VM15

Panel - User

User manual
VM15 – Panel

9UMEN1514-1200
Release: 210707

VM15 Panel

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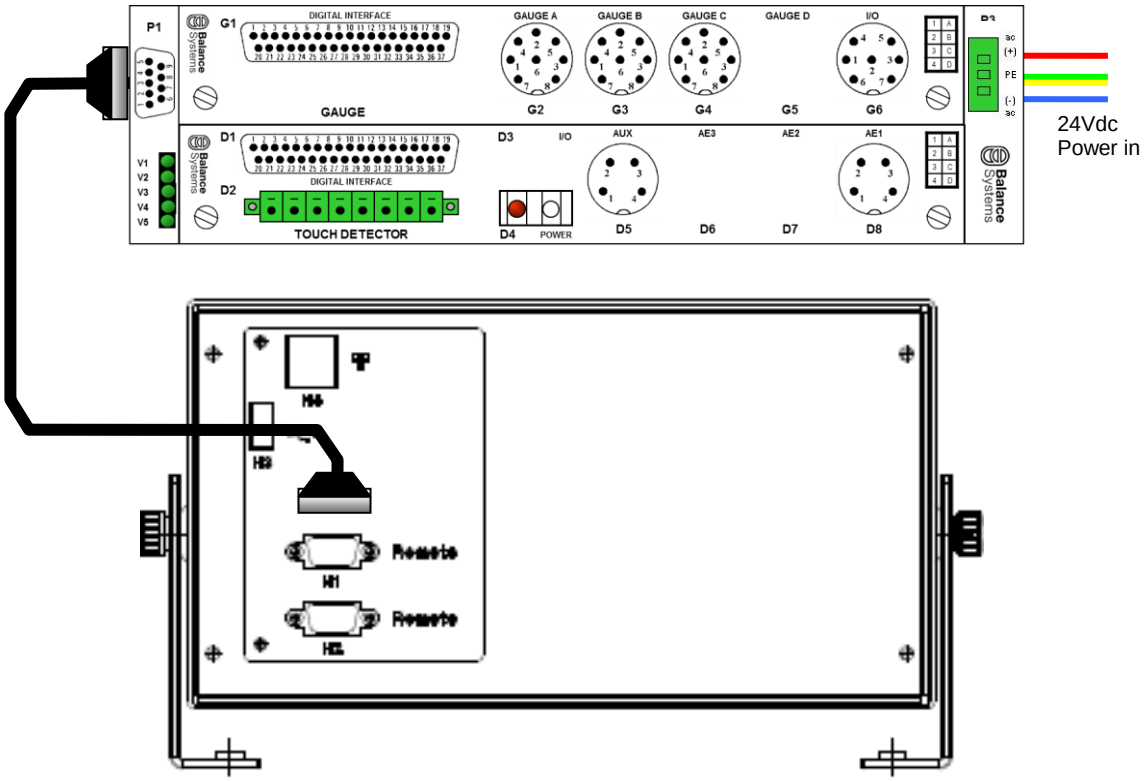
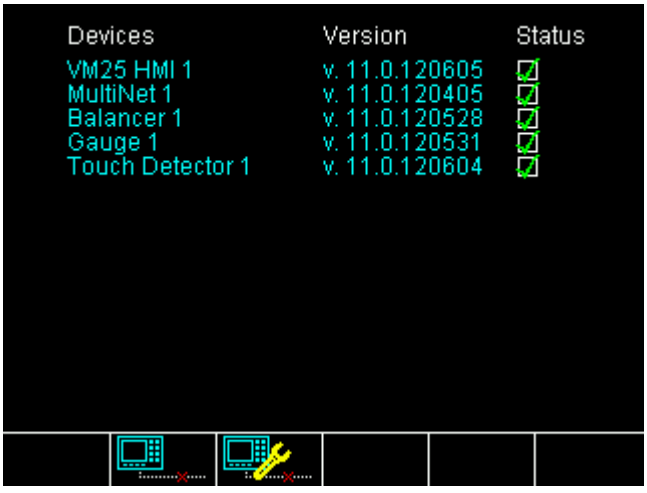
1. Use of the VM15 Panel

1.1. VM15 Panel start up

- Be sure that the VM15 rack is connected to the VM15 Panel unit.

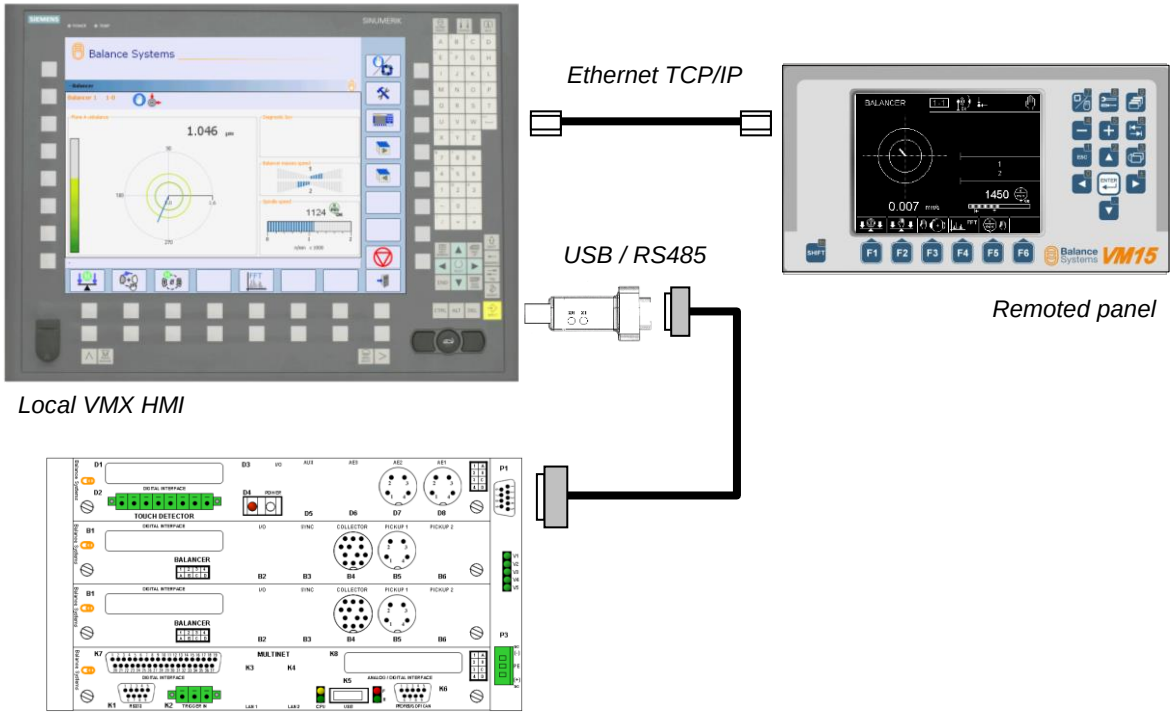


- Switch on the VM15 rack and wait for the program loading on VM15 Panel.

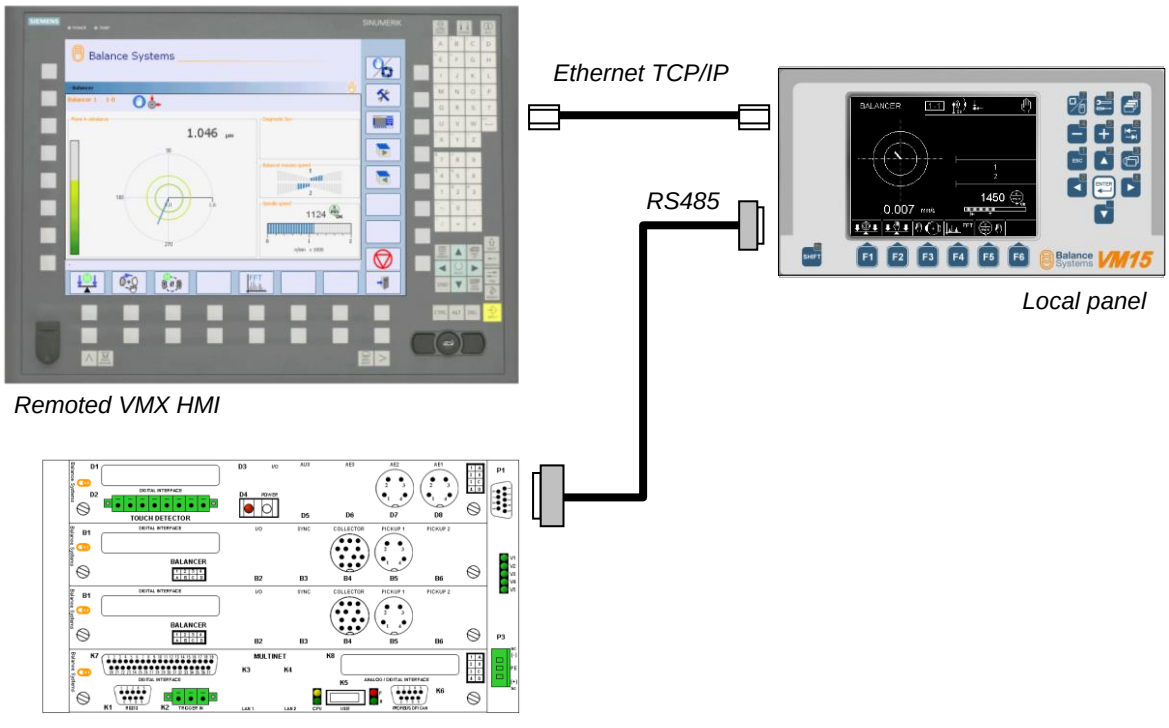


1.2. Operating with a panel connected to the VM15 rack

It is possible to run the VM15control panel even when the system is already equipped with a VMX HMI application.



Picture a: Connection through BsLink

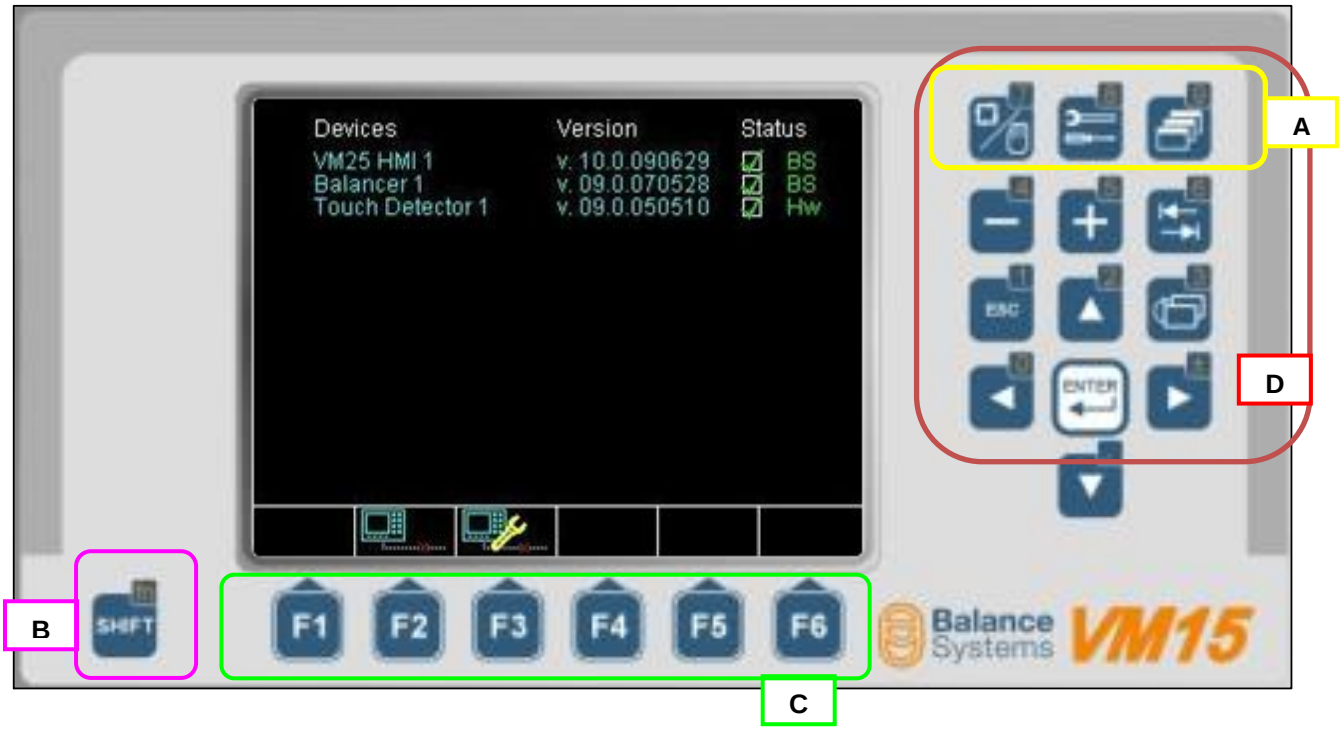


Picture b: Connection through ethernet TCP/IP

1.3. Layout description

The VM15 Panel layout is as follows:

A. System commands
B. Numerical keyboard / 2nd (alternate) function button.
C. Device commands
D. Main keyboard



1.3.1. System commands

Button	Name	Description
	Automatic / Manual	Switches the displayed device between Automatic and Manual mode
	Parameters	Direct access to parameter pages
	Change page	Switches the displayed page between the installed devices

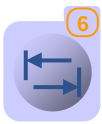
1.3.2. Numerical keyboard / 2nd function button

Button	Description
	Keep pressed to enable the numerical keyboard and the 2nd function commands.

1.3.3. Device commands

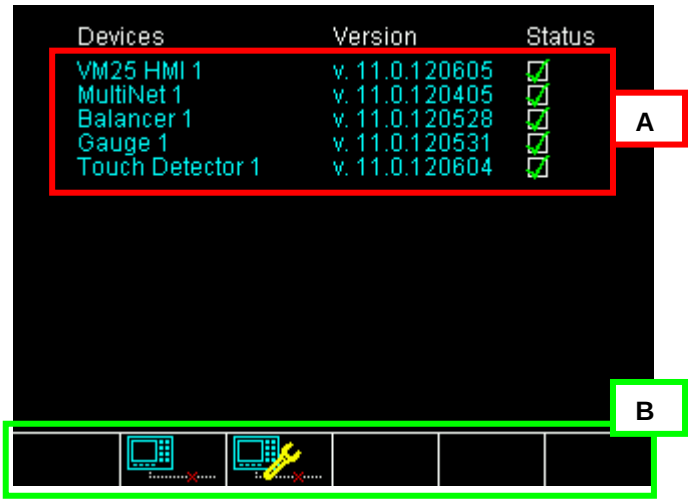
Button	Description
	Function commands F1..F6
	Function commands F7..F12

1.3.4. Main keyboard

Button	Description	Numerical keyboard description  + Button
	Decrease value	Select number 4
	Increase value	Select number 5
	Set default value (factory preset)	Select number 6
	Exit	Select number 1
	Move up	Select number 2
	Previous menu	Select number 3
	Move left	Select number 0
	Enter	---
	Move up	Select sign ±
	Move down	Select decimal point

1.4. Typical pages description

1.4.1. Initial and System page



On screen are identified the following areas:

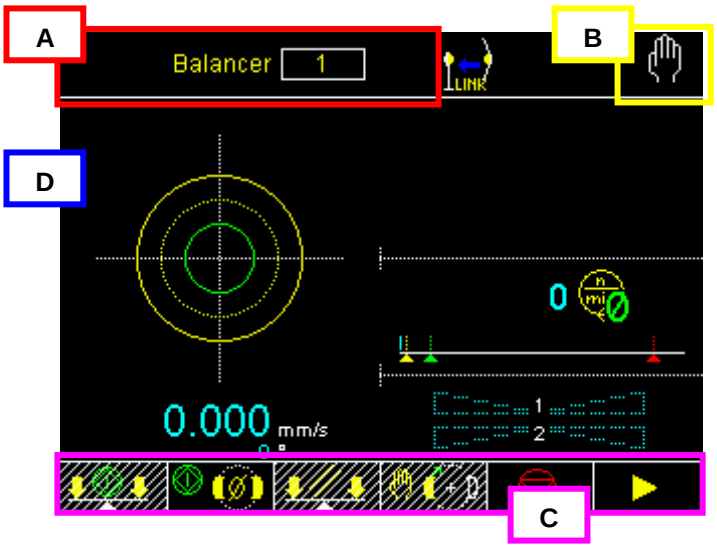
A. List of the installed devices:
   - Name dello strumento
   - Versione software
B. Command bar associated to "**Fx**" buttons

The available commands are described in the table below.

Icon	Command Name	Button	Description
	Connect	F1	Start the connection procedure between the VM15 Panel interface and the VM15 rack
	Disconnect	F2	Stop the communication between the VM15 Panel interface and the VM15 rack

Once the application start up is completed, the panel will display the status page of the first device enabled in the list.

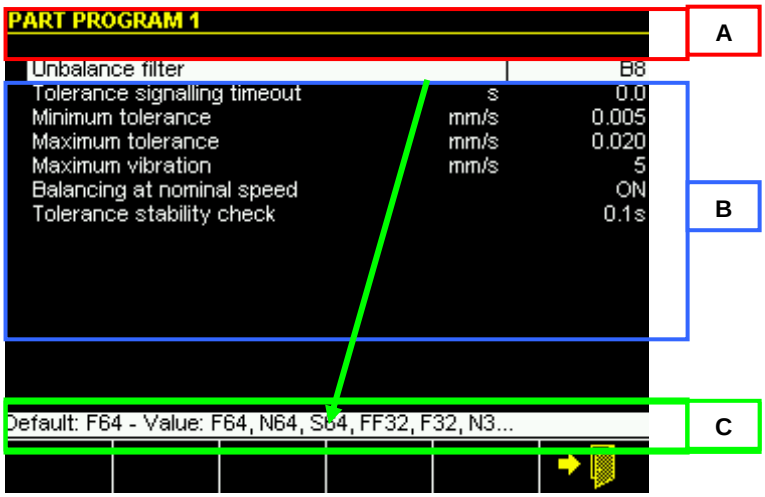
1.4.2. Status page of a device



On screen are identified the following areas:

A. Device name or page name
B. Operating mode (Automatic / Manual)
C. Command bar associated to "**Fx**" buttons
D. Graphic area of diagram and data of the process. See details for each device.

1.4.3. Parameter page



In the parameter modification page are present the following areas:

A. Actual parameter page and position in the device parameter tree
B. For each parameter are indicated:

- Description (parameter's name)
- Measuring unit
- Actual value

C. For each parameter with a **numerical** format are indicated:

- Min value
- Max value
- Default value (factory preset)
- Actual value

For each parameter with a **list** format are indicated:

- Default value (factory preset)
- Actual value

The available commands are described in the table below.

Icon	Command name	Button	Description
	Work	F1	Access to working parameters
	Setup	F2	Access to setup parameters
	Option	F3	Access to option parameters
	Exit	F6	Exit

1.4.3.1. Parameters selection and modification

Selection

To select the parameter, use the buttons 

, 

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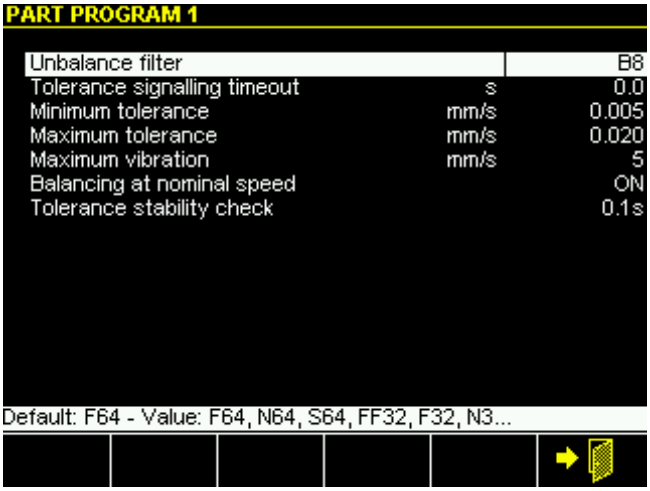


Modification

The selected parameter can be modified:

- By editing the new value, using the numerical keyboard: button 

+ Number
- By selecting the new value, using the button 

or 

- To save and activate the new value, press 

NOTE
If the new value is out of range, this will not be accepted.

1.5. Manual commands

The access and the execution of the manual commands is context based. Depending on the choices of the system installer or on the operating conditions, some commands may not be available for execution or not accessible. The commands, which are not accessible, does not appear in the menu.

The commands, which are not executable due to the context conditions, will appear disabled.

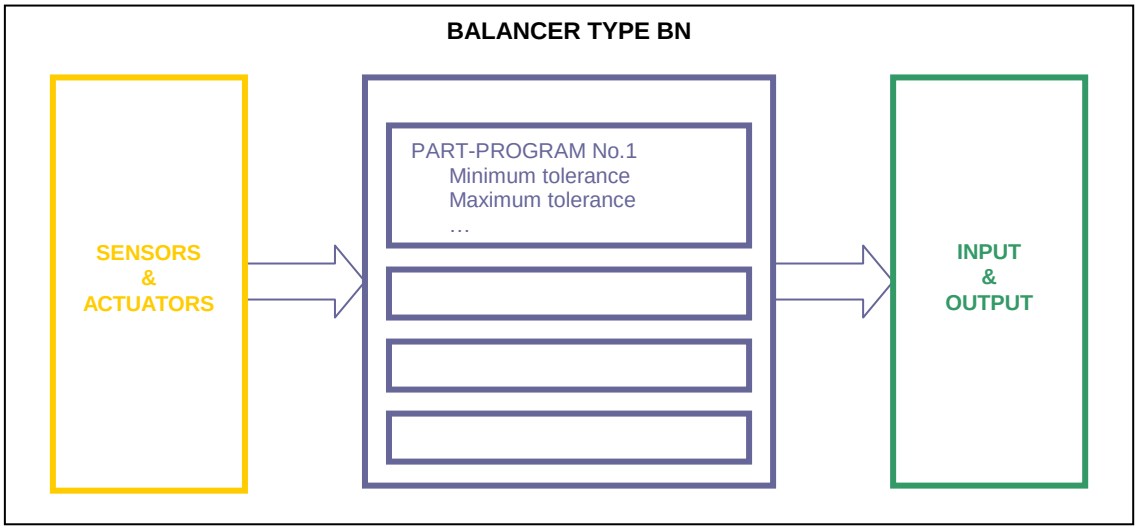
Icon	Description
	Available command
	Not executable command

2. Balancer [type BN – 1 plane]

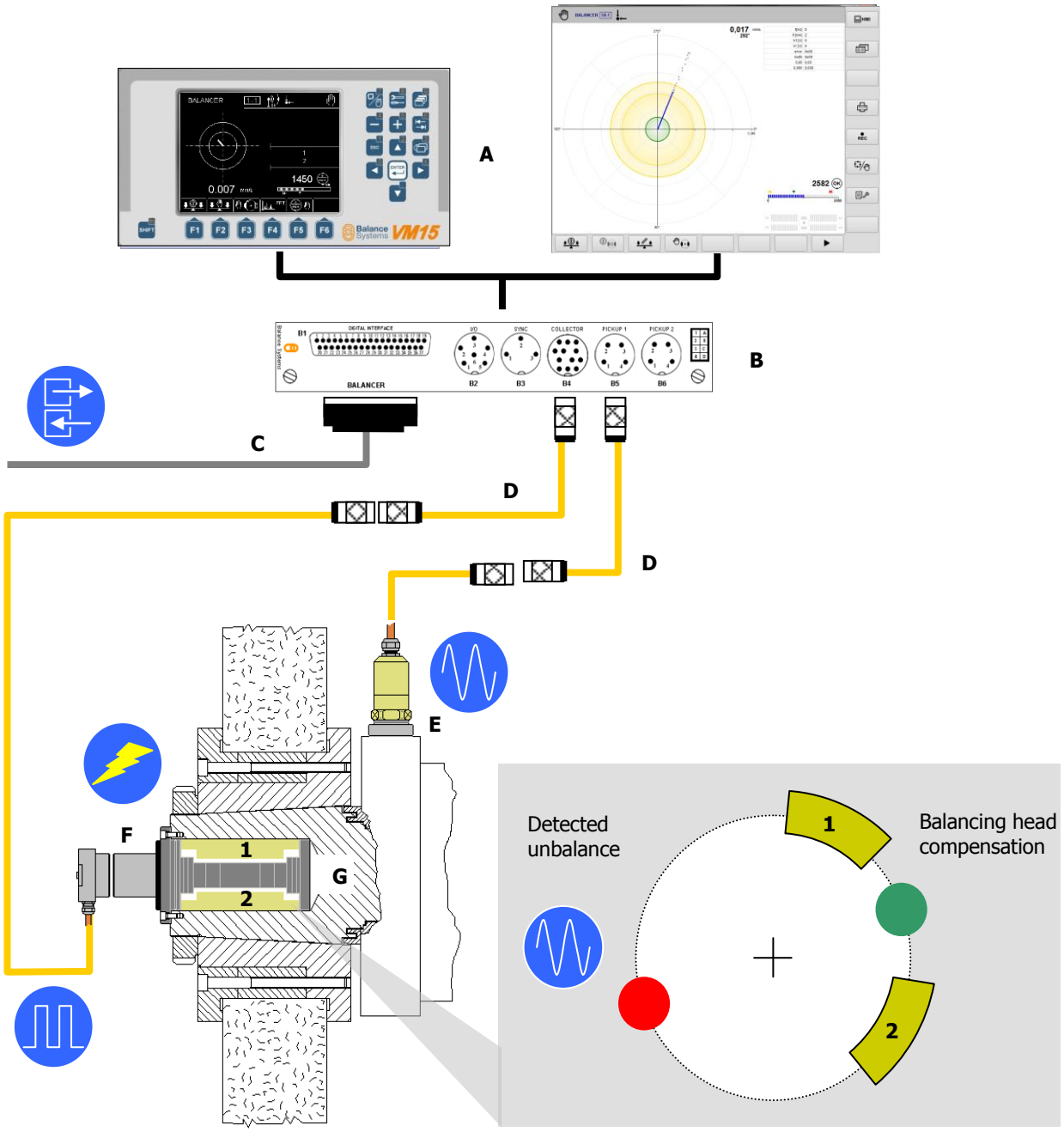
2.1. Introduction

The VM15 balancer is the device dedicated to the automatic balancing of the grinding wheel and spindle assembly. The balancer can work both in automatic and in manual mode.
The available functions depend on the acces level defined by the system installer.

ORGANIZATION SCHEME

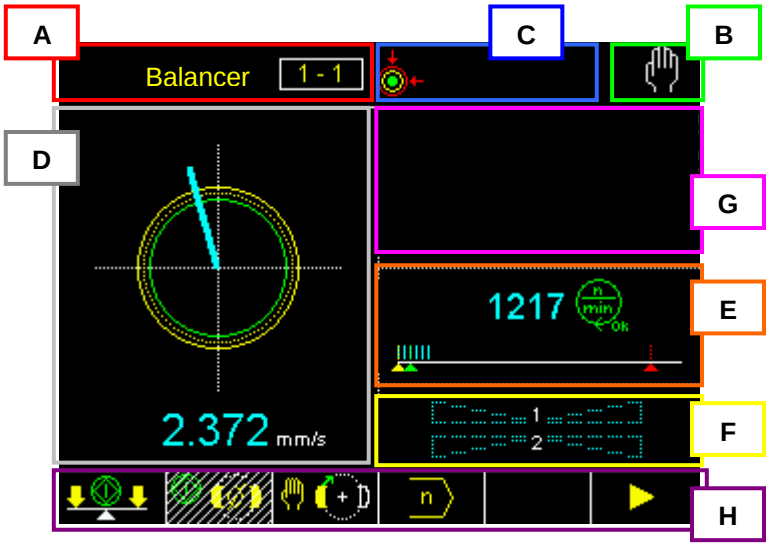


The components of the balancing system are shown in the following picture



Component	Description
A	User interface: VM15 Panel
B	Balancer card unit
C	Digital interface (I/O signals)
D	Extension cable
E	Vibration transducer (accelerometer)
F	Collector: static and rotating part. Power signals for the balancing head and rotation speed detection
G	Balancing head

2.2. Status page



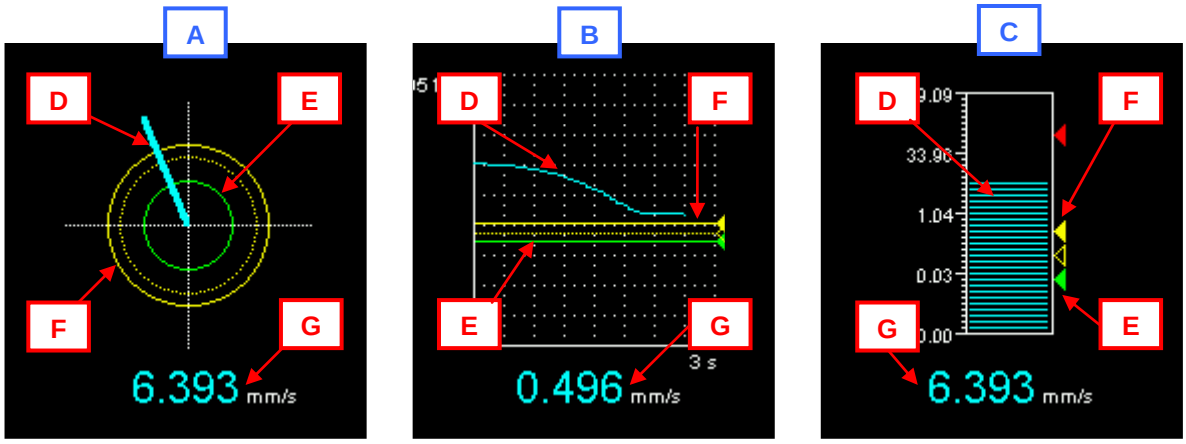
A. Device name
B. Operating mode (Automatic / Manual)
C. Area reserved to status signalling
D. Graphic area to rappresent the unbalance diagram:
   - Diagram
   - Programmed tolerance limits
   - Unbalance value
E. Spindle rotation speed diagram: rotation status, limits.
F. Balancing head diagram. The indication in the bar graphs are proportional to the speed of the weights. The symbol "→I" indicates that the two compensation weights are in contact.
G. Messages and diagnostic data display area
H. Command line, accessible by [Fx] buttons.

In details:

Area C: Status and Alarm signalling

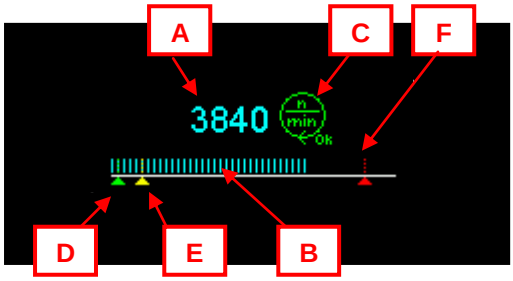
A. Icons which rappresent the status of the device (see next paragraph for further details)

Area D: Unbalance diagram



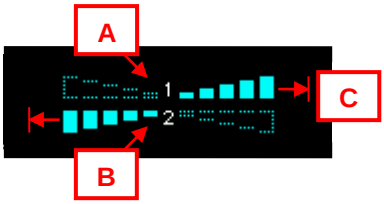
A. Polar diagram
B. Trend diagram: Unbalance vs time
C. Bar graph diagram
D. Unbalance rappresentation
E. Minimum tolerance
F. Maximum tolerance
G. Unbalance value (magnitude)

Area E: Rotation speed diagram



A. Value of the spindle rotation speed [rpm]
B. Bar graph diagram of the rotation speed
C. Rotation speed status (see next paragraph for further details)
D. Minimum rotation speed
E. Nominal rotation speed
F. Maximum rotation speed

Area F: Balancing head diagram



A. Graphic rappresentation of the movements of the compensation weight No.1. The movement is bidirectional and the bar graph filling is proportional to the speed of the weight.
B. As “A” but referred to compensation weight No.2
C. Current protection. It indicates that the two compensation weights are in contact or that one weight is locked due to short circuit.

2.3. Status and alarm signalling

During the normal operating mode some variable are continously monitored and when necessary, some icons or messages are displayed to inform the operator about such conditions.

NOTE
When the condition can be dangerous both for the machine integrity and the operator safety a number of signalling to the machine PLC/NCU are generated and icons on the screen will appear for the operator.

Unbalance signalling			
Icon	**ID**	**Name**	**Description**
	3002	UNBALANCE INSIDE MIN TOLERANCE	The spindle is balanced within the programmed minimum tolerance limit
		UNBALANCE INSIDE MAX TOLERANCE	The spindle is balanced within the programmed maximum tolerance limit
	3001	UNBALANCE OUT OF TOLERANCE	The spindle is out of balance conditions
	3022	ALARM: MAX VIBRATION	The out of balance value is too high to execute an automatic balancing cycle. It is necessary to reduce the unbalance using the manual procedure (see next paragraph), to reduce the unbalance value under the 50% of the valu programmed in the parameter “MAXIMUM VIBRATION”. Then it will be possible to run an automatic cycle again. ***NOTE:*** *This condition should be investigated because can be due to a defect or a damage in the grinding wheel.*

Spindle rotation speed signalling			
Icon	**ID**	**Name**	**Description**
	3008	SPINDLE STEADY	The spindle is stopped. It depends on the choiche of the system installer if this condition means that the spindle speed is lower than 60 rpm (default) or lower than a programmed value.
	3005	SPINDLE NOT AT NOMINAL SPEED	The spindle rotation speed has not reached the nominal conditions
	3004	SPINDLE AT NOMINAL SPEED	The spindle rotation speed has reached the nominal conditions and it is stable
	3006	ALARM: SPINDLE SPEED OVER MAX LIMIT	The spindle rotation speed is greather than the maximum value programmed
	3007	ALARM: ROTATION SPEED FAULT	The rotation speed sensor might be damaged or not connected

Balancing head signalling			
Icon	**ID**	**Name**	**Description**
	3020	ALARM: MOTORS NOT READY	The balancing head could be disconnected or faulty

Vibration transducer (pick-up) signalling			
Icon	**ID**	**Name**	**Description**
	3003	ALARM: PICK-UP NOT READY	The vibration transducer could be disconnected or faulty

Alarm signalling			
Icon	**ID**	**Name**	**Description**
	1004	ALARM (generic)	Generic alarm condition

Automatic cycles signalling (balancing and neutral positioning)			
Icon	**ID**	**Name**	**Description**
 blinking	1002 1001	CYCLE IN PROGRESS...	Automatic cycle in progress (e.g. balancing or neutral positioning)
	3037	SELF-LEARNING CYCLE ACTIVE	A self-learning cycle is in execution to adjust automatically the balancing parameters.
	3039	WARNING: AUTOMATIC BALANCING IMPOSSIBLE	The system detected bad conditions to execute the automatic balancing cycle. This signal can be generated by: ▪ Insufficient compensation capacity ▪ Balancing adjusted incorrectly ▪ Permanent MAXIMUM VIBRATION conditions ▪ Permanent balancing timeout
	3038	WARNING: BALANCING TIMEOUT	The balancing cycle was aborted due to timeout. The balancing timeout is programmed by the system installer.
	3021	ALARM: MAX COMPENSATION REACHED	During the balancing cycle, the balancing head reached the maximum compensation capacity. If this message occurs while the unbalance is greather than the programmed tolerance, means that the balancing head is not able to compensate the actual unbalance.
	3017	NEUTRAL POSITION REACHED	The two compensation weights reached the neutral position (weights at 180°).
	3018	WARNING: NEUTRAL CYCLE IMPOSSIBLE	The balancing head installed does not allow the neutral cycle.
	3019	ALARM: NEUTRAL CYCLE FAIL	The neutral cycle cannot be completed succesfully. Try to repeat the command. If the alarm does not desappear check the integrity of the system.

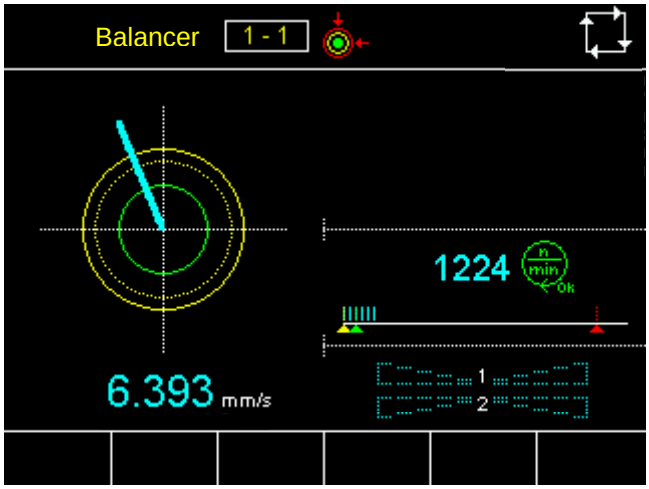
Brushes collector type signalling			
Icon	**ID**	**Name**	**Description**
	3016	BRUSHES COLLECTOR: POWER ON	Indicates that the command to switch on the collector was activated
	3036	RING COLLECTOR: ELECTROVALVE ON	Indicates that the control command for the pneumatic driver was activated

NoLink collector type signalling			
Icon	**ID**	**Name**	**Description**
	3031	WARNING: COLLECTOR NOT READY	The static and the rotating part of the collector are not coupled
	3029	HARDWARE LINK IN PROGRESS... (ANIMATED)	The hardware coupling between the static and the rotating part of the collector is in progress. The signal disappears as soon as the coupling is optimized.
	3028	COMMUNICATION LINK IN PROGRESS… (ANIMATED)	The communication link between the static and the rotating part of the collector is in progress. The signal disappears as soon as the communication is stable.
	3032	COLLECTOR CONNECTED	The static and the rotating part of the collector are correctly coupled
	3015	WARNING: COLLECTOR MISALIGNED	The distance or the misalignement between the static and the rotating part of the collector is too wide. The signal disappears as soon as the two parts are correctly aligned.
	3010	WARNING: STATIC PART PROTECTION	An extra current was detected on the static part of the collector. After a while, the system restarts automatically to optimize the coupling parameters.
	3013	WARNING: ROTATING PART PROTECTION	An extra voltage was detected on the rotating part of the collector. After a while, the system restarts automatically to optimize the coupling parameters.
	3011	ALARM: STATIC PART	An extra current is permenently detected on the static part of the collector. The system retries a new optimization only if a command which involve the movement of the weights is sent (e.g. balancing, neutral positioning, manual moving).
	3014	ALARM: ROTATING PART	Despite a number of trials it is not possible to estabilish a link between the static and the rotating part. The rotating part maight be missing or too far. The system retries a new optimization only if a command which involve the movement of the weights is sent (e.g. balancing, neutral positioning, manual moving).
	3009	ALARM: TEMPERATURE ON STATIC PART	The temperature on the static part has reached the limit of 80°C.
	3012	ALARM: TEMPERATURE ON ROTATING PART	The temperature on the rotating part has reached the limit of 80°C.

2.4. Commands

2.4.1. Automatic mode

All the commands related to the automatic cycles are managed through the PLC/NCU.

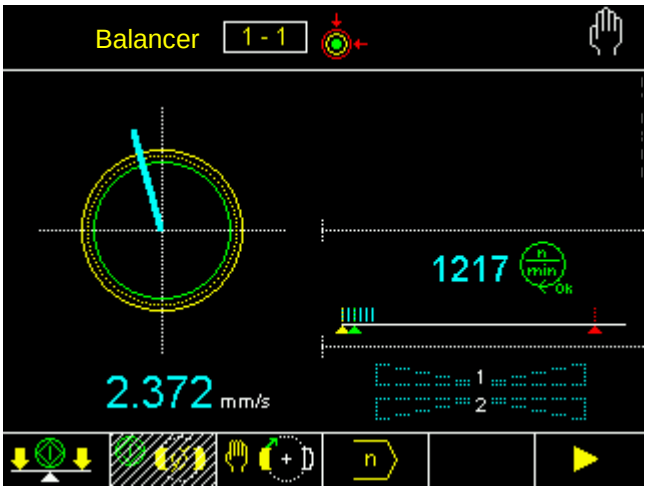


System commands		
Icon	**Command name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic / Manual	Switches the balancer device between automatic and manual mode

2.4.2. Manual mode

In manual mode the operator can verify or use the balancer independent from the machine PLC/NCU. This can be useful during the parameters setup of the balancing system, to direct access to the commands without necessarily to involve the PLC/NCU cycle.
In addition, the operator can carry out research on the behavior of the machine and the interaction between its components, e.g. determine vibrations produced by other unbalances than that of the grinding wheel (see here after).

The manual mode is accessible only at programmer level (or higher).



System command		
Icon	**Command name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Parameters	Access to balancer parameter pages
	Automatic / Manual	Switches the balancer between automatic and manual mode

2.5. WORK parameters

To access the WORK parameters press 

For the description of the WORK parameter, refer to the document Parameter Setup

2.6. Automatic cycles

Automatic cycle commands			
Icon	**Command name**	**Button**	**Description**
	Start balancing	F1	Carries out the automatic balancing cycle. During the balancing procedure, the system may also activate automatically the acquisition cycle (self-learning).
	Start neutral positioning	F2	Positions the compensation weights of the balancing head into their minimum compensation condition (weights at 180°). In this way, the effect of the balancing head is neutralized. *NOTE: It is recommended to start a neutral positioning cycle after each replacement of the grinding wheel or removal of the balancing head.* *NOTE: For safety reason, the neutral positioning cycle must be excuted when the spindle is steady. If the spindle is still rotating the command will not be carried out. If the spindle is started, after having given the command, the cycle will in any case be executed.*
	Stop	F5	Abort the actual cycle

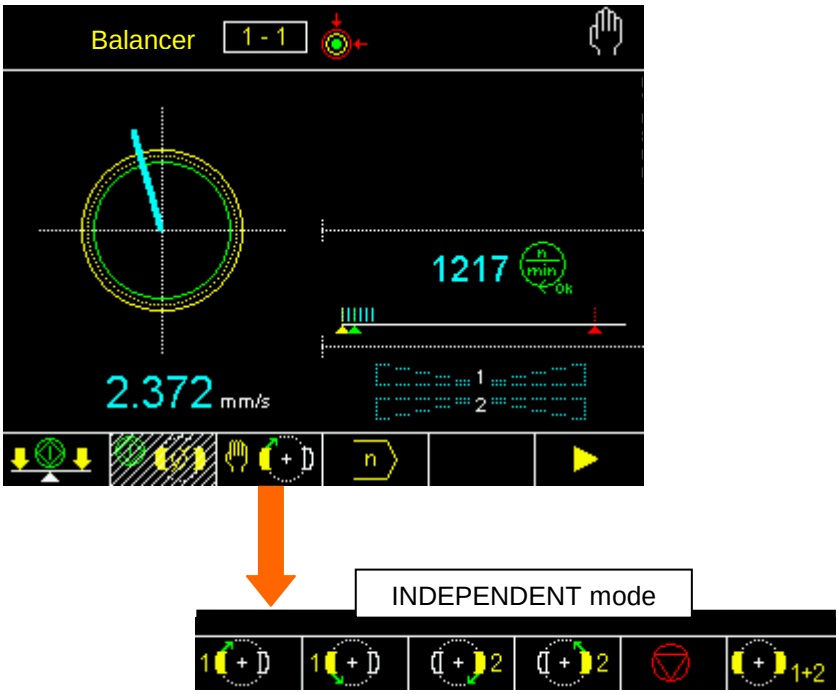
2.7. Procedures and auxiliary functions

Procedures and Auxiliary functions commands			
Icon	**Command name**	**Button**	**Description**
	Motors	F3	Permits to move manually the two motors which control the two compensation weights inside the balancing head
	Manual balancing	F2	Accesses the guided procedure of Manual Balancing (or Pre-Balancing) on 1 plane

Those commands which require a more detailed description will be analyzed in the next paragraphs, and in addition, some typical procedures are described.

2.7.1. Manual movement of the compensation weights (Motors)

By the command **Motors**  **[F3]** it is possible to move manually the compensation weights inside the balancing head.



The commands menu permits to move the weights in independent mode (single weight), using function keys F1, F2, F3, F4.

During the manual movement of the weights, with the grinding wheel rotating, on the screen one can note the variation of the unbalance. When keeping one of the buttons F1, F2, F3, F4 pressed, the shifting speed of the weights increases gradually until reaching its maximum value. One can observe this in that area of the screen dedicated to the motors. If in this area the symbol "→|" or "|←" appears, this indicates that the compensating weights have collided and that consequently, continuing the movement of the weight in this direction, one will not obtain any variation of the unbalance.

Manual movement of the compensation weights commands: INDEPENDENT mode			
Icon	**Command name**	**Button**	**Description**
	Weigth 1 forward	F1	Move weight #1. Forward.
	Weigth 1 backward	F2	Move weight #1. Backward.
	Weigth 1 forward	F3	Move weight #1. Forward.
	Weigth 1 backward	F4	Move weight #1. Backward.
	Stop	F5	Exit

2.7.1.1. Manual balancing procedure

The procedure of manual balancing is very simple and must be done at small steps, until reaching the best possible results, namely an unbalance which is smaller than the minimum threshold of tolerance.

Although it is inefficient to balance manually, nevertheless, here after one explains how to proceed, because it is considered useful to know the criterion of the shifting of the compensating weights, which has to be done in the case of exceeding the maximum vibrations threshold  . In fact, this condition, as already explained, causes blocking of the automatic balancing function.

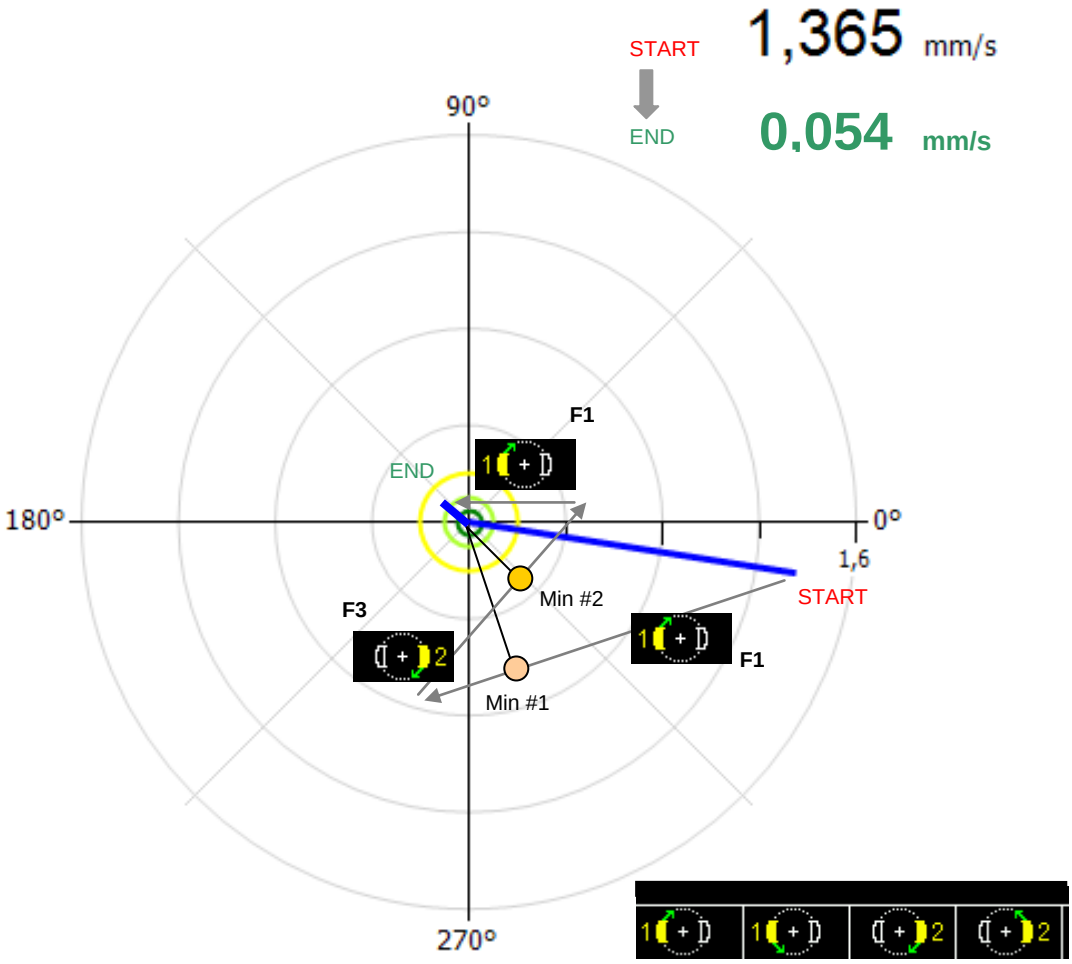
Here after, a simple description is given, but it is recommended to read the whole paragraph prior to staring with the procedure.

Procedure

1. Run up the spindle and look at the unbalance behaviour.
2. Activate the manual movement as INDEPENDENT mode.
3. Press  [F1] Weight #1 forward.
4. If the unbalance value increases, invert the moving direction:  [F2] Weight #1 backward.
5. Continue to move the weight in the direction of unbalance decreasing until the unbalance value crosses the minimum. As soon as the unbalance value starts to increase, stop the movement.
6. Move the weight #2 in the same direction; if the previous minimum was reached with F1, then press  [F3] Weight #2 forward. Otherwise, press  [F4] Weight #2 backward.
7. The unbalance value will decrease. Continue to move the weight in the direction of unbalance decreasing until the unbalance value crosses a new minimum.
   a. If this new minimum is lower than the previous (point 5), continue to alternate  [F3] and  [F1], each time waiting for a new minimum, until the unbalance value reaches the tolerance value.
   b. If this new minimum is greather than the previous (point 5), change the direction of moving. Alternate  [F2] and  [F4], each time waiting for a new minimum, until the unbalance value reaches the tolerance value.
8. If after a sequence the tolerance value is skipped, change the direction of moving and repeat.

NOTE
During all the phases of movement of the weights one should monitor that there is no collision between the two weights (indicated by symbol "→I" and/or "I←"*). Should this, however, happen, one has to move the weights into the opposite direction.*

NOTE
The described method is only indicative. Once having reached a certain security with the procedure, the operator will be able to decide for himself how to best balance manually.


START
1,365 mm/s
END
0,054 mm/s
90°
180°
0°
270°
F1
END
1,6
START
Min #2
F3
F1
Min #1

2.7.2. Manual Balancing or PRE-Balancing on 1 plane

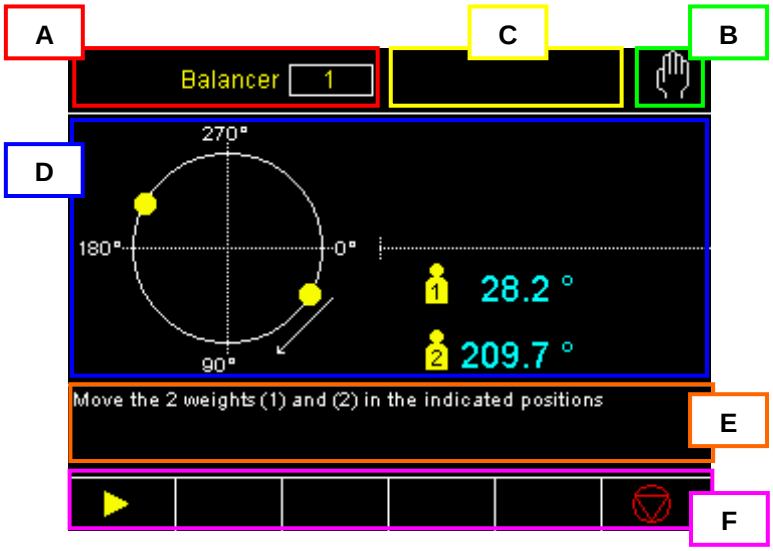
2.7.2.1. Introduction

This optional procedure for Manual Balancing or PRE-Balancing on 1 plane with the grinding wheel installed in the machine makes possible reduce the initial unbalance of a new grinding wheel so that the balancing head maintain a satisfactory margin of adjustment even when, due to lack of available space, it is not possible to size the balancing head to the maximum grinding wheel unbalance permitted (according with ISO 6103 regulation). This procedure is also useful in all those cases where it is not possible to equip the machine with an automatic balancing system.
The balancing precision which can be reached depends solely on the accuracy with which the balancing weights are positioned, based on the indications of the system.
It is possible to execute the balancing procedure by thre different COMPENSATION METHOD:

- DISPLACEMENT: two identical weights permanently installed on grinding wheel flange will be displaced during the calibration and correction steps to achieve the best final result.
- ADDITION: two identical weights will be added during the calibration and correction steps to achieve the best final result.
- WEIGHTS: a number of defined or acquired weights (i.e. grub screw) can be screwed in threaded holes prepared around the circumference of the rotating body.

The procedure is fully step by step guided by system.

2.7.2.2. Status page



A. Device name
B. Manual operating mode
C. Area reserved to status signalling
D. Graphic area to rappresent the unbalance diagram:

   - Diagram
   - Programmed tolerance limits
   - Unbalance value
   - Rotation speed
   - Balancing positions

E. Messages area
F. Command line, accessible by [Fx] buttons.

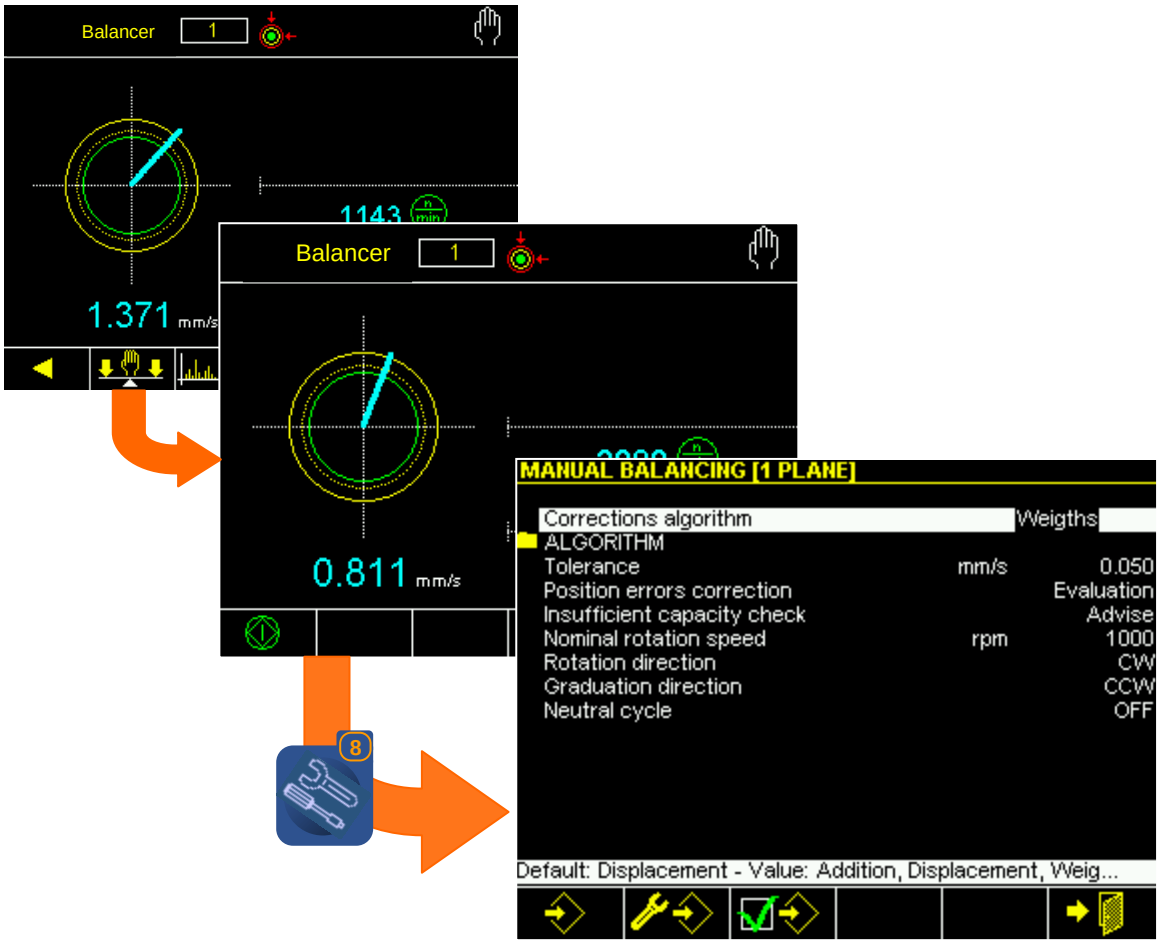
NOTE
According to the settings foreseen by the installer of the system, it is possible that the balancer card may work exclusively with the Manual Balancing or PRE-Balancing function (that means without the part of the managing of the automatic balancing through balancing head). In this case the PRE-Balancing status page becomes the main page of the device.

2.7.2.3. WORK parameters

To access the WORK parameters

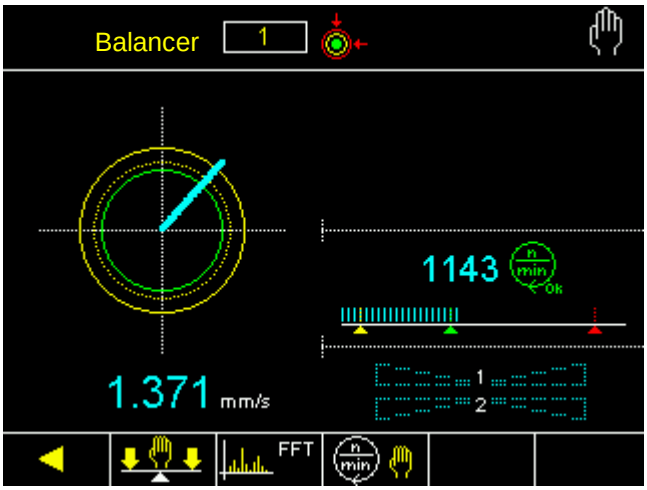
- Enter in the **Manual balancing** page using the **[F2]**  **botton**
- Press the **Parameters**  button

For the description of the WORK parameters, refer to the document: Parameter Setup



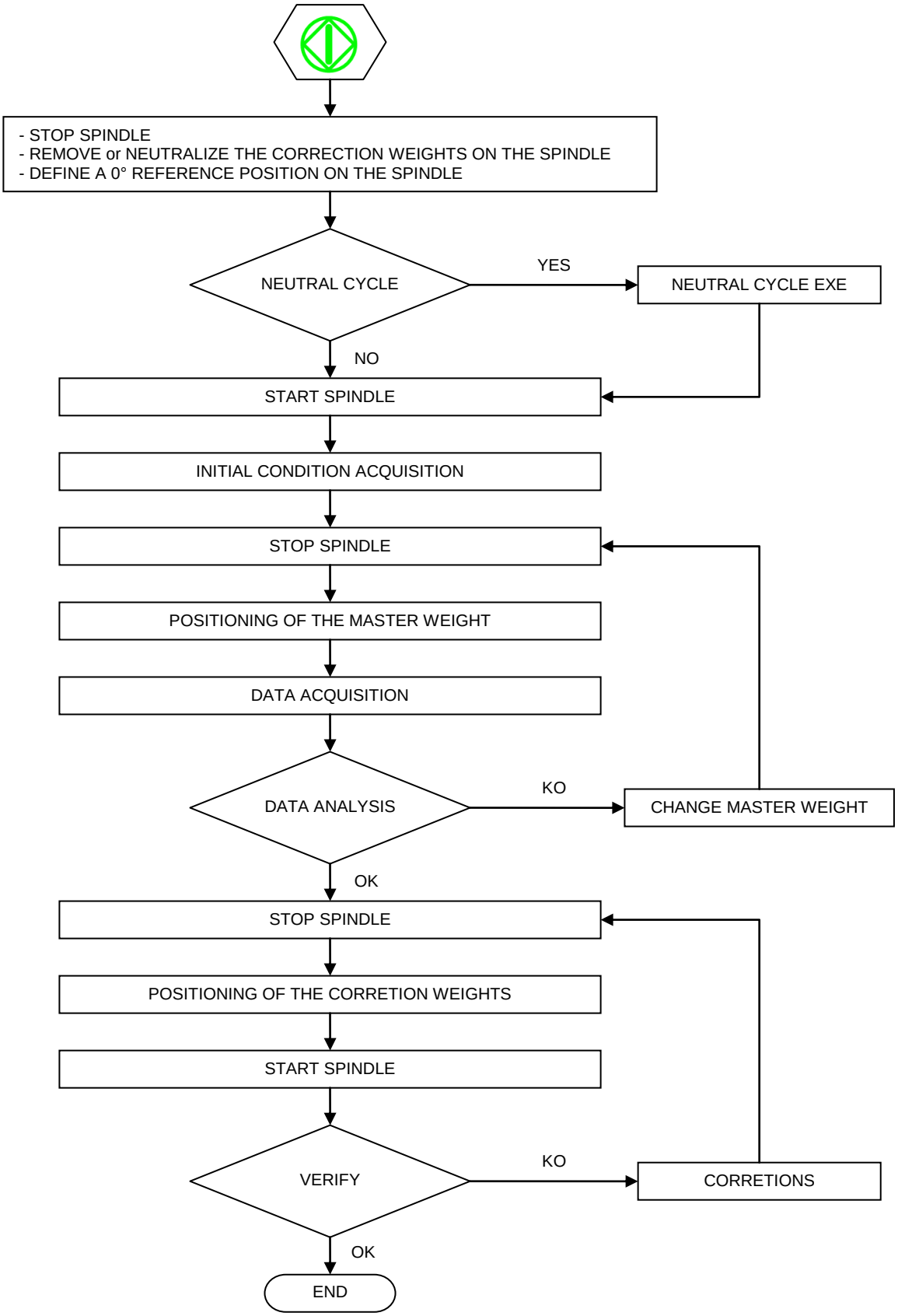
2.7.2.4. Balancing procedure

The procedure starts by **Manual Balancing**  **[F2]** command.



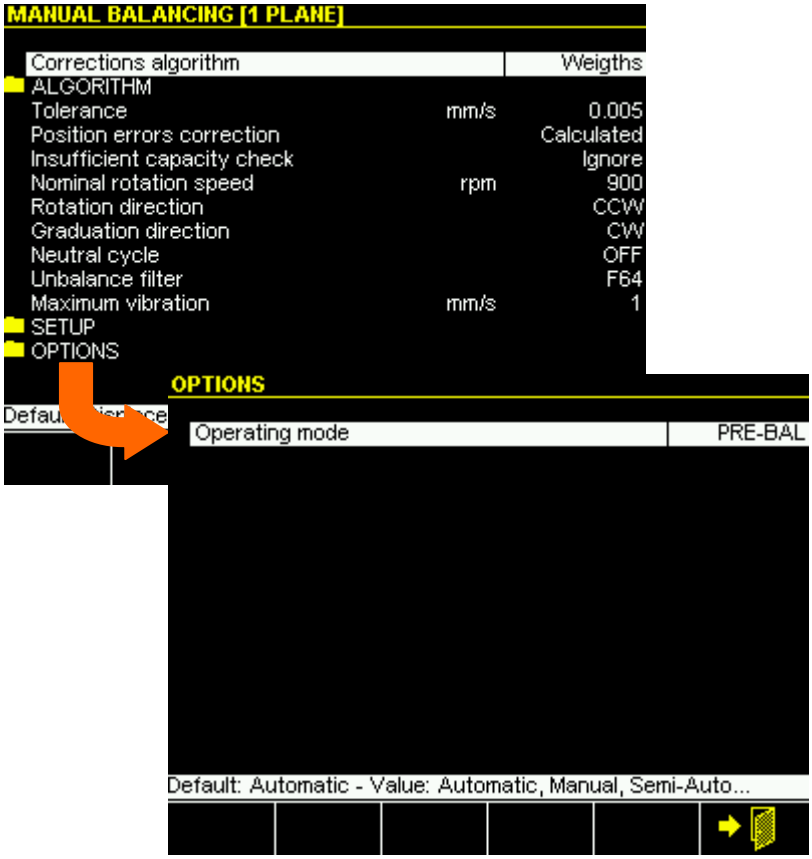
Manual Balancing / PRE-Balancing commands			
Icon	**Command name**	**Button**	**Description**
	Start	F1	Start the procedure
	Stop	F6	Stop the procedure
	Next	F1	Permission to go to the next stage in the procedure. The system automatically checks that the operator's confirmations are reasonable and shows, in the message area, any operations or conditions that must be achieved in order to carry on.
	Ignore		Ignore the suggestion and go straight to the next step
	Change		Change some of the conditions during the procedure without having to cancel it
	Correction	F1	Following the checking operation, this indicates the amount of correction to be made to the position of the weights by displaying a diagram giving the ideal position (solid weights) and the actual position (blank weights).
	Start weights acquisition	F2	Using the "Compensation method = WEIGHTS" and "Weights type = ACQUIRED", starts the procedure to acquire the effect of the master weights.
	Stop weights acquisition	F2	Using the "Compensation method = WEIGHTS" and "Weights type = ACQUIRED", stops the procedure to acquire the effect of the master weights.
	Calibration	F2	Start the calibration procedure
	Save calibration	F1	Save calibration data
	Exit	F6	Exit

2.7.2.5. Procedure flow chart

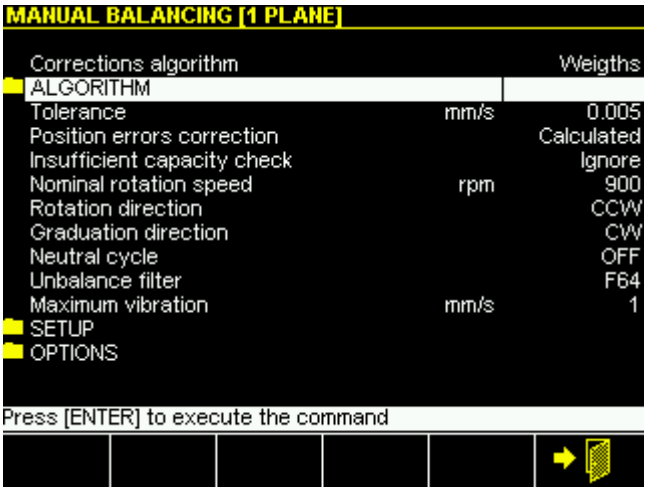


2.7.2.6. Procedure example

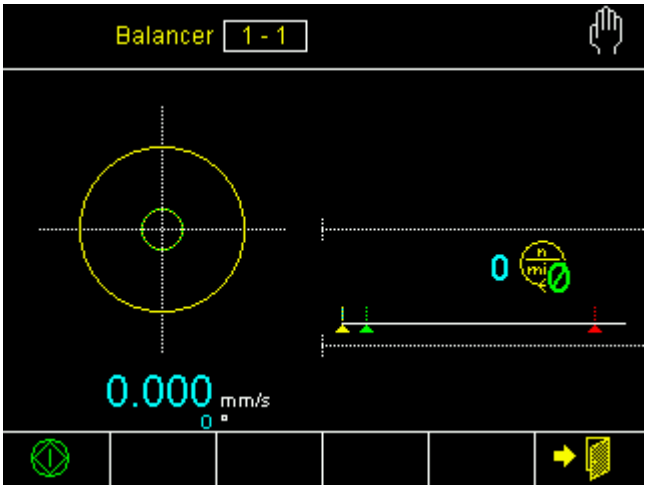
From the home screen “Options” menu, select “pre-balancing – PRE-BAL” operating mode.



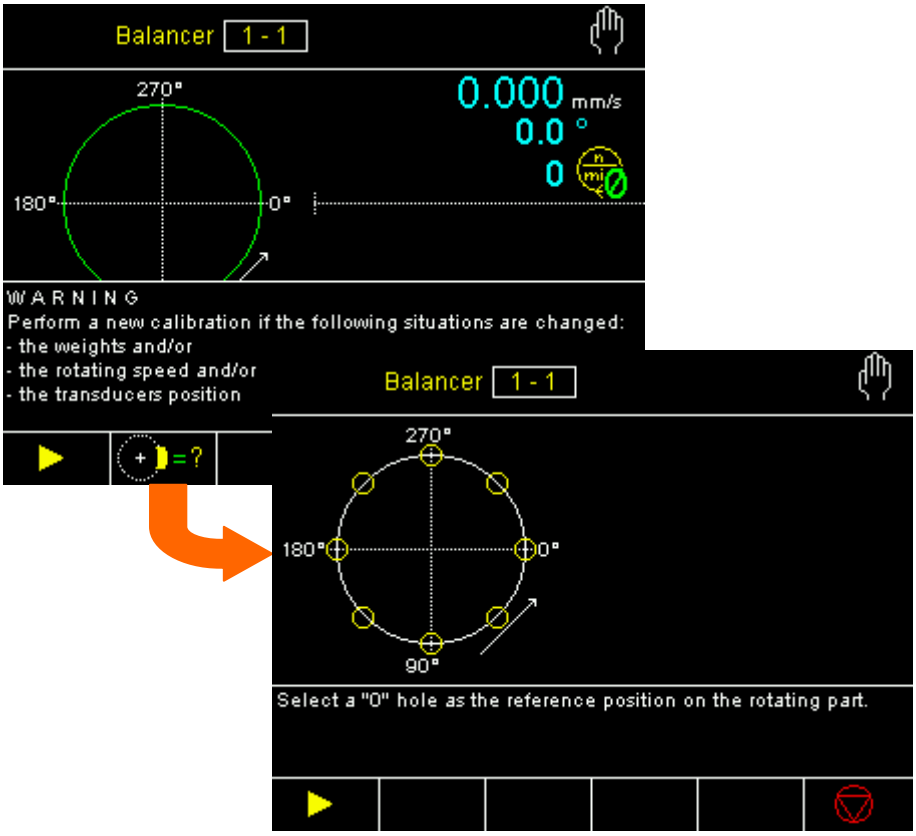
Sitll from the home screen, set the various parameters (Alorithm, Tolerance, Nominal rotation speed, Rotating direction etc…) required to perform the balancing procedure.



Once setted all the needed values, move to the balaning main page. To initialize the procedure (fully automatic) press “F1”.



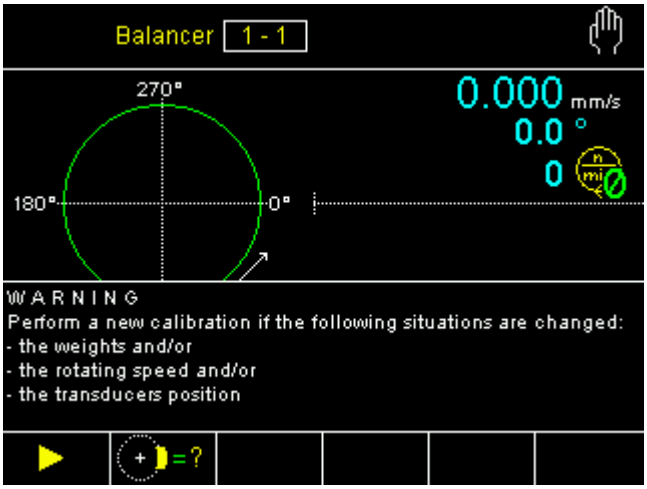
NOTE: At the first start the system needs to be calibrated. Press “F2” to start the autmatic calibration procedure.



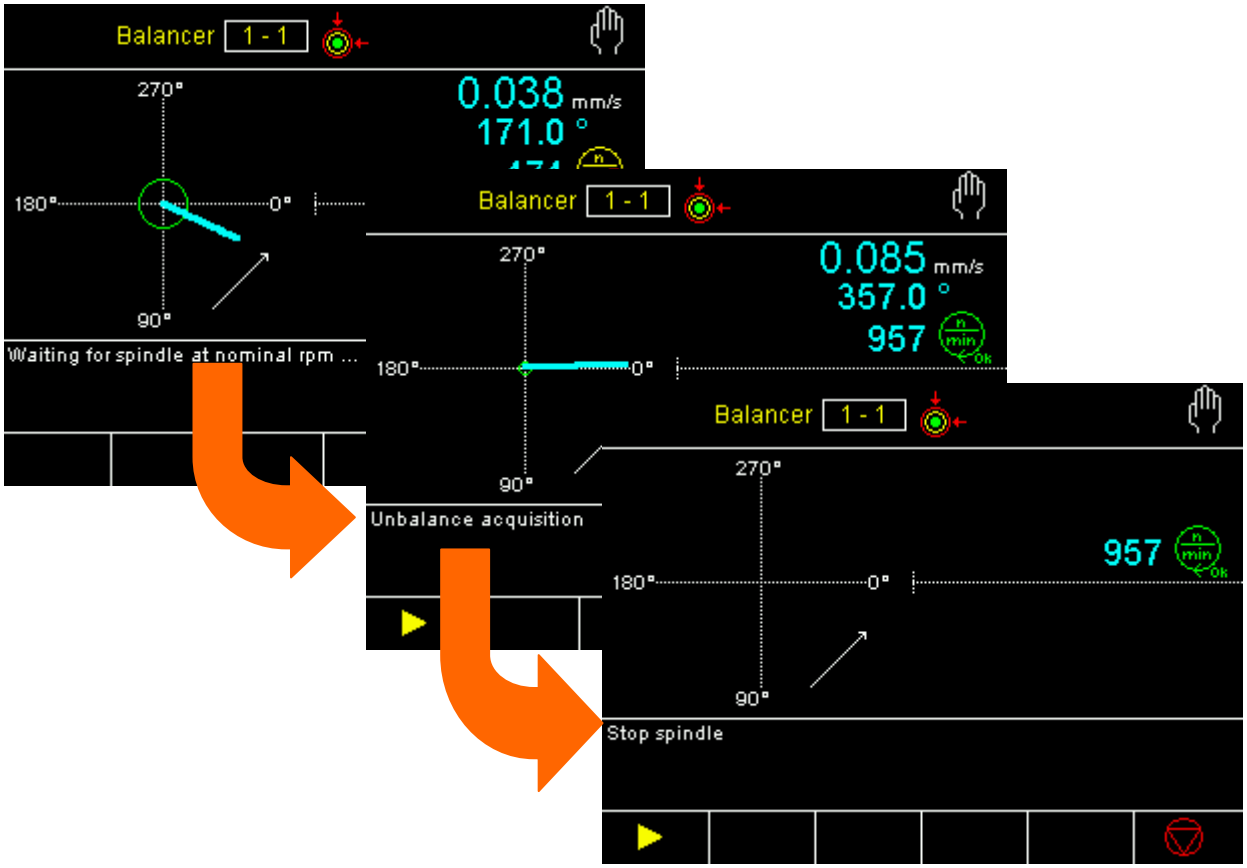
NOTE: In case of “acquired weights” operating mode, the system will require the operator to position some test weights (up to 10) to acquire the effect. In caso of “defined weights” operating mode the system will require the operator to write the mass of each (in grams) weight needed (up to 10).

Once acquired the new calibration the system will get back to the initial balancing page screen.

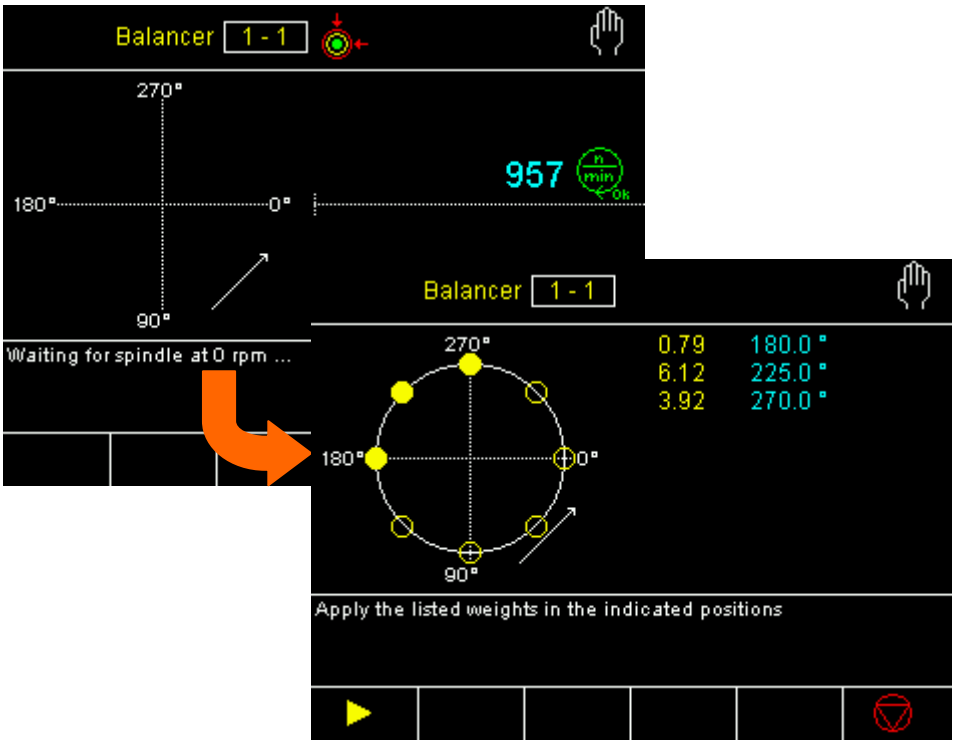
To start the balancing procedure press “F1”.



The system requires to start the spindle to acquire the unbalanicing entity.

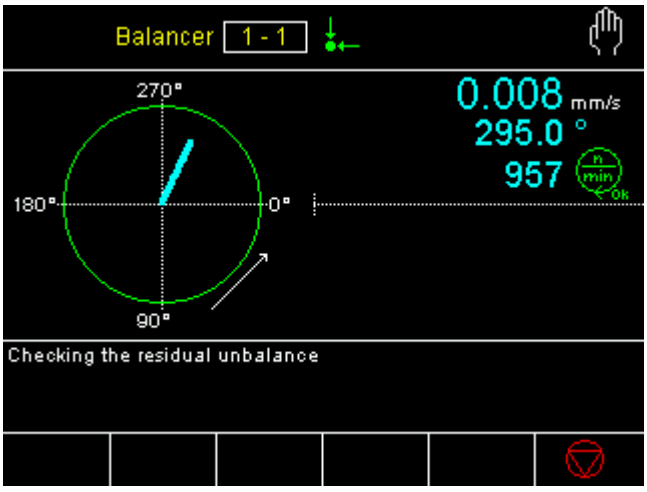


Once stopped the spindle the system will require the operator to position the correction weight to the indicated positions.



NOTE: in case of “acquired weights” operating mode, the system will require to install the weights (named P1, P2, P5 etc…) on the defined position.
In case of “defined weights” operating mode, the system will require the operator to install the weights (in grams) on the defined position.

Once installed the correction weights on the indicated positions, press “F1”.
The system will require to start again the spindle to verify the residual unbalance entity.



If the residual unbalance entity is within the setted unbalance tolerance, the manual balancing procedure is finished.

2.7.2.7. Notes for correctly executing the procedure

- The procedure is completely assisted by the machine and the instructions for the operator are visualized on the control panel step by step, in the operator message area.

- In case of correction for adding or displacement, once selected master weight, the system elaborates the acquired data and to make the angular positions in which two balancing weights must be fixed, that weights must be equal to master weights.

- The 0° reference position is very important. We suggest you graduate the rotating system in degrees (on the spindle body or on a flange or on the toolholder.
  If the rotating system already has a vernier graduated in degrees, we suggest you utilize the “0” as a reference position. it is important that, once the “0” reference position and the graduation direction (clockwise or counter-clockwise) have been established, the relative work parameter is set accordingly. In this way, the machine will correctly indicate the final positions of the correction weights.

- The angular positions of the correction weights are counted beginning from the “0” reference position, turning the spindle in the nominal direction of rotation.

- Once a calibration has been memorized, it remains valid only if the work parameters and the position of the sensors in the machine are not modified If they are modified, calibration will have to be carried out again.
  In particular, if after having memorized the calibration the indicated correction positions are not correct (balance cannot be obtained), check if.

  - the transducer and/or the rotation sensor have been moved;
  - the type of sample weight has been substituted;
  - the spindle rotation speed has been changed
  - the machine has been turned off.

  In these cases, calibration must be repeated.

- The machine signals and advises the operator when the weights offer an insufficient compensation capacity.

- In order to guarantee adequate precision, the weights must be positioned so that the middle of the weight corresponds to the angular position indicated by the machine.

- If you are unable to obtain the set TOLERANCE value although the procedure is correctly carried out, check if:

  - the TOLERANCE value is not too small;
  - the detected unbalance is unstable and fluctuates in and out of the set TOLERANCE circle. In these cases, you can go ahead by either increasing the tolerance value in the work parameter or checking that the reading instability is not caused by external factors (see section on PROBLEM SOLVING);
  - there are some moving objects that disturb the vibration transducer reading (i.e., presence of a socket near the work area or cables or cooling pipes that come into contact with the transducer body);
  - the settings of the “rotation direction” and “graduation direction” parameters do not correspond to the actual situation and, therefore, they have to be modified so that they are coherent with what can be seen by the operator.

- If, during the calibration or balancing procedure, the control panel constantly displays “WAITING FOR NOMINAL RPM” in the operator message area, check the following:

  - The spindle was not started up.
  - The spindle rotates at a speed of less than 100 rotations/min.
  - The rotation sensor is not regulated well or has broken down.

- If, during the calibration or balancing procedure, the control panel constantly displays “WAITING FOR SPINDLE 0 RPM” in the operator message area, check the following:

  - The spindle was not stopped.
  - There are moving objects that disturb the rotation sensor reading.

3. Touch Detector [type TD]

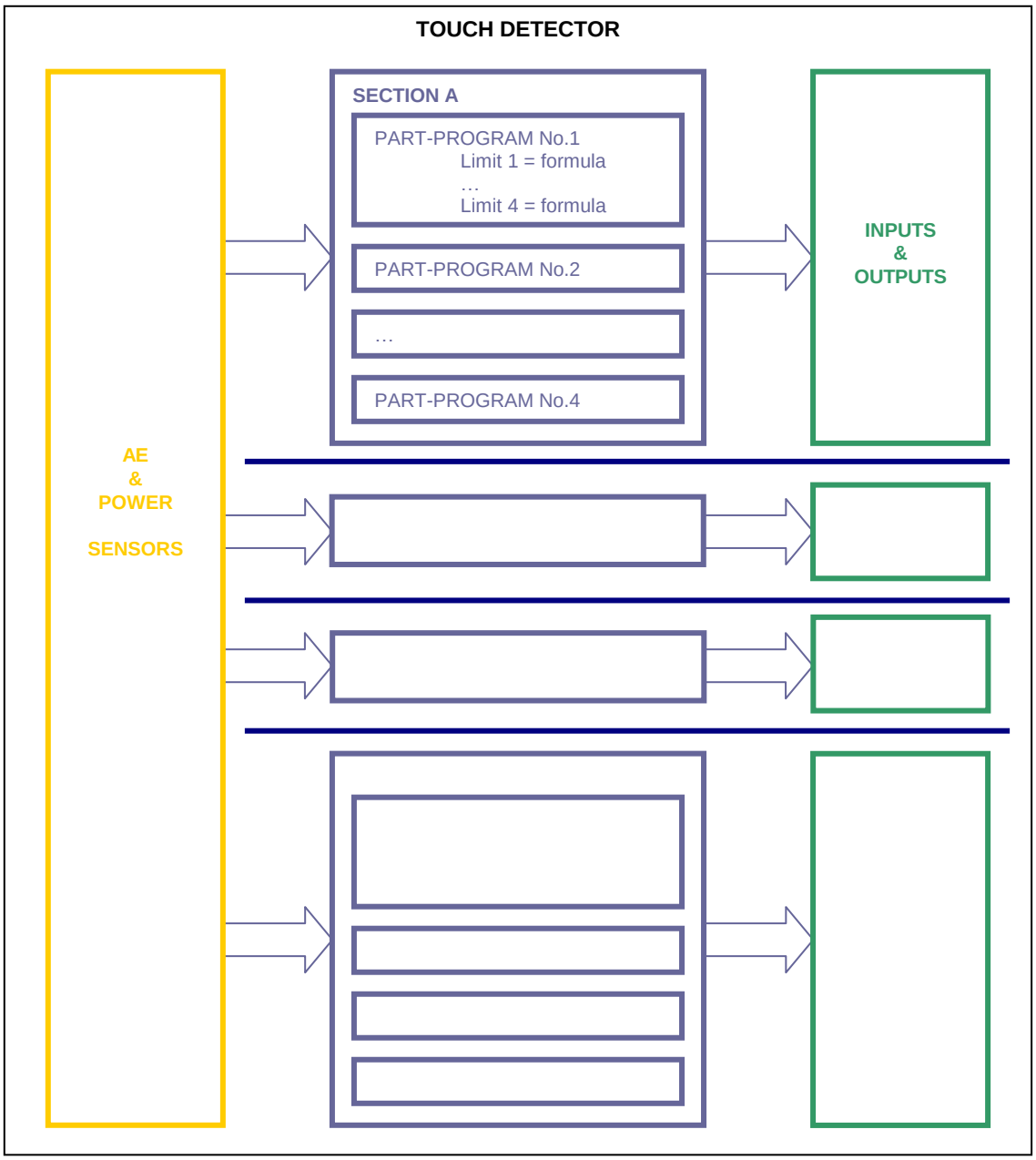
3.1. Introduction

The TOUCH DETECTOR (or GAP CONTROLLER) of the VM15 series permits to reduce the cycle times by increasing the infeed of the grinding wheel to the piece. It prevents the problem of burning and is a valid system for monitoring and control during the whole working process.

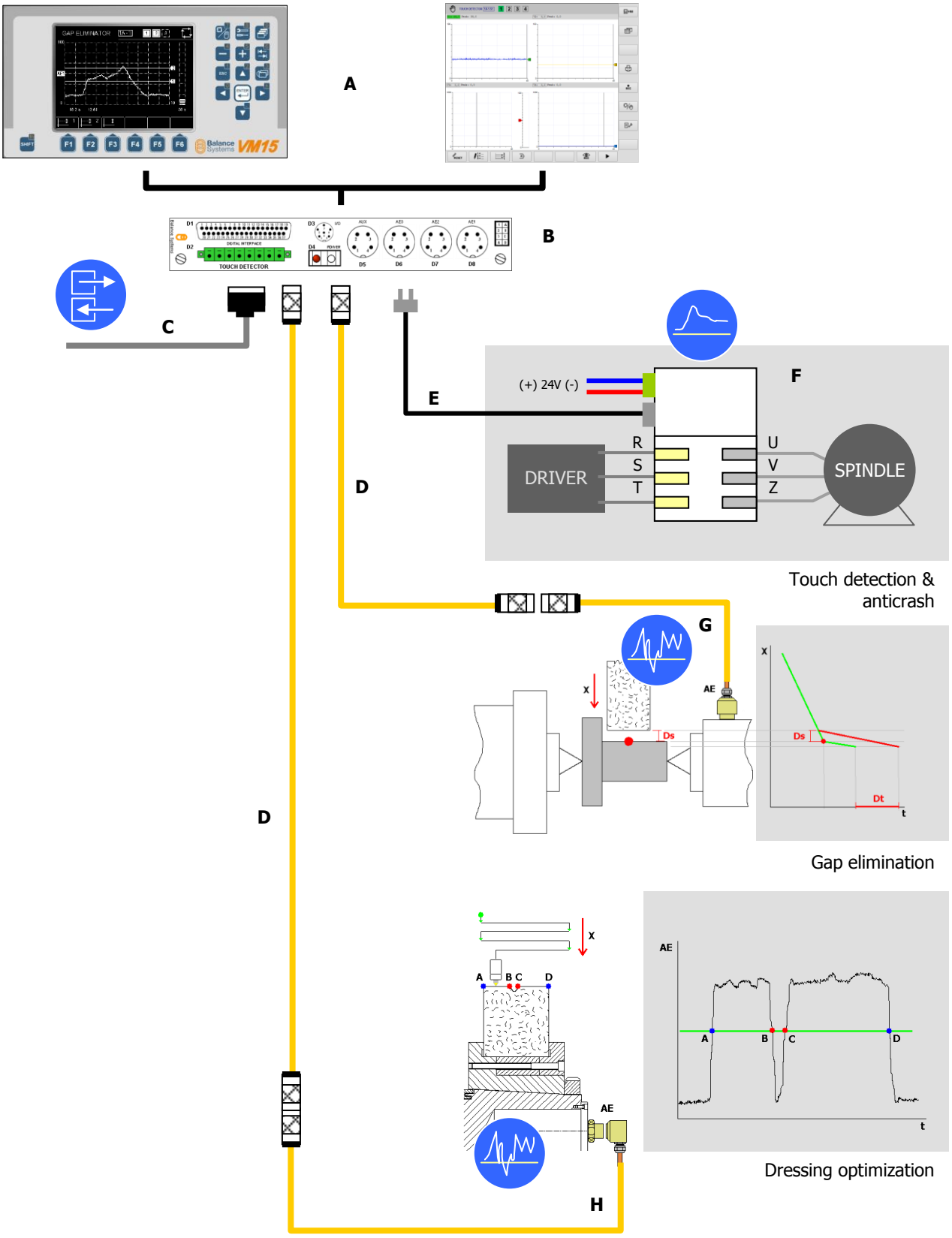
All the working phases can be controlled by means of the interface with the PLC/NCU of the grinding machine.

The card allows up to 4 part-programs, which may be activated one at a time, manually or via the PLC/NCU. Each program is dedicated to a particular setup of the signaling thresholds for limit 1 (i.e. touch), limit 2, limit 3 (i.e. warning or burning) and limit 4 (i.e. anti-crash alarm). (See the organization scheme of the touch detector).

ORGANIZATION SCHEME



The components of the touch detector system are shown in the following picture.

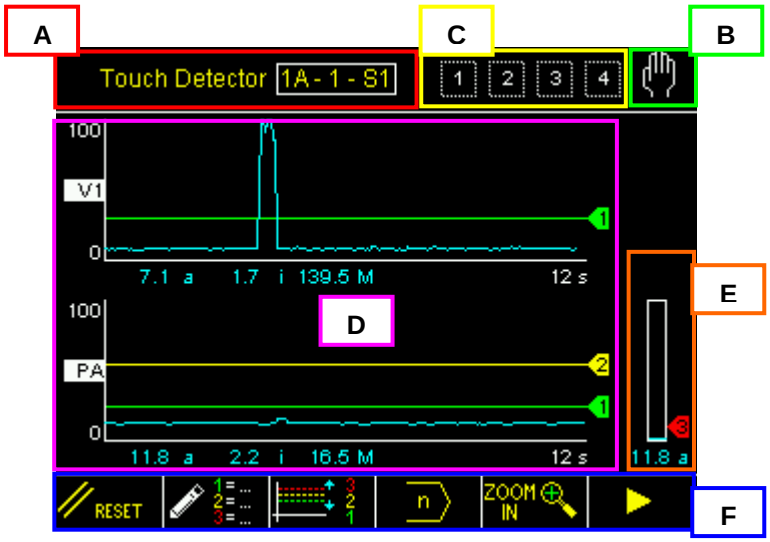


Component	Description
A	User interface: VM15 Panel
B	Touch detector card unit
C	Digital interface (I/O signals)
D	Extension cable
E	Fibre optic cable for power data transmission
F	Power transducer
G	Acoustic Emission sensor (static type)
H	Acoustic Emission sensor (wireless type)

The available functions depend on the acces level defined by the system installer.

The touch detector can work both in automatic and in manual mode.
In automatic mode all the commands and the status signalling are excanghed through the digital interface connected to the machine PLC/NCU; the VM15 panel shows the status of the actual process.
In manual mode all the available commands are launched by the operator through the VM15 panel while the status signalling to the machine PLC/NCU are manteined.

3.2. Status page



A. Device name:

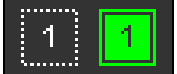
TOUCH DETECTOR 1 - A1 indicates **TOUCH DETECTOR 1 Section A, Part-Program 1**

B. Operating mode (Automatic / Manual)
C. Area reserved to status signalling.
D. Graphic area to rappresent the diagrams of the sources used to activate the limits 1, 2, 3 and 4. The number of the diagrams displayed depends on the active part-program.
   - Source vs time diagram
   - Programmed limits
   - Status of the programmed limits
   - Numerical value of the sources
E. Graphic area to rappresent the source for an independent control of the limit 3. In this case the source is rappresented with a bar graph.
F. Horizontal command line, accessible by [Fx] buttons.

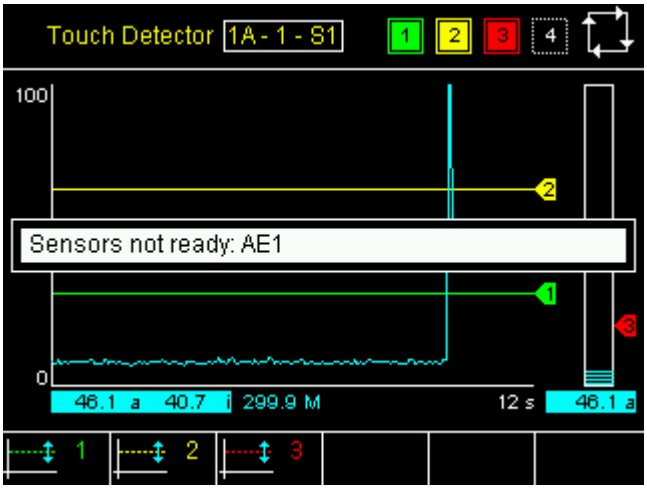
3.3. Status and alarm signalling

During the normal operating mode some variable are continously monitored and when necessary, some icons or messages are displayed to inform the operator about such conditions.

NOTE: *When the condition can be dangerous both for the machine integrity and the operator safety a number of signalling to the machine PLC/NCU are generated and icons on the screen will appear for the operator.*

Limits signalling			
Icon	**ID**	**Name**	**Description**
	5001 5003	Limit 1	Not Activ / Activ status of the output Limit 1
	5004 5006	Limit 2	Not Activ / Activ status of the output Limit 2
	5007 5009	Limit 3	Not Activ / Activ status of the output Limit 3
	5010 5012	Limit 4	Not Activ / Activ status of the output Limit 4

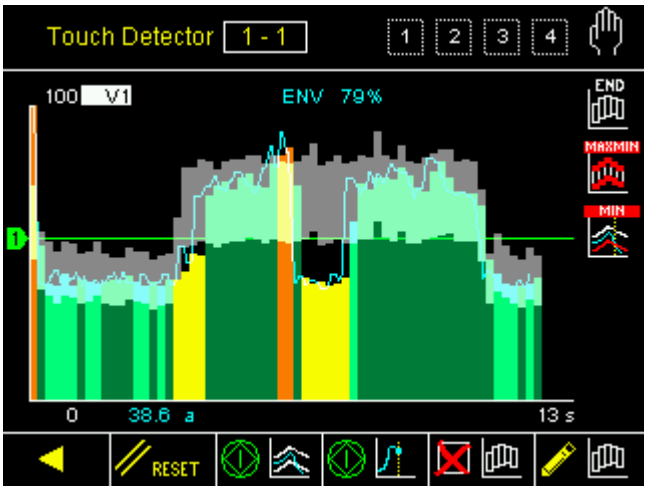
Sensors signalling			
Icon	**ID**	**Name**	**Description**
	5019	AE1 not ready	AE 1 sensor not ready (faulty or disconnected)
	5027	AUX not ready	AUX sensor not ready (faulty or disconnected)
	5017	P not ready	Power sensor of the section A not ready (faulty or disconnected)



This signalling means that the sensor is not operating properly. With this conditions the touch detector card stops the monitoring and move an alarm to the PLC/NCU of the machine.

3.3.1. Envelope signalling

Envelope function compares the current AE or Power process signal of a wheel dress to a stored Master shape of a known good dress to determine and report when the dressing process has been successfully completed, maximizing the efficiency and the shape quality of the dressing process.



Envelope signalling		
Icon	**Status name**	**Description**
	No stored time duration	Time duration is not saved. It appears if “Self learning process duration” parameter is ON. Time duration learning is required
	Time duration learning in process	Time duration learning is in process It appears if “Self learning process duration” parameter is ON.
	Time duration learning error	Some errors occurred during time duration learning. New time duration learning is required
	Time duration learning correct executed	Time duration learning correct executed
	No stored master	No master saved. Learning cycle is required.
	Master learning in process	Master Learning in process
	Master learning error	Some errors occurred during master shape acquisition. New learning cycle is required
	Master learning good	Master shape has been acquired successfully
	Process timeout	Process executed without any STOP signal. Stop process signal has not been received after process duration (learned or defined by related parameter).
	Autostart timeout	No trigger signal occurs after START signalling. It can appear if AUTOSTART parameter is different by OFF.
	Envelope in progress	Comparison process in progress (in-cycle).
	Process stopped	Process has been stopped
	Zone over tolerance	Output is no-latched, comparison process is in progress (in-cycle) and the signal is over defined tolerance in current zone (current zone assumes ORANGE color).

Envelope signalling		
Icon	**Status name**	**Description**
	Zone below tolerance	Output is no-latched, comparison process is in progress (in-cycle) and the signal is lower defined tolerance in current zone (current zone assumes YELLOW color).
	Zones out of tollerance	Output is latched, comparison process is in progress (in-cycle) and the signal is out defined tolerance in more than one zone (current zone assumes ORANGE color).
	Ip max	Outputs is no latched and instantaneous signal value is over IP max limit (in-cycle).
	Ip min	Outputs is no latched and instantaneous signal value is lower IP min limit (in-cycle).
	Ip crash	Outputs is latched and instantaneous signal value is over IP crash limit (in-cycle)
	Ip max – min	Output is latched and instantaneous signal value is out of set limits (max and min) (in-cycle).
	Envelope End	Process correctly executed (end cycle) Stop process signal has been sent to VM system before process timeout signalling.
	Envelope good	Comparison process has been executed (end cycle) and the signal is inside defined tolerance in all zones (GREEN).
	Process over tolerance	Comparison process has been executed (end cycle) and the signal is over defined tolerance in one or more zones (ORANGE).
	Process below tolerance	Comparison process has been executed (end cycle) and the signal is lower defined tolerance in one or more zones (YELLOW).
	Process out of tolerance	Comparison process has been executed (end cycle) and the signal is over defined tolerance in one or more zones (ORANGE) and lower defined tolerance in one or more zones (YELLOW).

Percentage of number of zones in which the process is inside defined tolerances is continuously updated and displayed on the screen.

3.4. Commands

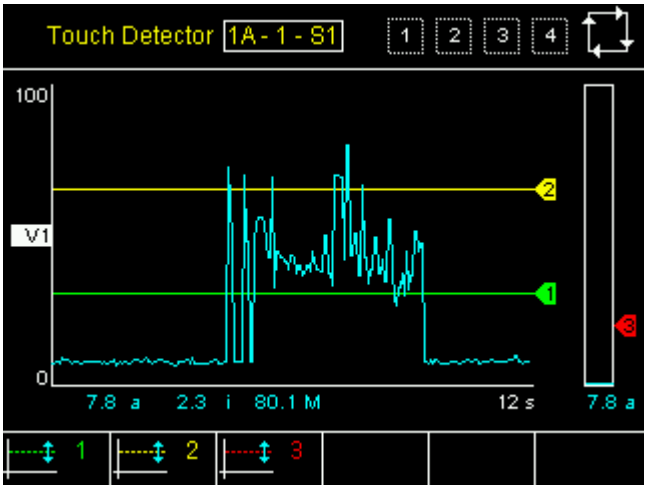
3.4.1. Automatic mode

All the commands related to the automatic cycles are managed through the PLC/NCU.

The only exceptions which permit the operator to interfere from the keyboard apply to the possibility to carry out manual corrections of the numerical value of the thresholds and the possible commutation to manual mode, with which all manual commands are again available.
During automatic functioning, the proceeding in time of the quantities concerned are shown. In addition, the possible activation of the imposed thresholds are marked.

***NOTE**: The digital outputs available depend on the set-up done by the system's installer.*

***NOTE**: The availability of independent sources for signaling Limit 1, Limit 2, Limit 3 and Limit 4 depends on the setup done by the system's installer.*



System commands		
Button	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the touch detector device to manual mode

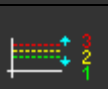
Correction commands			
Icon	**Command Name**	**Button**	**Description**
	Limit 1 Correction	F1	Fine adjustment of the thresholds related to limit 1 in the formula
	Limit 2 Correction	F2	Fine adjustment of the thresholds related to limit 2 in the formula
	Limit 3 Correction	F3	Fine adjustment of the thresholds related to limit 3 in the formula
	Limit 4 Correction	F4	Fine adjustment of the thresholds related to limit 4 in the formula

3.4.2. Manual mode

In manual mode, the device operates completely independent from the CNC of the grinding machine. All the commands to the device are given by the user via keyboard. The signalings to the CNC of the machine are, however, maintained.

The manual mode is accessible only at programmer level (or higher).

System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the touch detector device to automatic mode
	Parameters	Parameters setup

Commands			
Icon	**Command Name**	**Button**	**Description**
	Reset Limits	F1	The reset of the outputs Limits 1, 2, 3 and 4 executes the following operations: 1. Resets the outputs signalling of Limit 1, 2, 3, 4. 2. If modifications have been made on the thresholds in the formula, the new values imposed for the positioning of the thresholds are activated. 3. If the incremental values are used in formula, the new reference value for the calculation of the thresholds will be adjusted.
	Formula	F2	Access to formula editing
	Limits correction	F3	Quick access to fine adjustment of the thresholds related to limits in the formula
	Change Part Program	F4	Part-Program selection for manual mode operations. With this parameter one imposes one of the available part-programs for the section of the touch detector. The part-programs are numbered from 1 to n. By imposing “0”, the part-program selected by the PLC/NCU of the machine will be activated. When selecting a number from 1 to n, a specific program will be imposed, which does not give the possibility to the PLC/NCU, to use a different program. ***NOTE:*** *Operating in automatic mode the selection made by PLC/NCU has the priority.*
	Zoom + / Zoom -	F5	Access to diagrams selection
	Next commands line	F6	Access to next commands line

Those commands which require a more detailed description will be analyzed in the next paragraphs, and in addition, some typical procedures are described.

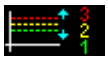
3.4.3. Procedures and auxiliary functions

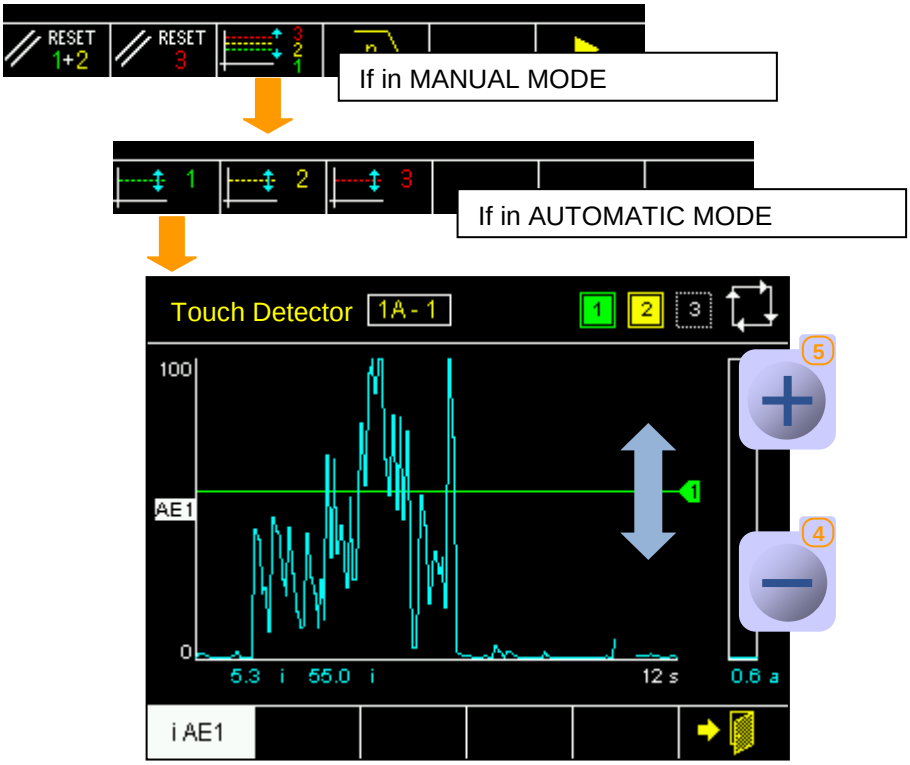
3.4.3.1. Limits correction

This function is available both in automatic and in manual operating mode.

The commands Limit 1, 2, 3, 4 Corrections [F1], [F2], [F3], [F4] permits to modify only the numerical value of the thresholds imposed in the formulas of the program used. In this way it is possible to make a fine adjustment which permit to improve the signalling on the basis of the working conditions.

To modify the Limits 1, 2, 3 and 4:

- Access the pages to modify the limits 1, 2, 3 and 4 using the commands:
  - **Limit 1 correction**  **[F1]**
  - **Limit 2 correction**  **[F2]**
  - **Limit 3 correction**  **[F3]**
  - **Limit 4 correction**  **[F4]**
- in alternative, when in manual mode, press the button **Corrections**  **[F3]** and then the commands  ,  ,  , 
- use the  and  buttons to setup the new value
- Press **Exit**  **[F6]** to return to tha main status page



NOTE

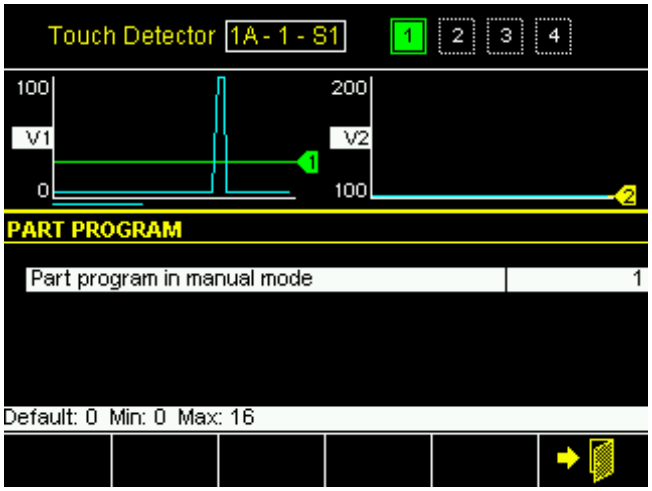
Changing the limits also the formula of the active part-program will be updated.

Icon	Command name	Button	Description
	Exit	F6	Exit

3.4.3.2. Part-Program change

To change the current part-program use the **Part-Program change** 

[F4] command



- Press the 

or 

to enter the new value
- Press 

to save the new value
- Enable the new part-program using the **Reset** 

[F1] command.

NOTE

Selecting the "0" value, the system will use the setup selected by the NCU/PLC through the automatic interface (digital inputs or profibus).

3.4.3.3. Graphic visualization [Zoom command]

The **Zoom +** 

and Zoom - 

[F5] commands allow to select which diagram has to be dispalyed (V1, V2, V3, V4 and/or Power)

- Press 

command to access the diagram choice menu

- Select/Unselect the diagram to be displayed using the following commands:
  - 

/ 

[F1] for V1 diagram
  - 

/ 

[F2] for V2 diagram
  - 

/ 

[F3] for V3 diagram
  - 

/ 

[F4] for V4 diagram
  - 

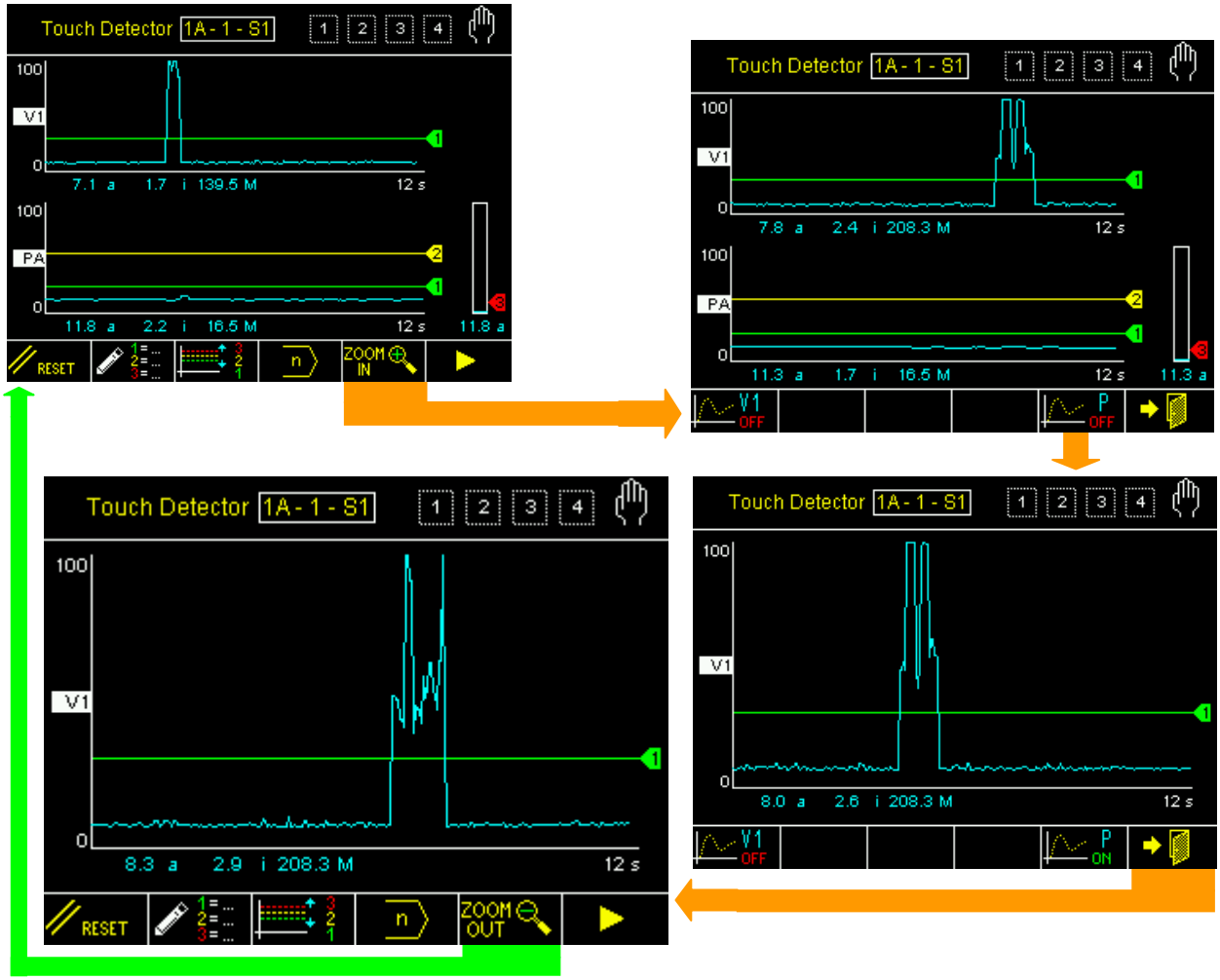
/ 

[F5] for POWER diagram

- Press **Exit**  **[F6]** to return to the main status page

- Press **Zoom –** 

[F5] command to display all the diagrams

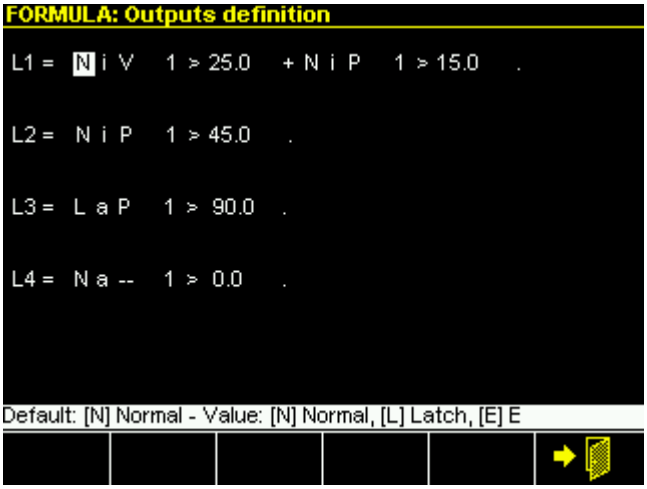

Touch Detector
1A - 1 - S1
1
2
3
4
100
V1
0
7.1 a
1.7 i 139.5 M
12 s
PA
11.8 a
2.2 i 16.5 M
RESET
n
ZOOM IN
7.8 a
2.4 i 208.3 M
11.3 a
1.7 i 16.5 M
V1 OFF
P OFF
8.3 a
2.9 i 208.3 M
ZOOM OUT
8.0 a
2.6 i 208.3 M
P ON

3.4.3.4. Formula editing

The four outputs signalling definition (Limit 1, 2, 3 and 4) are related to four simple formulas which are defined in each part-program.

To edit the formula of the actual part-program:

- Press the **Formula**  **[F2]** command



- Use the  ,  ,  ,  buttons to select the formula components
- Use the  ,  buttons to change the value
- Press  to save each modification

NOTE
The method to compile the formula and all the details on each the terms are argouments for the system installer and are described in the Parameter Setup document.

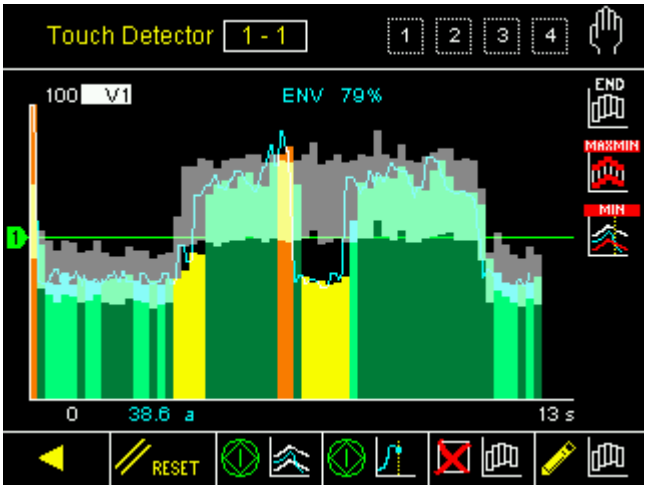
3.4.3.5. Envelope

Envelope function has been developed to provide process control enhancement to grinding machines.
It provides process monitoring of the quality and consistency of straight or profiled wheel contact in the dressing or grinding process in order to increase grinding machine efficiency.
Envelope function is provided assuring that maximum or minimum degree of wheel contact is maintained throughout a dress or grind cycle.
Envelope function also includes gap and crash control for background continuous monitoring. Dedicated signals allows to enable Envelope monitoring with precise triggers, while a traditional part-program defined through formula and limits is active.

It compares the current AE or Power process signal of a wheel dress to a stored Master shape of a known good dress to determine and report when the dressing process has been successfully completed, maximizing the efficiency and the shape quality of the dressing process.

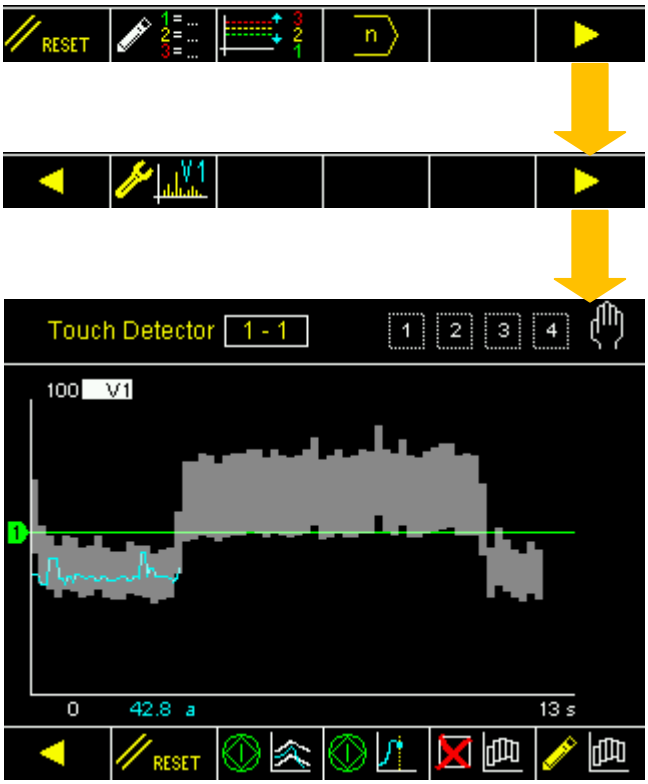
Envelope function allows to:

- determine if the wheel is being dressed with a proper defined shape
- Recognition of small defects in the dressed form
- Monitoring of the grinding wheel contour to ensure the accuracy of shape



- **Gray:** Learned Master shape shown in background
- **Dark green.** Zone matches the master
- **Light Green.** Borderline zone nearing lower limit
- **Yellow.** zone below lower shape
- **Orange.** zone over higher shape
- **Red.** zone over Crash limit
- **Blue.** Zone below the Noise level

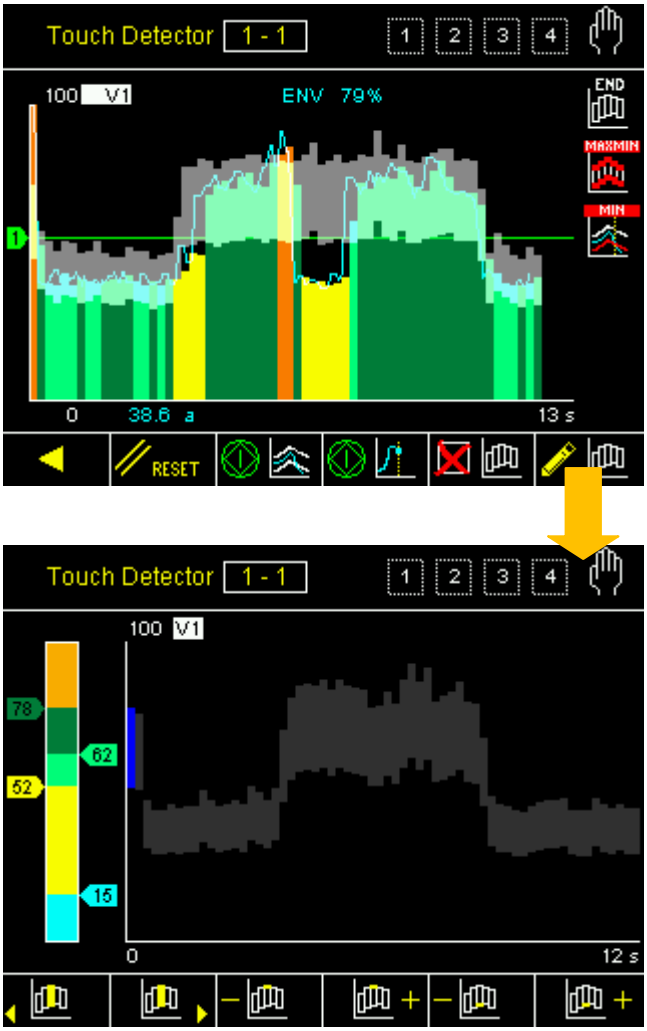
To access to envelope function, please refer to following steps:



Envelope commands			
Icon	**Command name**	**Button**	**Description**
RESET	Reset Limits	F1	The reset of the outputs Limits 1, 2, 3 and 4 executes the following operations: ▪ Resets the outputs signalling of Limit 1, 2, 3, 4. ▪ If modifications have been made on the thresholds in the formula, the new values imposed for the positioning of the thresholds are activated. ▪ If the incremental values are used in formula, the new reference value for the calculation of the thresholds will be adjusted. ▪ Resets all the envelope outputs signalling
	Start process Stop process	F2	Start / stop following processes: ▪ Learning cycle (master shape performing) ▪ Dressing or grinding process (to be compared with master shape)
	Start learning Stop learning	F3	Learning cycle enabling / disabling (master shape performing)
	Master delete	F4	Delete current stored master shape
	Edit mode	F7	Access to Edit mode page. Allows to manually edit current stored master shape
	Next	F8	Go to next menu

3.4.3.5.1 Master shape edit mode page

Once master shape is correctly recorded press edit mode button  to access to edit page in order to manually change the tollerances.

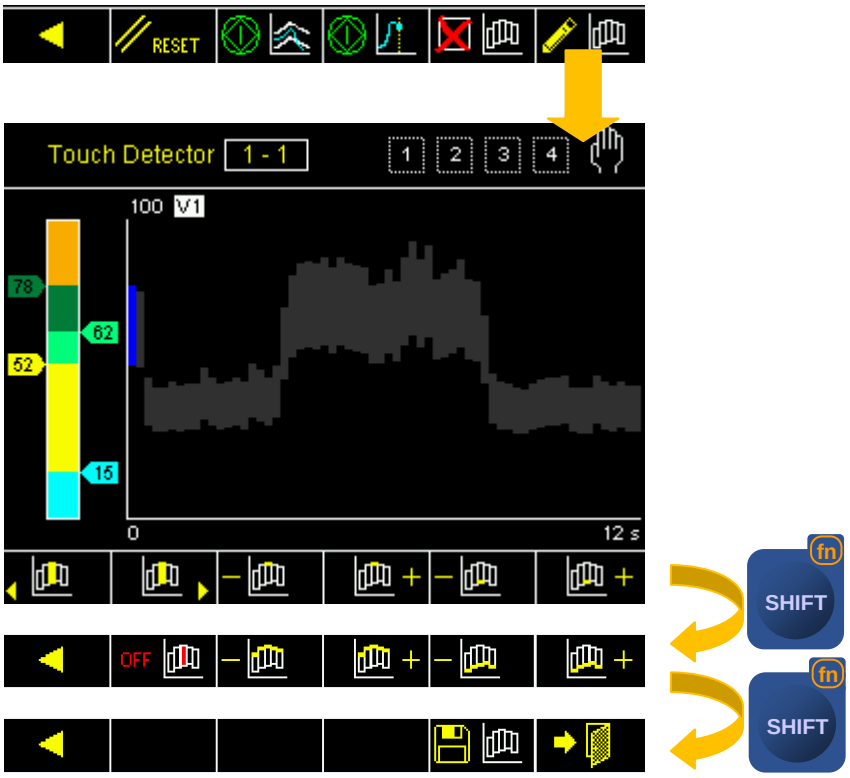


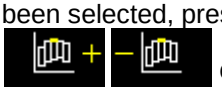
Envelope commands			
Icon	**Command name**	**Button**	**Description**
	Move left and select	F1	Move left the cursor to select the zone to edit
	Move right and select	F2	Move right the cursor to select the zone to edit
+	Increase top selected	F3	Increase upper allowed tolerance level of selected zone
–	Decrease top selected	F4	Decrease upper allowed tolerance level of selected zone
+	Increase bottom selected	F5	Increase bottom allowed tolerance level of selected zone

Envelope commands			
Icon	**Command name**	**Button**	**Description**
	Disable selected Enable selected	F7	Enable or disable selected zone in order to edit it
	Decrease top curve	F1	Decrease upper allowed tolerance level of all zones
	Increase top curve	F2	Increase upper allowed tolerance level of all zones
	Decrease bottom curve	F3	Decrease bottom allowed tolerance level of all zones
	Increase bottom curve	F4	Increase bottom allowed tolerance level of all zones
	Master save	F6	Save modified master shape
	Next	F8	Go to next menu

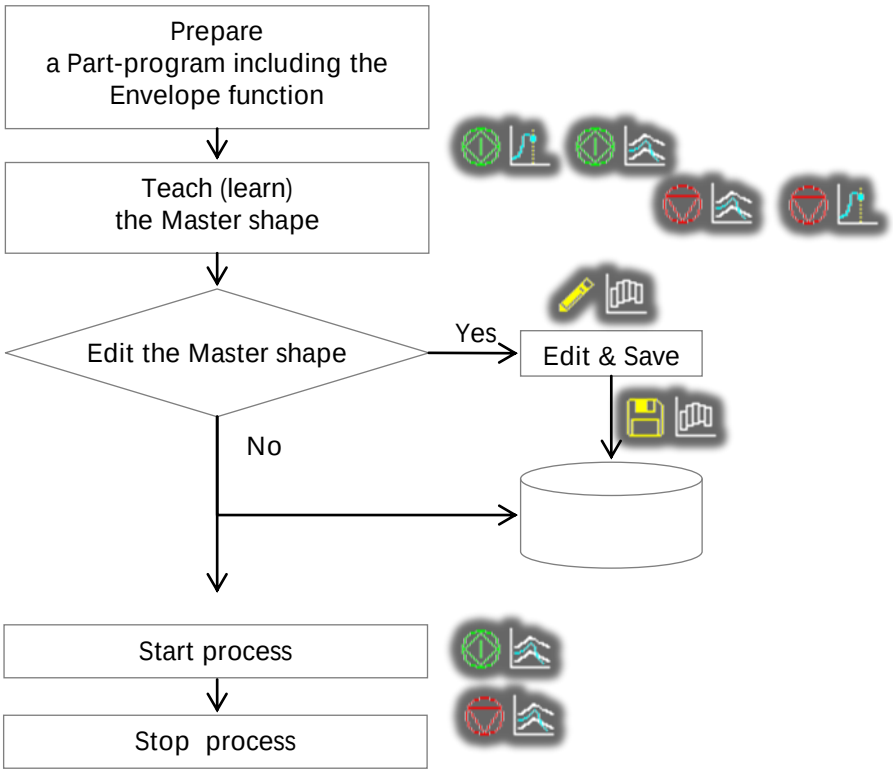
Vertical colored bar on the left of the screen, shows current tolerances levels in each zone.

There are different ways to edit the master shape.



1. <u>Edit a single zone</u>
   - Select the zone to edit using  or  .
   - Once the zone has been selected, press on Enable selected button  .
   - Edit the zone using  or  .
   - Press on disable selected button  .
   - Save the master pressing  button.
2. <u>Edit the entire shape</u>
   - Edit the entire shape using  or  .
   - Save the master pressing  button.

3.4.3.5.2 Typical flow chart of the process



3.5. WORK parameters

To access the WORK parameters press 

For the description of the WORK parameter, refer to the document Parameter Setup

4. Gauge [type GA]

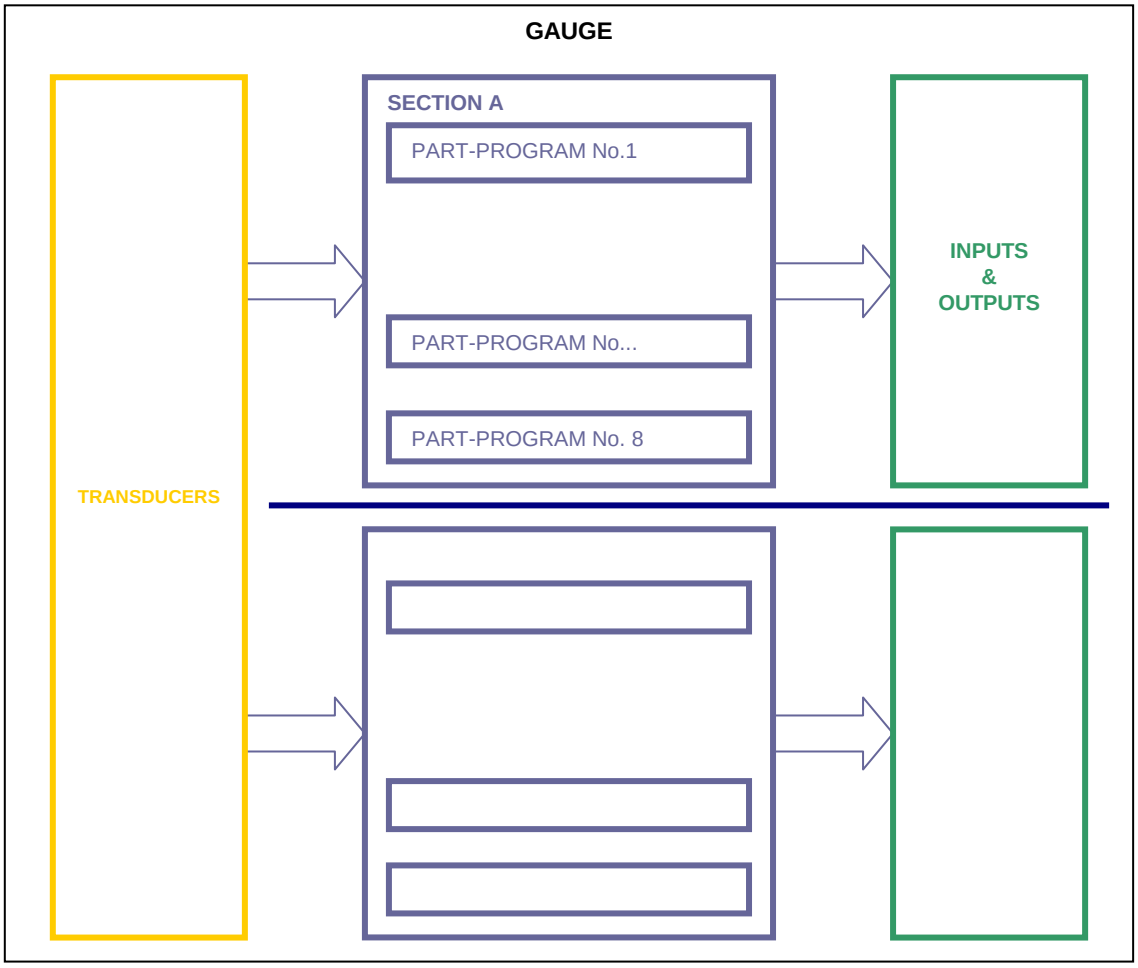
4.1. Introduction

The gauging system, or more precisely the precision comparator, is used both in-process and post-process.

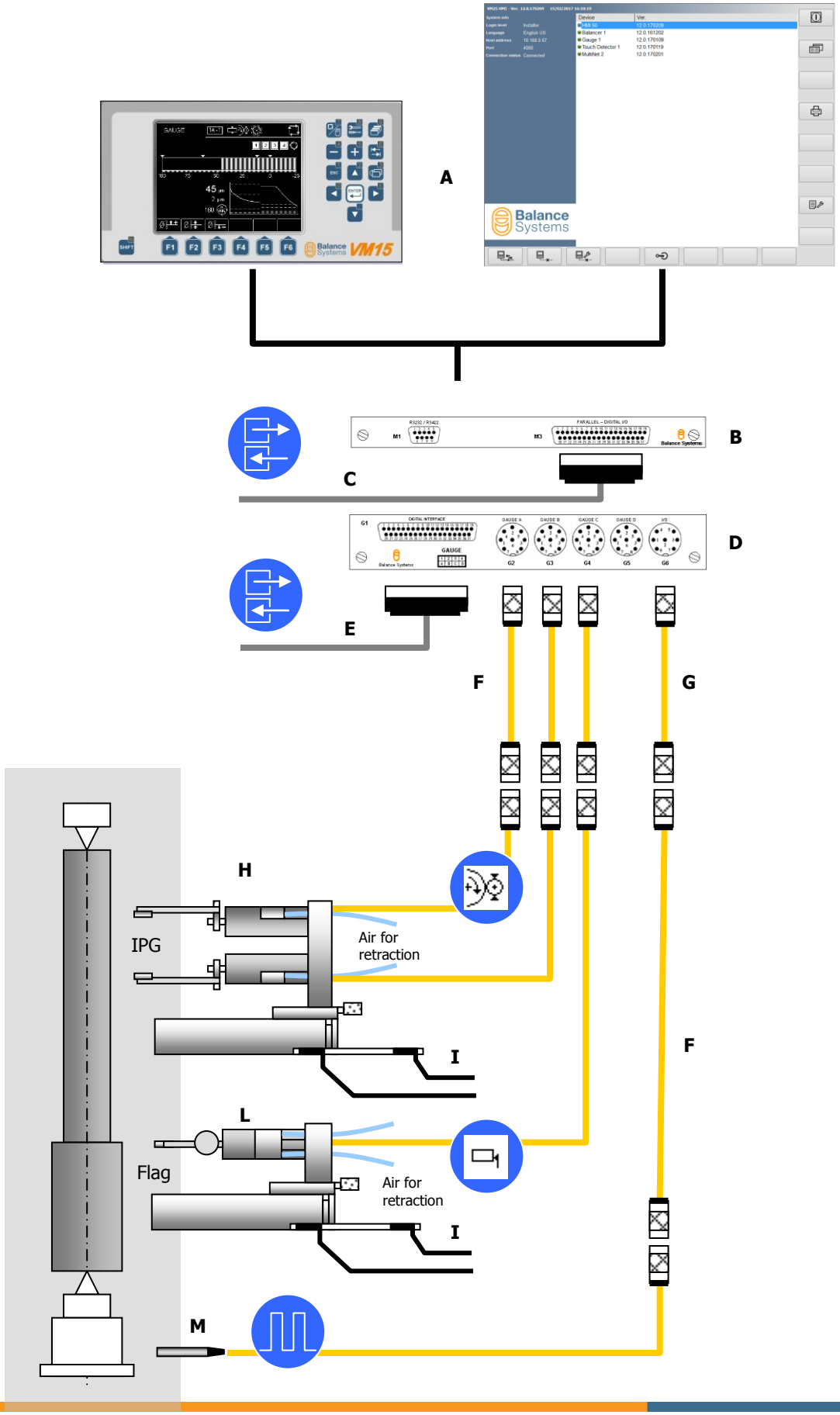
- with the in-process mode the system controls the dimension during the work phase of the piece.
- with the post-process mode the system checks the final dimension of the finished piece.

All the working phases can be controlled by means of an interface with the CNC of the grinding machine.
The gauge card can accept up to 8 part-programs, which may be activated one by one, manually or by means of the CNC, where each one is dedicated to a particular set-up of the thresholds of signalling and programming of the gauging heads (see the organisation chart of the gauge).

ORGANIZATION SCHEME OF THE GAUGE



The components of the gauge system are shown in the following picture.

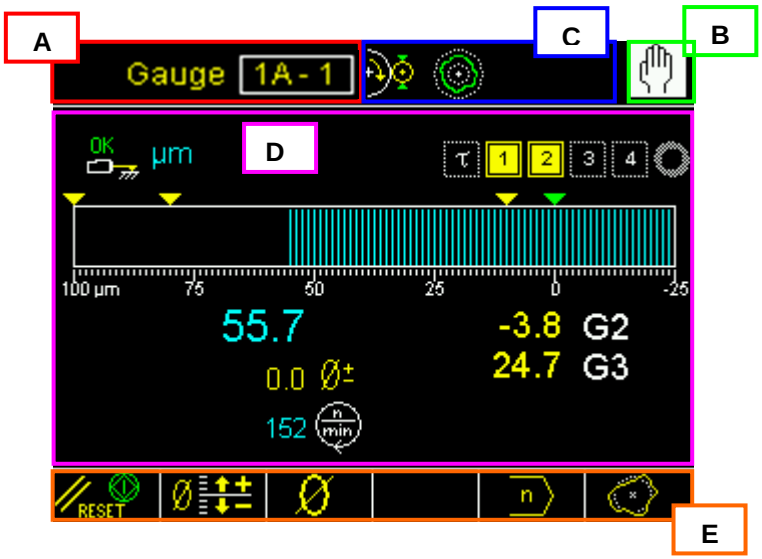


Component	Description
A	User interface: VM15 Panel
B	Multilink card (opzional): BIN/BCD interface
C	Digital interface – dimension data in BIN/BCD format (position – flag)
D	Gauge card
E	Digital interface (I/O signals)
F	Extension cables
G	Synchronism cable adapter
H	Diameter gauge equipment
I	Sensors for slide positioning

The available functions depend on the acces level defined by the system installer.

The gauging function may be used in automatic or in manual mode. In automatic mode, all commands and possible signallings are carried out by means of the interface of the CNC of the machine. The operator panel furnishes only a monitoring of the functioning state, and gives the operator the only possibility to correct the offset values of the thresholds imposed in the formulas.
In manual mode, the gauging system carries out only those functions that may be selected from the command menu, maintaining the possible signallings towards the CNC of the machine.

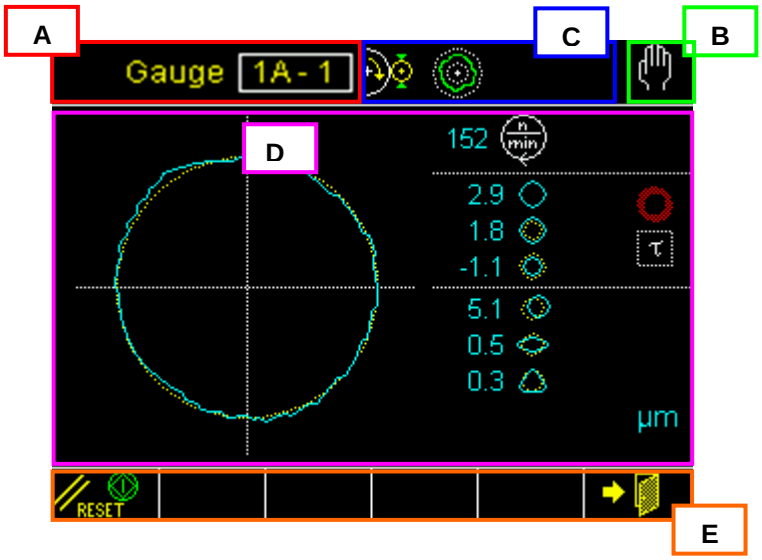
4.2. Status page



A. Device name:

GAUGE 1 – A1 indicates **GAUGE 1 Section A, Part-Program 1**

B. Operating mode (Automatic / Manual)
C. Area reserved to status signalling.
D. Graphic area to rappresent the diagrams of the sources
   - Dimension diagram
   - Output commands status
   - Gauging head status
   - Numerical value of the dimension
   - Numerical value of the programmed offset
   - Rotation speed of the workhead
   - Numerical value of each gauging transducer
E. Command line, accessible by [Fx] buttons.



A. Device name:

GAUGE 1 – A1 indicates **GAUGE 1 Section A, Part-Program 1**

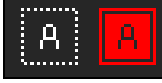
B. Operating mode (Automatic / Manual)
C. Area reserved to status signalling.
D. Graphic area to rappresent the diagrams of the sources
   - Roundness diagram
   - Output commands status
   - Value of the shape components
   - Rotation speed of the workhead
   - Measuring unit
E. Command line, accessible by [Fx] buttons.

4.3. Status and alarm signalling

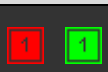
During the normal operating mode some variable are continously monitored and when necessary, some icons or messages are displayed to inform the operator about such conditions.

NOTE: *When the condition can be dangerous both for the machine integrity and the operator safety a number of signalling to the machine PLC/NCU are generated and icons on the screen will appear for the operator.*

Gauging mode signalling			
Icon	**ID**	**Name**	**Description**
	7012	In-Process gauging	In-Process gauging enabled
	7013	Post-Process gauging	Post-Process gauging enabled
	7015	Roundness analysis	Roundness analysis enabled
µm mil	7001 7002	Measuring unit	Measuring unit

Output commands signalling			
Icon	**ID**	**Name**	**Description**
	7024 7026	Cycle start delay	Timer status Active / Expired to count the start cycle delay
	7042 7044	Dwell timeout	Dwell timeout: in-progress / expired
	7027 7029	Command 4	Not Activ / Activ status of the command 4 output (Roughing)
	7030 7032	Command 3	Not Activ / Activ status of the command 3 output (Finishing)
	7033 7035	Command 2	Not Activ / Activ status of the command 2 output (Super-finishing)
	7036 7038	Command 1	Not Activ / Activ status of the command 1 output (Dwell or Spark-out)
	7039 7041	Command 0	Not Activ / Activ status of the command 0 output (Cycle end, part at the size)
	7045 7047	Warning – Part undersized	Not Activ / Activ status of the command A output (Warning: Part undersized)

Gauge transducers signalling			
Icon	**ID**	**Name**	**Description**
	7003	TG200 error	TG200 gauge head non connected or not ready
	1004	TG200 error	TG200 gauge head measuring dimension not valid
	7004	In measuring poosition	The gauge head is in measuring position
	7005	Retraction	The gauge head has retracted the fingers
	7006	Retraction not executed	ALARM: the gauging head cannot retract the fingers
	7017	Overrange	Out of measuring range
		Max dimension	Max dimension reached
	7008	Hold dimension	Freeze the current dimension

Roundness signalling			
Icon	**ID**	**Name**	**Description**
	7062 7060	Roundness threshold 1	Roundness threshold No.1 In / Out tolerance
	7065 7063	Roundness threshold 2	Roundness threshold No.2 In / Out tolerance
	7068 7066	Roundness threshold 3	Roundness threshold No.3 In / Out tolerance
		Roundness inactive	The roundness analysis is not started
	7048	Roundness out of tolerance	Roundness out of tolerance
	7049	Roundness in tolerance	Roundness in tolerance

Roundness and shape components signalling			
Icon	**ID**	**Name**	**Description**
	7051	Runout error	Total roundness error
	7053	Exernal deviation	Top profile dimension
	7052	Internal deviation	Bottom profile dimension
	7054	Excentricity	Value of the excentricity component
	7055	Ovality	Value of the ovality component
	7056	3-lobed	Value of the 3rd component
	7057	4-lobed	Value of the 4th component
	7058	5-lobed	Value of the 5th component
	7059	Residual	Value of the residual component

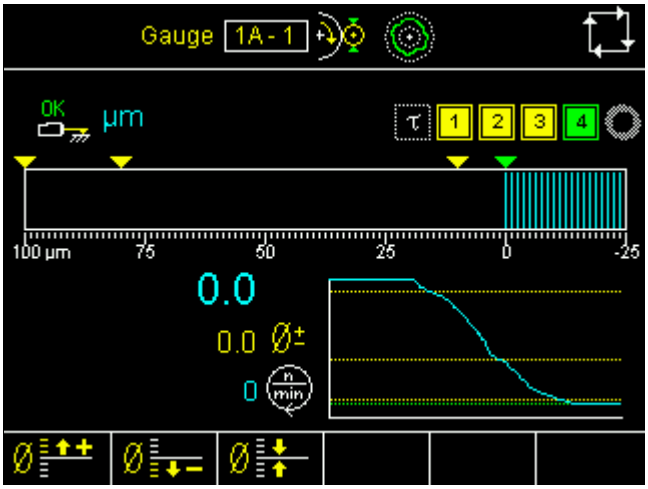
4.4. Commands

4.4.1. In Process gauge

4.4.1.1. Automatic mode

In automatic mode, the device is controlled entirely by the CNC of the machine. The only exceptions, where the operator may intervene from the keyboard, are the possibility to carry out manual corrections of the offset value of the master piece and the comutation to manual mode, where one accesses all commands.

In automatic mode, the operator can see on the monitor the quotes of the programs activated in the two sections, in numerical value as well as with graphics bar. In addition, the activated output commands are marked.



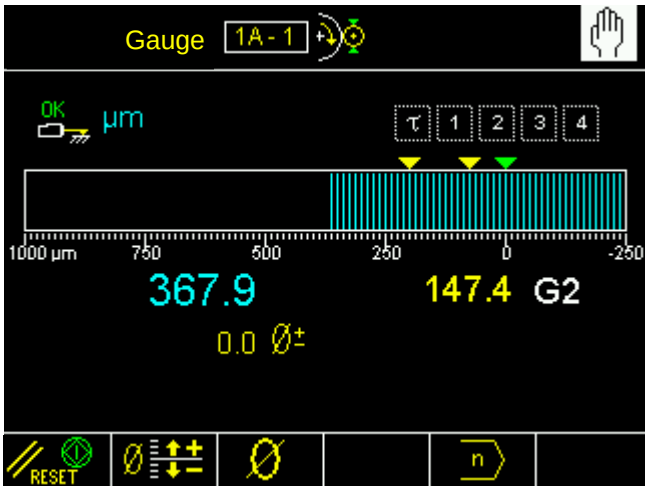
System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the gauge device to manual mode

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Offset increment	Increments the offset value
	F2	Offset decrement	Decrements the offset value
	F3	Offset reset	Takes the offset value to zero

4.4.1.2. Manual mode

The manual operating mode is accessible at the PROGRAMMER level only.

In manual mode the device functions are completely indipendent from the CNC of the machine. All the commands to the device are entered by hand from the keyboard. The signallings towards the CNC of the machine are, however, maintained.



System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the gauge device to automatic mode
	Parameters	Parameters setup

Commands			
Icon	**Button**	**Name**	**Description**
	F1	Reset	The reset of the thresholds carries out the following operations: 1. Reset of the signallings refering to the four quote thresholds. Any signallings sent to the CNC of the machine are removed, and the four thresholds are reset, thereby bringing the system back to normal working conditions. 2. If modifications have been made to the general parameters, be it the formulas or the thresholds, the new values imposed will be activated.
	F2	Offset correction	Access to the modification of the numerical values of the offset
	F3	Zeroing	Access to the zeroing functions
	F2	Part Program	Selection of the part-program which should be activated from the work-piece. The part-programs are numbered from 1 to 8. Selecting 0 the part program is managed by the PLC through the digital interface. Selecting a number between 1 and 8, the correspondent part-program willl be used and the PLC selection is ignored. ***NOTE:*** *In automatic mode the part-program is always selected by the PLC.*

4.4.2. In-Process gauging and Roundness analysis

Enabling the In-Process gauging with roundness analysis, the in-process gauging cycle previously decribed is followed by the roundness analysis process.

NOTE: *A necessary condition both for automatic and manual modes when using the in-process roundness analysis is the synchronizing signal from which the piece rpm is detected.*

4.4.2.1. Automatic mode

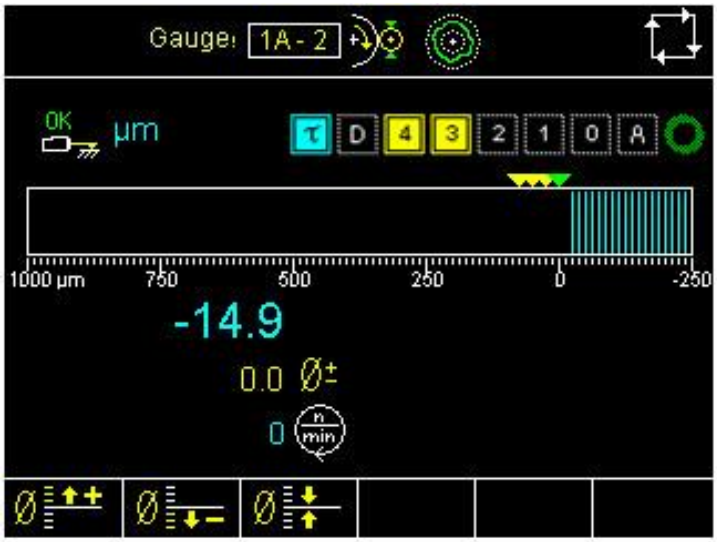
The roundness analysis supplies to the machine's CNC a signal that means that the piece is within or off roundness tolerance based on the programmed max internal and external deviations. The signals act as follows, during the automatic cycle.

Once a cycle is started, the output commands (0...4) signals changes in order to allow the CNC control to switch to pre-programmed feed rates.

When the roundness analysis is enabled, the command 3 is also used to signal the work-piece roundness status to the NCU. During the working pheses the commands (0..4) are managed as follows:

1. At the start cycle the command 1 works as first skip signal (machine will reduce the feed rate)
2. After the command 2 activation, when usually starts the finishing phase, the output command 1 will be resetted.
3. Simoultaneausly with the command 3 reset the system starts the roundness monitoring.
4. As soon as the command 4 (end cycle) will be activated, the output command 3 will be updated with the roundness status of the finished work-piece. In details:
   - ➢ Command 3 activated → Roudness in tolerance
   - ➢ Command 3 not active → Roudness out of tolerance

In automatic mode, to warrant the cycle-time, the roundness digram is not displayed.



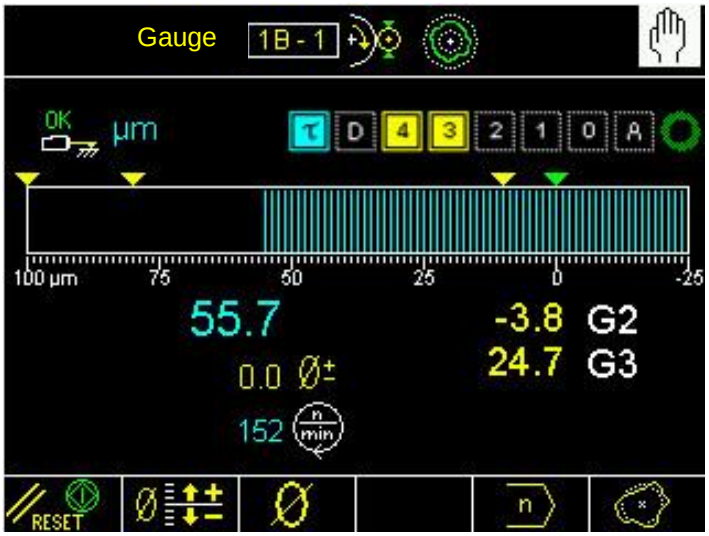
System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the gauge device to manual mode

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Offset increment	Increments the offset value
	F2	Offset decrement	Decrements the offset value
	F3	Offset reset	Takes the offset value to zero

4.4.2.2. Manual mode

The manual operating mode is accessible at the PROGRAMMER level or higher.

In manual mode, a detailed roundness analysis of the piece is possible. The system can display, with a programmed resolution, the roundness diagram; also the programming of the form components is permitted (deviations, eccentricity, ovality, etc.). The Output command 3 is still updated.

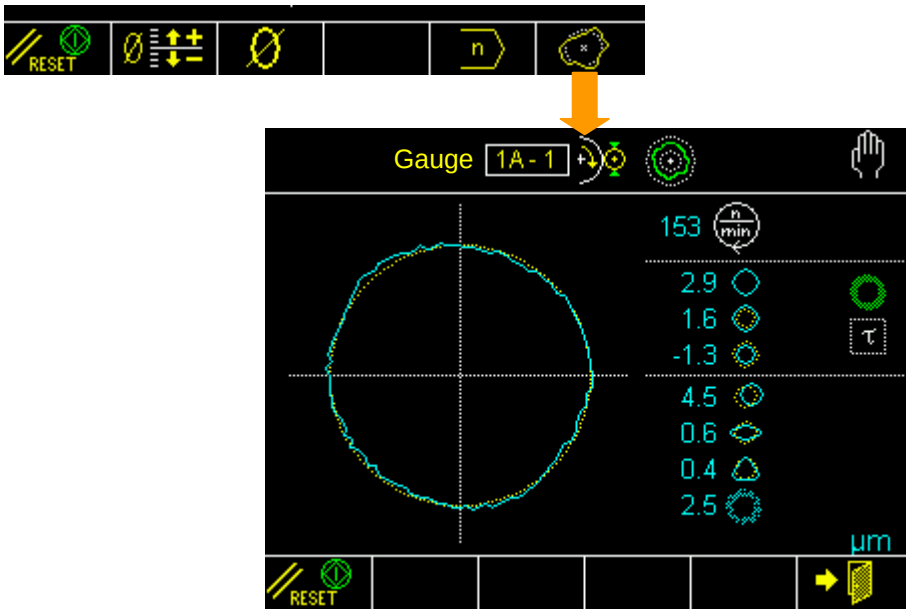


System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the gauge device to automatic mode
	Parameters	Parameters setup

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Reset	The reset of the thresholds carries out the following operations: 1. Reset of the signallings refering to the four quote thresholds. Any signallings sent to the CNC of the machine are removed, and the four thresholds are reset, thereby bringing the system back to normal working conditions. 2. If modifications have been made to the general parameters, be it the formulas or the thresholds, the new values imposed will be activated.
	F2	Offset correction	Access to the modification of the numerical values of the offset
	F3	Zeroing	Access to the zeroing functions
	F5	Part-program	Selection of the part-program which should be activated from the work-piece. The part-programs are numbered from 1 to 8. Selecting 0 the part program is managed by the PLC through the digital interface. Selecting a number between 1 and 8, the correspondent part-program willl be used and the PLC selection is ignored. ***NOTE:*** *In automatic mode the part-program is always selected by the PLC.*
	F6	Roundness	The command allows access to the roundness analysis page

4.4.2.2.1 Roundness

To access the Roundness analysis function, press the **Roundness**  **[F5]** button.

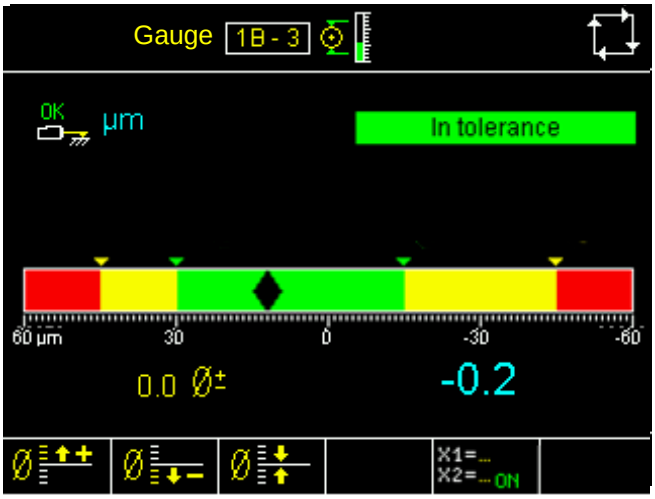


Commands			
Icon	**Command name**	**Button**	**Description**
	Start / Stop	F1	Start / Stop the roundness procedure
	Roundness analysis ON /OFF	F3	Start / Stop the roundness analysis
	Exit	F6	Exit from the function

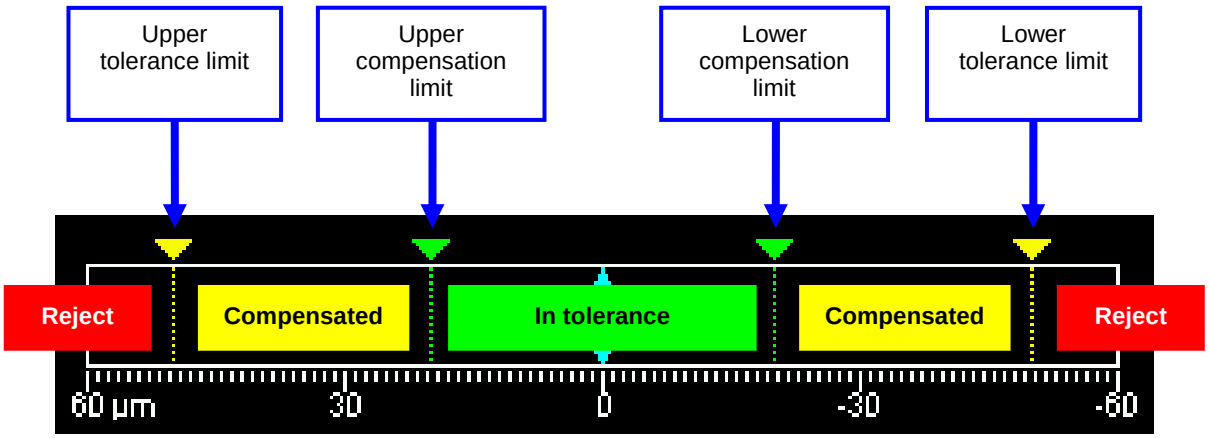
4.4.3. Post-Process gauging

4.4.3.1. Automatic mode

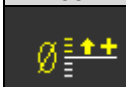
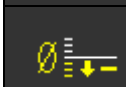
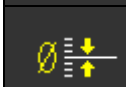
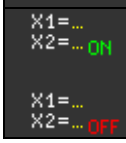
In automatic mode, the NCU starts the gauging cycle. The system resets the output commands 1..4 and starts the measure acquisition. As soon as the command 4 (data ready) is triggered, the coded output commands 1..3 are ready to rapresent the dimensional status of the piece (for the coding scheme see Components).



The system displays the dimension status of the piece according to the programmed tolerance and compensation limits.



System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the gauge device to manual mode

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Offset increment	Increments the offset value
	F2	Offset decrement	Decrements the offset value
	F3	Offset reset	Takes the offset value to zero
	F5	Diagnostic variables ON /OFF	Enables the display of diagnostic variables

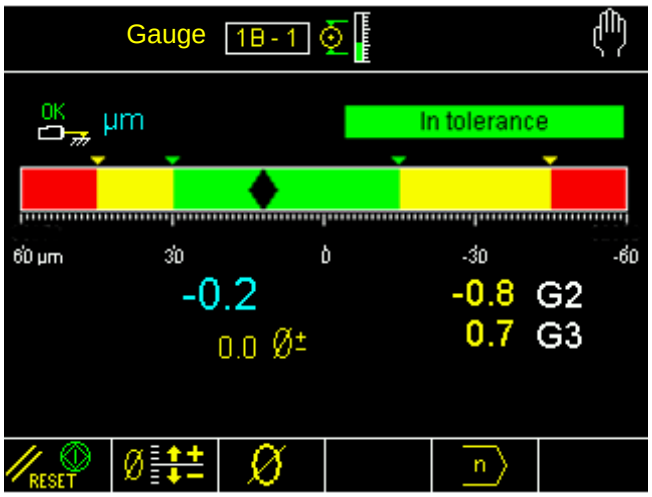
4.4.3.2. Manual mode

In manual mode the device functions are completely indipendent from the PLC of the machine. All the commands to the device are entered by hand from the keyboard. The signallings to the PLC of the machine are still maintained.

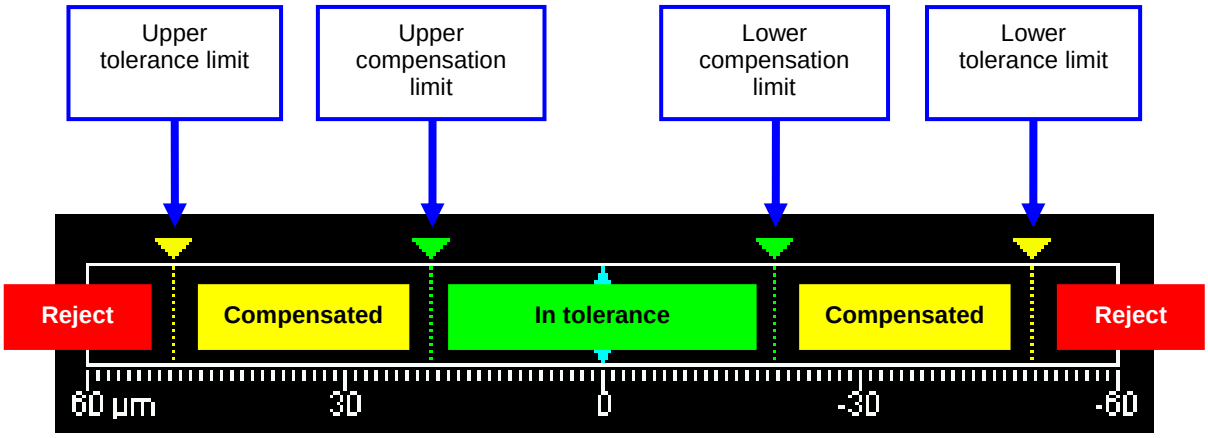
Using the Reset command 

[F1] the measuring system restores the outputs S1..S4 relative to the commands and starts the dimensional check of the piece.

The manual operating mode is accessible at the PROGRAMMER level or higher.



The system displays the dimension status of the piece according to the programmed tolerance and compensation limits.



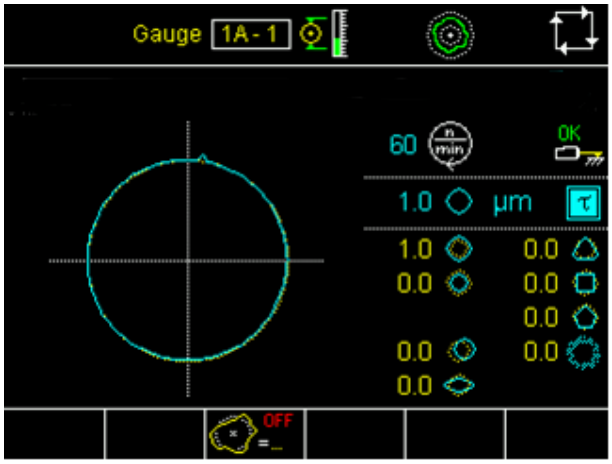
System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the gauge device to automatic mode

Commands			
Icon	**Button**	**Name**	**Description**
	F1	Reset	The reset of the thresholds carries out the following operations: 1. Reset of the signallings refering to the four quote thresholds. Any signallings sent to the CNC of the machine are removed, and the four thresholds are reset, thereby bringing the system back to normal working conditions. 2. If modifications have been made to the general parameters, be it the formulas or the thresholds, the new values imposed will be activated.
	F2	Offset correction	Access to the modification of the numerical values of the offset
	F3	Zeroing	Access to the zeroing functions
	F5	Part Program	Selection of the part-program which should be activated from the work-piece. The part-programs are numbered from 1 to 8. Selecting 0 the part program is managed by the PLC through the digital interface. Selecting a number between 1 and 8, the correspondent part-program willl be used and the PLC selection is ignored. ***NOTE:*** *In automatic mode the part-program is always selected by the PLC.*
	F4	Diagnostic variables ON /OFF	Enables the display of diagnostic variables

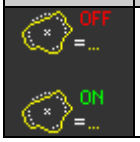
4.4.4. Post-Process roundness analysis

4.4.4.1. Automatic mode

In automatic mode, the NCU starts the gauging cycle. The system resets the output commands 1..4 and starts the measure acquisition. As soon as the command 4 (data ready) is triggered, the output commands 1..3 are updated to rapresent the roundness status of the piece as per the related programmed parameters and formula (see Components for details).



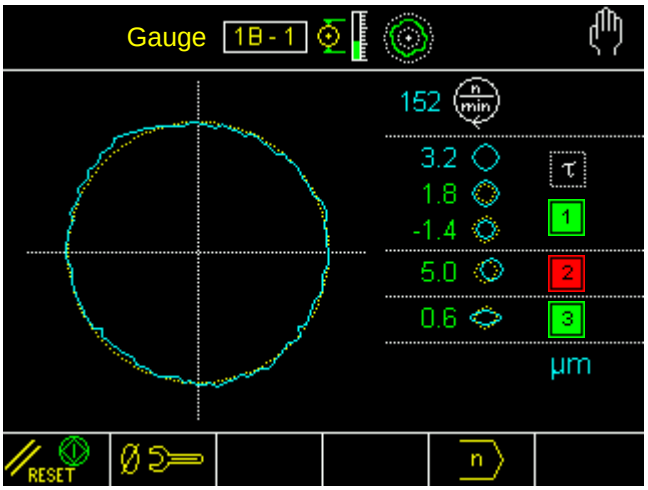
System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the gauge device to manual mode

Commands			
Icon	**Command name**	**Button**	**Description**
	Roundness analysis ON /OFF	F3	Start / Stop the roundness analysis

4.4.4.2. Manual mode

The manual operating mode is accessible at the PROGRAMMER level or higher.

In manual mode the device functions are completely indipendent from the CNC of the machine. All the commands to the device are entered by hand from the keyboard. The signallings towards the CNC of the machine are, however, maintained.



System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the gauge device to automatic mode
	Parameters	Parameters setup

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Start / Stop	Start / Stop the roundness procedure
	F2	Mechanical zeroing	Access to the mechanical zeroing page
	F3	Roundness analysis ON /OFF	Start / Stop the roundness analysis
	F5	Part-Program change	Selection of the part-program which should be activated fro the work-piece. The part-programs are numbered from 1 to 8. Selecting 0 the part program is managed by the NCU through the digital interface. Selecting a number between 1 and 8, the correspondent part-program willl be used and the NCU selection is ignored. ***NOTE:*** *In automatic mode the part-program is always selected by the NCU/PLC*

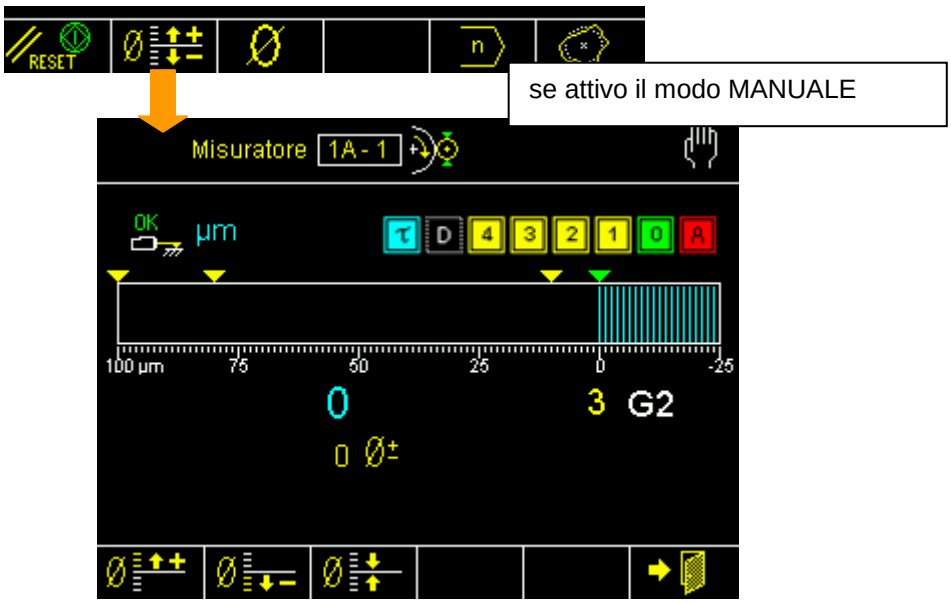
4.4.5. Commands details

4.4.5.1. Offset correction

To correct the offset:

- While in manual mode, use the command **Offset correction** **[F2]** to access the offset correction page related to the actual part-program
- Use the buttons:
  - **[F1]** to increment the offset
  - **[F2]** to decrement the offset
  - **[F3]** to reset the offset

While in manual mode, press **Exit** **[F6]** to return to the main page



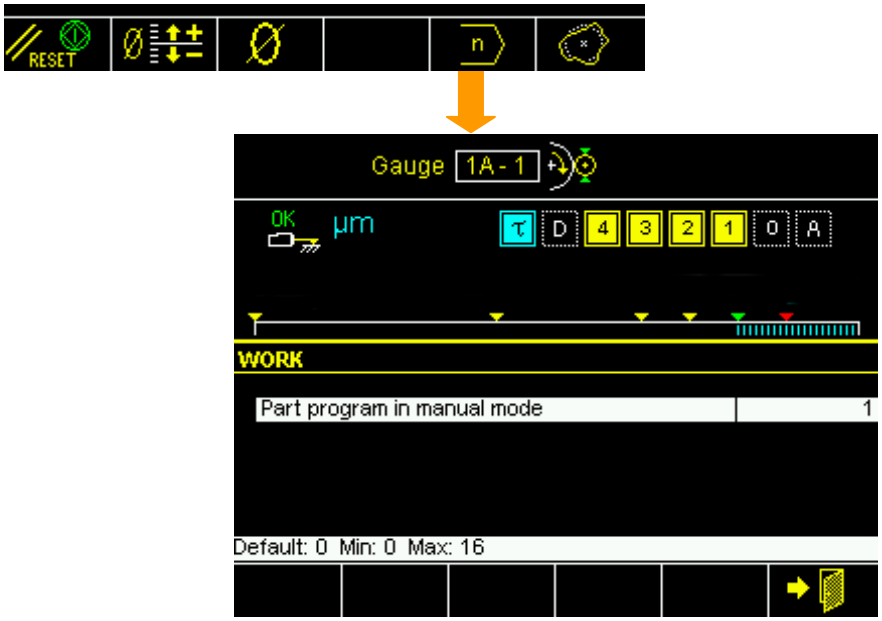
Correction commands			
Icon	**Command name**	**Button**	**Description**
	Offset increment	F1	Increments the offset value – programmable step
	Offset decrement	F2	Decrements the offset value – programmable step
	Offset reset	F3	Takes the offset value to zero
	Exit	F6	Exit from the function

NOTE: *the offset is resetted by electronic zeriong procedure.*

4.4.6. Part-Program change

To change the current part-program:

- Set the operating mode to manual using the key 
- Use the Change **Part-Program command**  **[F5]**
- Use the keuy  and  to set the new value
- Press  to save the new value
- Press **Exit**  **[F6]** to return to the main page
- Activate the new part program with the Reset command  **[F1].**



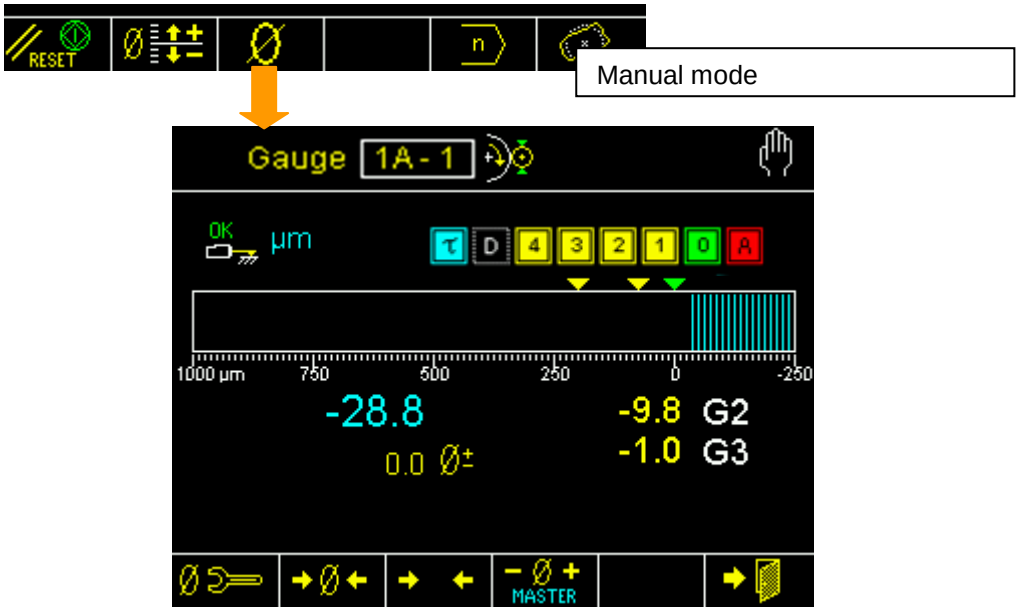
Commands – Part-Program change			
Icon	**Command name**	**Button**	**Description**
	Exit	F6	Exit from the function

NOTE: *Selecting "0" the system will activate the part-program selected by the NCU through the digital inputs.*

4.4.7. Zeroing

Prior to starting the working cycle, it is necessary to zero the gauging system. Since the work is done by removal, the zero point is the final quote of the worked piece.

- Set-up of the work program to be used during the cycle then
- Press the **Zeroing** **[F3]** button to access the zeroing page



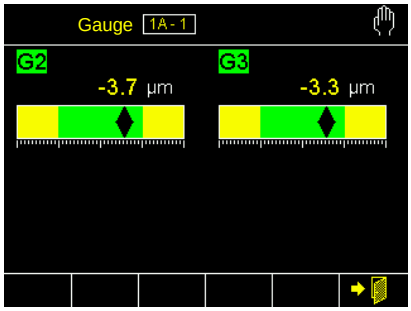
Zeroing commands			
Icon	**Button**	**Name**	**Description**
	F1	Mechanical zeroing	Access to the mechanical zeroing page
	F2	Electronic zeroing	Electronic zeroing execution
	F3	Reset of the electronic zeroing	Delete the electronic zeroing value of the active part-program
MASTER	F4	Master deviation	Access to the set up of the master deviation parameter
	F6	Exit	Exit

4.4.7.1. Procedure

Mechanical Zero

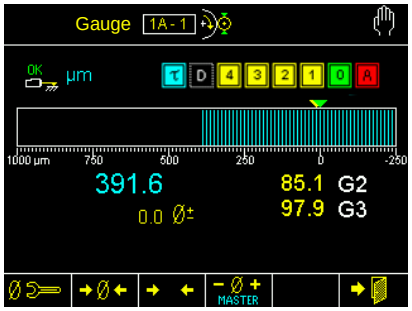
RAW adjustment of the tips

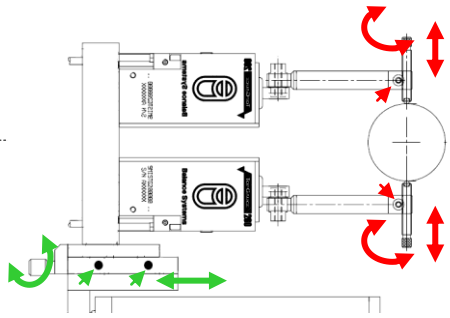
- Press **Mechanical Zeroing** **[F1]**
- Unlock the tips
- Shift each tip until a dimension in the range ±50.0 µm is diplayed
- Lock both tips



Searching for the diameter (Max Dimension)

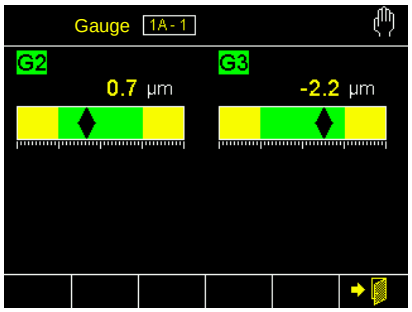
- Press **Exit** **[F6]** to go back to zeroing page
- Unlock the screws of the fine slide
- Rotate the knob to move back / forward the equipment until the MAX dimension is reached and displayed on the screen
- Lock the screw of the fine slide





FINE adjustment of the tips

- Press **Mechanical Zeroing** **[F1]**
- Unlock the tips again
- Shift each tip until a dimension in the range ±50.0 µm is diplayed
- Lock both tips



Electronic Zero

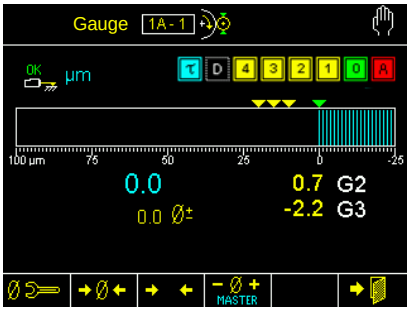
Electronic Zero

Continous surface → Static ZERO

- Press **Exit** **[F6]** to go back to the zeroing page
- Press **Electronic Zeroing** **[F2]**

***NOTE:** the electronic zeroing resets the offset*

Interrupted surface → Synchronized ZERO



4.4.7.2. Master deviation from zero

To set up the master deviation from zero

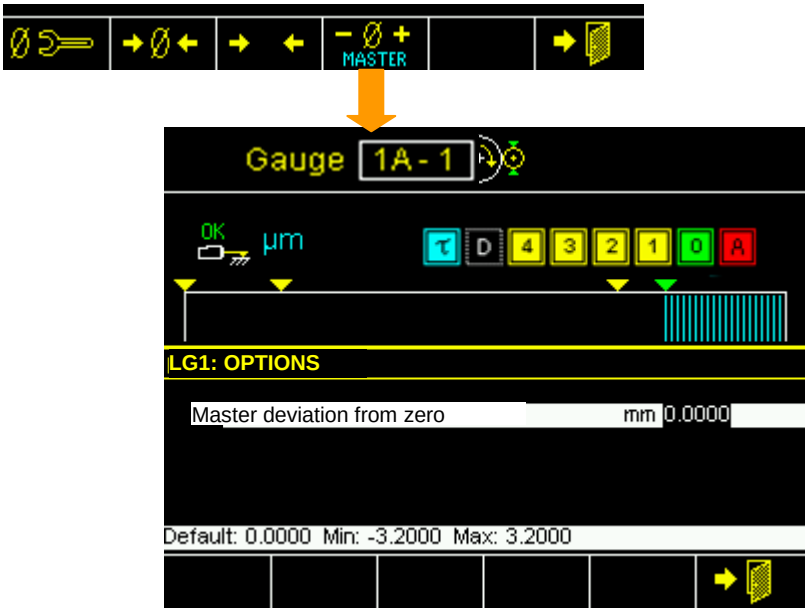
- Press the 

[F4] button
- Use the 

and 

buttons to modify the value
- Press 

to save the new value
- Press the **Exit** 
[F6] button to go back to the main page



Correction commands			
Icon	**Button**	**Name**	**Description**
	F6	Exit	Exit

4.5. WORK parameter

To access the WORK parameters, press the **Parameters**  button

For the description of the WORK parameter, refer to the document Parameter Setup

5. Gauge [type NG]

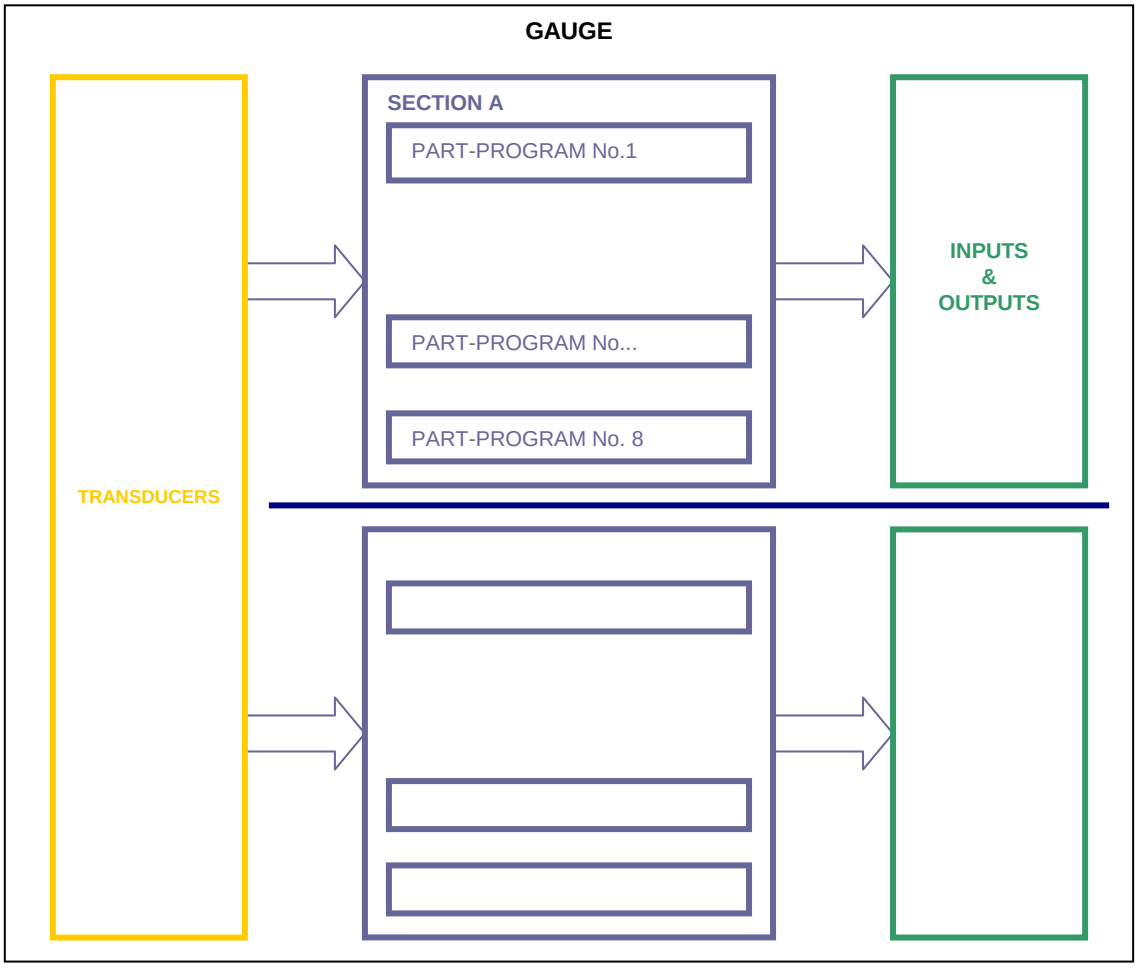
5.1. Introduction

The gauging system, or more precisely the precision comparator, is used both in-process and post-process.

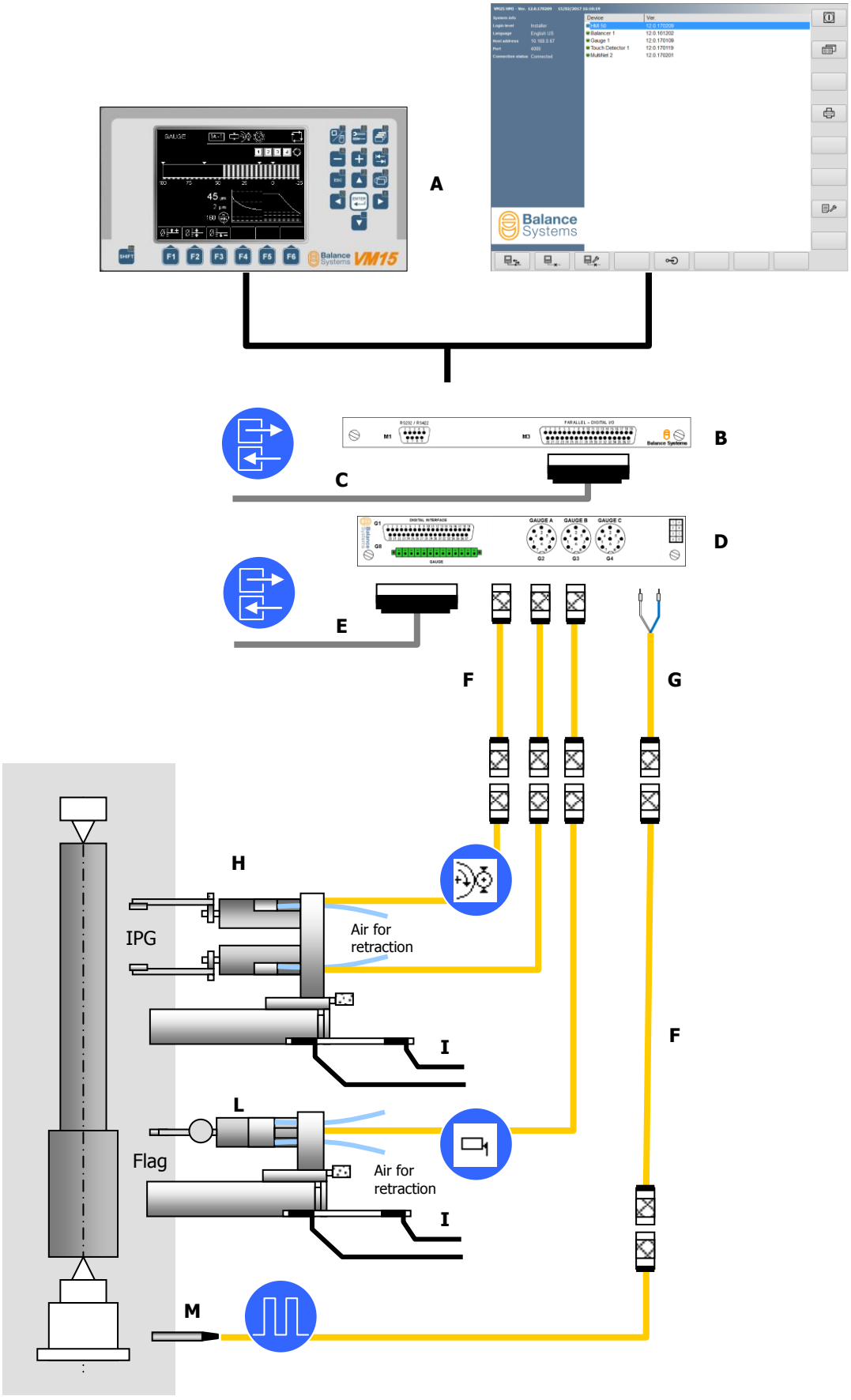
- with the in-process mode the system controls the dimension during the work phase of the piece.
- with the post-process mode the system checks the final dimension of the finished piece.

All the working phases can be controlled by means of an interface with the CNC of the grinding machine.
The gauge card can accept up to 8 part-programs, which may be activated one by one, manually or by means of the CNC, where each one is dedicated to a particular set-up of the thresholds of signalling and programming of the gauging heads (see the organisation chart of the gauge).

ORGANIZATION SCHEME OF THE GAUGE



The components of the gauge system are shown in the following picture.

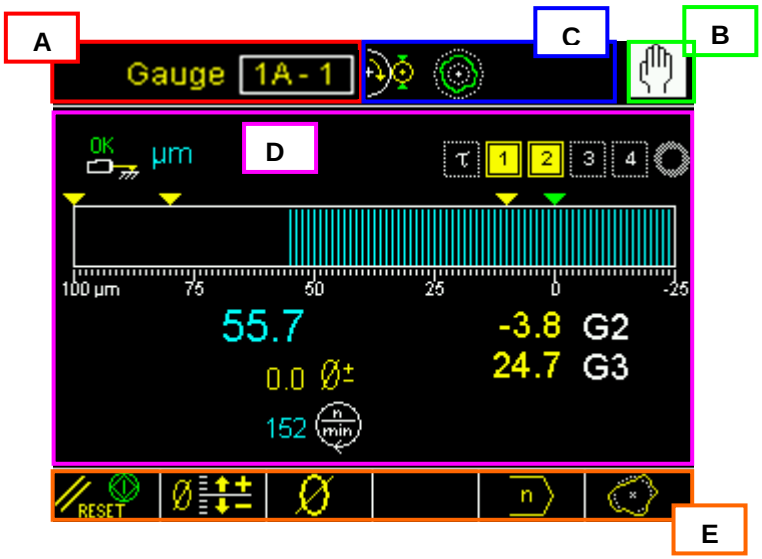


Component	Description
A	User interface: VM15 Panel
B	Multilink card (opzional): BIN/BCD interface
C	Digital interface – dimension data in BIN/BCD format (position – flag)
D	Gauge card
E	Digital interface (I/O signals)
F	Extension cables
G	Synchronism cable adapter
H	Diameter gauge equipment
I	Sensors for slide positioning

The available functions depend on the acces level defined by the system installer.

The gauging function may be used in automatic or in manual mode. In automatic mode, all commands and possible signallings are carried out by means of the interface of the CNC of the machine. The operator panel furnishes only a monitoring of the functioning state, and gives the operator the only possibility to correct the offset values of the thresholds imposed in the formulas.
In manual mode, the gauging system carries out only those functions that may be selected from the command menu, maintaining the possible signallings towards the CNC of the machine.

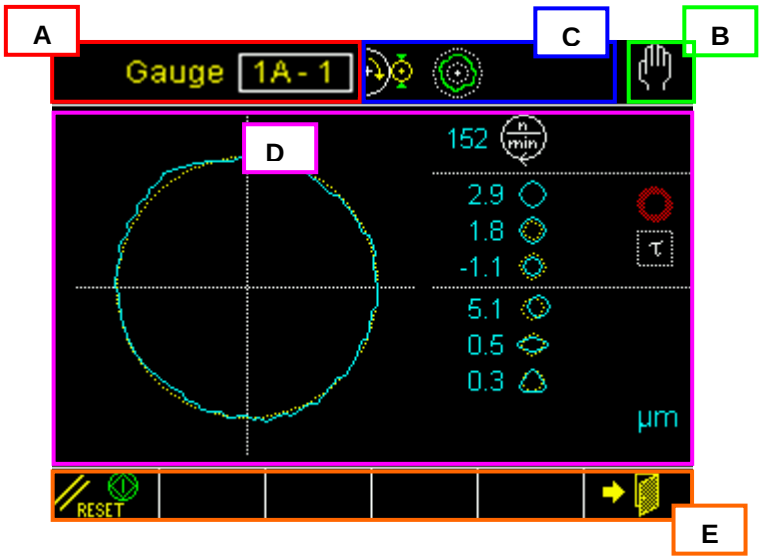
5.2. Status page



F. Device name:

GAUGE 1 – A1 indicates **GAUGE 1 Section A, Part-Program 1**

G. Operating mode (Automatic / Manual)
H. Area reserved to status signalling.
I. Graphic area to rappresent the diagrams of the sources
   - Dimension diagram
   - Output commands status
   - Gauging head status
   - Numerical value of the dimension
   - Numerical value of the programmed offset
   - Rotation speed of the workhead
   - Numerical value of each gauging transducer
J. Command line, accessible by [Fx] buttons.



F. Device name:

GAUGE 1 – A1 indicates **GAUGE 1 Section A, Part-Program 1**

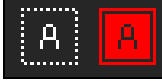
G. Operating mode (Automatic / Manual)
H. Area reserved to status signalling.
I. Graphic area to rappresent the diagrams of the sources
   - Roundness diagram
   - Output commands status
   - Value of the shape components
   - Rotation speed of the workhead
   - Measuring unit
J. Command line, accessible by [Fx] buttons.

5.3. Status and alarm signalling

During the normal operating mode some variable are continously monitored and when necessary, some icons or messages are displayed to inform the operator about such conditions.

NOTE: *When the condition can be dangerous both for the machine integrity and the operator safety a number of signalling to the machine PLC/NCU are generated and icons on the screen will appear for the operator.*

Gauging mode signalling			
Icon	**ID**	**Name**	**Description**
	7012	In-Process gauging	In-Process gauging enabled
	7013	Post-Process gauging	Post-Process gauging enabled
	7015	Roundness analysis	Roundness analysis enabled
µm mil	7001 7002	Measuring unit	Measuring unit

Output commands signalling			
Icon	**ID**	**Name**	**Description**
	7024 7026	Cycle start delay	Timer status Active / Expired to count the start cycle delay
	7042 7044	Dwell timeout	Dwell timeout: in-progress / expired
	7027 7029	Command 4	Not Activ / Activ status of the command 4 output (Roughing)
	7030 7032	Command 3	Not Activ / Activ status of the command 3 output (Finishing)
	7033 7035	Command 2	Not Activ / Activ status of the command 2 output (Super-finishing)
	7036 7038	Command 1	Not Activ / Activ status of the command 1 output (Dwell or Spark-out)
	7039 7041	Command 0	Not Activ / Activ status of the command 0 output (Cycle end, part at the size)
	7045 7047	Warning – Part undersized	Not Activ / Activ status of the command A output (Warning: Part undersized)

Gauge transducers signalling			
Icon	**ID**	**Name**	**Description**
	7003	TG200 error	TG200 gauge head non connected or not ready
	1004	TG200 error	TG200 gauge head measuring dimension not valid
	7004	In measuring poosition	The gauge head is in measuring position
	7005	Retraction	The gauge head has retracted the fingers
	7006	Retraction not executed	ALARM: the gauging head cannot retract the fingers
	7017	Overrange	Out of measuring range
		Max dimension	Max dimension reached
	7008	Hold dimension	Freeze the current dimension

Roundness signalling			
Icon	**ID**	**Name**	**Description**
	7062 7060	Roundness threshold 1	Roundness threshold No.1 In / Out tolerance
	7065 7063	Roundness threshold 2	Roundness threshold No.2 In / Out tolerance
	7068 7066	Roundness threshold 3	Roundness threshold No.3 In / Out tolerance
		Roundness inactive	The roundness analysis is not started
	7048	Roundness out of tolerance	Roundness out of tolerance
	7049	Roundness in tolerance	Roundness in tolerance

Roundness and shape components signalling			
Icon	**ID**	**Name**	**Description**
	7051	Runout error	Total roundness error
	7053	Exernal deviation	Top profile dimension
	7052	Internal deviation	Bottom profile dimension
	7054	Excentricity	Value of the excentricity component
	7055	Ovality	Value of the ovality component
	7056	3-lobed	Value of the 3rd component
	7057	4-lobed	Value of the 4th component
	7058	5-lobed	Value of the 5th component
	7059	Residual	Value of the residual component

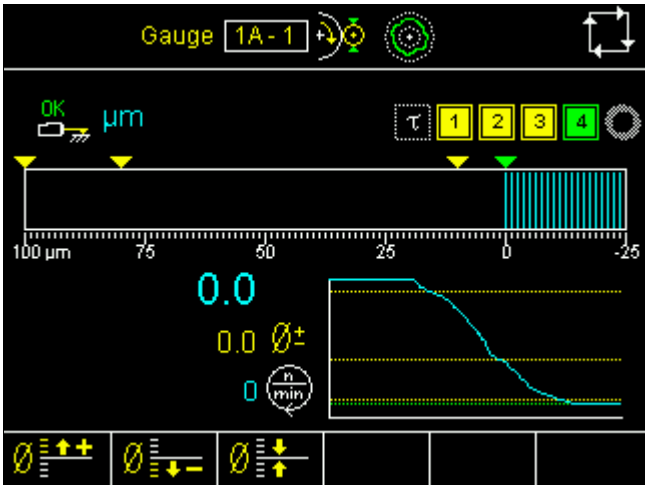
5.4. Commands

5.4.1. In Process gauge

5.4.1.1. Automatic mode

In automatic mode, the device is controlled entirely by the CNC of the machine. The only exceptions, where the operator may intervene from the keyboard, are the possibility to carry out manual corrections of the offset value of the master piece and the comutation to manual mode, where one accesses all commands.

In automatic mode, the operator can see on the monitor the quotes of the programs activated in the two sections, in numerical value as well as with graphics bar. In addition, the activated output commands are marked.



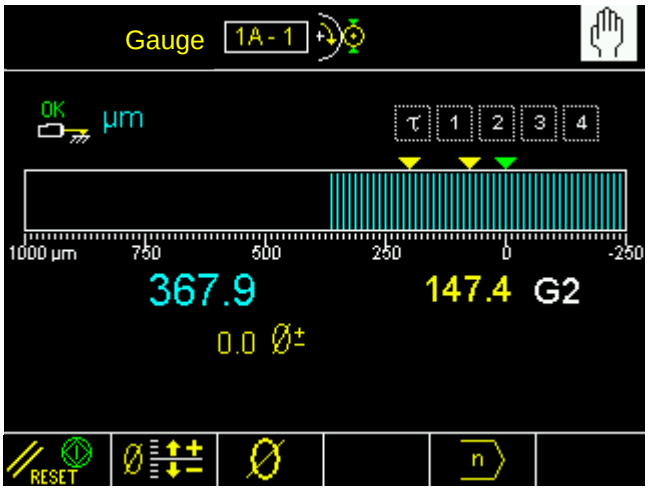
System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the gauge device to manual mode

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Offset increment	Increments the offset value
	F2	Offset decrement	Decrements the offset value
	F3	Offset reset	Takes the offset value to zero

5.4.1.2. Manual mode

The manual operating mode is accessible at the PROGRAMMER level only.

In manual mode the device functions are completely indipendent from the CNC of the machine. All the commands to the device are entered by hand from the keyboard. The signallings towards the CNC of the machine are, however, maintained.



System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the gauge device to automatic mode
	Parameters	Parameters setup

Commands			
Icon	**Button**	**Name**	**Description**
	F1	Reset	The reset of the thresholds carries out the following operations: 3. Reset of the signallings refering to the four quote thresholds. Any signallings sent to the CNC of the machine are removed, and the four thresholds are reset, thereby bringing the system back to normal working conditions. 4. If modifications have been made to the general parameters, be it the formulas or the thresholds, the new values imposed will be activated.
	F2	Offset correction	Access to the modification of the numerical values of the offset
	F3	Zeroing	Access to the zeroing functions
	F2	Part Program	Selection of the part-program which should be activated from the work-piece. The part-programs are numbered from 1 to 8. Selecting 0 the part program is managed by the PLC through the digital interface. Selecting a number between 1 and 8, the correspondent part-program willl be used and the PLC selection is ignored. ***NOTE:*** *In automatic mode the part-program is always selected by the PLC.*

5.4.2. In-Process gauging and Roundness analysis

Enabling the In-Process gauging with roundness analysis, the in-process gauging cycle previously decribed is followed by the roundness analysis process.

NOTE: *A necessary condition both for automatic and manual modes when using the in-process roundness analysis is the synchronizing signal from which the piece rpm is detected.*

5.4.2.1. Automatic mode

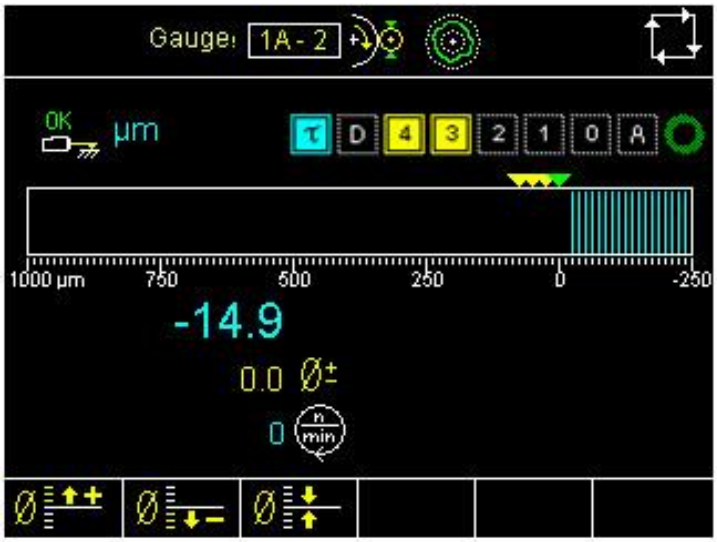
The roundness analysis supplies to the machine's CNC a signal that means that the piece is within or off roundness tolerance based on the programmed max internal and external deviations. The signals act as follows, during the automatic cycle.

Once a cycle is started, the output commands (0...4) signals changes in order to allow the CNC control to switch to pre-programmed feed rates.

When the roundness analysis is enabled, the command 3 is also used to signal the work-piece roundness status to the NCU. During the working pheses the commands (0..4) are managed as follows:

5. At the start cycle the command 1 works as first skip signal (machine will reduce the feed rate)
6. After the command 2 activation, when usually starts the finishing phase, the output command 1 will be resetted.
7. Simoultaneausly with the command 3 reset the system starts the roundness monitoring.
8. As soon as the command 4 (end cycle) will be activated, the output command 3 will be updated with the roundness status of the finished work-piece. In details:
   - Command 3 activated → Roudness in tolerance
   - Command 3 not active → Roudness out of tolerance

In automatic mode, to warrant the cycle-time, the roundness digram is not displayed.



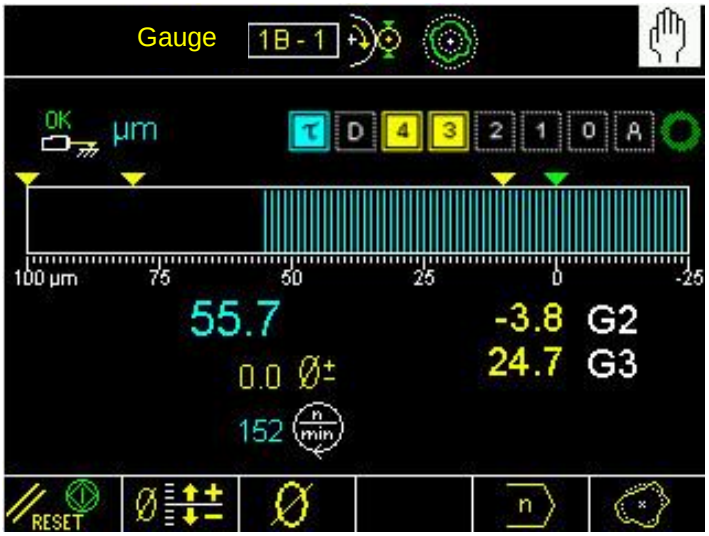
System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the gauge device to manual mode

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Offset increment	Increments the offset value
	F2	Offset decrement	Decrements the offset value
	F3	Offset reset	Takes the offset value to zero

5.4.2.2. Manual mode

The manual operating mode is accessible at the PROGRAMMER level or higher.

In manual mode, a detailed roundness analysis of the piece is possible. The system can display, with a programmed resolution, the roundness diagram; also the programming of the form components is permitted (deviations, eccentricity, ovality, etc.). The Output command 3 is still updated.

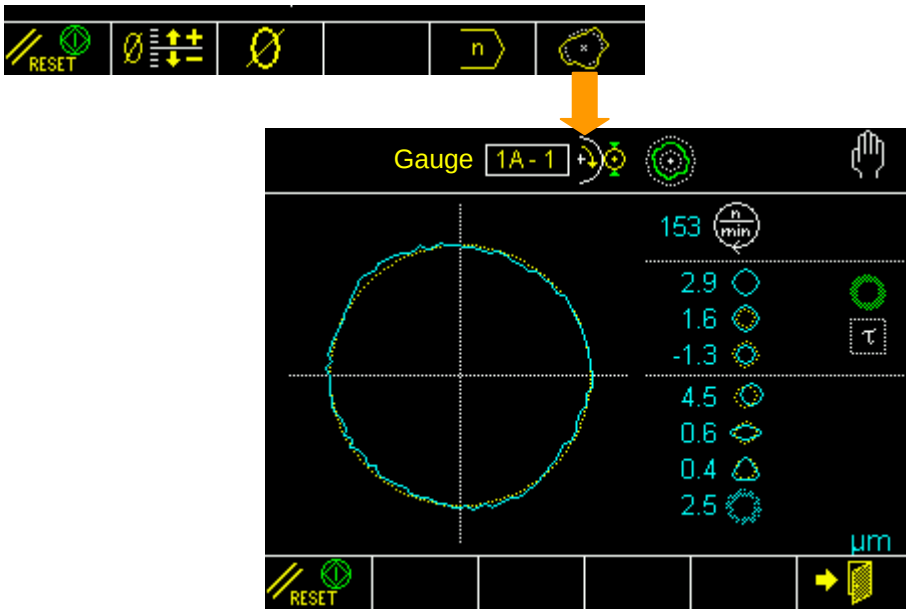


System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the gauge device to automatic mode
	Parameters	Parameters setup

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Reset	The reset of the thresholds carries out the following operations: 3. Reset of the signallings refering to the four quote thresholds. Any signallings sent to the CNC of the machine are removed, and the four thresholds are reset, thereby bringing the system back to normal working conditions. 4. If modifications have been made to the general parameters, be it the formulas or the thresholds, the new values imposed will be activated.
	F2	Offset correction	Access to the modification of the numerical values of the offset
	F3	Zeroing	Access to the zeroing functions
	F5	Part-program	Selection of the part-program which should be activated from the work-piece. The part-programs are numbered from 1 to 8. Selecting 0 the part program is managed by the PLC through the digital interface. Selecting a number between 1 and 8, the correspondent part-program willl be used and the PLC selection is ignored. ***NOTE:*** *In automatic mode the part-program is always selected by the PLC.*
	F6	Roundness	The command allows access to the roundness analysis page

5.4.2.2.1 Roundness

To access the Roundness analysis function, press the **Roundness**  **[F5]** button.

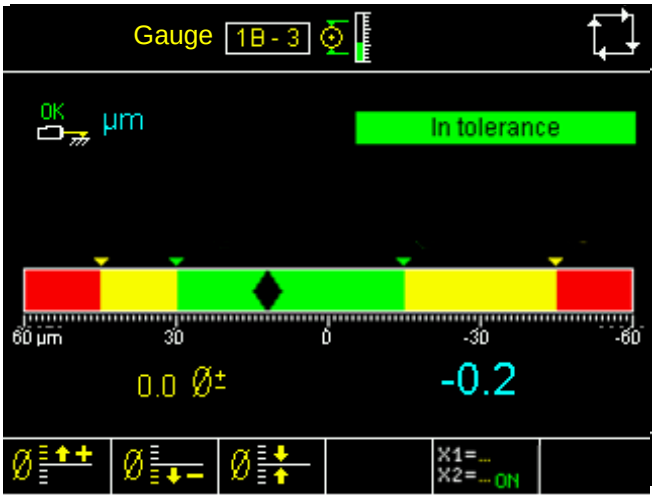


Commands			
Icon	**Command name**	**Button**	**Description**
	Start / Stop	F1	Start / Stop the roundness procedure
	Roundness analysis ON /OFF	F3	Start / Stop the roundness analysis
	Exit	F6	Exit from the function

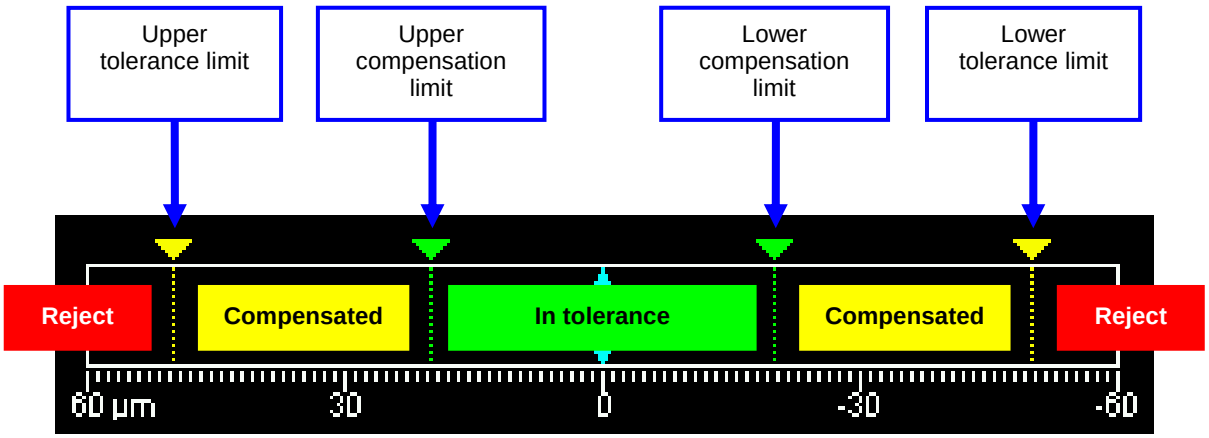
5.4.3. Post-Process gauging

5.4.3.1. Automatic mode

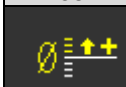
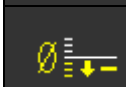
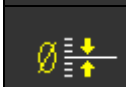
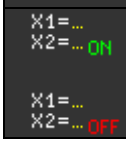
In automatic mode, the NCU starts the gauging cycle. The system resets the output commands 1..4 and starts the measure acquisition. As soon as the command 4 (data ready) is triggered, the coded output commands 1..3 are ready to rapresent the dimensional status of the piece (for the coding scheme see Components).



The system displays the dimension status of the piece according to the programmed tolerance and compensation limits.



System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the gauge device to manual mode

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Offset increment	Increments the offset value
	F2	Offset decrement	Decrements the offset value
	F3	Offset reset	Takes the offset value to zero
	F5	Diagnostic variables ON /OFF	Enables the display of diagnostic variables

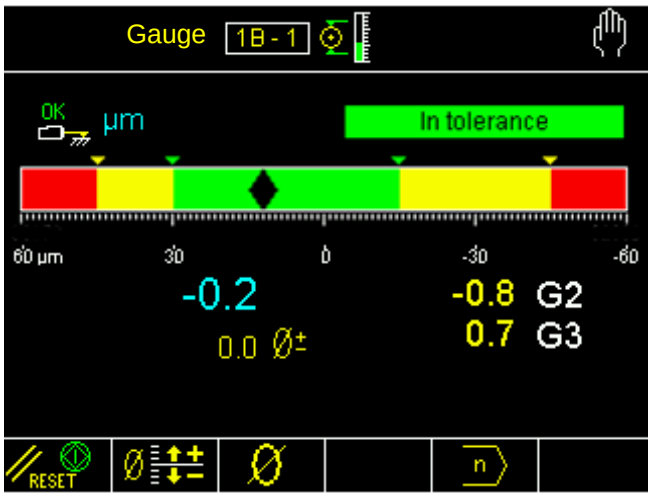
5.4.3.2. Manual mode

In manual mode the device functions are completely indipendent from the PLC of the machine. All the commands to the device are entered by hand from the keyboard. The signallings to the PLC of the machine are still maintained.

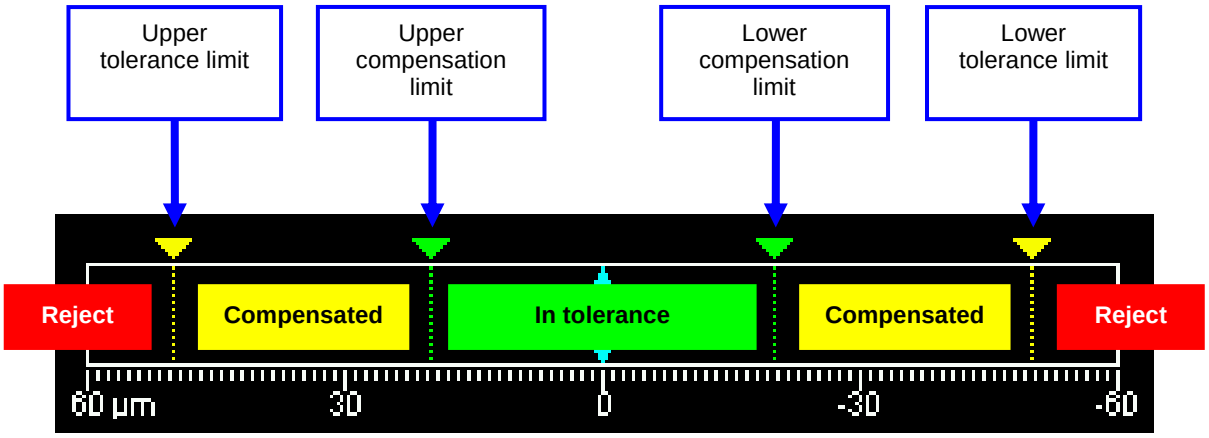
Using the Reset command 

[F1] the measuring system restores the outputs S1..S4 relative to the commands and starts the dimensional check of the piece.

The manual operating mode is accessible at the PROGRAMMER level or higher.



The system displays the dimension status of the piece according to the programmed tolerance and compensation limits.



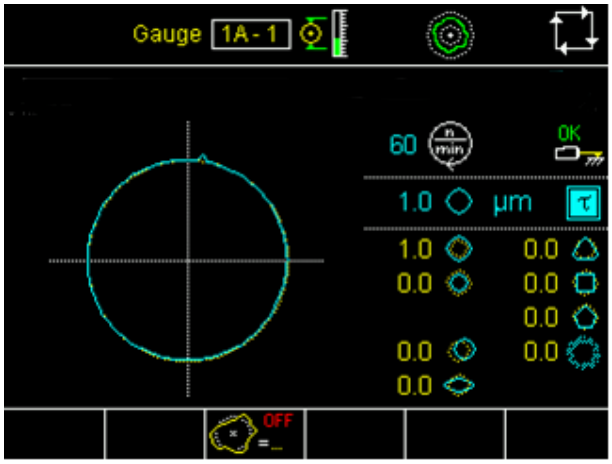
System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the gauge device to automatic mode

Commands			
Icon	**Button**	**Name**	**Description**
	F1	Reset	The reset of the thresholds carries out the following operations: 3. Reset of the signallings refering to the four quote thresholds. Any signallings sent to the CNC of the machine are removed, and the four thresholds are reset, thereby bringing the system back to normal working conditions. 4. If modifications have been made to the general parameters, be it the formulas or the thresholds, the new values imposed will be activated.
	F2	Offset correction	Access to the modification of the numerical values of the offset
	F3	Zeroing	Access to the zeroing functions
	F5	Part Program	Selection of the part-program which should be activated from the work-piece. The part-programs are numbered from 1 to 8. Selecting 0 the part program is managed by the PLC through the digital interface. Selecting a number between 1 and 8, the correspondent part-program willl be used and the PLC selection is ignored. ***NOTE:*** *In automatic mode the part-program is always selected by the PLC.*
	F4	Diagnostic variables ON /OFF	Enables the display of diagnostic variables

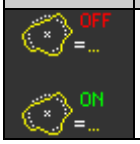
5.4.4. Post-Process roundness analysis

5.4.4.1. Automatic mode

In automatic mode, the NCU starts the gauging cycle. The system resets the output commands 1..4 and starts the measure acquisition. As soon as the command 4 (data ready) is triggered, the output commands 1..3 are updated to rapresent the roundness status of the piece as per the related programmed parameters and formula (see Components for details).



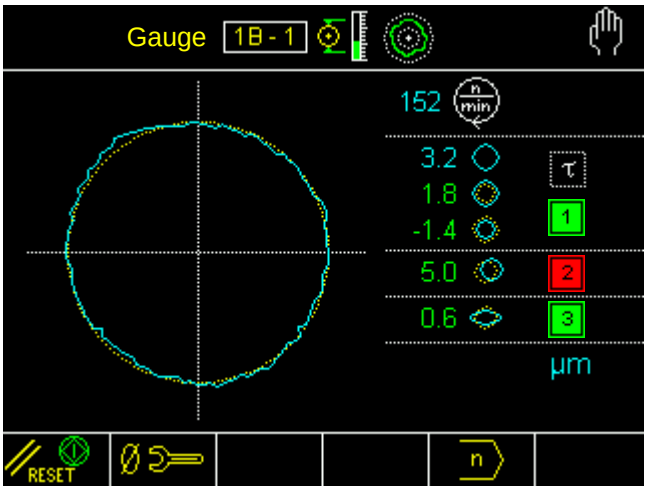
System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Manual	Switches the gauge device to manual mode

Commands			
Icon	**Command name**	**Button**	**Description**
	Roundness analysis ON /OFF	F3	Start / Stop the roundness analysis

5.4.4.2. Manual mode

The manual operating mode is accessible at the PROGRAMMER level or higher.

In manual mode the device functions are completely indipendent from the CNC of the machine. All the commands to the device are entered by hand from the keyboard. The signallings towards the CNC of the machine are, however, maintained.



System commands		
Icon	**Name**	**Description**
	Change page	Switches the displayed page between the installed devices
	Automatic	Switches the gauge device to automatic mode
	Parameters	Parameters setup

Correction commands			
Icon	**Button**	**Name**	**Description**
	F1	Start / Stop	Start / Stop the roundness procedure
	F2	Mechanical zeroing	Access to the mechanical zeroing page
	F3	Roundness analysis ON /OFF	Start / Stop the roundness analysis
	F5	Part-Program change	Selection of the part-program which should be activated fro the work-piece. The part-programs are numbered from 1 to 8. Selecting 0 the part program is managed by the NCU through the digital interface. Selecting a number between 1 and 8, the correspondent part-program willl be used and the NCU selection is ignored. ***NOTE:*** *In automatic mode the part-program is always selected by the NCU/PLC*

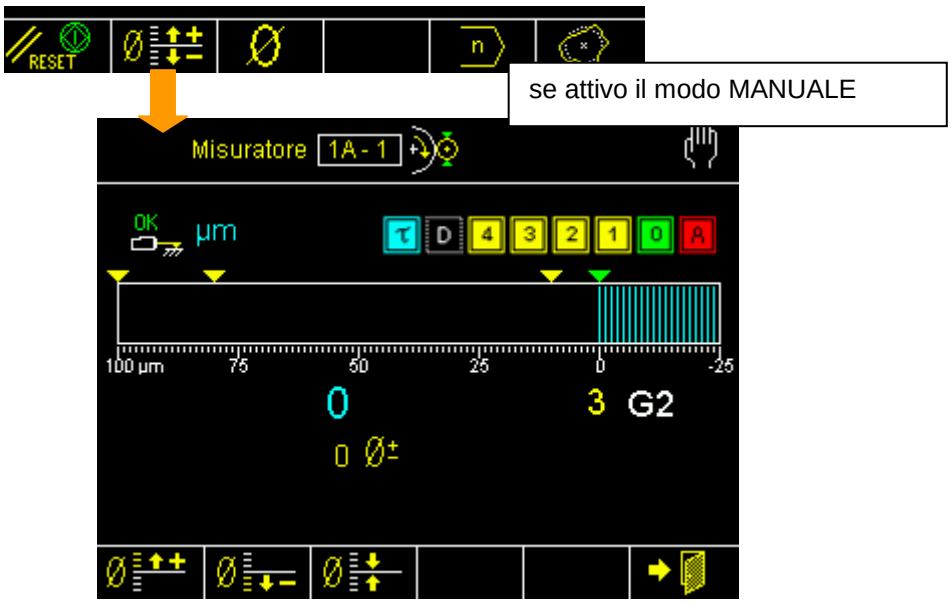
5.4.5. Commands details

5.4.5.1. Offset correction

To correct the offset:

- While in manual mode, use the command **Offset correction**  **[F2]** to access the offset correction page related to the actual part-program
- Use the buttons:
  -  **[F1]** to increment the offset
  -  **[F2]** to decrement the offset
  -  **[F3]** to reset the offset

While in manual mode, press **Exit**  **[F6]** to return to the main page



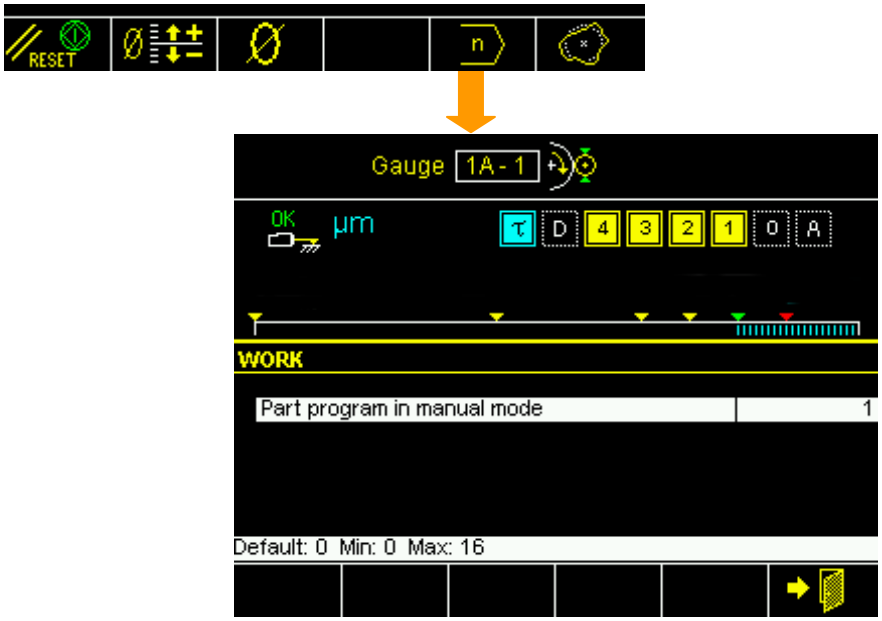
Correction commands			
Icon	**Command name**	**Button**	**Description**
	Offset increment	F1	Increments the offset value – programmable step
	Offset decrement	F2	Decrements the offset value – programmable step
	Offset reset	F3	Takes the offset value to zero
	Exit	F6	Exit from the function

NOTE: *the offset is resetted by electronic zeriong procedure.*

5.4.6. Part-Program change

To change the current part-program:

- Set the operating mode to manual using the key 
- Use the Change **Part-Program command**  **[F5]**
- Use the keuy  and  to set the new value
- Press  to save the new value
- Press **Exit**  **[F6]** to return to the main page
- Activate the new part program with the Reset command  **[F1].**



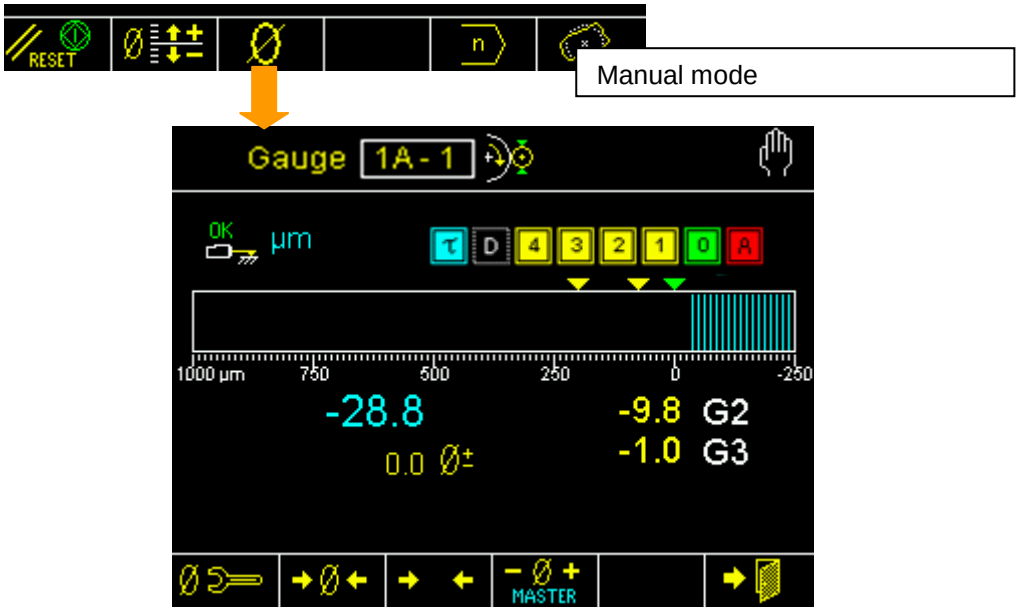
Commands – Part-Program change			
Icon	**Command name**	**Button**	**Description**
	Exit	F6	Exit from the function

NOTE: *Selecting "0" the system will activate the part-program selected by the NCU through the digital inputs.*

5.4.7. Zeroing

Prior to starting the working cycle, it is necessary to zero the gauging system. Since the work is done by removal, the zero point is the final quote of the worked piece.

- Set-up of the work program to be used during the cycle then
- Press the **Zeroing** **[F3]** button to access the zeroing page



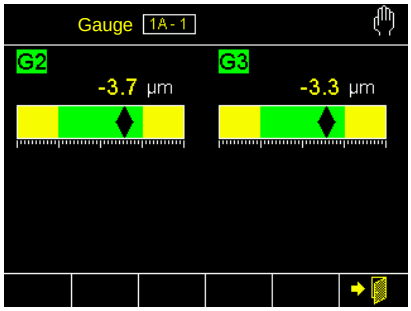
Zeroing commands			
Icon	**Button**	**Name**	**Description**
	F1	Mechanical zeroing	Access to the mechanical zeroing page
	F2	Electronic zeroing	Electronic zeroing execution
	F3	Reset of the electronic zeroing	Delete the electronic zeroing value of the active part-program
MASTER	F4	Master deviation	Access to the set up of the master deviation parameter
	F6	Exit	Exit

5.4.7.1. Procedure

Mechanical Zero

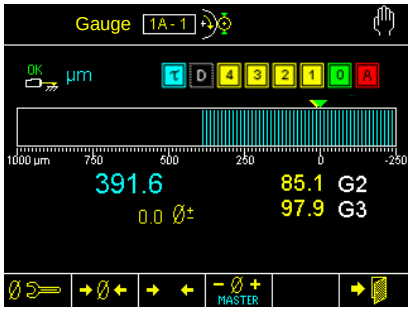
RAW adjustment of the tips

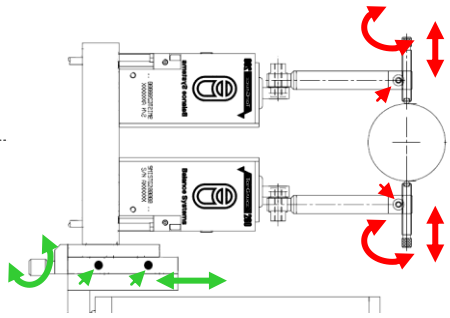
- Press **Mechanical Zeroing** **[F1]**
- Unlock the tips
- Shift each tip until a dimension in the range ±50.0 µm is diplayed
- Lock both tips



Searching for the diameter (Max Dimension)

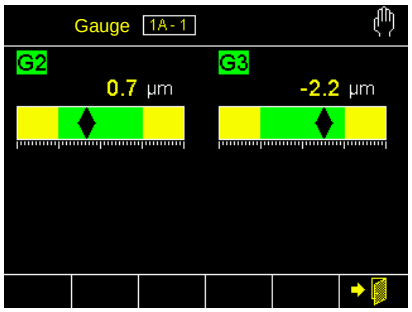
- Press **Exit** **[F6]** to go back to zeroing page
- Unlock the screws of the fine slide
- Rotate the knob to move back / forward the equipment until the MAX dimension is reached and displayed on the screen
- Lock the screw of the fine slide





FINE adjustment of the tips

- Press **Mechanical Zeroing** **[F1]**
- Unlock the tips again
- Shift each tip until a dimension in the range ±50.0 µm is diplayed
- Lock both tips



Electronic Zero

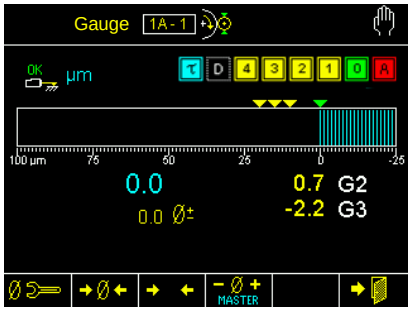
Electronic Zero

Continous surface → Static ZERO

- Press **Exit** **[F6]** to go back to the zeroing page
- Press **Electronic Zeroing** **[F2]**

***NOTE:** the electronic zeroing resets the offset*

Interrupted surface → Synchronized ZERO



5.4.7.2. Master deviation from zero

To set up the master deviation from zero

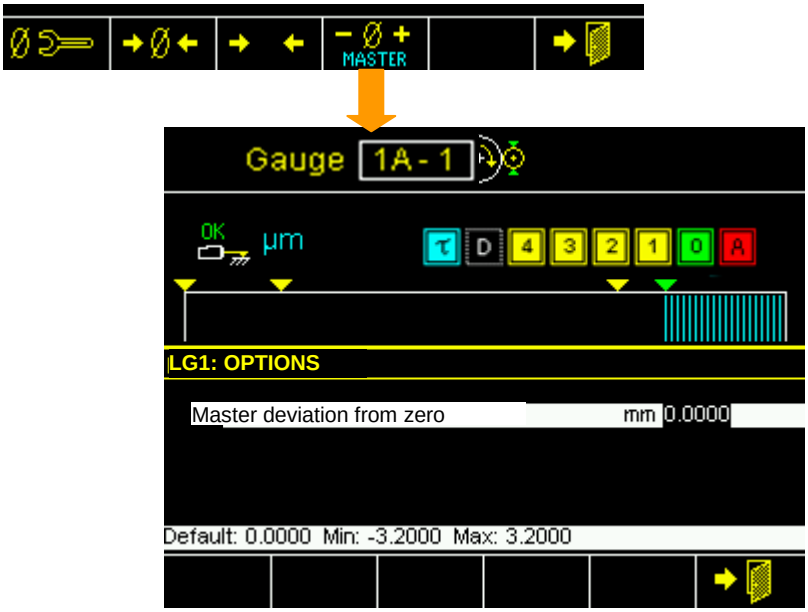
- Press the 

[F4] button
- Use the 

and 

buttons to modify the value
- Press 

to save the new value
- Press the **Exit** 
[F6] button to go back to the main page



Correction commands			
Icon	**Button**	**Name**	**Description**
	F6	Exit	Exit

5.5. WORK parameter

To access the WORK parameters, press the **Parameters**  button

For the description of the WORK parameter, refer to the document Parameter Setup

6. Appendix

Documents referred to in the text		
Name document	**Paragraphs**	**Link**
Setup parameter	2.5, 2.7.2.3, 3.4.3.4, 3.5, 4.5,	9UMEN1505-1200 YYMMDD Parameter Setup v120 En.pdf
Components	4.4.3.1, 4.4.4.1,	9UMEN1506-1200 YYMMDD Components v120 En