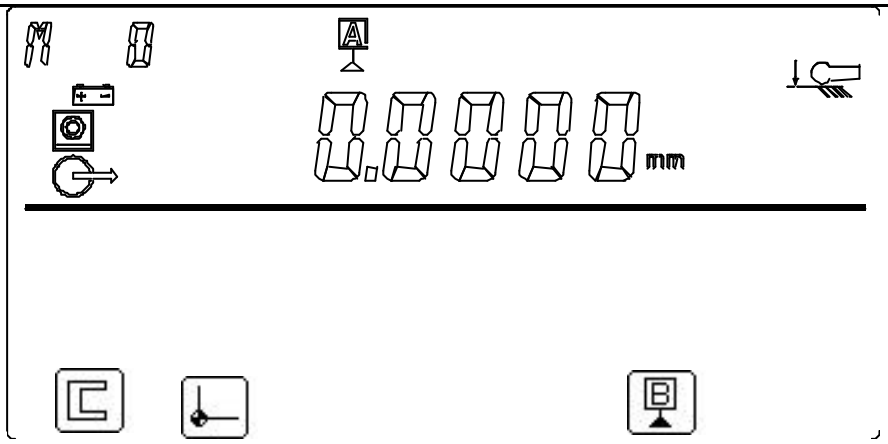
Measuring without inversion of the probing direction: mode St-1

	Capturing reference value St-1 with a single probe contact	
		Position probe insert close to the reference point to be probed, then start value capture by pressing the function key enabling single probe contact or rotating the power control

 or rotate the power control by one click		Mode St-1 Display shows one single probe V-shaped signs appear according to the direction to which the carriage moves. Number of signs at a speed of 7,5 mm/s = 1 or 15 mm/s = 2. At higher speed using the rotary power control = 3
		If value numbering isn't activated, display shows St-1 instead of M0

Measuring with inversion of the probing direction: mode St-2

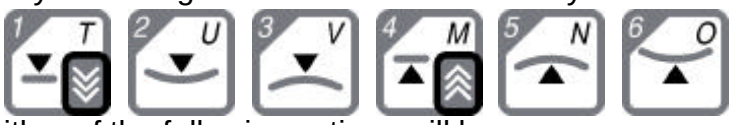
	Capturing reference value St-2 with two probe contacts	
		Position probe insert close to the reference point to be probed, then start value capture by pressing the function key enabling one or two probe contacts or rotating the power control

	Approaching first probing point	
 or rotate the power control by one click		<u>Mode St-2</u> Display shows two probes. V-shaped signs appear according to the direction to which the carriage moves. Number of signs at a speed of 7,5 mm/s = 1 or 15 mm/s = 2. At higher speed using the rotary power control = 3
	Approaching second probing point	
Once first probe contact has occurred, you may decide to activate St-2 or not		<u>Mode St-2</u> Full contact V-shaped signs appear according to the direction to which the carriage moves. Number of signs at a speed of 7,5 mm/s = 1 or 15 mm/s = 2. At higher speed using the rotary power control = 3
		If numbering isn't enabled, display shows St-2 instead of M0

Reference value will be equal to the mean value obtained from the two probe contacts.

Examples

1 By activating either of these function keys



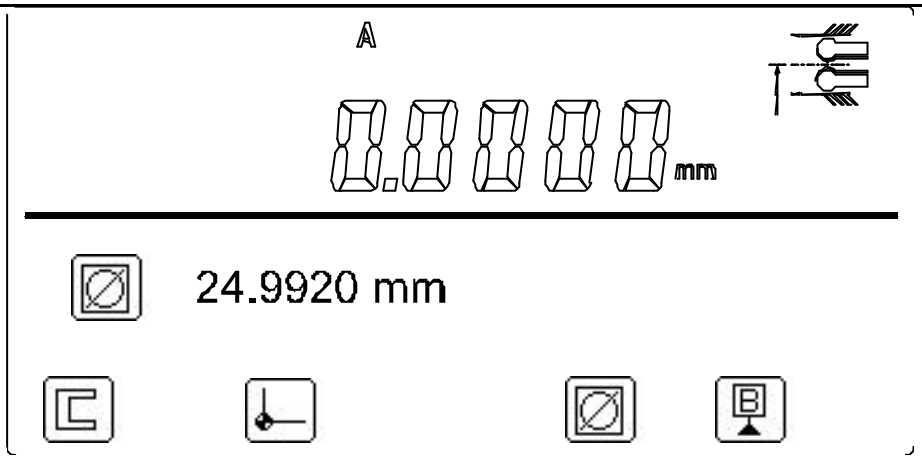
either of the following actions will happen:

– If neither keys for *fast displacement* is pressed within less than 2 seconds, TESA Micro-Hite plus M will repeat the same function at the same location.
– If either of the keys for *fast displacement* is pressed within less than 3 seconds, you'll be able to select one of the 6 measuring functions available for probing another point.
– If the rotary power control is used to move the probe insert, TESA Micro-Hite plus M will repeat the same function at the new location.

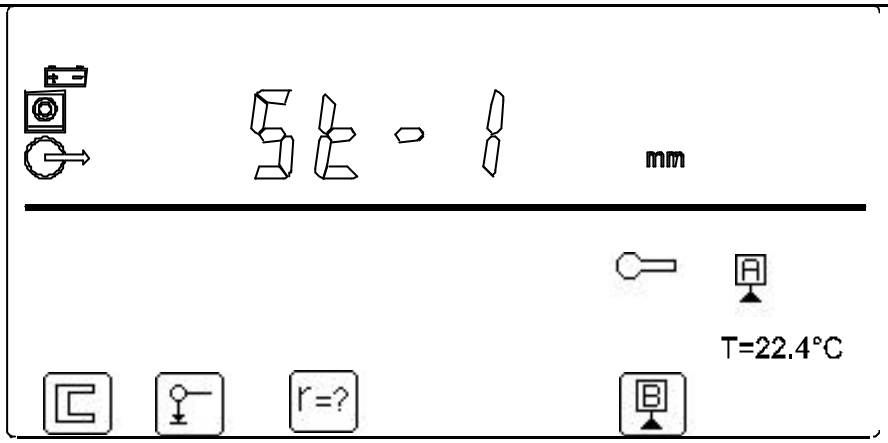
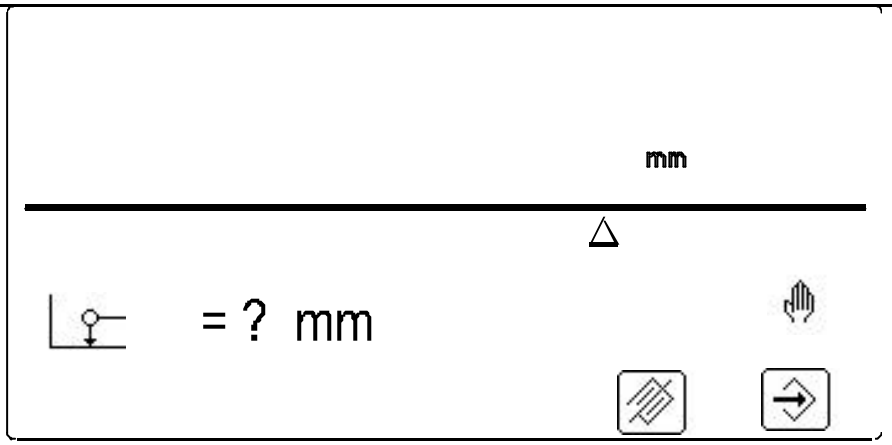
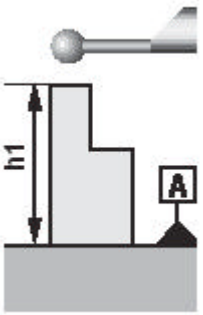
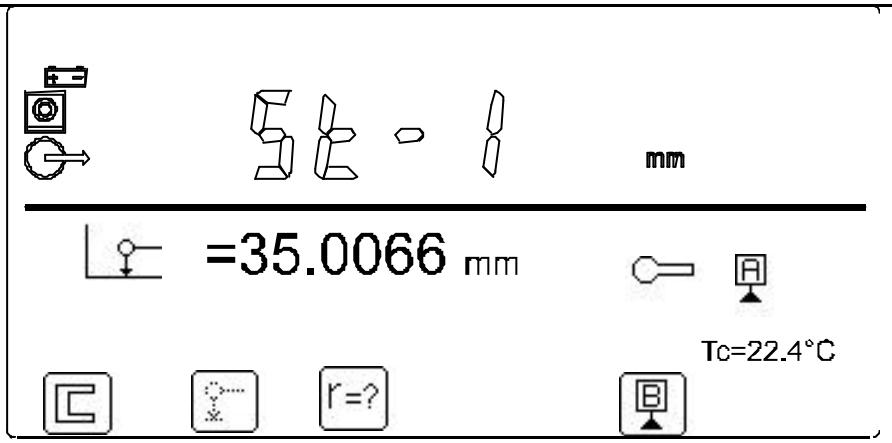
In either case, the reference value will match the average of both probe contacts.

2 By activating either of these function keys

the reference value will be taken at the centre of the part feature to be measured.

	Value capture at the centre of a groove (example)	
		

*3.4) **PRESET function***

		
	Entering a PRESET value against an indirect reference	
		Input PRESET value 
	PRESET value once entered (e.g. 35.0066 mm)	
		Ready for capturing indirect reference with a single probe contact

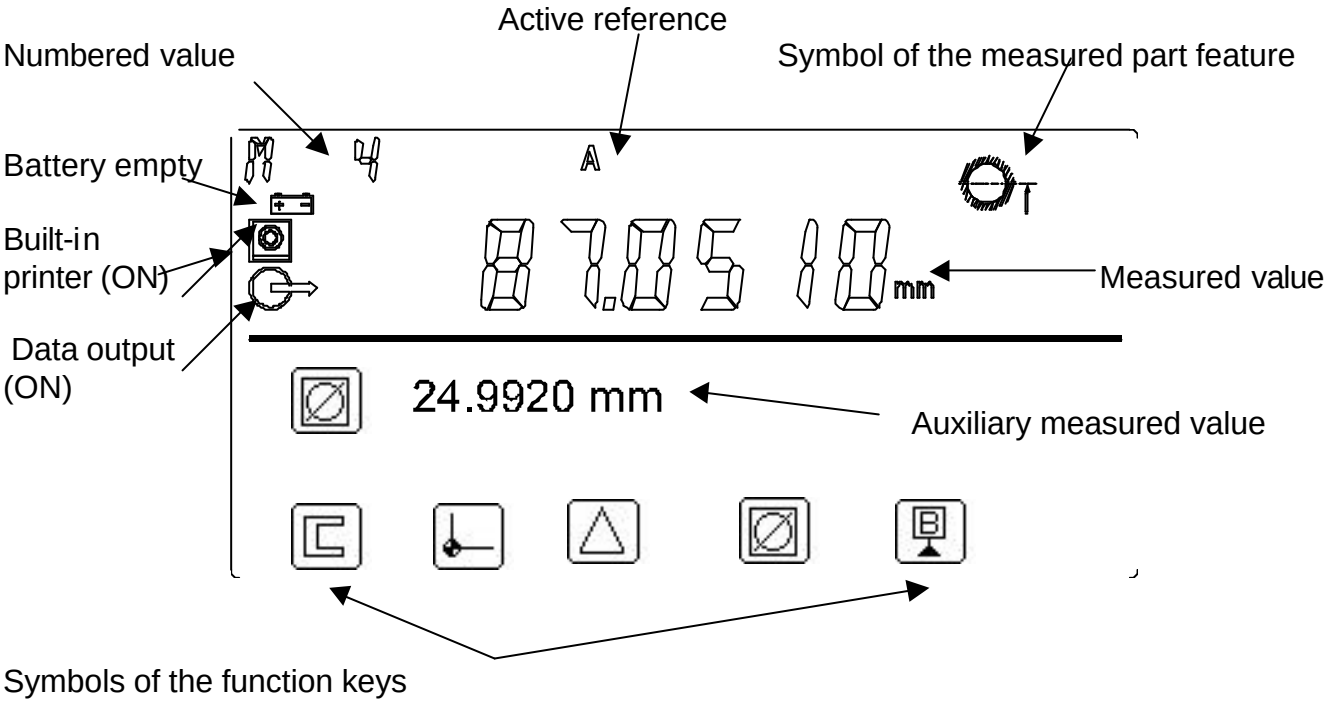
4) LC Display

Consists of one main display (upper part) plus one auxiliary display (lower part).
Display size: 128 x 63 mm.

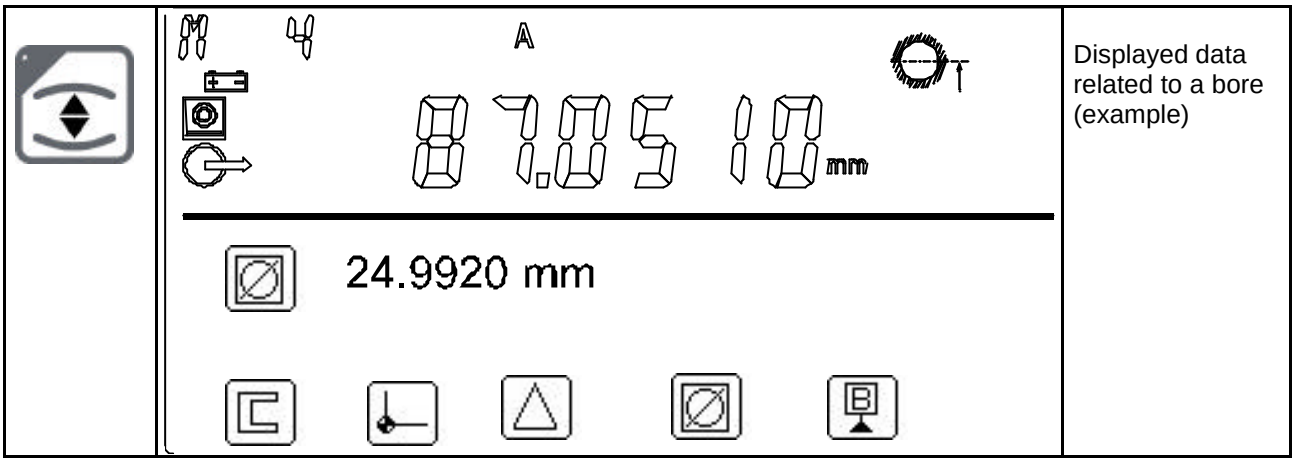
Main display is split into segments (7-segment/sign), providing high visibility necessary to inspect parts most accurately.
Auxiliary display is a dot display, allowing a wide number of symbols to be created to make the height gauge easy to use and to learn.

Display mode for:
- Length measurement: measured values plus symbols for the functions.
- Perpendicularity and straightness measurement: measured values plus symbols.

Digit size:
- Main display: 12,7 x 6,4 mm (7-decade display plus minus sign)
- Auxiliary display: 6,3 x 4,2 or 3,8 x 2,9 mm (7-decade display plus minus sign)



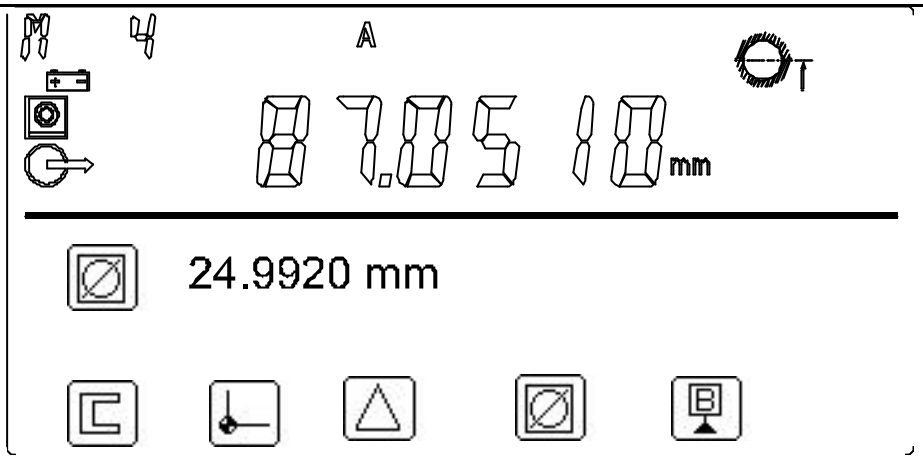
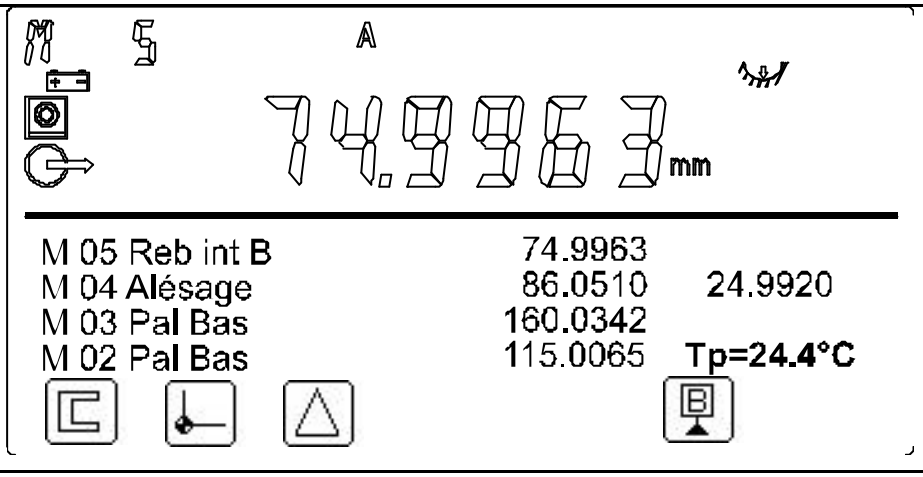
4.1) Main display



Displayed data related to a bore (example)

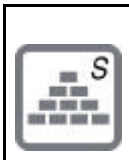
- F1 : Prompt for new probe constant
- F2 : Prompt for new capture of the relevant reference value (the counter of the measure is not reset to zero)
- F3 :
  1) Displaying of the difference value obtained from the last two displayed values
  2) Automatic displaying of the difference value obtained from the last two measured values
  3) Quit « Automatic displaying of the difference value obtained from the last two measured values »
- F4 :
  1) Temporary displaying of the difference value resulting from two probe contacts made on a bore, a shaft or a groove on the main display
  2) Continuous displaying of the difference value resulting from two probe contacts made on a bore, a shaft or a groove on the main display
  3) Quit « Continuous displaying of the difference value resulting from two probe contacts made on a bore, a shaft or a groove on the main display »
- F5 :
  1) Prompt for base reference B
  2) Prompt for base reference A

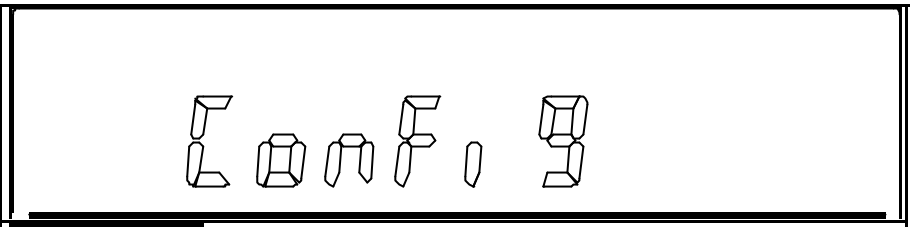
4.2) Display format in mode measurement

	Large	
		
	Small	
		Display shows the last measured value in a large format plus the last four ones in a small format (main and auxiliary display).

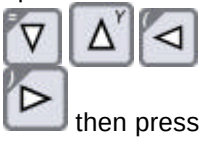
5) ***Configuration menu***  **:**

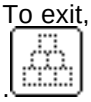
To access this menu, press key  . To exit this menu, either press F6 
or key 





A Unit format
B Language / Header
C Speed / Stabilisation
D General parameter
E Input / Output RS
F Printer
G Temperature compensation
H Date and time
I Header texte
J Default paramet.

Choose your option with  then press Enter to confirm . You may also access this menu directly by inputing the relevant letter.

To exit, press  .

To access submenus, press the key with the relevant letter or the arrow keys  to move the cursor. Next, confirm by pressing  .

To exit each submenu, press either of both following keys:

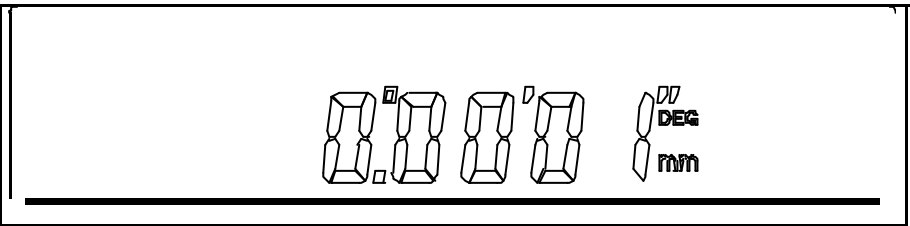
-  Use this key if you want to validate all changes before exiting.
-  Use this key if you want to delete all changes before exiting.

5.1) Unit format (A)

Allows you to choose the desired unit system for length and angle measurement as well as the resolution for the measurement results.

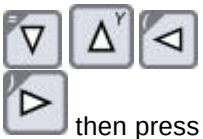
or

to confirm your selection



Unit format

Length: mm / inch
Resolution: 0.0001 / 0.001 / 0.01
Angle: DMS / DEG / RAD

Choose units and resolution with  then press  to confirm.

To delete all changes and return to the configuration menu, press 

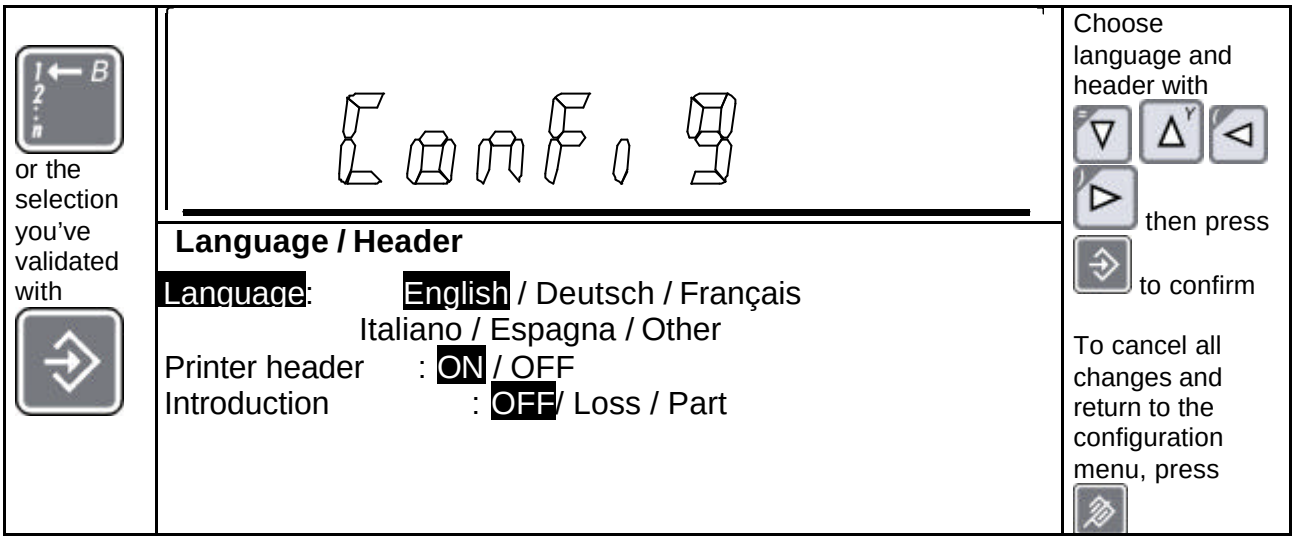
5.2) Language / Header (B)

Allows you to choose your preferred language. If you've selected Header, you may set the relevant parameters as follows:

OFF Can only be activated in the configuration menu (submenu 1).

Loss When starting up Execution of a part programme or pressing either key  or  . This option also prompts your control panel to reset the counter to zero.

Part When starting up Execution mode for measuring each single piece or pressing either key  or  . This option also prompts your control panel to reset the counter to zero.



5.3) Speed / Stabilisation (C)

Allows you to set the desired probe speed for fast displacement or for approaching the measuring point. During the waiting time given for stabilisation, the measured value may only vary to the extent of the limit value, which depends on the selected resolution.
Criteria:

Resolution to 0,0001 mm	Permissible variation < 0,5 µm
Resolution to 0,001 mm	Permissible variation < 1 µm
Resolution to 0,01 mm	Permissible variation < 5 µm

In most cases, we advise to activate the option AUTO for optimum waiting time and best results. The option % prompts you to validate your selection by pressing key  after each probe contact.

Your control panel will refer to the response times given for Displaying and Positioning when running a part programme. With respect to this, report to Executing a part programme (18) and Generating data files (17).

RS or the selection you've validated with	ConF, 9 **Speed / Stabilisation** Measuring speed : 7,5 / 15 mm/s Quick move : 20 / 30 / 40 mm/s Stabilisation : Auto / 0,5s/ 1s / 2s / % Display delay : 2s Positioning delay : 2s	Choose speed and stabilisation time with ▽ Δ ◁ ▷ then press to confirm To cancel all changes and return to the configuration menu, press Time limit :

5.4) General parameter (D)

Automat. number When set to ON, the measured values are stored in the memory (switching the instrument off will stop registration). When set to OFF, only the last two measured values are available for calculating a median or a distance.

Display When set to Large, display shows the last measured value in the upper part whilst the second one, if any, appears in the lower part, both in large format.
When set to Small, display shows the last measured value in large format in the upper part whilst the last four ones appear in a small format in the lower part.

Print With Manual, you won't be able to print until you press PRINT.
With Auto, printing occurs after each value acquisition or computing operation.

Beep : With ON, a loud beep sound warns you after each value acquisition.
With the sign ½, a weak beep sound warns you after each value acquisition.
With OFF, beep sound is disabled.

Auto OFF : With ON, the instrument switches itself off as soon as preset time is over.
With OFF, you won't be able to switch it off until you press ON OFF

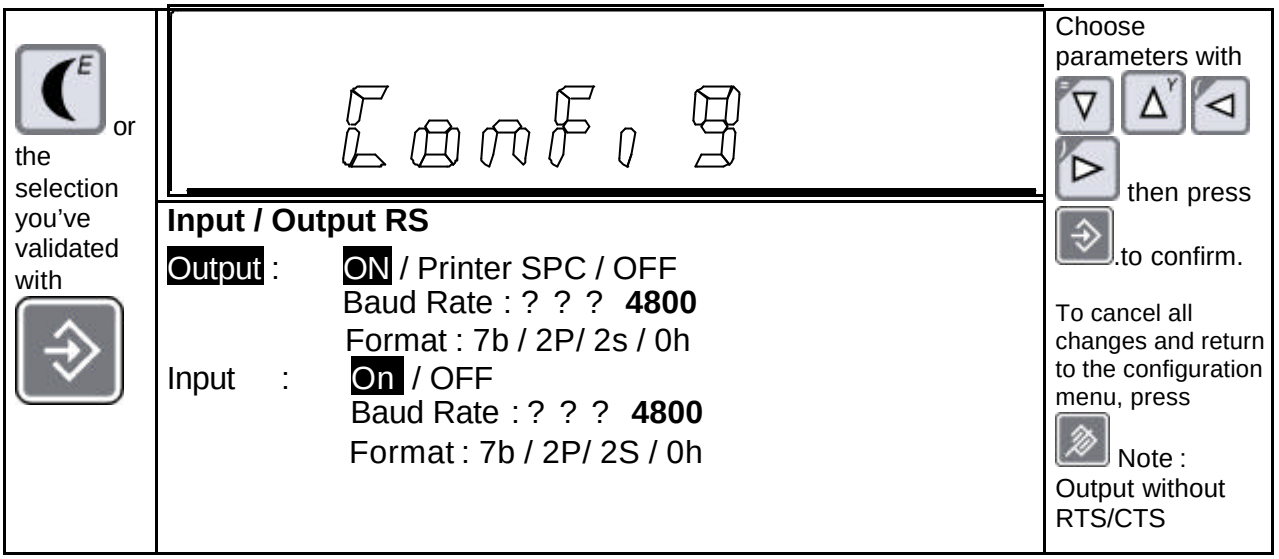
D or the selection you've validated with	ConF, 9 **General parameter** Automat. Number: ON / OFF Display : Big size / Small size Print : Manuel / Auto Beep : ON / ½ / OFF Ext. P : Print / Measurement Auto OFF : ON / OFF Delay : 20 (min)	Choose parameters with ▽ Δ ◁ ▷ then press to confirm To cancel all changes and return to the configuration menu, press Time limit: 2 to 999 min.

5.5) RS 232 input / output (E)

Allows both to be activated as well as the desired format to be selected.

Output With ON, output of the measured value only is prompted (Data output).
With Printer SPC, data output includes the header (if any) along with the number and type of the measured dimension.
With OFF, data output is disabled.

Input With ON, data input is enabled.
With OFF, data input is disabled.

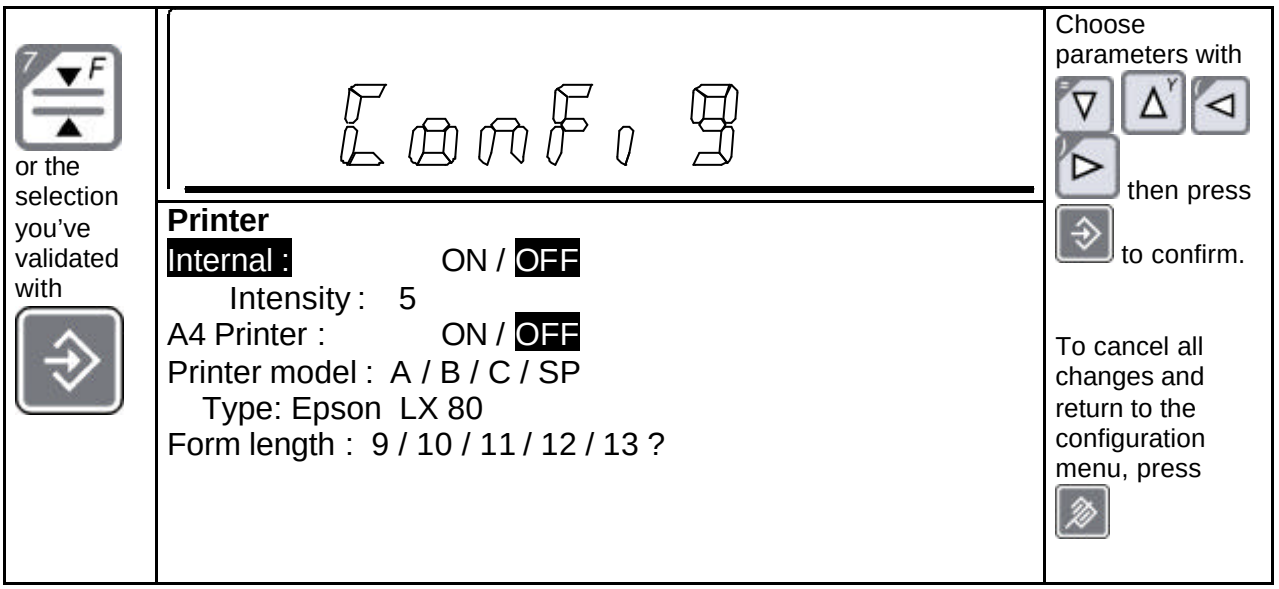


5.6) Printer (F)

Allows you to activate the built-in printer (Model 00760220) along with the Centronics output of the A4 printer. The drivers you may choose are the following:

A) Epson LX 80
B) HP PCL (Ex:: HP Laser Jet 1200 series)

You're also allowed to select the desired paper length (9 to 13 inches). Standard length is 12 inches.



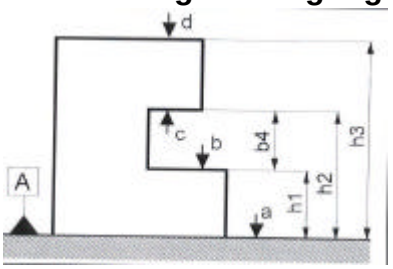
5.7) Temperature compensation (G)

If you're working in room that has no air-conditioning or if temperature of the workpiece is high, you may ask for a correction of the measured value while taking the variation in temperature of the workpiece into account along with its coefficient of linear expansion. To have this done, set Temperature Compensation to ON, then enter the temperature value of the workpiece with its related coefficient. The height gauge temperature will automatically be measured by the sensor at half height of the column.

You may input the workpiece temperature in either of the following ways:

- OFF: for use of the preset value from the configuration menu.
- Keyboard: for changing the value through the keyboard in measurement mode.
- RS : for capturing the value via the RS port in measurement mode.
- RS Auto : for automatic value capture via the RS port before each probe contact.

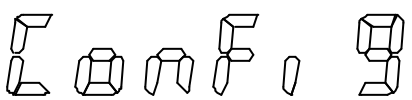
Switching the height gauge off causes your selection to be lost.



All values captured in this way will be corrected based on the following information:

T_R : Reference temperature (default value : 20°C)
T_C : Height gauge temperature
T_P : Workpiece temperature
a_C : Coefficient of linear expansion of the height gauge (fixed value available from the column)
a_P : Coefficient of linear expansion of the workpiece
H_{PM} : Workpiece height as measured
H_{PC} : Workpiece height once corrected

$$H_{PC} = H_{PM} * (1 + a_C (T_C - T_R) - a_P (T_P - T_R))$$

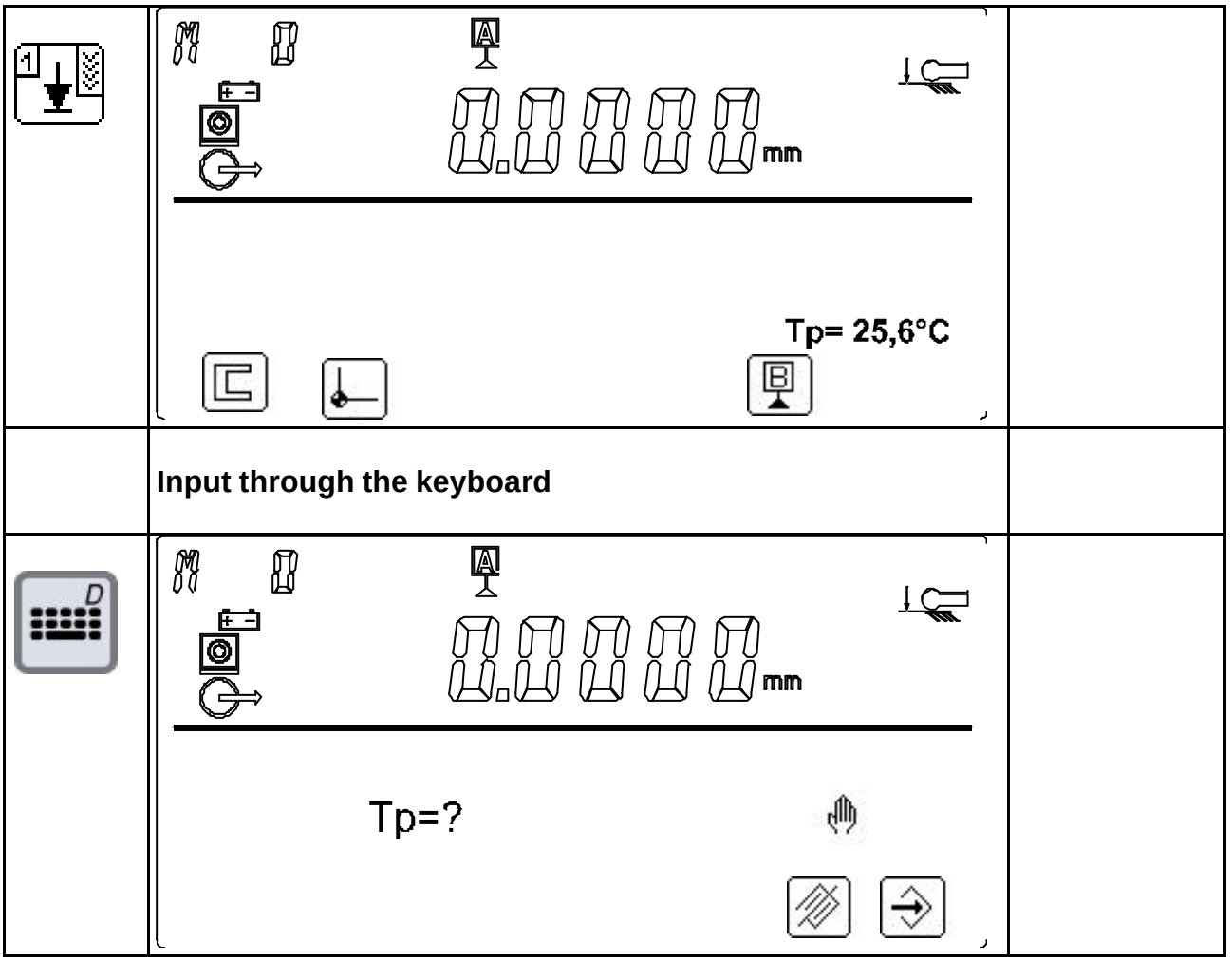
 or the selection you've validated with 	 **Temperature compensation** Compensation: ON / OFF Reference temp. : 20.0°C Part temp. : 25.9°C Part coef: 11.5 E-6 / K Temperature input : OFF / Keyboard / RS / RS Auto	Choose parameters with  then press  to confirm. To cancel all changes and return to the configuration menu, press  Temp + Coeff limit : -99.9 to 999.9

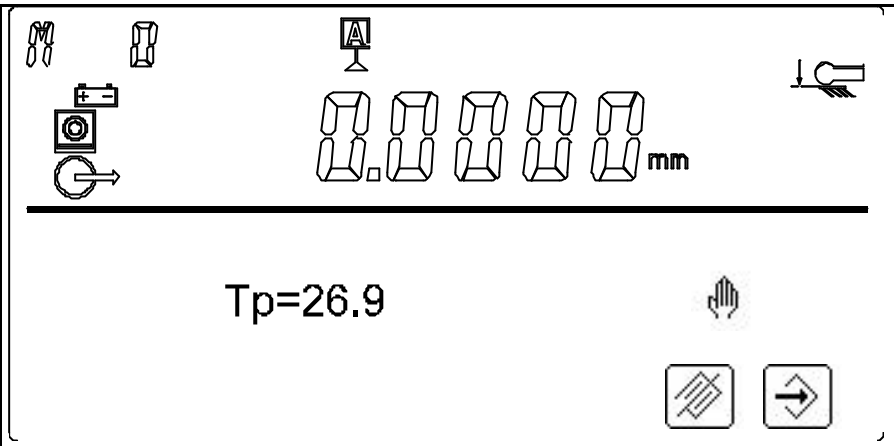
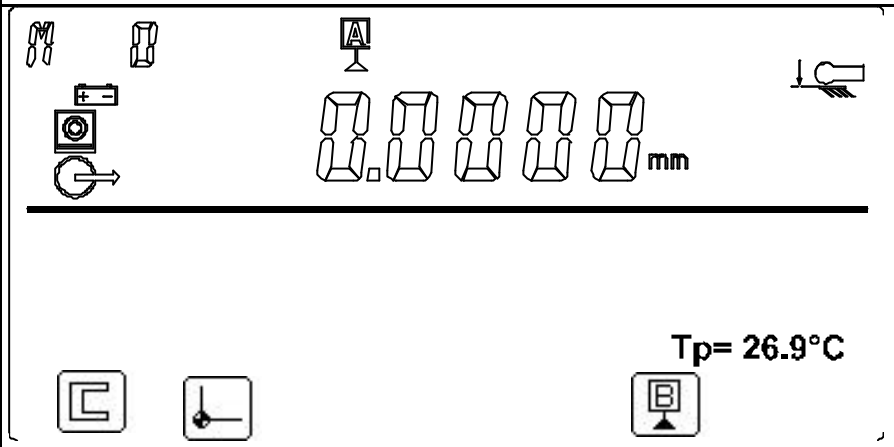
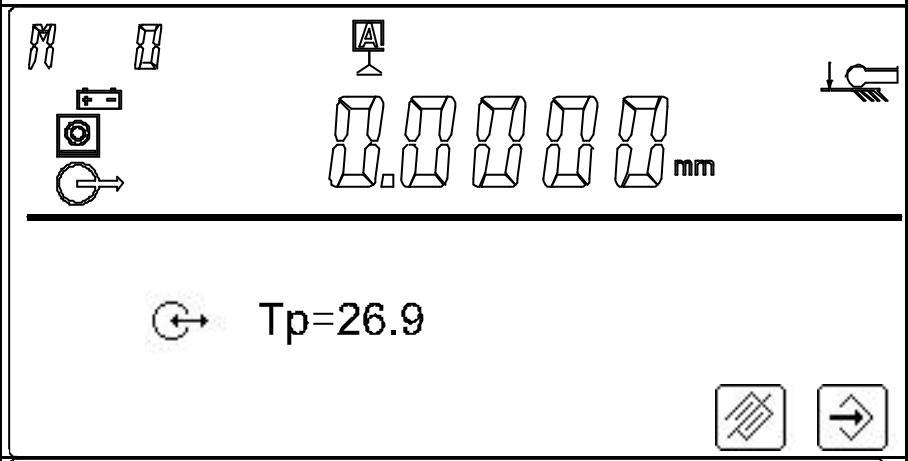
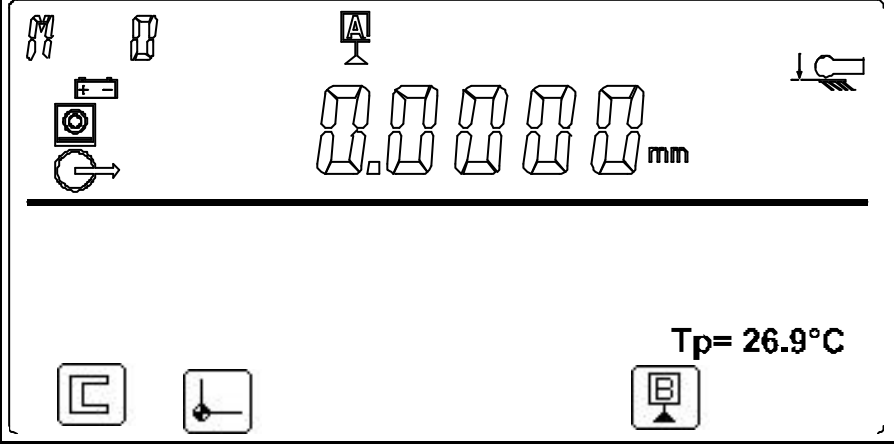
Height gauge temperature is displayed as the reference value is being captured.
Workpiece temperature appears continuously after each probe contact.

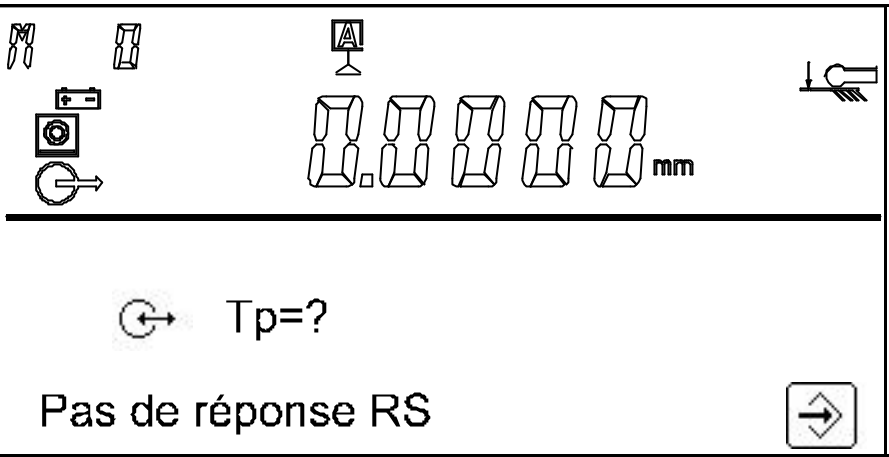
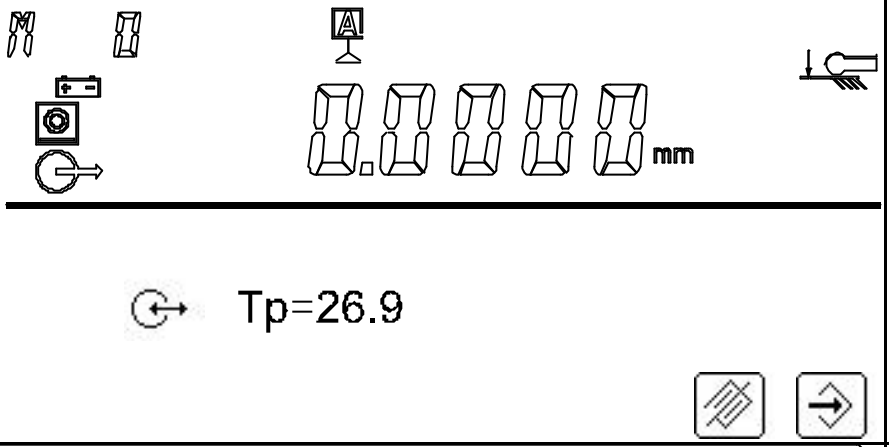
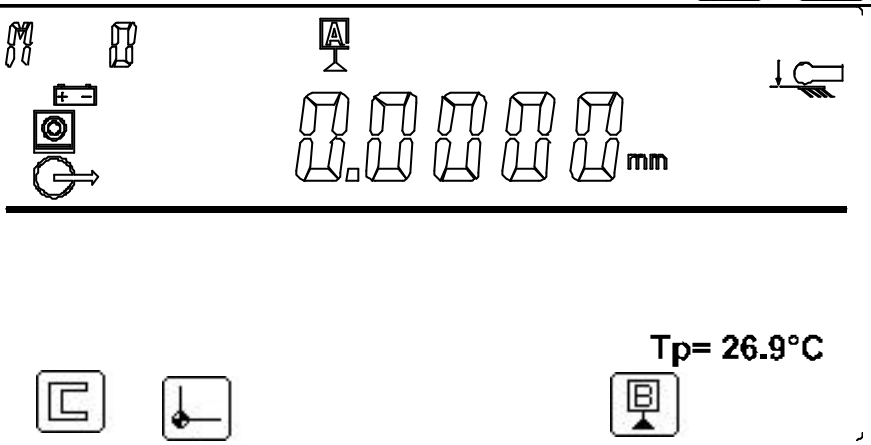
Entering workpiece temperature

- In measurement mode with numbering excluded, you're always allowed to enter the workpiece temperature. Tough displayed value will not be assigned, the correction along with the new value for Tp will be effective with the next probe contact.
- In measurement mode with numbering included, you are not allowed to enter any value unless you've captured the first reference value or press the key  or  to reach M0.
- In mode Executing a part programme, you may input the workpiece temperature as soon as the measurement process for a single workpiece or a part series is started.

Inputs (example)

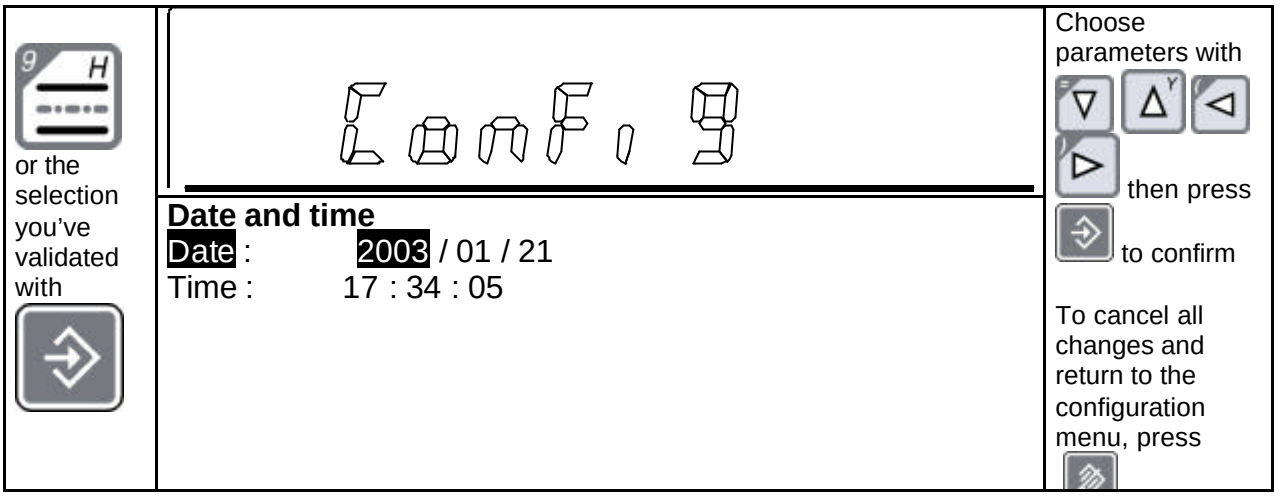


Digit input 26.9		Enter temperature value through the keyboard
or		New value will be further input in the configuration menu **Warning: If the reference is on the workpiece**
	Manual input via RS port	
RS		Press the RS key for value capture using this port
or		Press Enter to confirm value capture. New value will be further input in the configuration menu. **Warning: If the reference is on the workpiece**

		If Rs port does not answer once prompted, a message appears to warn you.
	Automatic input via RS port	
No operation is required		Display shows temperature value
 or 		Press Enter to confirm value capture. New value will be further input in the configuration menu. **Warning:** **If the reference is on the workpiece**

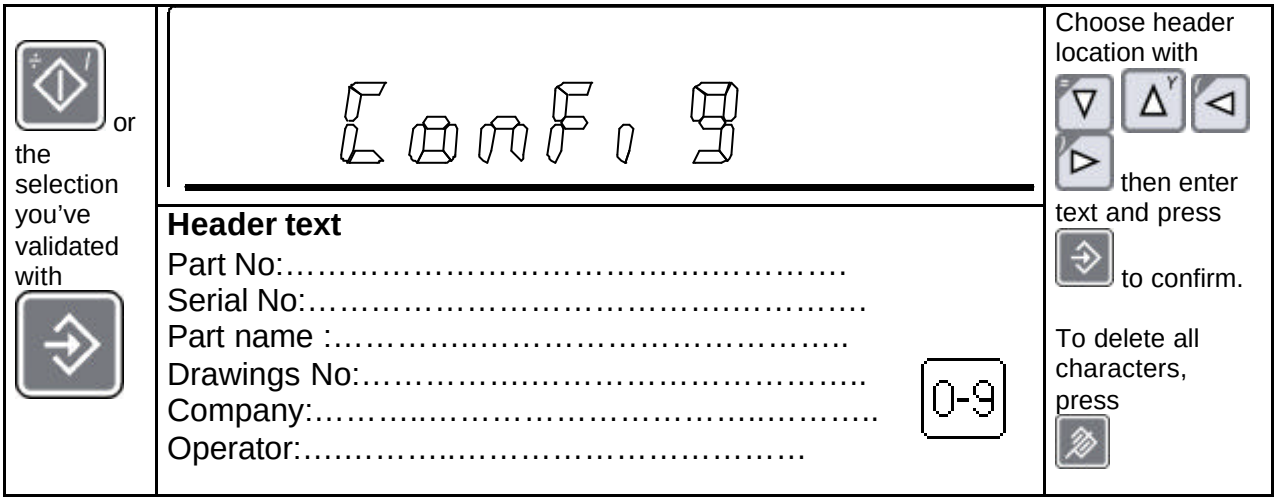
5.8) Date and time (H)

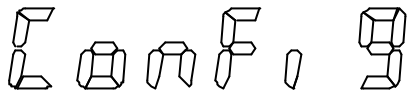
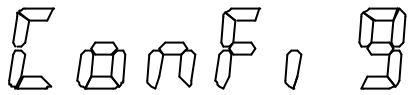
Lets you enter the date and the time. Since your control panel includes a back-up type battery, these data remain stored in the memory even after the height gauge has been switched off.



5.9) Header text (I)

Predefined header provides 6 lines that can be complemented using the arrow plus alphanumeric keys. This 6-line header may also be entirely modified if necessary. The text you can edit using this option will include 31 characters per line. The header you've edited will remain stored even after the language has been changed or the height gauge switched off. To have the predefined lines appearing in the chosen language, the default header needs to be reinitialised (report to submenu J for more information).



0-9 Alpha/ numerical conversion	 **Header text** Part No:…… Serial No:…… Part name :…….. Drawings No:…….. Company:…….. Operator:…….. A-Z	Choose header location with ▽ △ ◁ ▷ then enter text and press ⏎ to confirm. To delete all characters, press ⌫
A-Z Alpha/ numerical conversion	 **Header text** Part No:…… Serial No:…… Part name :…….. Drawings No:…….. Company:…….. Operator:…….. 0-9	Choose header location with ▽ △ ◁ ▷ then enter text and press ⏎ to confirm. To delete all characters, press ⌫

5.10) <u>Default parameters (J)</u>

Use this option if you want to reset all configuring parameters to the default values.

If so, answer All to Parameters and Yes to Are you sure. Then Press ⏎ to confirm.

To reinitialise the header lines only, select Header and Yes, then press ⏎ to confirm.

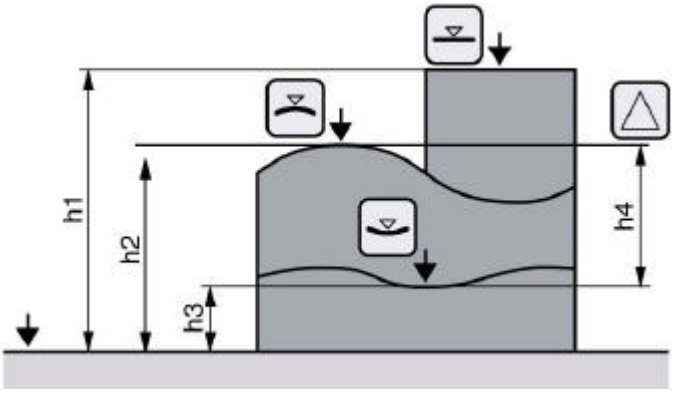
J or the selection you've validated with ⏎	 **Default parameter** Parameter : All / Header Are you sure: No / Yes	Choose parameters with ▽ △ ◁ ▷ then press ⏎ to confirm To cancel all changes and return to the configuration menu, press ⌫

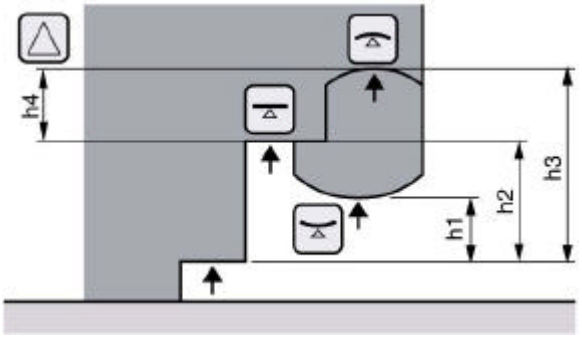
6) ***Features and functions***

6.1) ***Measuring lengths using the function « Single probe contact »***

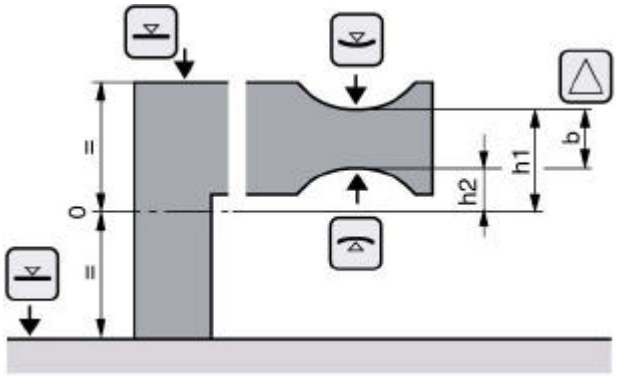
Used function keys: 

Without inversion of the probing direction:



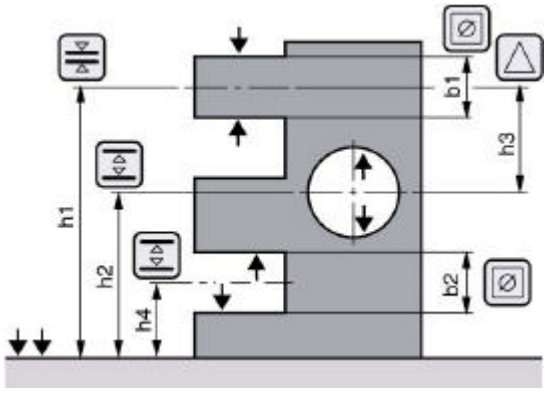


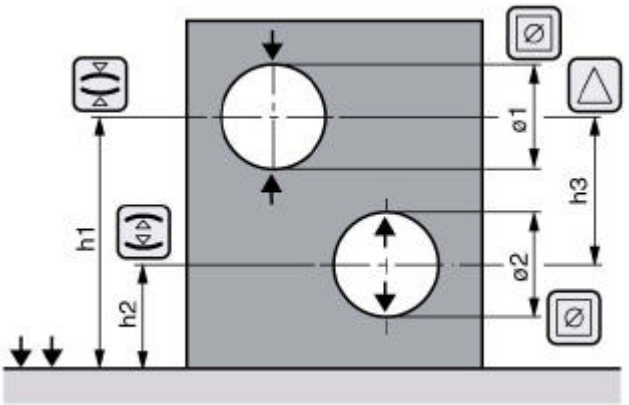
With inversion of the probing direction:



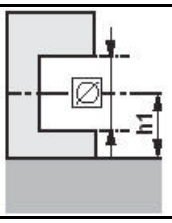
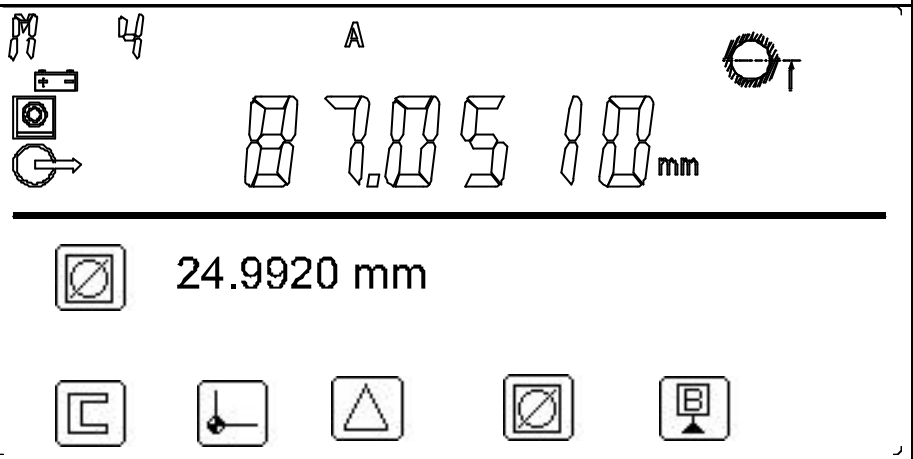
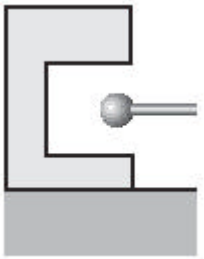
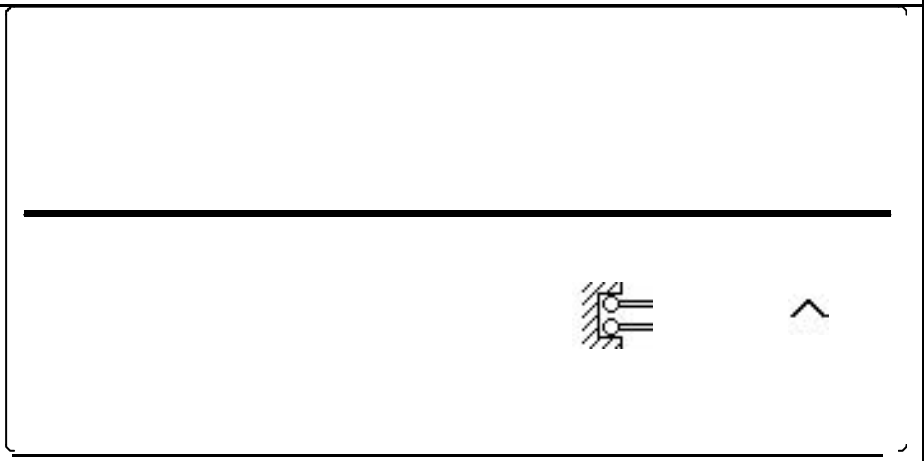
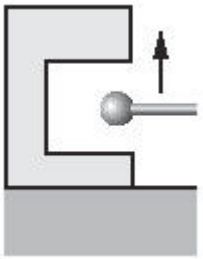
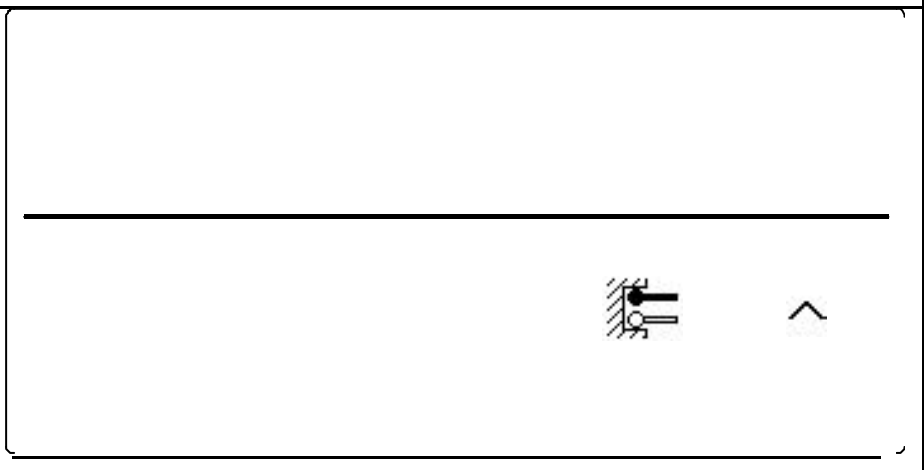
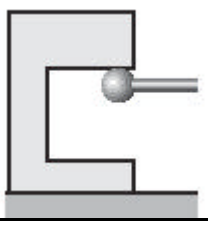
6.2) ***Measuring lengths using the function « Dual probe contact »***

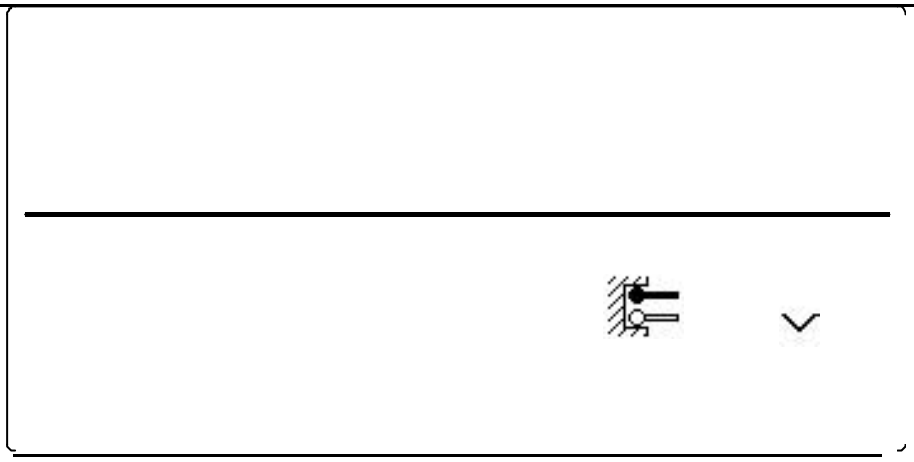
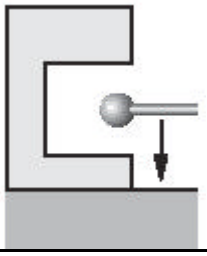
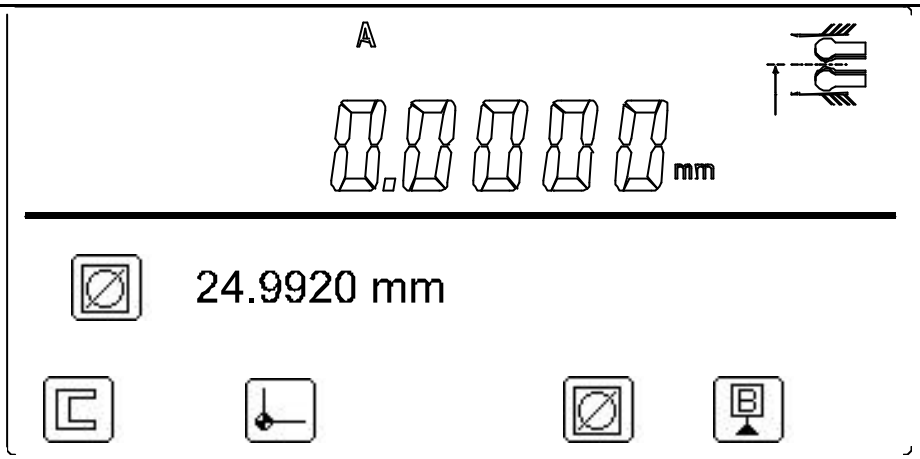
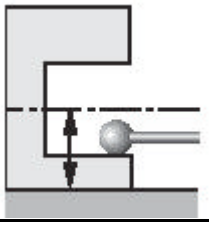
Used function keys: 



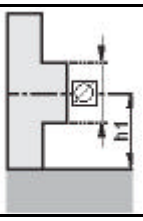
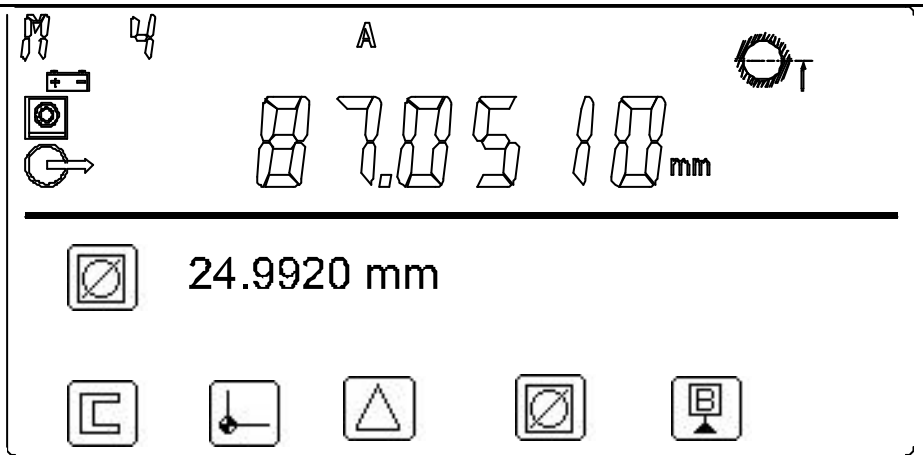
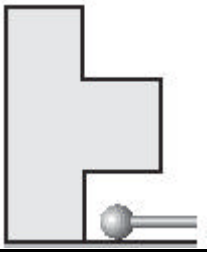


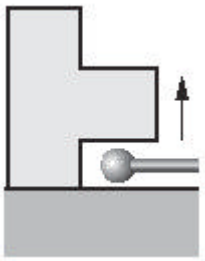
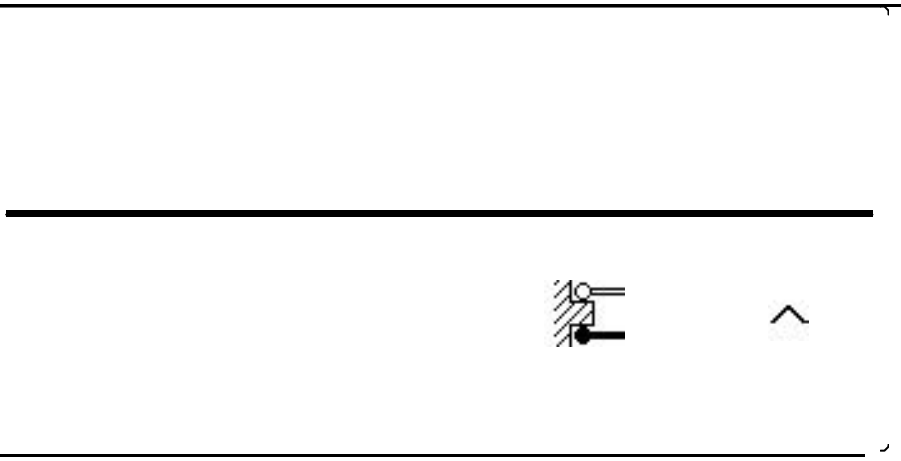
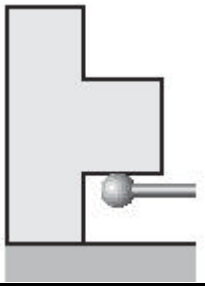
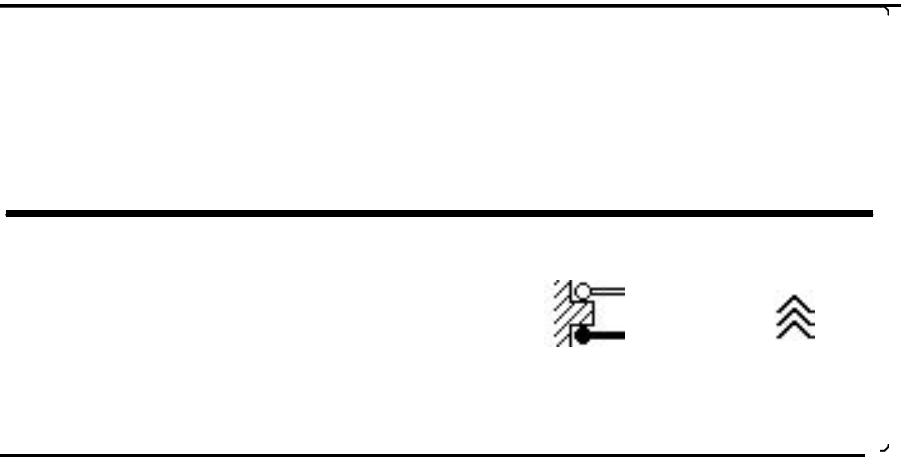
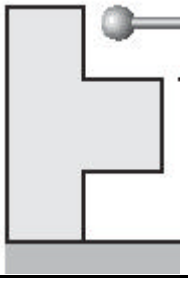
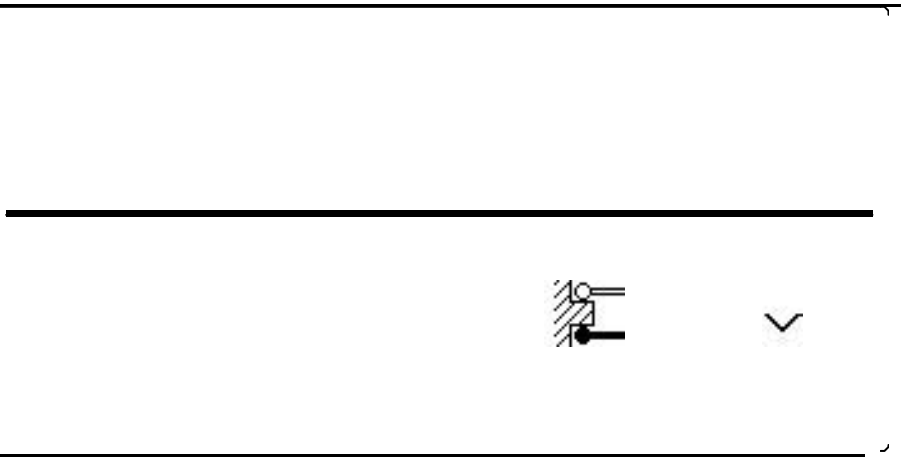
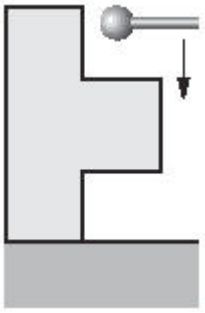
6.3) ***Measuring grooves*** :

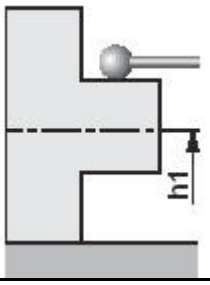
	Probing procedure	
		Position probe insert in the groove by pressing both positioning keys or rotating the power control. 
		Probe moves up automatically for first value capture. 
		Single probe symbol appears as first value is being captured. Once retracted, probe insert comes to a standstill. 

		Probe moves down automatically for capturing second value. Probe displacement can be accelerated by means of the rotary power control 
		Probing procedure is ended. Probe retraction occurs automatically. Display switches over to normal display. 

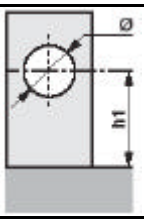
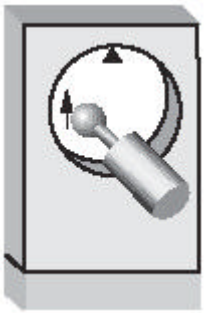
6.4) <u>Measuring ribs</u> :

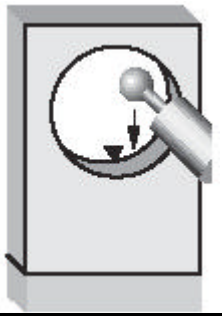
	Probing procedure	
		Position probe insert below the rib by pressing both positioning keys or rotating the power control. 

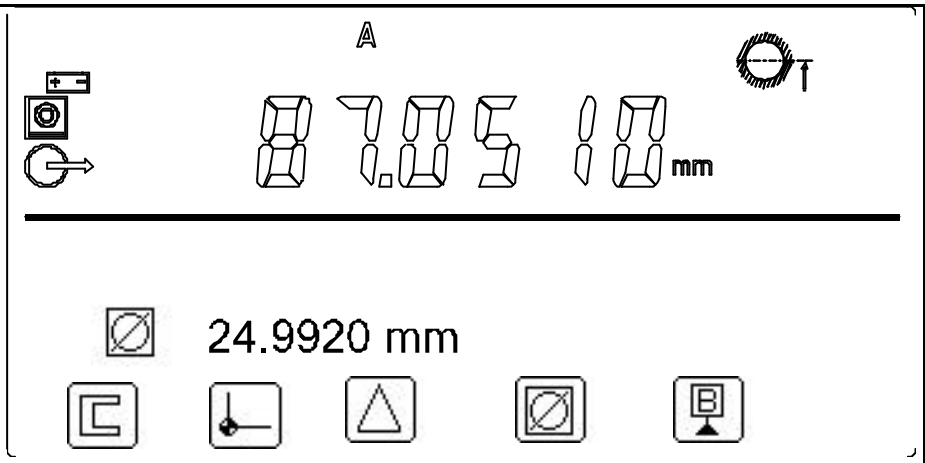
		Probe moves up automatically for first value capture. 
		Single probe symbol appears as first value is being captured. Once retracted, probe insert comes to a standstill. 
		Position probe insert above the rib by pressing both positioning keys or rotating the power control. 
 or rotating the power control by one click		Probe moves down automatically for capturing second value. 

	A 0.0000 mm 24.9920 mm	Probing procedure is ended. Probe retraction occurs automatically. Display switches over to normal display. 

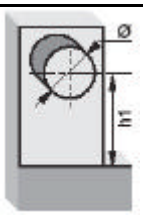
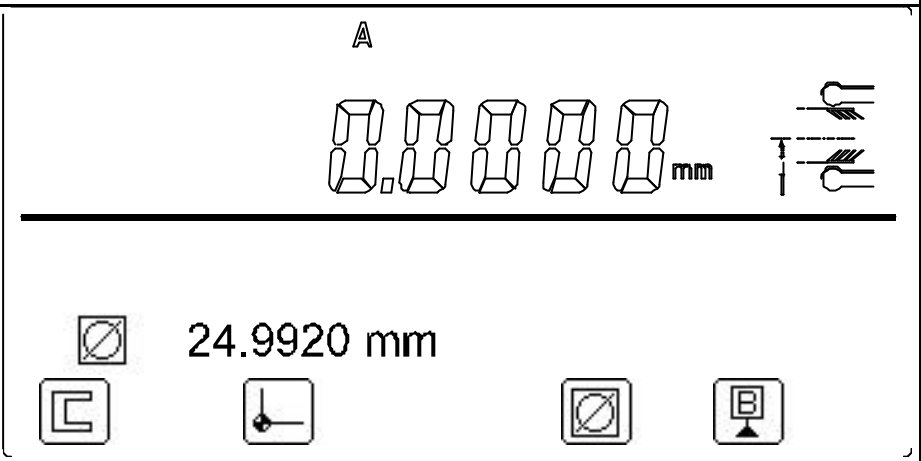
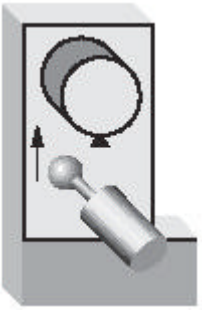
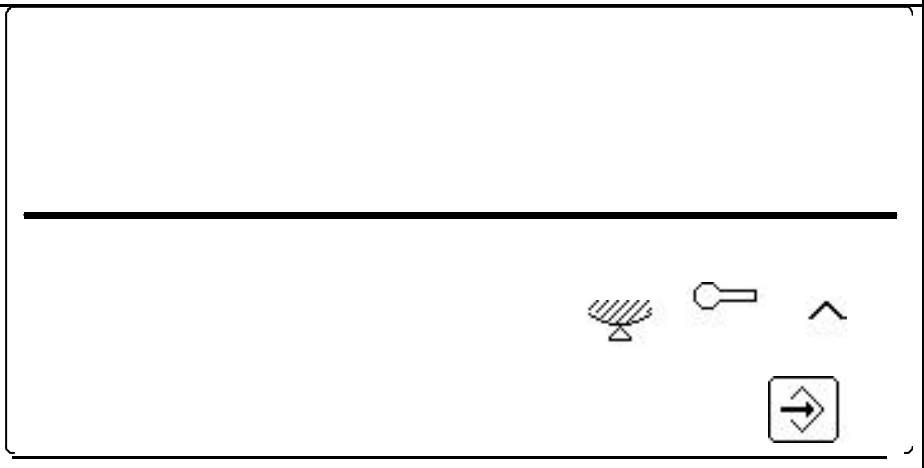
6.5) Measuring bores :

	Probing procedure	
	A 0.0000 mm 24.9920 mm	Position probe insert into the bore using both positioning keys or the rotary power control. Release measurement cycle by pressing the relevant function key or lightly rotating the power control twice in the direction you want to start probing.
		Probe moves up 

		Probe symbol appears as soon as probe insert has stabilised after contacting the workpiece feature.
	Moving the workpiece (or the vertical column) laterally allows automatic detection of the culmination point with a BEEP sound and highlighted probe symbol to warn you. This point must be probed once (default setting). But, you may choose to travel past this point twice by pressing the ENTER key. If the value dispersion is exceeding 10 µm, an acoustic signal prompts you to repeat the probing procedure. The option you've selected remains stored for each probe contact with detection of the culmination point. To return to the single probe contact option, press the Enter key again or switch the height gauge off.	
		Highlighted symbol for detection of the culmination point.
		Probe moves down. For faster displacement, use the rotary power control. 

		Probe symbol appears as soon as probe insert has stabilised after contacting the workpiece feature.
	Moving the workpiece (or the vertical column) laterally allows automatic detection of the culmination point with a BEEP sound and highlighted probe symbol to warn you. This point must be probed once (default setting). But, you may choose to travel past this point twice by pressing the ENTER key. If the value dispersion is exceeding 10 µm, an acoustic signal prompts you to repeat the probing procedure.	
		Once culmination point is detected, probing procedure is ended. Probe retraction occurs automatically. Display switches over to normal display. 

*6.6) **Measuring shafts***

	Probing procedure	
		Position probe insert below the diameter to be measured by pressing both positioning keys or rotating the power control. Release the measurement cycle by pressing the relevant function key.
		Probe moves up. 
		Probe symbol appears as soon as probe insert has stabilised after contacting the workpiece feature.

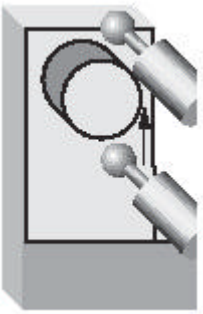
Moving the workpiece (or the vertical column) laterally allows automatic detection of the culmination point with a BEEP sound and highlighted probe symbol to warn you.
This point must be probed once (default setting). But, you may choose to travel past this point twice by pressing the ENTER key.
If the value dispersion is exceeding 10 µm, an acoustic signal prompts you to repeat the probing procedure.
The option you've selected remains stored for each probe contact with detection of the culmination point. To return to the single probe contact option, press the Enter key again or switch the height gauge off.

Highlited symbol for detection of the culmination point.

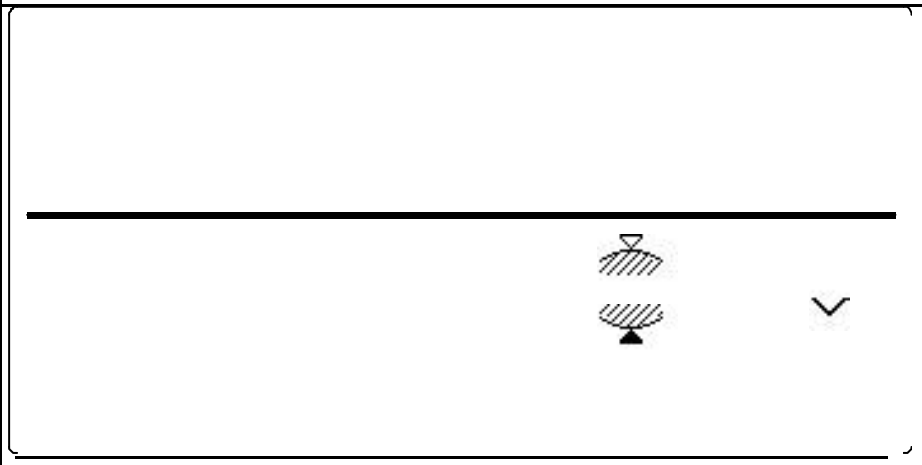
Once retracted, probe insert comes to a standstill.

or use the **rotary power control**

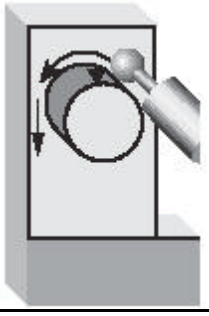
Position probe insert above diameter to be measured by pressing both positioning keys or rotating the power control.

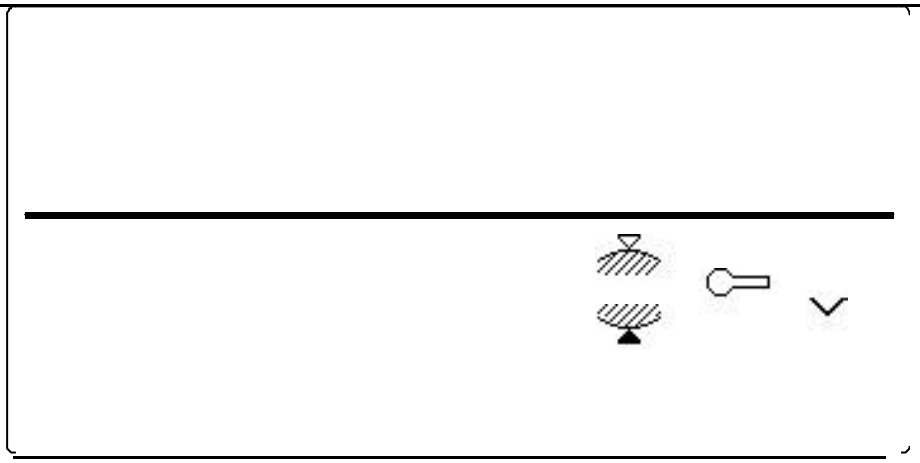
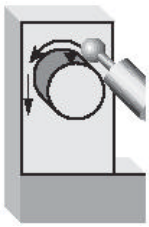
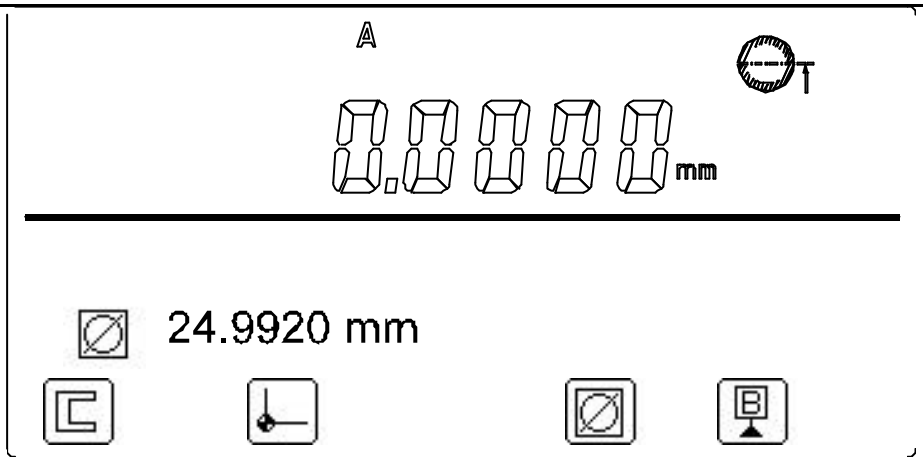


or **rotate power control by one click**



End measurement cycle by pressing ENTER or rotating the power control. Probe moves down.



		Probe symbol appears as soon as probe insert has stabilised after contacting the workpiece feature.
	Moving the workpiece (or the vertical column) laterally allows automatic detection of the culmination point with a BEEP sound and highlighted probe symbol to warn you. This point must be probed once (default setting). But, you may choose to travel past this point twice by pressing the ENTER key. If the value dispersion is exceeding 10 µm, an acoustic signal prompts you to repeat the probing procedure.	
		Once culmination point is detected, probing procedure is ended. Probe retraction occurs automatically. Display switches over to normal display. 

6.7) Calculating a median

Provided the value numbering option is not selected, you can access this function any time by pressing . The median is usually calculated from the measured values obtained for both part features that were last displayed.

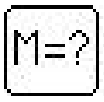
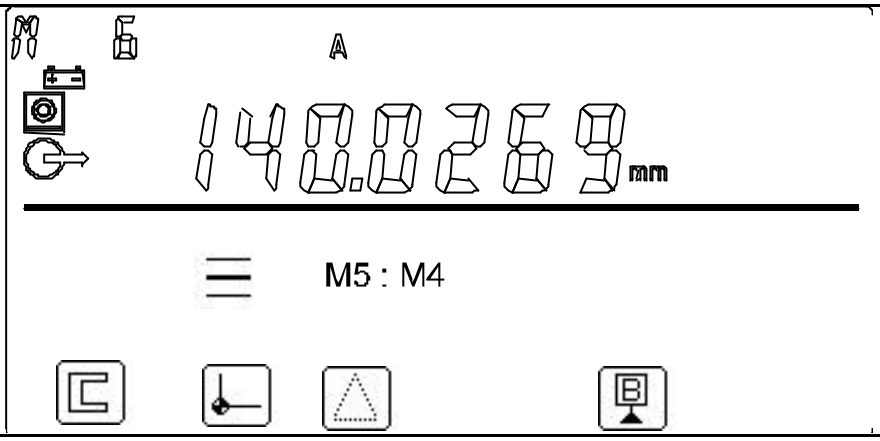
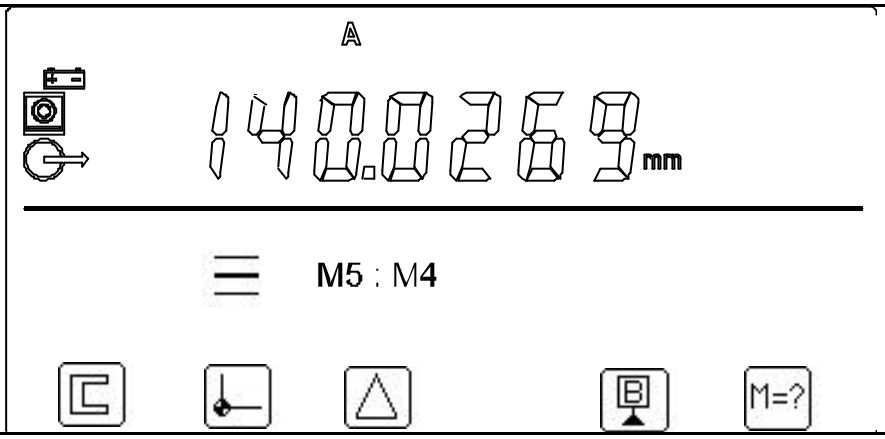
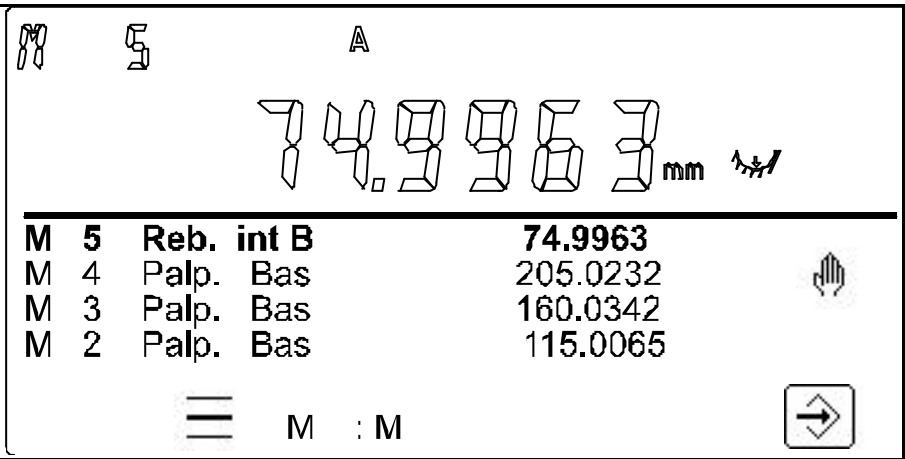
	M 04 205.0232 mm	
	M 05 74.9963 mm	
	140.0269 mm M5 : M4 M=?	Calculation of the mean value of the two part features you've last measured

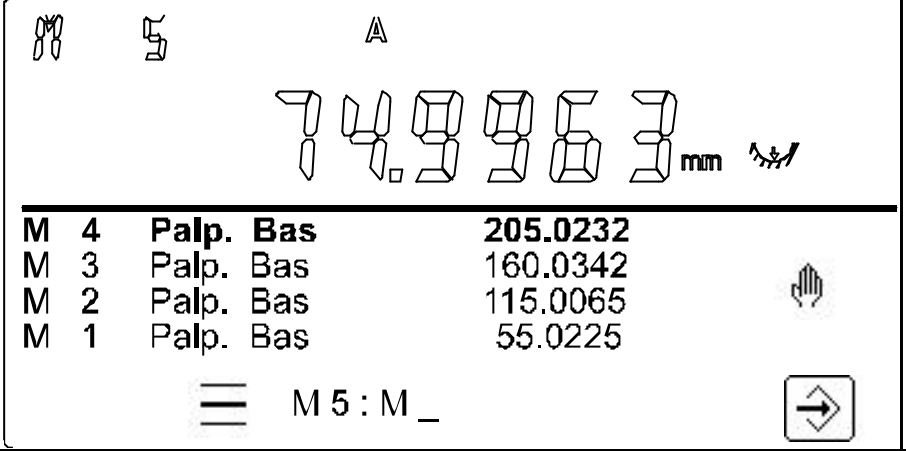
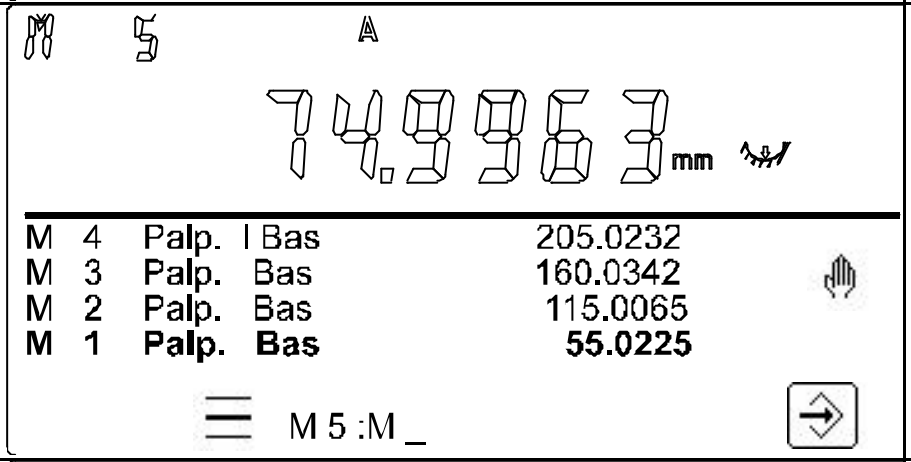
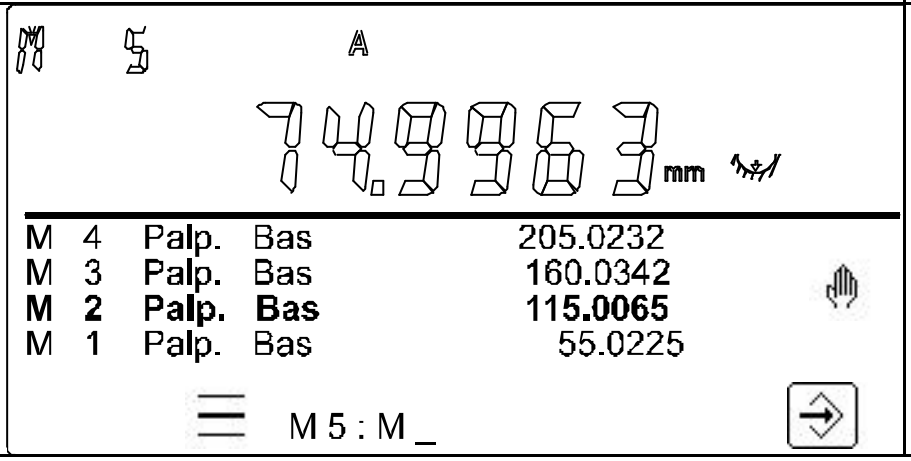
At this point, your Power Panel *plus* M gives you the choice between three possibilities :

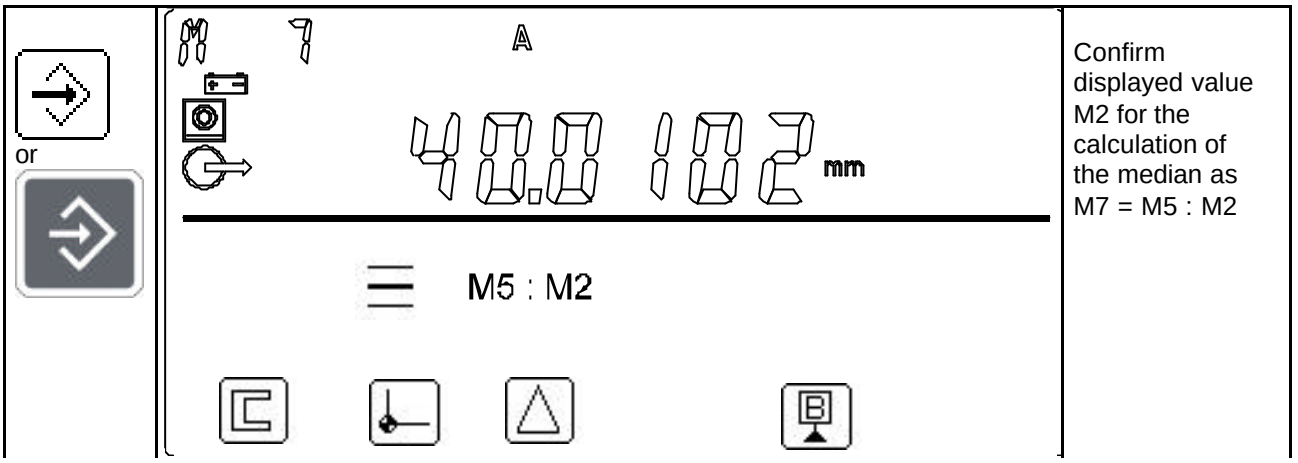
- Store median value as a M06 dimension with the aid of the function key F6 M=?

Skip value storage and access directly the function by pressing  for calculating a new median (M ? ? M ?)

- Skip value storage when carrying out the measurement directly

	Registering median value as dimension **M6 = (M05 :M04)**	
		Acknowledged median value as dimension.
	Prompting median function	
		Calculation of the mean value of the two part features you've last measured.
	Calculating the median based on chosen or keyed in values	
		Auxiliary display shows the last four measured values from the table. Higher value appears highlighted.

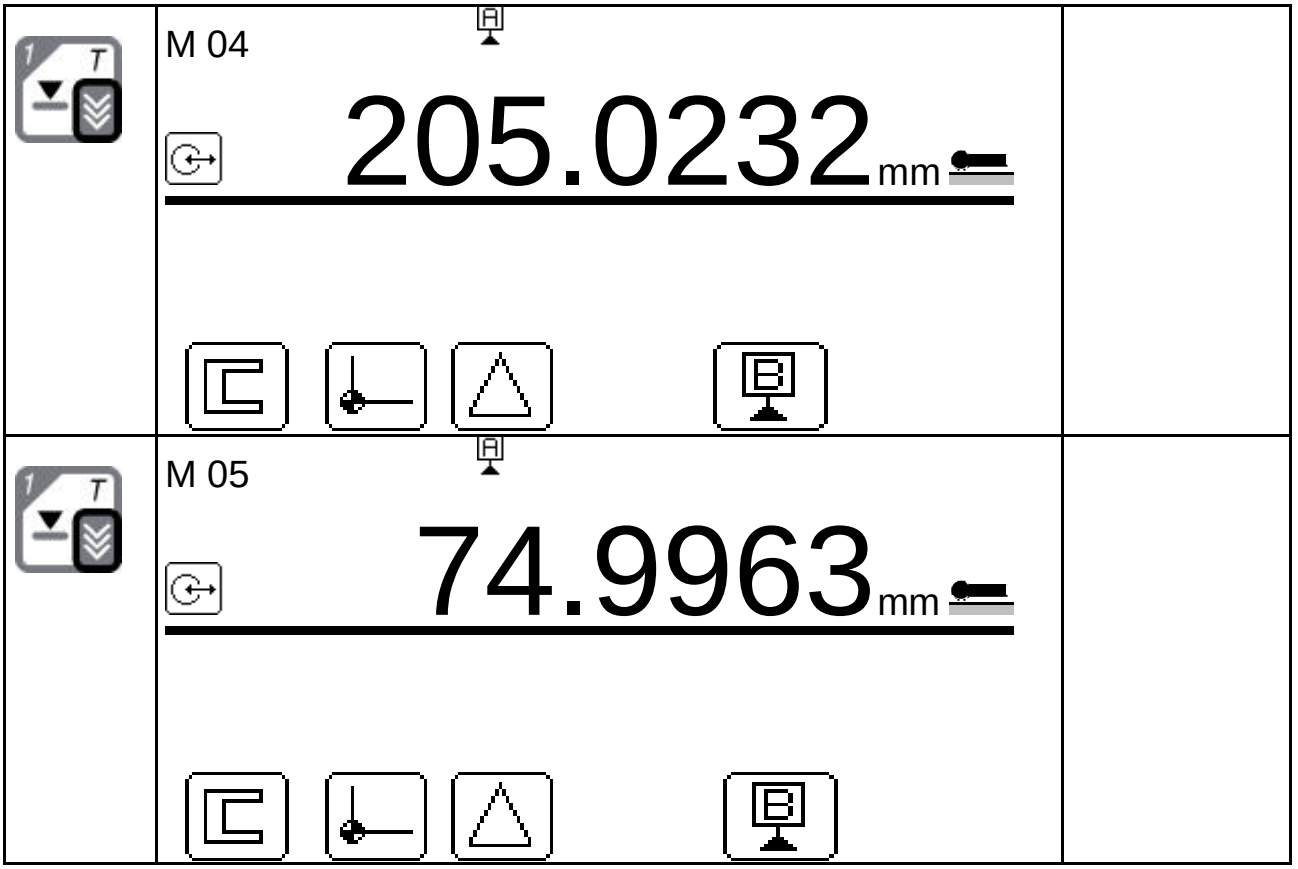
	Skip one measured value upwards Skip one measured value downwards Skip one page (4 values) upwards Skip one page (4 values) downwards	Choose desired values using the arrow keys or enter value number through the keyboard
		Display shows desired value (M5) along with the last four ones from the table. Higher value is highlighted.
3 times Or		Choose displayed value M1 as first parameter for calculating the median.
		Choose displayed value M2 as second parameter for calculating the median.

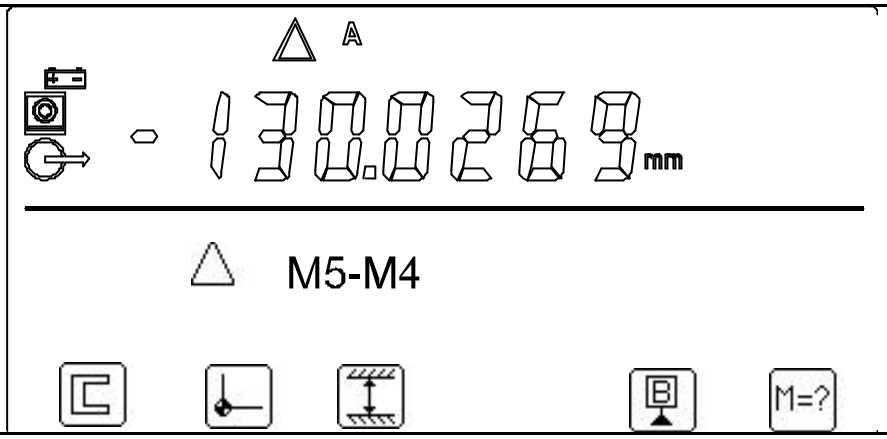


Confirm displayed value M2 for the calculation of the median as M7 = M5 : M2

6.8) Calculating distances

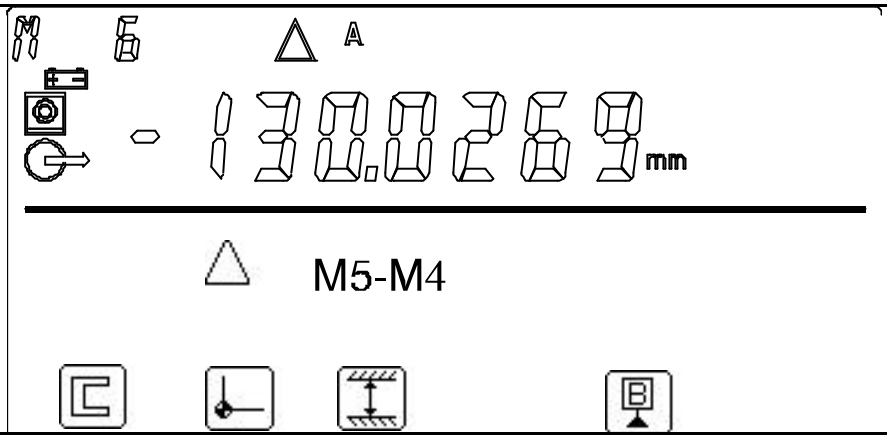
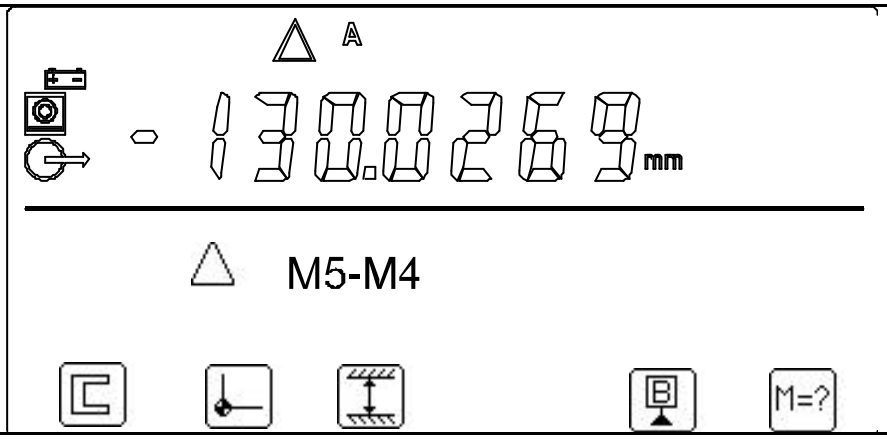
Providing the option Value Numbering was not selected earlier, you can access this function any time by pressing . A distance value is usually calculated from the measured values obtained for both part features that were last displayed.



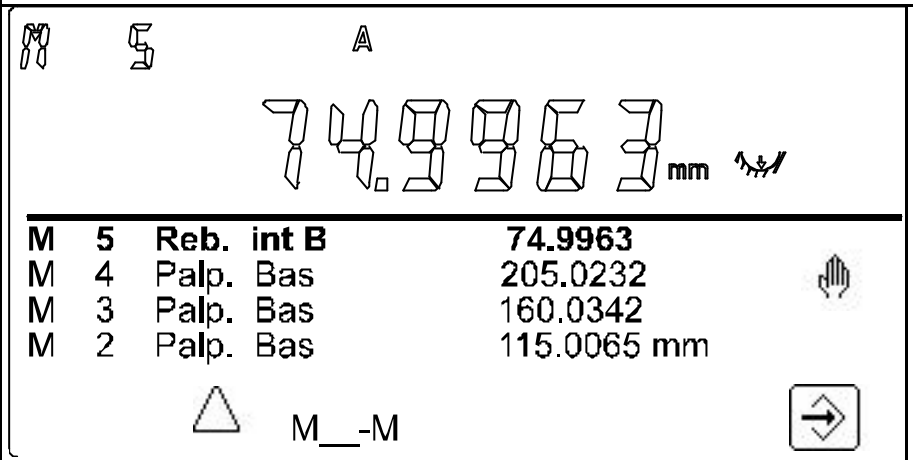
or		Calculation of the distance between both part features you've last measured.

At this point, your Power Panel *plus* M gives you the choice between the following possibilities:

- Store distance value as M06 dimension by pressing function key F6 M=?
- Skip value storage and access directly the function by pressing for calculating a new distance (M ? - M ?)
- Skip value storage and take the measurement directly.

	Registering distance value as dimension M6 = (M05-M04)	
M=?		Acknowledged distance value as dimension
	Prompting distance function	
		Calculation of the distance between both part features you've last measured.

Calculating distance value based on chosen or keyed in values



Auxiliary display shows the last four values from the table. Higher value is highlighted.

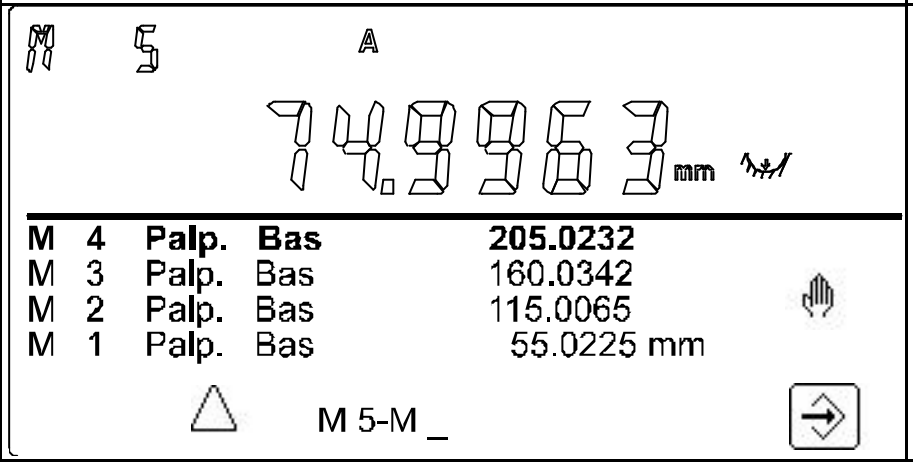
Skip one measured value upwards.

Skip one measured value downwards.

Skip one page (4 values) upwards.

Skip one page (4 values) downwards.

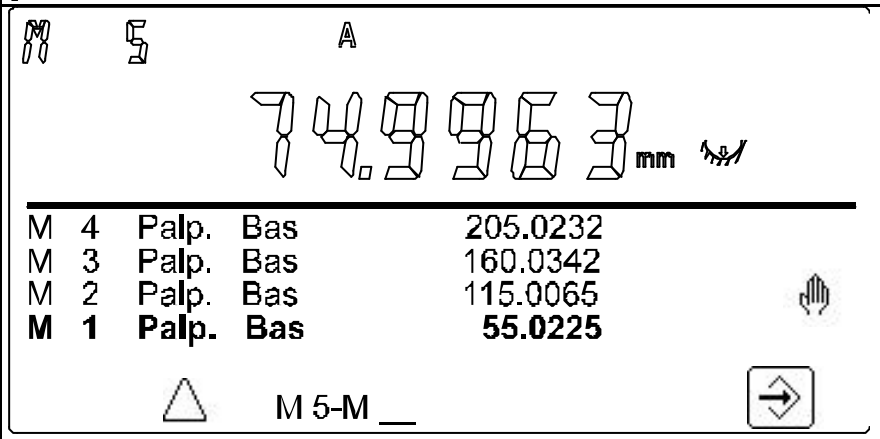
Choose desired values using the arrow keys or enter value number through the keyboard..



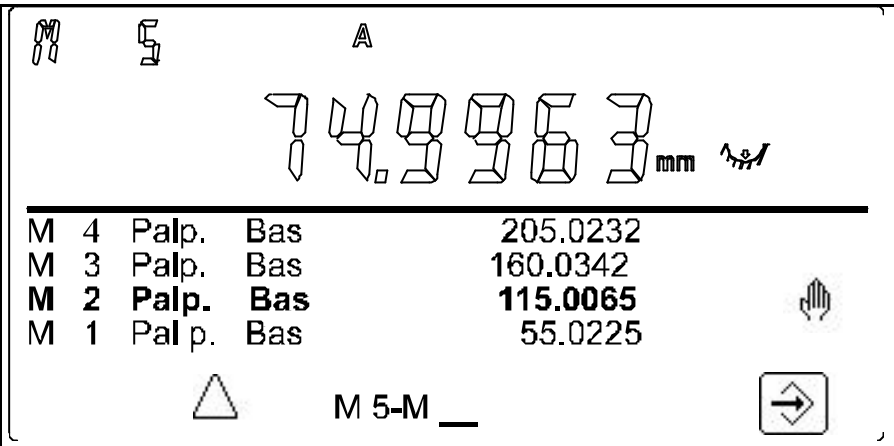
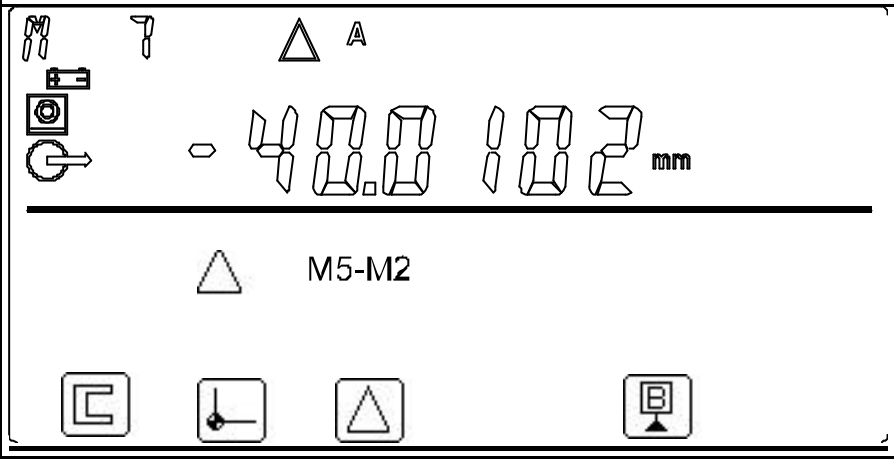
Display shows desired value (M5) along with the last four ones from the table. Higher value is highlighted,

3 times

Or



Choose displayed value M1 as first parameter for calculating distance value.

		Choose displayed value M2 as second parameter for calculating distance value.
 or 		Confirm displayed value M2 for the calculation of distance value M7 = M5 - M2

*6.9) **Measuring a diameter or a width** :*

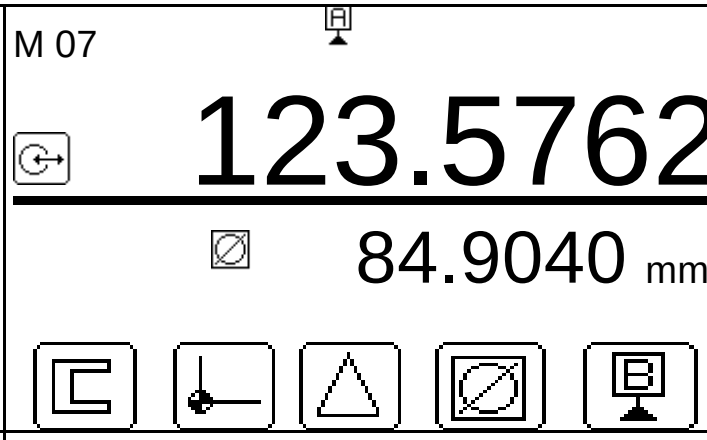
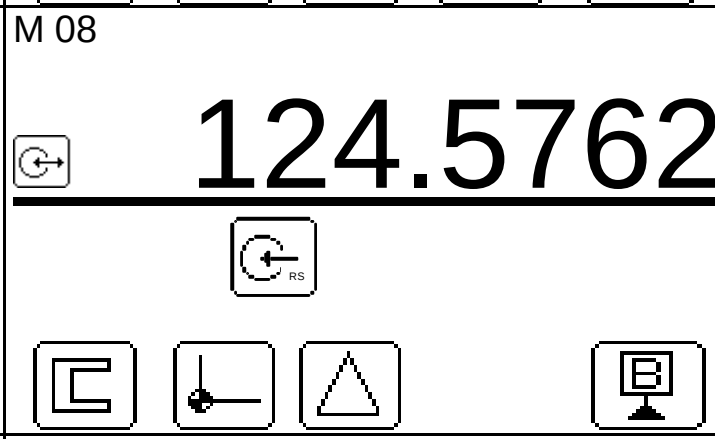
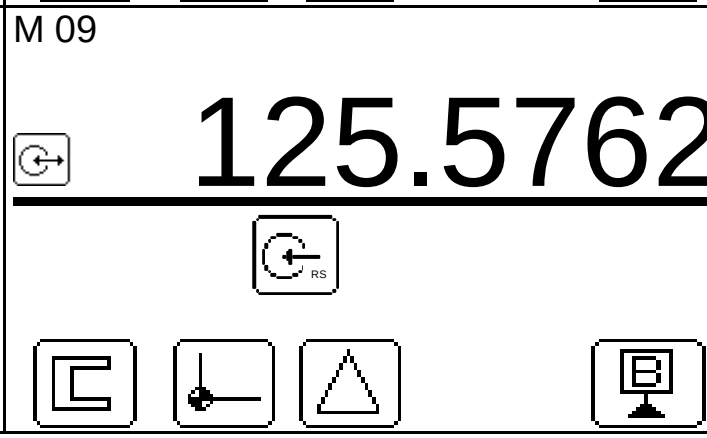
	M 07 123.5762 mm 84.9040 mm	Standard display after each probe contact.
or	M 08 84.9040 mm 84.904 mm	Standard display after each probe contact.
	M 08 84.9040 mm 123.5762 mm	Main display will then show the difference obtained from both probe contacts with the part feature that comes next. The centre of the part feature being measured will appear on the auxiliary display.

*7) **Entering the measuring instrument***

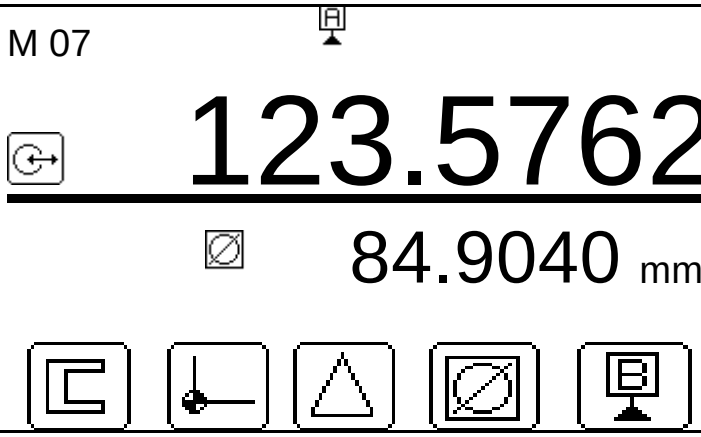
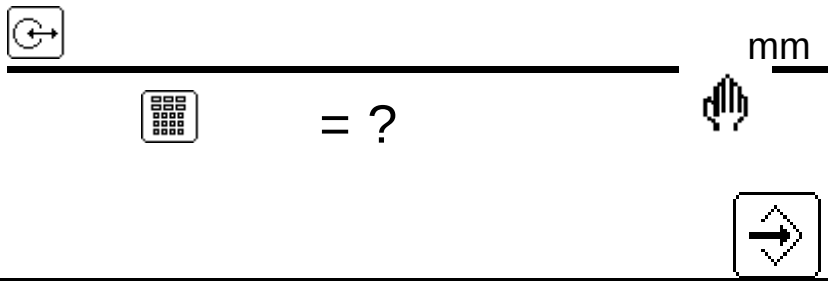
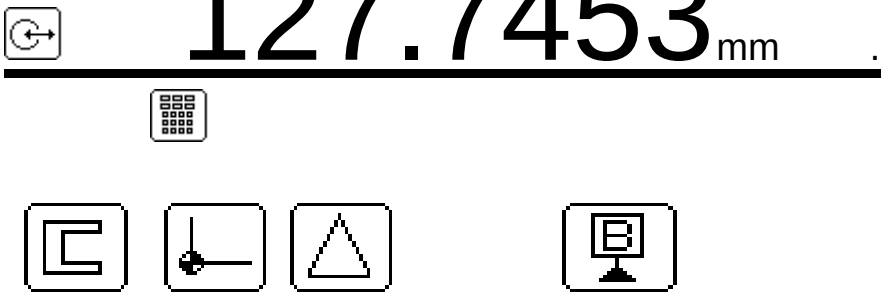
This input allows the connection of an opto-electronic measuring instrument, RS type, which can be purchased from TESA or any other manufacturer. The following parameters can be altered as desired in the configuration menu:

Data rate:	4800 bauds
Character length:	7 bits
Start :	1 bit
Stop :	2 bits
Parity :	even

Transmission format :
With use of the cable No. 04761049, bidirectional : as above or opto-RS
With use of the cable No. 04761046, monodirectional : 4800 bauds
(or 1200 bauds for a measuring instrument from an earlier generation), 7b, 2P, 2S, oh.

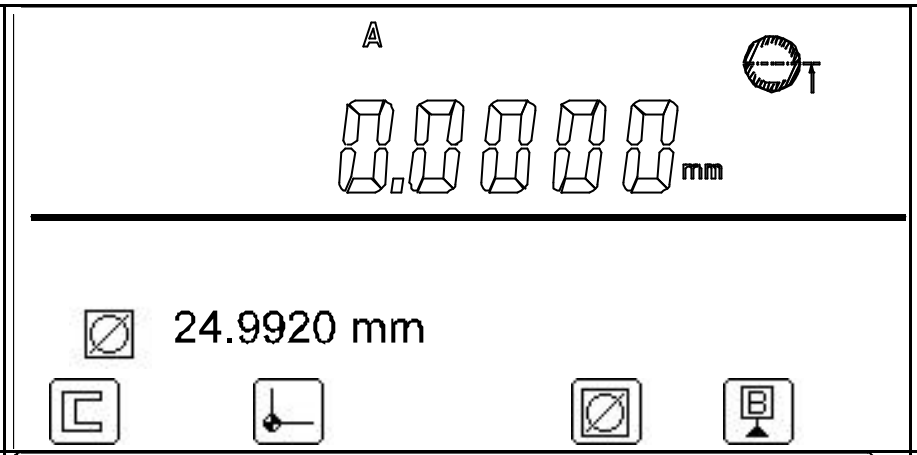
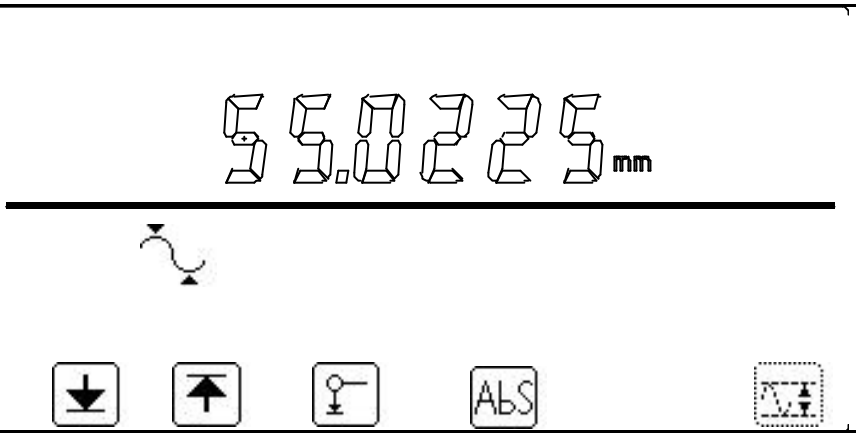
		RS function may be activated from the main display or through St 1/2
		Measured value may be captured as follows: -by pressing RS key -using the foot switch sending relevant value from connected tool directly
		M09 value captured directly by sending it from connected tool directly. Ready for all subsequent value acquisitions.

8) ***Entering data through the keyboard***

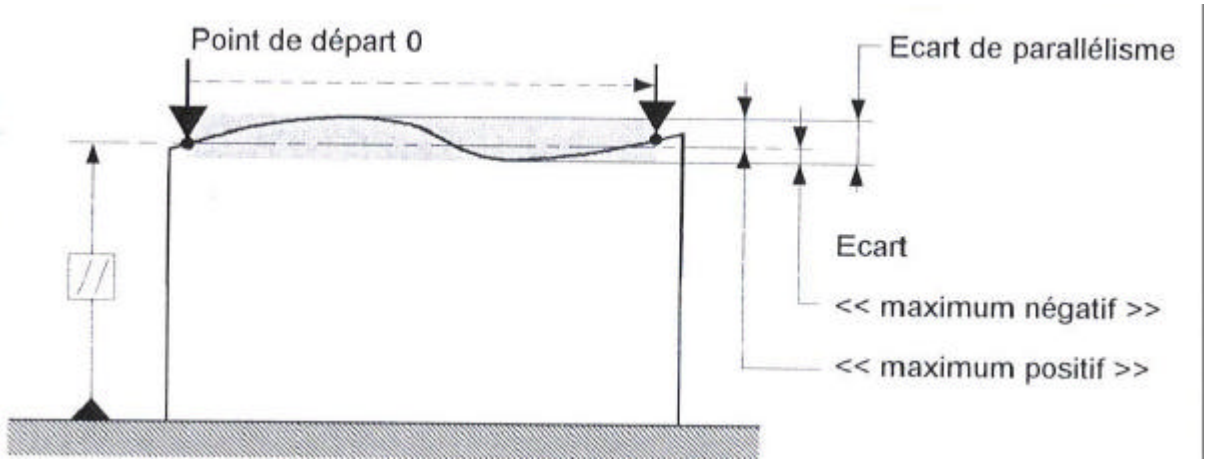
	M 07  	This function can be activated from the main display or through St 1/2.
	M 08  	Enter desired value through the keyboard, then confirm by pressing 
	M 08  	Ready for all subsequent value acquisitions.

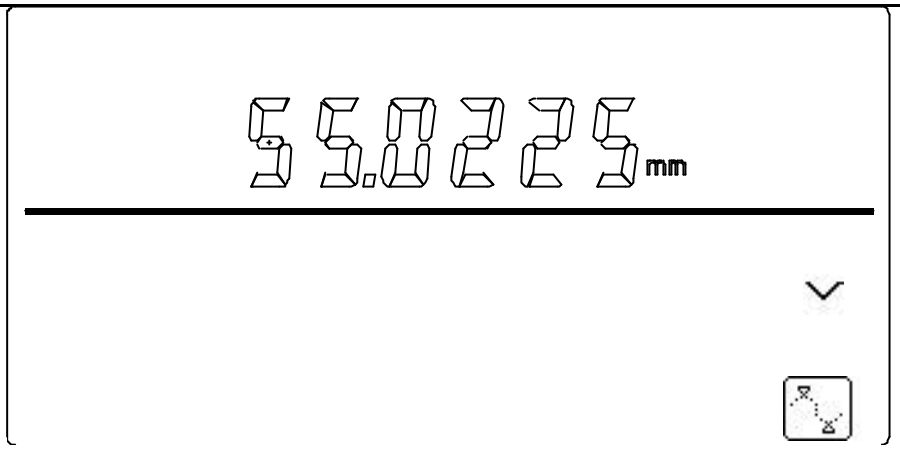
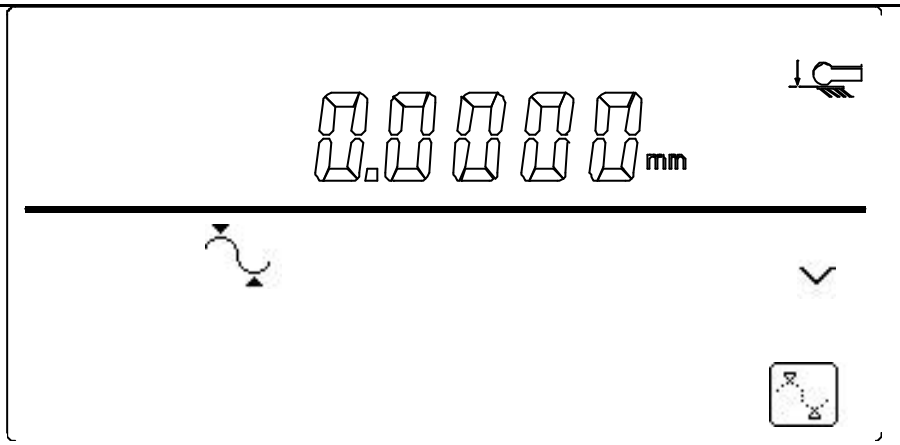
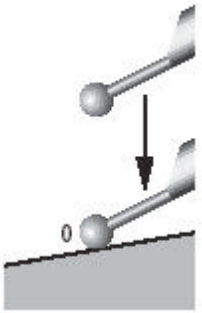
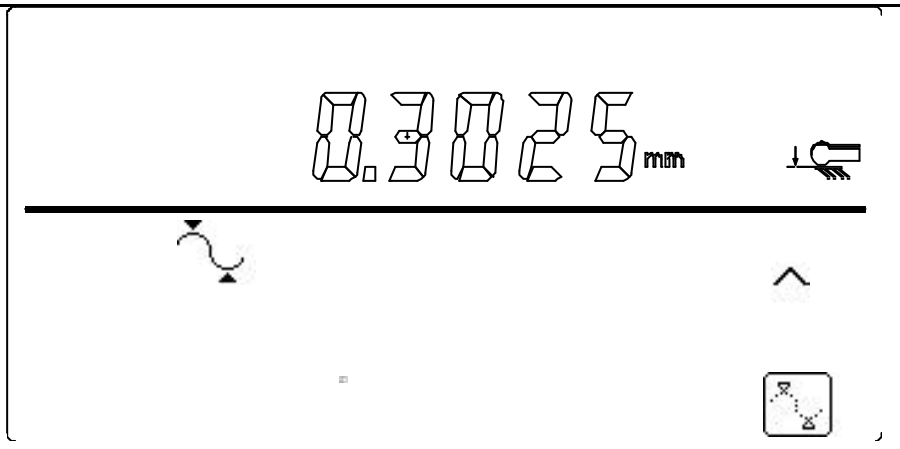
9) ***Measuring flatness and parallelism errors***

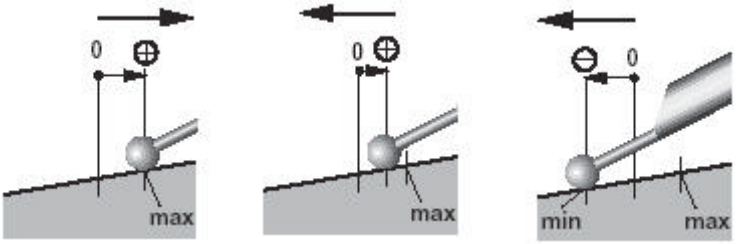
You may access the menu MAX/MIN from any position within part programs by simply activating the function key .
To exit this menu and return to the reference mode you've previously quitted, press F6

		Position probe insert using the arrow keys or rotating the power control.
		After you've access the menu Measuring flatness and parallelism errors on a flat surface, display shows the measured value against active reference.

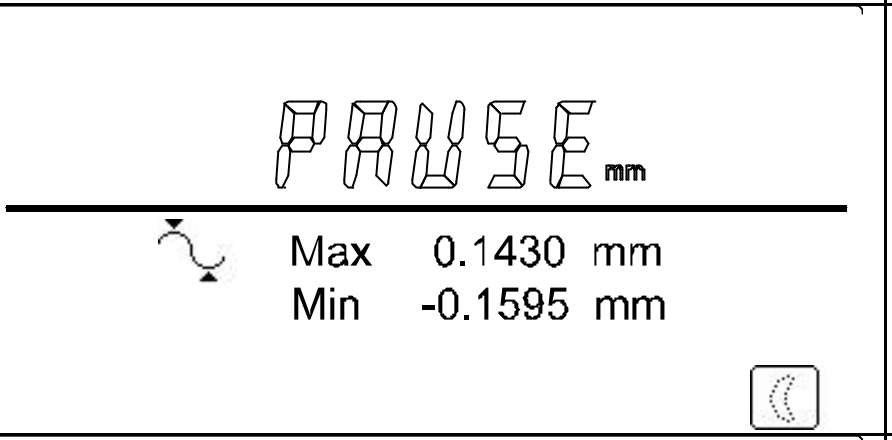
- F1 : Measurement outset downwards
- F2 : Measurement outset upwards
- F3 : Data input for PRESET value
- F4 : Measurement in ABS mode
- F6 : Exit from menu



 or rotate **power control**		Display continuously shows the measured value against active reference. V-sign indicates probe moving direction. Rotary power control may be used for approaching relevant probing point
		Zero value appears once probe insert has stabilised 
		Display shows measured value at once. V-sign indicates new probe moving direction..

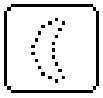


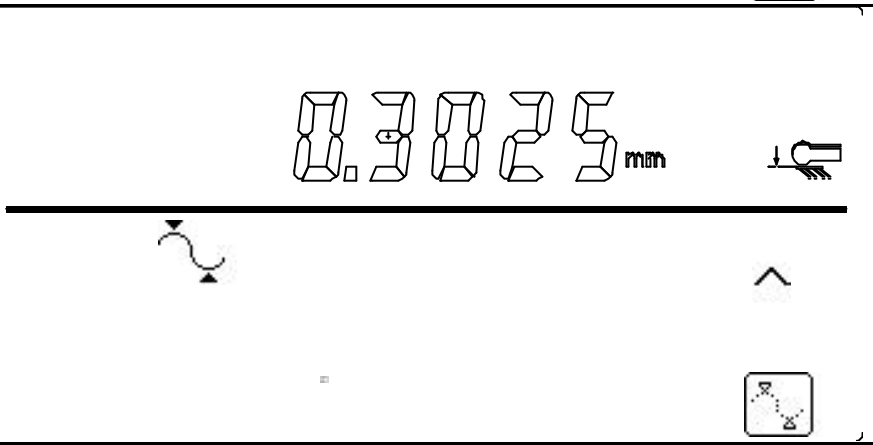
Prompting for PAUSE



After PAUSE has been prompted, display shows both Min and Max values.

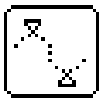
Value acquisition is deferred.





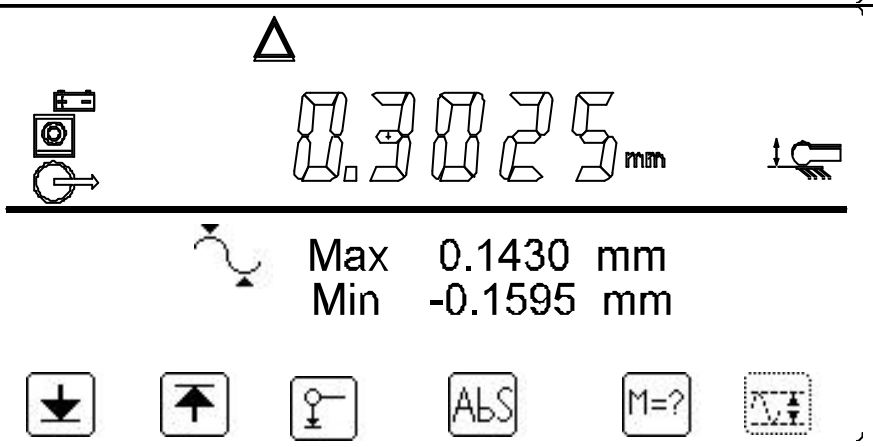
Measured value reappears.

V-sign indicates probe moving direction

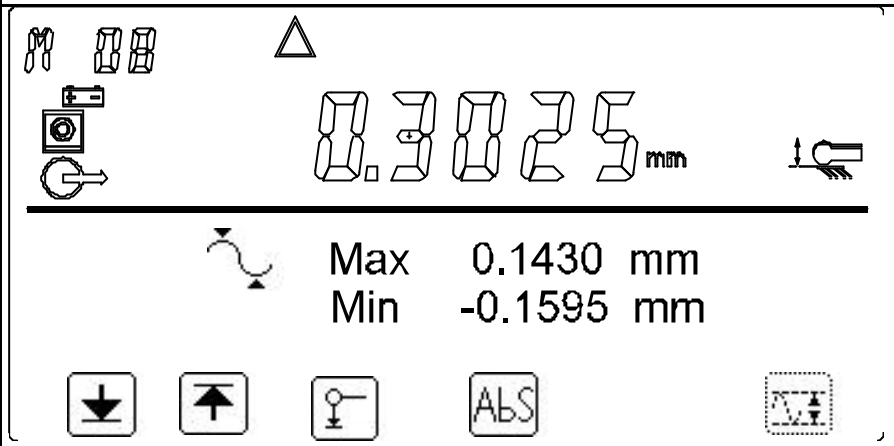
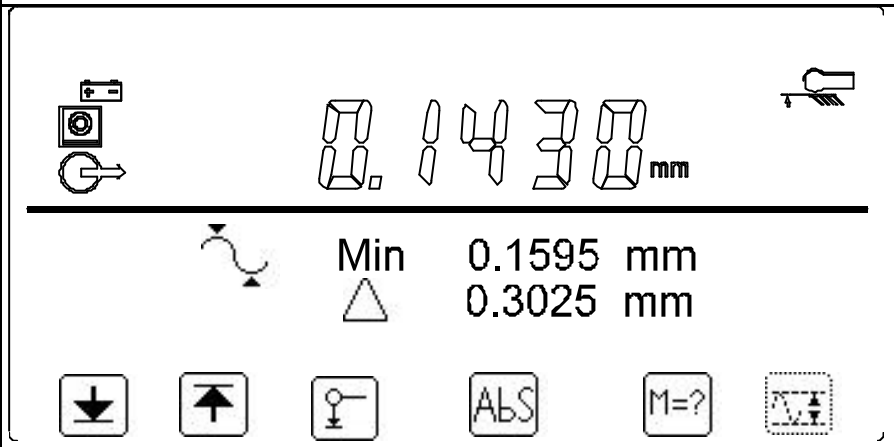
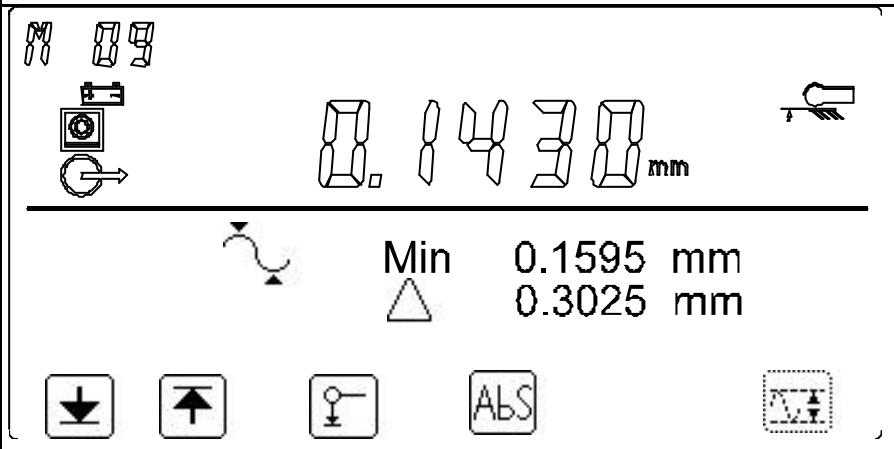


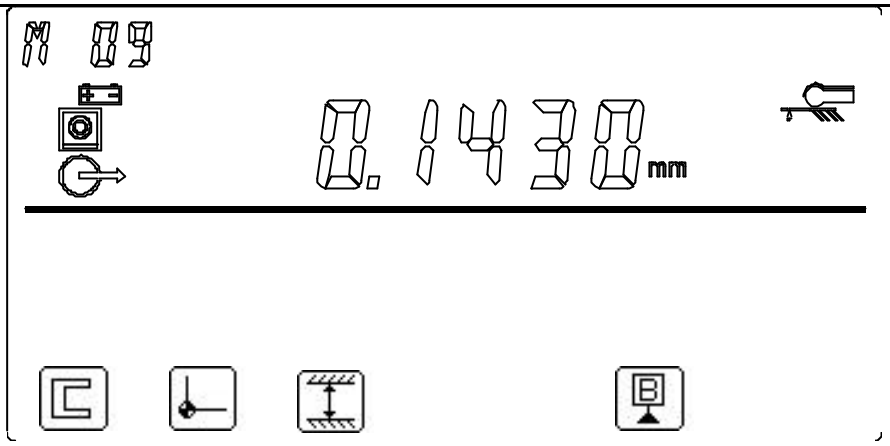
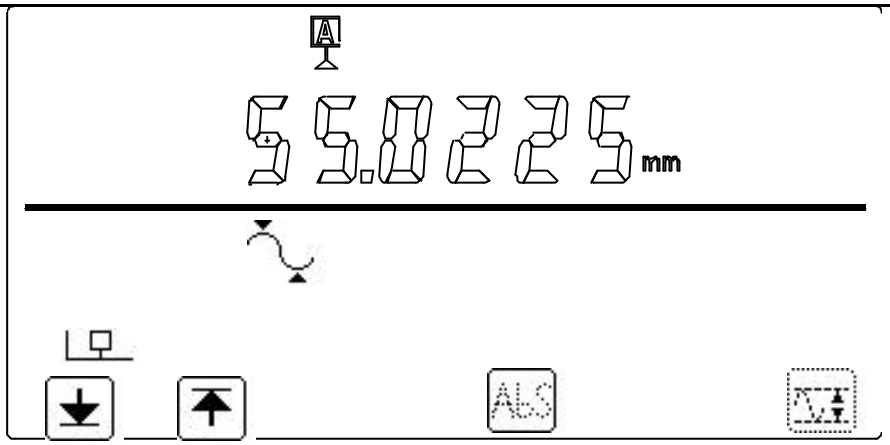
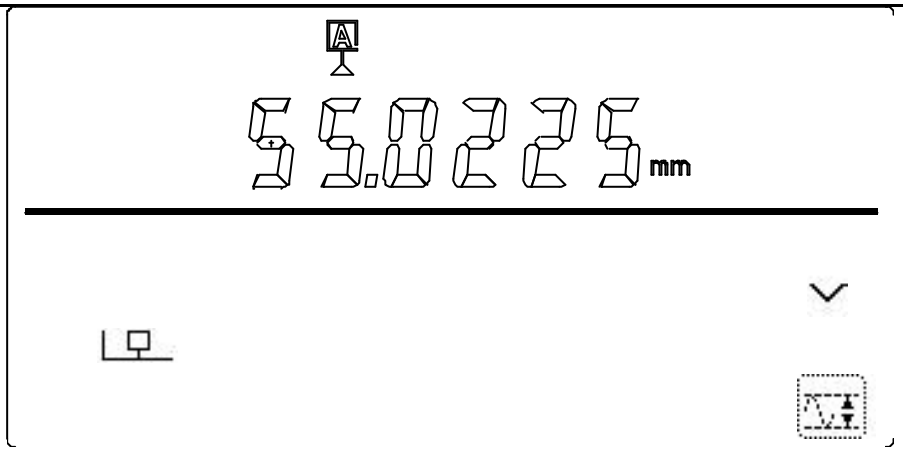
or

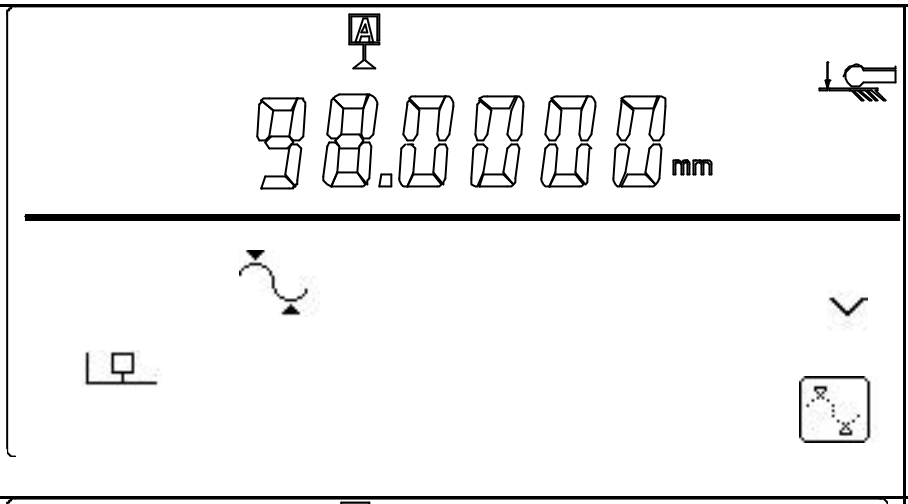
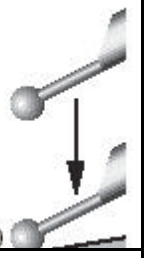
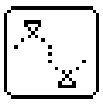
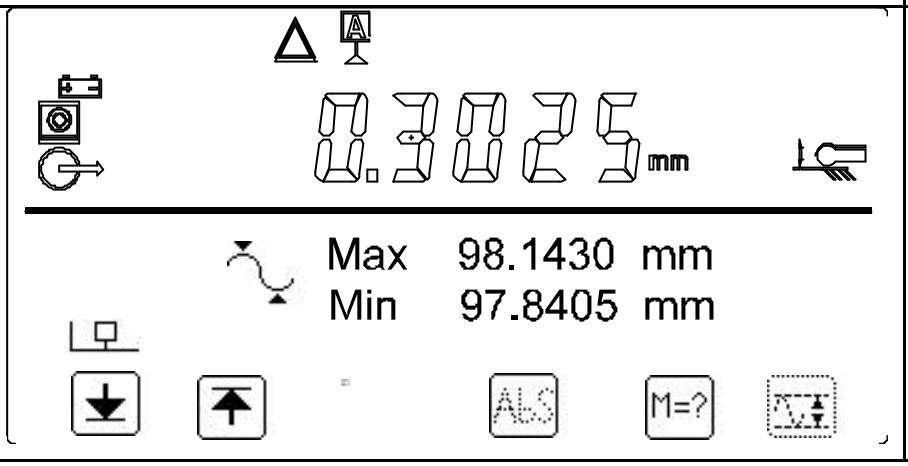
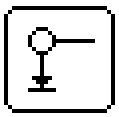
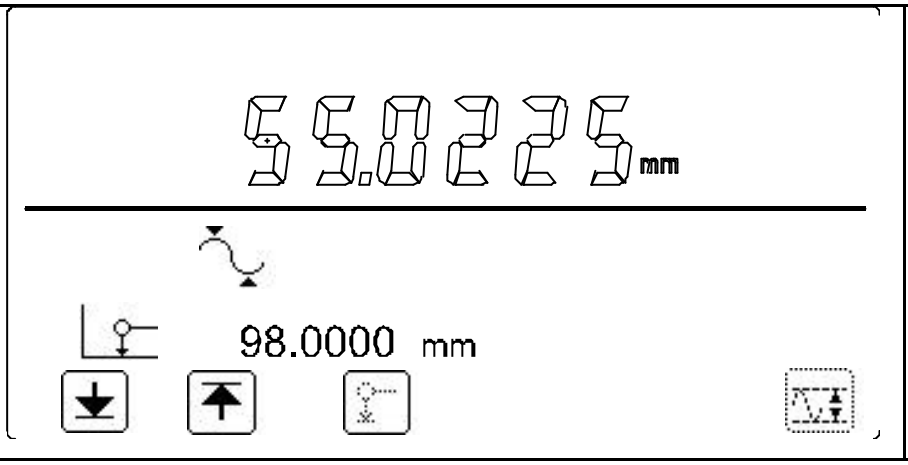
or **rotating the power control by one click**

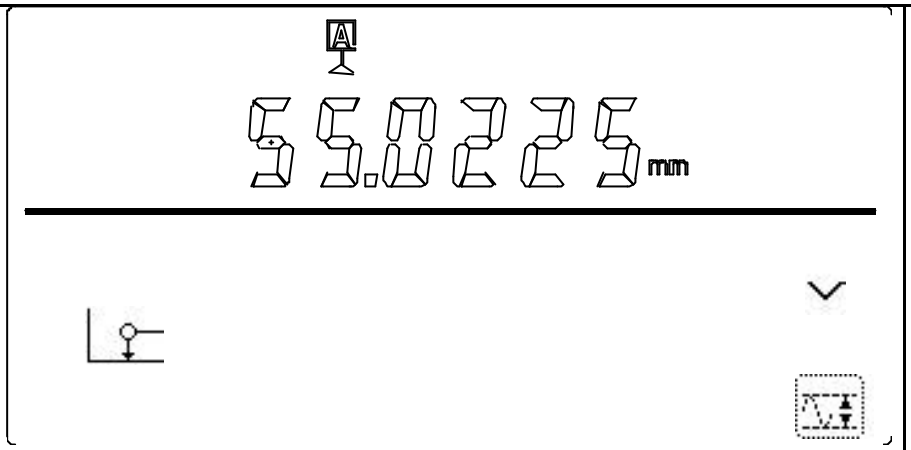
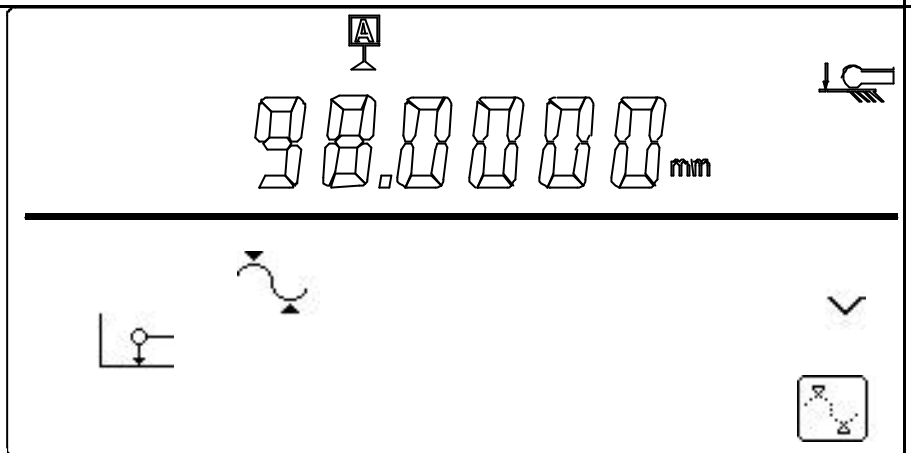
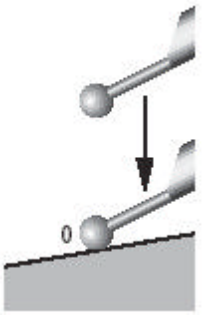
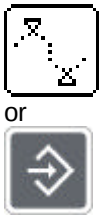
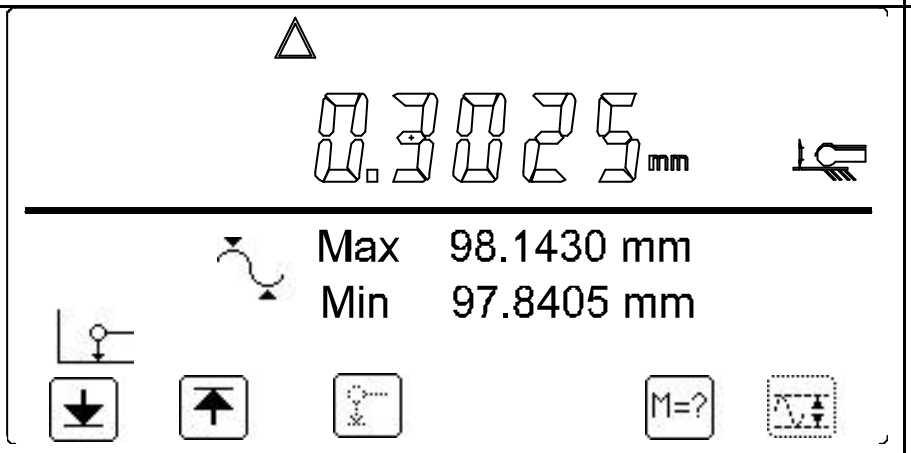
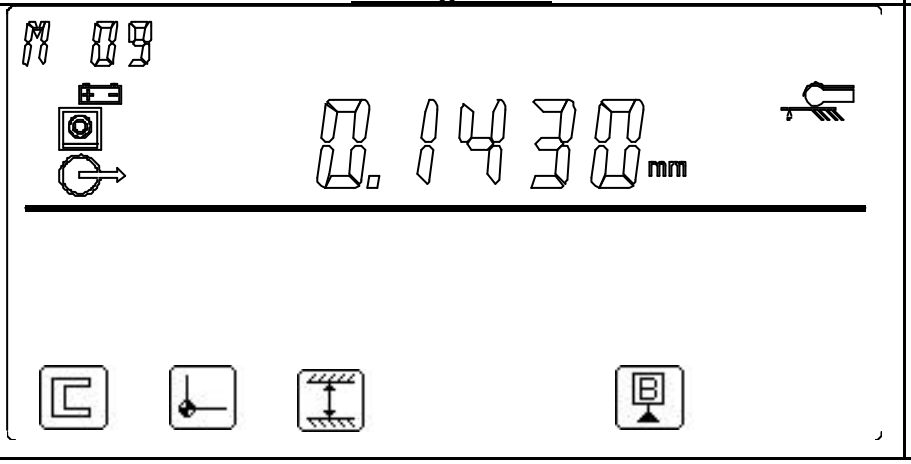


Measured value stops fluctuating. Display shows both Max and Min values.

	Registering measured value	
M=?		**If you've activated value numbering in configuration menu,** value shown on main display is added in the logbook (M = ?).
	Prompting for value rotation on main display (?, Max and Min values)	
Δz or ▽		Press Δ' or ▽' to get both Max and Min values appearing in turn on the main display. Proceed in a same way for the remaining values.
	Registering measured value	F5 M= ? Only allowed if value numbering is ON.
M=?		**If you've activated value numbering in configuration menu,** value shown on main display is added in the logbook (M = ?).

	Exiting menu	
		**Return to main display** All subsequent measurements will be taken based on the reference value you've activated before accessing menu *Measuring parallelism errors.*
	Prompting for parallelism measurement in ABS mode	
		Display shows value measured against active reference value. If St-1 is enabled, you may only press F1 or F2 according to the probing direction.
 or rotating **the power control**		Display shows value measured as probe is being displaced. V-sign indicates probe moving direction. Rotary power control may be used for approaching the relevant point.

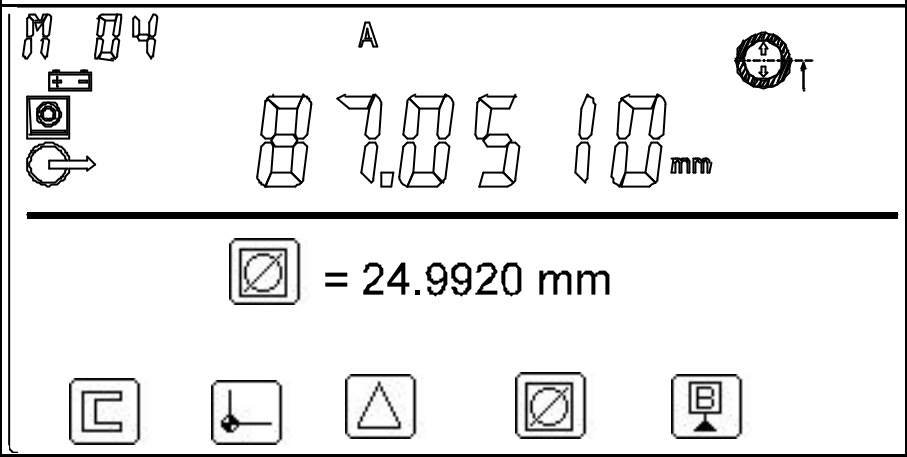
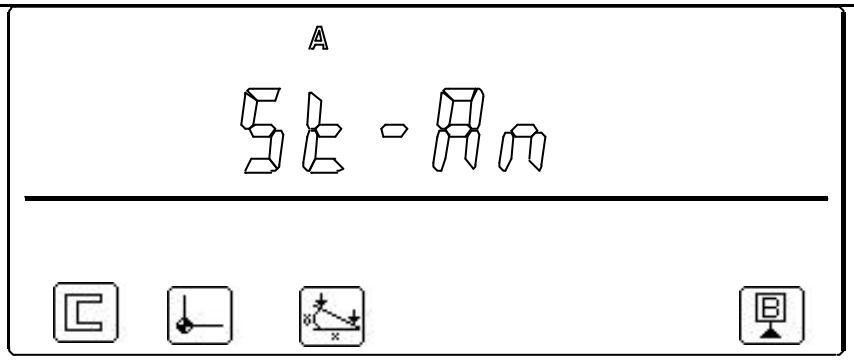
		Once probe insert has stabilised, display shows absolute value measured against active reference value. 
 or  or rotating **power control by one click**		Measured value stops fluctuating. Display shows the deviation along with both absolute Max and Min values. M= ? adds displayed value in the logbook..
	Prompting for calculating parallelism deviation with PRESET	
 +  + 98.0000 		Display shows measured value against active reference..

 or rotating **the power control**		Display shows value measured as probe is being displaced. V-sign indicates probe moving direction. Rotary power control may be used for approaching the relevant point.
		Once probe insert has stabilised, display shows PRESET value. 
 or rotating **the power control by one click**		Measured value stops fluctuating. Display shows the deviation along and both Max and Min values with PRESET value. M= ? adds value shown on main display in the logbook.
	Exiting menu	
		**Return to main display** All subsequent measurements are taken based on the reference value you've activated before accessing menu *Measuring parallelism errors*.

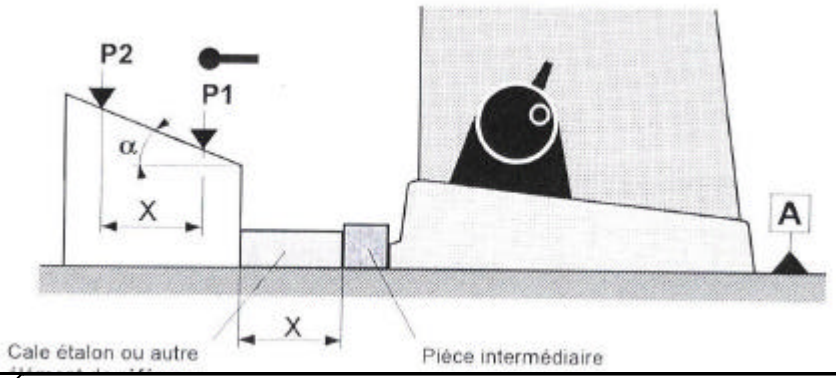
10) Measuring angles

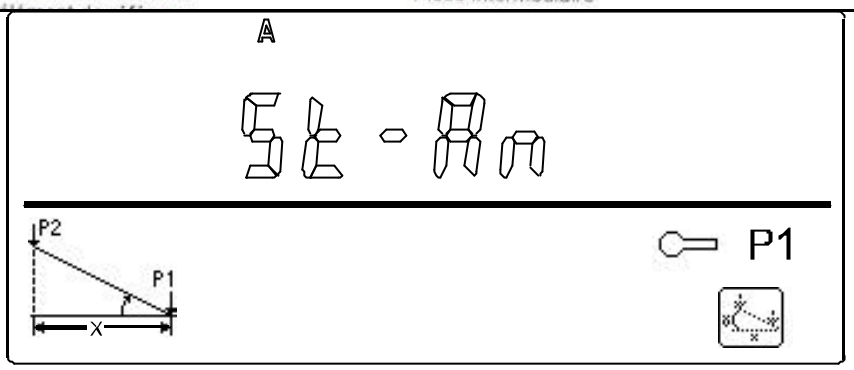
To access this menu, press . Next, the following submenus is available:

- Angle of any inclined surface to the reference surface

	Possible condition before accessing menu (mode St-2 with value numbering)	
		Measuring mode *Calculating the angle* can only be enabled from main display.
	Calculating relevant angle	
		**Prompt angle measurement**.
	To quit this menu and return to standard mode, press	

Measuring angle of any inclined surface to reference surface

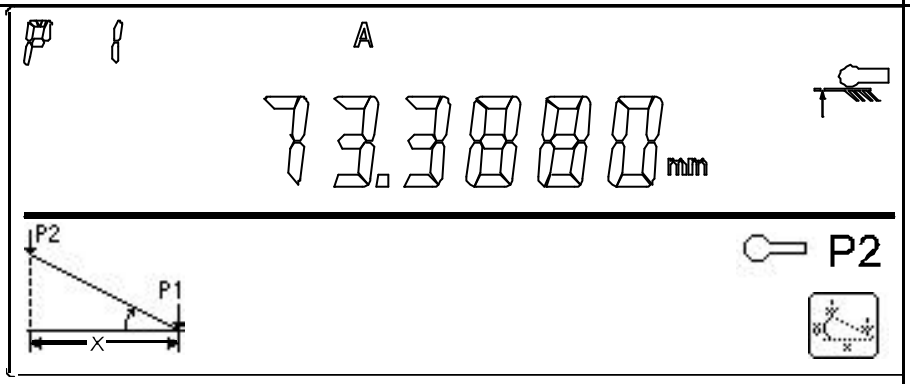




Mode 1
Angle calculation based on two probing points.

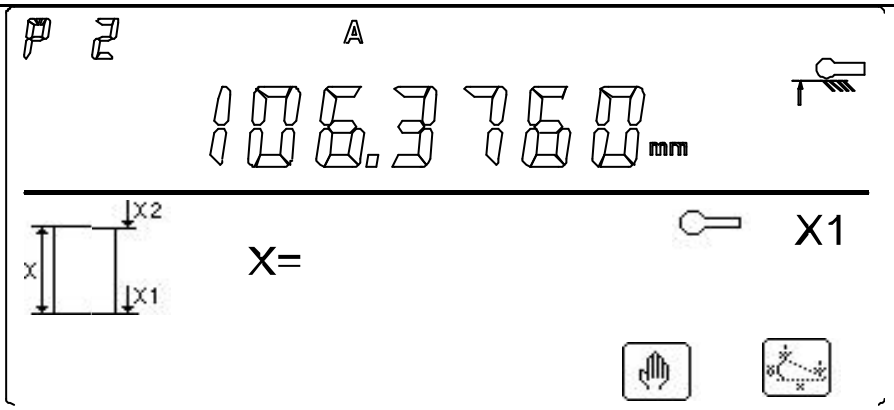
General:
Probe contacts of any type are allowed in either modes
St-1 or St-2.

P1

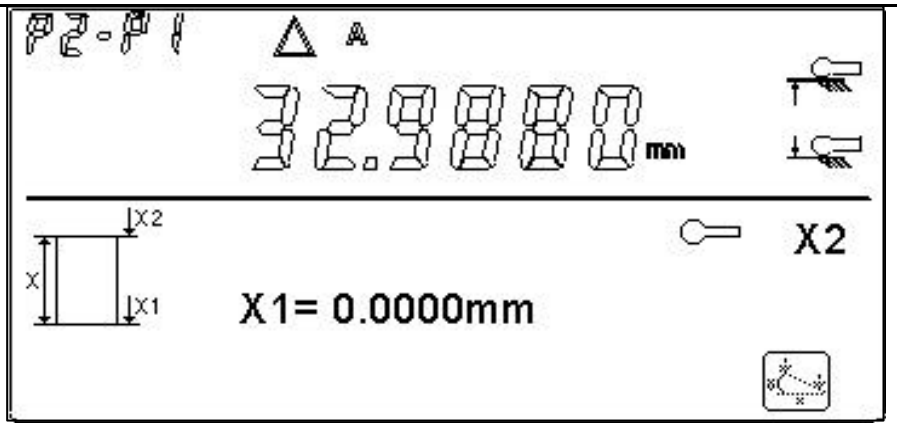
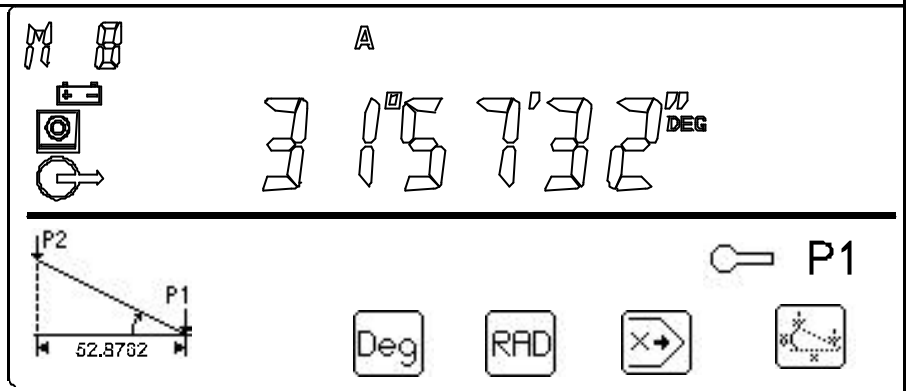


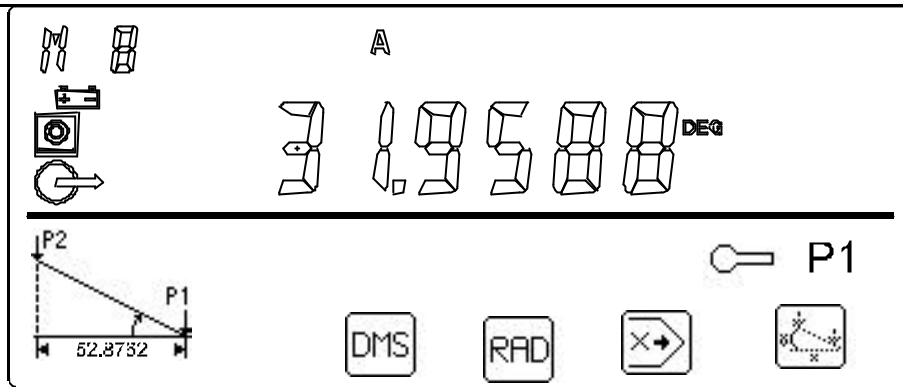
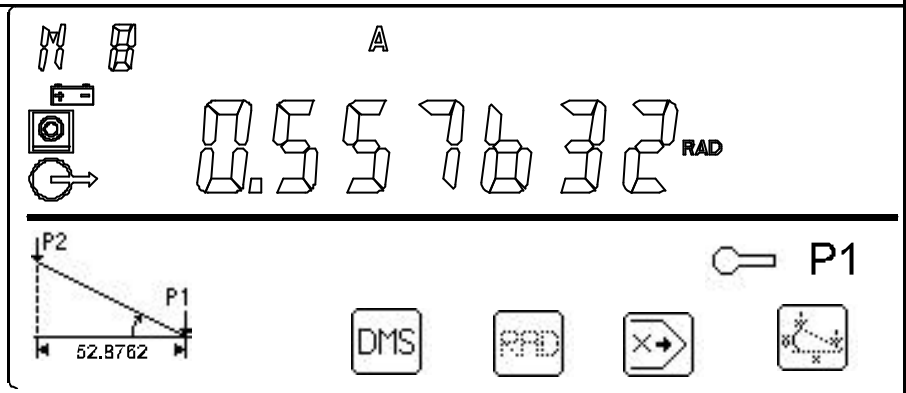
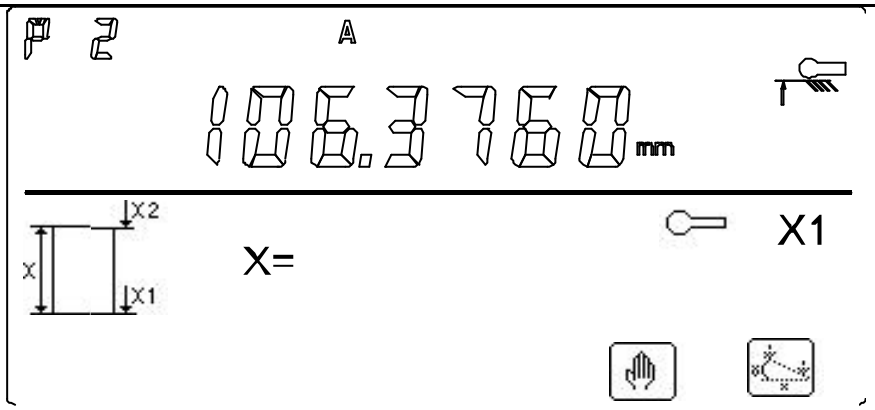
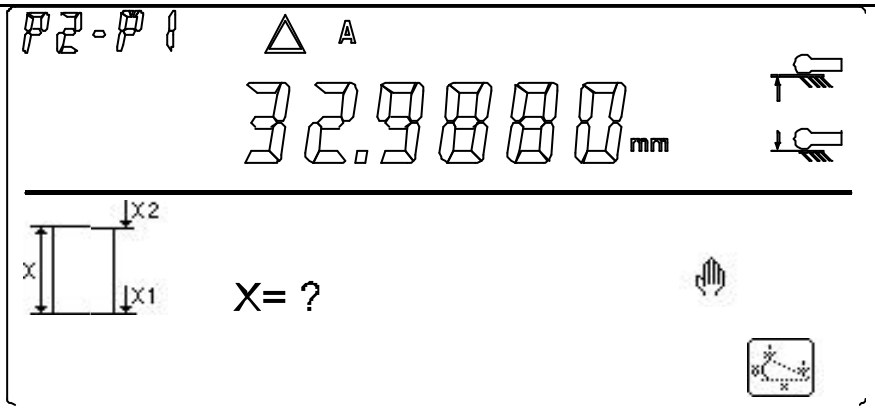
Probe point P1

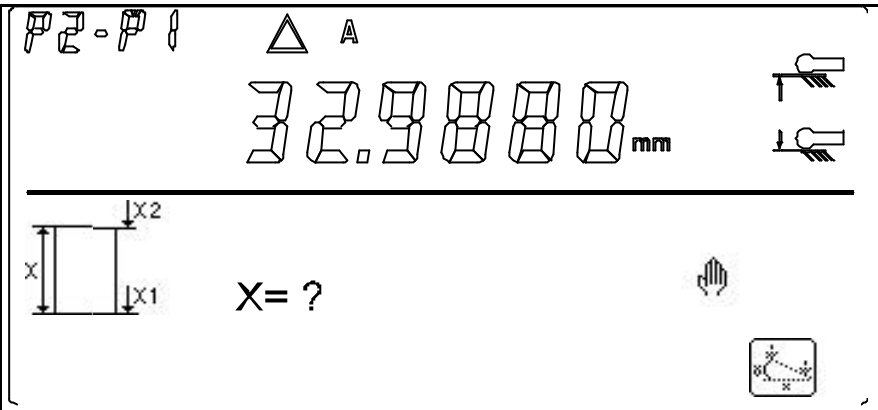
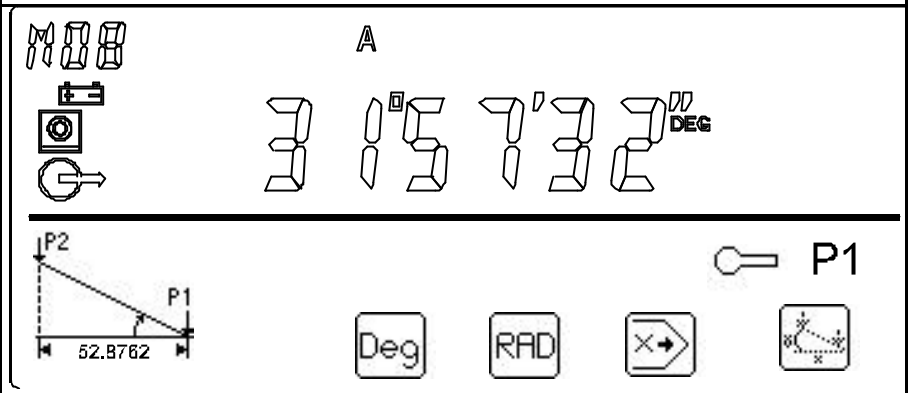
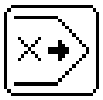
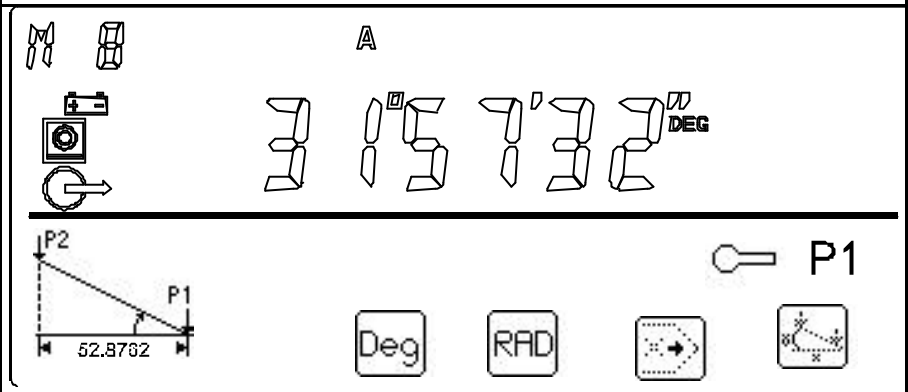
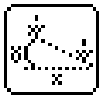
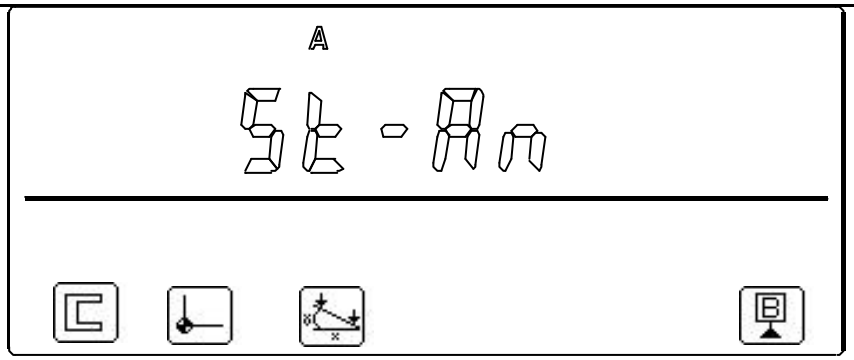
P2



Probe point P2

	Probing gauge block	
 X1		Probe first point on the gauge block.
 X2		Probe second point on the gauge block. Relevant angle = arc tg (P2-P1)/X is being calculated. Display shows calculated value in selected unit.
	 Conversion into degree, minute and second  Conversion into decimal degree  Conversion into radian  Storage of X value for all subsequent angle measurements. If a part programme is created by learning, this value remains constantly available in the memory and it will not be necessary to enter it again bye executing the programme.	Perform new probe contact or exit Mode 1

	Changing units of measurement	
Deg		Temporary conversion into degrees.
RAD		Temporary conversion into radian. Press F4 to replace radian by the unit you've previously selected by pressing F3.
	Entering gauge block dimension	
1 U		Prompt for value input once you've probed point P2.
		Activate value input.

Entering X value = 52.8762 through the keyboard		Enter desired value
		Press to confirm Angle = arc tg (P2-P1)/X is calculated. Display shows calculated value in the unit previously selected in configuration menu
	Registering gauge block height	
		Value remains stored for all subsequent probe contacts.
	Exiting mode 1	
		End mode 1 and return to angle measurement
	 Pressing this key lets you exit Angle measurement	

11) Measuring perpendicularity and straightness deviations

Your POWER PANEL *plus* M allows you to establish perpendicularity and straightness deviations using the TESA IG-13 digital probe or an RS type measuring instrument. Form and position errors are captured according to ISO 1101. For more information on the way to proceed when measuring, read chapter 4.17 in the instruction manual that came with your TESA Micro-Hite plus M height gauge.

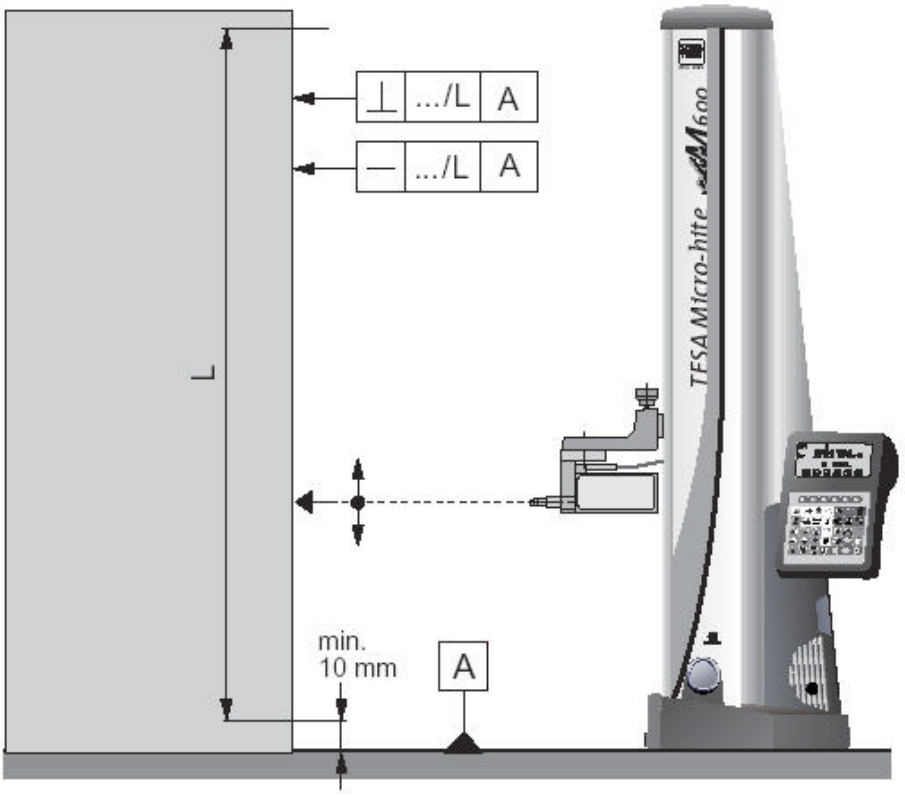


Fig. 1
Configuration pour la saisie des écarts de perpendicularité et de rectitude

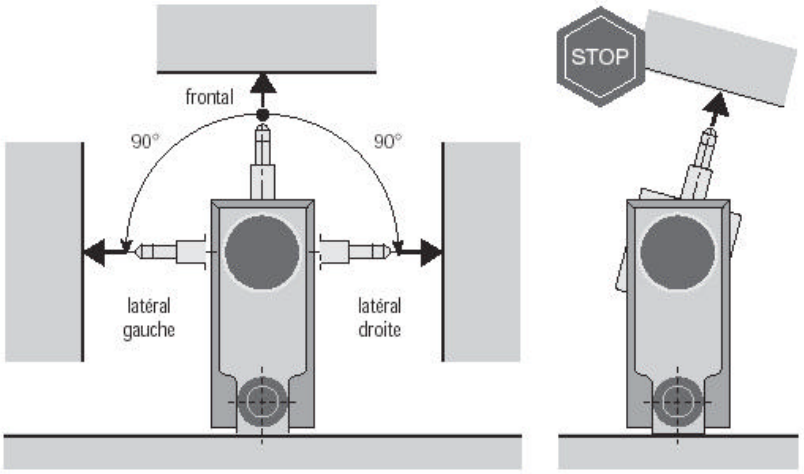
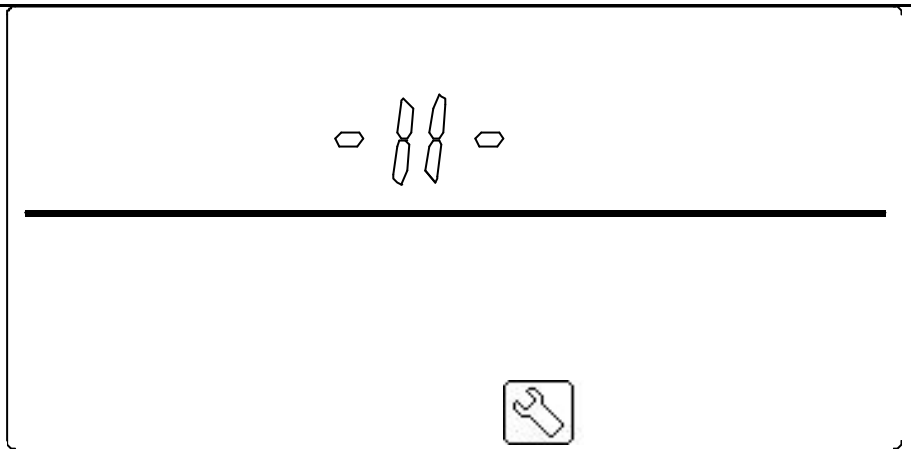
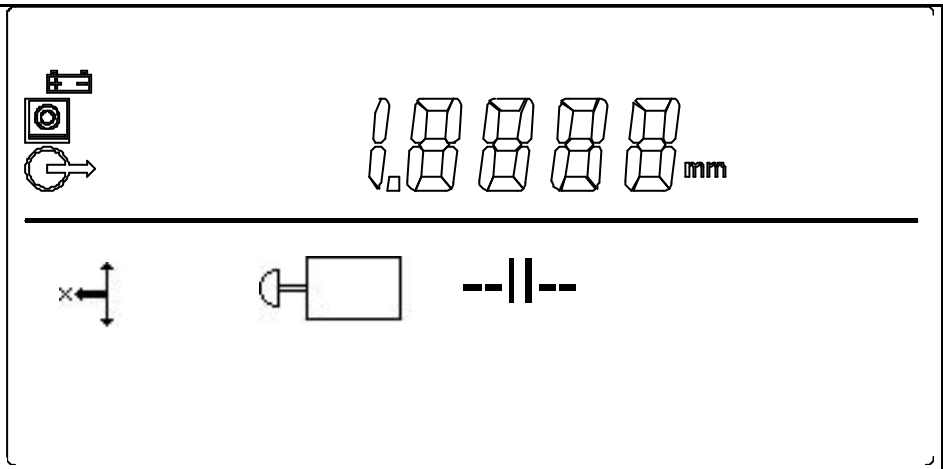
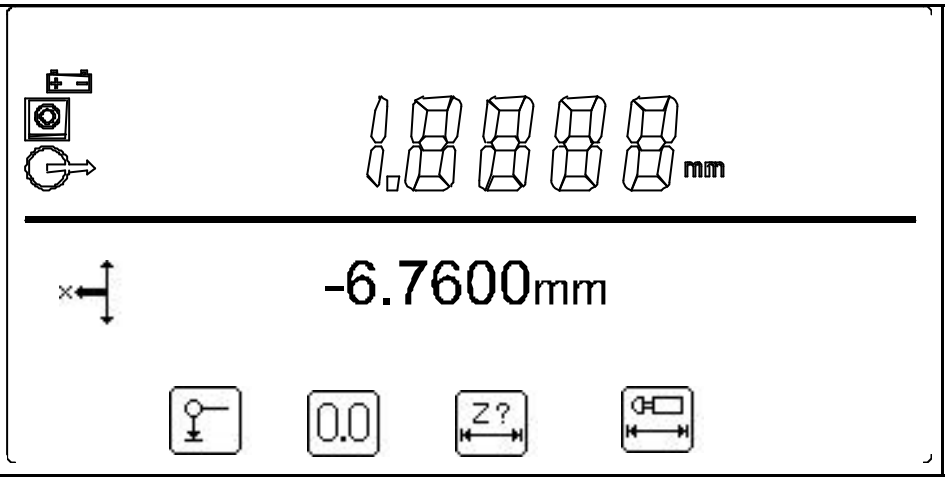
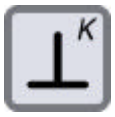
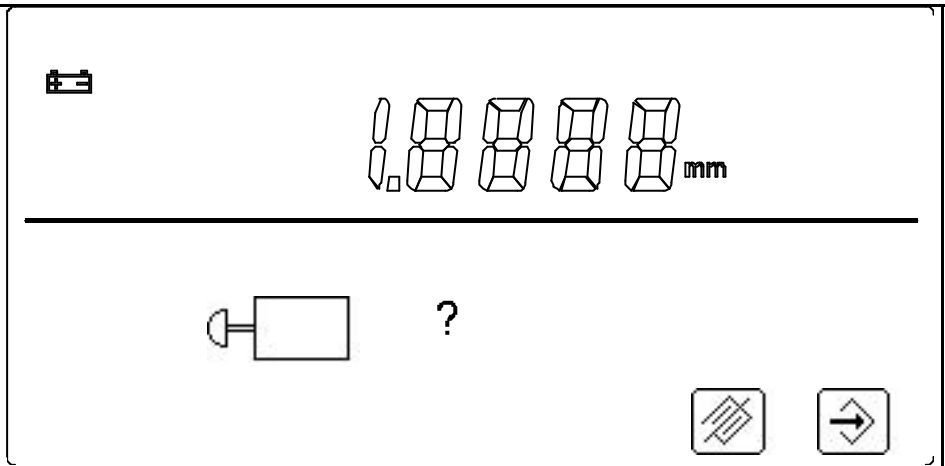
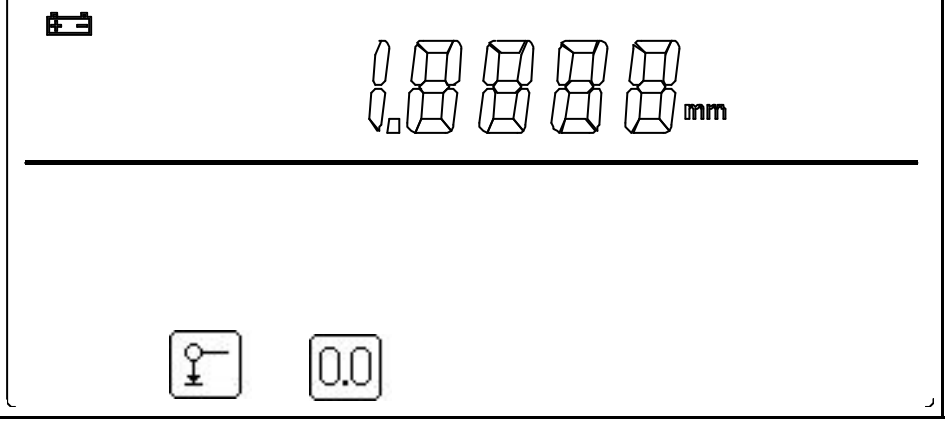


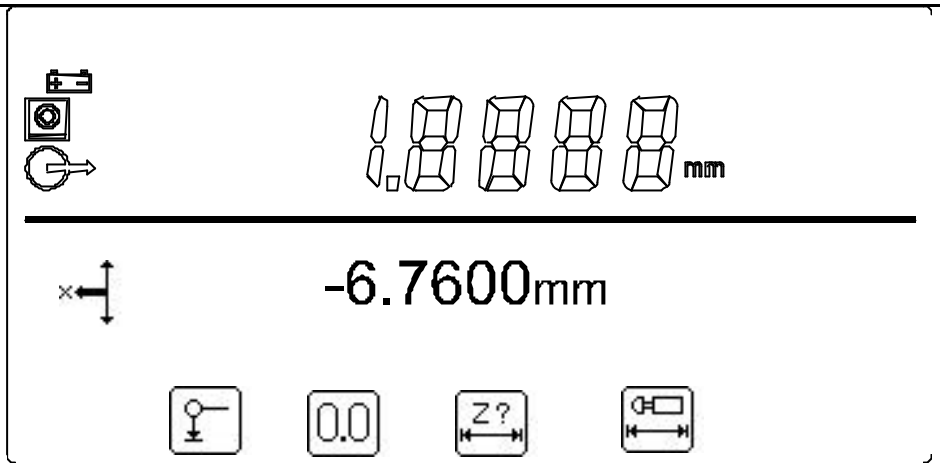
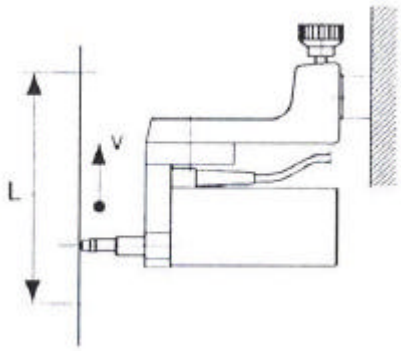
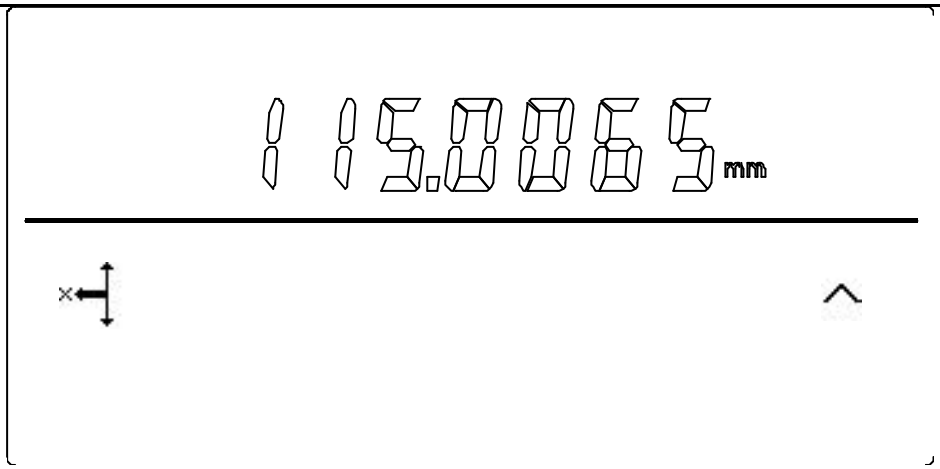
Fig. 2
Trois positions de crantage pour le placement correct du palpeur TESA IG-13

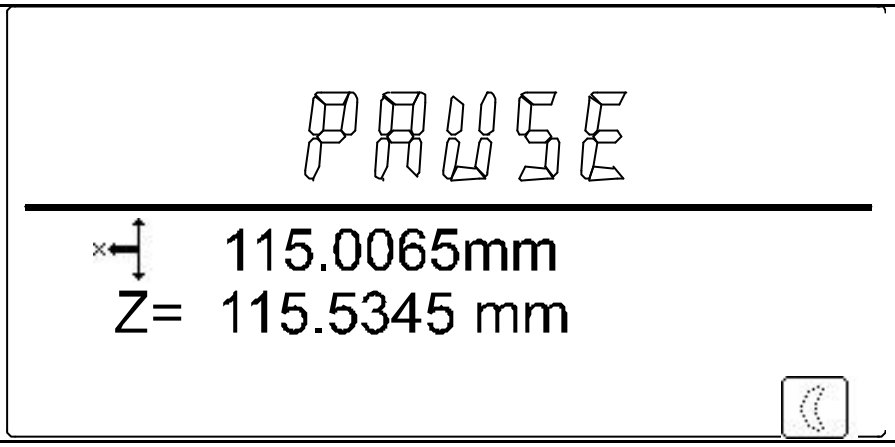
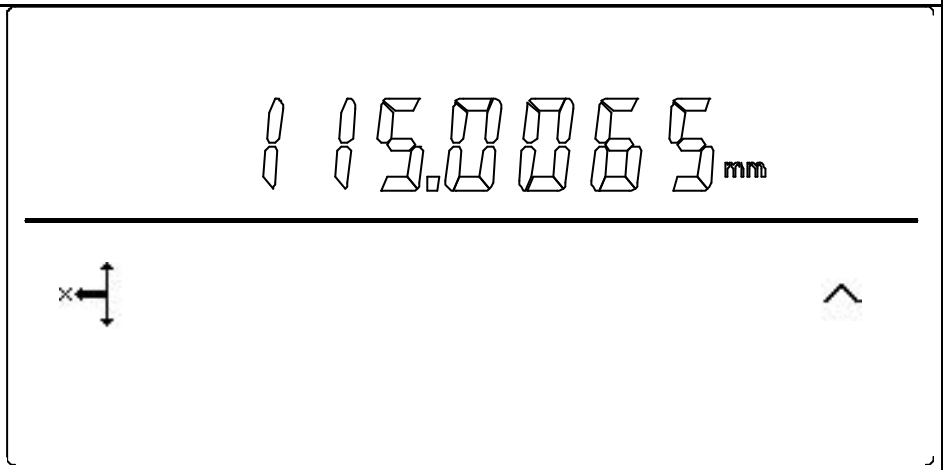
You may access the mode that allows you to measure perpendicularity and straightness deviations in either of the following ways :

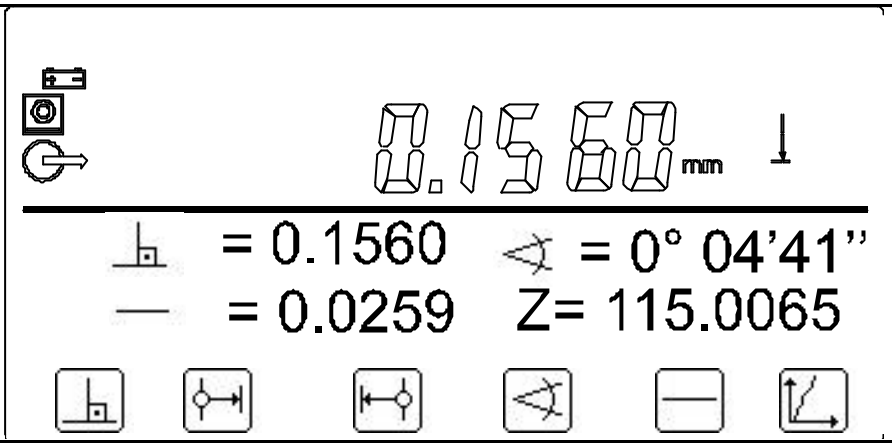
- Automatically by switching on your height gauge providing TESA IG-13 is connected to the control panel.
- By using the function key ⊥ᴷ from the main menu.

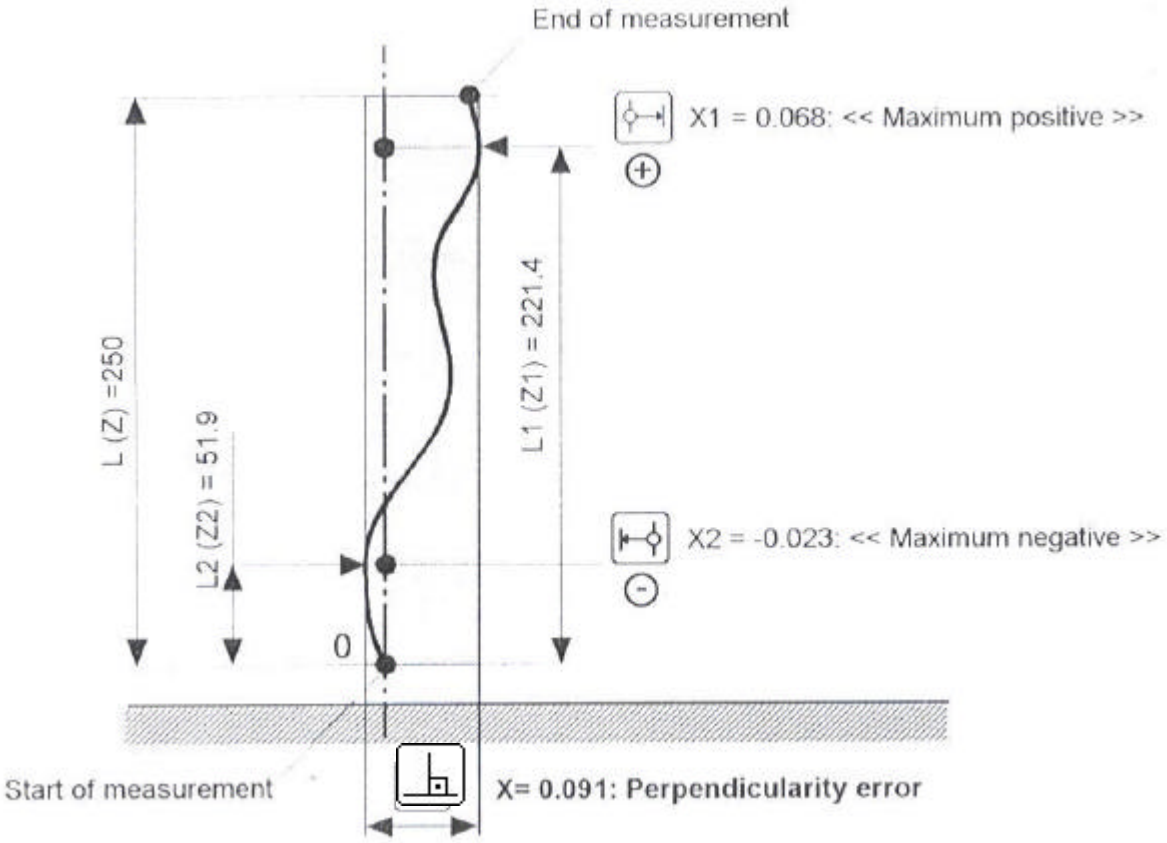
	Accessing mode by switching on	
ON/OFF		Search for the reference value. Detect whether TESA IG-13 is connected. Test whether an RS tool is used. Ignore all other keys..
	First option: TESA IG-13 could be recognised by switching the height gauge on. Second option: Function key ⊥ᴷ could be prompted. Whenever the RS tool along with TESA IG-13 are simultaneously connected, priority is given to the IG-13.	
1) Travelling past reference mark with automatic recognition of TESA IG-13. 2) Prompting for function key ⊥ᴷ		Display shows computed value in Z axis along with probe direction. Wait for reference mark to be passed over by moving probe insert manually.
	First option: Reference mark could be passed over by moving the measuring bolt of the probe manually. Second option: RS tool could be recognised whilst no probe was connected.	

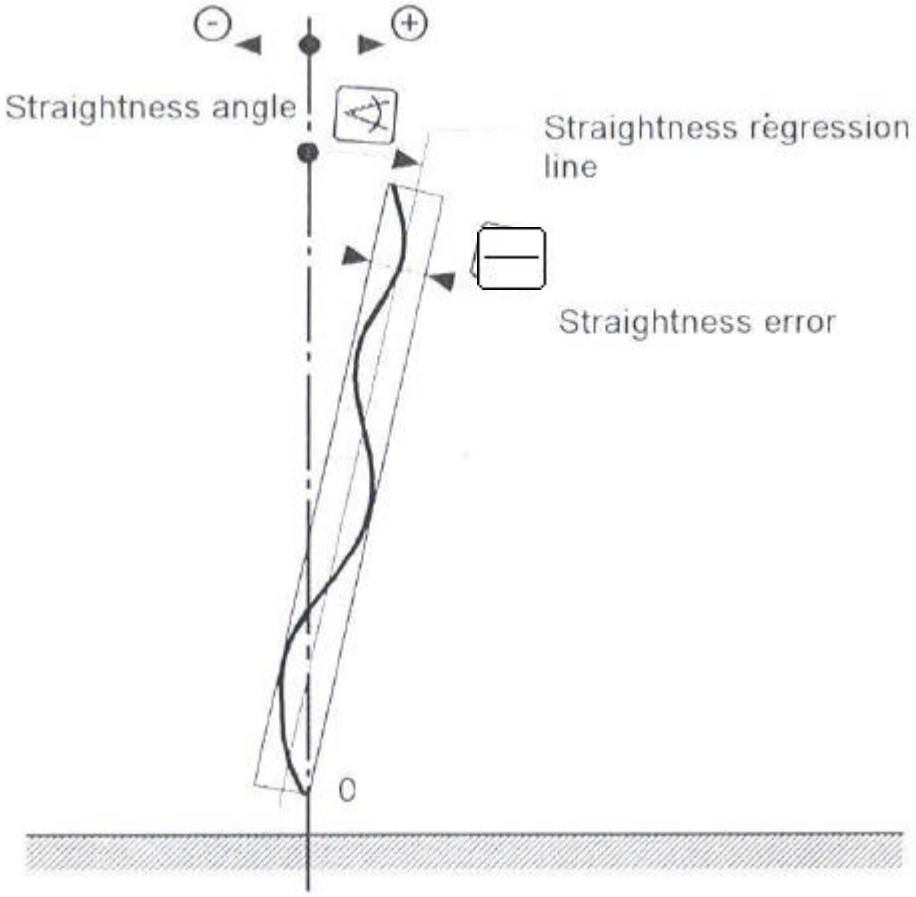
1) Travelling past the reference mark 2) Using connected RS tool		Main display shows computed value in the Z axis Auxiliary display shows computed value that refers to IG-13 (or RS tool) along with probe direction in either of both X or ±Y axis. With use of an RS tool, you're allowed to measure in the X axis only..
	Entering a PRESET value in the Z axis Setting the counter to zero in both X and Z axes. Entering the measuring range in the Z axis. Entering the measuring range in the X axis (based on the graph scale)	
	No probe or dial gauge could be recognised when accessing measuring mode	
		Prompt for rejected measured value - No IG-13 probe or dial gauge is connected. Press the key to return to standard mode or to access Z mode with disconnected probe.
 or 		Access to Z mode with disconnected probe. Press to quit this mode and return to standard mode.

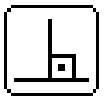
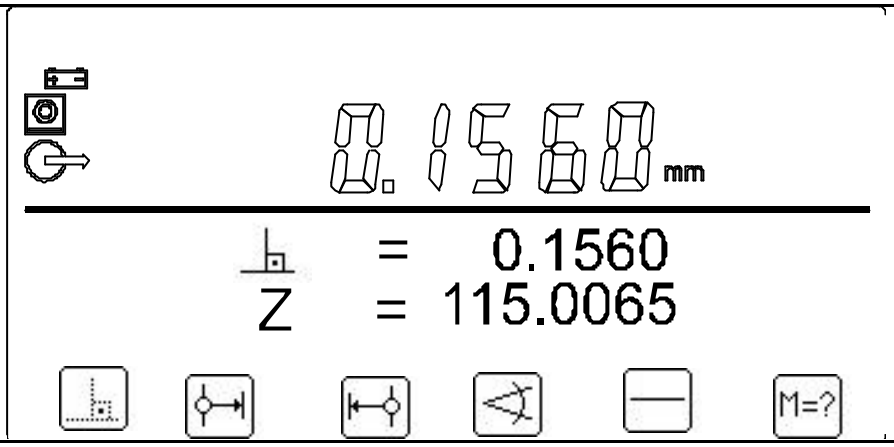
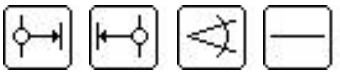
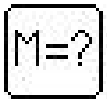
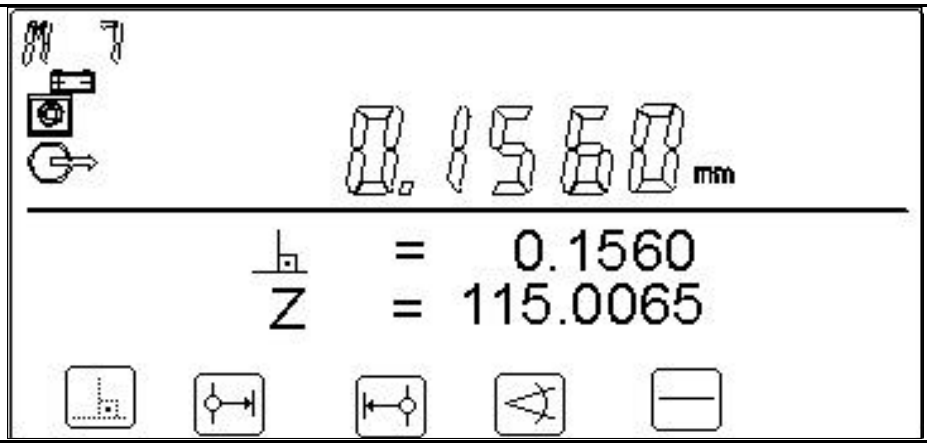
	Measuring perpendicularity and straightness deviations	
		**Displayed data before starting up the measurements**
	There are several ways to start up your probing operations.  Activating this key or rotating the power control clockwise by one click allows you to start probing up.  Activating this key or rotating the power control counter clockwise by one click lets you start probing down (the speed (v) at which probe will move should have been initially set to ON in the configuration menu).   Activating this key lets you start probing while keeping probe displacement (v) under control using the rotary power control.	
  or rotating the power control 		**Start measurement** Display shows single Z axis.

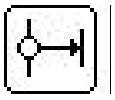
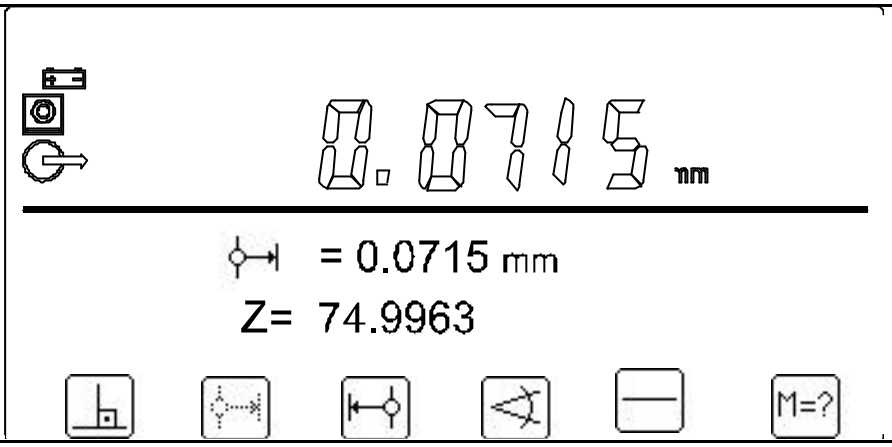
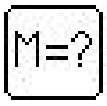
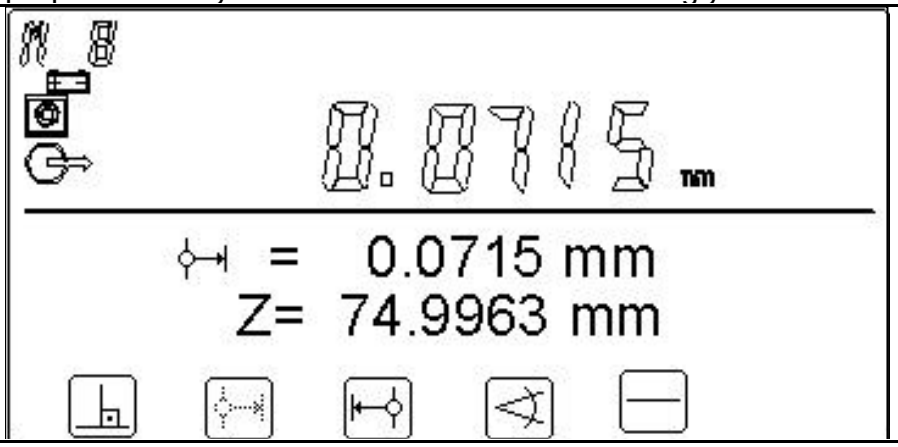
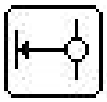
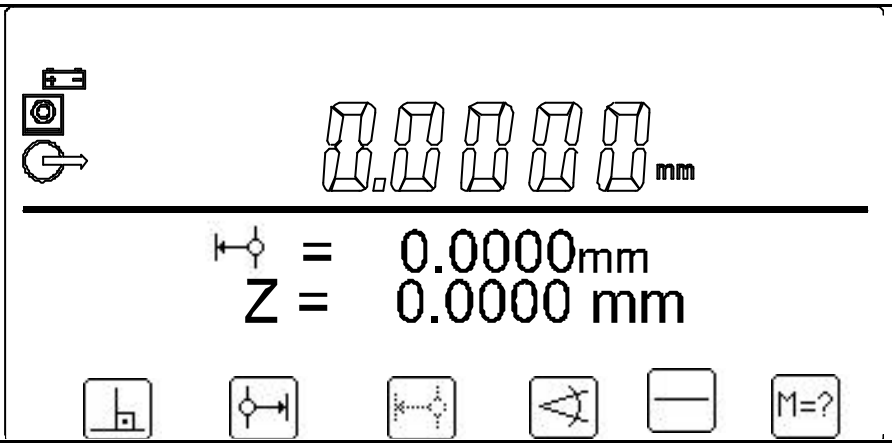
	As you're measuring you may also activate the following keys:  To stop value capture and probe displacement.  To end value capture. You may also use the rotary power control.  To aboard the value capture.	
	Prompting for PAUSE mode	
		Stop data acquisition. Display shows current value along with the value captured in Z axis as this mode was accessed..
	Exiting PAUSE mode	
		Start data acquisition back again

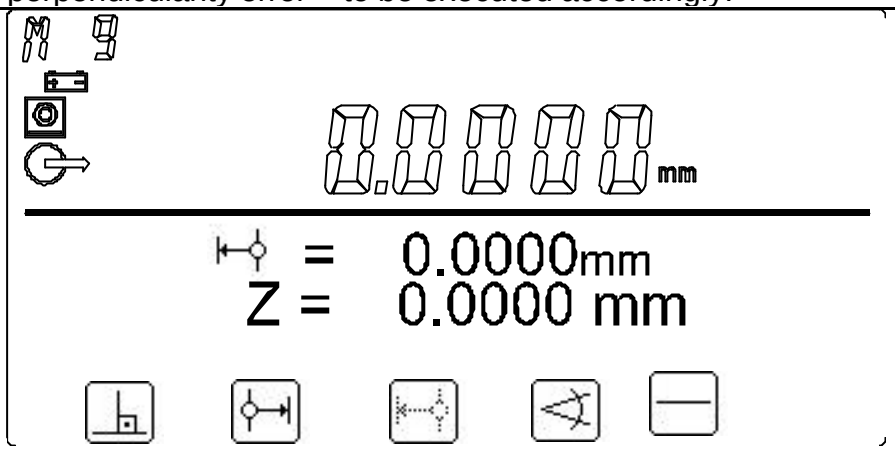
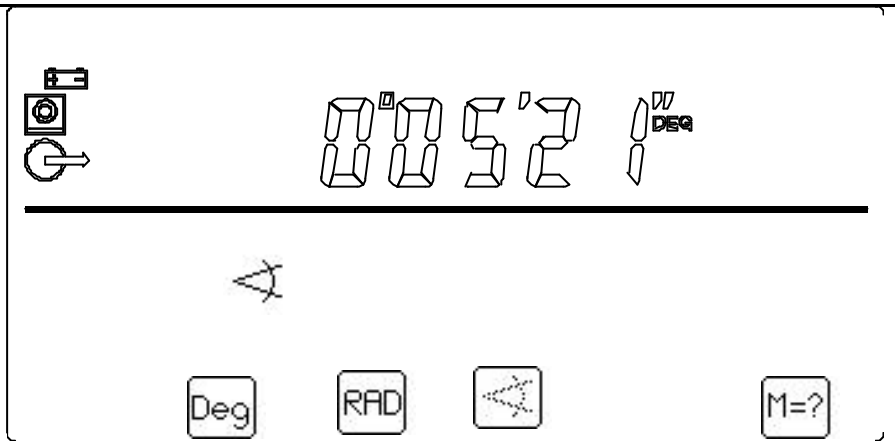
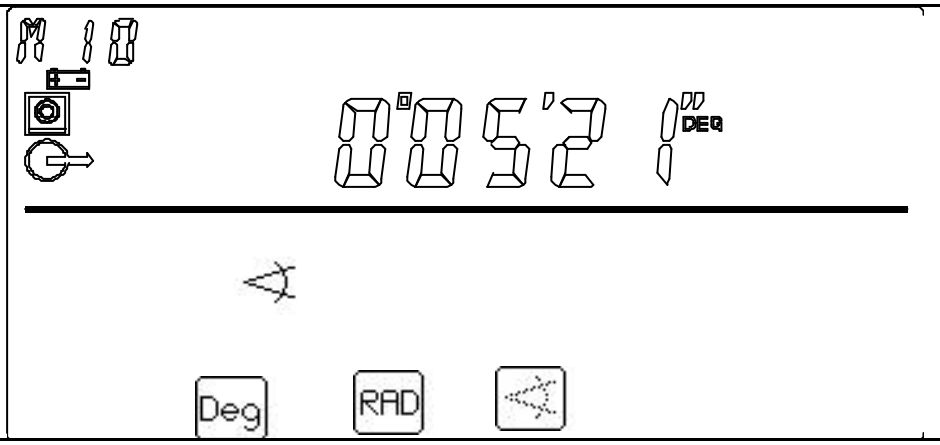
	Fin de la prise de la mesure. Affichage général	
 or rotating the power control 		**Full display shows measurement results** Measuring perpendicularity error appears on main display. Measured straightness deviations, angle and range in Z axis appear on auxiliary display.
	At this point, you may decide to prompt for either of the following options:  Perpendicularity error  Highest measured value with its position  Lowest measured value with its position  Straightness angle  Straightness error  Curve diagram of measured values  Printing measured values  Use these keys or the rotary power control to start a new measurement.  Use this key to get data displayed when starting up back again. The reference values and logbook will not be initialised.  Use this key to exit the perpendicularity measuring mode.	

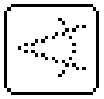
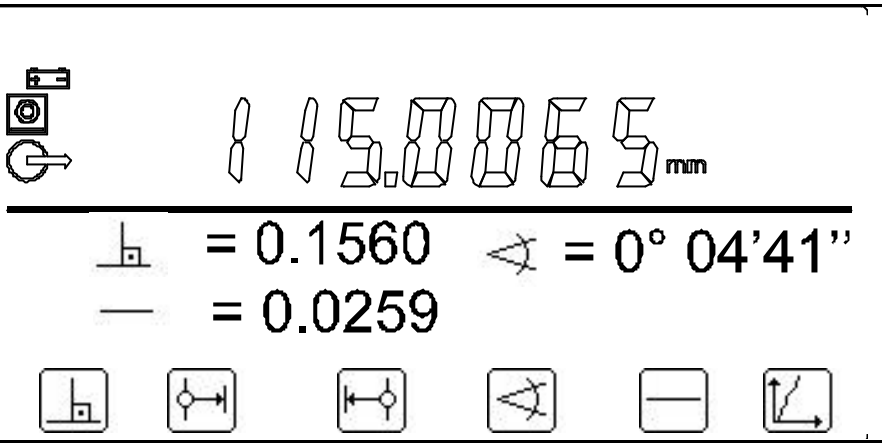
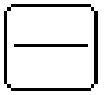
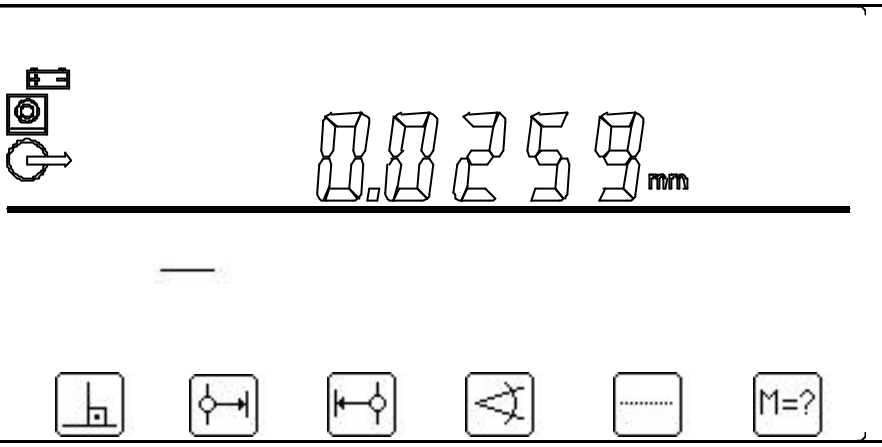
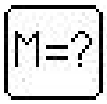
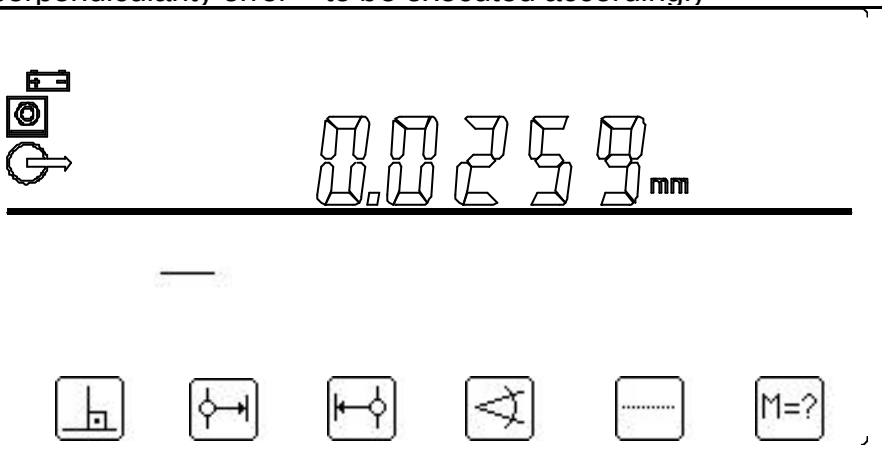
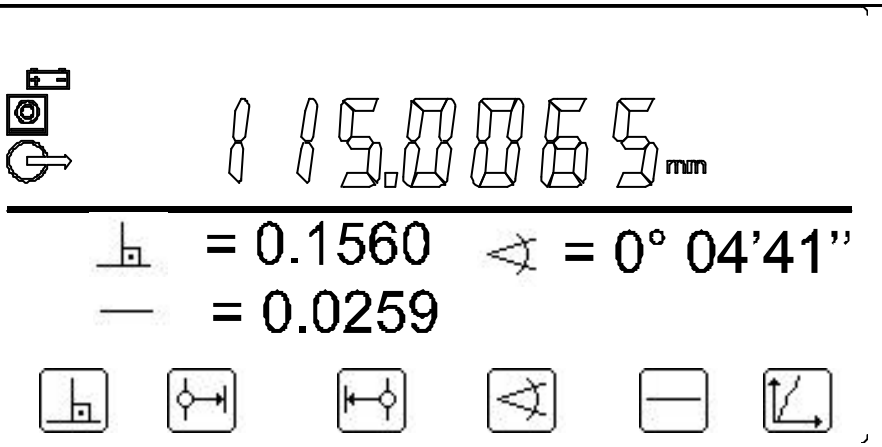

End of measurement
X1 = 0.068: << Maximum positive >>
L (Z) =250
L2 (Z2) = 51.9
L1 (Z1) = 221.4
X2 = -0.023: << Maximum negative >>
0
Start of measurement
X= 0.091: Perpendicularity error

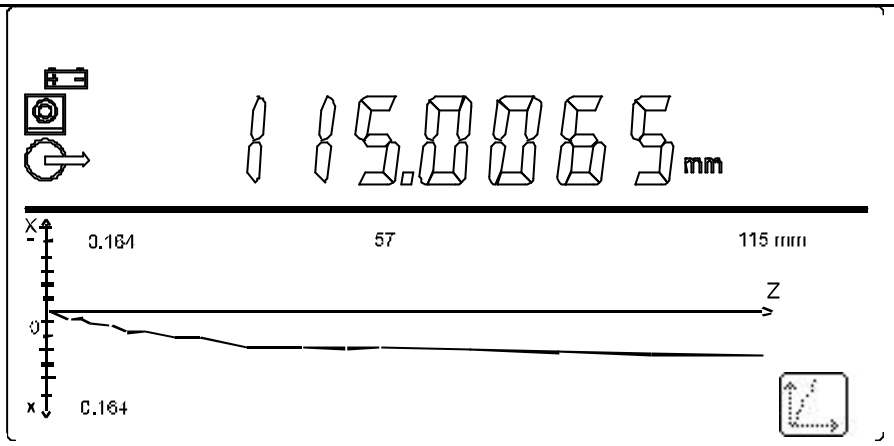
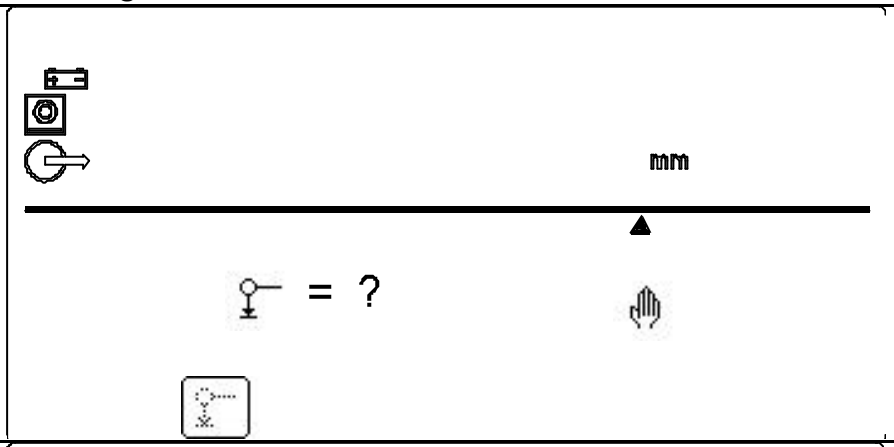
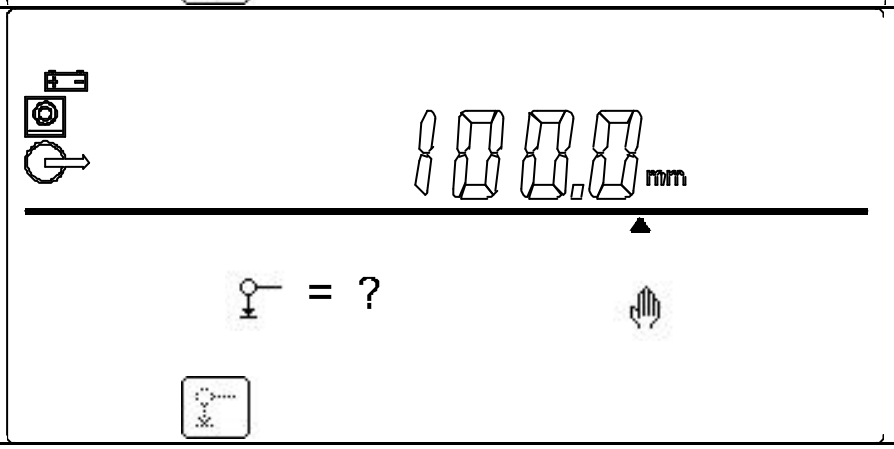

Straightness angle
Straightness regression line
Straightness error
0

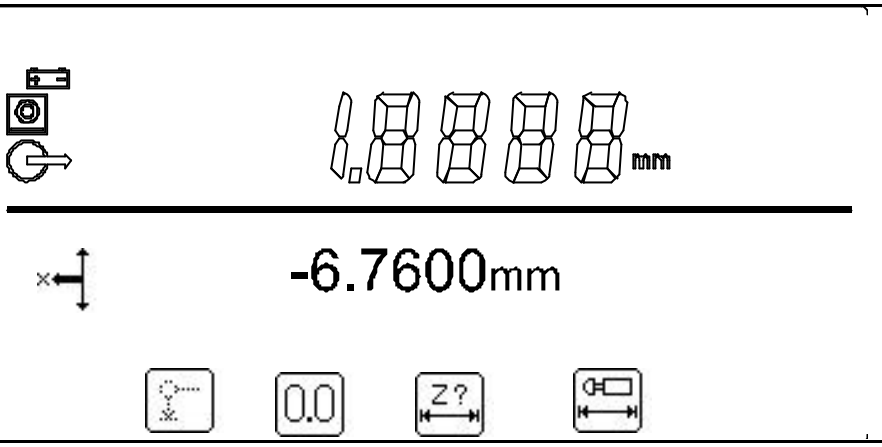
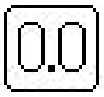
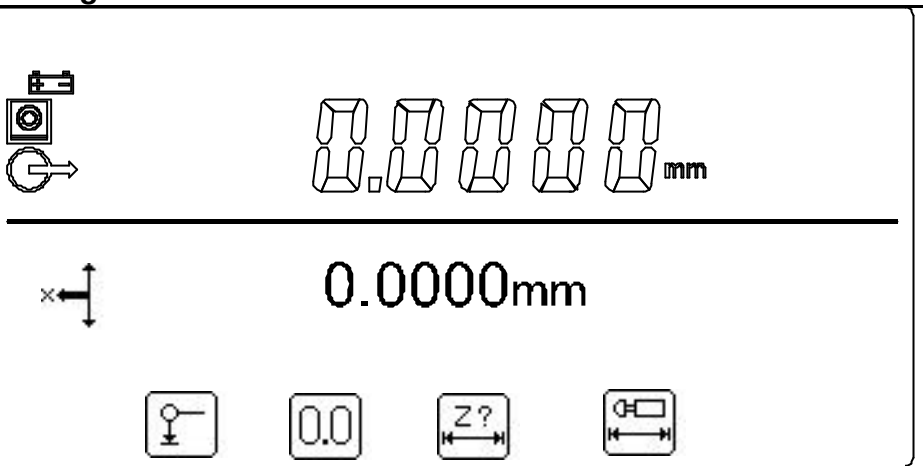
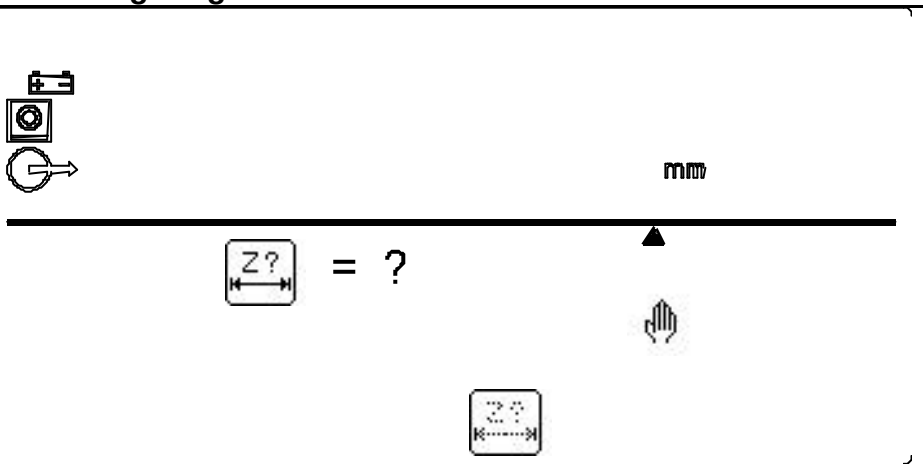
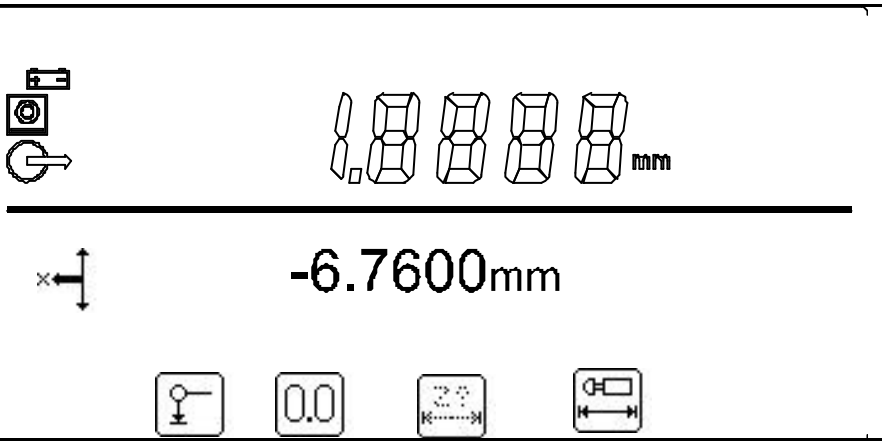
	Prompting for perpendicularity error	
		Main display shows perpendicularity error (Max-Min). Auxiliary display shows measuring range in Z axis.
	At this point, you may decide to press either of the following keys :  to save measured value in the logbook (provided value numbering was initially enabled in the configuration menu).  to print measured values related to both perpendicularity error and Z range.  or  Use either of both keys to return to measurement results - previously displayed.  Use these keys to access other measured values.  Use these keys or the rotary power control to start a new measurement.  Use this key to get data displayed when starting up back again. The reference values and logbook will not be initialised.  : Use this key to exit the perpendicularity measuring mode.	
		Save measured value in the logbook.

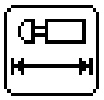
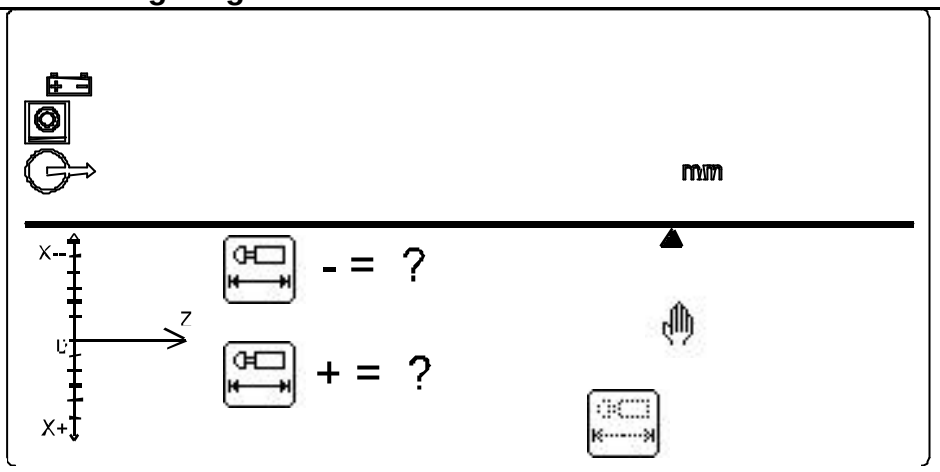
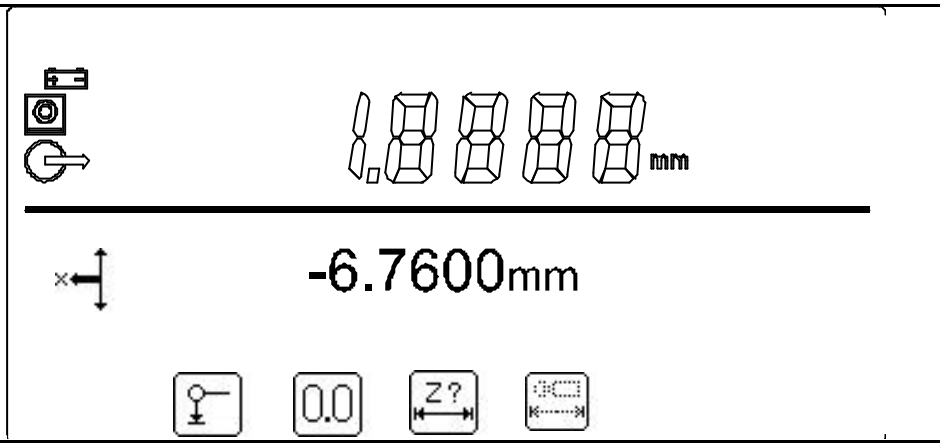
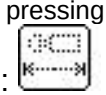
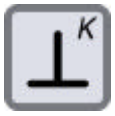
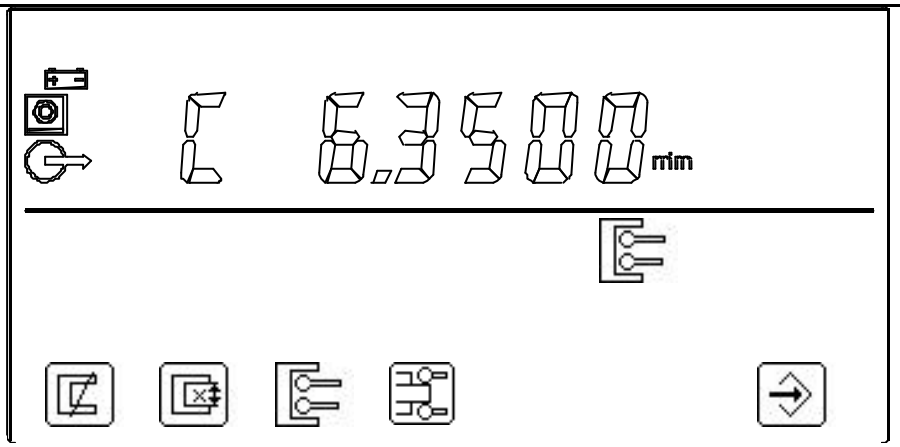
	Prompting for highest value	
		Main display shows highest value (Max) while its position in Z axis appears on the auxiliary display
	From this stage, you may ask for all operations described under « Prompting for perpendicularity error » to be executed accordingly.	
		Save highest value in the logbook.
	Prompting for lowest value	
		Main display shows lowest value (Min) while its position in Z axis appears on the auxiliary display.

	From this stage, you may ask for all operations described under « Prompting for perpendicularity error » to be executed accordingly.
M=?		Save lowest value in the logbook.
	Prompting for straightness angle	
		Main display shows straightness angle.
	At this point, you may press either of the following keys : Deg and RAD to change temporarily angle unit into decimal degree or radian. or to return to displayed measurement results of - . Use these keys or the rotary power control to start a new measurement. M=?, PRINT, , : to activate the same functions as described earlier in this chapter.	
M=?		Save straightness angle in the logbook.

		Return to measurement results of - previously displayed.
	Prompting for straightness error	
		Main display shows measured straightness error.
	From this stage, you may ask for all operations described under « Prompting for perpendicularity error » to be executed accordingly	
		Save straightness angle in the logbook.
		Return to measurement results of - previously displayed.

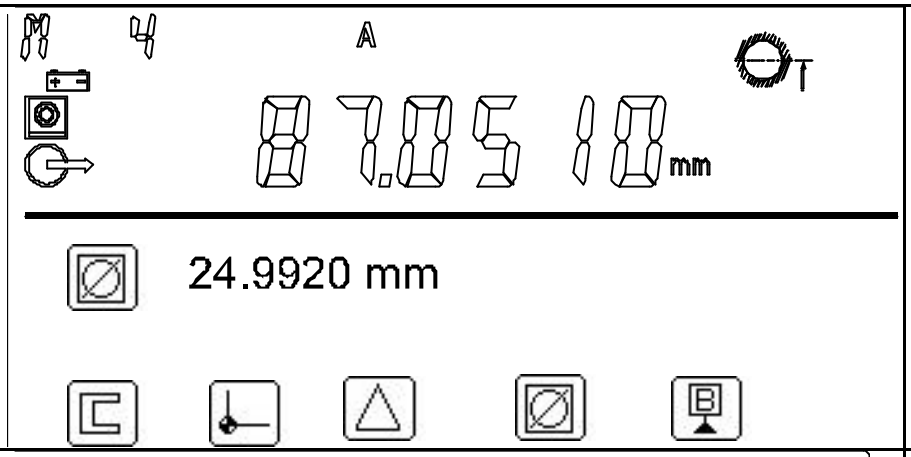
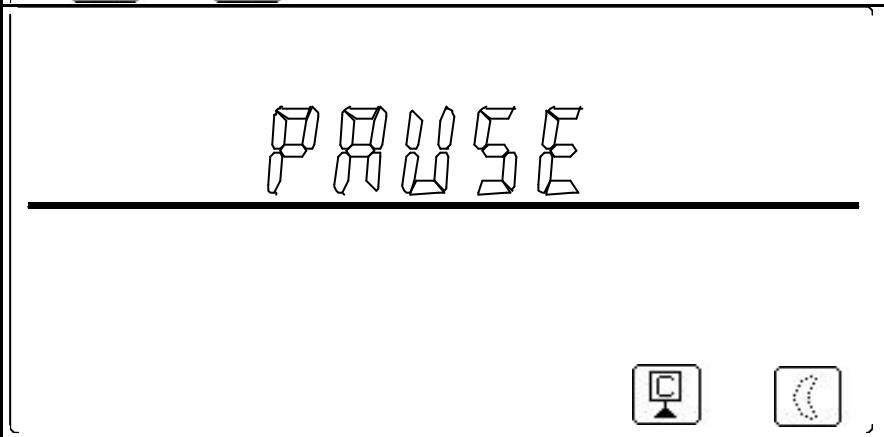
	Prompting for graph curve of measured values	
		Auxiliary display shows graph curve along with Z range. The main display shows the measuring Z range.
	From this point, you may press either of the following keys : or : to return to measurement results of - previously displayed. Use these keys or the rotary power control to start a new measurement. M=?, PRINT, , : to activate the same functions as described earlier in this chapter.	
	Entering PRESET value in Z axis	
		Input PRESET value.
Entering 100,0 through the keyboard		Displayed value once entered. Confirm by pressing or skip validation and press F2 to quit

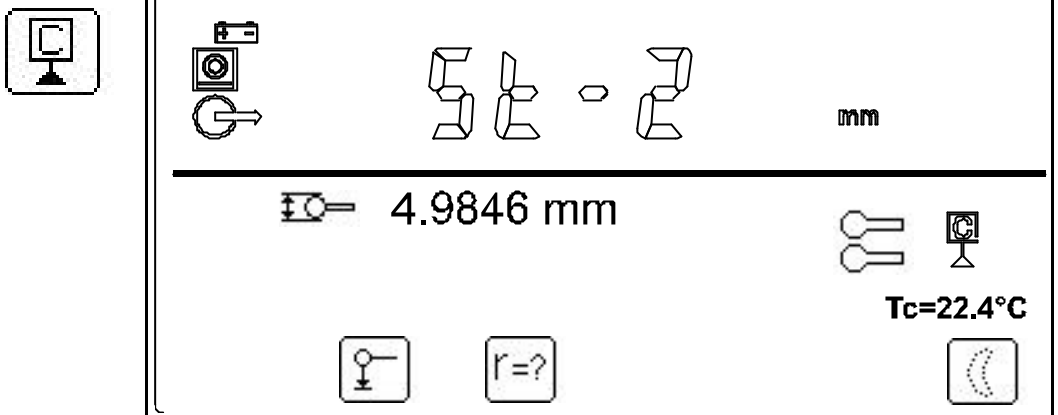
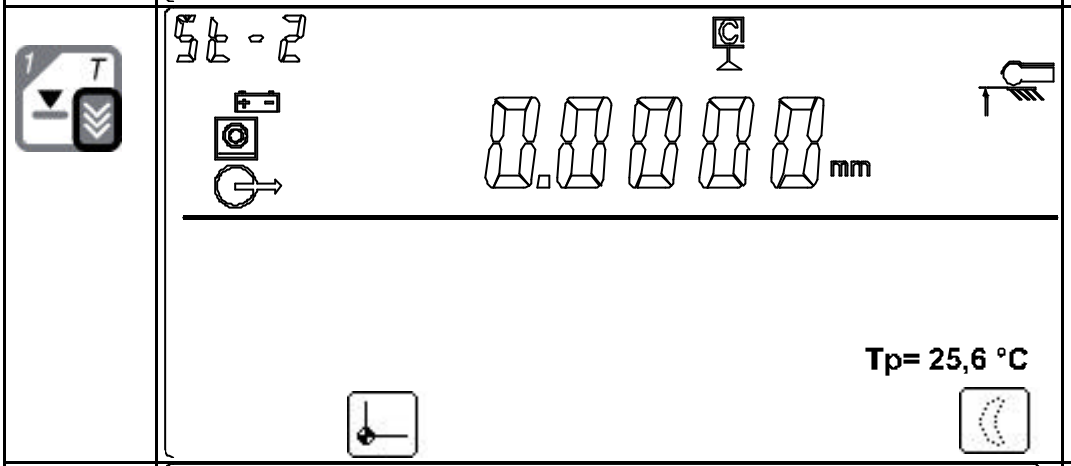
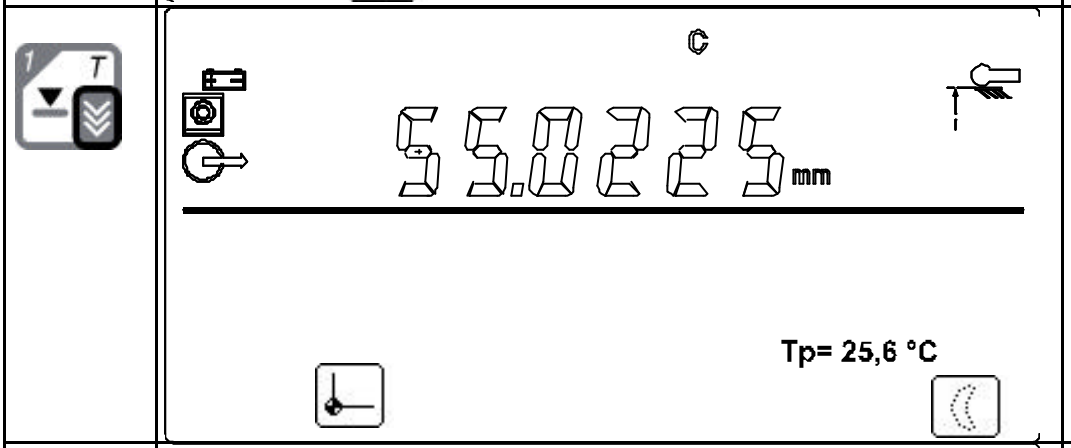
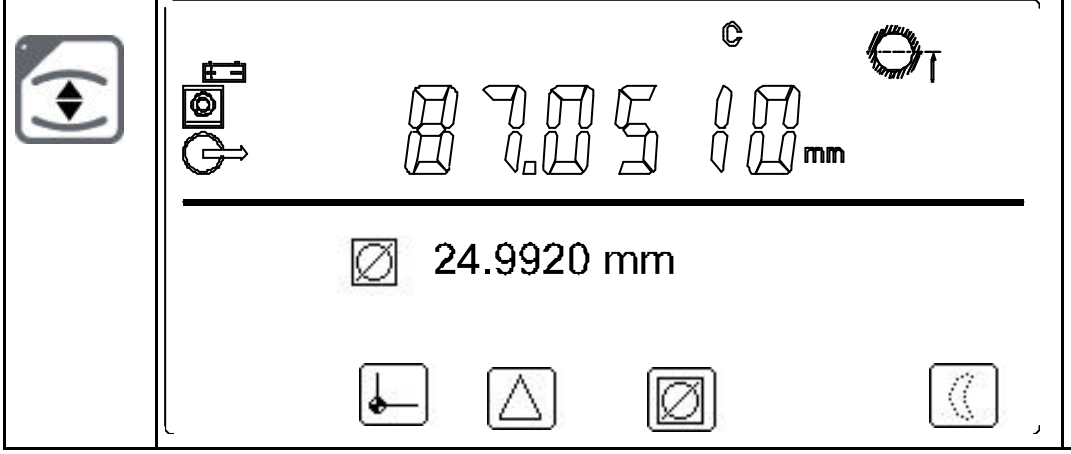
		Validate PRESET value in Z axis temporarily. This value will serve as a basis for all subsequent measurements.
	Setting counters of both Z and X axes to zero	
		Set both counters temporarily to zero. This setting will be cancelled each time you start measuring - .
	Measuring range in Z axis	
		Input relevant value through the keyboard. This value may be lying within 2 and 1000 mm. Confirm by pressing  or skip validation and press F4  to quit
		Confirm input value by pressing  or cancel input value by pressing F4 

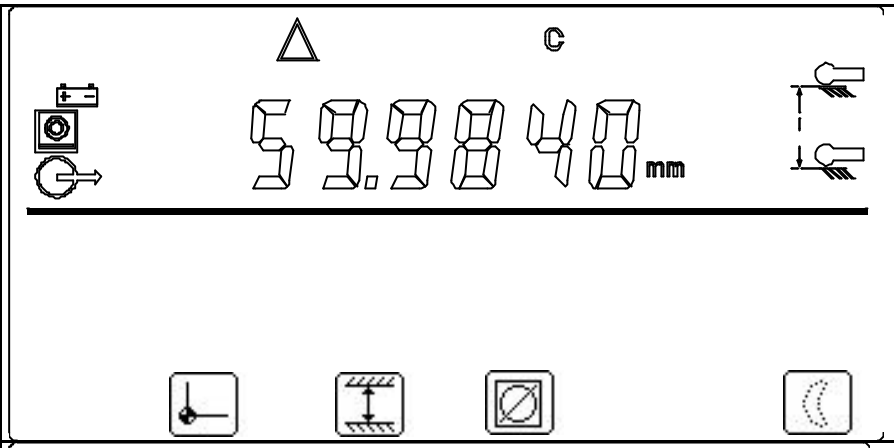
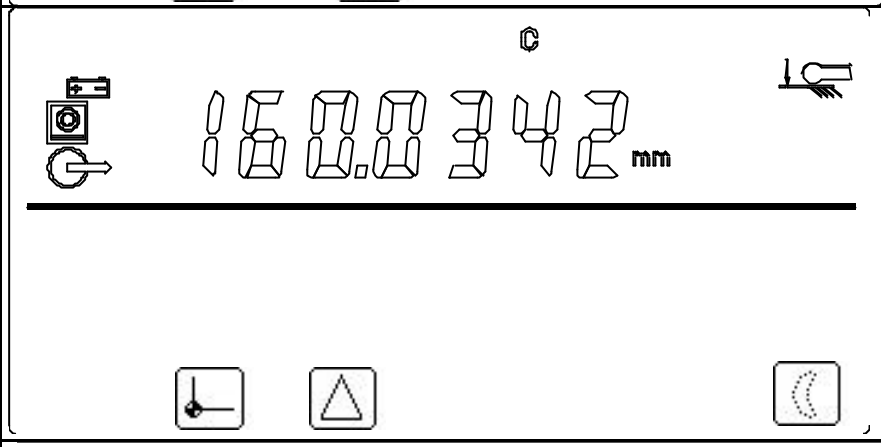
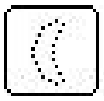
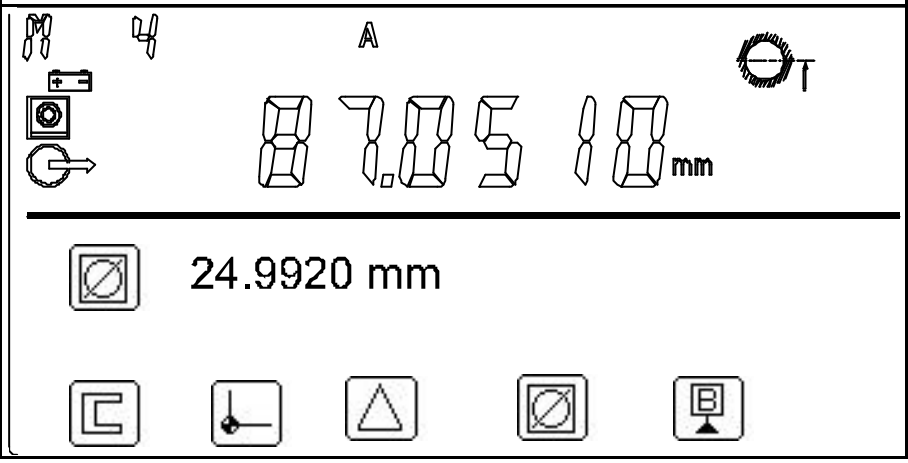
	Measuring range in X axis	
		Input graph scale values related to the X range through the keyboard. Both values may be lying within ± 0,0500 and ± 50.0000 mm Confirm by pressing  or skip validation and press F5  to quit
		Confirm scale values by pressing  or cancel both values by pressing F5: 
	Exiting perpendicularity mode	
		Exiting this mode means that probe constant will need to be captured again. Previous measured values remain stored.

12) PAUSE

Use this function key to activate the still mode. Once this is done, you may continue measuring based on a new reference C. The measured values will not be kept in the memory and the measurement cycle will not be interrupted. When capturing deviations in parallelism and perpendicularity, this function also serves to temporarily stop value capture, e.g. when getting over a groove (see chapter 9 and 11 for more information).

		PAUSE can be prompted from the measuring mode.
		System has switched over to the standby condition.
	To access reference C temporarily or To exit PAUSE mode and return to previous stage.	
	In the PAUSE mode, you're not allowed to capture a new probe constant as this operation could affect the measurement cycle being carried out at the time this mode was enabled. You may, however, use the functions enabling you to perform all needed probe contacts or measure distances or medians.	

	Prompting for reference C	
		Prompt for the measuring mode as configured before accessing this command.
		Capture reference value
		Displayed value after first probe contact
		Displayed value after second probe contact

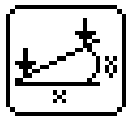
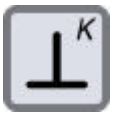
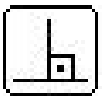
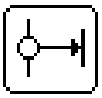
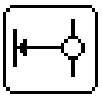
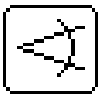
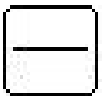
		Calculation of the distance between the last two measured values
		Displayed value after third probe contact.
		Quit PAUSE mode and return to previous stage.

13) Characteristics of the measuring functions

Each measuring function is given a name along with a single or several measured values.

Fonction	N°	Type	Ref	Axe	Val 1	Val 2	Val 3	Unité Cote	Texte Nom
	M01	Pal H	A	Z	xxxx.xxxx	-	-	mm	
	M02	Reb int H	A	Z	xxxx.xxxx	-	-	mm	
	M03	Reb Ext H	A	Z	xxxx.xxxx	-	-	mm	
	M04	Pal B	A	Z	xxxx.xxxx	-	-	mm	
	M05	Reb int B	A	Z	xxxx.xxxx	-	-	mm	
	M06	Reb Ext B	A	Z	xxxx.xxxx	-	-	mm	

Fonction	N°	Type	Ref	Axe	Val 1	Val 2	Val 3	Unité Cote	Texte Nom
	M07	Rainure	A	Z	xxxx.xxxx	xxxx.xxxx	-	mm	
	M08	Tenon	A	Z	xxxx.xxxx	xxxx.xxxx	-	mm	
	M09	Diam Int	A	Z	xxxx.xxxx	xxxx.xxxx	-	mm	
	M10	Diam Ext	A	Z	xxxx.xxxx	xxxx.xxxx	-	mm	
	M11	Batt	- Si Abs A	Z	Max xxxx.xxxx	Min xxxx.xxxx	-	mm	
	M12	Moy	A	Z	xxxx.xxxx	-	-	mm	
	M13	Delta	A	Z	xxxx.xxxx	-	-	mm	
	M14	RS	-	-	xxxx.xxxx	-	-	mm	
	M14	Clav	-	-	xxxx.xxxx	-	-	mm	

Fonction	N°	Type	Ref	Axe	Val 1	Val 2	Val 3	Unité Cote	Texte Nom
	M15	Ang. 2Pal	A	-	Palp 1 xxxx.xxxx	Palp 2 xxxx.xxxx	X xxxx.xxxx	Rad	
									
	M18	Perp	-	Perp	?X xxx.xxxx	?Z xxxx.xxxx	-	mm	
	M19	Perp max	-	Perp	Xmax xxx.xxxx	Z xxxx.xxxx	-	mm	
	M20	Perp min	-	Perp	Xmin xxx.xxxx	Z xxxx.xxxx	-	mm	
	M21	Ang. Perp	-	Angle	x.xxxxxx	-	-	Rad	
	M22	Rect	-	Rect	xxx.xxxx	-	-	mm	

14) 2D measurement 

To access this mode from the standard mode, the following conditions must first be met:

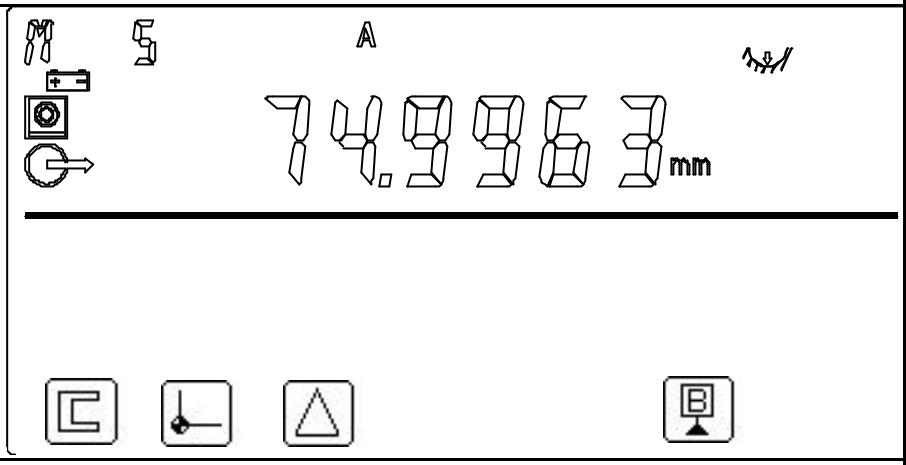
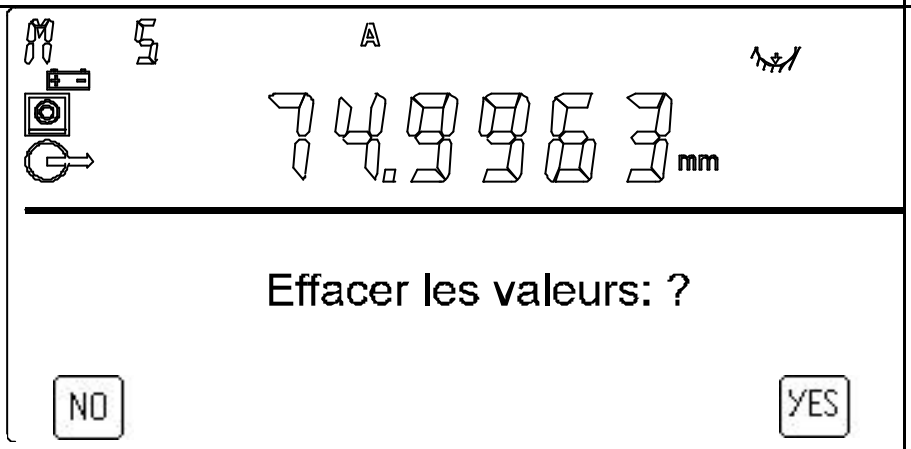
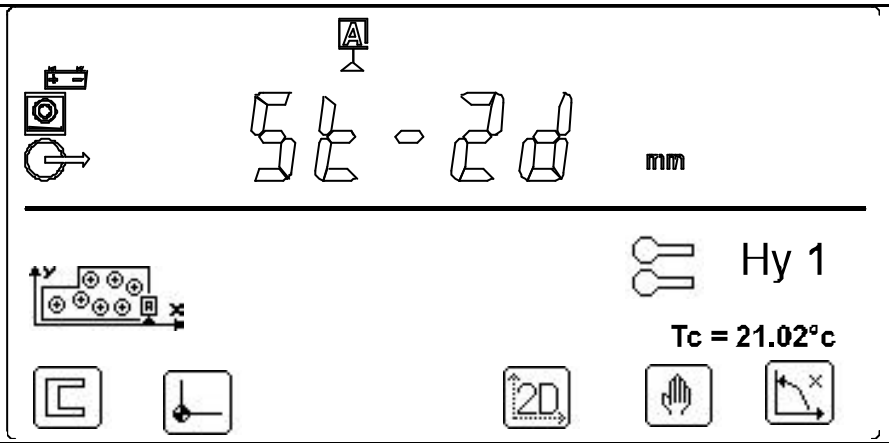
- Probe constant has been established prior to access mode.
- Reference value has been captured at least at the time you were accessing this mode.
- Numbered values possibly saved in the logbook have been retained or erased by answering displayed warning message appropriately.

To measure the centre heights, you may proceed in either of the following ways :

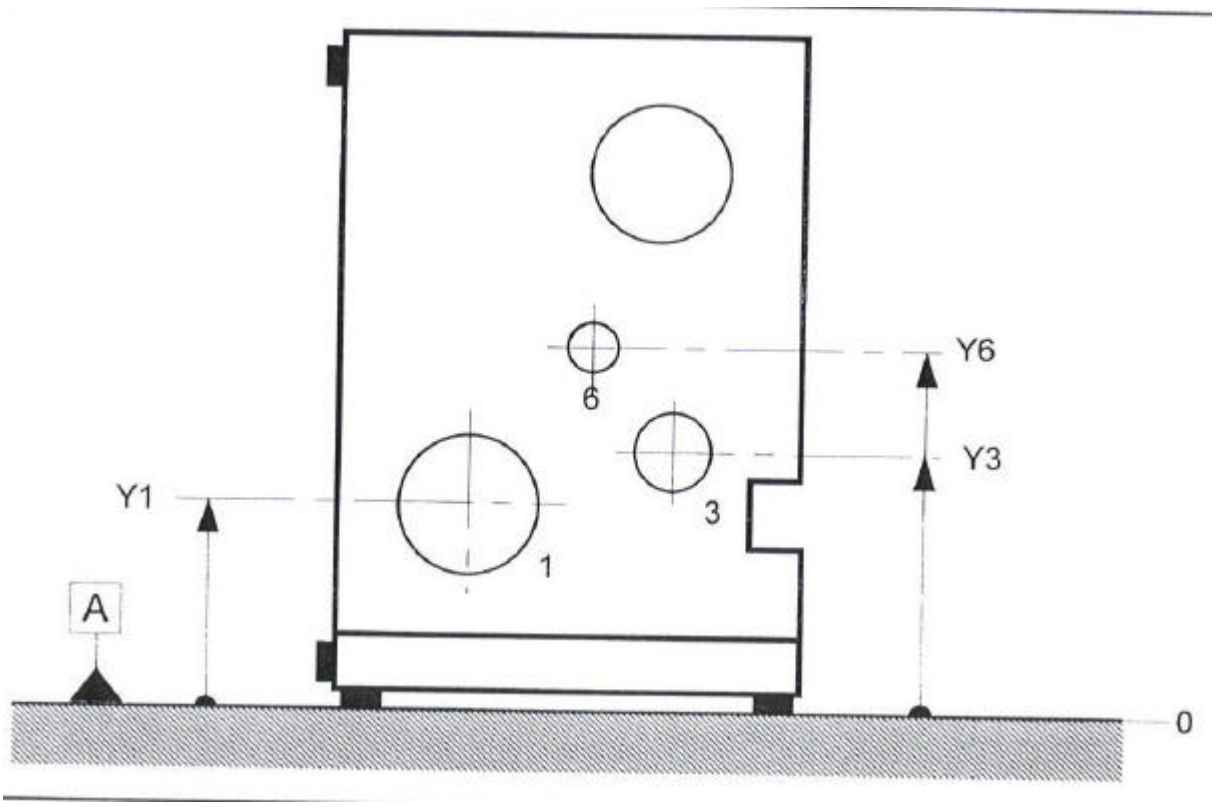
- With detection of the culmination point by pressing  or 

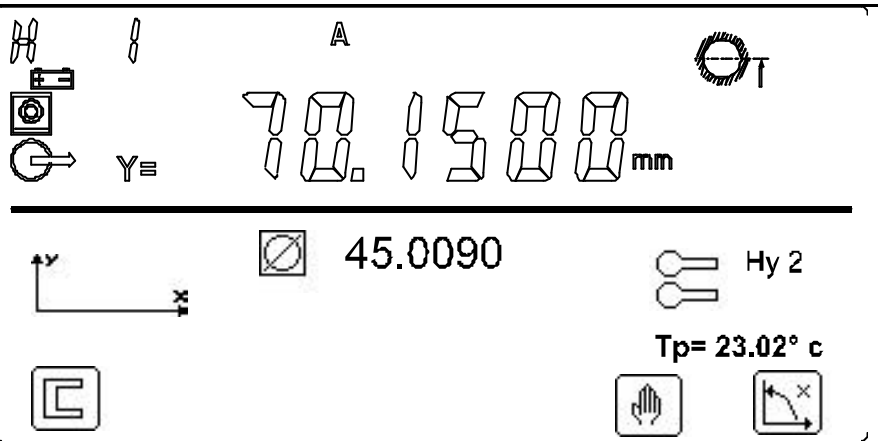
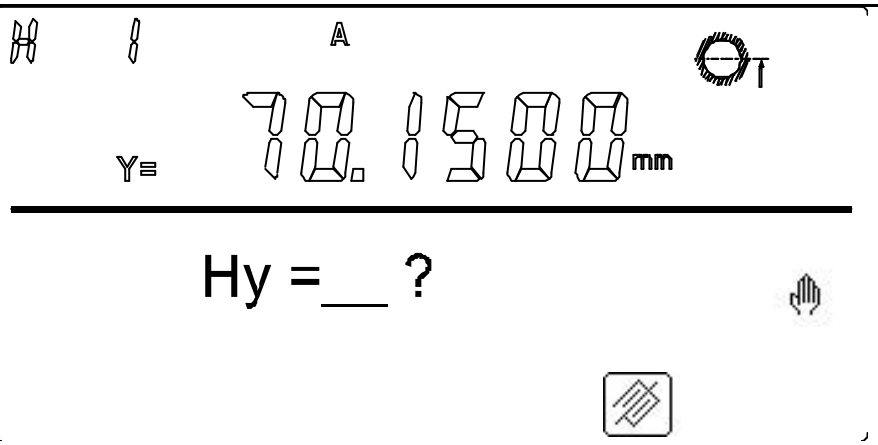
- Without detection of the culmination point by pressing  or  . Relevant value will not be displayed as the measurement results are being processed.

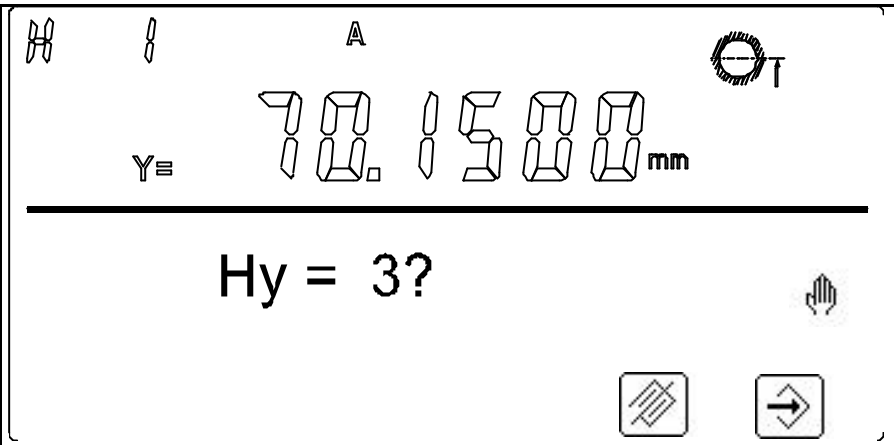
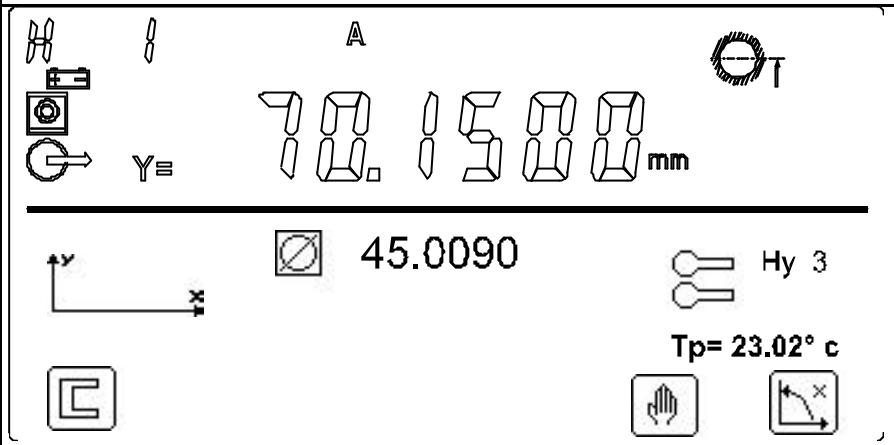
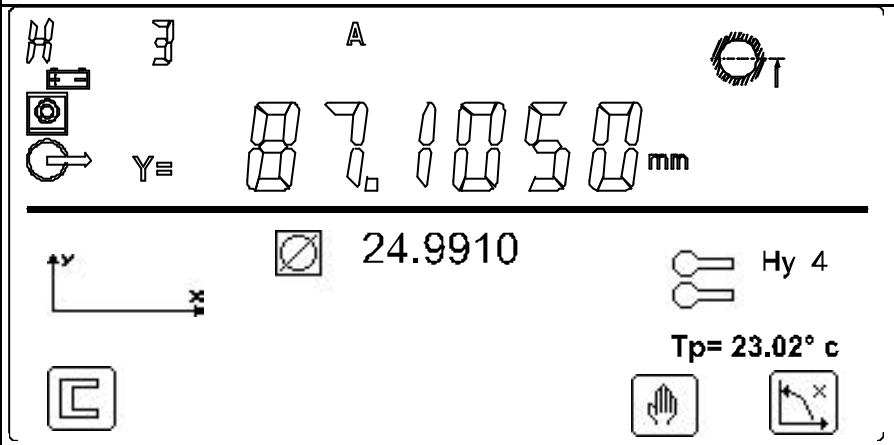
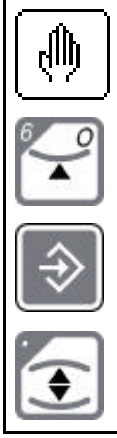
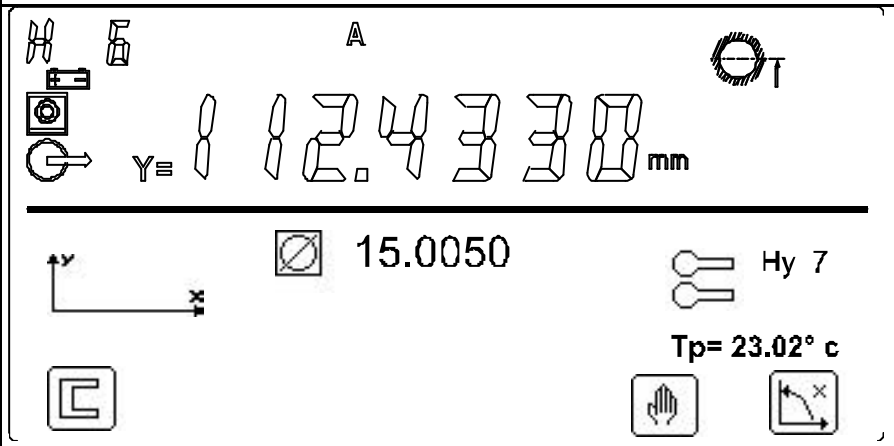
Fonction	N°	Type	Ref	Axe	Val 1	Val 2	Texte Nom
	H1	Centre mm	A	Y X	xxxx.xxxx xxxx.xxxx	xxxx.xxxx xxxx.xxxx	
	H2	Centre mm	A	Y X	xxxx.xxxx xxxx.xxxx	xxxx.xxxx xxxx.xxxx	
	H3	Centre + Diam Int mm	A	Y X	xxxx.xxxx xxxx.xxxx	xxxx.xxxx xxxx.xxxx	
	H4	Centre + Diam Ext mm	A	Y X	xxxx.xxxx xxxx.xxxx	xxxx.xxxx xxxx.xxxx	

	Common measurement in mode St-2	
		Activate St-2
	Entering in measuring mode 2D	
		M values saved in the logbook may either be retained or erased if automatic numbering has been selected. In this example, Yes prompts for next value M1. No prompts for next value M6
	Starting up 2D measurement in Y axis	
 or 		
	 Exit 2D measuring mode  Prompt for manual input of relevant number  Rotation through X axis	

14.1) Measuring in coordinate direction Y

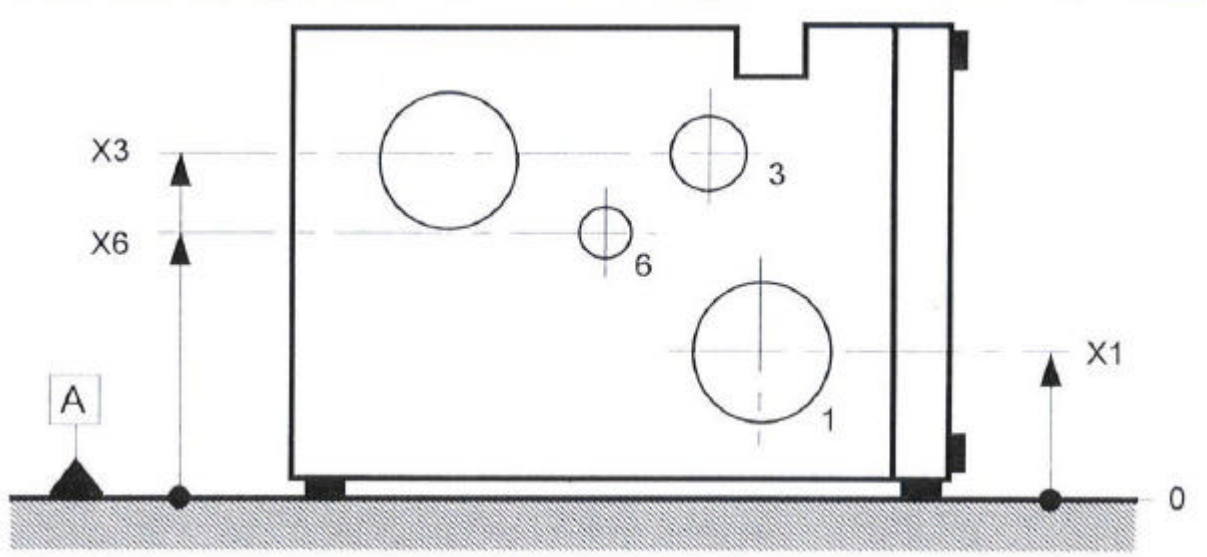


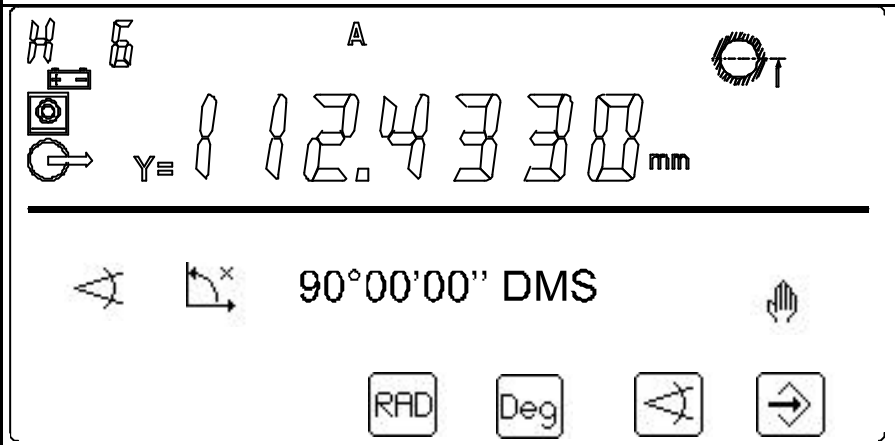
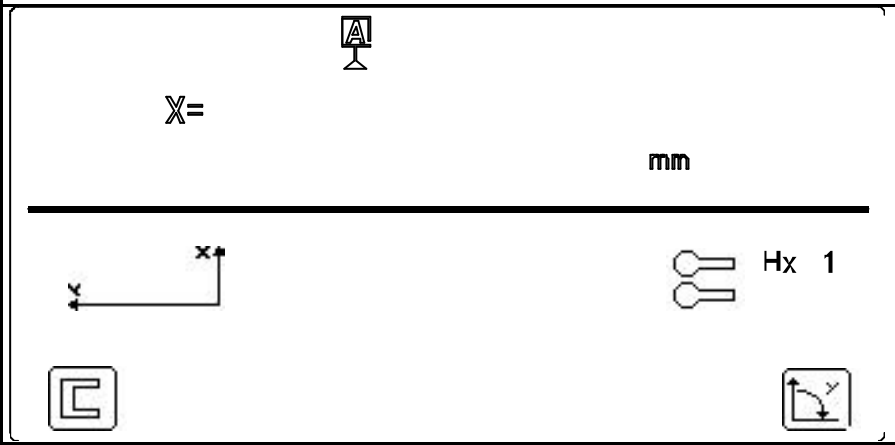
	Measuring in Y axis	
		Probe bore 1 with detection of the culmination point. **Display shows measured value H 1 (Y).** Confirm next proposed value or input a new number
		Enter number of next bore to be probed

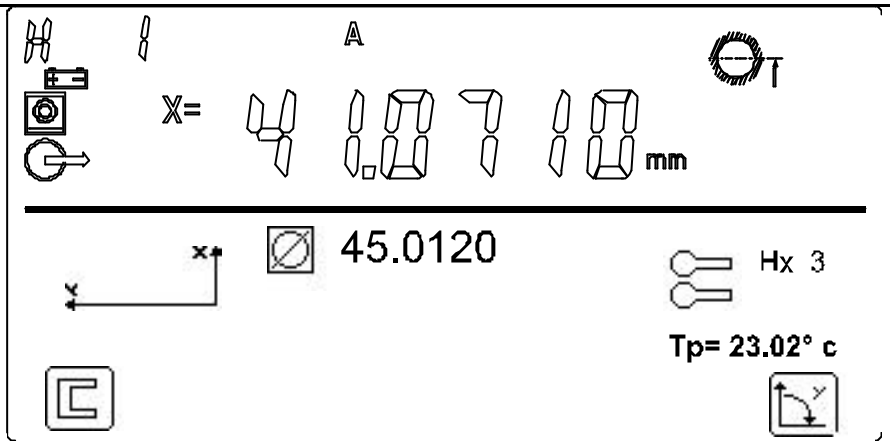
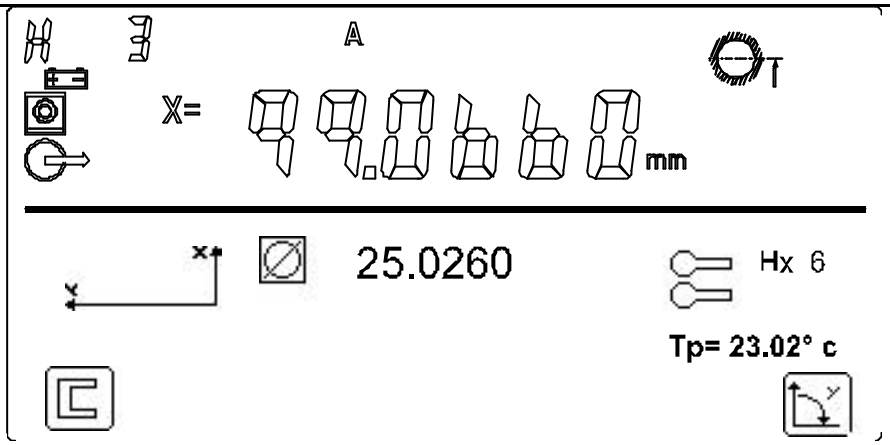
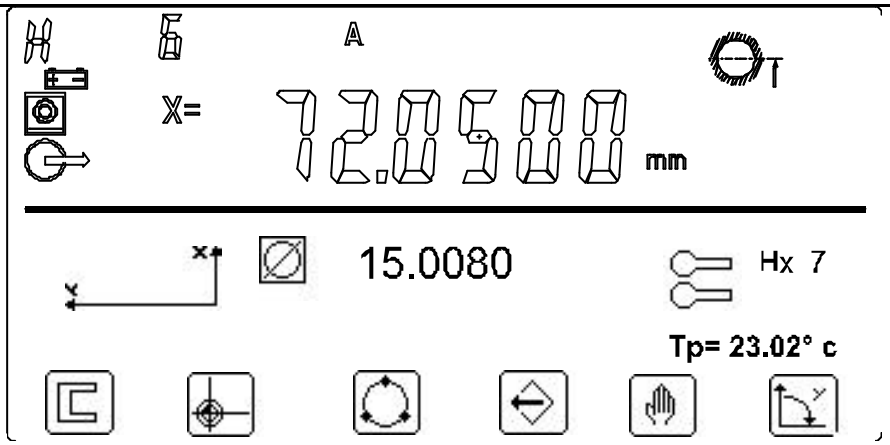
		Input desired number to Hy.
		Confirm number of next bore to be probed
		Probe bore 3 with detection of the culmination point.
		Enter number of next bore (6) to be probed with detection of the culmination point..

End Measuring in coordinate direction Y.

14.2) Measuring in coordinate direction X

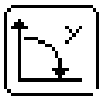
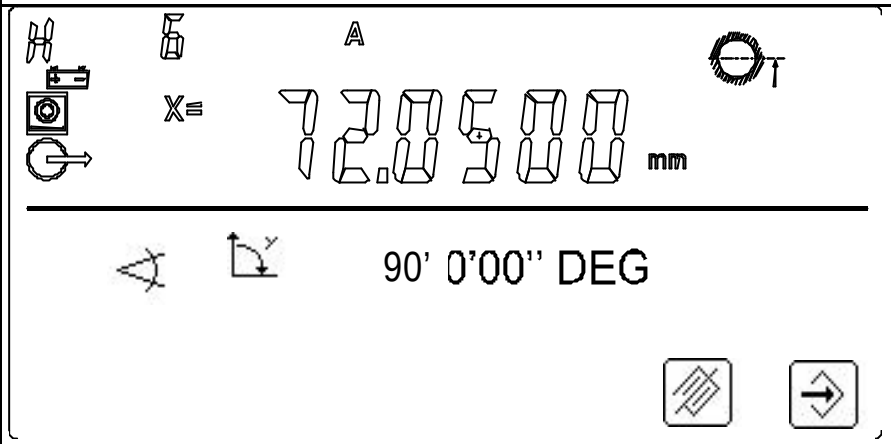
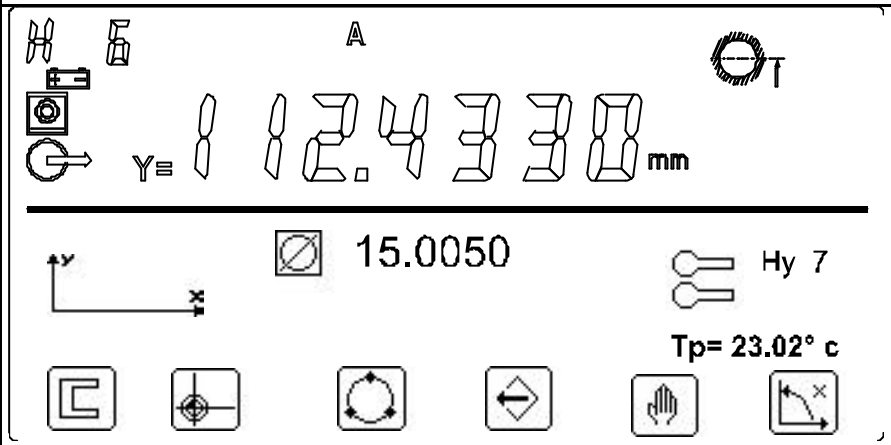
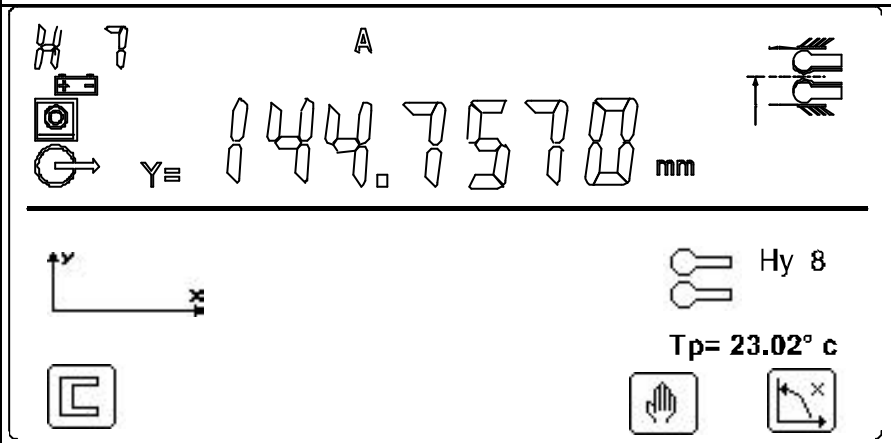
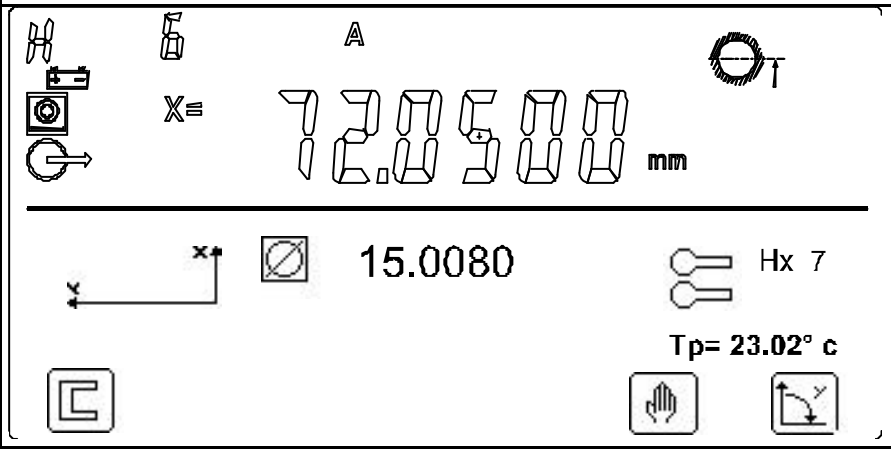


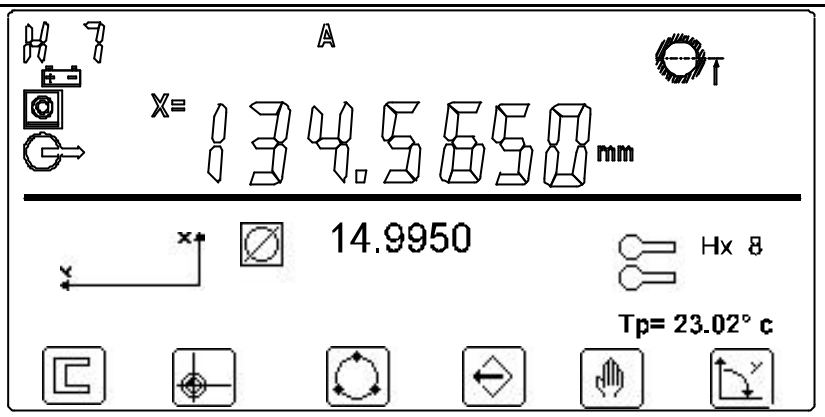
	Prompting for workpiece rotation	
		Confirm default value (angle to 90°) or displayed value if you've previously pressed **F5**. You may also change angle unit or input a new angle value. Rotation angle is limited to ± (45° to 135°).
		Validate workpiece rotation.

	Measuring in X axis	
		Probe bore 1 with detection of the culmination point. Bore that comes next in the table is proposed in the order of the probe contacts made in X axis. **Display shows measured value H 1 (X).**
		Probe bore 3 with detection of the culmination point. Bore that comes next in the table is proposed in the order of the probe contacts made in X axis.
		Probe bore 6 with detection of the culmination point. Bore that comes next in the table is proposed in the order of the probe contacts made in X axis. Data can either be analysed or checked at the end of the couples of probe contacts.

End Measuring in coordinate direction X.

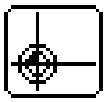
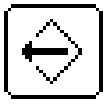
The measurement results can be checked before 2D analysis is started up. You may also decide to measure the part features that were skipped earlier. To do so, proceed as described on the following pages.

	Probing bore 7 additionally	
		Rotate X axis to Y axis. Display shows angle value with reverse sign.
		Confirm rotation through axis Y.
		Probe bore 7 without detection of the culmination point in Y axis. **Display shows measured value H 7 (Y).**
 and 		Repeat workpiece rotation through X axis, then confirm. Display shows height value which was last captured in this axis.

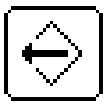
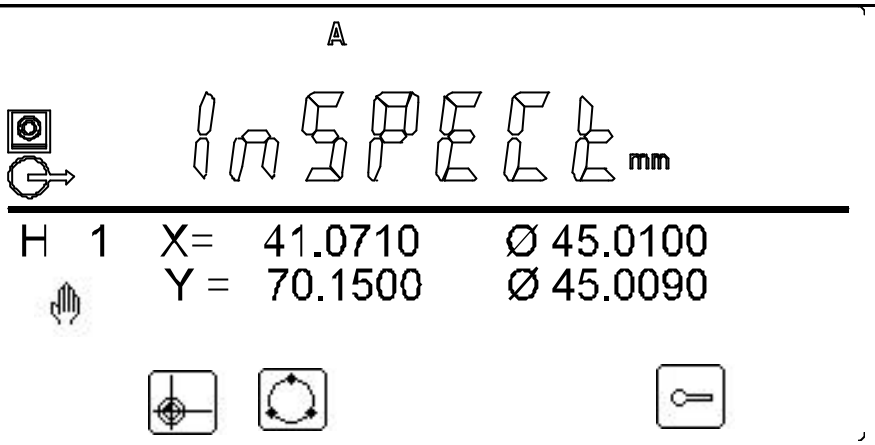
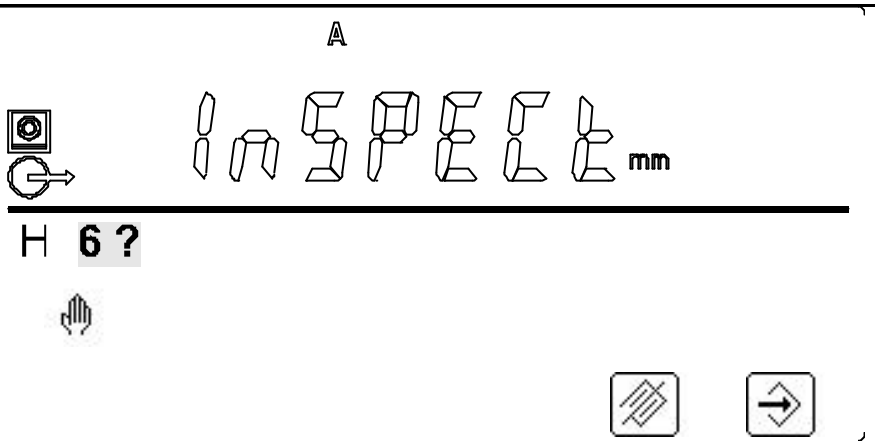
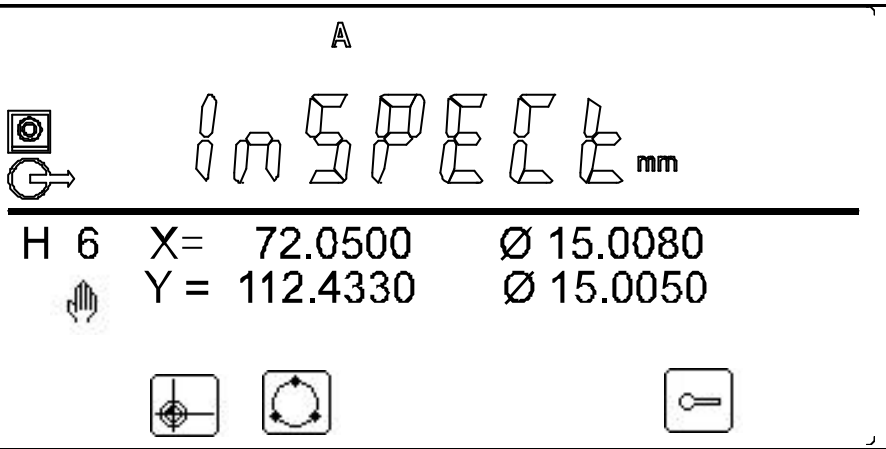
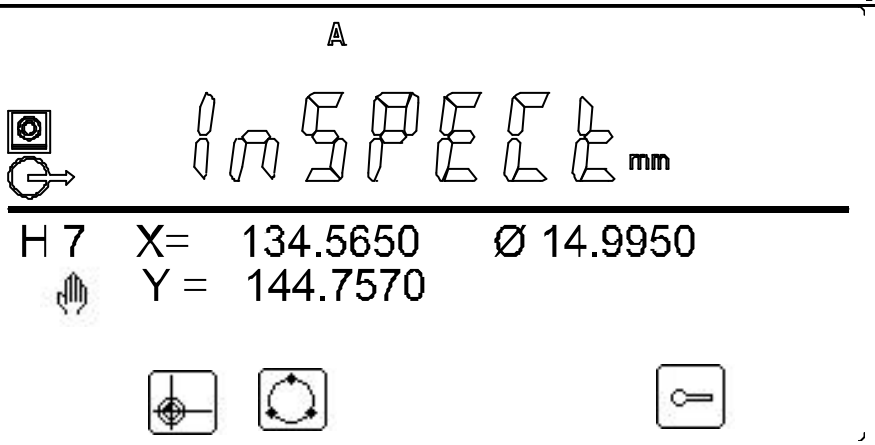
		Probe bore 7 in X axis with detection of the culmination point. **Display shows measured value H 7(X).**

End Measuring in both coordinate directions X and Y.

At this point, you may activate either of the following keys :

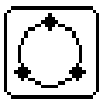
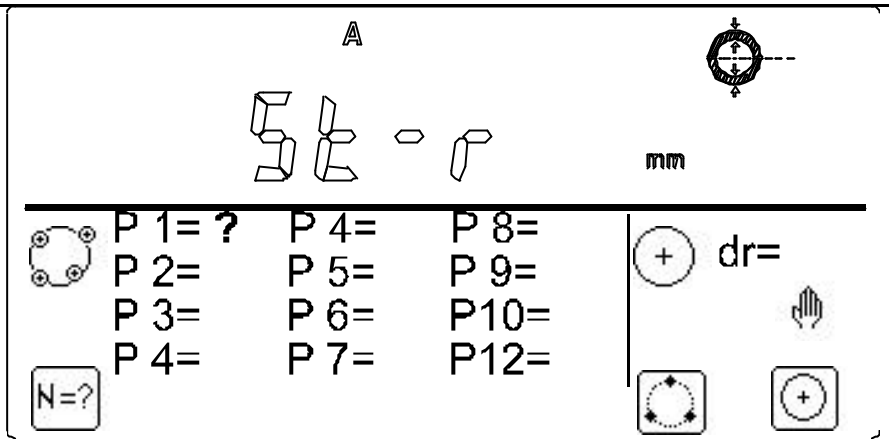
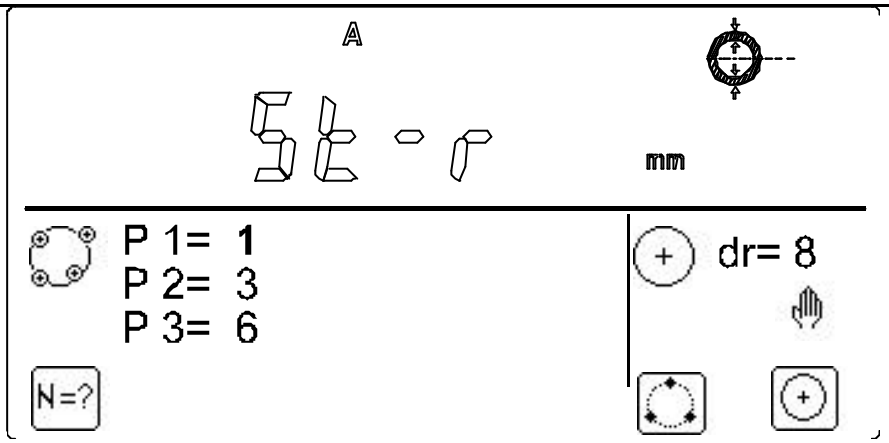
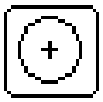
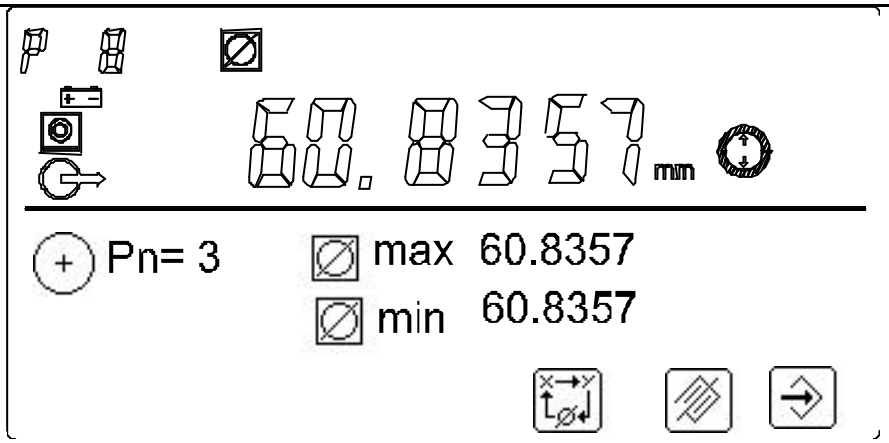
-  To define the origin point of the coordinate system
-  To calculate the regression circle based on measured part features
-  To check the measurement results
-  : Initialise the register of measurement, quit the 2D mode and return to the reference M0.
-  : Initialise all 2D measurements (H et M) and return to the beginning of the 2D mode.

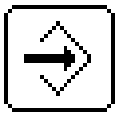
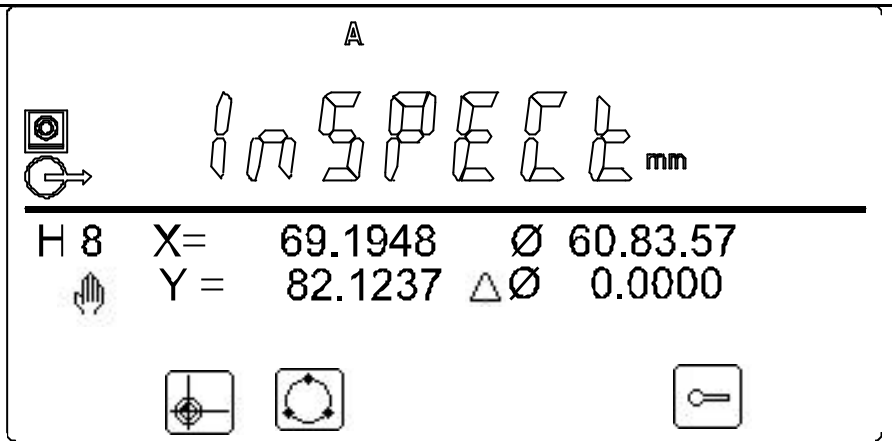
*14.3) **Checking 2D measurements :***

	Prompting for InSPECt to view Hy and Hx values	
		Use the arrow keys to have measured values displayed or enter desired number directly through the keyboard. Next, press Enter to confirm.
		Prompt for part feature 6.
		Confirm to view all relevant values.
		Use arrow keys  to scroll part features in desired order. Special case: bore 7 was not probed in both axes but in a single axis (X) with detection of the culmination point.

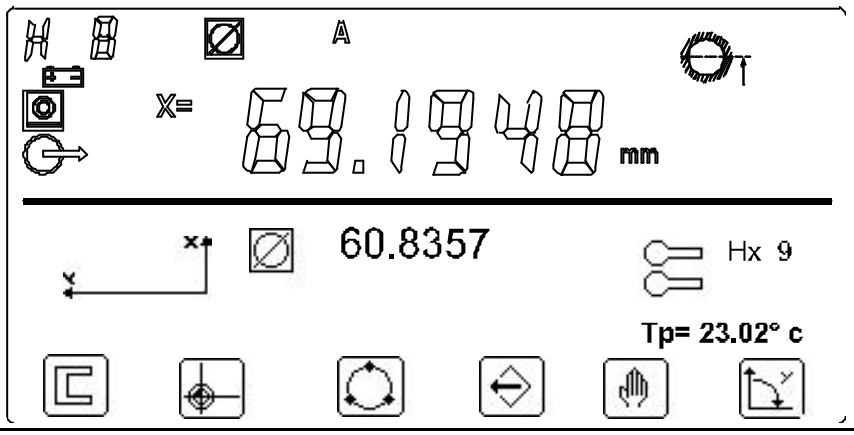
- 

Keep pressing this key, to print all values of the H elements.

	Prompting for calculation of a regression circle	
		Number of displayed Px matches that of measured H (max. 12 per page). Number of features used for calculating the regression circle may be within 3 and 64.
	N=? : This option is useful then the regression circle consist of many elements. It's allow just to enter the number of bores and the the first one	
1 + 3 + 6 + 8 +		Input each number. If desired feature has been used already or if it was not probed, you'll get a warning message. Use arrow key to move the cursor to dr = for entering relevant number.
		Display shows measured diameter of the regression circle along with both max and min values.

		Confirm and return to InsPECT mode. Display shows coordinate values along with the measured diameter and the difference between both max and min values.

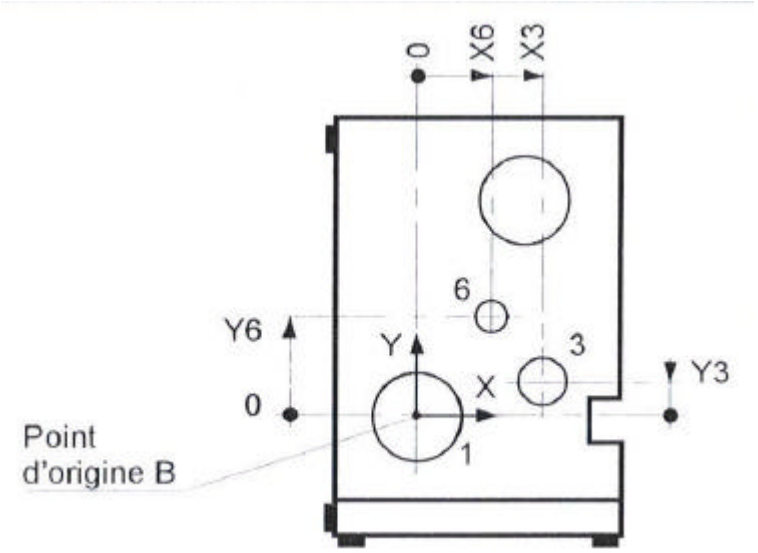
At this point, you may either return to the probing mode by pressing  or access the 2D analysis mode by activating the function key  to have the origin point of the coordinate system be first determined.

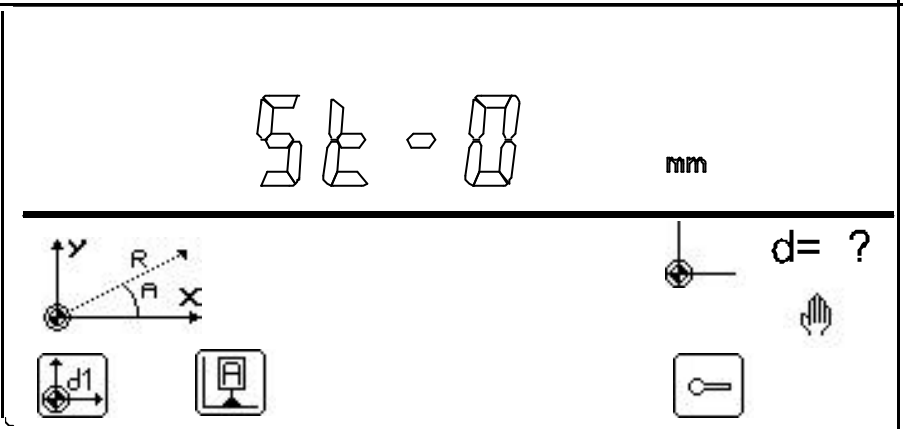
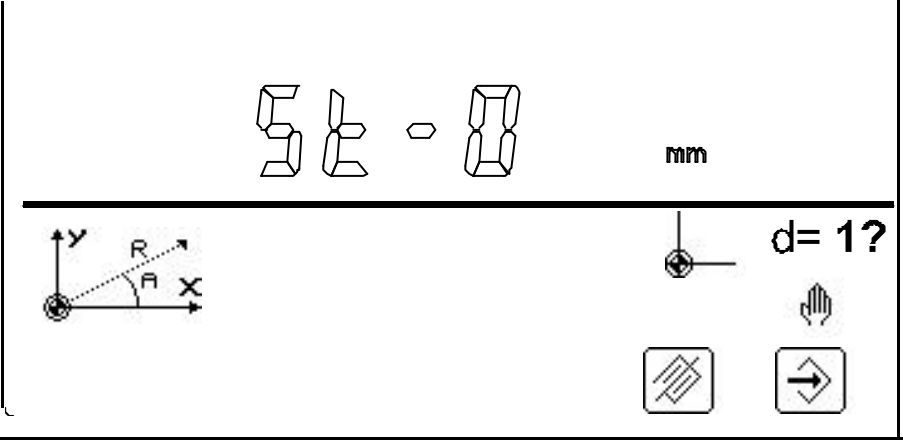
	Returning to the probing mode	
		Perform new probe contact or exit 2D mode by pressing key 

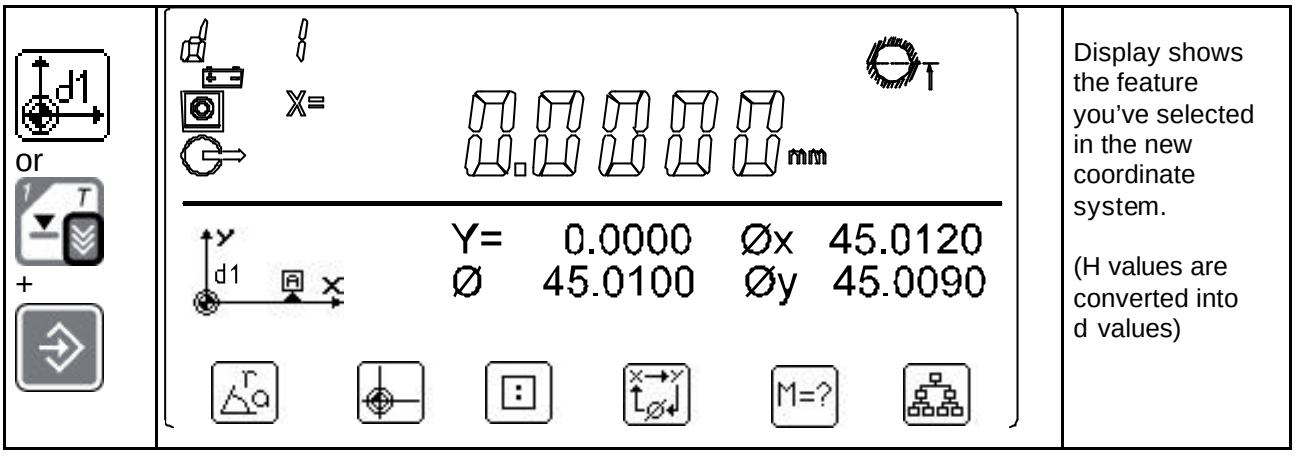
15) Performing 2D analysis

A 2D analysis allows you to execute various operations such as levelling and selecting the coordinate system or the numbered values M you want to print out. First, you need to determine the origin of the coordinate system.

15.1) Translation of the origin of coordinates to the bore axis



	Prompting for origin point	
		If bore 1 is the origin, press function key F1 or input any other desired number through the keyboard. Confirm your entry by pressing
		Enter number of the bore to be used to form the origin of the coordinate system.



From then on, you may decide
to view the other part features using the arrow keys

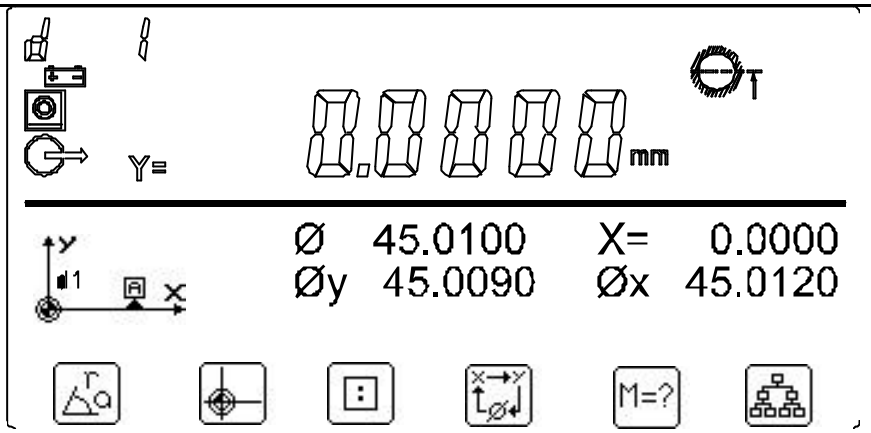
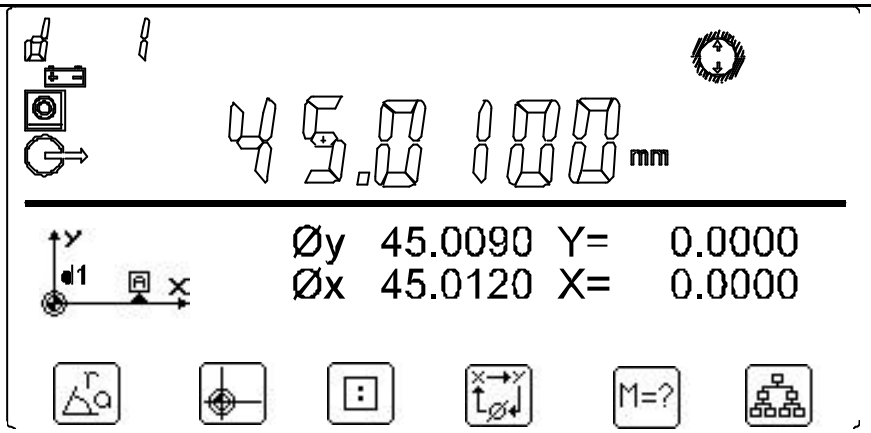
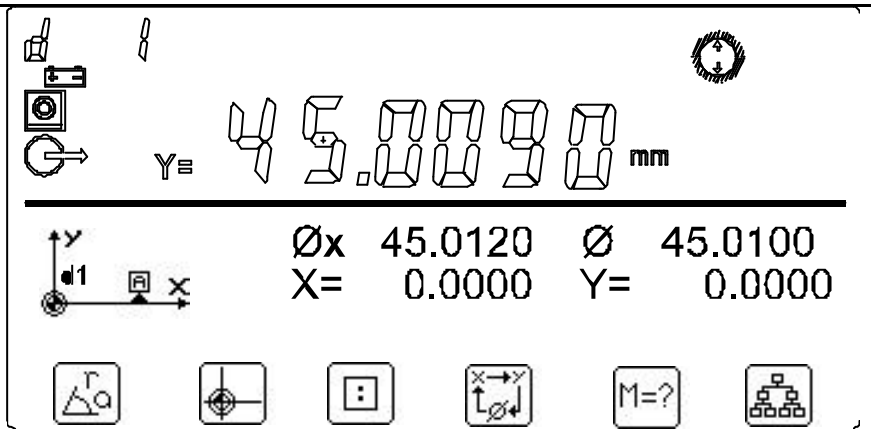
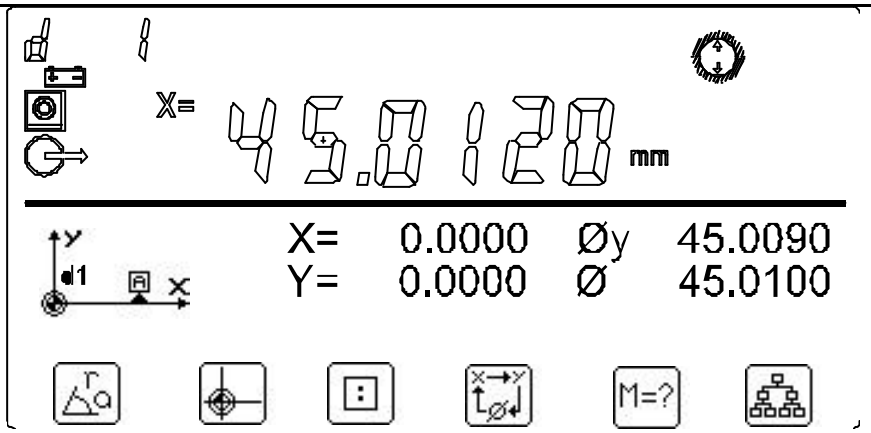
- to ask for next feature to be displayed
- to aks for previous feature to be displayed
- to jump forwards by 4 features
- to jump backwards by 4 features

or to access desired part feature directly using the keyboard.
In this case, confirm by pressing

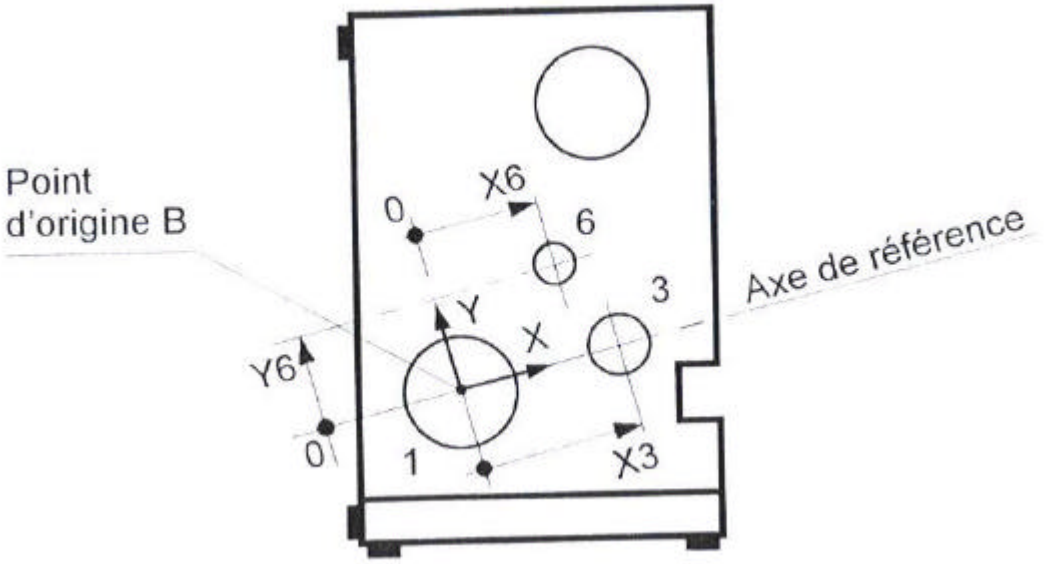
Available functions :

- Conversion into polar coordinate system
- New point of origin
- Alignment of the coordinate system
- Rotation of measured value through the main system
- Registration of the measured value shown on the main display as Mn+1 providing automatic value numbering is set to On. When saving a part programme, this value alone will be saved as measured dimension.
- Auxiliary geometric functions
- Press shortly: Print the value appearing on the main display
  Keep pressing this key to print all M and d elements values.

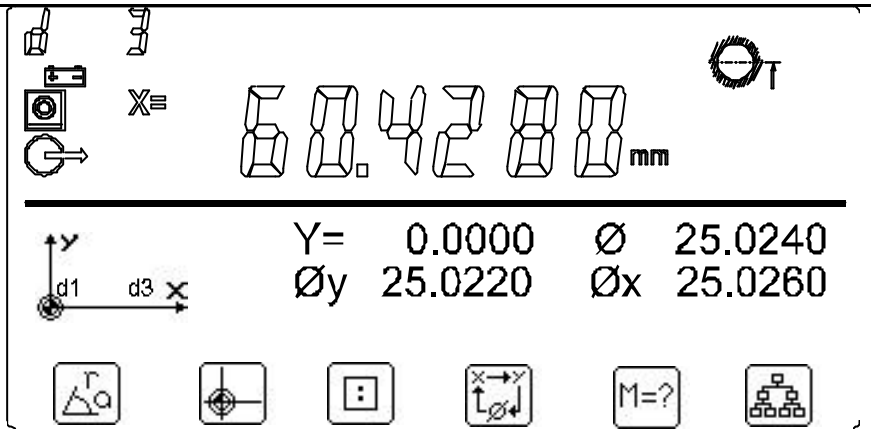
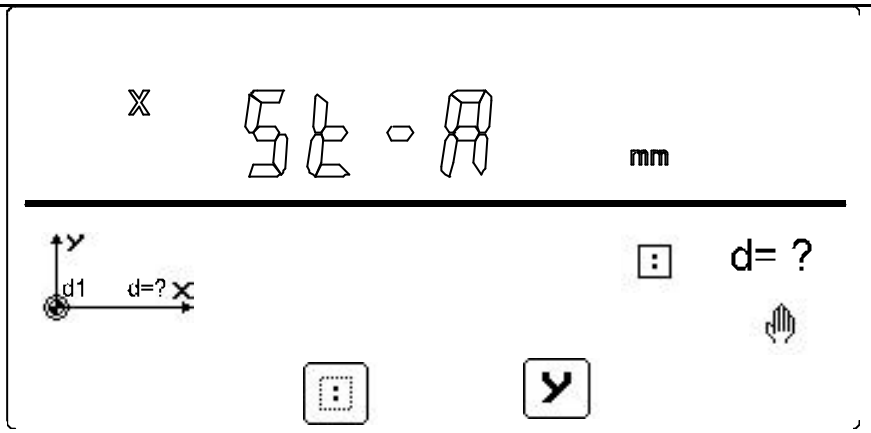
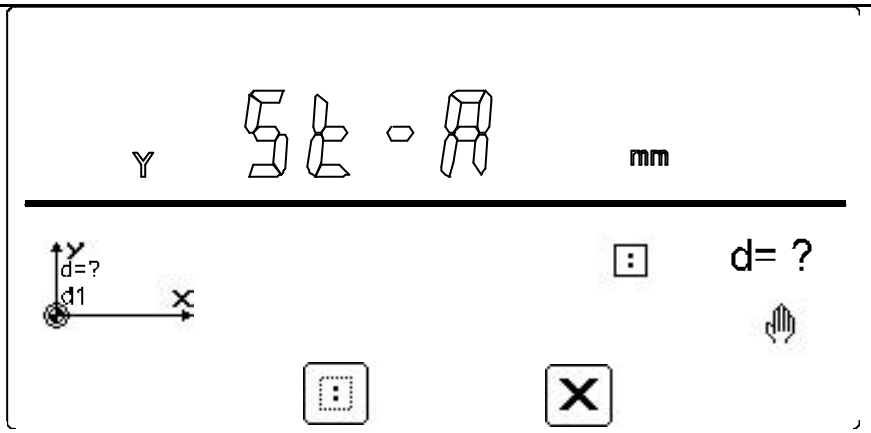
15.2) Rotation of displayed value through the main system

		Shift Y value to main display.
		Shift mean diameter to main display.
		Shift measured diameter in Y axis to main display.
		Shift measured diameter in X axis to main display. Press key once again to restore display to its starting condition.

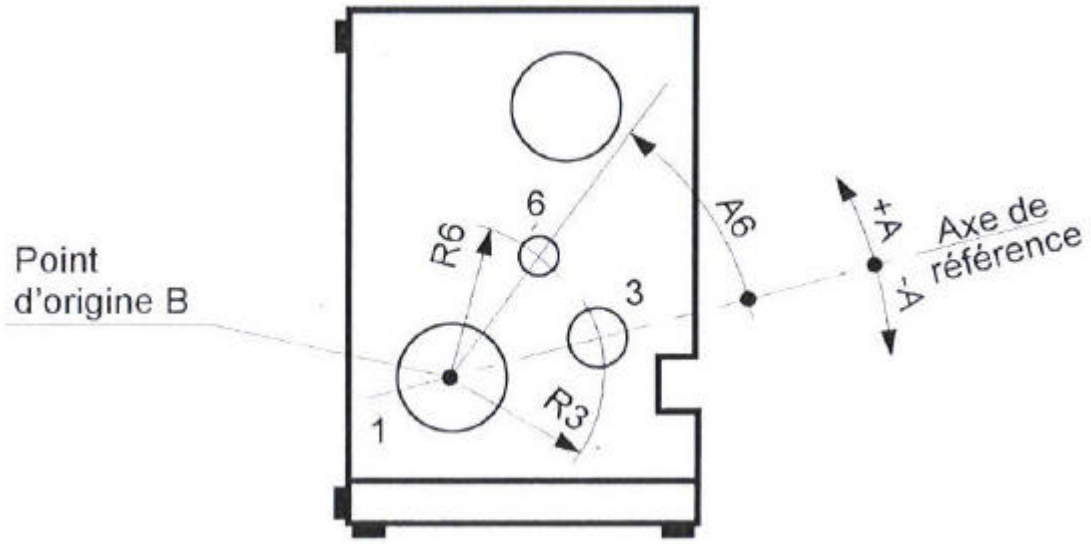
15.3) Aligning the coordinate system to the bore axis

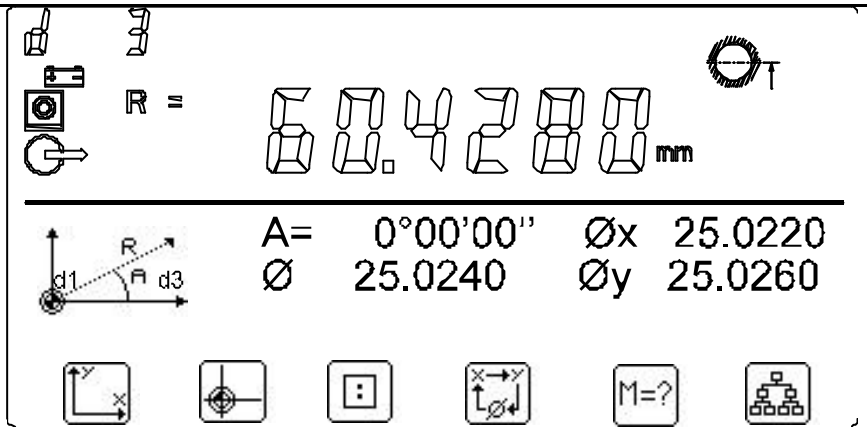


	This function is prompted for once the origin point has been determined	
	X 5t - A mm Y d1 d=? X d= ?	Enter number of the relevant bore to proceed in X axis. If you want to proceed in the Y axis, first press key Y
3 V	X 5t - A mm Y d1 d=? X d= 3?	Input number 3.

		Confirm by pressing  Display shows the feature you've selected in the new coordinate system..
	Proceeding in the Y axis	
		
		Enter desired number. Follow the same procedure as for X axis.

15.4) Changing measured values into polar coordinates

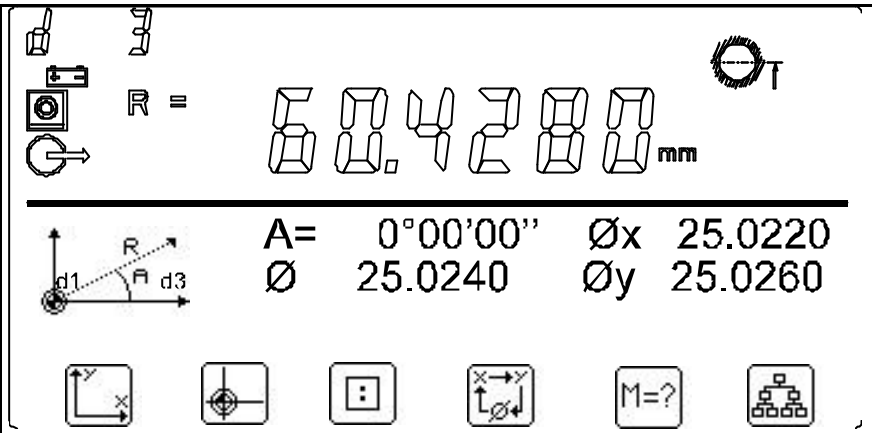
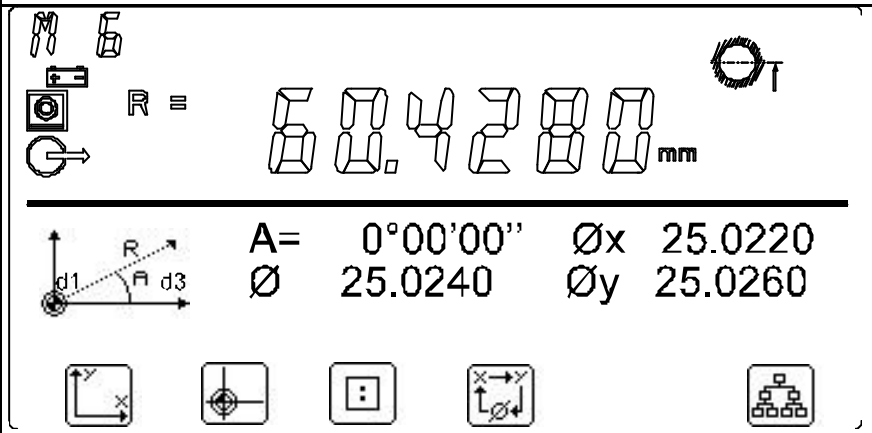


	Prompting for changing coordinates	
		Display shows the feature you've selected in the new polar coordinate system.

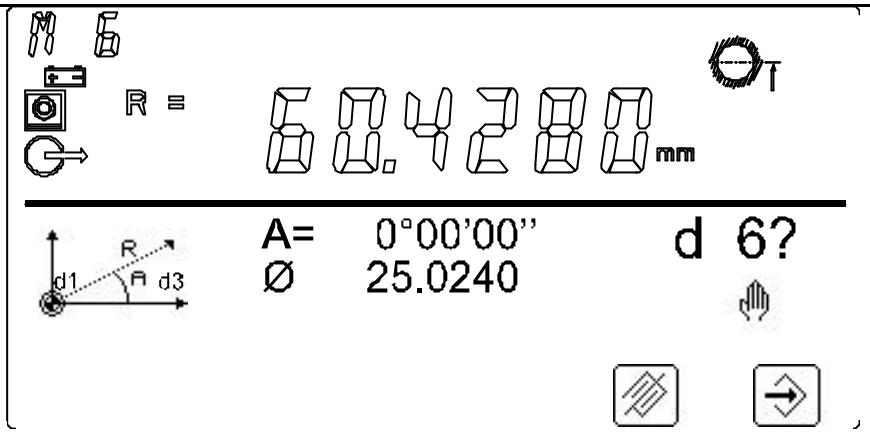
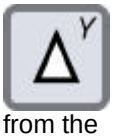
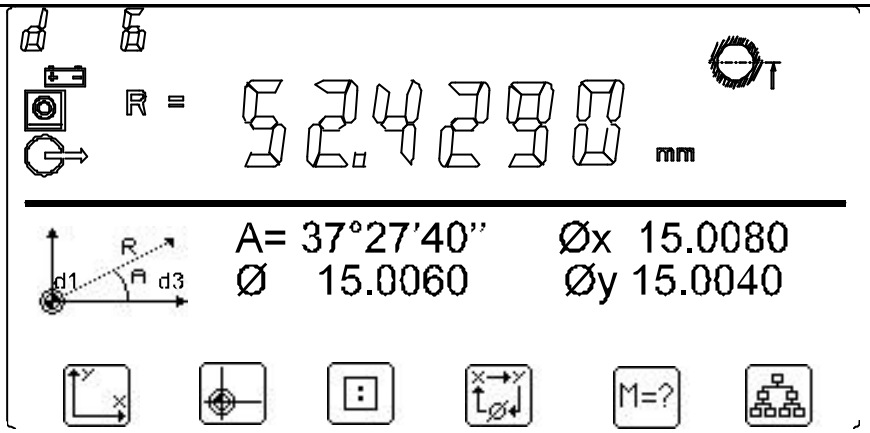
- Changing into cartesian coordinates

*15.5) **Registering a measured dimension*** M=?

Use the arrow keys together with  to choose the value you want to save in the constant table M – i.e. the distance between both part features 1 and 3 in the example shown below.

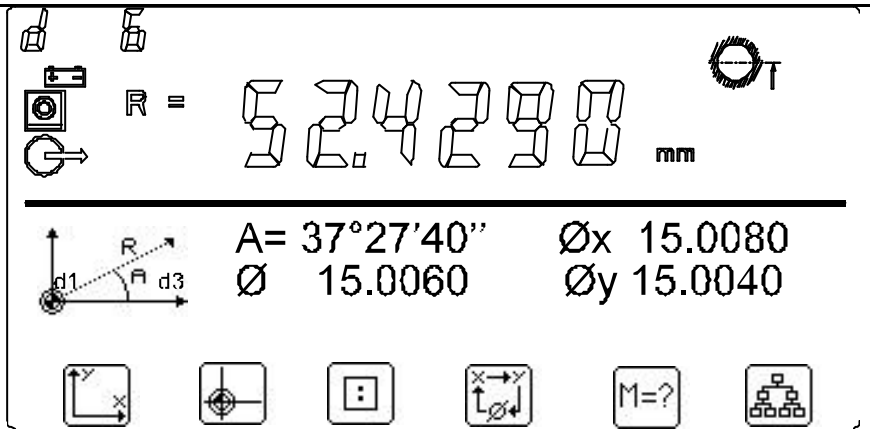
		Display shows selected value
M=?		Add value in constant table M. Example : M6 when answering YES at prompt 2D or M1 when answering NO.

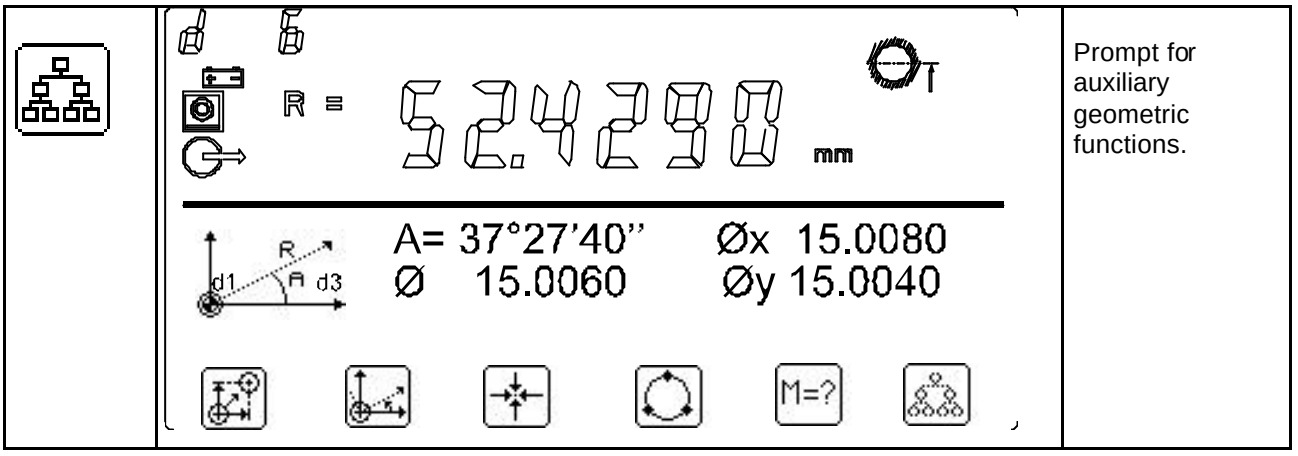
Important : When executing a part programme by learning, you won't be able to view any numbered value, except for those saved in the constant table M.

		Example : prompting part feature with number 6.
 or  from the previous step.		Display shows prompted feature.

15.6) Auxiliary geometric functions

Have part feature 6 being displayed in polar coordinates before going on.



Prompt for auxiliary geometric functions.

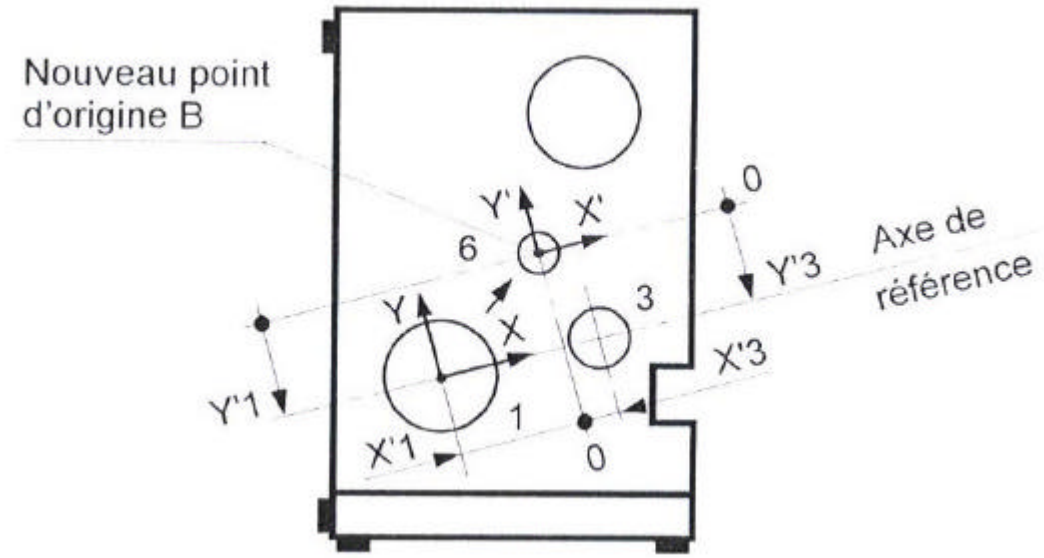
Available functions

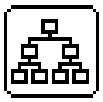
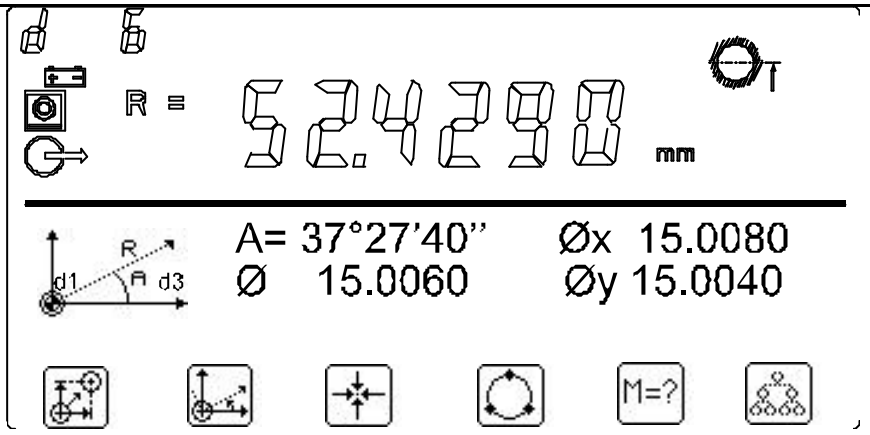
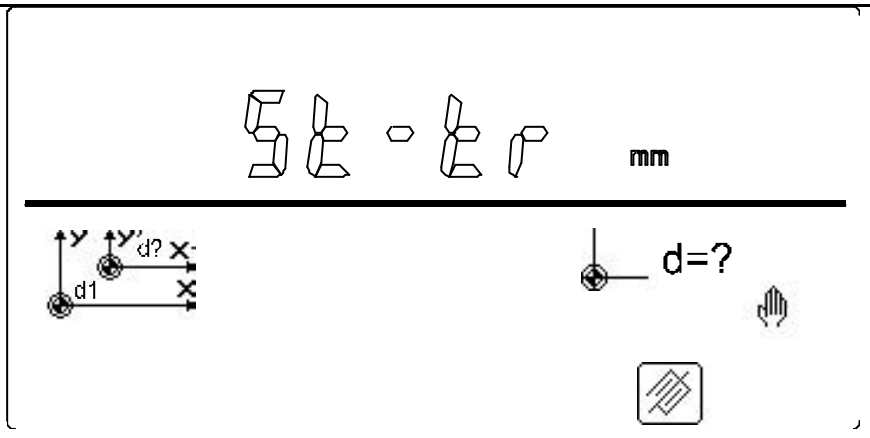
- Translation of coordinate system to another part feature
- Rotation of coordinate axes through a given angle
- Definition of of the coordinates of a fictitious origin point
- Calculation of the regression circle
- Storage of the measured value shown on the main display as Mn+1 providing automatic value numbering is set to On. When saving a part feature, this value alone will be saved as measured dimension.
- Return to main geometric functions

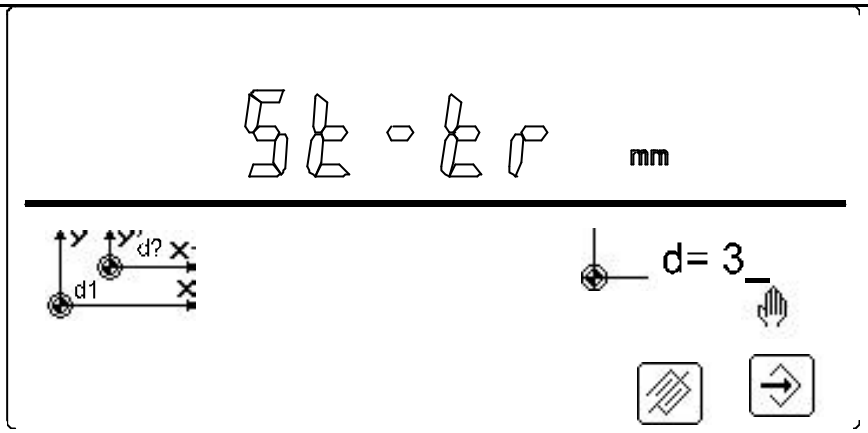
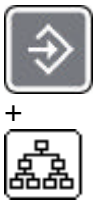
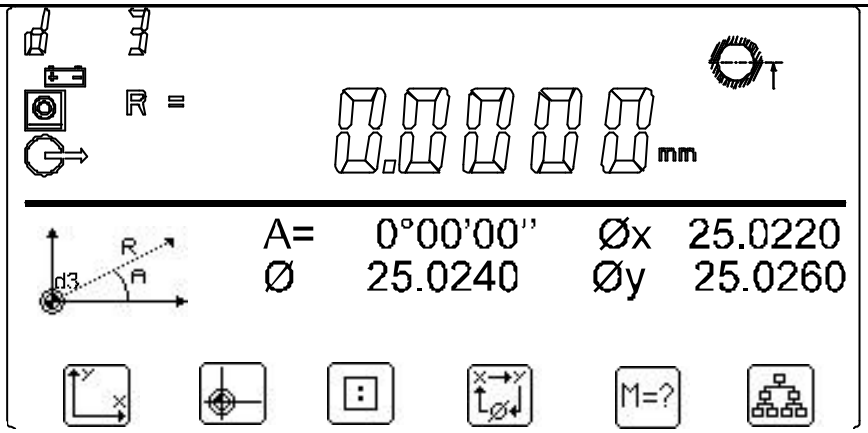
The following functions may either be accessed from the main or auxiliary geometric functions.

- Calculation of angle value between 3 part features
- Calculation of the distance between 2 points, i.e.:
  - distance, ΔX plus ΔY in both X and Y coordinate axes
  - distance, ΔR plus ΔAngle in polar coordinate system

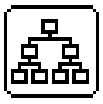
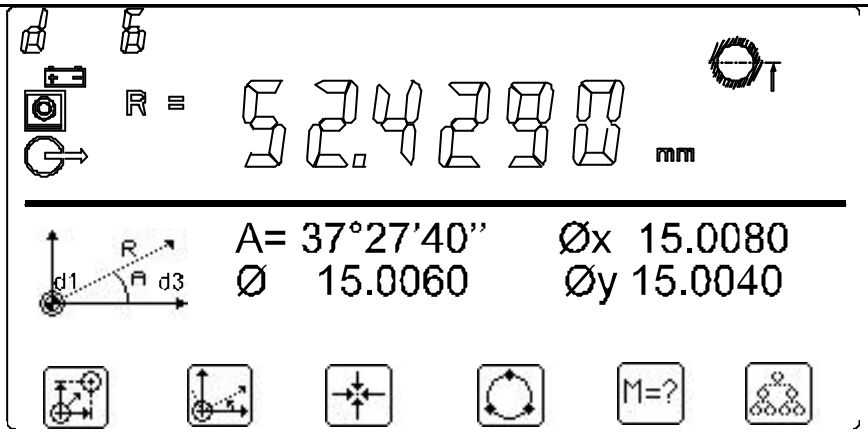
15.6.1) Translating the coordinate system from the reference axis to new axis

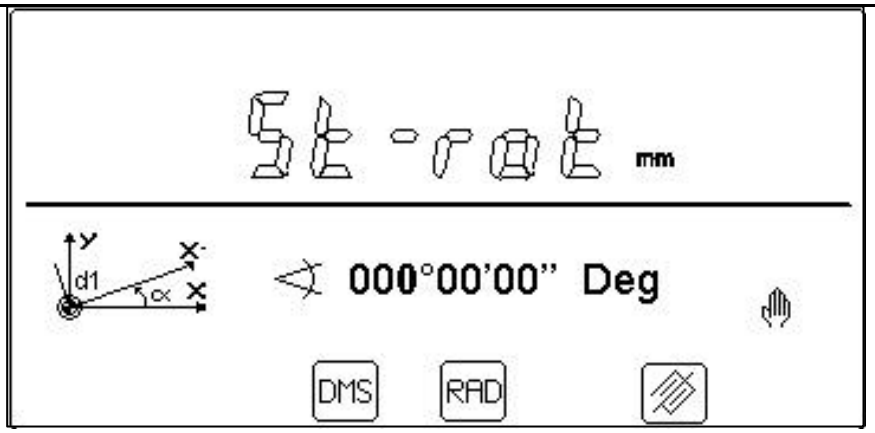
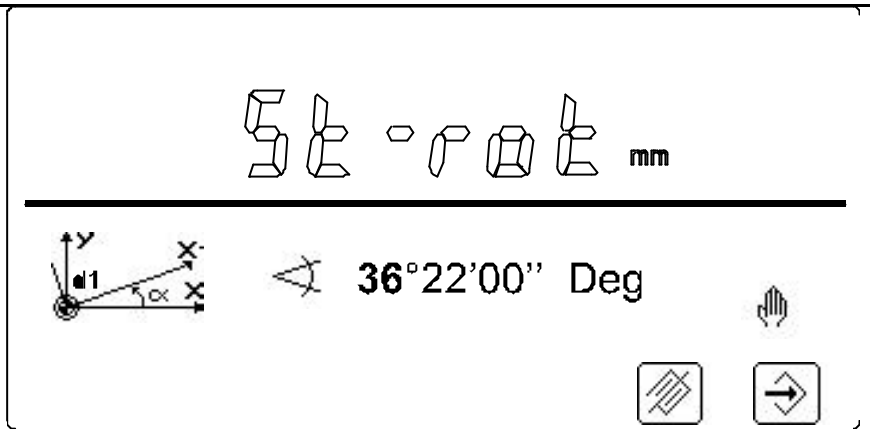
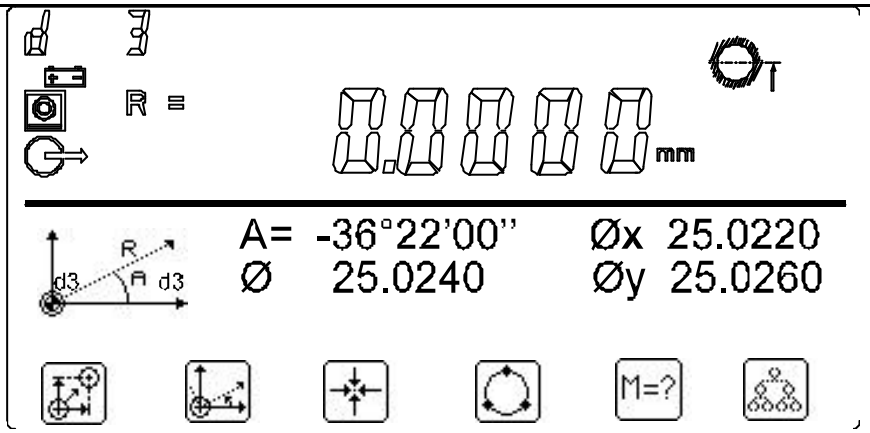


		Prompt for auxiliary geometric functions.
		Prompt for translation of coordinate system.

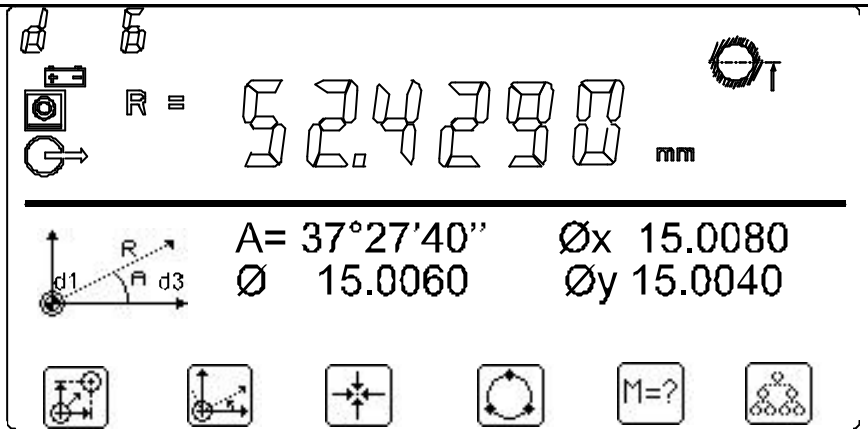
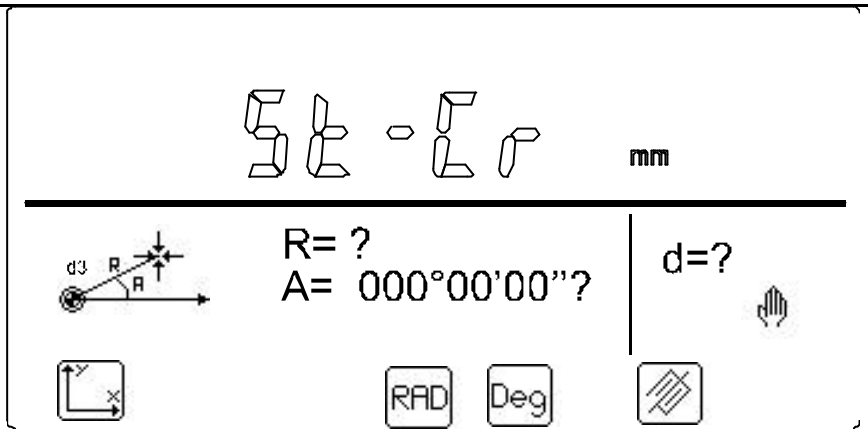
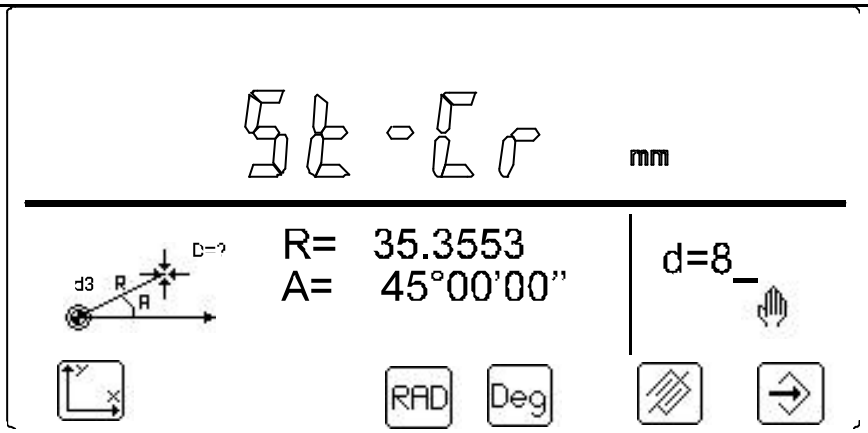
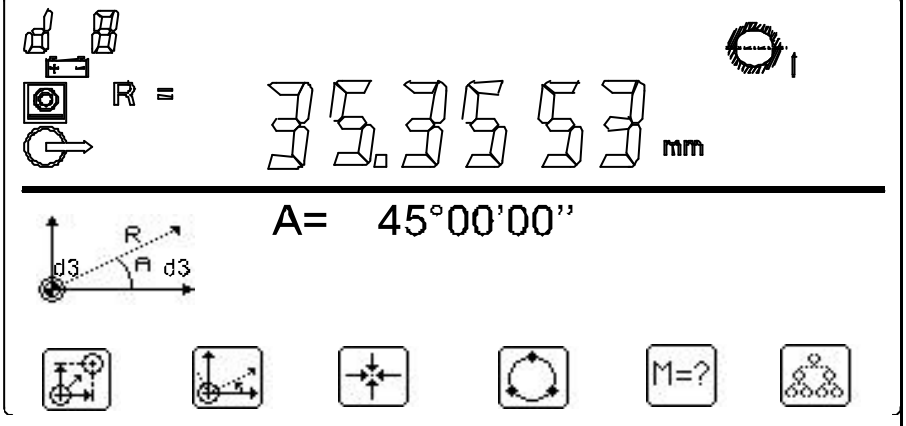
		Enter number of relevant part feature.
		Confirm translation of origin point and return to analysis (main menu). Display shows origin point in the new coordinate system.

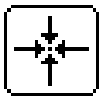
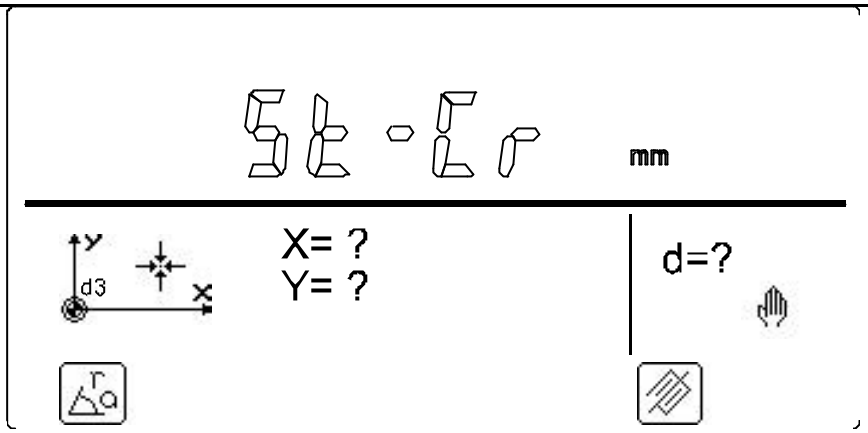
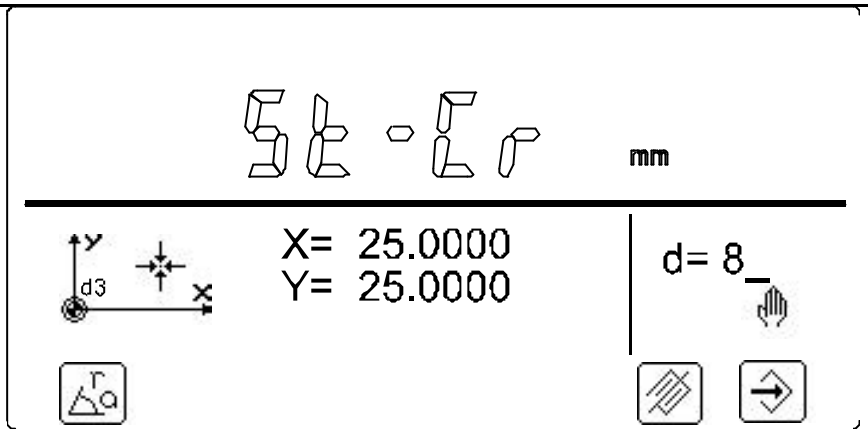
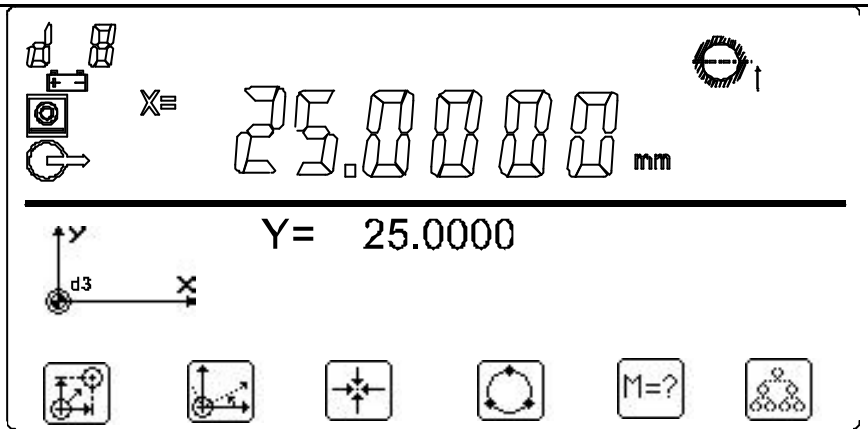
15.6.2) <u>Rotating the coordinate system through its origin point</u> 

		Prompt for auxiliary geometric functions.

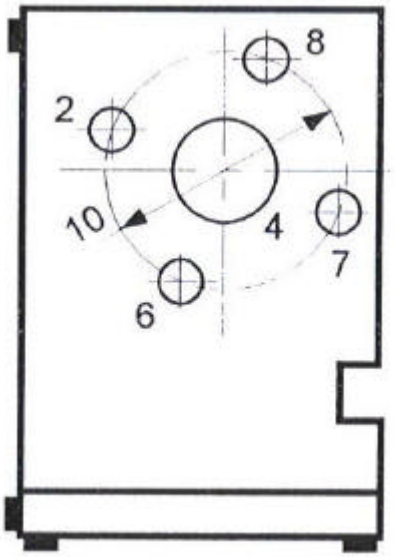
		Prompt for rotation of coordinate system.
Entering 36.22 via the keyboard		Input rotation angle of coordinate system.
		Confirm input value. Display shows part feature you've previously selected in the new coordinate system.

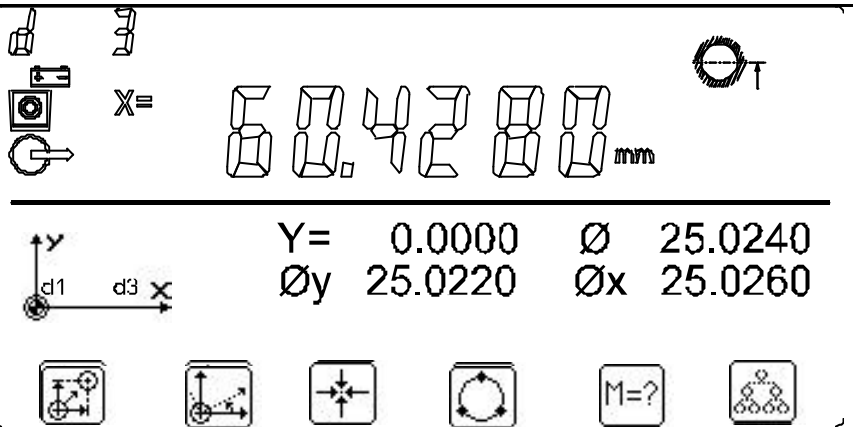
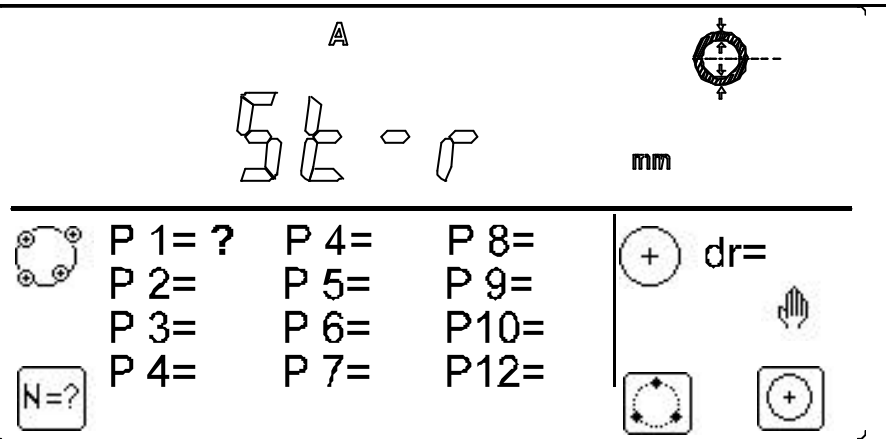
*15.6.3) **Creating a fictitious origin point***

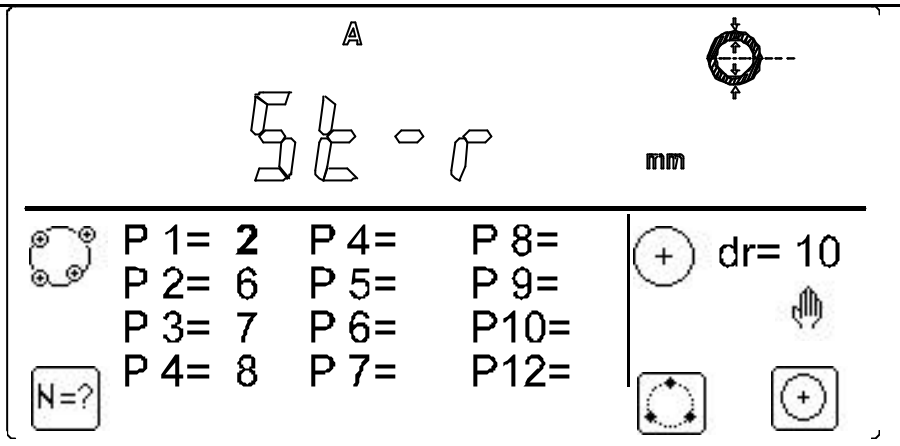
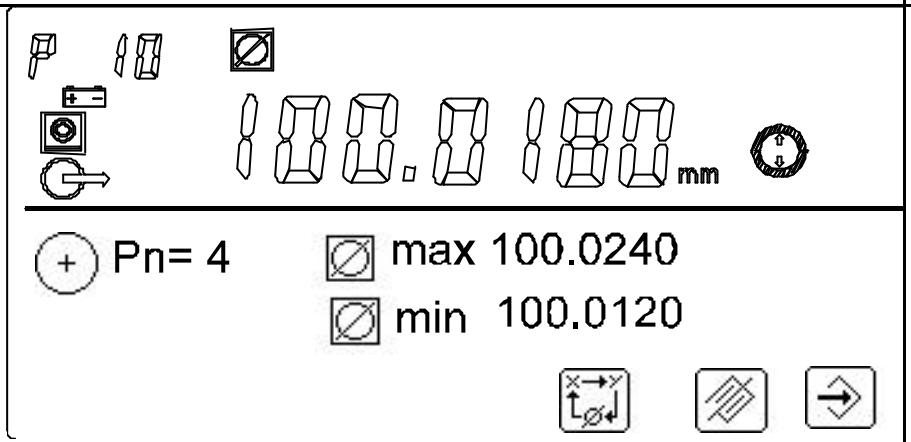
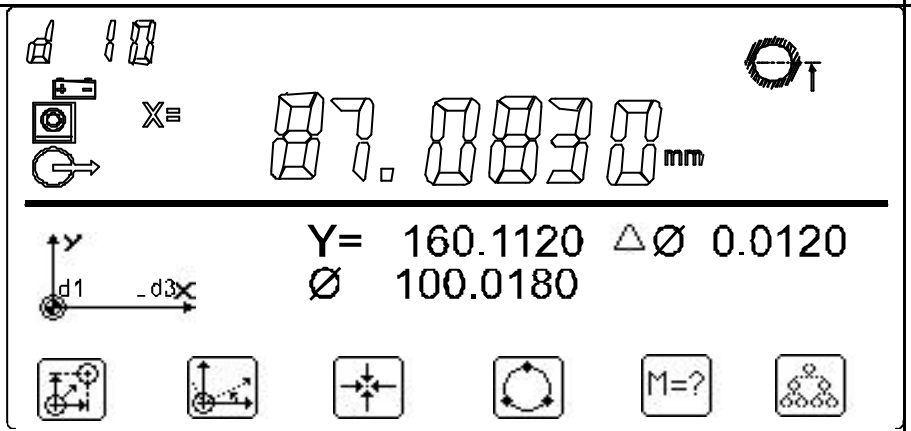
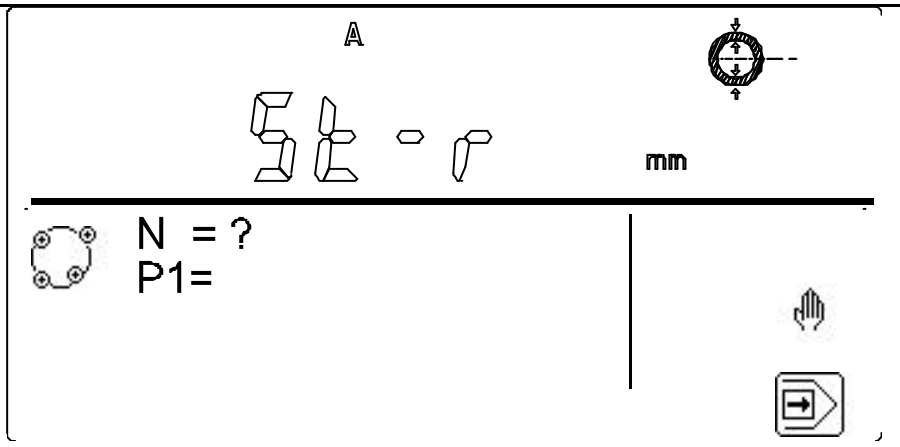
		Prompt for auxiliary geometric functions.
		Prompt for polar coordinate system.
Entering data through the keyboard		Enter R value, angle value and feature number through the keyboard. Use the arrow keys (? ? ? ?) to move from a field to another.
		Display shows radius with angle alone to avoid mixing it with a probed feature. If your entry needs to be complemented or the number you've input has to be changed you'll get a warning message.

		Prompt for cartesian coordinate system.
Entering data trhough the keyboard		Enter both X and Y values along with relevant number. Use the arrow keys (? ? ? ?) to move from one field to another.
		Display shows both values alone to avoid mixing them with a probed feature. If your entry needs to be complemented or the number you've input has to be changed, you'll get a warning message.

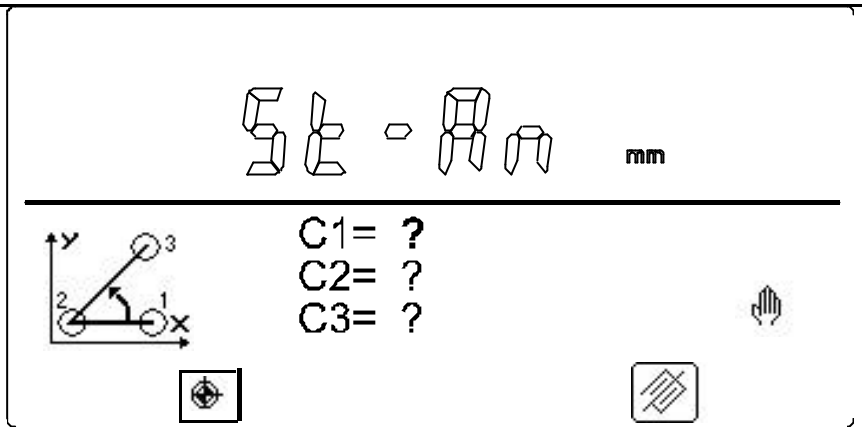
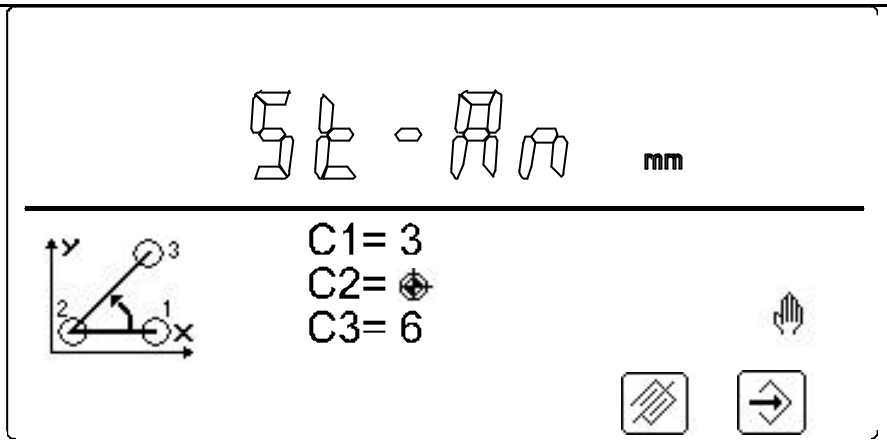
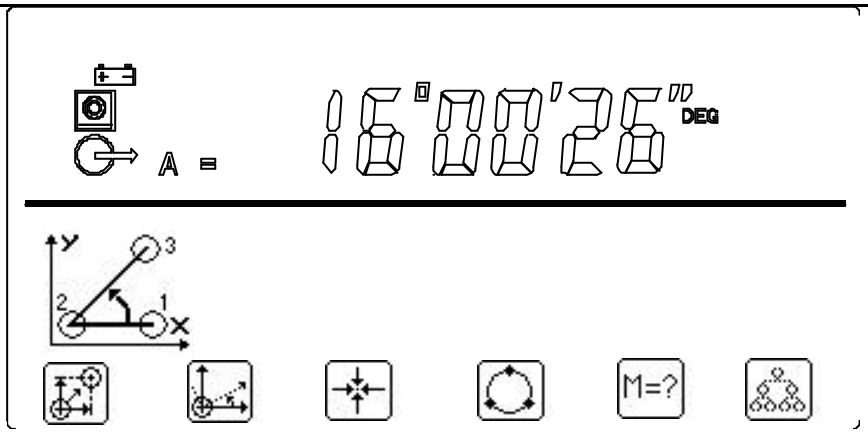
15.6.4) Calculating the regression circle



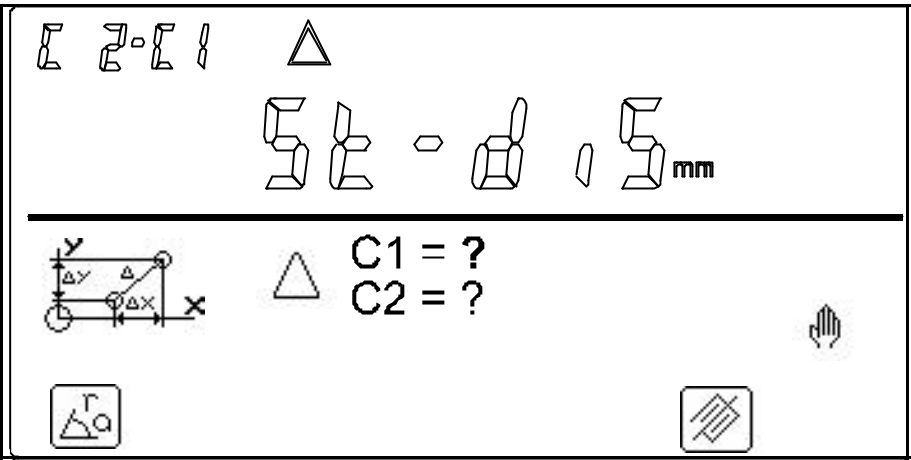
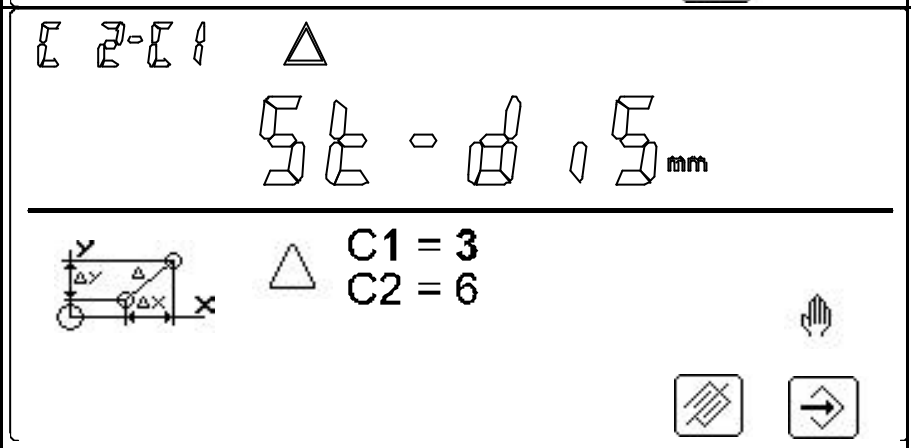
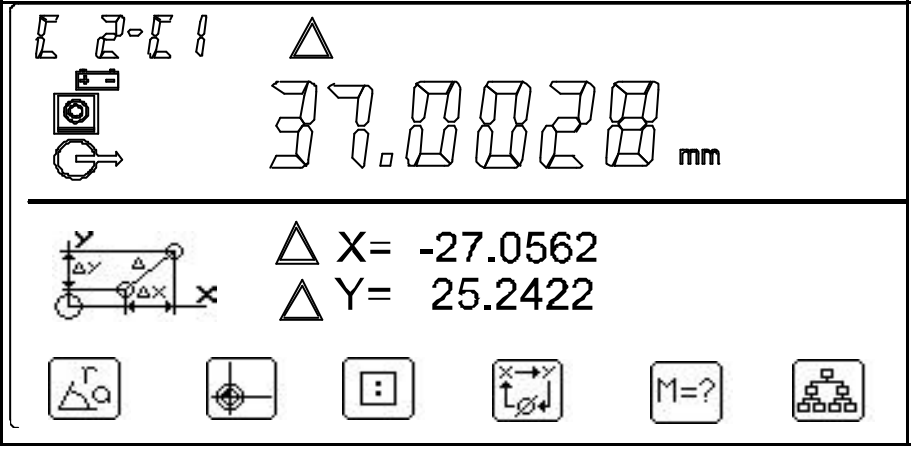
		Prompt for auxiliary geometric functions
		Number of displayed Px matches that of measured H (max. 12 per page). Number of features used for calculating the regression circle may be within 3 and 64.
	N=? : This option is useful then the regression circle consist of many elements. It's allow just to enter the number of bores and the the first one	

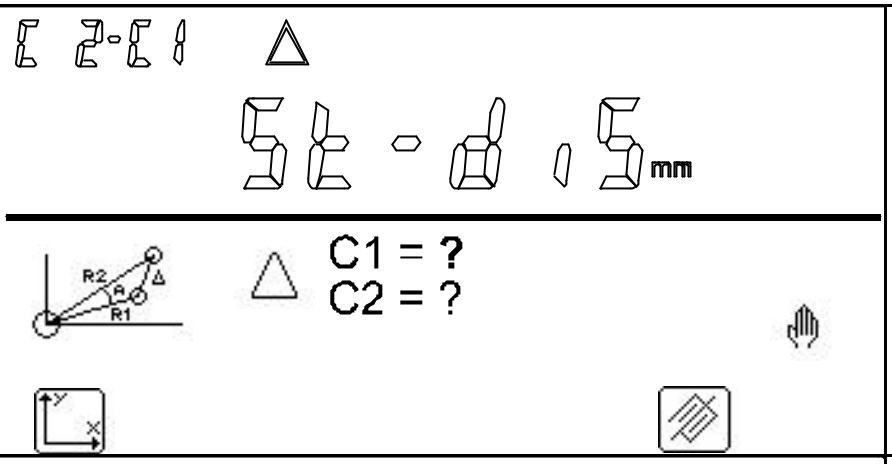
2 + 6 + 7 + 8 + 10 +		Enter each number. You'll get a warning message if desired feature has been used or if it was not probed. Use arrow key to move the cursor to dr= for entering relevant number.
		Display shows measured diameter of the regression circle along with both max and min values.
		
	Introduction with option N= ?	
N=?		Enter number of bores and the number of the first one. Confirm with F6. The first display of this page will appear. Possibility to change elements. Follow the procedure describe up woods.

15.6.5) Calculating the angle between 3 geometric elements

		Prompt for relevant function. This function may also be prompted from 2D analysis.
Entering data through the keyboard and pressing F2 if you've selected origin		Enter requested data. **Special case :**. Press F2 to enter the origin point from analysis, allowing reference value to be used as origin point.
		Display shows relevant angle which may be saved using the function key M?. If your entry needs to be complemented or one of the selected features does not exist, you'll get a warning message.

15.6.6) Calculating the distance between 2 points

		**In cartesian coordinate system:** Prompt for relevant function. This function can also be prompted from 2D analysis.
Entering data through the keyboard		Enter requested data. If your entry needs to be complemented or one of the selected features does not exist, you'll get a warning message.
		Display shows measured distance in the cartesian coordinate system along with ? X = X6 – X3 ? Y = Y6 – Y3

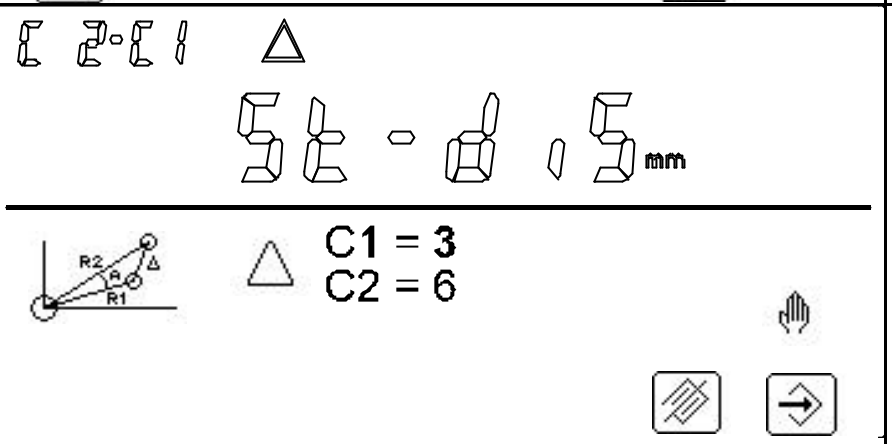


In polar coordinate system :

Prompt for relevant function.

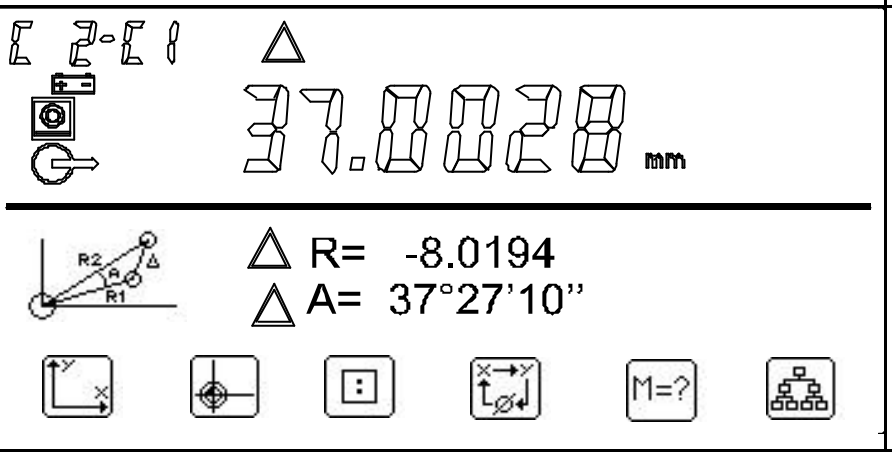
This function can also be prompted from 2D analysis

Entering data through the keyboard



Enter requested data.

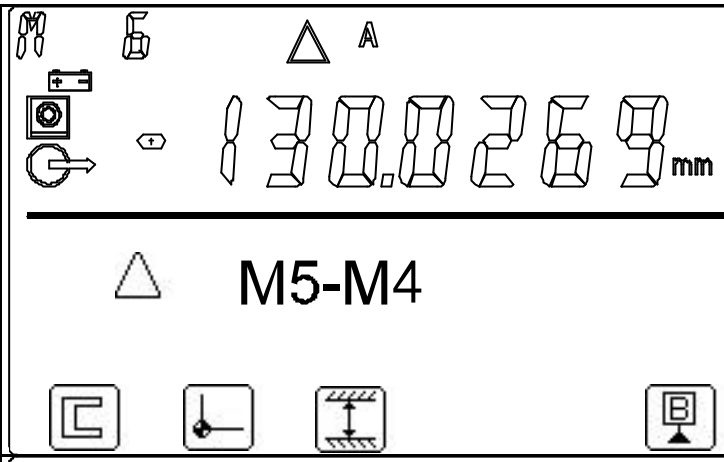
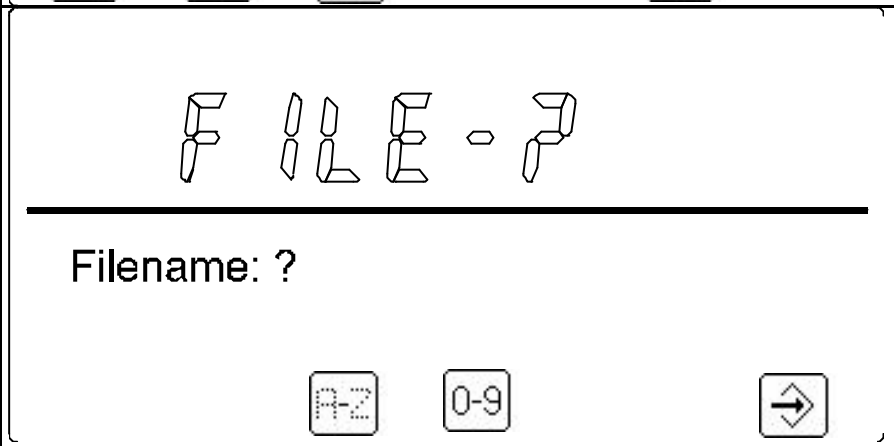
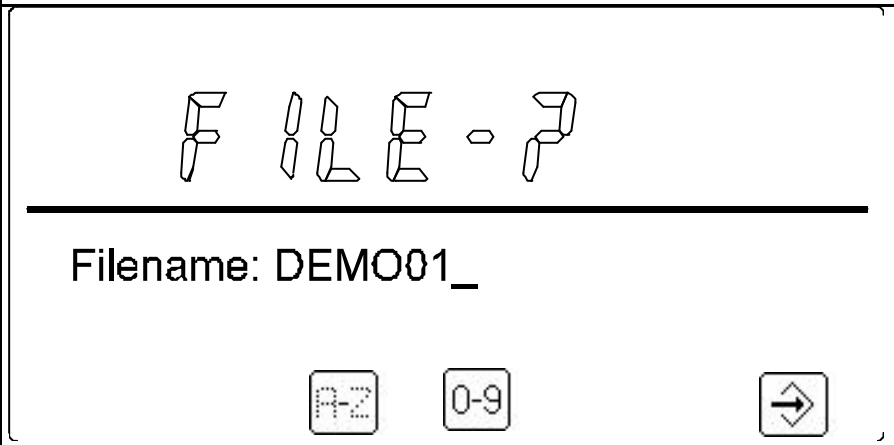
If your entry needs to be complemented or one of the selected features does not exist, you'll get a warning message.

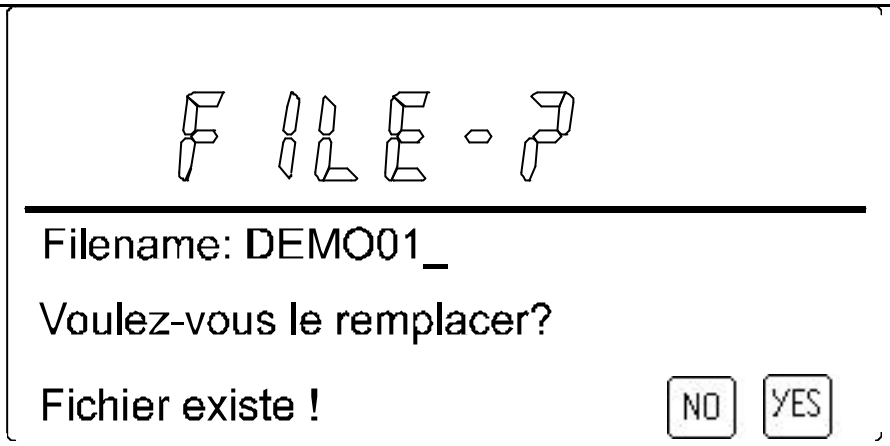
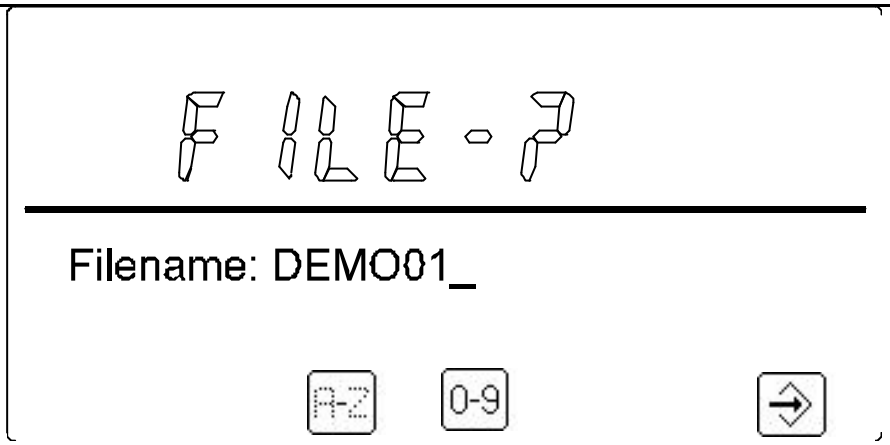
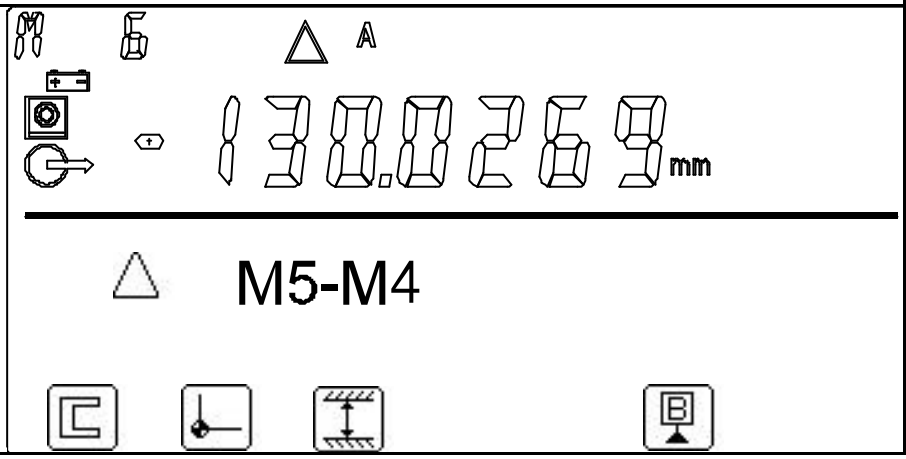


Display shows measured distance in the polar coordinate system along with
? R = R6 – R3
? A = A6 – A3

16) Creating a part programme by learning

To create a part programme by learning, you need just measure as usual, then press the key as detailed in the example that follows.

M=?		Create a learn programme once you've executed 5 probe contacts and store measured distance between both features M5 and M4 as M6.
Q		**Enter file name** Max. 16 characters.
Entering data through alpha-numeric keyboard.		

		Display tells you that the file is existing while prompting you to answer accordingly.
		If the answer is NO, you may enter a new file name.
 or  for entering new file name		Save your file «Learn programme » and return to the measuring mode.

All measured values captured since you've switched your height gauge on will be registered together with those related to the probe constant or the references. If you don't want to include constant or reference values, activate  to instruct the programme to only store those values measured since that time you've pressed this key.

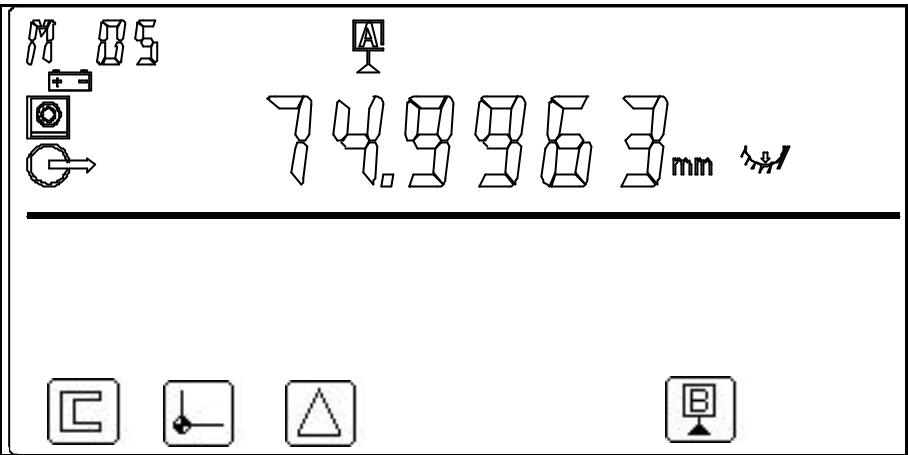
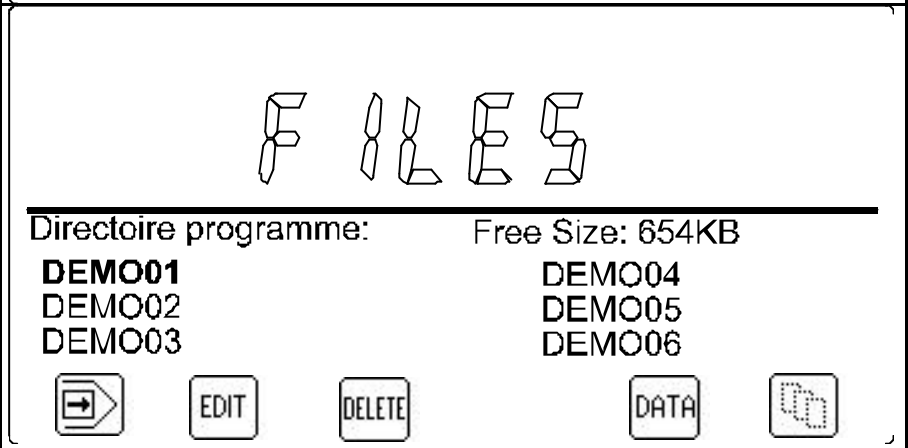
To create a 2D part programme, proceed in the same way. You may also access this mode after you've carry out a number of 1D measurements.

Procedure:

- Capture constant value prior to reference value « St2 » by pressing 
- Set counter to zero, if necessary, by pressing 
- Perform 1D measurements, if required (optional)
- Access 2D mode by pressing 
- Perform 2D measurements (Hy….Hx)
- Establish the origin of the coordinate system with alignment (levelling, d01…dn)
- Execute needed calculation, then assign desired numbered values (M01…….Mn)
- Create a learn programme file where this procedure will be saved by pressing  . This file will contain the values captured in either of both 1D and 2D modes as well as those obtained when measuring angles or parallelism errors.

Note: You won't be able to create a part programme by learning unless you've enable automatic value numbering.

*17) **Managing files***

		This mode may also be accessed from the measuring mode..
		**Prompt for managing files** Make your selection using the arrow keys. ON/OFF key cannot be activated when managing or editing files. **Cursor shows programme file you've last created.**

To load numbered values from the programme into the memory back again. At this point, you're also allowed to add any value, especially in 2D mode.

EDIT

To edit a desired part programme where you may add tolerance values or enter or erase numbered values.

DELETE

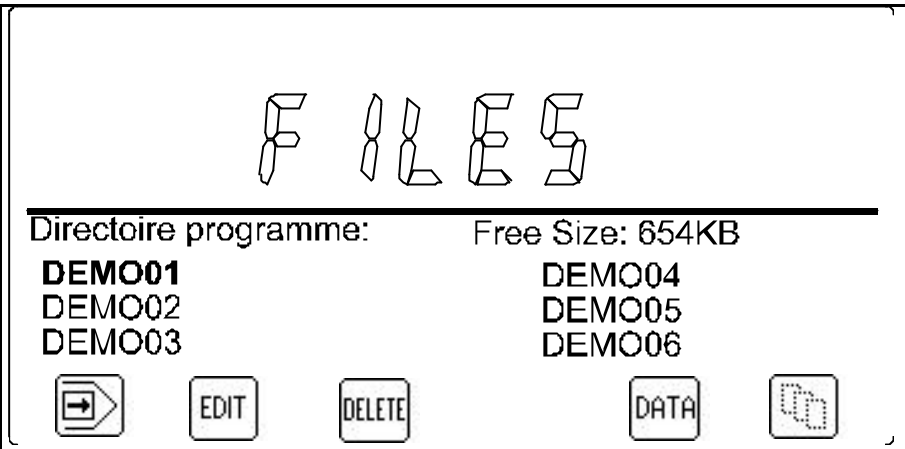
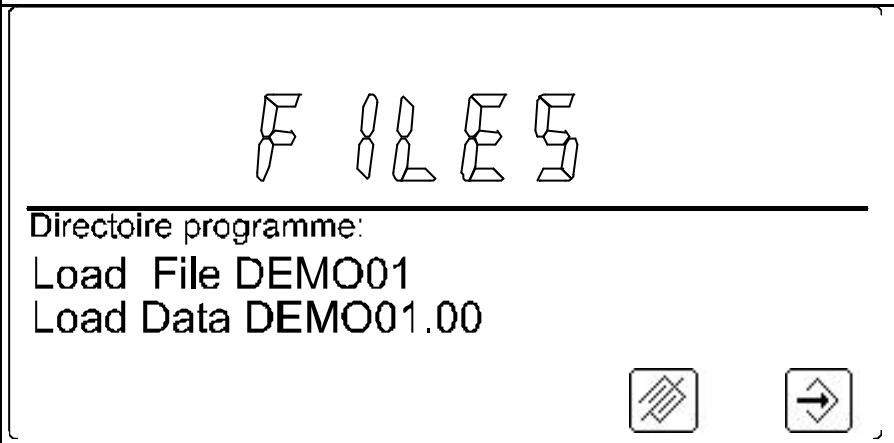
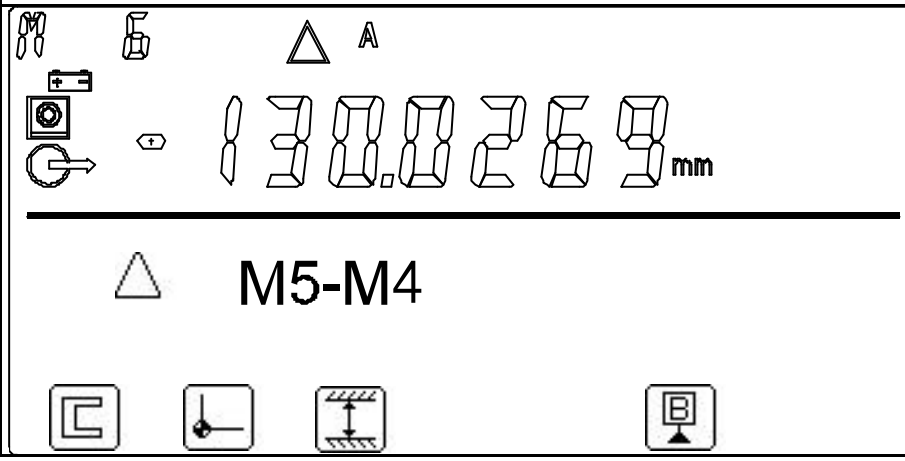
To delete selected part programme in the memory.

DATA

To access data files with the measurement results.

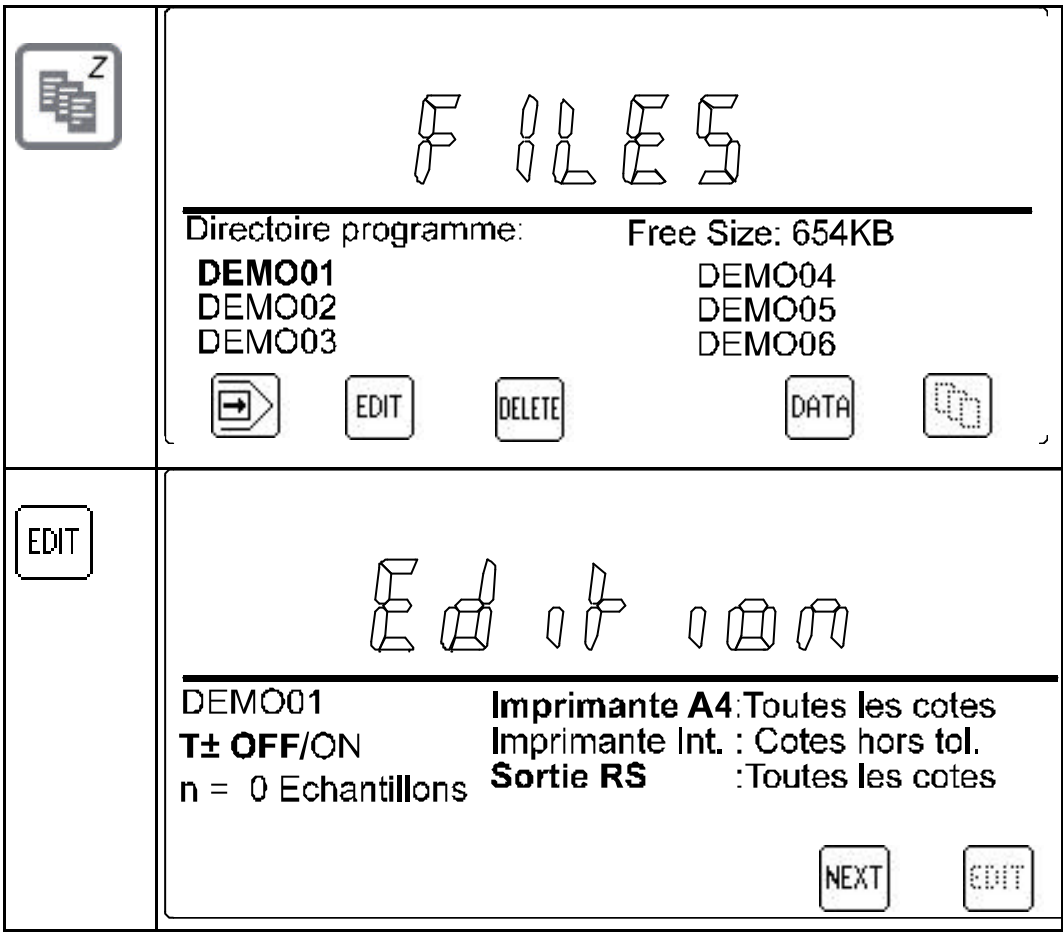
To exit from relevant menu.

*17.1) **Restoring a measurement programme***

		**Prompt for managing files** Make your selection using the arrow keys. The ON/OFF key cannot be activated when managing or editing files. **Cursor shows programme file you've last created.**
		Confirm both displayed file and data.
or		Provided constant and reference values have not been changed in the meanwhile, display shows data as they were as you've saved the part programme.

Note : This option lets you get back the measured values you've stored before switching your height gauge off, for instance. You may also add two-dimensional dimensions, what is not allowed from the edition menu.

17.2) Editing a measurement programme EDIT



Prompt for managing files
Make your selection using the arrow keys. The ON/OFF key cannot be activated when managing or editing files.
Cursor shows programme file you've last created.

Edit chosen tolerance and printing options.

The programme based configuration can only be changed from this menu.

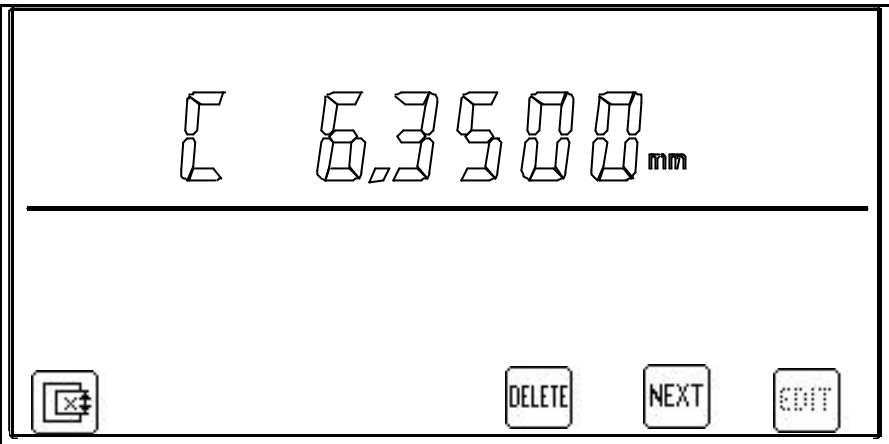
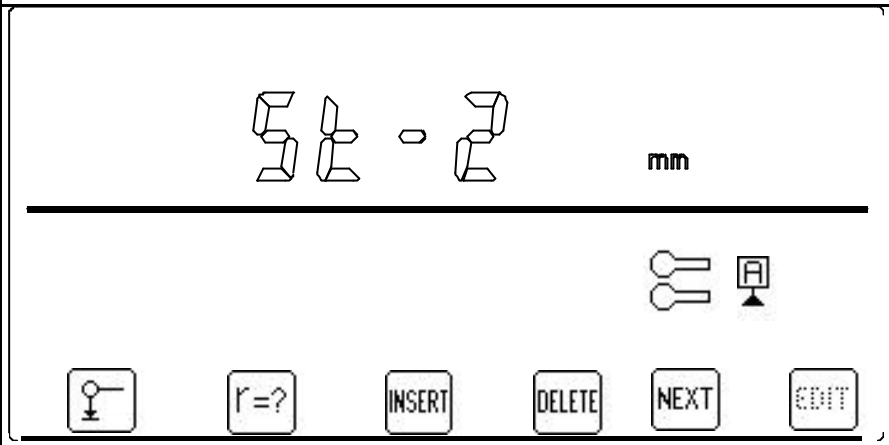
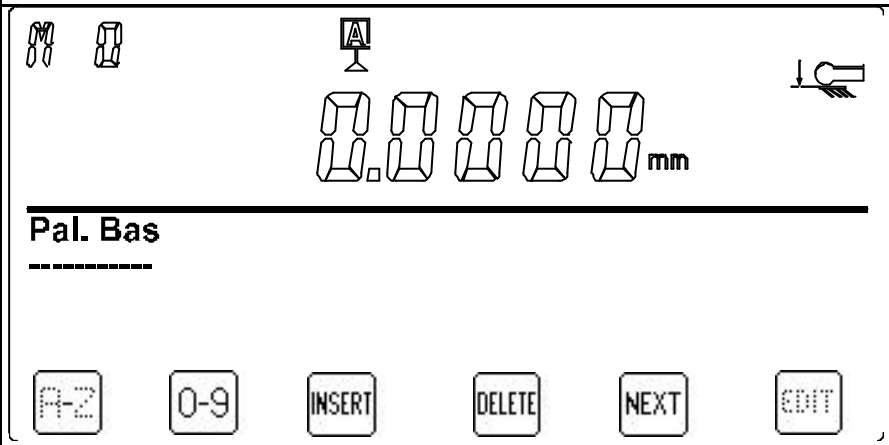
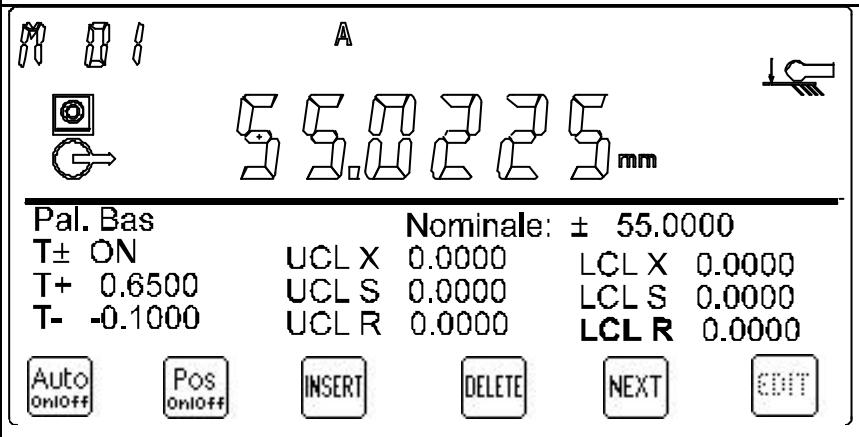
T±OFF/ON : To work with or without tolerances (arrows ? and ?).
N = 0 : To define the sample size if you want to use control limits.
A4 printer :
Built-in printer :
RS outputs :
So as to have the desired values printed on your reports, you may choose between the options available from each of the three outputs, namely:

- All dimensions
- Out-of-tolerance dimensions
- Classification

To move from a field to another, use the arrow keys ? and ? .
To select the print command, use the arrow keys ? and ?

NEXT — To move to the next programme sequence.

PRINT — To print the selected part programme if you hold this key down (only on A4 printer).

NEXT		Displayed constant value which may needs to be captured as the programme is started up. If not, jump to the next step.
NEXT		Capture reference value. You may also input a preset value or enter desired retraction travel. Capture constant value as the programme is started up if required. If not, jump to the next step (M1).
NEXT		Display shows probing direction to capture the reference value.
NEXT		**Common case:** Display shows entered tolerances with both control limits UCL and LCL. If displayed sample size is 0, this means that no control limits will be displayed and entered.

ON: Automatic prompting for next value as soon as the response time of display is over.
OFF: In the Execution mode, press F6 to have this done.

ON : Automatic positioning of the probe. The relevant value will be captured automatically as soon as the given response time is over.
OFF : Position the probe manually, then press F6 to start probing.

Inserting a new dimension before the displayed one.

Cancelling displayed dimension.

Prompting for next dimension.

Exiting the Edition mode with possible storage of all changes.

To move from a field to another, use the arrow keys ? , ?

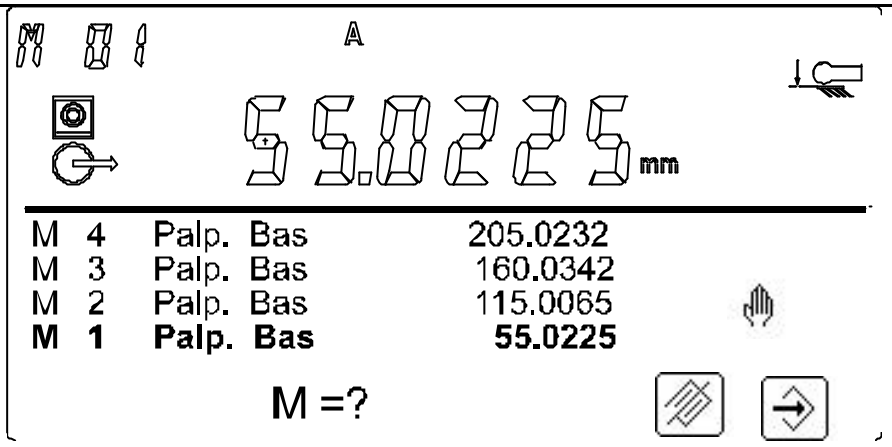
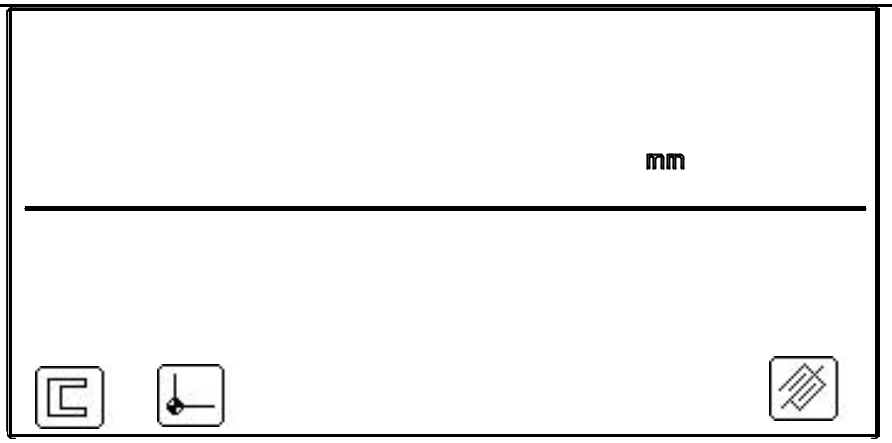
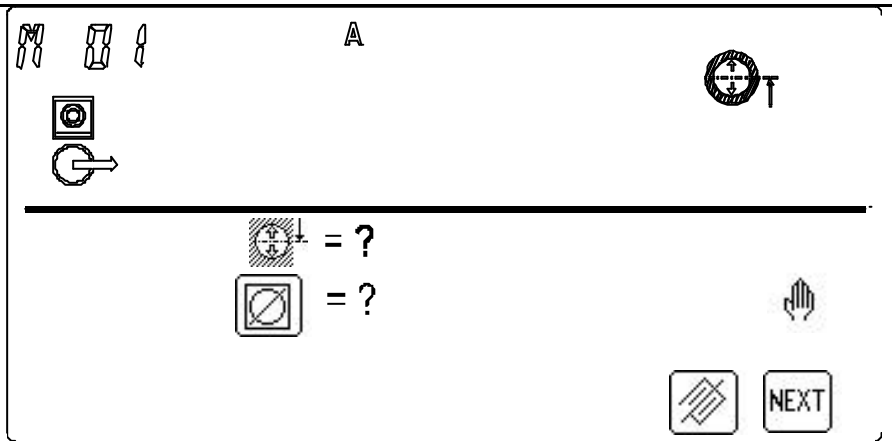
T± ON — Use the arrow key ? to set this option to OFF.

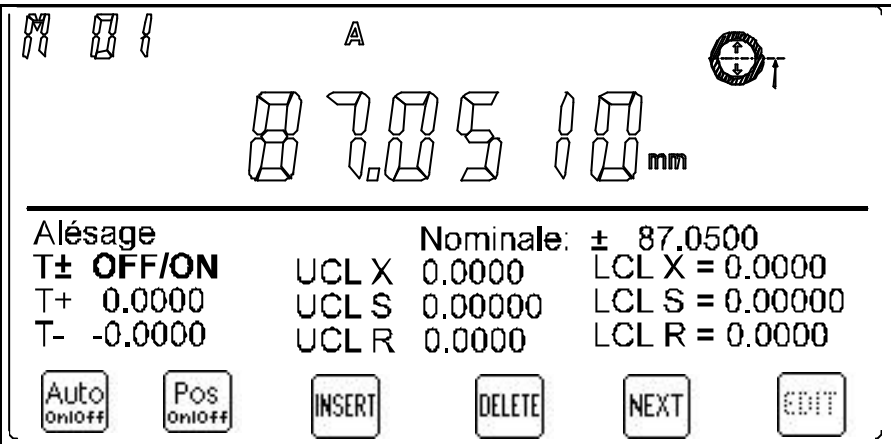
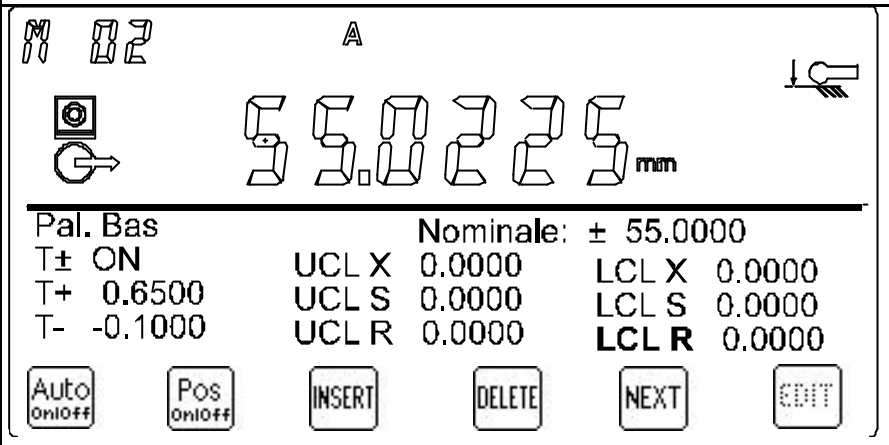
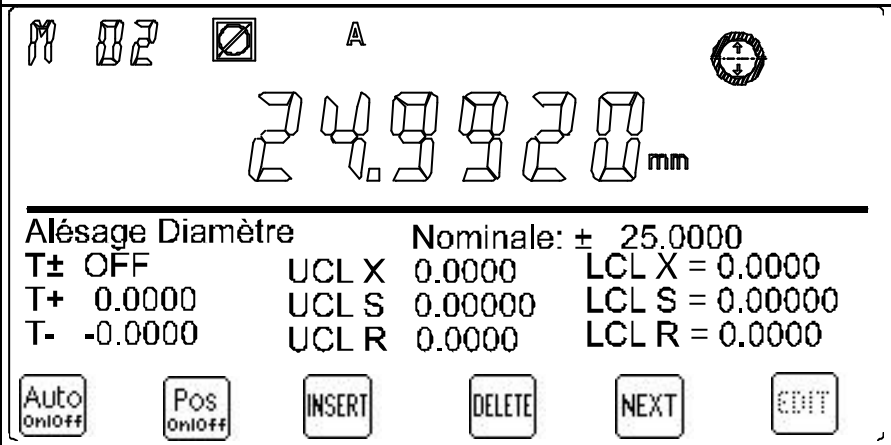
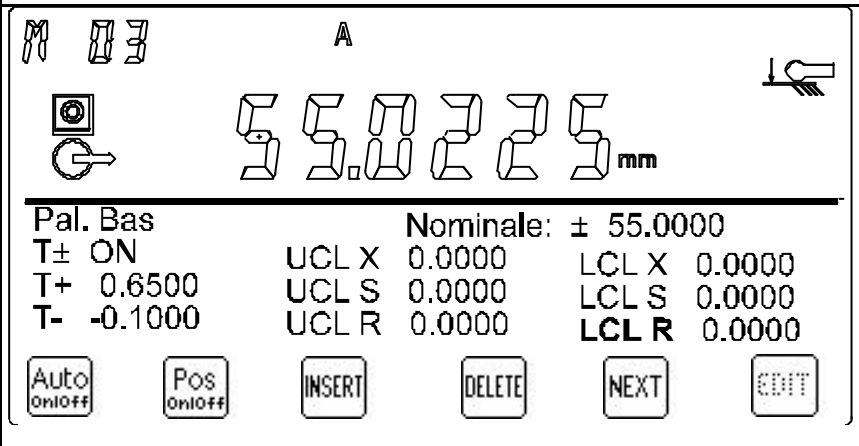
Probing down — Default name corresponds to the definition of the probe contact to be made. Once you've accessed this field using the arrow keys, you may enter a specific name for each numbered d value (max. 16 characters). If so, confirm each entry by pressing 

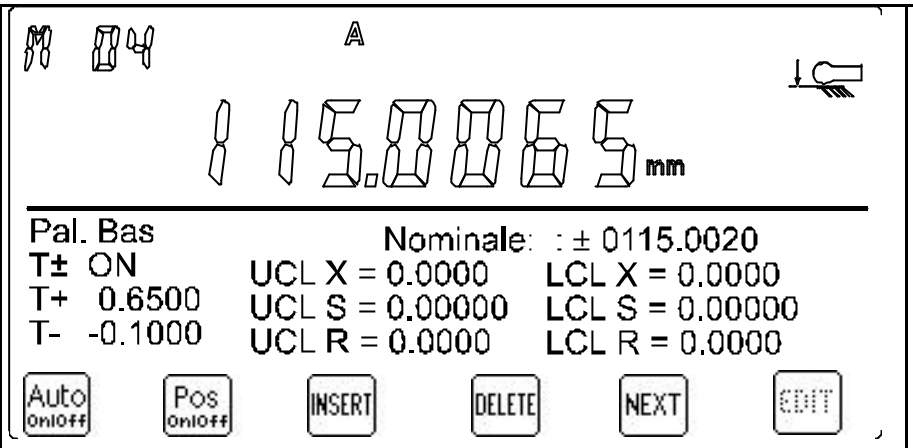
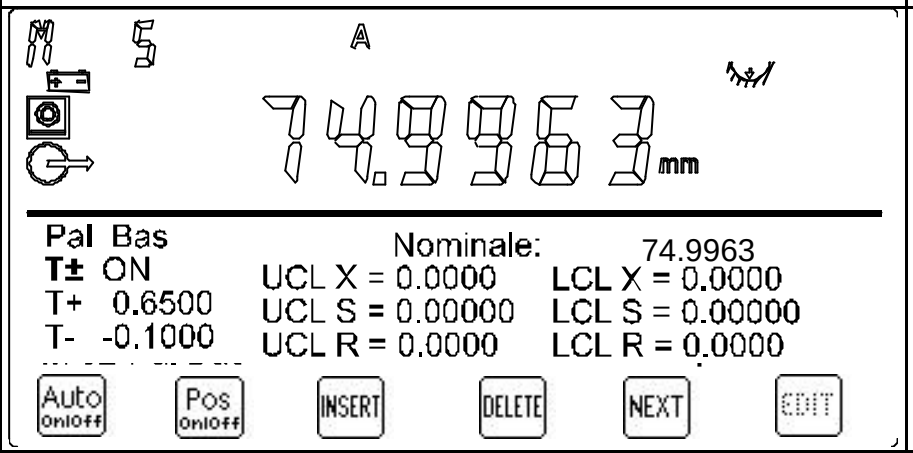
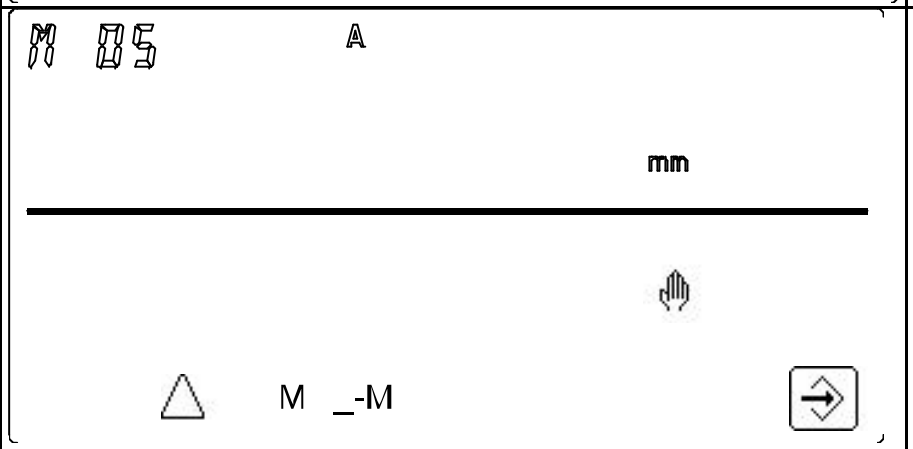
Nominal — Default value is displayed when creating the part programme. Once you've accessed this field using the arrow keys, you may ask for the relevant nominal value to be edited. If so, confirm by pressing 

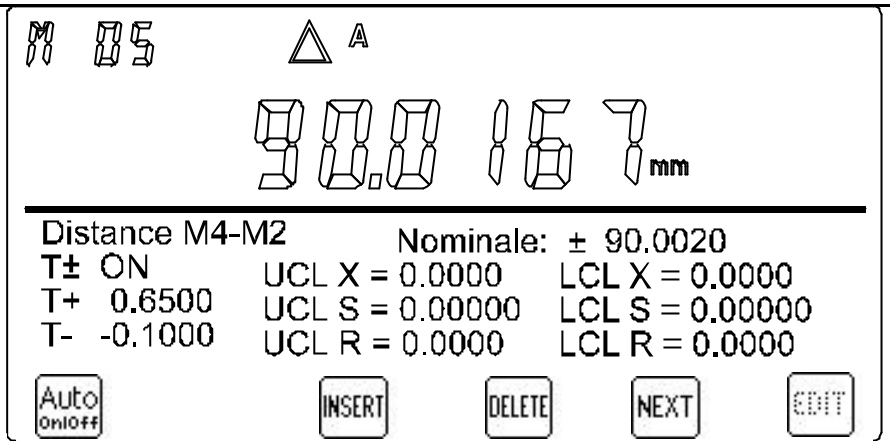
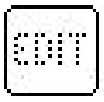
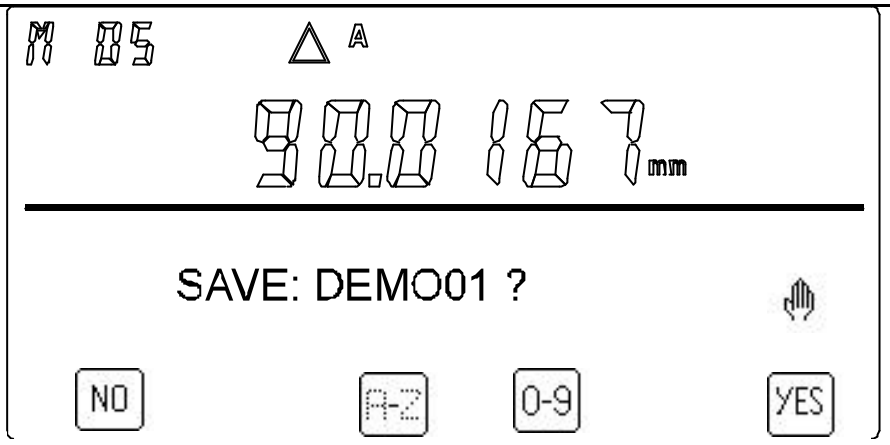
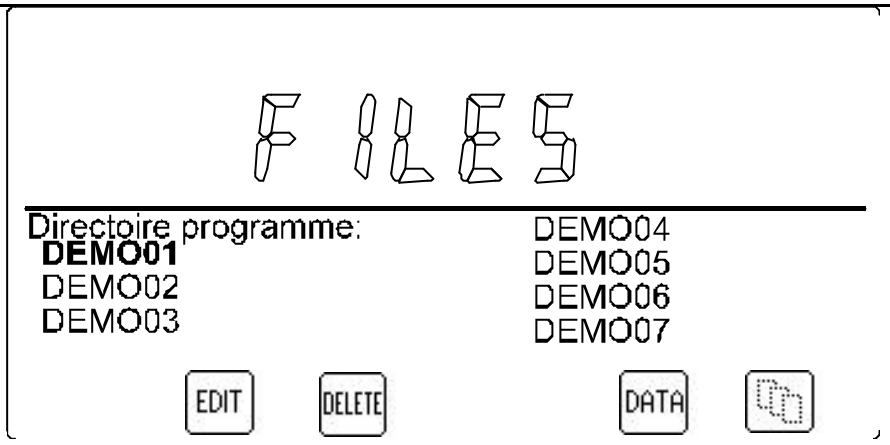
Proceed in the same way to edit desired tolerances.

T+	Upper tolerance limit
T-	Lower tolerance limit
UCL X	Upper control limit for X (mean of sample)
LCL X	Lower control lmit for X
UCL S	Upper control limit for S (standard deviation of sample), non-active
LCL S	Lower control limit for S, non-active
UCL R	Upper control limit for R (range of sample), non-active
LCL R	Lower control limit for R, non-active

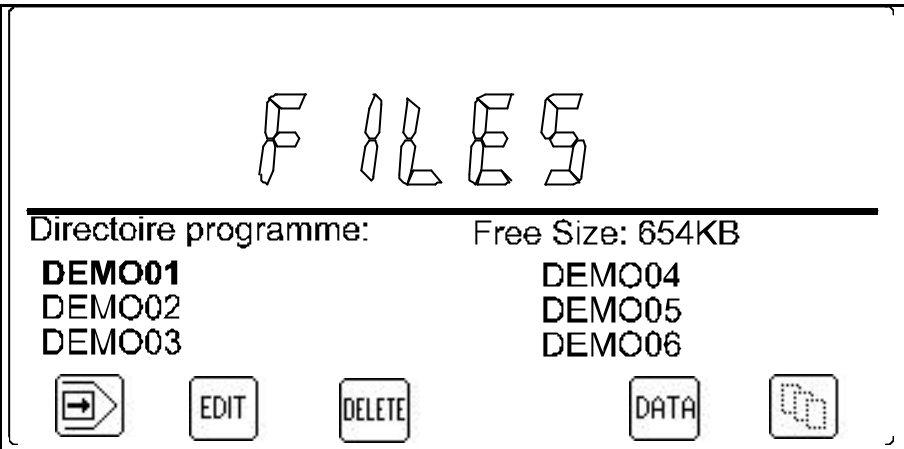
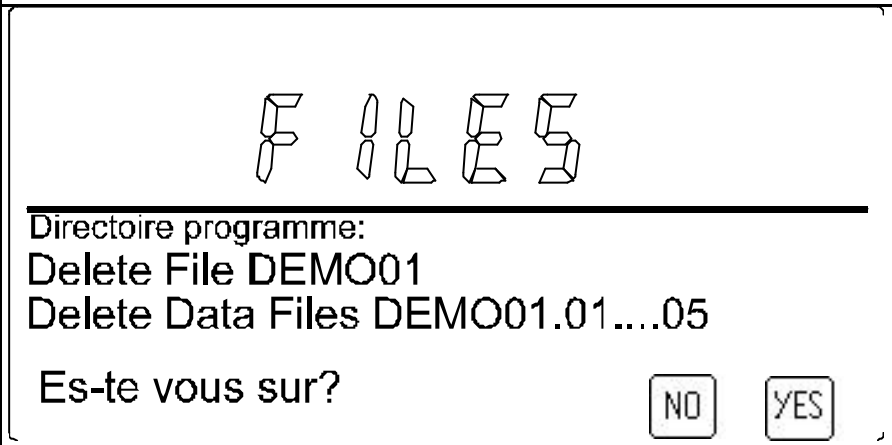
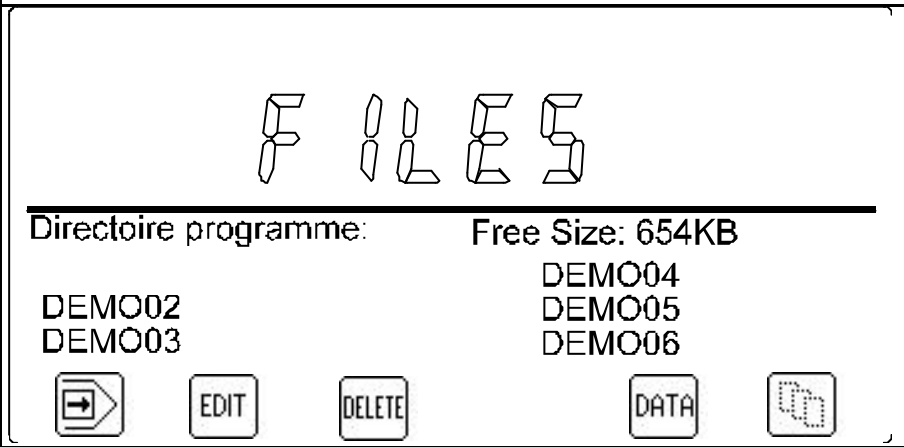
	Direct access to a dimension	
		**Prompt for listed dimensions** Select desired dimension using the arrow keys or enter relevant number through the keyboard. Confirm by pressing  .
	Inserting a dimension	
		First choose the programme step you want to be inserted before the one shown on display : - Capturing constant value (F1) - Capturing reference value (F2) - Capturing a measured value by pressing the relevant key.
		**Entering a bore centre instead of numbered value M1** Input bore centre and diameter through the keyboard.

NEXT		**Editing a new name** Select default name you want to change.
NEXT		Display shows dimension M02, M01 before inserting.
INSERT + * W		**Inserting the calculation of the bore diameter** To have this done, the function you've previously selected must include a dual probe contact.
NEXT		Display shows dimension M03, M02 before inserting. Tolerances may be changed along with both UCL/LCL control limits according to the configuration of this part programme.

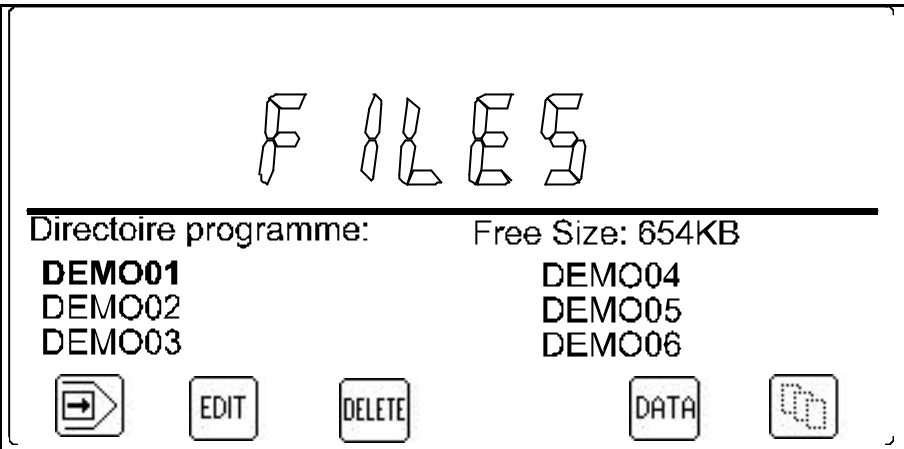
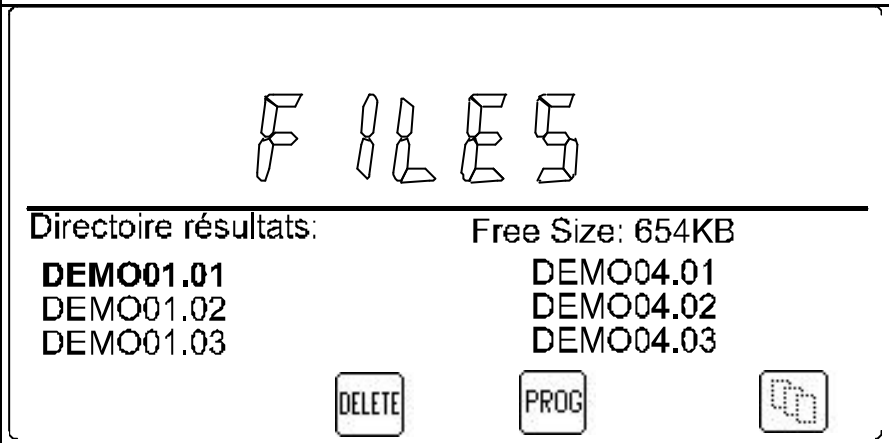
NEXT		Display shows dimension M04. Tolerances may be changed along with both UCL/LCL control limits according to the configuration of this part programme.
NEXT		Display shows dimension M05. Tolerances may be changed along with both UCL/LCL control limits according to the configuration of this part programme.
INSERT + + P		Inserting the calculation of a distance before the dimension M05, witch will be M06. Identical procedure for the median calculation.
	Data introduction : - N° of previous dimension only authorized . - Use the keyboard to introduce the number or select the dimension by means of the arrows ? ,? . - Use F6 or  to confirm the selected dimension	

		Display shows the distance M05. Tolerances may be changed along with both UCL/LCL control limits according to the configuration of this part programme.
		Save your file before exiting the Edit mode. You may create a new file by simply changing the file name and leave the older one unchanged..
		Display shows pointed file once saved. Remember that the ON/OFF key cannot be used as long as both managing and edition modes are activated.

17.3) Cancelling a measurement programme DELETE

Z		**Prompt for managing files** Select desired programme file using the arrow keys. Do not use the ON/OFF key while both managing and edition modes are activated. **Programme file which was last saved is pointed.**
DELETE		Confirm your selection by answering prompt accordingly. All related data files are automatically cancelled as selected file is being removed from the programme.
YES		

17.4) Managing measurement files [DATA]

[Z]		**Prompt for managing measurement files** Select desired data file using the arrow keys. Do not use the ON/OFF key while both Generation and Edition modes are activated. **Programme file which was last saved is highlighted.**
[DATA]		**Prompt for result files** Select desired file using the arrow keys. To erase files one after the other, use the function key [DELETE]
	To exit this mode and return to the measuring mode, press the function key	

18) Executing a part programme 

The configuration menu provides a number of parameters which may need to be specifically set for each part programme. The settings that need be made for running this part programme are described as follows:

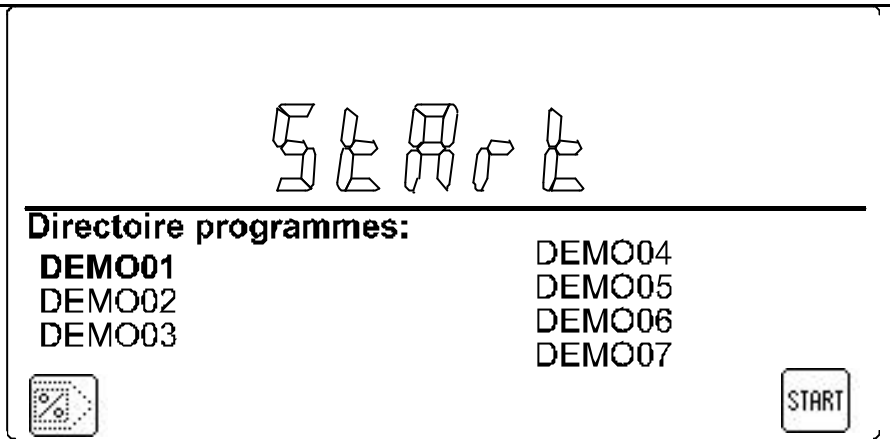
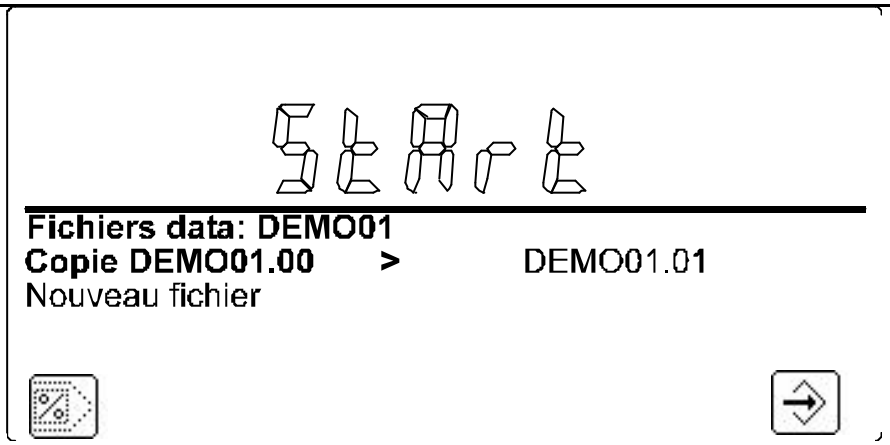
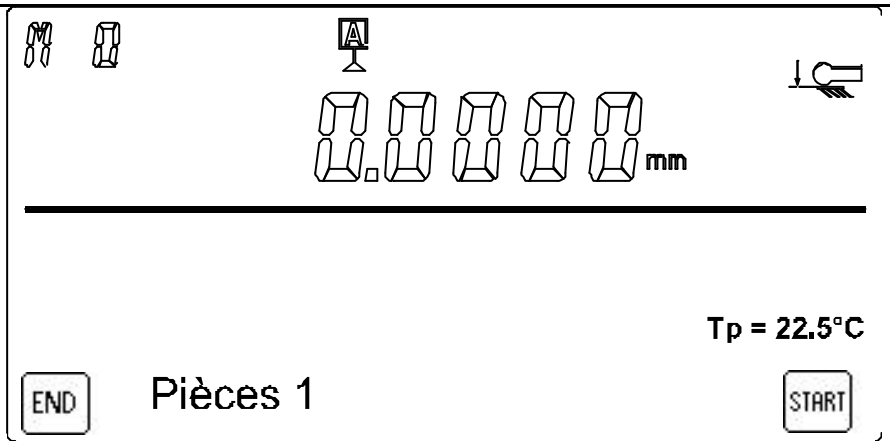
- Probing speed: 7,5 / 15 mm/s
- Fast displacement: 20 / 30 / 40 mm/s. Probe will automatically be positioned at the selected speed when starting probing.
- Response time of display: given value indicates in seconds how long display remains blocked before next numbered value appears. This options is enabled when AUTO is set to ON.
- Waiting time for stabilisation: given value indicates in seconds how long you've to wait before starting probing after the probe has reached its correct position. This option is enabled when POS is set to ON.

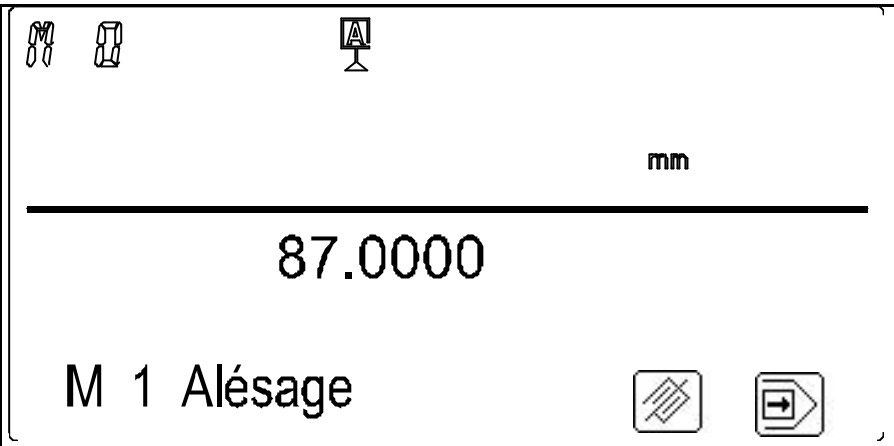
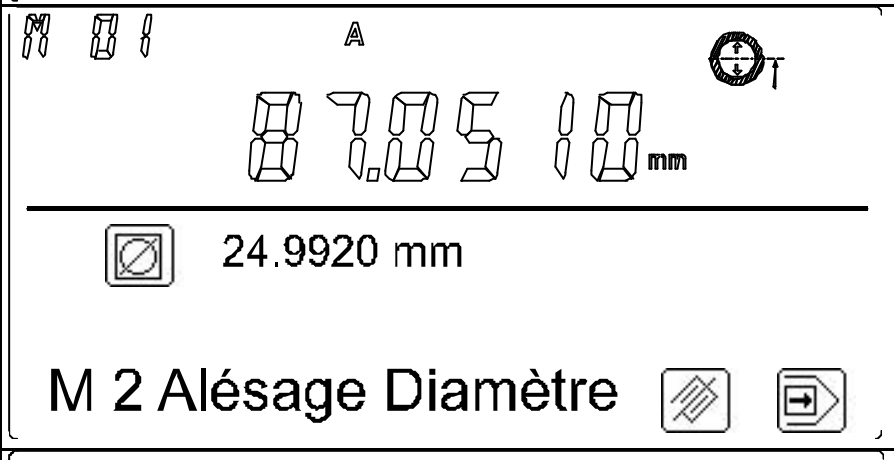
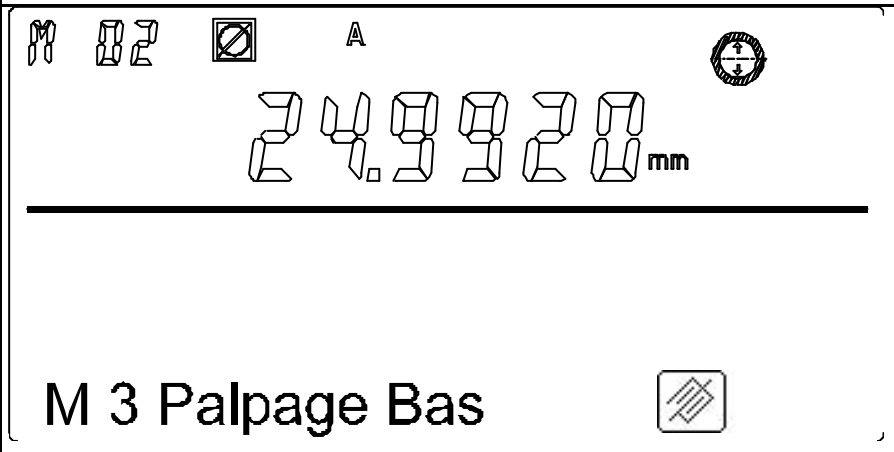
AUTO	POS	Prompt for next dimension	Positioning	Response time of display	Waiting time for stabilisation	Displayed value
OFF	OFF	Enter	Manual + Enter to start probing	Infinite	Infinite	Last measured value. Next value is prompted once Enter is pressed.
OFF	ON	Enter	Auto	Infinite	As set	Last measured value. Probe is positioned once Enter is pressed. Next value is prompted once given waiting time is over.
ON	OFF	Auto	Manual + Enter to start probing	As set	Infinite	Last measured value. Next value is prompted once given response time is over. Subsequent value is prompted once Enter is pressed.
ON	On	Auto	Auto	As set	As set	Last measured value. Probe is positioned once response time is over. Nex value is prompted once waiting time is over.

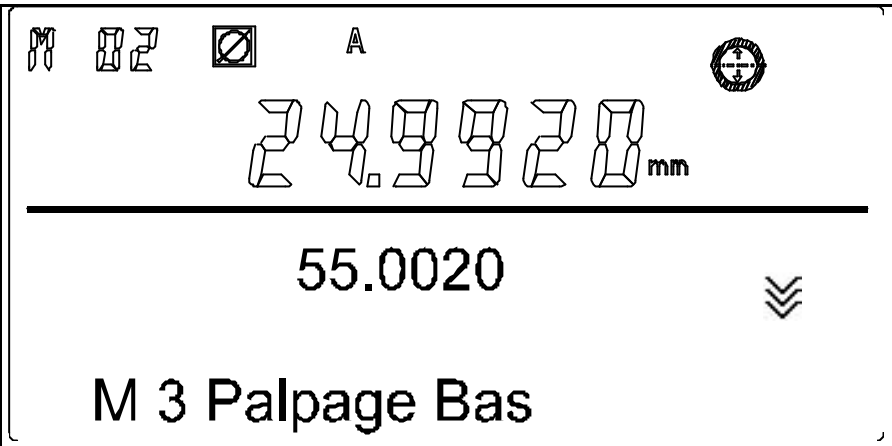
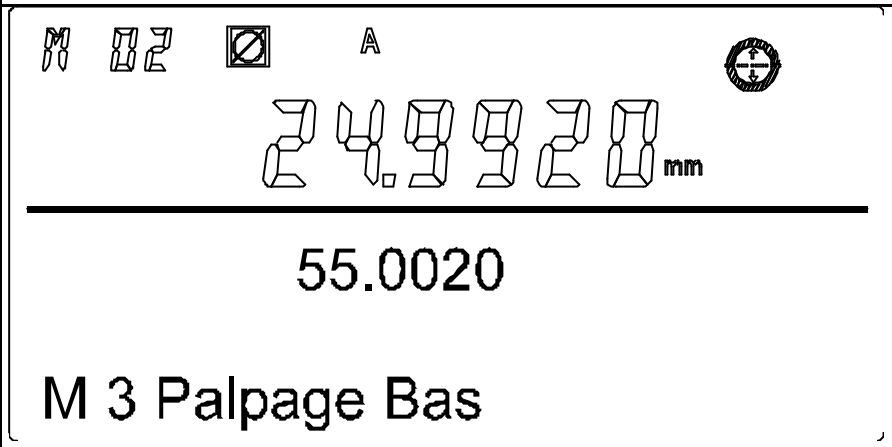
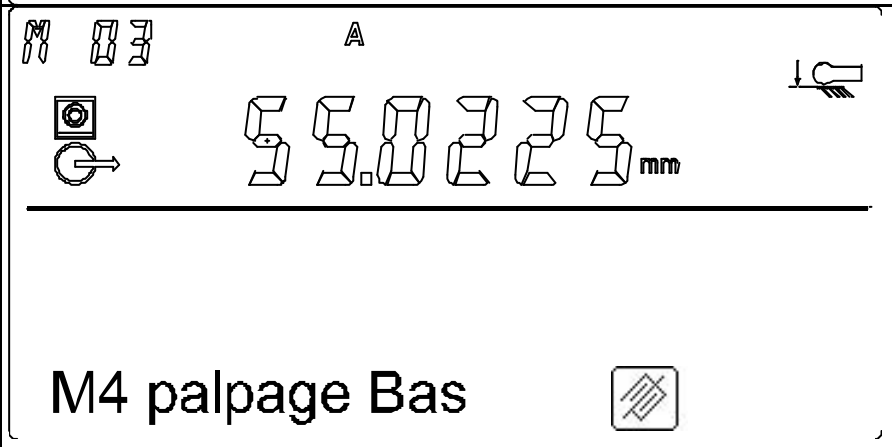
Note : The function key F6 may be activated instead of Enter or the power control may be rotated by one click.

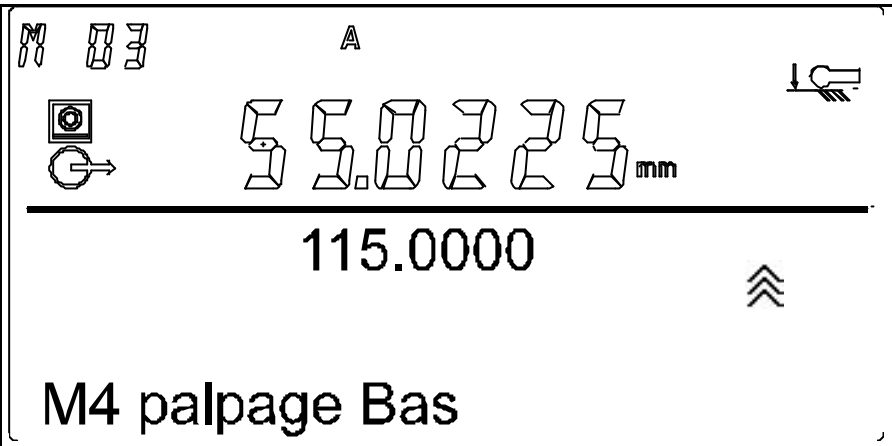
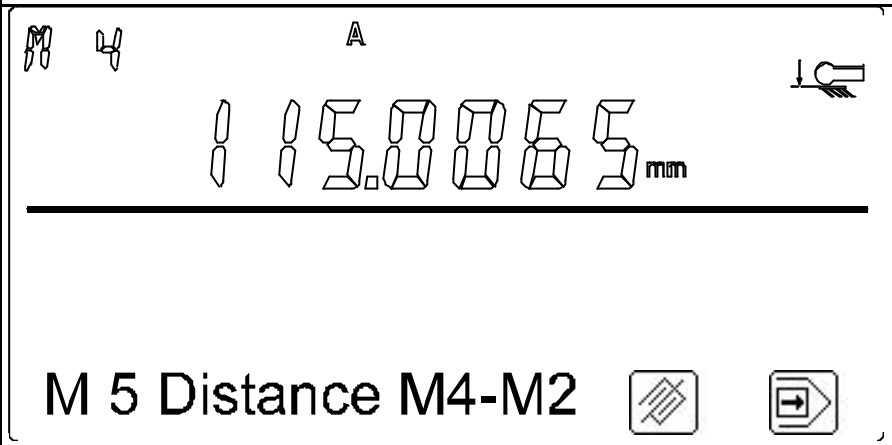
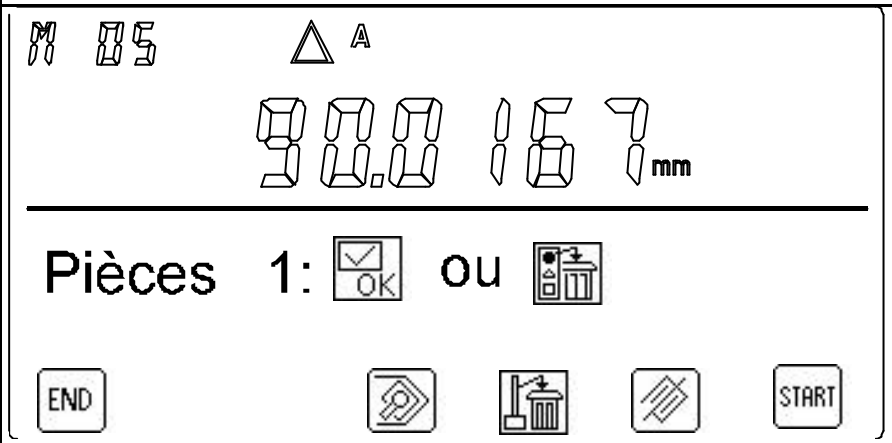
18.1) Simple 1D programme :

Follow this procedure to execute a part programme:

	Accessing the Execution mode	
		**Choose desired measurement programme** Select desired file using the arrow keys Press F1 to return to St-1/2.
	Special case as this mode was first prompted	
		Use Start if you want the values measured in the Learn mode to be loaded in data file 01. Relevant workpiece will be given the number 1. If not, move the cursor to new file.
	Procedure if numbered value M1 must be captured as the part programme is started up AUTO ON/OFF and POS ON/OFF as described hereafter	
		Example with creation of a new data file. If, the copy of the 1st part is choosen, the unit will display the end of the cycle and indicate the classification.

START or depending on previous setting or using the rotary power control		Display shows next part feature to be probed **Condition**: M0 : Auto/OFF, M1 : Pos/OFF Position probe manually.
or or using the rotary power control		Probe relevant bore
Numbered value M1 has been captured		**Display shows numbered value M1** Proposal for M2: calculating bore diameter M1 **Condition** : M1: Auto/OFF M2: Pos/ON
or or using the rotary power control		**Display shows bore diameter M2** along with next measurement to be taken. **Conditions**: M2 : Auto/ON M3 : Pos/ON

Automatic positioning		Probe is automatically positioned to the part feature M3. **Positioning options**: - at the centre of a bore or a groove -3 mm away from the surface to be probed once for a shaft or a rib
Automatic positioning is ended		Activate double beep sound once probing point has been approached Start measuring function M3 as soon as the required waiting time for positioning is over.
Automatic capture of numbered value M3		Probe part feature M3
Numbered value M3 has been captured		**Display shows numbered value M3** along with next measurement to be taken **Condition**: M3 : Auto/ON, M4 : Pos/ON

Automatic positioning as set		Probe is automatically positioned to the next part feature (M4).
Numbered value M4 has been captured		**Display shows numbered value M4** Response and waiting times are those previously entered in the configuration mode.
Depending on your settings in the edition mode (e.g. AUTO/OFF for M4)  or  or using the rotary power control		**Display shows numbered value M 5** **Last measured value usually includes :** Workpiece classification with good or scrap as well as automatic printing if selected in the edition mode.

End of measure part N° 1 :

Indication of the part classification:

 Symbol appearing if the part is within tolerance.

 Symbol appearing if the part is rejected or needs to be reworked since at least one measured value is out of tolerance.

Once each workpiece has been measured, the following options are available:

END To save the measured values in the relevant data file, close data file, return to first step for selecting another part programme or exit.

To view out-of-tolerance values

To cancel the measured workpiece

To erase last measured value

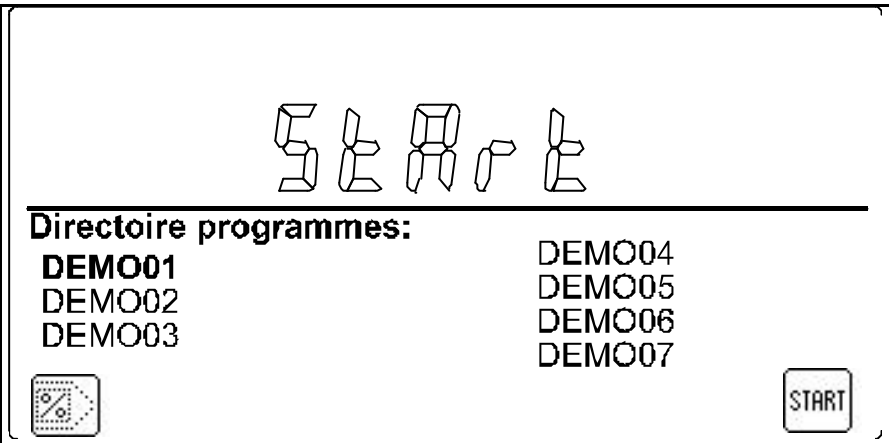
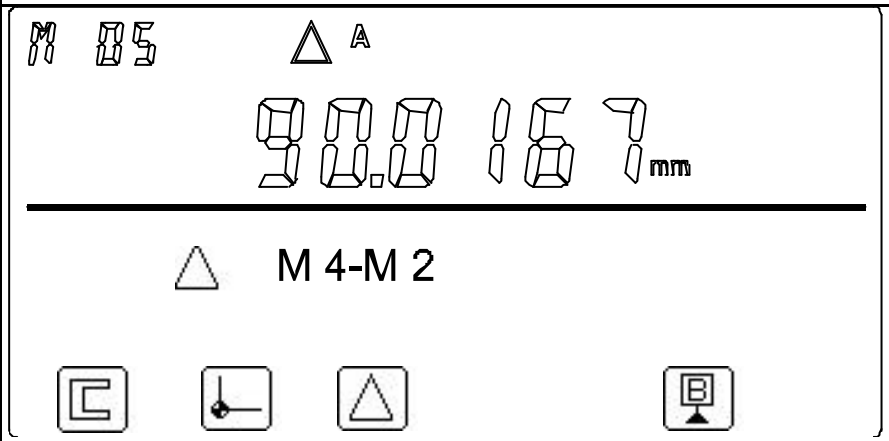
START To save the measured values in data file and start probing another workpiece

or to list M and H values in their chronological order.

To print the measured values with header (hold key down to have this done)

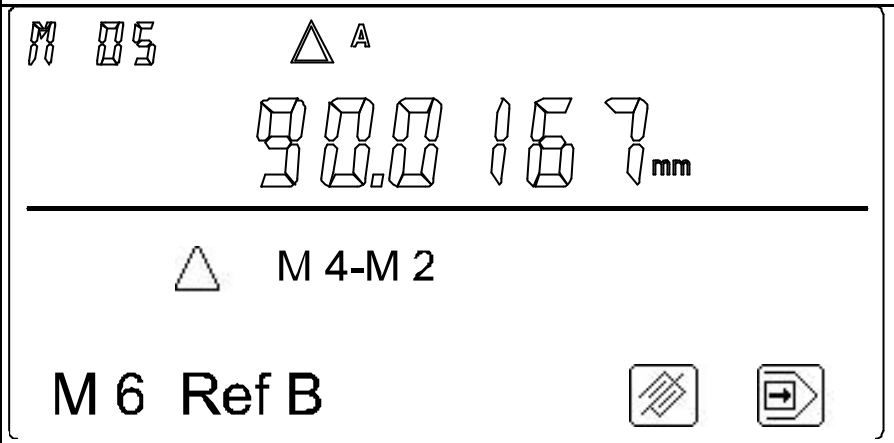
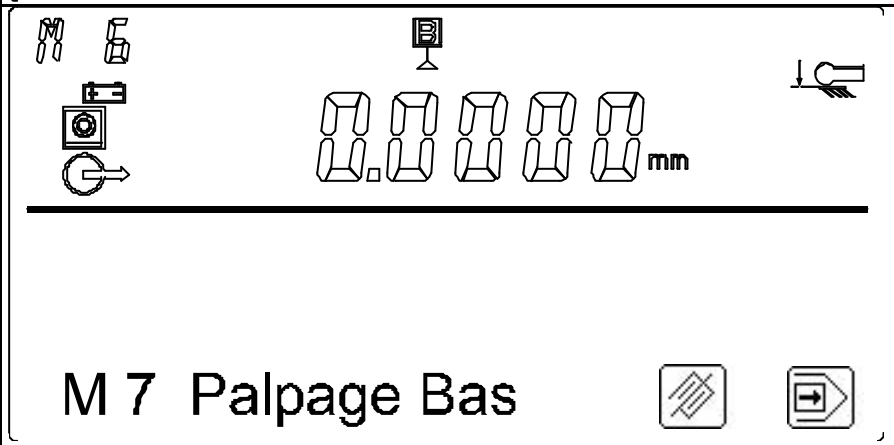
To prompt for the header you want to modify

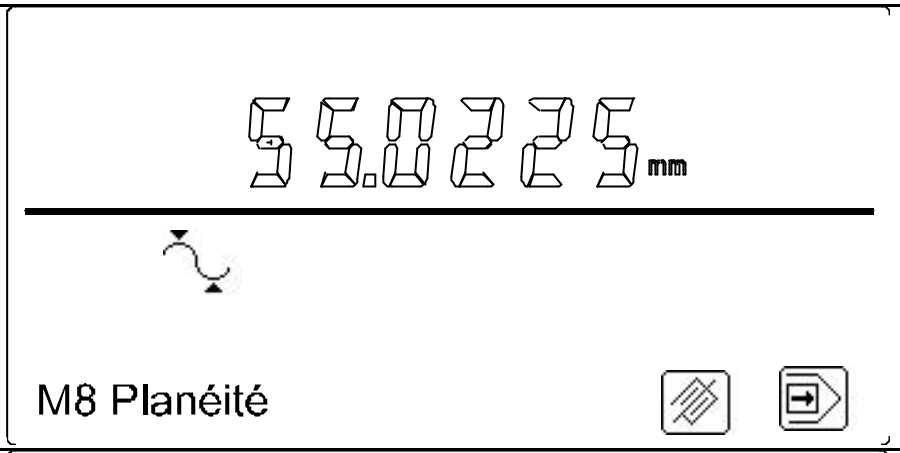
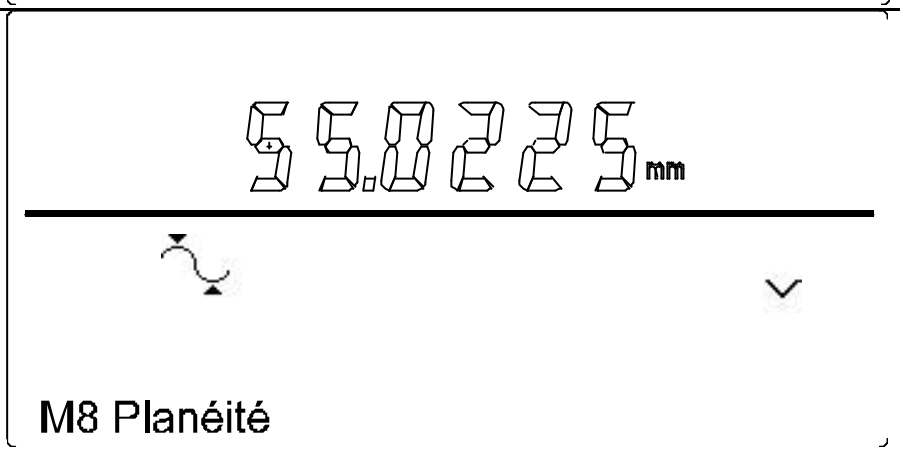
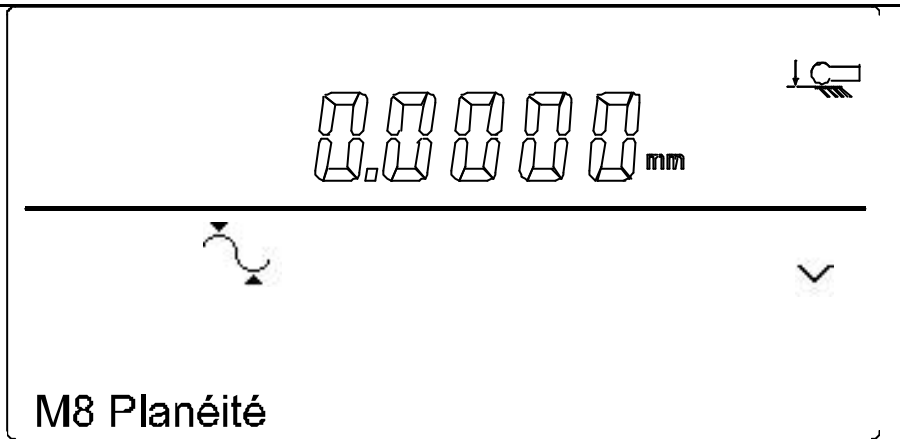
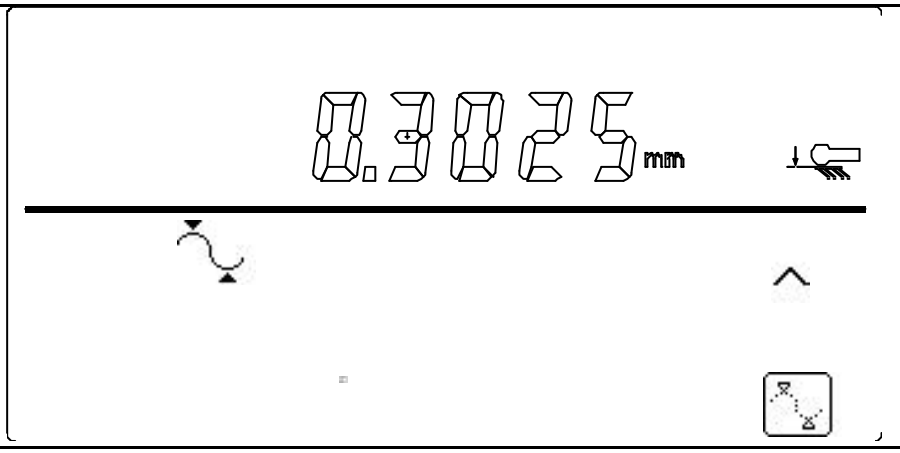
To prompt for the statistics menu

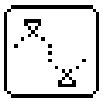
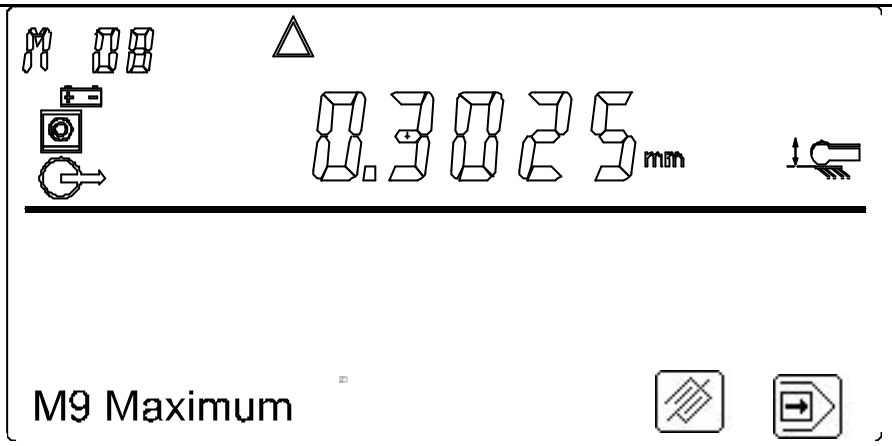
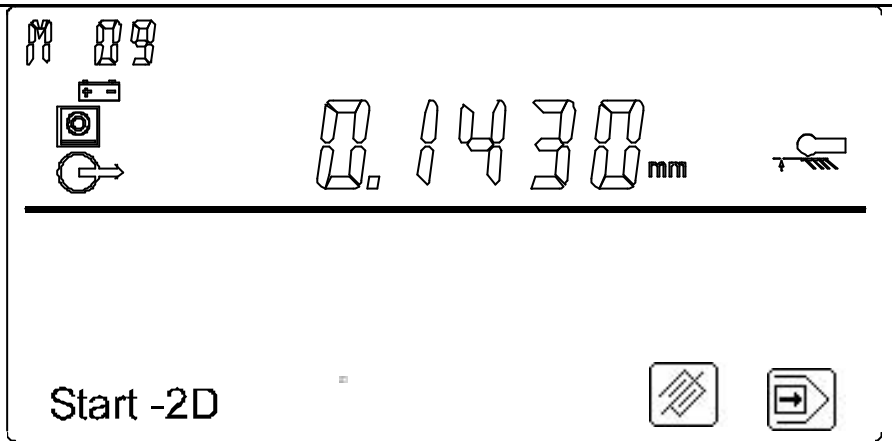
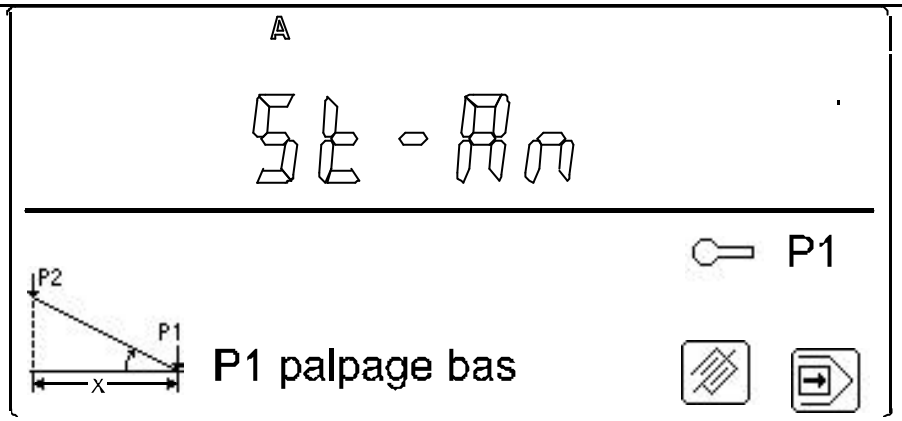
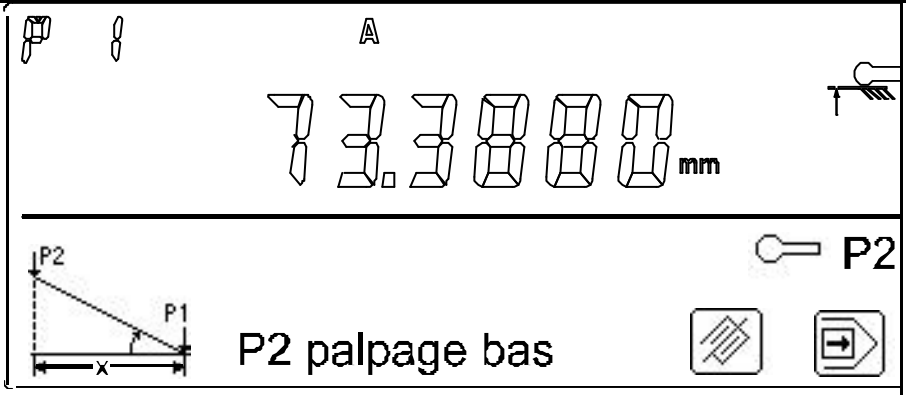
END		Choose another part programme or return to St-1/2
F1		Return to St-1/2

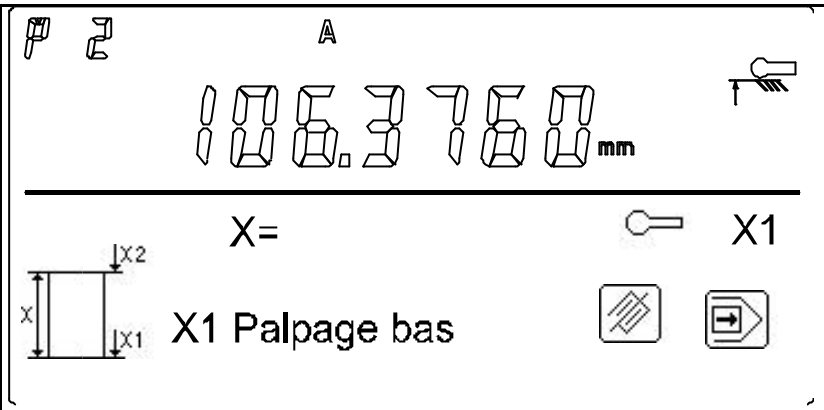
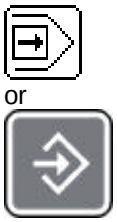
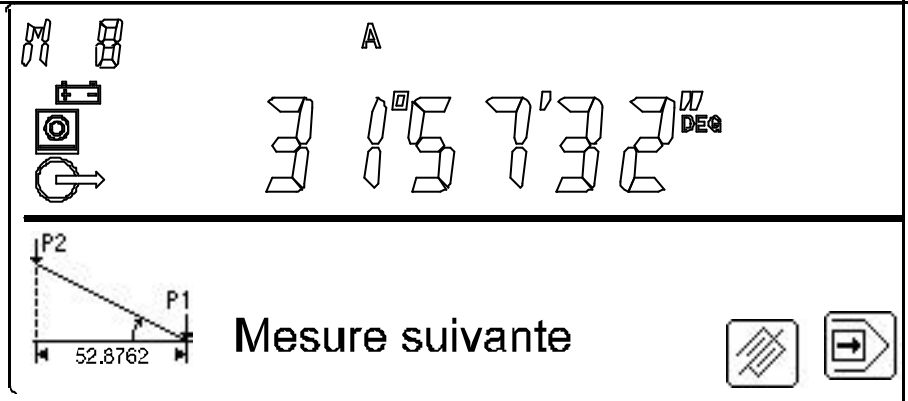
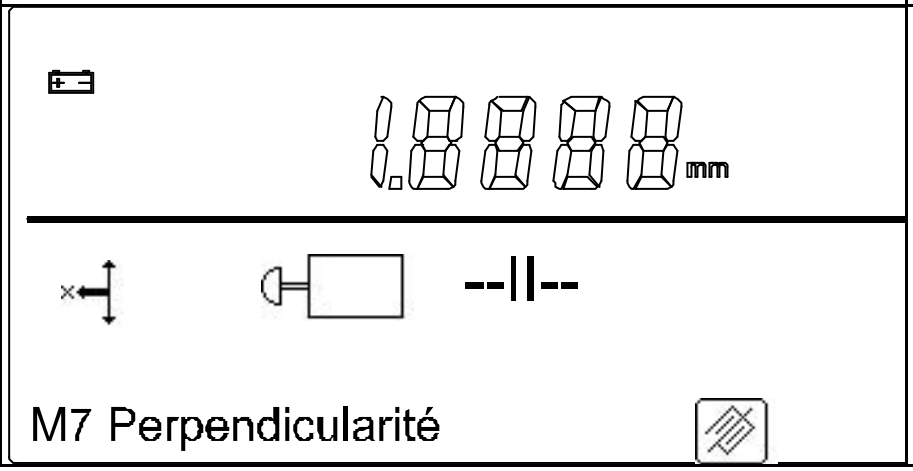
18.2) <u>Programme with angle, perpendicularity and 2D measurements:</u>

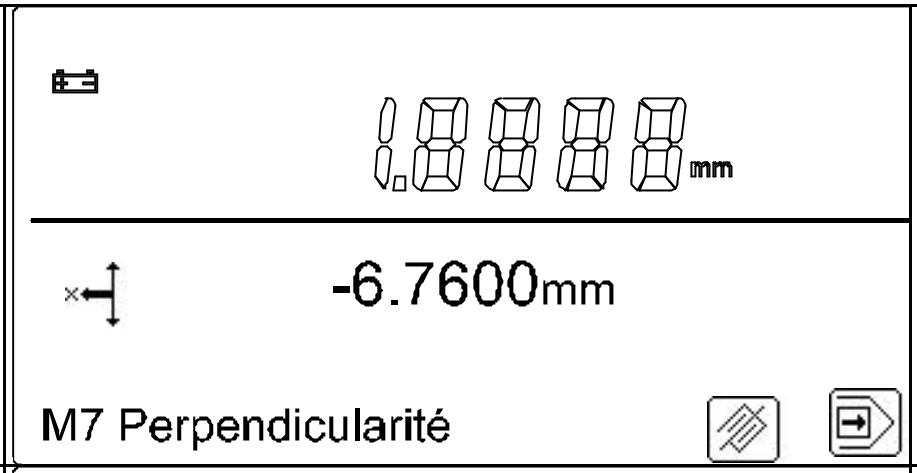
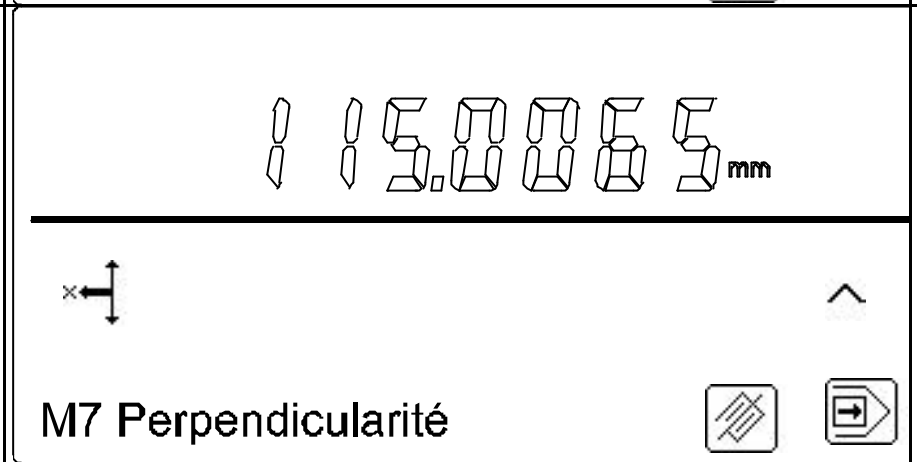
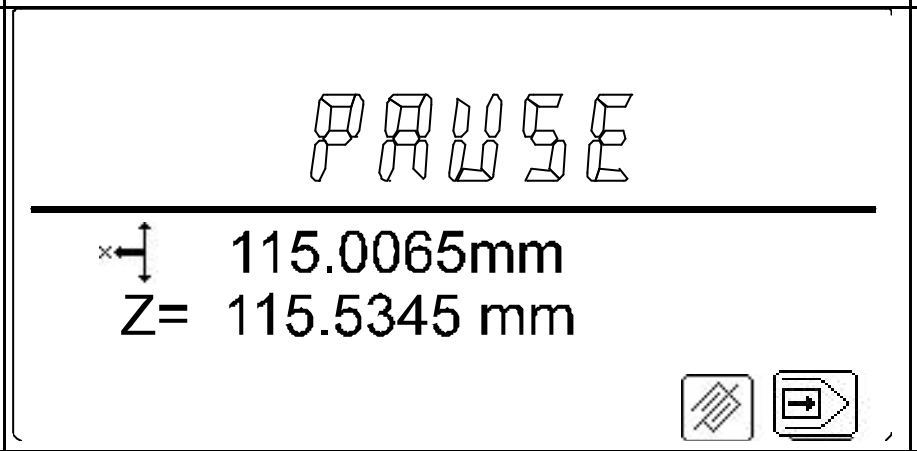
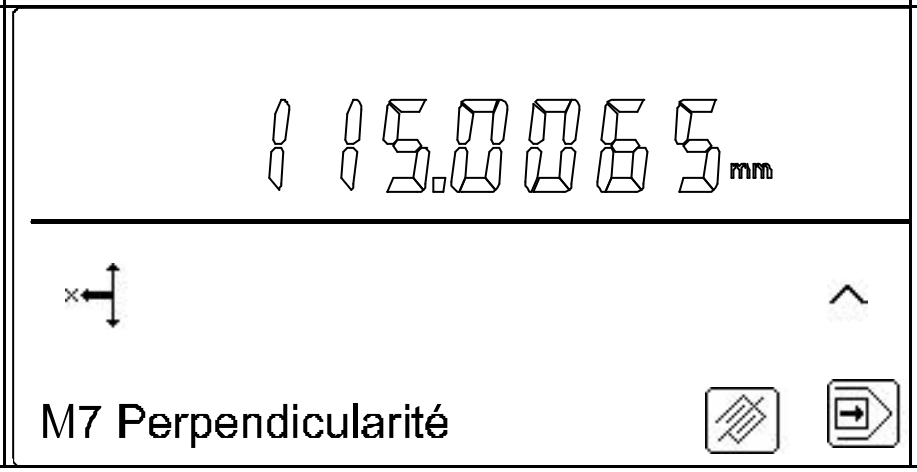
The way some specific measurements are carried out is described hereafter:

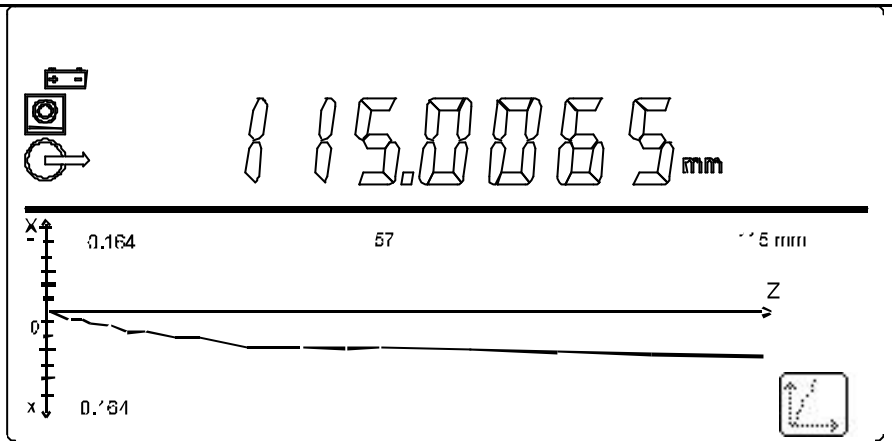
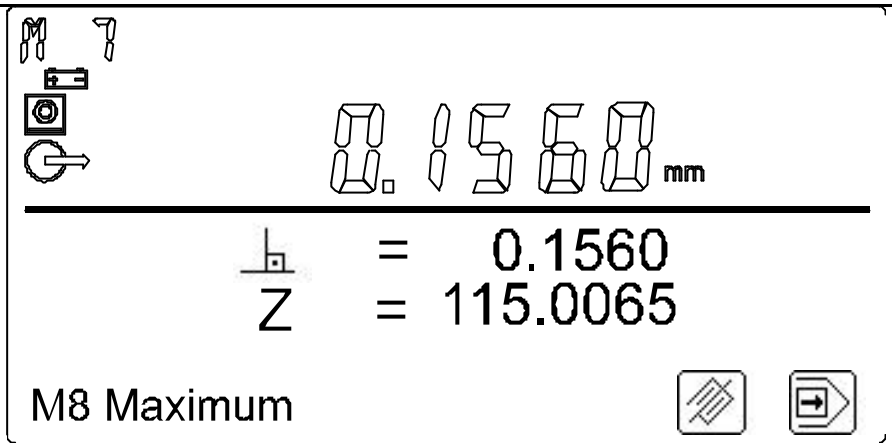
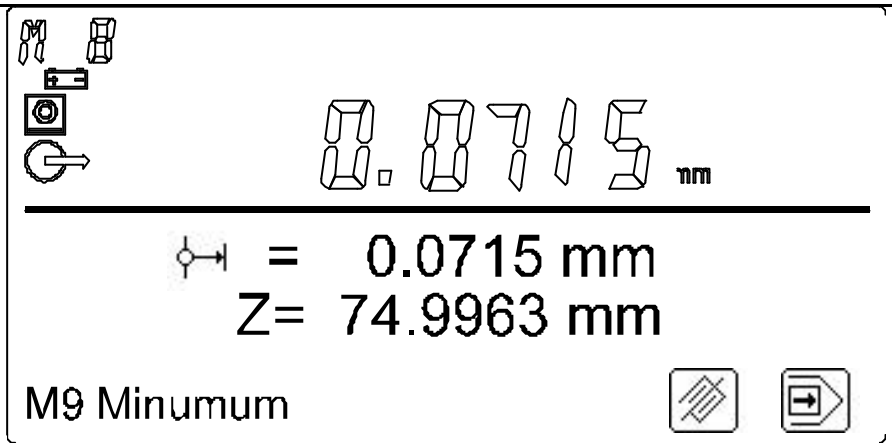
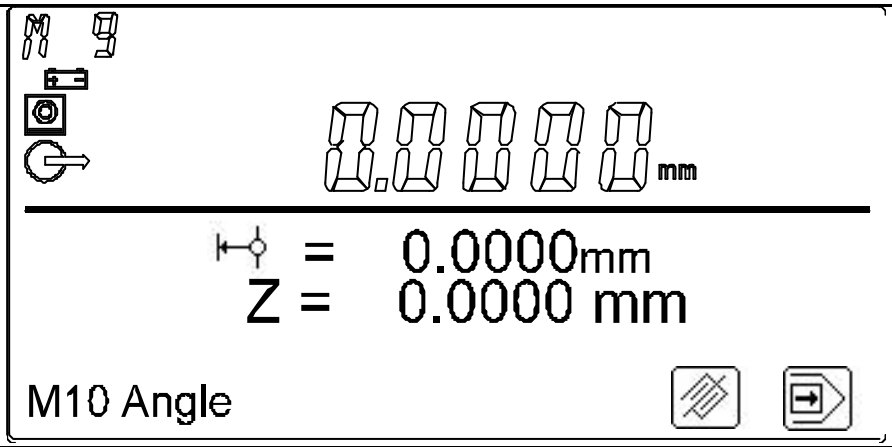
	Generating the capture of a new reference B	
Activating key according to set parameters in the edition mode		Display shows numbered value M 5 Response and waiting times are those previously entered in the configuration mode.
Enabling automatic probing sequence		Probing down is in progress. Displayed data depend on the type of measurement to be taken.
Activating key according to set parameters in the edition mode		Display shows numbered value M6 (reference B) Response and waiting times are those previously entered in the configuration mode.

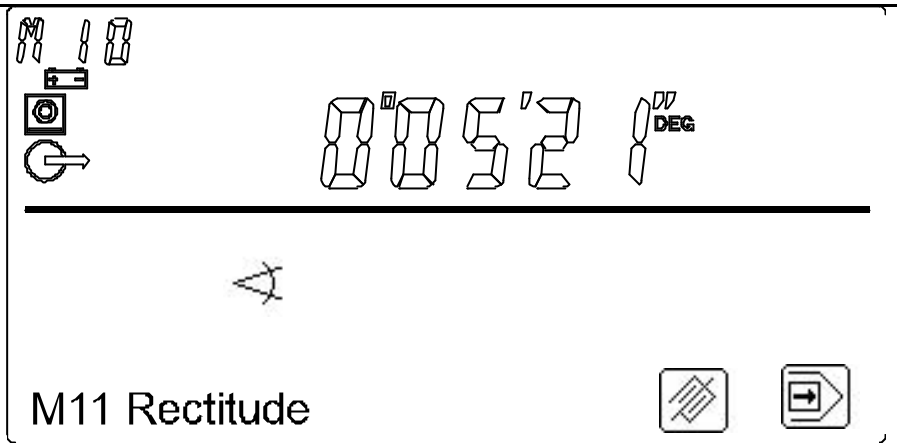
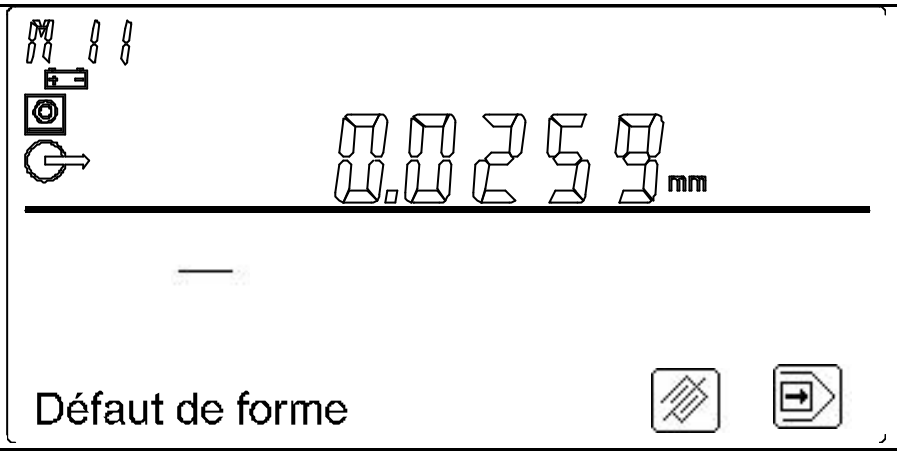
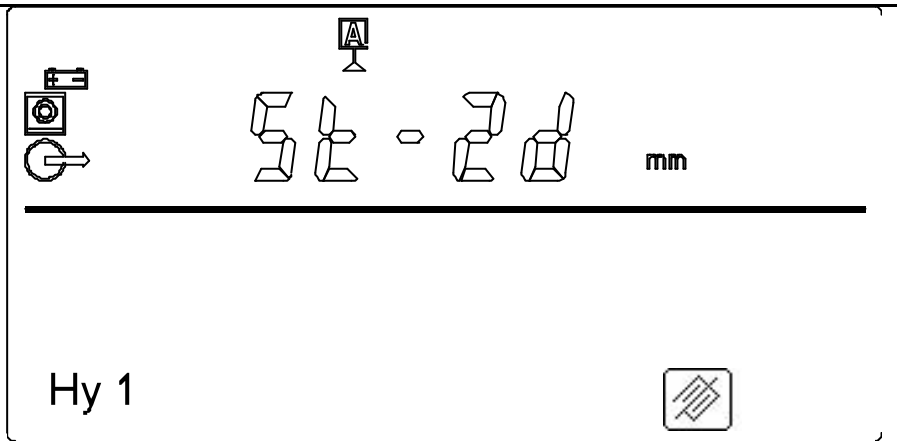
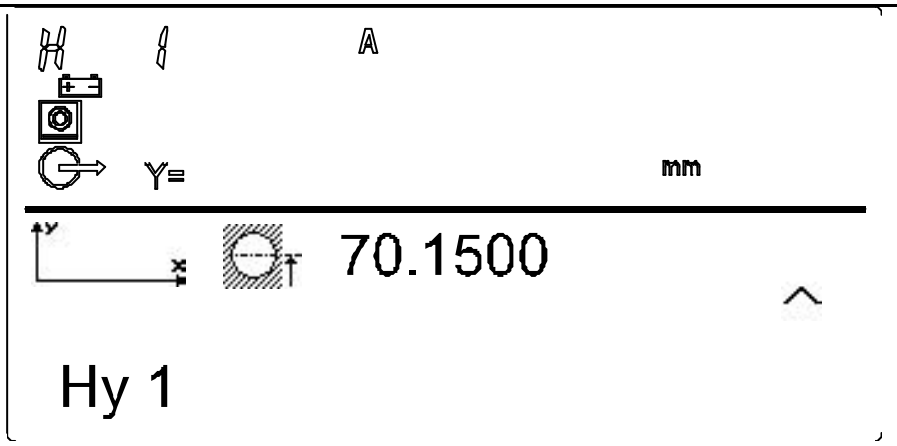
	Carrying on with flatness measurement	
Activating key according to the previous dimension parameters set in the edition mode		Access the measuring mode. Programme is waiting until first probe contact is started up.
 or using the rotary power control		Display shows floating value. V-sign indicates moving direction. **The rotary power control may also be used for for approaching the probing point.**
		Contact the workpiece surface with the probe and start probing once it has stabilised.
		Main display shows instant value. V-sign indicates moving direction.

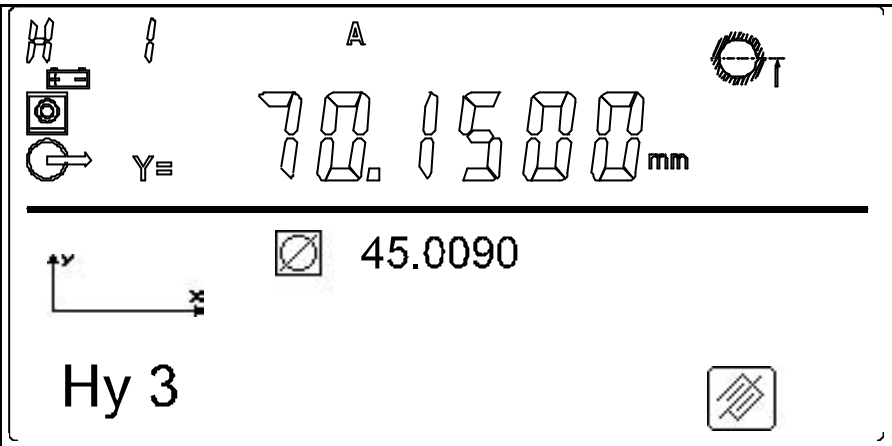
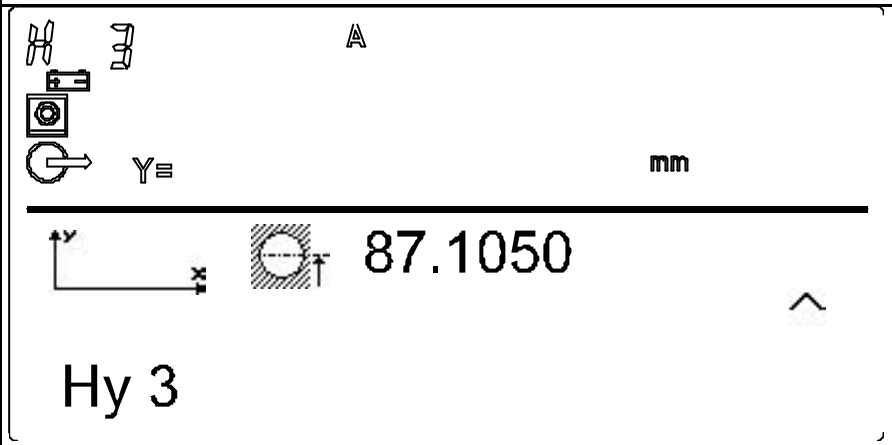
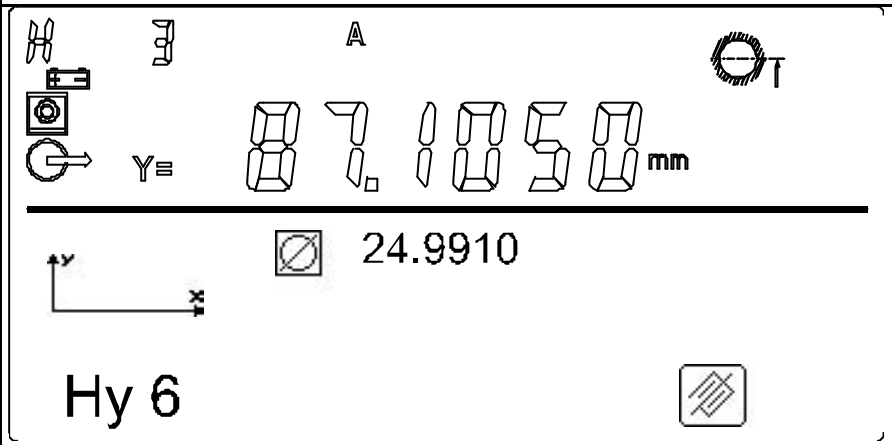
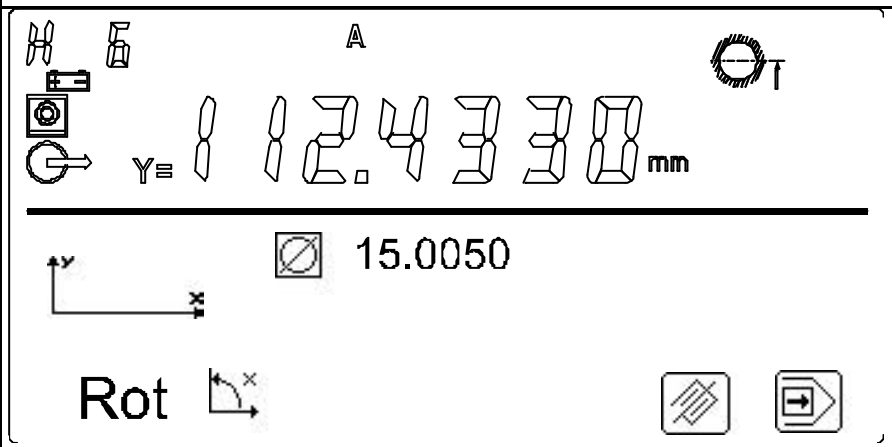
 or  or using the rotary power control		Main display shows numbered value M8. Auxiliary display shows next part feature to be probed.
Activating key according to the previous dimension parameters set in the edition mode		Next step depends on the action you want to take, i.e: execute another measurement, measure perpendicularity or flatness, perform a 2D measurement. In this example, display asks for a 2D measurement to be taken.
	Carrying on with angle measurement	
Activating key according to the previous dimension parameters set in the edition mode		**Prompt for angle measurement using a gauge block** **Proceed step by step** for all angle measurement.
 or  or using the rotary power control		**First probe contact**

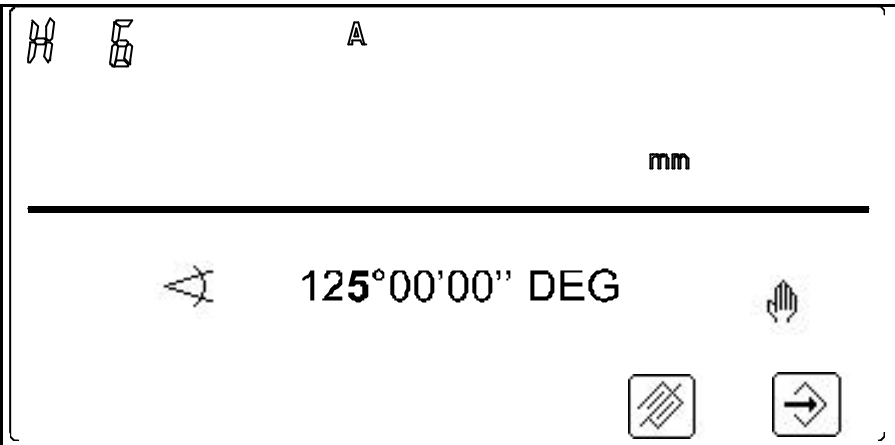
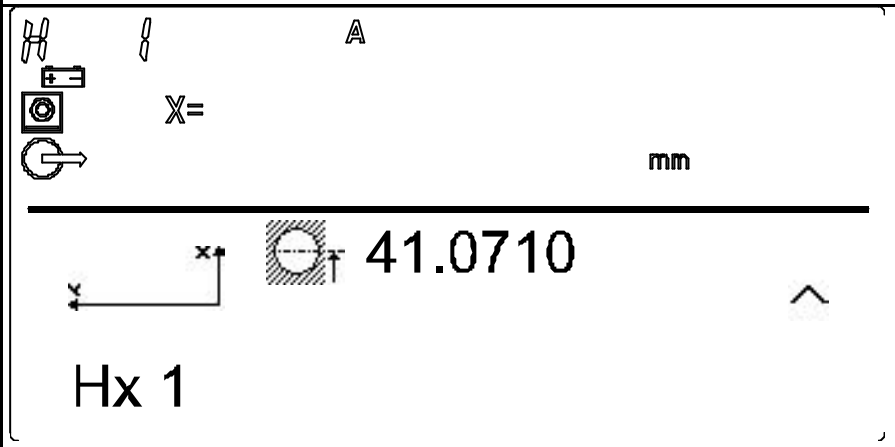
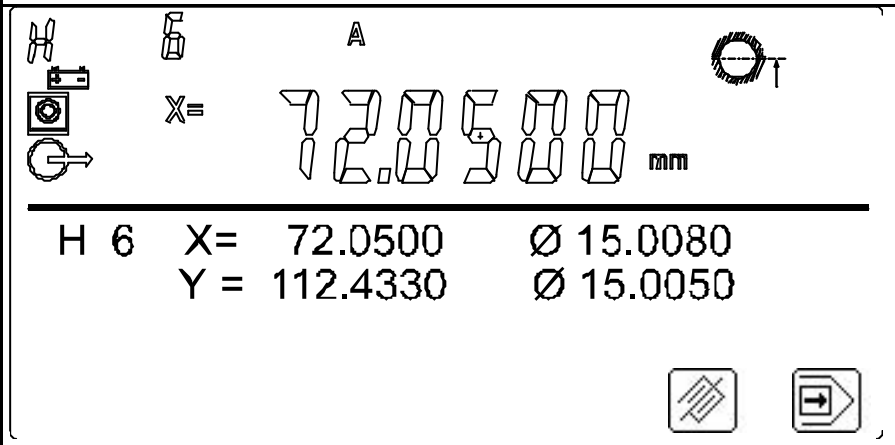
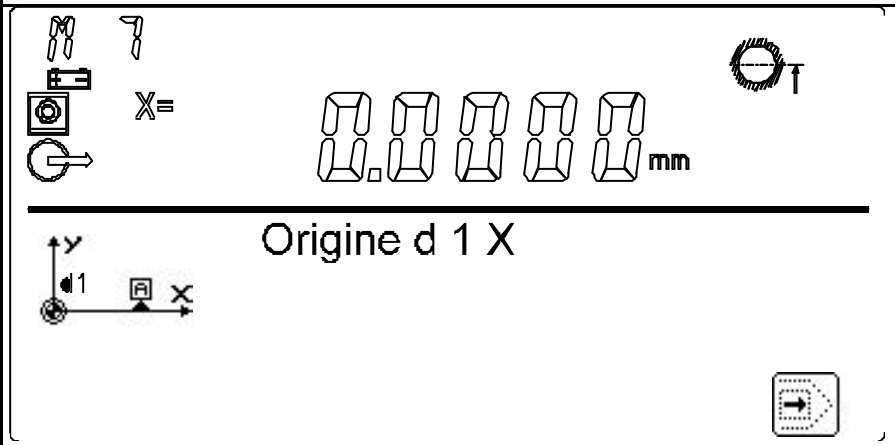
or  or using the rotary power control		**Second probe contact**
	At this point, you may go ahead according to the procedure you've followed when creating the part programme, i.e.: - Gauge block has been measured (as described in chapter 10). - Gauge value has been entered manually (as described in chapter 10) - Gauge value has been registered in the memory in the Learn mode. If so, jump to next step.	
or  or using the rotary power control		Display shows angle value once gauge block has been measured and gauge value has been input through the keyboard or called out from the memorised value in the Learn programme.
	Carrying on with perpendicularity measurement	
Activating key according to desired part programme		This option can be inserted into a part programme

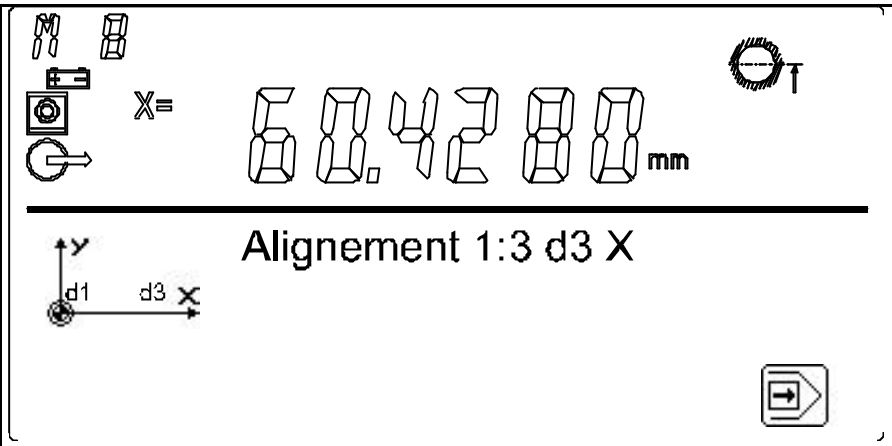
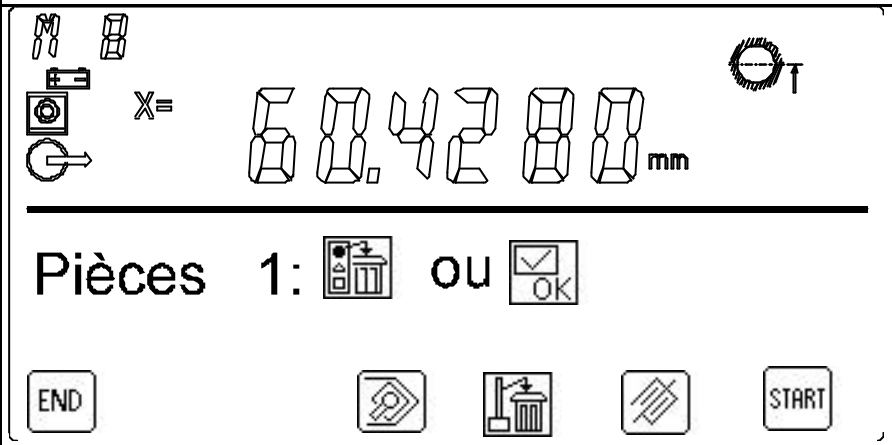
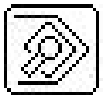
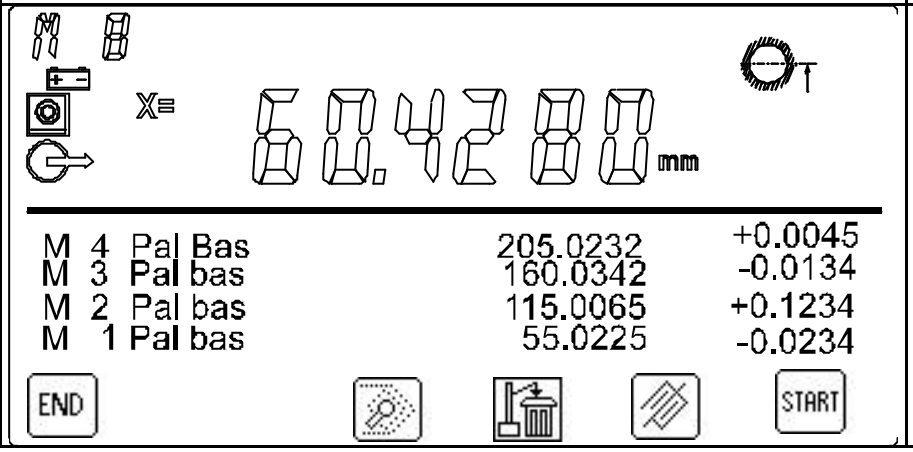
Moving probe insert and travelling past the reference mark		Note: Numbered value that comes next will be displayed according to selected part programme. In this example, display shows Z value along with the value obtained from TESA IG-13. The probe may also be positioned by rotating the power control.
or or using the rotary power control		Probe moves as instructed when creating part programme. Once measured value has been captured, probe stops moving automatically or you may use the keyboard or the rotary power control.
		**Prompt for pause (optional)** No probe contact is allowed. Auxiliary display shows: - Z value as data acquisition has been stopped - actual Z value (in dynamic probing)
		**Release pause and continue the measurement**

or or using the rotary power control		**Display shows the curve of the form error as measured, if the curve has been acceded during de creation of the Learn programme**
F6		**Display shows numbered value M7** (Max-Min) along with the Z range**.**
Activating key according to the previous dimension parameters set in the edition mode		**Display shows numbered value M8** (Max) along with related position in the Z axis.
Activating key according to the previous dimension parameters set in the edition mode		**Display shows numbered value M9** (Min) along with related position in the Z axis

Activating key according to the previous dimension parameters set in the edition mode		**Display shows angle value M10**
Activating key according to the previous dimension parameters set in the edition mode		**Display shows straightness value M11**
	Carrying on with 2D measurement	
Displaying positioning along with related probe contact This sequence may be interrupted using the rotary power control.		**Usual configuration :** Automatic displaying and positioning based on both given response and waiting times.
Displaying positioning along with related probe contact This sequence may be interrupted using the rotary power control		Display shows probe position for value capture (H1).

Displaying positioning along with related probe contact This sequence may be interrupted using the rotary power control.		Displayed value once captured as soon as given response time went by go to the next step.
Displaying positioning along with related probe contact This sequence may be interrupted using the rotary power control		Display shows probe position for next value capture (H3)
Displaying positioning along with related probe contact This sequence may be interrupted using the rotary power control		Displayed value H3 once done. After response time is over, probe moves into position for next value capture (H6).
Displaying positioning along with related probe contact This sequence may be interrupted using the rotary power control		Displayed value H6.

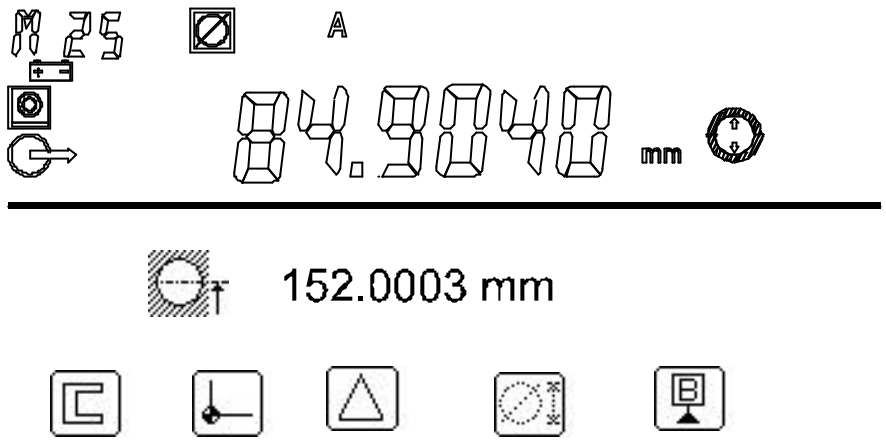
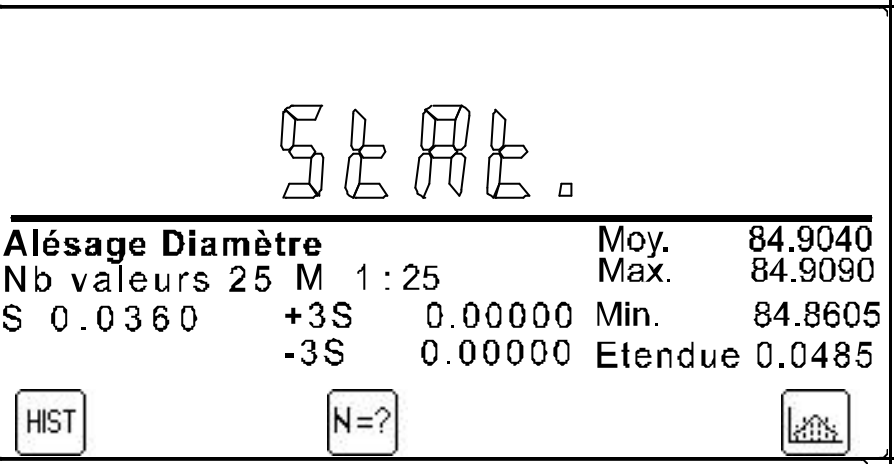
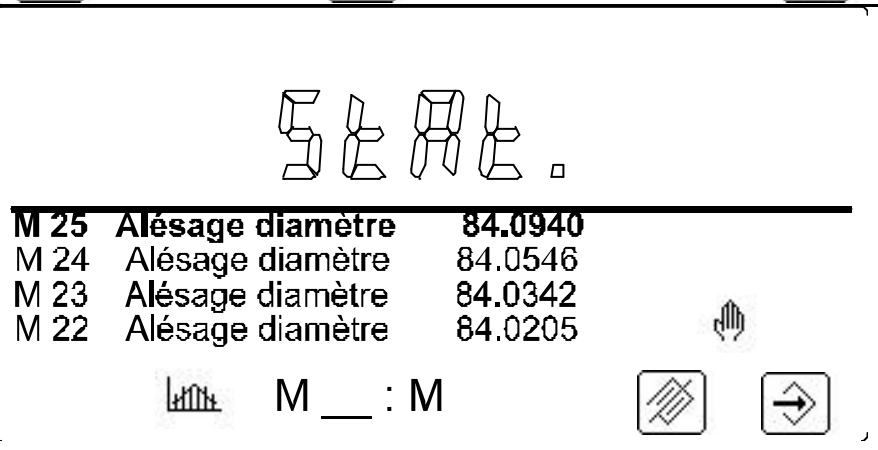
		Proceed as in 2D mode for entering angle value. Value last input replaces the previous one.
		Auxiliary display shows probe position for next value capture (H1.)
	Carrying on with next values that are identical for both X and Y axes	
		Display shows H values captured in both axes
		**Display shows numbered value M7** Response time is the one previously entered in configuration mode.

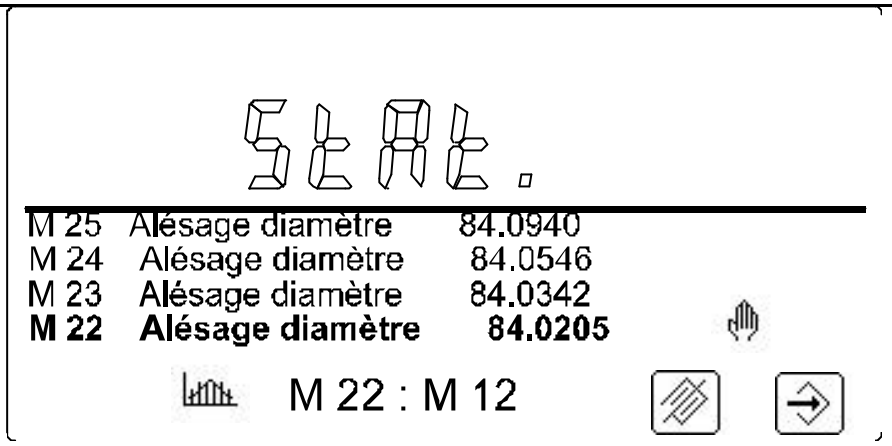
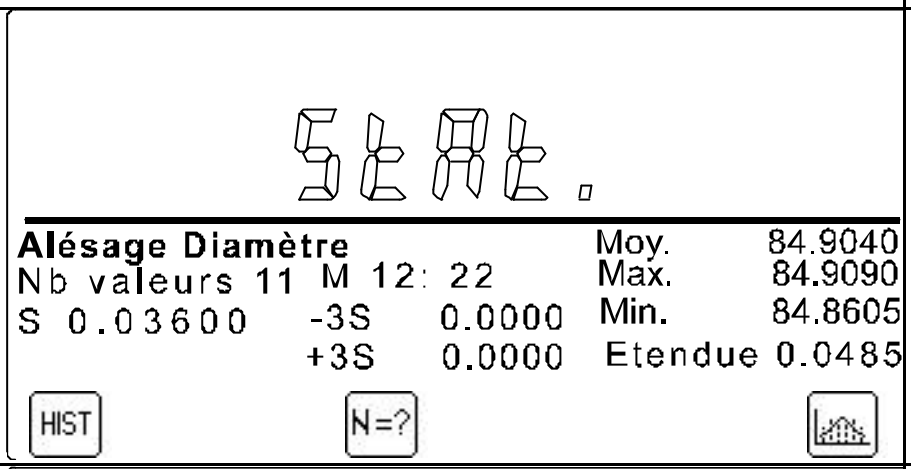
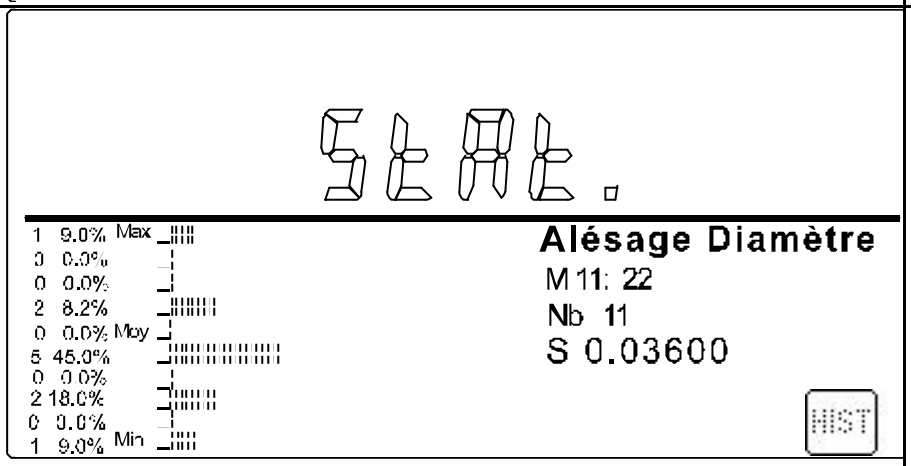
Activating key according to the previous dimension parameters set in the edition mode		**Display shows numbered value M8** Response time is the one previously entered in configuration mode.
Activating key according to the previous dimension parameters set in the edition mode		**Display shows numbered value M8** **Last measured value usually includes**: Workpiece classification with good or scrap as well as automatic printing if selected in the edition mode.
		**Prompt for listing scraps** Display shows out-of-tolerance values along with related deviations from the upper or lower tolerance limit.

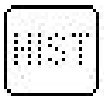
19) Statistics menu

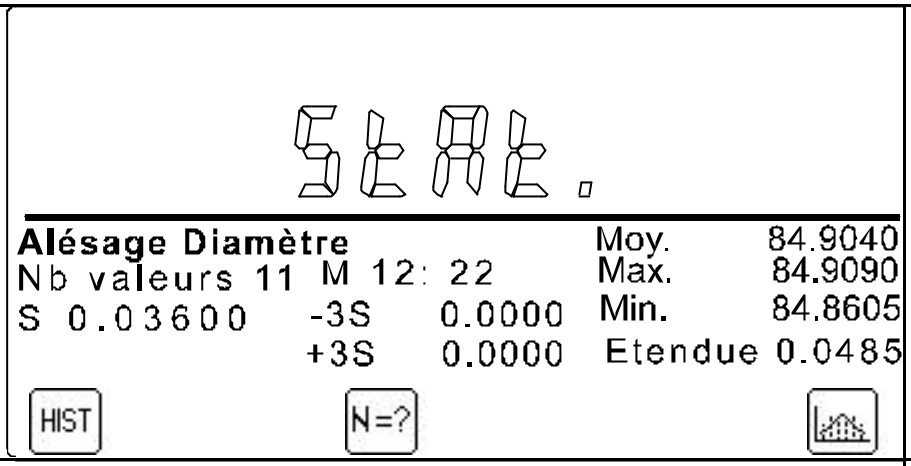
This menu can be called out from either of the three following sequences:

1) Measuring mode
2) Execution mode
3) Managing data file menu

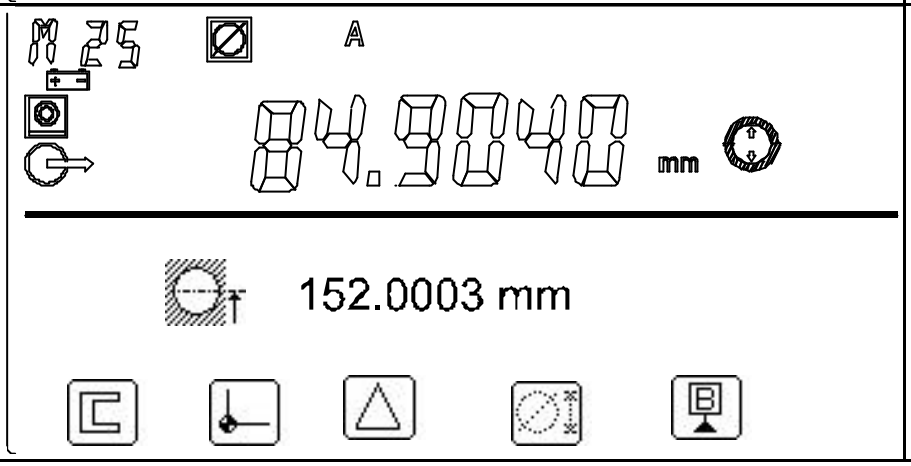
	Prompting statistics menu from measuring mode	
M=?		Displayed bore diameter as measured on 25 workpieces subsequently.
R		Default values as prompted from the table, e.g. M1 to M25. These values are accepted as being identical to one another, e.g. for bores diameters.
N=?		Choose the values you want to have statistically processed (M? to M?). Enter each value number or use the arrow keys to select both first and last values : ? ? (± 1) plus ? ? (± 4) resp.

22 +  + 12		Choose the numbered values M12 to M22 as statistical data processing.
		Confirm selected values M12 to M22
HIST		Displayed histogram Processed data include 10 classes as well as the number of inspected workpieces with their related percentage, i.e : **M 11:22** for numbered values M11 to M22 **Nb 11** for inspected workpieces **S** for standard deviation
	 : Press this key to enter header text  : Press this key to print desired histogram with the header text	



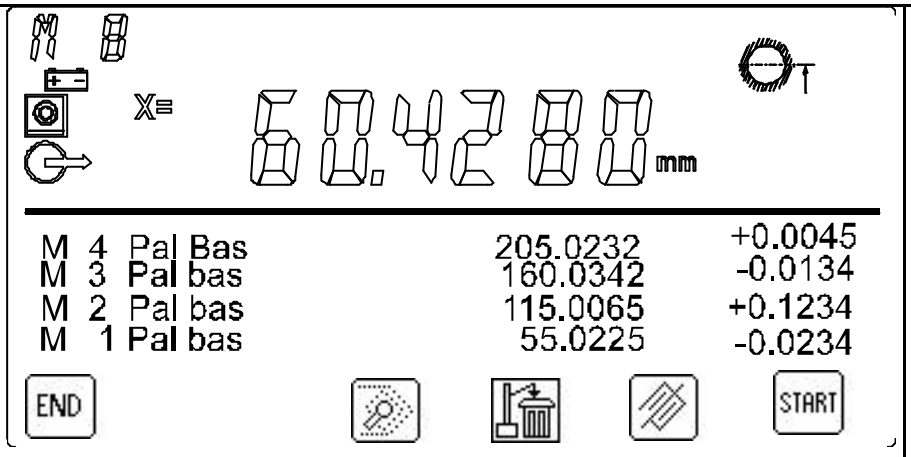


Auxiliary display shows selected values M12 to M22 after data processing has occurred.



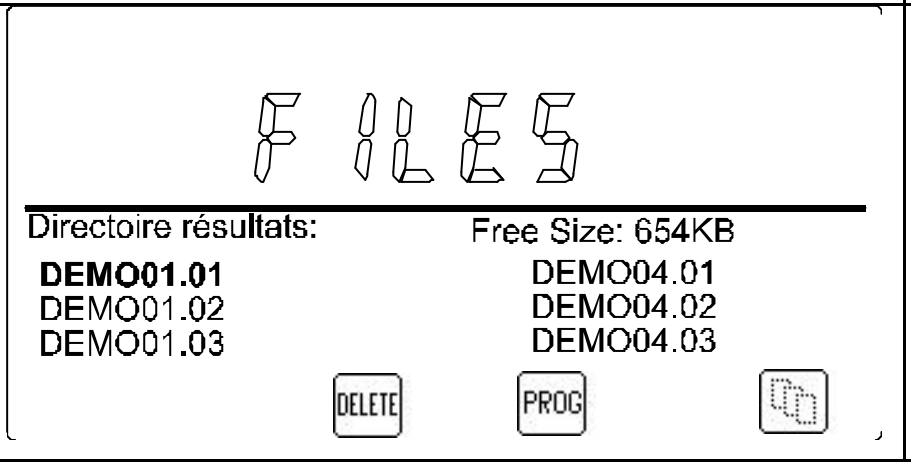
Exit statistics menu and return to the measuring mode.

Prompting statistics menu from execution or managing data files



Access from the execution mode

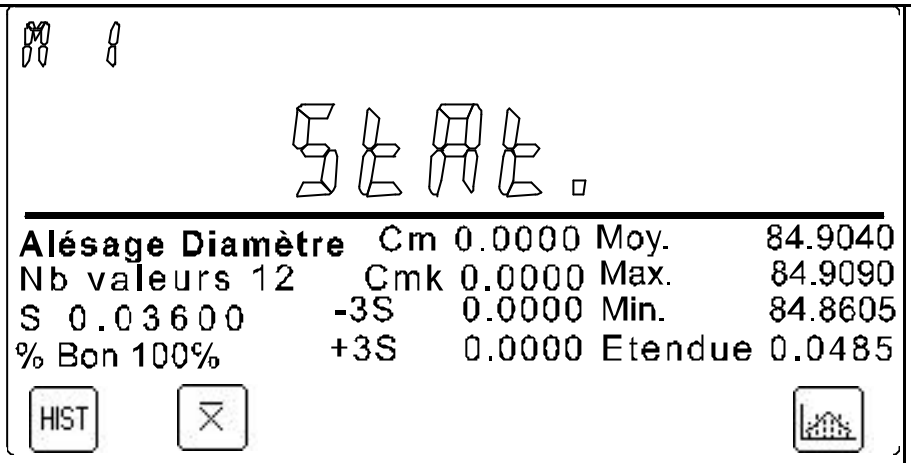
You may prompt for this menu once each part has been measured or analysis of out-of-tolerance values has been required.



Access from managing data file menu

Use the arrow keys to select desired result file and prompt statistics menu.

Prompting statistics menu from execution or managing data files



Displayed data
Numbered value M1 appears as default value.

You won't be able to activate F2 unless you've entered desired values for : UCLX and LCLX. If not, you'll get the message « No limits ».

: To enter header text

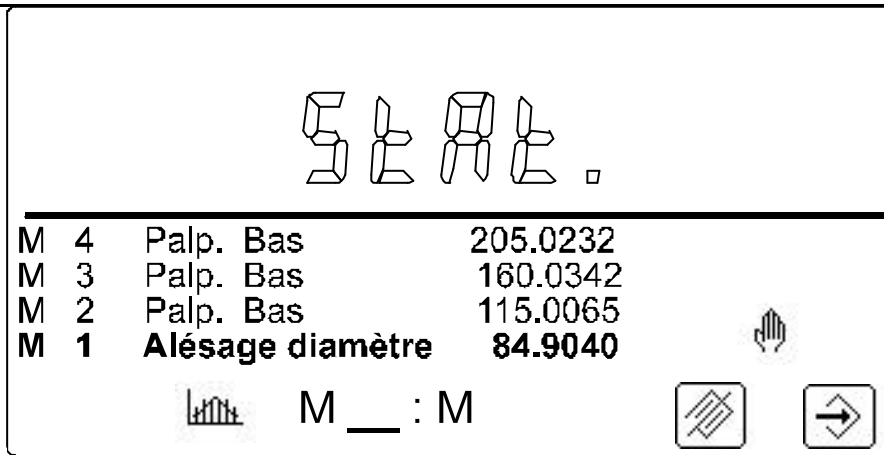
PRINT To print statistical data related to selected value (M1 in the example).

HIST To call out M1 related histogram

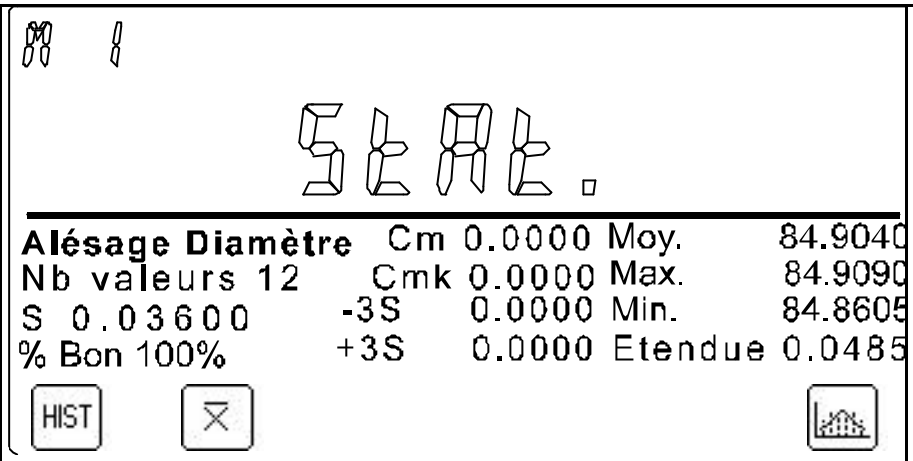
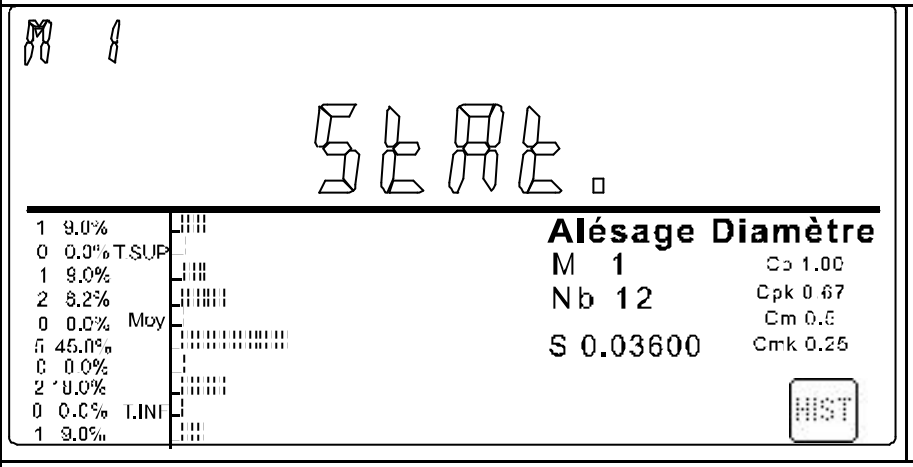
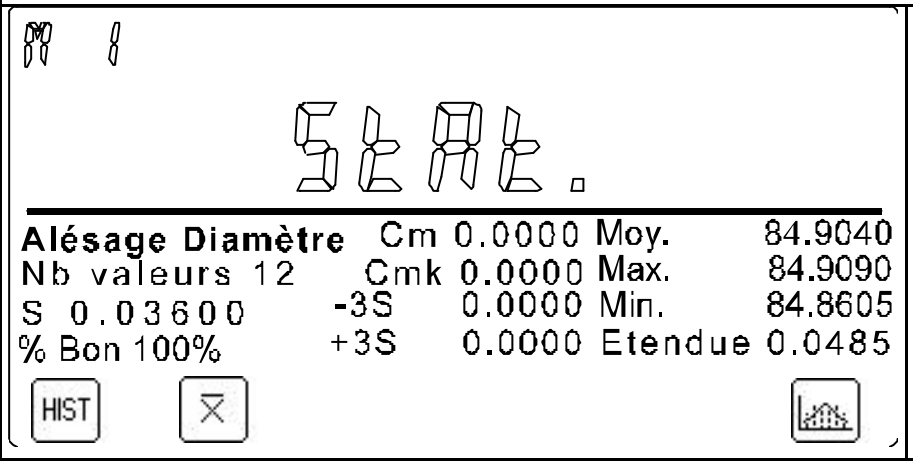
To call out M1 related Xbar card (mean value of sample)

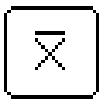
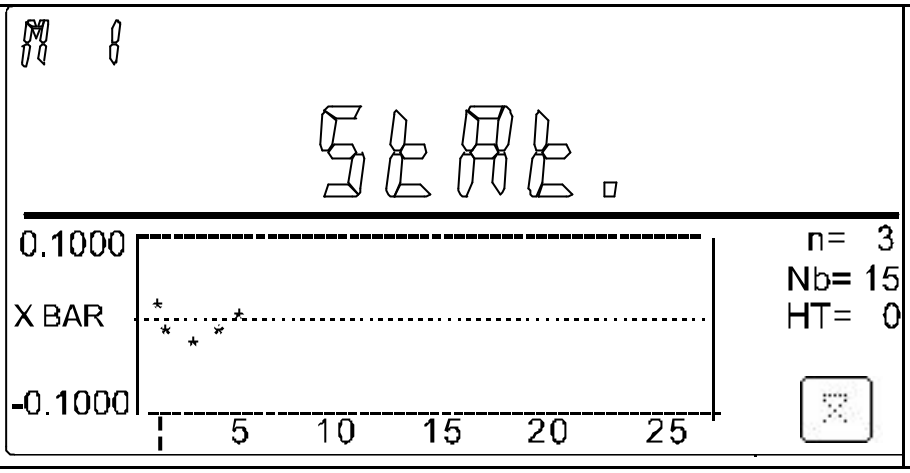
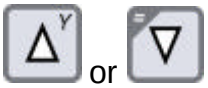
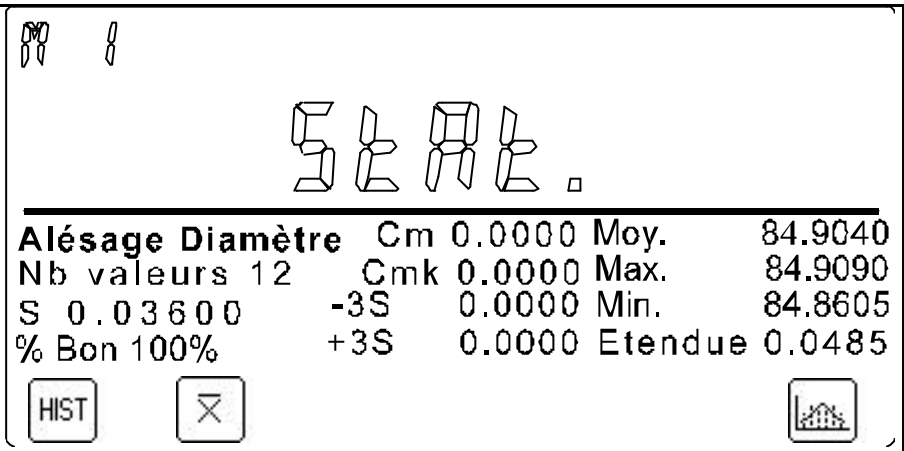
: To exit statistics menu

or to choose another dimension



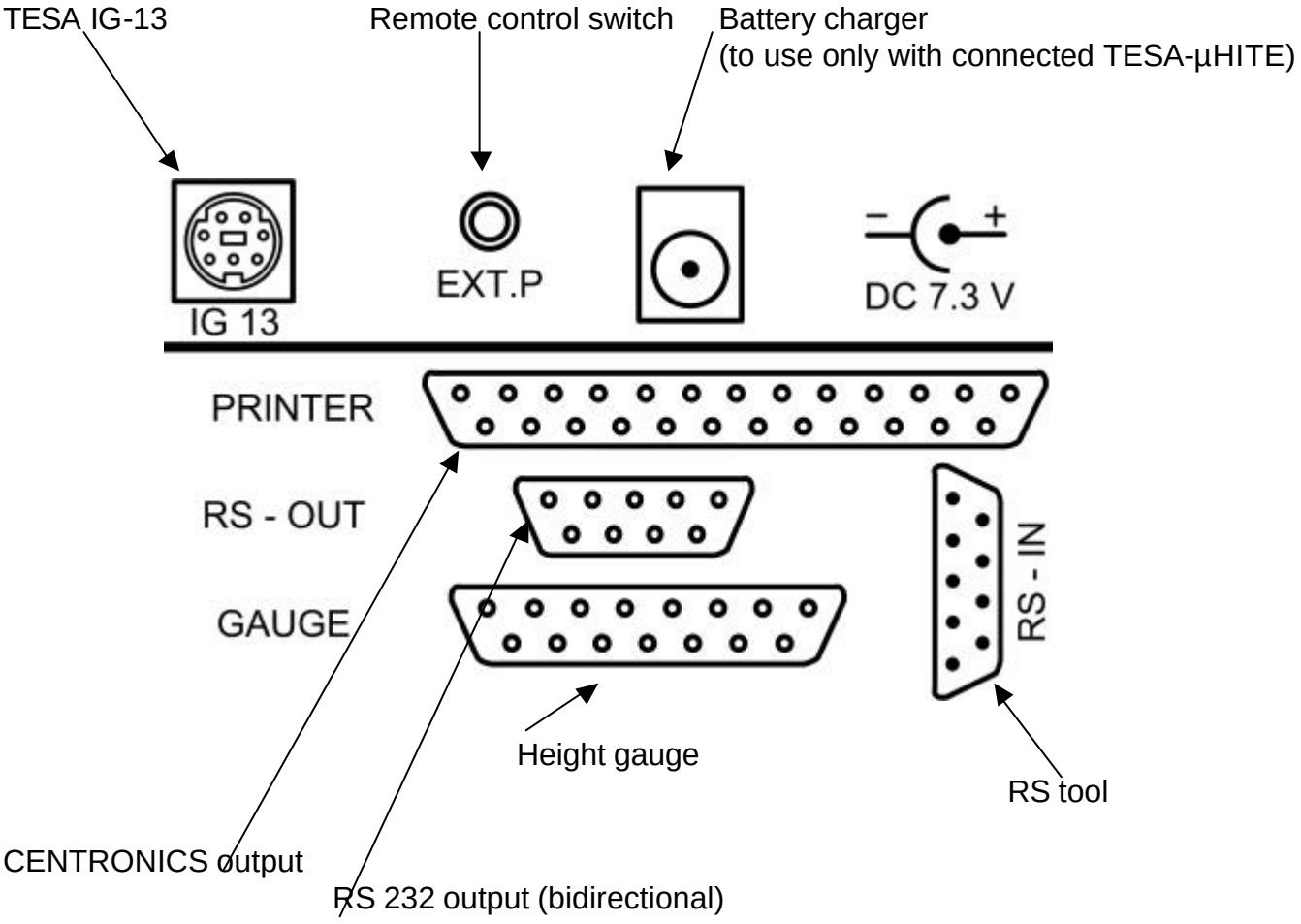
Use this arrow key to select desired dimension or enter number of desired dimension through the keyboard.

		Auxiliary display shows processed values that relate to selected dimension.
	Prompting for histogram	
HIST		Displayed data related to M1 with: 8 good classes 2 out-of tolerance values Standard deviation (S) Cp= (upper T minus lower T) / 6S Cm= (upper T minus lower T) / 8S
	 : To enter header text  : Print the histogram of the selected dimension (M1 in this example)  or  : to choose another dimension	
HIST		

	Prompting for Xbar card	
		**Displayed measuring process for M1**. X scale always shows the last 25 samples of n workpieces. Samples that are not within control limits are either marked with the arrow key ? or with ? pointed to the relevant limit value.
	 or : to choose another dimension  or  : to display previous or next samples (25 items)	
		Quit Xbar card
	Return to the execution mode or in the managing files menu.	

20) Interfaces

This section describes the input sockets on the top and back of your control panel.



20.1) RS 232 digital input

This input allows the connection of an opto-electronic measuring instrument, RS type, which can be purchased from TESA or any other manufacturer. The following parameters can be altered as desired in the configuration menu:

Data rate:	4800 bauds
Character length:	7 bits
Start :	1 bit
Stop :	2 bits
Parity :	even

Transmission format :
With use of the cable No. 04761049, bidirectional : as above or opto-RS
With use of the cable No. 04761046, monodirectional : 4800 bauds
(or 1200 bauds for a measuring instrument from an earlier generation),
7b, 2P, 2S, oh.

20.2) RS 232 digital output

The connecting cable 04761052 is used to link TESA Micro-hite *plus* M to SPC Printer or a host computer.

Data rate:	4800 bauds
Data bits:	7 bits
Start :	1 bit
Stop :	2 bits
Parity :	even

These parameters can be altered in the configuration mode.

Monodirectional or bidirectional data transfer

Data transfer may either be triggered off by activating the function key PRINT or using a remote control switch (hand or foot switch) connected to « EXT.P » at the rear of your control panel.

Data transfer	mm :	±9999.999(9) <cr/lf>
	In :	±99.99999 <cr/lf>

Bidirectional data transfer

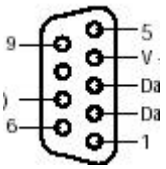
This transfer mode allows direct control of the height gauge from a PC. Given instructions are as below. Each order must be ended using ASCII code « CR ».

?<cr>	Measured value	
ID ?<cr>	Insrument's identification	TE…<cr/lf>
VER ?<cr>	Instrument's version	2.1<cr/lf>
UNI ?<cr>	Unit system	MM or IN<cr/lf>
MM<cr>	Metric (mm)	<cr/lf>
IN<cr>	Inch (in)	<cr/lf>

Pin layout on the 9-pin (female) connector:

Control panel:		PC:
2 TXD (Data Out)	→	RXD
3 RXD (Data Req)	←	TXD
5 GND		

Additional pins (unused):



20.3) CENTRONICS output and printer type (A4)

The Centronics output can accept any A4 printer type fitted with a parallel port.

Choice of drivers that can be used:

A) Epson LX 80
B) HP PCL (HP Laser Jet 1200 series)

Paper length:
From 9 to 13 inches.
Standard length is 12 inches.

Use the configuration menu to select desired printer.

Note: As long as the printer buffer does not contained a full page, most of the Laser printer do not start to print. To print a non completed page press the appropriate button on the printer of the  key on the panel.

21 Printing formats

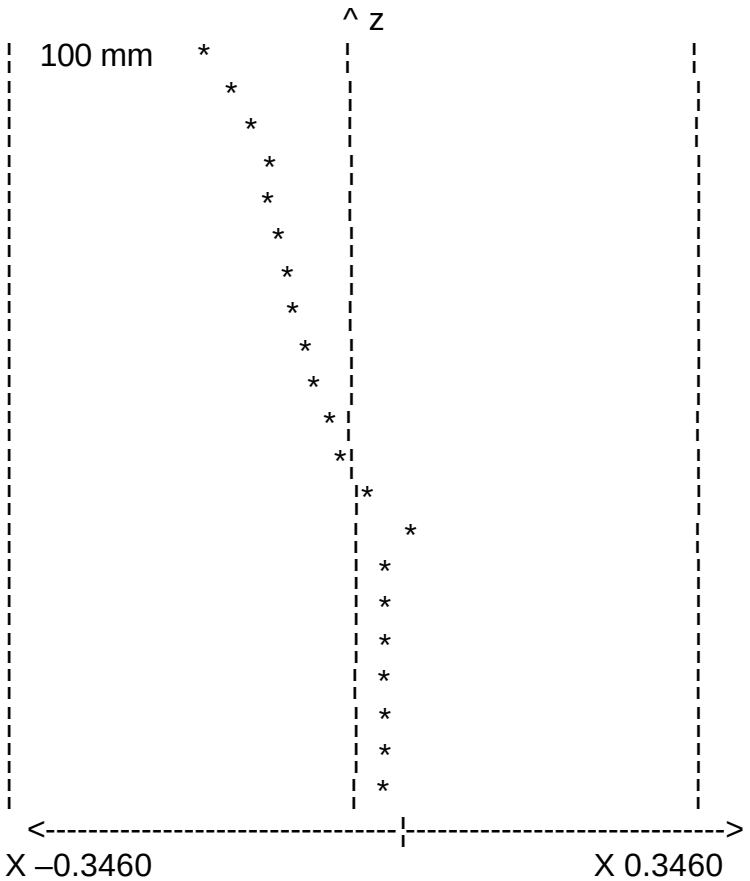
SPC Printer
Perpendicularity curve

Part Nbr:……..
Series Nbr:……..
Part name:……..
Drawing Nbr:……
Company:……
Operator:……

_____

Deviation from perpendicularity:
X = 0.3460 mm: Z = 100.7285 mm
Highest value:
X1= 0.0000 mm: Z1= 0.0000 mm
Lowest value:
X2= -0.3460 mm : Z2= 99.9635 mm
Deviation from straightness :RCT= 0.00283460 mm
Sloping deviation: ANG= 0°05’26’ deg

Graphical curve



Centronics
Perpendicularity curve

Part Nbr:……..Series Nbr:……..
Part name:……...Drawing Nbr:…….
Company: ……....Operator:…….

Deviation from perpendicularity:

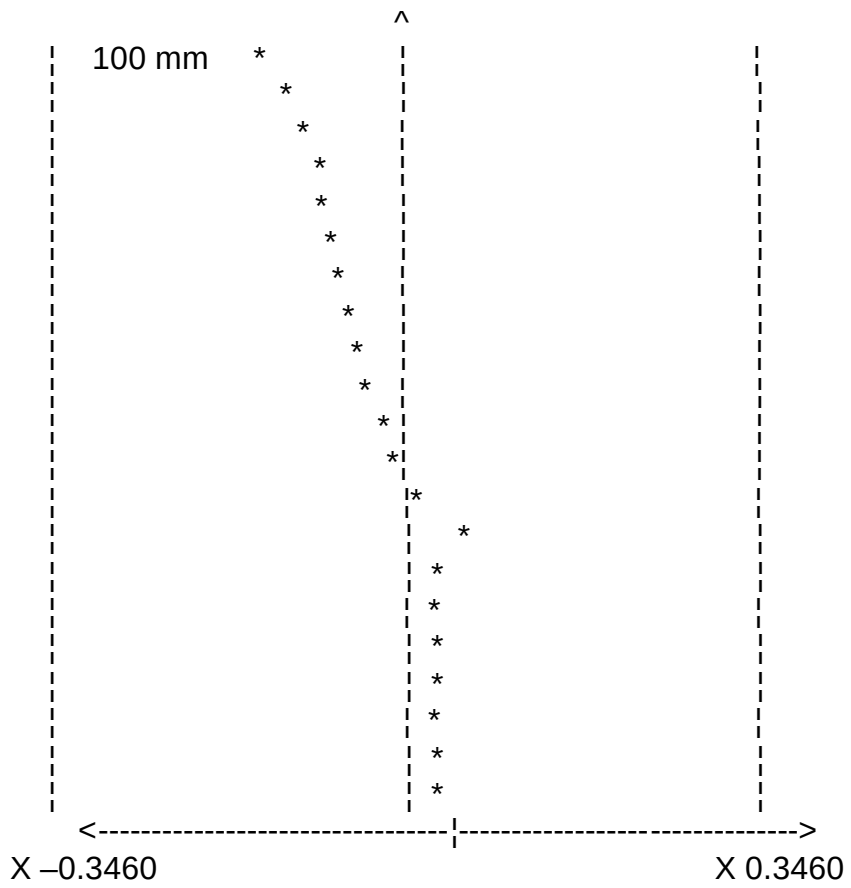
	X = 0.3460 mm ;	Z = 100.7285 mm
Highest value	X1 = 0.0000 mm ;	Z1= 0.0000 mm
Lowest value	X2 = -0.3460 mm ;	Z2= 99.9635 mm

Deviation from straightness :

RCT= 0.00283460 mm

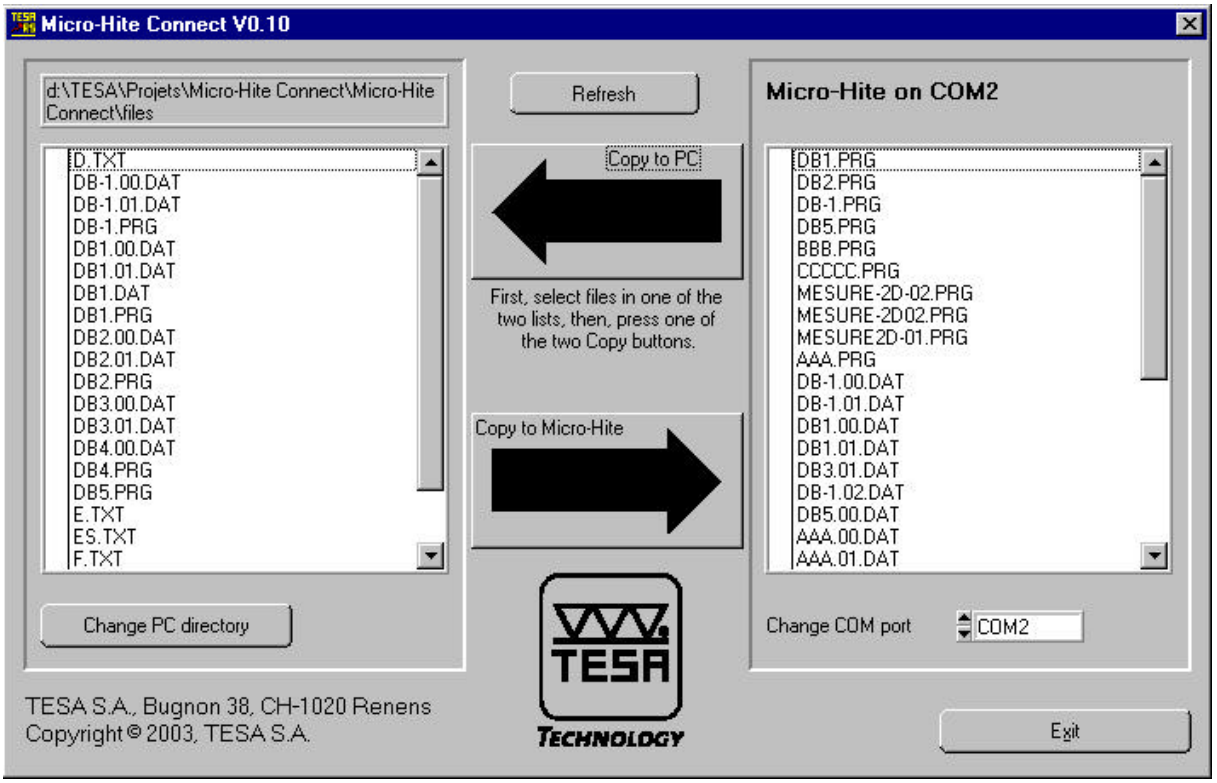
Sloping deviation ANG= 0°05’26’ deg

Graphical curve



22) Exporting data files to PC

A program used on a PC allows the transfer of program and data files from the column gauge into the PC and in the opposite way. By means of this program it is possible to load a language file into the column gauge.



22.1) Data file format

The format of the results file created on the PC is the following:

Number of measured value, described Parameters, Value, Nominal, Upper Tol., Lower Tol., Diff. (Deviation from nominal),

Date:2003/03/24 Time:17:43:09
Date:2003/03/24 Time:17:47:12
Part No:
Serial No:
Part name:
Drawings No:
Company:
Operator:
BEGIN 1
M001,"Radius d6 1:3",52.4787,52.4771,0.0100,0.0000,0.0016
M002,"Angle d6 1:3",0.6539,0.6540,0.0100,0.0100,-0.0001
M003,"lg. totale: Centre X",9.6075,9.6000,0.0500,-0.0500,0.0075,
M004,"lg. 6.8: Centre X",-6.7933,-6.8000,0.0500,-0.0500,0.0067,
M005,"angle 0.08x45°: Angle XY",-45.664,-45.000,2.000,-2.000,-0.664,
M006,"lg.0.50: Composante X",0.6159,0.5000,0.0500,-0.0500,0.1159,0.0659,
M007,"Lg. 1.4: Composante X",1.4153,1.4000,0.0500,-0.0500,0.0153,
M008,"Ø1.63: Composante Y",1.6323,1.6300,0.0200,-0.0300,0.0023,
M009,"Ø1.83: Composante Y",1.8262,1.8300,0.0300,-0.0300,-0.0038,
M010,"Lg. 0.08: Composante X",0.0956,0.0800,0.0200,-0.0300,0.0156,
M011,"lg. 2.40: Centre X",-2.4124,-2.4000,0.1000,-0.1000,-0.0124,
M012,"largeur 0.27: Composante Y",0.2573,0.2700,0.0300,-0.0200,-0.0127,
END

23) Sales programme

POWER PANEL *plus* M with built-in printer	TESA Order N°: 00760220
Pupitre POWER PANEL *plus* M without built-in printer	TESA Order N°: 00760221

Options :

Thermal paper roll, 57 mm wide	TESA order N°: 04765008
Battery Back-up	TESA order N°: 031269

*25) **Warranty***

We guarantee this product against any fault of design, manufacture or material for a period of 12 months from the date of purchase. any repair work carried out under the guarantee conditions is free of charge. Our responsibility is limited to the repair of the product or, if we consider it necessary, to its free replacement.
The following are not covered by our guarantee:
batteries and damages due to incorrect handling, failure to observe the instruction manual, or attempts by any non-qualified party to repair the product; any consequences whatever which may be connected either directly or indirectly with the prod-uct supplied or its use.

(Extract from our General Terms of Delivery, December 1, 1981)

26) Declaration of conformity

We thank you very much for your confidence in purchasing this product.

Declaration of conformity with confirmation of traceability

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

Declaration of conformity with ISO/CEI Guide 22 as well as EN 45014

Manufacturer: TESA S.A.

Full name and address:

TESA SA
Rue du Bugnon 38
CH-1020 RENENS
Switzerland

We declare that the following product(s):

Product name	TESA MICRO-HITE *plus* M Power Panel *plus* M
Product type	00730060 / 00730061 / 00730062 00730063 / 00730064 / 00730065 00760220 / 00760221

is (are) in compliance with the following standard (*):
EN 61326-1, Classe B

* with unplugged batttery charger

Each product supplied conform with the European guidelines 73/23/CEE and 89/336/CEE, which were modified at a later date according to the guideline 93/68/CEE

Renens, 31st March 2003

J.D. Richard
Manager of Quality Assurance