MIVI 8004

Technical Manual

Ref.: 124-34/6

Quality system certified

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1 General presentation

1.1 A two-part equipment

The measuring chain is composed of two inseparable elements: the sensor and the electronic device that controls it. The sensor cannot be used with another electronic device because they are matched together as one vibrating system, and vice versa.

The provided viscosity information is relative. In the same fluid and under the same environmental conditions, the information is the same. For two fluids with a different rheological behavior, the response can be different. Since it is perfectly repeatable, it just needs a different correlation.

The active part of the sensor is composed of a vibrating rod held in oscillation at resonance frequency by driving magnets. When the rod is immersed into a viscous material, the amplitude of the vibration is dampened. The vibration amplitude and its frequency vary according to the viscosity and the density of the product where the rod is immersed.

The sensor receiving coil detects the response and the signal is converted to a viscosity and density values through the electronic device. The factory calibration is performed with standard oils.

The electronic device acquires the coils' amplitudes and generates various signals. These signals represent the properties being measured. It is also in charge of powering the whole system.

It is composed of three software modes:

« USER » Mode :

Used for the working mode, it allows:

- Visualizing the viscosity and set point values and the outputs states (relays, control et digital link);
- Accessing to ADAPTATION mode;
- Commuting between the manual and the automatic control.

« ADAPTATION » Mode :

Allows adjusting the functioning parameters as:

- The adjustment of zero in air;
- Hysteresis and thresholds alarms values;
- Parameters of the information filter;
- Control parameters (PID, time of cycle, set points values, …)

It allows also accessing to the CONFIGURATION Mode.

« CONFIGURATION » Mode :

Allows defining:

- Viscosity signal linearization;
- Alarm types;
- Output types (relays, analogues, digital);
- Control type, …

1.2 Checking the equipment at the receipt

a) At first, check the supply conformity with the ordered equipment, mainly the presence of the parts necessary for the equipment mounting. Those to be used at the process will be given to the concerned department, for the installation preparation.

b) Place the sensor on a soft foam plate, connect it to processor (see §3.10) and switch on. The vibration appears at the rod, the viscosity indication is close to zero (or close to the minimal required current value of the analog output). When touching the rod, the information has to increase.

In case of subnormal operation *a)* or *b)*, check as follows:

- power supply, connections, cables;
- the good condition of the vibrating rod (no bending on knock damages).

1.3 Checking the equipment when placed at the process

Before filling the network check that the viscosity information is stable (vibrating rod in air). If not, check the strength of the sensor fitting, then rotate the sensor of 90° (4 possible positions). Choose the position where the information is the most stable.

Locate this position, in order to restore it when the sensor is removed – put in place.

Adjust the mounting offset, at room temperature. The rod is vibrating in air.

When possible, note the viscosity information when a cleaning or rinsing solution is flowing.

If the original calibration is convenient, one of the 2 above mentioned values can be taken as reference for periodic control of the equipment operation each time that the same conditions will occur (rod in air, or in the cleaning solution). Such an operation can be assimilated to a self-checking.

If the original calibration has been modified the reference values will be of course those obtained with the new calibration.

1.4 Periodic checking

Conformity to regulations relative to Quality Insurance implicates a periodic control of the measuring equipment used in the manufacturing operations, taking in consideration (or correcting) their drift in time.

It is proved that this equipment drift is negligible. However, it is good to check their aspect and their response once a year, at the same time as the other process equipment.

A fast test is many times available, when the sensor active part is in air, or immersed in a cleaning or rinsing solution. As long as these values stay similar, we can say that the sensor operation is right among its whole range (if no intermediate re-programming occurred).

1.4.1 Offset adjustment in the air

The sensor active part must be clean and dry.

Note the algebraic value to be added to the displayed one, in order to get zero at the display. This value has to be added to the existing one at "OFFS" step (in adjustment mode, "SPEC" block, see § 5.9).

The information automatically comes back to normal user mode after 30 seconds.

Example: if you read a viscosity value in the air of 0,5cP, add -0.5 to the existing offset value (OFFS).

1.4.2 Modification of the previous calibration

The device has been programmed in order to answer your needs. These features are noted on the factory specification pages at the end of this document.

At first, be sure that the modification is necessary, and not consecutive to a non coherent comparative information (different measuring conditions, bad standards, inaccurate or wrong laboratory measurements,…).

1. Place the MIVI sensor on a rigid support.
2. Remove the algebraic value from "OFFS" step. (§ 5.9).
3. Take several samples (or standards) with known viscosity among the whole viscosity scale. Then, Dive the vibrating rod of the sensor into each sample. You can also make the calibration on line.
4. Suppress the previous calibration, in order to get the rough response of the equipment :
   Go to "CFG" block, then enter 369 code, then… "N SEG" step. On next step, enter 1 (one segment = no linearization).
   Program X0 to 0; Y0 to 0;
   Program X1 to 2.250; Y1 to 2250;
   Program UP.LO to 0;
   Program UP.Li to 2250.
   Come back to user mode (Sub block "UTL?", then).
5. By means of standards (or samples with known viscosity), establish the device response curve: required viscosity value = F (delivered value).
   Choose characteristic points among the curve, the first for air, the last for full scale (max=21 points).
6. Go again to "CFG" block (§ 6.4).
   After "NSEG" step, program the number of chosen segments (i.e. the points number – 1).
7. Enter the rough value of the maximum viscosity at X0, and the corresponding viscosity at Y0.
8. Enter the rough values at X2, X3 … steps. Enter the required values at Y2, Y3, … steps, up to the programmed points number.
   Come back to user mode "UTL?" sub block, then INP with).
   If the viscosity value in air is not 0, adjust it as mentioned above (§ 1.5.1).

1.5 Directives and Standards

1.5.1 European Pressure Equipment Directive

Up to 60 bars, MIVI sensors are in agreement with the article 3.3 of the PED 97/23/EC. In case of higher pressure, sensors are certified one by one.

The mounting flange is an accessory to be welded on the process line. It means it can not be individually certified but with the whole process line.

1.5.2 EMC and low voltage directive

The processor 9601 is in agreement with EMC specifications detailed into 89/336/EEC (modified by 92/31/EEC and 93/68/EEC).

Processors 9601 are supplied by 24 VDC. So they are not subjected to the Directive Low tension 73/23/CEEC (modified by 93/68/CEE).

MIVI sensors have been designed and manufactured according to the electrical safety rules.

1.5.3 Ex-proof certifications

MIVI sensors are in agreement with 94/9/EC directive (ATEX) and with FMRC-3615 class (FM) for equipments installed in explosive gas atmospheres or in presence of combustible dust:

Ex II 2G (gas) or Ex II 2D (dust)			FM APPROVED MIVI FM
Ex d IIC T1 to T6	:	gas	Class I, Div. 1, Groups A, B, C & D T4A
Ex tD A21 IP67 T75°C to T300°C	:	dust	ambient temp. range: from -20°C to 100°C

Be sure the sensor's certification is in accordance with the security level required on your process location: area classification, equipments group, protection method, gas type, temperature codes…

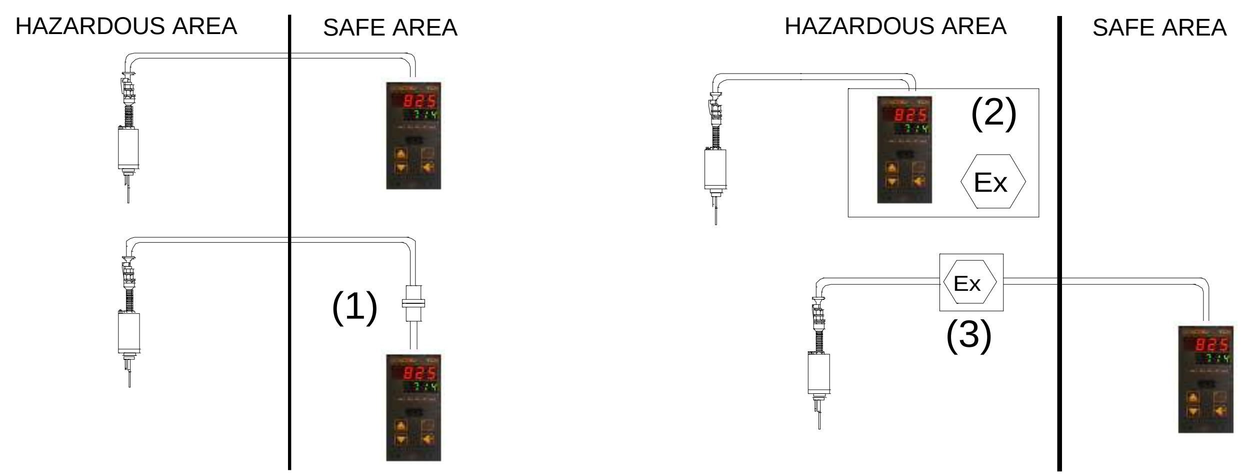
Area classification and equipments installation rules are detailed into IEC 7910 and EN 60079-0 standards for gas or EN 60079-31 standards for dust.

To always keep the maximum security level, do not open it. We moreover recommend installing the sensor in a horizontal position or with the cable gland oriented to the ground.

Check as often as possible that the information indicated on the sensor's identification plate is still visible.

1.5.4 Installation in hazardous area

Here are the possible ways to install MIVI sensors in hazardous area.



(1) : non-exproof connectors (2) : exproof box (3) : exproof connection box

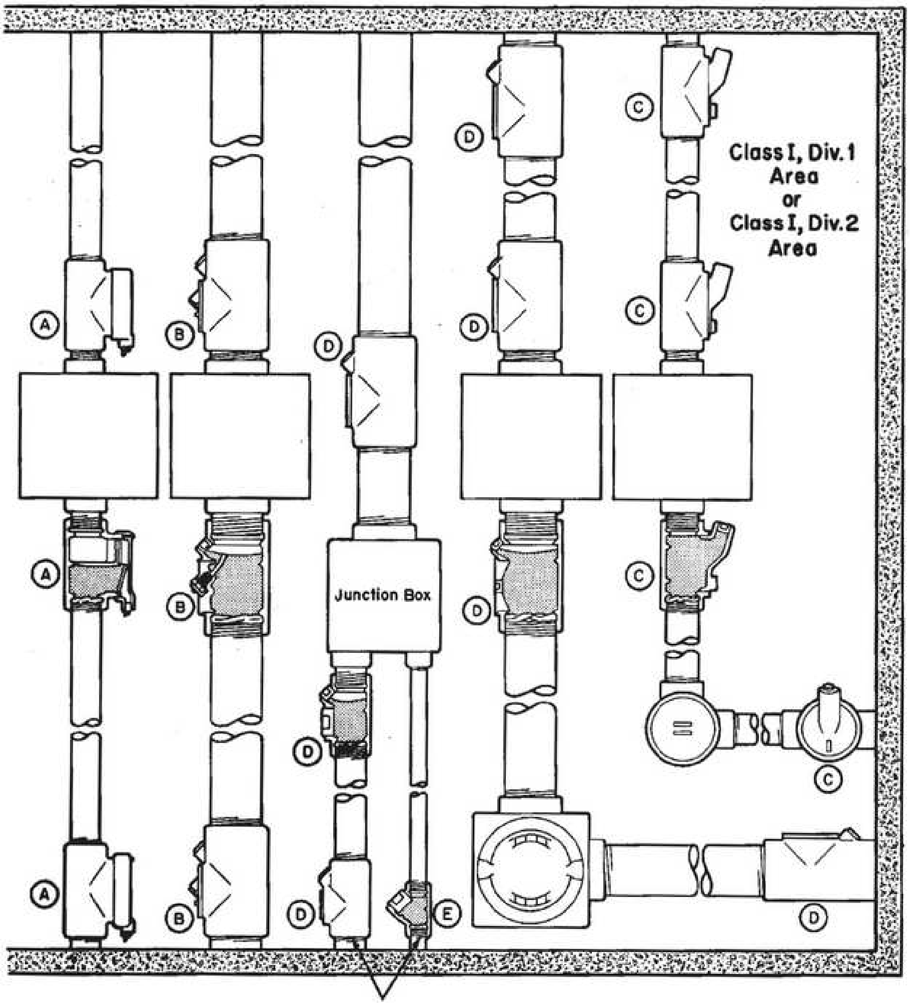
IMPORTANT: Always connect the sensor's body (screw on the top of the body) to the ground.

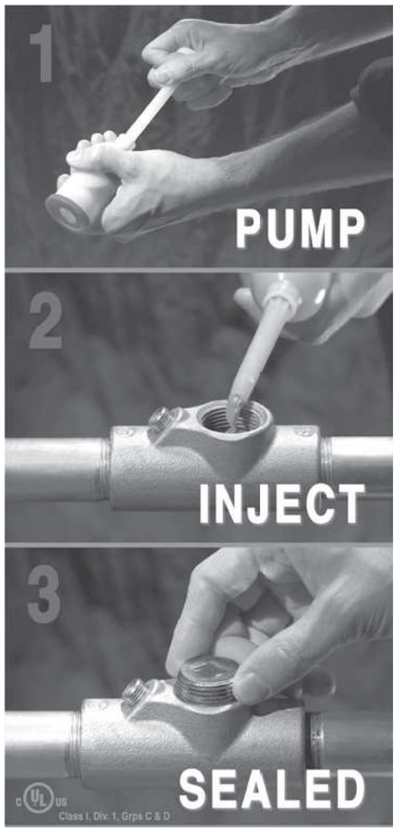
1.5.5 Special design and recommendations for the FM sensors

For the FM sensors, it is necessary to add a protection in accordance to the area's risks level. As long as the cable is in a hazardous area, it should be protected as recommended in the 2011 NEC code digest, appendix IV.

Our sensors are certified until the end of the flexible conduit, where we connected a NPT joint. For connecting the sensor in agreement with the class, the installer should follow the instructions given in the 2011 NEC code digest, appendix IV.

This means a conduit seal has to be connected to our NPT joint, according to the examples you have hereunder.





This equipment is not provided by SOFRASER.

<u>Note:</u> In order to protect the inner part of the sensor (body + flexible conduit) during transportation, we use a black silicone tape to cover the NPT joint's end. This has nothing to do with a FM approved protection and shall be removed while being installed on site.

Hereunder are some features of the conduit seals to be installed.

EYS and EZS sealing fittings:

- restrict the passage of gases, vapors, or flames from one portion of the electrical installation to another at atmospheric pressure and normal ambient temperatures.
- limit explosions to the sealed-off enclosure.
- prevent precompression or “pressure piling” in conduit systems.

While not an *NEC* requirement, many engineers consider it good practice to sectionalize long conduit runs by inserting seals not more than 50 to 100 feet apart, depending on the conduit size, to minimize the effects of “pressure piling.”

Sealing fittings are required:

- at each entrance to an enclosure housing an arcing or sparking device when used in Class I, Division 1 and 2 hazardous locations. To be located as close as practicable and, in no case, more than 18" from such enclosures. The enclosure's installation instructions may specify a distance less than 18".
- at each entrance of 2" size or larger to an enclosure or fitting housing terminals, splices, or taps when used in Class I, Division 1 hazardous locations. To be located as close as practicable and, in no case, more than 18" from such enclosures.
- in conduit systems when leaving the Class I, Division 1 or Division 2 hazardous locations.
- where cables terminate at enclosures that are required to be explosionproof.
- where cables leave Class I, Division 1 locations and where they leave a Class I, Division 2 location if they are attached to process equipment that may cause a pressure of over 6 in. of water to be exerted on a cable end.

2 The MIVI sensor

2.1 Various models

- General-purpose sensors
- Sanitary sensors
- Ex-proof sensors (ATEX, FM, JIS)
- High pressure sensors (up to 150 bars)
- Special models, according to the requirements (material and design)
- When required, a temperature probe can be incorporated to the MIVI sensor

2.2 Sensor installation

It operates at any position, even upside down. Its active part has to be permanently immersed in the fluid (low part of the network or reactor). If the fluid temperature varies widely and fast, choose the upside down or horizontal position, in order to allow a convenient air convection among the sensor body.

It is screwed to its mounting flange by means of 4 screws M6X100 (or 8 screws M8 for high pressures). The mounting flange has to be welded close to the device generating the viscosity variations (heater, mixer, reactor, etc…). Retention, high flow velocities, strong vibrations and high magnetic fields have to be avoided.

According to the application the mounting flange material can be:

- Stainless steel Z3CND 17/11-02 (316L)
- Carbon steel XC38
- Other materials, according to the requirement.

2.2.1 Elbow mounting

The flange is welded on a right angle tee as indicated in figure 1.

The minimal pipe diameter is of 32 mm.

The flange and the pipe axes have to be superjacent.

The flow direction is as indicated on figure 1 (unless for fibrous fluids where the flow is inverted and the rod protector removed. (see §2.2.5).

A free area of at least 150 mm length is necessary.

Advice: Choose a sensor position in order to assure a permanent fluid renewal and to avoid the existence of "dead zones".

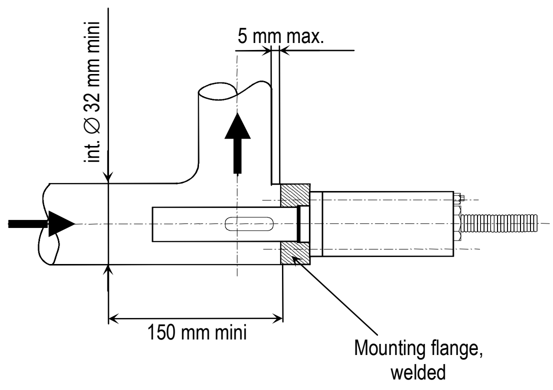


figure 1

2.2.2 Plane side mounting

The flange is welded on a metal plate as indicated on figure 2.

The free area around the vibrating rod has to be at least ∅ 40, 150 mm length.

In order to avoid parasitic vibrations, the plate where the flange is welded must be thicker than 5 mm.

Advice: Preferably choose a horizontal position for the rod placement with all the liquid flows turned to the top in order to avoid the apparition of bubbles.

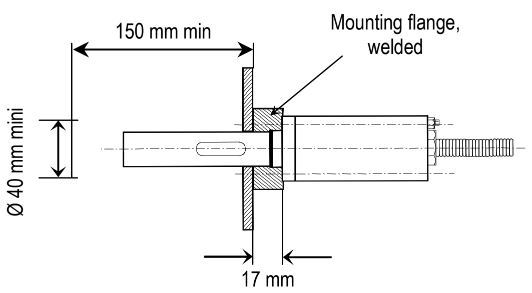


figure 2

2.2.3 Pot mounting, for small flow rates, or pilot plant

see example on figure 3

2.2.4 Special mountings

The small sensor size allows many different mounting features according to the user's requirements. Consult your distributor.

2.2.5 Replacement cap

Each mounting flange is provided with an obturation kit:

- cap and O-ring
- 4 fixing screws CHC M6 (or 8 fixing screws M8 for high pressure sensor)

It allows the installation working when the sensor has to be removed.

on circulation

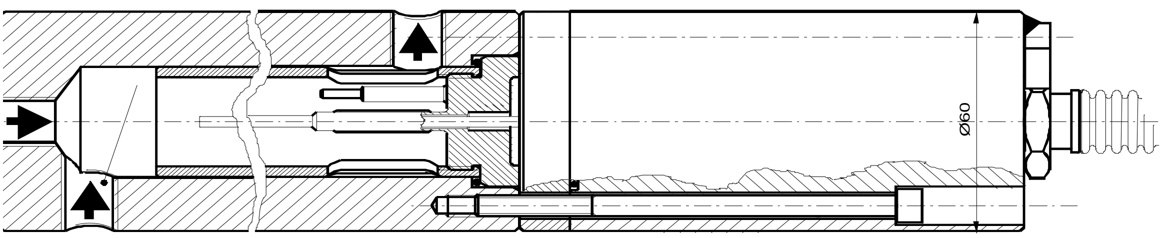


figure 3

2.3 Practical advices

Torque at the mounting screws: 9 N.m ± 1 at the M6×100 screws, or 22 N.m ± 1 at the M8 screws (for the high pressure design).

Tightness is assured by a O-ring (2 for sanitary model). The grounds for the sensor and the electronic devices must be at the same voltage level.

Warning:

Each sensor is equipped with a guard tube in order to protect the vibrating rod. This protector must be left on the sensor at the time of the assembly on the mounting flange. The fluid renewal is done through the slits of the protector. He has not to be removed unless when the sensor is used in particular conditions: on pot mounting, sanitary use, very viscous and fibrous fluids.

WARNING!

In this case, the mounting / removing of the sensor must be made with precaution, in order to avoid bending the vibrating rod.

A ring, with the same dimensions of the protector's base, must be placed on the head of the sensor in order to maintain the O-ring.

IMPORTANT:

- *As soon as the sensor is removed, screw immediately its protection tube.*
- *IP 67 rightness is only obtained when firmly screwing either the cable connectors, their replacing caps, and the cable gland.*
- *The minimal bending radius at the flexible pipe (electric outlet) is of 100 mm. Less radius can generate leakage, then failure.*

1.1 Checking

In case of subnormal operation, check the following points:

- Electrical connections (connectors, cables, power supply…)
- Remove the sensor from the process and clean it
- Check that the vibrating rod is not bent.

When powered on, check with the finger there is a vibration at the end of the rod. At this moment, the viscosity information (displayed on the electronic device) has to increase.

2.4 Sensors wiring

wire	***color***
A	blue
B	brown
C	transparent
D	black

2.5 *Models and dimensions*

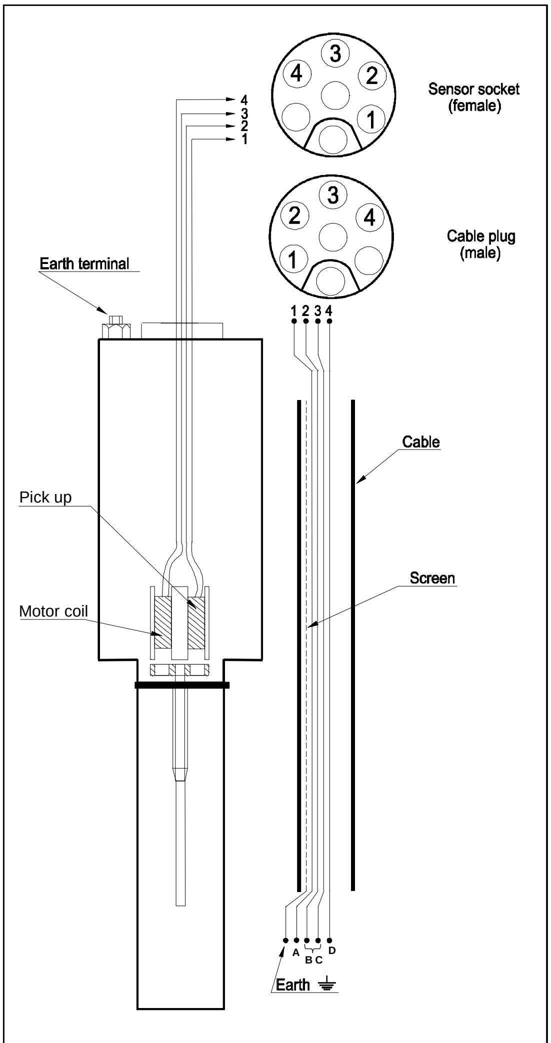


Figure 4

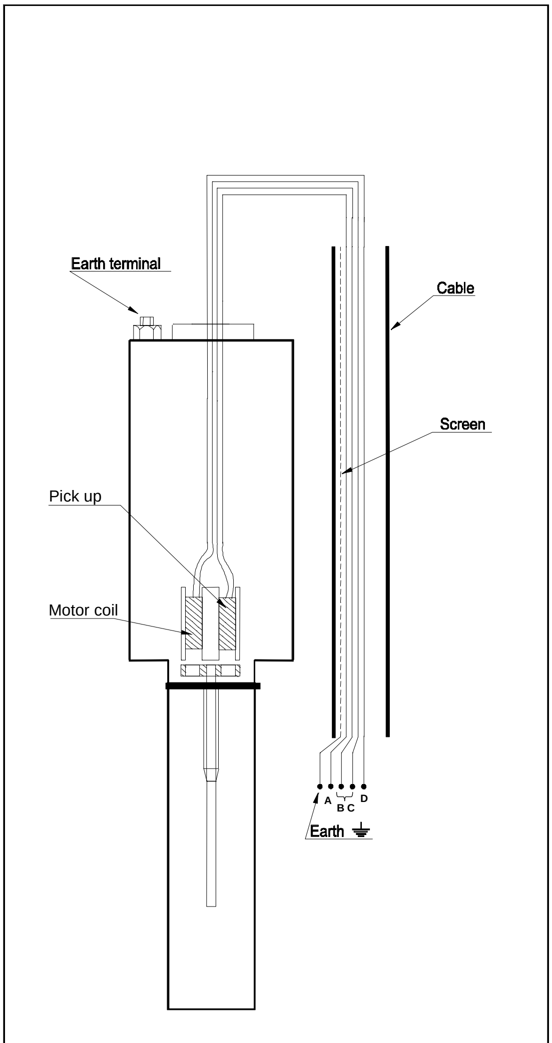
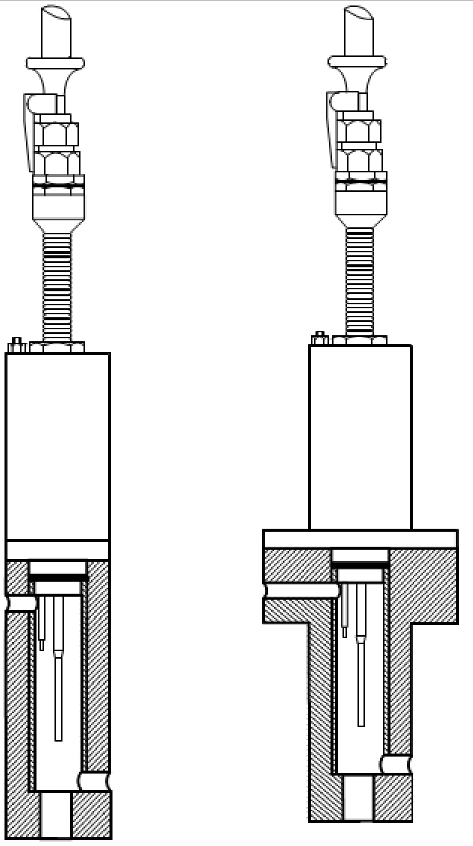


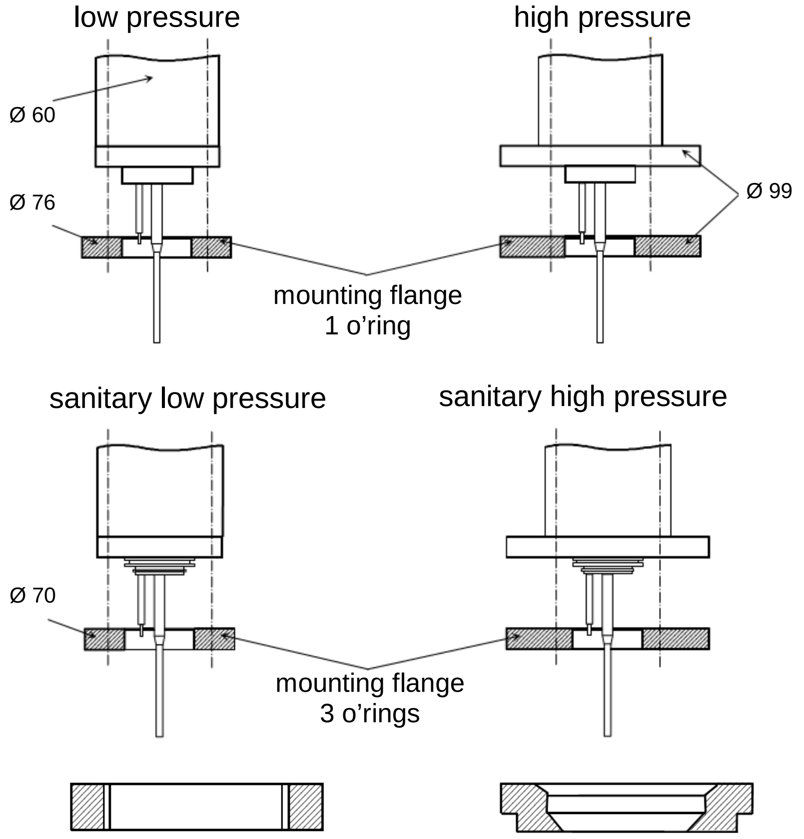
Figure 5

2.6 Various mountings



Ex-proof MIVI on a ¼ gas pot

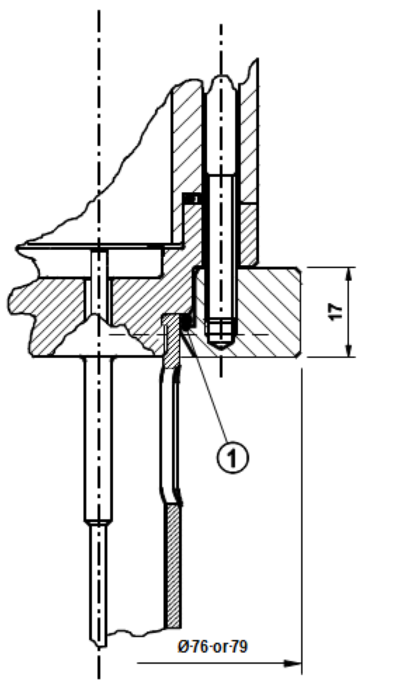
high temperature Ex-proof MIVI on a ¼ gas pot



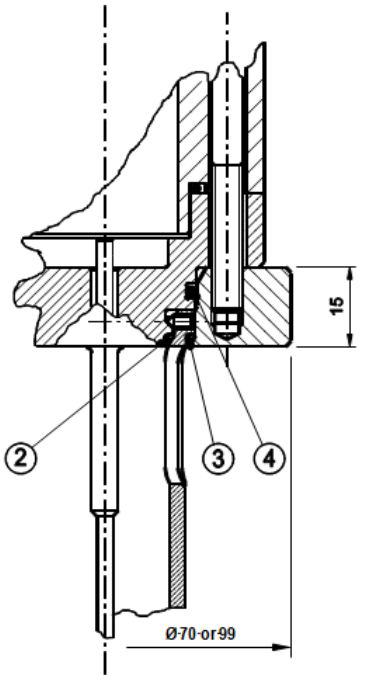
standard replacement ring

sanitary replacement ring

2.7 Watertightness



① o' ring Ø 29,82 * 2,62



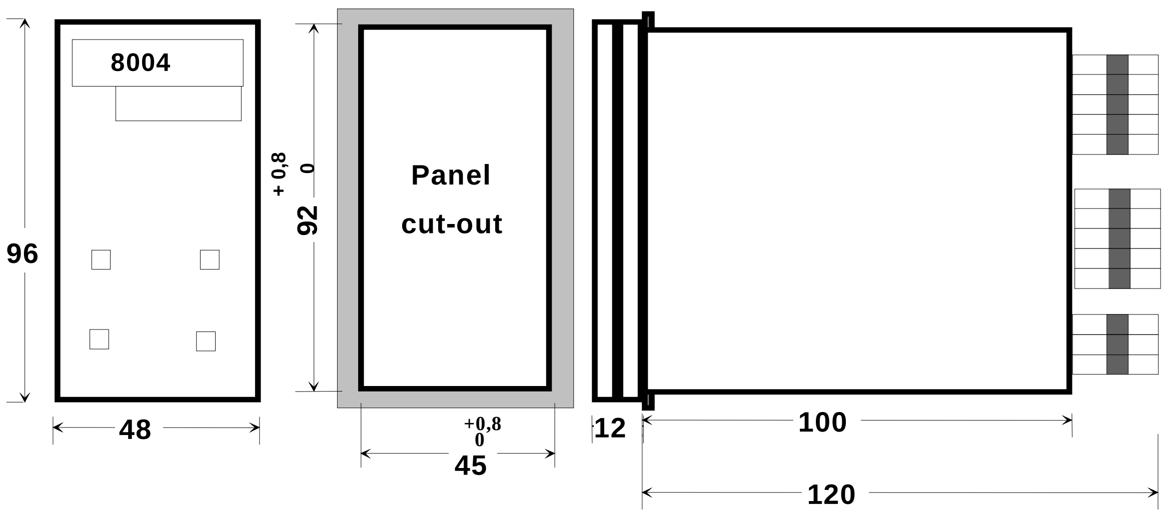
② o' ring Ø 21,95 * 1,78
③ o' ring Ø 30,00 * 2,00
④ o' ring Ø 30,00 * 2,50

3 Controller

3.1 General features

Mechanical	Weight	170g without options n°3 and n°4; 200g with options n°1 and n°3
	Case dimensions	Width: 48 mm; Height: 96 mm Total depth: 132 mm Depth behind the collar: 120 mm with options n°3 or n°4)
	Panel cut-out	45 (±0,6) x 92 mm (±0,8)
	Casing	NORYL UL 94 V-0 auto-extinguishable
	Color	Black
	Fixing	With plastic-made fixing parts
	Tightness	IP65 on front panel, IP20 on rear panel
	Electrical connec-tions	Screw terminals 2 x 1.5mm²
Cycle time		200 ms
Power supply	Standard	85 to 265 V ac/dc
	Low voltage Option	18 to 54 V ac/dc
	Consumption	6VA
Display	4 red displays 10mm with 7-segment LED to display the process variable	
	4 green displays 8mm with 7-segment LED to display the set point, the control parameters…	
	5 lights to indicate the digital communication working, the alarms or control out-put, the set point evolution and the manual mode.	

3.2 Panel cut-out



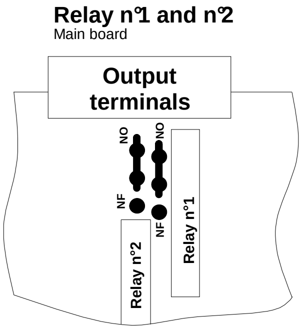
3.3 Outputs

3.3.1 Standard relay outputs n°1 and n°2

Contact type	NO/NF Selection through internal strap or jumper (see diagrams below). NO: Normally open / NF: Normally closed
Power cut-off	2A, 250Vac or 30Vdc
Mechanical operations number	500 000

Note: The relays n°1 and 2 have one common point.
In our factory, the relays are wired on the NO option.

Relays location



3.3.2 Optional digital communication output

Enables the communication with a computer (master)

Type	RS485	RS 232
Continuous insulation voltage	U < 265Vrms	
Type	Multi-points	Single point
Wiring	1 pair	
Maximum distance	1000 meters	30 meters
Baud rate	1200 to 38400 bauds	
Protocol	Modbus / Jbus RTU ***slave***	

3.3.3 Current or voltage outputs n°1 and n°2

Current output :

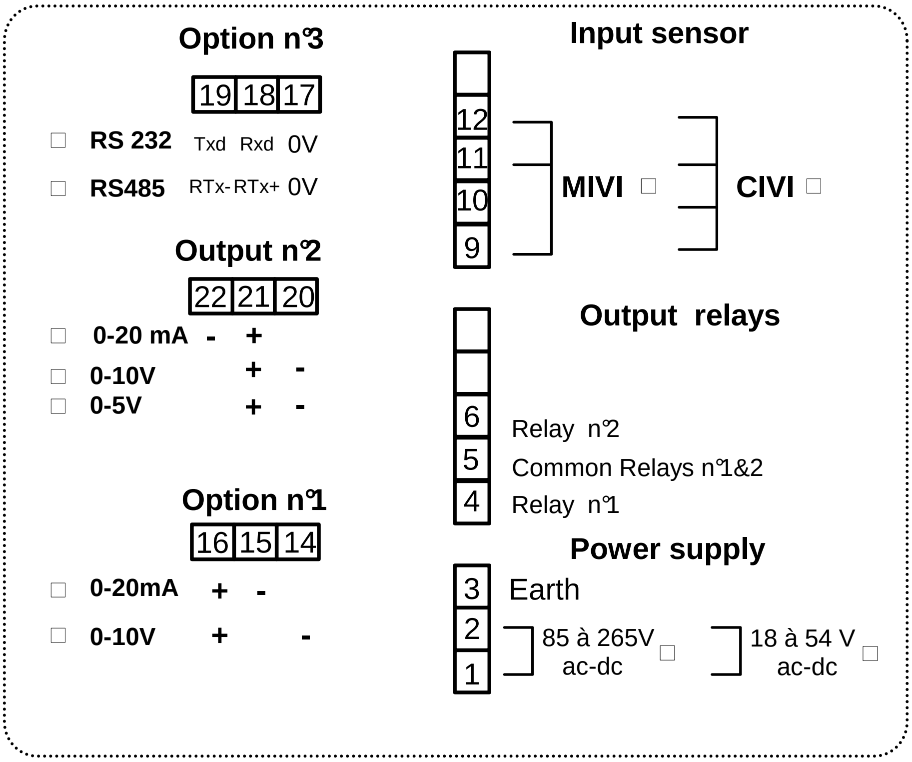
Output current	0-20mA
Maximum load	750Ω
Accuracy	0,1%
Resolution	0,03%
Temperature drift	80ppm/°C
Maximum output current allowed	< 22mA
Constant insulation voltage	U < 265Vrms

Voltage output :

Output voltage	0-10V or 0-5V (possible for output n°2 only)
Accuracy	0,1%
Resolution	0,025%
Temperature drift	80ppm/°C
Maximum output current allowed	< 20mA
Protection	By a poly-switch fuse 200mA
Constant insulation voltage	U < 265Vrms

3.4 Connections

Terminals board



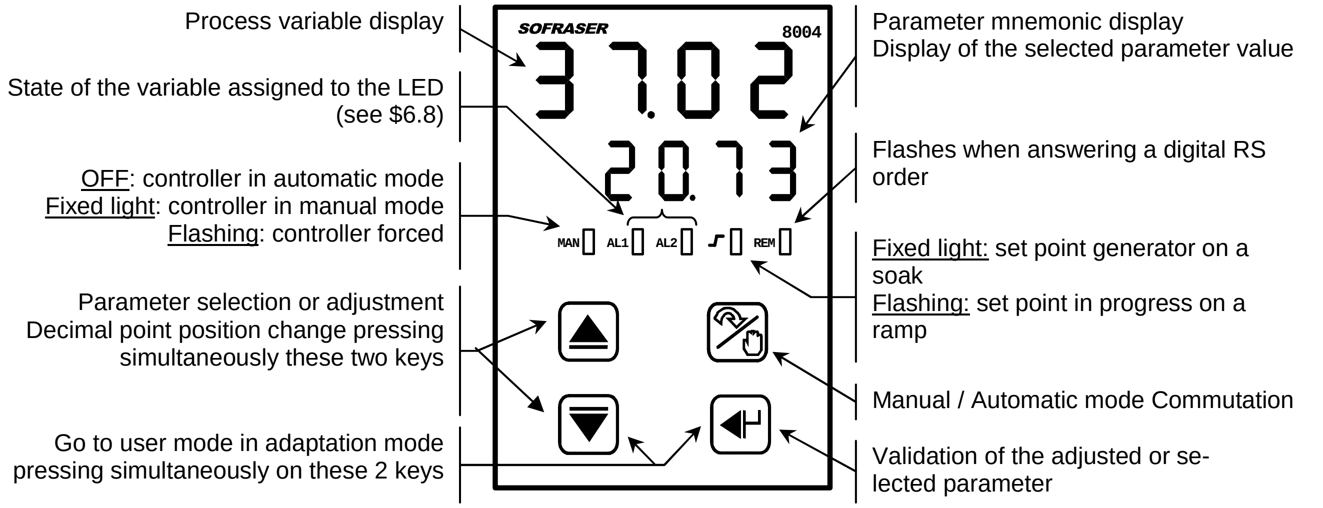
3.5 Standards

Type	Reference	Observations	Limites
Low voltage security	EN61010-1	Installation class	CAT III / 265Vrms
		Pollution degree	2
CEM immunity	EN50081-1	Emission	
	EN50082-2	Immunity	
Input	CEI584	Thermocouples	
	CEI751	RTD	
Sturdiness	EN60068-2-32	Fall	1 m
Protection	CEI529	On the front panel	See § 3.1
		On the rear panel	See § 3.1
Climatic conditions	10-90 % HR without condensation	Working	0 to +50°C
		Storage	-20 to +70°C

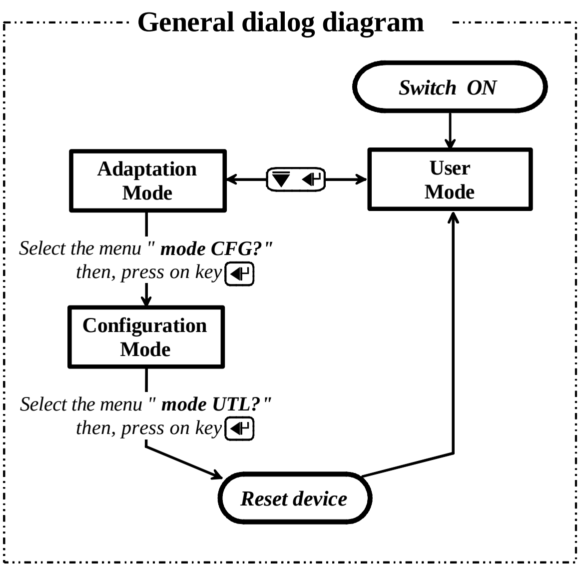
4 User Mode

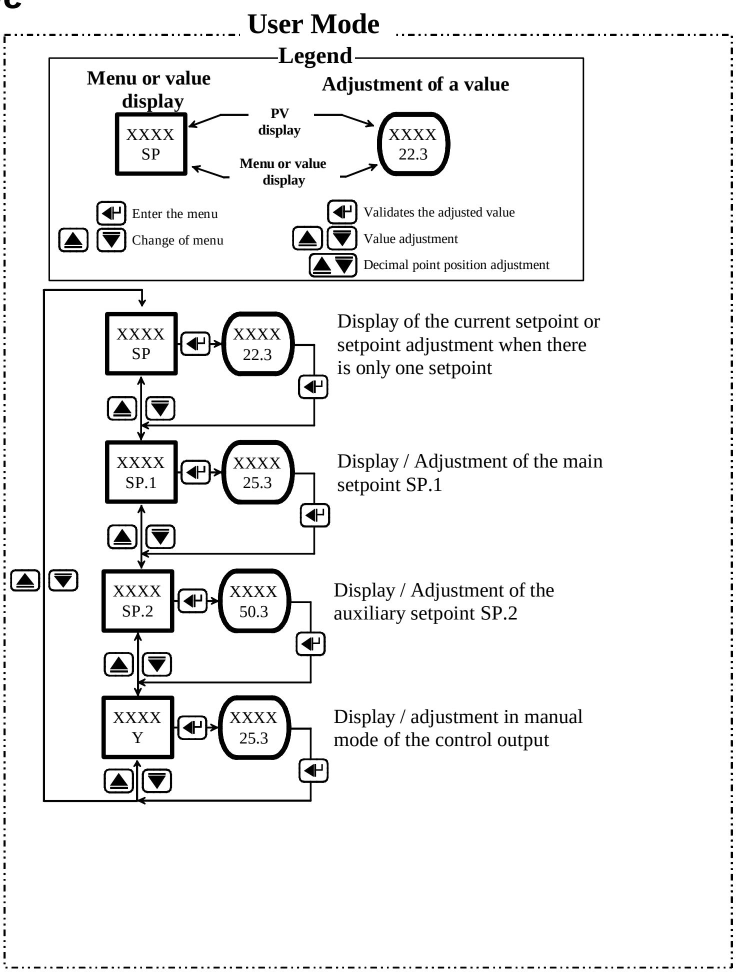
The User mode is the standard working mode of the controller. The loop measure is constantly displayed on the red display. The green display enables you to select the various parameters of the loop: Current set point **SP**, main set point **SP1**, second set point **SP2** (if it has been configured), control output **Y**.

4.1 Display and keys definition



4.2 Dialog diagram in user mode

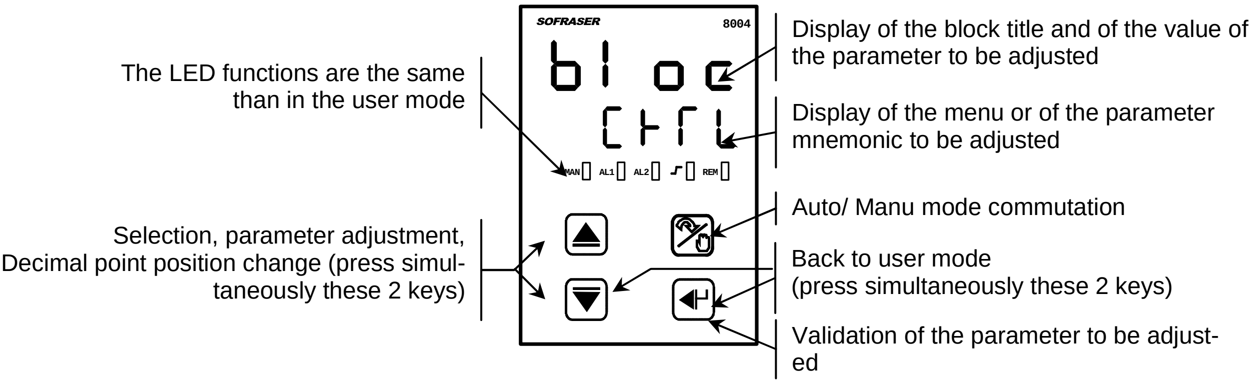




5 Adaptation Mode

The adaptation mode enables you to adjust various parameters such as PID values, process variable filter etc.…while the controller is functioning.

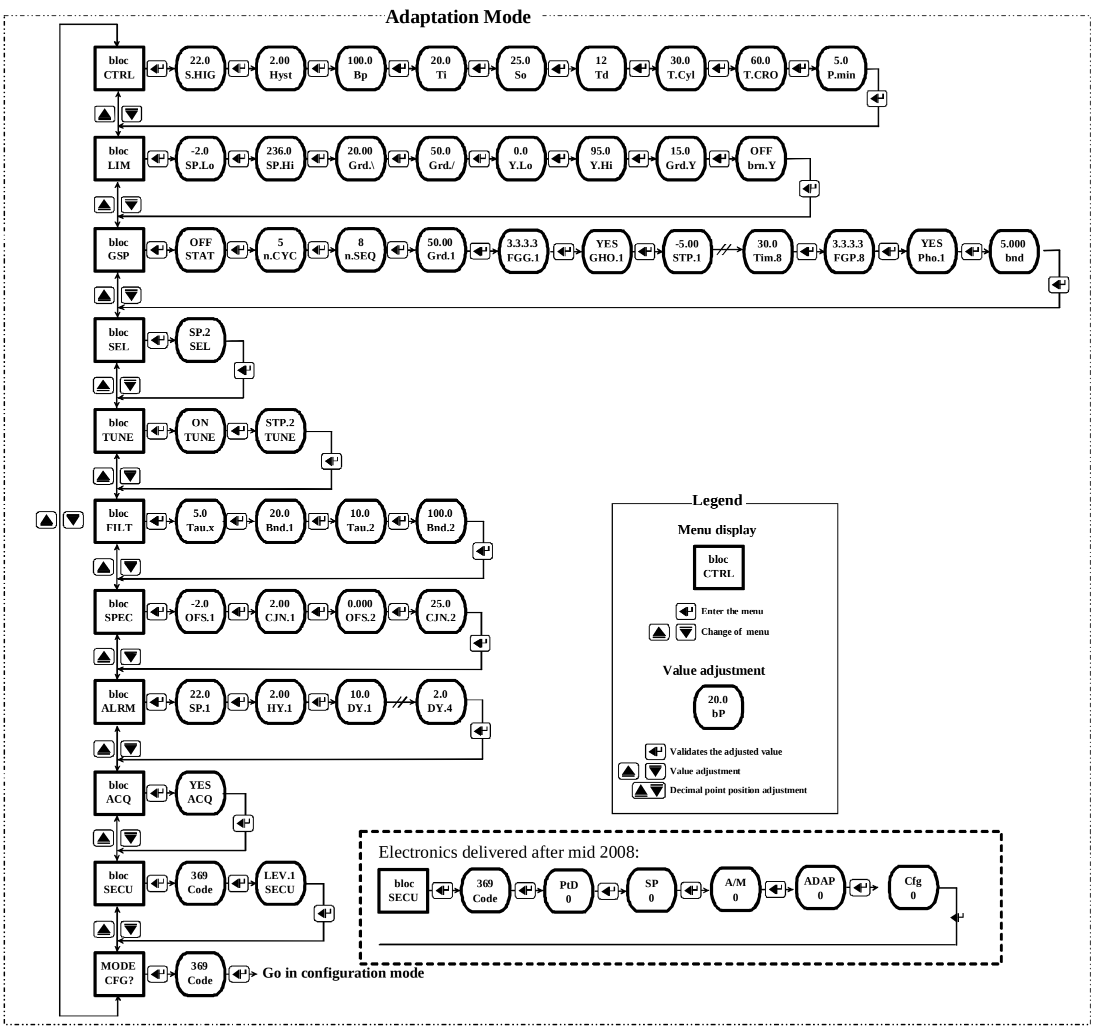
5.1 Display and keys definition



5.2 Dialog diagram in adaptation mode

Access to the Adaptation mode: press simultaneously the keys "▼" and "▯".

To go back to the user mode, proceed the same way or you automatically go back to the user mode if no key is pressed during 30 seconds approximately.



5.3 Control block "CTRL"

Parameter	*Control*	*Definition*	*Limits*
S.HIG	ON, MIDDLE or OFF	Value of the ON threshold in engineering unit compared to the deviation on the set point in progress.	Process variable Min. to Max
Hyst	ON / OFF ON, MIDDLE or OFF	Control hysteresis	0 to 20 % of the measurement range
Bp	PD or PID	Proportional band	0,2 to 999,9 %
Ti	PID	Integral time	0,02 to 99,99 min
So	PD except Servodrive without feedback potentiometer	Band centering	0 to 100% of the output
Td	PD or PID	Derivative time, derived action inactive if Td=0	0 to 2000 sec
T.CYC	Discontinuous	Cycle time or valve modulation time	1 to 2000 sec
T.CRO	Servodrive without feedback potentiometer	Valve crossing time	1 to 2000 sec
P.min	Servodrive without feedback potentiometer	Minimum shifting time of the valve (minimum pulse time)	0,1 to 20 sec
band	With cool output	Dead band or overlap band	±100% of the output
S.Col	With ON/OFF cool output	Cool output triggering threshold	0 to 100% of the output
H.Col	With ON/OFF cool output	Cool output triggering hysteresis	0 to 20% of the output
G.Col	With discontinuous cool output	Cool output gain	0 to 10
C.Col	With discontinuous cool output	Cool output cycle time	1 to 2000 sec

5.4 Limits block "LIM."

Parameter	*Control*	*Definition*	*Limits*
SP.Lo	All	Low set point limit	Process variable Min. to Max.
SP.Hi	All	High set point limit	SP.Lo to Process variable Max.
Grd.	All if the set point is configured with a gradient (see § 6.5.2 and § 6.5.3)	Set point downward gradient [1], in engineering unit per minute	0.001 to 1000 Eu/min
Grd./	All if the set point is configured with a gradient (see § 6.5.3)	Set point upward gradient [2], in engineering unit per minute	0,001 to 1000 Eu/min
Y.Lo	PD or PID different from servodrive without feedback potentiometer	Control output low limit	0 to 100% of the output
Y.Hi	PD or PID different from servodrive without feedback potentiometer	Control output high limit	Y.Lo at 100% of the output
Soft	PD or PID different from servodrive without feedback potentiometer	Gradient on the control output, in % per minute, Active only when starting. Inactive if higher than 9990 or when the controller is forced or when it is in manual mode.	0,01 to 9999 %/min
Grd.Y	PD or PID different from servodrive without feedback potentiometer	Gradient on the control output, in % per minute, inactive if higher than 9990 or when the controller is forced or when it is in manual mode.	0,01 to 9999 %/min
brn.Y	ON / OFF	Value or state of the output in case of a sensor failure	OFF / ON
	ON, MIDDLE, OFF		OFF / Mid / HIGH
	PD or PID different from servodrive without feedback potentiometer		0 to 100% of the output
	Servodrive without feedback potentiometer		OFF ---- ON OFF ---- ON

[1] Warning : The gradient value must always be higher than the highest absolute value targeted, divided by 20000.
For example, if the highest value possible is 2500°C, the gradient must be higher than 2500/20000 = 0,125 Eu/min

5.5 Definition of the set point generator block "GSP"

The parameters can be modified only if the generator is stopped.

<table>
<tr><th>Parameter</th><th>Definition</th><th>Limits</th></tr>
<tr><td>STAT</td><td>Start or stop of the generator</td><td>ON / OFF</td></tr>
<tr><td>n.CYC</td><td>Number of generator cycles. 0 to reloop infinitely.</td><td>0 to 255</td></tr>
<tr><td>n.SEQ</td><td>Number of sequences (Gradient + soak) of the generator.</td><td>1 to 12</td></tr>
<tr><td>Grd.x</td><td>Gradient value n°x [2] in Engineering unit per minute. Inactive if higher than 990.</td><td>0,1 to 999,0 Eu/min</td></tr>
<tr><td>FGG.x</td><td colspan="2">Adjustment of the set point generator flags code on the gradient n°x.
<table>
<tr><th>Digit n°1</th><th>Digit n°2</th><th>Digit n°3</th><th>Digit n°4</th></tr>
<tr><td>0.→ Without</td><td>0.→ Without</td><td>0.→ Without</td><td>0.→ Without</td></tr>
<tr><td>1.→ Flag n°1</td><td>1.→ Flag n°3</td><td>1.→ Flag n°5</td><td>1.→ Flag n°7</td></tr>
<tr><td>2.→ Flag n°2</td><td>2.→ Flag n°4</td><td>2.→ Flag n°6</td><td>2.→ Flag n°8</td></tr>
<tr><td>3.→ Flag n°1 & 2</td><td>3.→ Flag n°3 & 4</td><td>3.→ Flag n°5 & 6</td><td>3.→ Flag n°7 & 8</td></tr>
</table></td></tr>
<tr><td>GHo.x</td><td>Gradient n°x fixed or not if the deviation is higher than the value bnd [3]</td><td>YES / NO</td></tr>
<tr><td>STP.x</td><td>Soak value n°x in Engineering unit (Eu)</td><td>-999 to 9999 Up</td></tr>
<tr><td>Tim.x</td><td>Soak value n°x in minutes</td><td>0,1 to 999,0 mn</td></tr>
<tr><td>FGP.x</td><td colspan="2">Adjustment of the set point generator flags code on the soak n°x.
<table>
<tr><th>Digit n°1</th><th>Digit n°2</th><th>Digit n°3</th><th>Digit n°4</th></tr>
<tr><td>0.→ Without</td><td>0.→ Without</td><td>0.→ Without</td><td>0.→ Without</td></tr>
<tr><td>1.→ Flag n°1</td><td>1.→ Flag n°3</td><td>1.→ Flag n°5</td><td>1.→ Flag n°7</td></tr>
<tr><td>2.→ Flag n°2</td><td>2.→ Flag n°4</td><td>2.→ Flag n°6</td><td>2.→ Flag n°8</td></tr>
<tr><td>3.→ Flag n°1 & 2</td><td>3.→ Flag n°3 & 4</td><td>3.→ Flag n°5 & 6</td><td>3.→ Flag n°7 & 8</td></tr>
</table></td></tr>
<tr><td>Pho.x</td><td>Soak n°x fixed or not if the deviation is higher than the value bnd [5]</td><td>YES / NO</td></tr>
<tr><td>bnd</td><td>Absolute value, in Engineering unit (Eu), of the tolerated range when a gradient or a soak is defined as fixed on the deviation</td><td>0,001 to 9999 Up</td></tr>
</table>

5.6 Set point selection block "SEL."

Parameter	Definition	Limits
SEL.	Selects the control set point (except when two set points are configured as selected by a logic input	SP.1 / SP.2

5.7 PID actions autotune Block (ZIEGLER-NICHOLS method) "TUNE"

This block appears when the controller is in automatic mode and when the deviation between the process variable and the set point is higher than 10%.

Parameter	Definition	Limits
TUNE	Start of the autotune. To stop it, press on the auto-manu key.	STOP / RUN
TUNE	Display of the stage in progress.	STP.0 to 4

Warning :

- This procedure forces the controller output at 100% and 0% during a while. Check that the process accepts it.
- The risk of set point overshooting is possible for the processes with a large proportional band.

[2] Warning: The gradient value must always be higher than the biggest absolute value targeted, divided by 20 000.
For example, if the biggest value possible is 2500°C, the gradient must be higher than 2500/20 000 = 0.125 Eu/mn
[3] When a soak or a gradient is not free from the deviation, the generator is waiting that the deviation enters in the defined range so as to go on.

Autotune operating procedure:

- Set the controller in manual mode.
- Stabilize the controller at a process variable lower than at least 20% of the usual working process variable.
- Set the set point to the process variable value so as to have no deviation (process variable = set point).
- Set the controller in automatic mode.

5.8 Filter block "FILT"

Parameter	Definition	Limits
Tau.1	Coefficient of the first order type filter of channel n°1.	0 to 60 sec
Bnd.1	Value of the channel n°1 band (close to the present process variable) in which the filter is active. Any process variable variation higher than this band value is not filtered. The filter power is nominal (tau declared) close to the point, it decreases linearly and then it is canceled on the band limit.	0 to 100 %

5.9 Special block "SPEC"

Parameter	Definition	Limits
OFS.1	Correction value of channel n°x in engineering unit . This value is reset at zero if you change the process variable type in the configuration.	-999 to 9999

5.10 Alarms block "ALRM"

Parameter	Definition	Limits
SP.x	Alarm x threshold value.	-999 to 9999
HY.x	Alarm x hysteresis value.	0 to 9999
DY.x	Alarm x temporization value. Considered as infinite if >= 9990 sec	0 to 9999 sec

5.11 Alarms acknowledgement block "ACQ"

Parameter	Definition	Limits
ACQ.	Alarms acknowledgement with the arrow keys: **NO:** no alarms acknowledgement **YES:** Acknowledgement: the alarms allowed to be acknowledged disappear (see § 5.10)	NO / YES

5.12 Security block "SECU"

Parameter	Definition	Limits
Code	Access code value for the modification of the device locking level.	**369**
PtD	Modification of the decimal point display **(0 forbidden, 1 authorized)**	0 or 1
SP	Modification of the set point value **(0 forbidden, 1 authorized)**	0 or 1
A/M	**Auto / Manu** commutation **(0 forbidden, 1 authorized)**	0 or 1
ADAP	Modification of the **ADAPTATION** parameters **(0 forbidden, 1 authorized)**	0 or 1
Cfg	Access to the configuration **(0 forbidden, 1 authorized)**	0 or 1

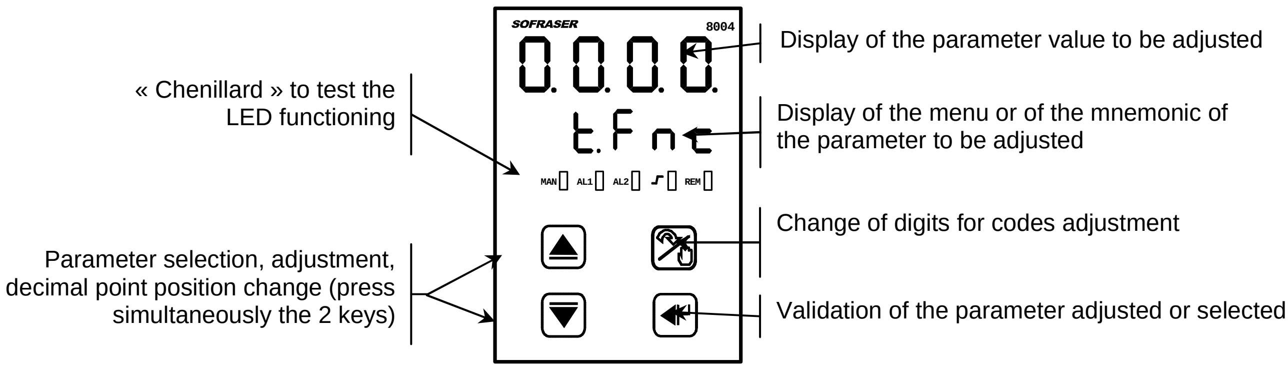
5.13 Access to the configuration mode block "CFG ?"

Parameter	Definition	Limits
Code	Access code to the configuration. If the locking level is higher than 0.	369

6 Configuration Mode

The configuration mode enables you to define the configuration of the following parameters: process variable, control algorithm, alarms and device output type.

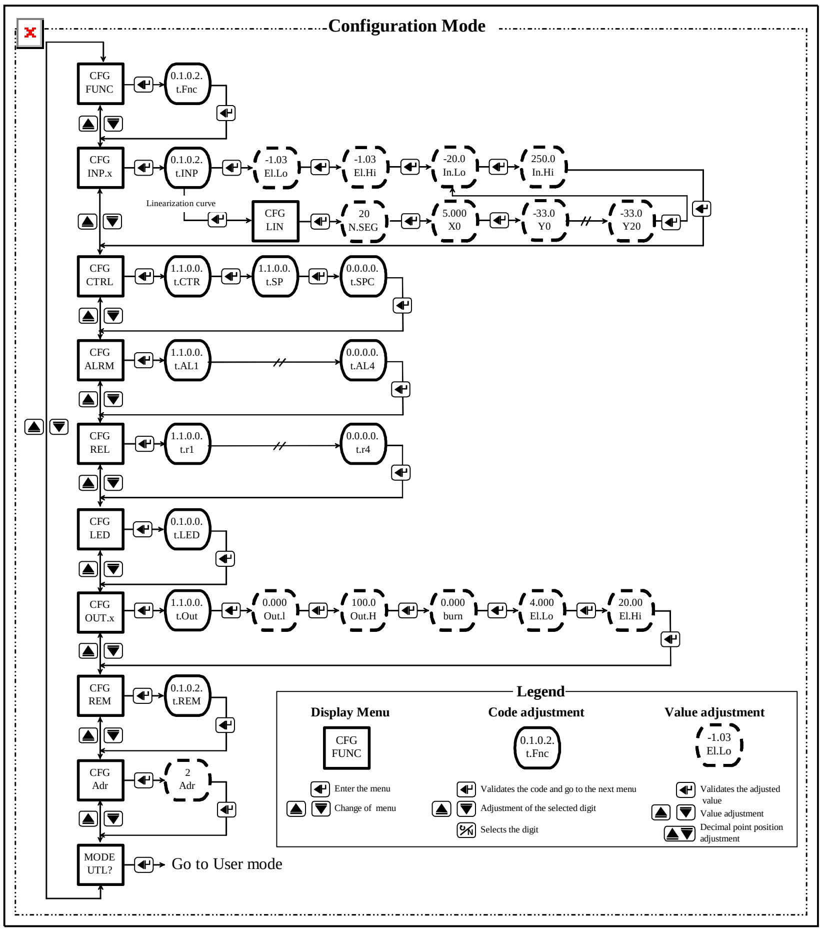
6.1 Display and keys definition



6.2 Dialog diagram in configuration mode

Access to the configuration:

1. In the adaptation mode, when the message «MODE CFG?» appears, press on the key «⏎» (the code 369 is required if a locking has been set, see § 5.12).
2. Pressing simultaneously on the keys "▼" and "⏎" during the display of the device version Vx.xx.



6.3 Function block "FUNC"

This block enables you to define the number of input channels to use.

T.FNC.			
DIGIT N°1	**DIGIT N°2**	**DIGIT N°3**	**DIGIT N°4**
Analog input number			
1. →1	**0.**	**0.**	**0.**
OTHERS SET UP MUST NOT BE USED			

6.4 INPUT N°1 block "INP.1"

This block enables to define the type of input processing to perform.
When you modify the input type, the offset (see §5.9) is reset at zero.
A linearization table (curve type processing) is available.

High level voltage input

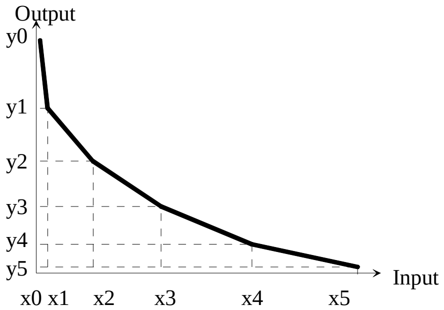
T.INP			
DIGIT N°1	**DIGIT N°2**	**DIGIT N°3**	**DIGIT N°4**
Type	***Range***		***Treatment***
1.→ Volt DC	**0.**→ ±2.25V	**0.**	**0.**→ Without
			1.→ Curve
OTHERS SET UP MUST NOT BE USED			

Following parameters must be adjusted

1. Electric Minimum in V **El.Lo**
2. Electric Maximum in V **El.Hi**
3. In the «Curve» case, declared linearization Eu = f(V)
4. Minimum (Eu: Engineering unit) **In.Lo**
5. Maximum (Eu: Engineering unit) **In.Hi**

In case of a curve treatment (digit N°4=1). Following parameters must be adjusted

1. Number of segments of the curve (20 maximum) **N.seg**
2. Abscissa (X.n) in Electric Unit **X.n**
3. Ordinate (y.n) in Engineering Unit **Y.n**



6.5 Control function configuration "CTRL"

6.5.1 Control type configuration

T.CTR			
DIGIT N°1	**DIGIT N°2**	**DIGIT N°3**	**DIGIT N°4**
Control Algorithm	**Sense**	**Heat output**	**Cooling output**
0.→ ON/OFF	**0.**→ Inverse	**0.**→ ON / OFF (logic +) OR ON / OFF 2 relays (logic ±)	**0.**→Without
1.→ ON / OFF 2 relays	**1.**→ Directe	**1.**→ Continuous (analog)	**1.**→ ON / OFF (logic -)
2.→ PD		**2.**→ Discontinuous (logic +)	**2.**→ Discontinuous (logic -)
3.→ PID		**4.**→ Servo-drive with feedback pot. (logic ±)	
OTHERS SET UP MUST NOT BE USED			

See parameters to be adjusted in ADAPTATION mode in the blocks CTRL, LIM, SEL and GSP

Cooling output is only selectable with continuous and discontinuous heat outputs

PID algorithm is serial – parallel type. Derivative action is on process variable with transitory gain value 3.
Transfer Function:

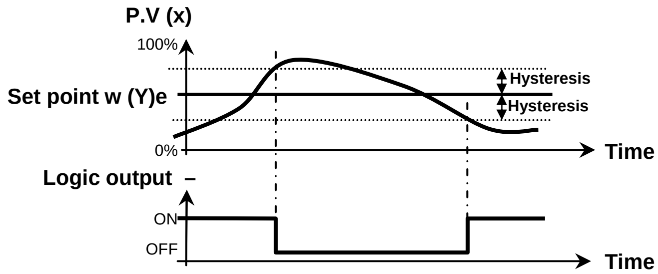
$$PID \rightarrow Y = G \bullet Gap \bullet \left(1 + \frac{1}{Ti \cdot p} + Td \cdot p\right) \qquad PD \rightarrow Y = G \bullet Gap \bullet (1 + Td \cdot p) + So$$

To drive the actuator it is necessary to configure in the analog output block (OUT.x) or in the output relays block (REL.x) one or several control output corresponding to the selected algorithm.

6.5.2 Control with only one output (heat control)

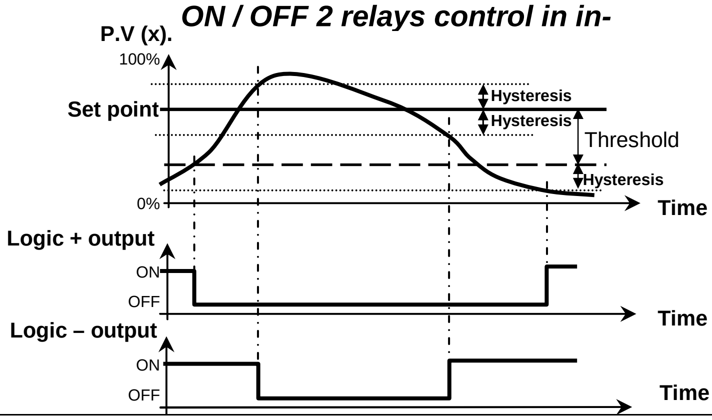
- Using ON/OFF control, control output is **logic + output**.

ON / OFF control in inverse mode



- In ON/OFF 2 relays control, the **logic – output** is for low output while the **logic + output** is for high action.

ON / OFF 2 relays control in in-



For ON / OFF 2 relays algorithm type « **AND** » (when the « high » relay is active, the « low » relay is also active), configuration of the outputs (§ 6.7) as follows :

- Relay « high » on **logic + output.** Relays configuration code : T.Rx = 0.0.0.0.
- Relay « low » on **logic - output.** Relays configuration code : T.Rx = 1.0.0.0.

For ON / OFF 2 relays algorithm type « **OR** » (When the « high » relay is active, the « low » relay is not active), configuration of the outputs (see § 6.7) as follows :

- Relay « high » on **logic + output**. Relays configuration code : T.Rx = 0.0.0.0.
- Relay « low » on **logic - output** « **AND NOT** » the **logic + output.** Relays configuration code : T.Rx = 1.4.0.0.

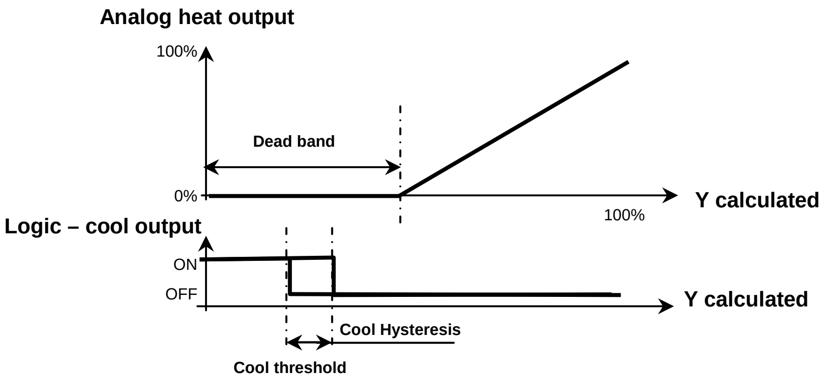
- Control output is the **analog output** for the continuous heat control algorithm.
- Control output is the **logic + output** for the discontinuous heat control algorithm.
- For a motorvalve with or without feedback potentiometer heat output control, the "opening" control output is the **logic+ output** and the "closing" control output is the **logic- output**.

6.5.3 Régulations avec sortie chaude et froide

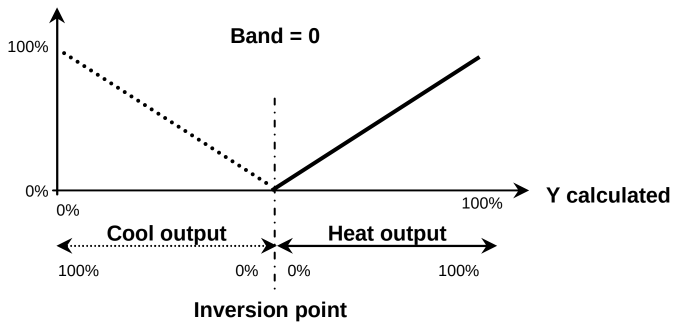
Cool output is always the **logic – output.**

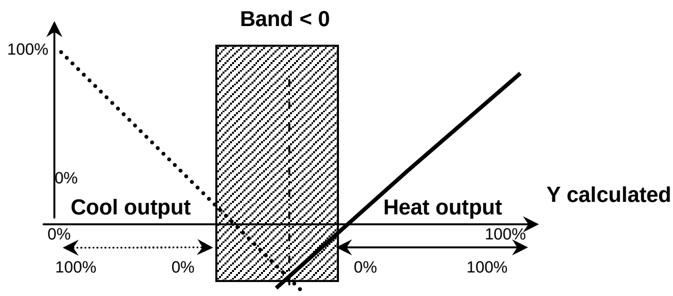
- In continuous heat control, control output is the **analog output.**
- In discontinuous heat control, control output is the **logic + output.**

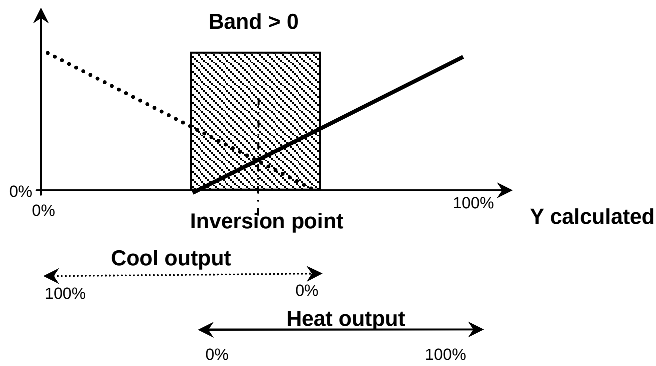
Reverse Heat & Cool Control with ON/OFF cool output



Heat & Cool Reverse control with discontinuous cool output







Cool gain definition :

$$\text{G.Col} = \frac{\textit{Cool output Course}}{\textit{Heat output Course}}$$

If the cool control system is twice more powerful than the heat control system, the cool gain must be equal to ½ (= 0,5).

Outputs inversion point formula :

$$I(\%) = \frac{G.Col}{G.Col + 1} \times 100$$

Calculation of the physical heat output :

$$Yc = Y\,calculated \times \left(1 + G.Col - \frac{Band}{100}\right) - 100 \times \left(G.Col - \frac{Band}{100}\right)$$

Calculation of the physical cool output :

$$Yf = -Y\,calculated \times \frac{\left(1 + G.Col - \frac{Band}{100}\right)}{G.Col} + 100$$

6.5.4 Set point type configuration

T.SP			
DIGIT N°1	**DIGIT N°2**	**DIGIT N°3**	**DIGIT N°4**
1st set point (SP.1)	**2nd set point (SP.2)**[4]	**Ramp on set point changing**	**Following set point in manual mode** [5]
1.→ Declared (keyboard)	**0.**→ Without	**0.**→ Without	**0.**→ No
	1.→ Declared (keyboard)	**1.**→ On every set point changing	**1.**→ Yes
		2.→ On set point type changing	
		3.→ On set point value changing	
OTHERS SET UP MUST NOT BE USED			

See the parameters to be adjusted in the ADAPTATION mode in the blocks CTRL, LIM, SEL and GSP.

[4] SP.1 or SP.2 selection is possible through logic input or through keyboard in the SEL block in adaptation mode (see § 5.6).
[5] Only the declared set points can follow the process measurement when controller is in manual mode.

6.5.5 Special functions configuration

T.SPC			
DIGIT N°1	DIGIT N°2	DIGIT N°3	DIGIT N°4
PV control channel	Logic input function	Set point generator [6]	
0.→ channel n°1	**0.**→Unused	**0.**→ Without	**0.**
		1.→ With	
OTHERS SET UP MUST NOT BE USED			

See the parameters to be adjusted in the ADAPTATION mode in the blocks CTRL, LIM, SEL and GSP.

6.6 Alarms 1 to 4 block "ALRM"

This block defines the use of a software alarm. To drive a relay output, it is necessary to go in the selected relay block and dedicate this relay to the alarm.

An alarm can be delayed and (or) stored for a certain period of time or indefinitely (time >= 9990 seconds)

Alarm acknowledgement can be inactive, active of alarm condition is true, or active only when alarm has disappeared.

The acknowledgement is performed in ADAPTATION mode, in the ACQ block.

The acknowledgement will cancel the alarm.

The alarm can also be used for the sensor failure situation.

T.Alx			
DIGIT N°1	DIGIT N°2	DIGIT N°3	DIGIT N°4
Type of alarm	Input control failure	Delay	Acknowledgement authorization
0.→ Inactive	**0.**→ No effect	**0.**→ Without	**0.**→ Without
1.→ High on process variable	**1.**→ Activated	**1.**→ Go (Delayed)	**1.**→ Always allowed
2.→ Low on process variable	**2.**→ Activated if high failure	**2.**→ Back (Stored)	**2.**→ Forbidden if alarm active
3.→ Difference set point – process variable (± Difference)	**3.**→ Activated if low failure	**3.**→ Go / Back (Delayed and stored)	
4.→ PV lower than the set point (+ Difference)			
5.→ PV higher than the set point (- Difference)			
6.→ Analog control high output			
7.→ Analog control low output			
8.→ High on channel n°1			
9.→ Low on channel n°1			
OTHERS SET UP MUST NOT BE USED			

- **Parameters to be adjusted in ADAPTATION mode in the ALRM block**
  1. Alarm threshold in Engineering unit (Eu) **SP.x**
  2. Alarm Hysteresis in Eu **HY.x**
  3. Delay value (DIGIT N°4≠0) from 0 to 9999 seconds **DY.x**

  If the delay value is higher than 9990 seconds, it is considered as infinite.
- **Parameters to be adjusted in ADAPTATION mode in the ACQ block**

  Alarms acknowledgement for the alarms allowed to be acknowledged.

[6] The set point profile generator definition is performed in adaptation mode (see § 5.5).

6.7 Relays 1 to 2 block "REL"

This relays 2 to 4 block only appears if these options have been installed. It is possible to fix a contact normally open or normally closed (see § 3.3.1).

T.rx			
DIGIT N°1	**DIGIT N°2**	**DIGIT N°3**	**DIGIT N°4**
Operand 1	**Operator**	**Operand 2**	**Logic Sense**
0.→ Logic + control output	**0.**→ Inactive	**0.**→ Logic + control output	**0.**→ PositiVE
1.→ Logic – control output	**1.**→ OR	**1.**→ Logic – control output	**1.**→ Negative
2.→ Alarm 1	**2.**→ OR NOT	**2.**→ Alarm 1	
3.→ Alarm 2	**3.**→ AND	**3.**→ Alarm 2	
4.→ Alarm 3	**4.**→ AND NOT	**4.**→ Alarm 3	
5.→ Alarm 4	**5.**→ XOR	**5.**→ Alarm 4	
6.→ Auto – Manual Status	**6.**→ XOR NOT	**6.**→ Auto – Manual Status	
7.→ Control on SP.2 set point		**7.**→ Control on SP.2 set point	
8.→ Control on set point generator		**8.**→ Control on set point generator	
9.→ Failure on process variable		**9.**→ Failure on process variable	
a.→ High failure on process variable		**a.**→ High failure on process variable	
b.→ Low failure on process variable		**b.**→ Low failure on process variable	
c.→ Logic input		**c.**→ Logic input	
d.→ Flag set point generator n°1		**d.**→ Flag set point generator n°1	
e.→ Flag set point generator n°2		**e.**→ Flag set point generator n°2	
f.→ Flag set point generator n°3		**f.**→ Flag set point generator n°3	
g.→ Flag set point generator n°4		**g.**→ Flag set point generator n°4	
h.→ Flag set point generator n°5		**h.**→ Flag set point generator n°5	
i.→ Flag set point generator n°6		**i.**→ Flag set point generator n°6	
j.→ Flag set point generator n°7		**j.**→ Flag set point generator n°7	
k.→ Flag set point generator n°8		**k.**→ Flag set point generator n°8	
l.→ Remote 1		**l.**→ Remote 1[7]	
m.→ Remote 2		**m.**→ Remote 2	
n.→ Remote 3		**n.**→ Remote 3	
o.→ Remote 4[8]		**o.**→ Remote 4[8]	

Examples:

- Active relay (power supplied) if alarm 1 AND NOT alarm 2: T.REL=2430;
- Inactive relay (no power supplied) if alarm 1 AND alarm 2: T.REL=2331.

6.8 Lights enabling block "LED"

This block allows enabling of the AL1 AND AL2 lights in user mode.

T.LED			
DIGIT N°1	**DIGIT N°2**	**DIGIT N°3**	**DIGIT N°4**
Light AL1	**Light AL2**		
0.→ Always off	**0.**→ Always off	**0.**	**0.**
1.→ Alarm 1	**1.**→ Alarm 1		
2.→ Alarm 2	**2.**→ Alarm 2		
3.→ Alarm 3	**3.**→ Alarm 3		
4.→ Alarm 4	**4.**→ Alarm 4		
5.→ Logic + control output	**5.**→ Logic + control output		
6.→ Logic – control output	**6.**→ Logic – control output		
7.→ Relay 1	**7.**→ Relay 1		
8.→ Relay 2	**8.**→ Relay 2		
OTHERS SET UP MUST NOT BE USED			

[8] Remote 1 to 4 are logic vaiables adjusted through digital communication (see § 7.1)

6.9 Analog outputs 1 & 2 block "OUT.x"

T.OUT			
DIGIT N°1	DIGIT N°2	DIGIT N°3	DIGIT N°4
Enabling	**Failure** (except for control output)		
0.→ Analog control output	**0.**→ Without	**0.**	**0.**
1.→ Logic + control output	**1.**→ If process variable failure		
2.→ Logic – control output	**2.**→ If high process variable failure		
3.→ Retransmission	**3.**→ If low process variable failure		
4.→ Set point			
5.→ Difference (SP - PV)			
6.→ Retransmission input n°1			
OTHERS SET UP MUST NOT BE USED			

Following parameters must be adjusted in CONFIGURATION

1. Minimum output in Eu (Engineering units) for analog retransmissions : **OUT.L**
2. Maximum output in Eu for analog retransmissions : **OUT.H**
3. Output value in case of process variable failure (mA or Volts) : **burn**
   This parameter appears only when the optional output n°1 is installed.
4. Minimum Electric output (mA or Volts) : **El.Lo**
   For analog output**:** value corresponding to minimum physic.
   For logic output: value corresponding to low logic level (0).
5. Maximum Electric ouptut (mA or Volts) : **El.Hi**
   For analog output: value corresponding to maximum physic.
   For logic output: value corresponding to high logic level (1).

Examples:

- Output 4-20 mA for output retransmission from 0 to 1000 cP with output =15 mA in case PV failure :
  T.OUT=3.1.0.0., OUT.L=0, OUT.L=1000, Burn=15 mA, El.Lo=4 mA, El.Hi=20 mA.
- Output 4-20 mA for analog control output 0 to 100% :
  T.OUT=0.0.0.0., OUT.L=0, OUT.H=100, El.Lo=0 mA, El.Hi=20 mA.
- Logic output 0-20 mA for a logic + control output :
  T.OUT=1.0.0.0., El.Lo=0mA, El.Hi=20mA.

6.10 REMOTE block "REM"

The block only appears if option has been installed.

T.REM			
DIGIT N°1	DIGIT N°2	DIGIT N°3	DIGIT N°4
Function	**Baud rate**	**Parity, stop bits number**	**Modbus resolution**
0.→ Modbus slave RTU	**0.**→ 1200	**0.**→ Without, 1 stop	**0.**→ 16 bits (0 to 65535)
	1.→ 2400	**1.**→ Even, 1stop	**1.**→ 15 bits (0 to 32767)
	2.→ 4800	**2.**→ Odd, 1stop	**2.**→ 14 bits (0 to 16383)
	3.→ 9600		**3.**→ 13 bits (0 to 8191)
	4.→ 19200		**4.**→ 12 bits (0 to 4095)
	5.→ 38400		**5.**→ 11 bits (0 to 2047)

6.11 Address RS block "Adr"

Unit digital RS address between 1 and 255.

7 MODBUS / JBUS Slave Protocol

The MODBUS slave protocol allows connection of several units to a supervisor. This supervisor must ask for the right information to the slaves.

The identified instructions are the following ones:

Functions 1 and 2	Reading bit
Functions 5 and 15 (0Fh)	Writing bit
Functions 3 and 4	Reading word
Functions 6 and 16 (10h)	Writing word

7.1 Cut out of the addressable bits memory

Bits can be reached through:

Functions bits 1 and 2 in reading, 5 and 15 (0Fh) in writing

Functions words 3, 4 in reading, 6 and 16 (10h) in writing to the addresses 2050 and 2051 (802 and 803) through 16 bits groups rowed as follows:

	Word															
	MSB byte								LSB Byte							
Word bit n°	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Bit N °	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8

Address Decimal	Address Hexadecimal	R.W.S[8]	Description of the bits
2	2	RWS	Auto (0) / Manu (1) mode
5	5	R	Alarm 1
10	A	R	Process variable failure
2048	800	R	Input N°1 failure
2049	801	R	Input N°2 failure
2050	802	RWS	Auto (0) / Manu (1) mode
2051	803	R	Logic + control output
2052	804	R	Logic – control output
2056	808	RWS	SP1 (0) / SP2 (1) Commutation
2057	809	RWS	OFF (0) / ON (1) set point profile generator
2064	810	RW	Alarms acknowledgement (pulse)
2065 to 2068	811 à 814	R	Alarm 1 to 4
2072 to 2077	818 à 81D	RW	Remote 1 to 6
2080 to 2087	820 à 827	R	Flag n°1 to 8 of profile generator

7.2 Cut out of the addressable words memory

Words can be reached through functions 3 and 4 in reading and 6 and 16 (10h) in writing, in mode relative according to configured MODBUS resolution (see § 6.10).

When the parameter address is not directly given, it can be calculated as follows :

Address = 2048 (0x800) + **Offset.**

[8] R: Parameter you can only read.
RW: Parameter you can read and write but not save in E2prom (Reset on supply failure)
RWS: Parameter you can read and write (100000 times only because saved in E2prom).

Example

To read process variable and set point in the relative mode, (Offset = 16) a reading instruction must be send to the address: 2048 + 16 = 2064 (0x810) in IEEE format through groups of 2 words rowed in the following board:

	1st Word	2nd Word		
N°bit of Word	15 … 0	15	14…7	6…0
IEEE Value	Fraction	Sign	Exponent	Fraction
IEEE bit N°	15 … 0	31	30 … 23	22 … 16

When the parameter address is not directly given, it can be calculated as follows :

Address = 32768 (0x8000) + 2* **Offset.**

Example

To read process variable and set point in IEEE mode (Offset = 16) four registers reading instruction must be sent to the address : 32768 + 2*16 = 32800 (0x8020).

Offset Decimal	Offset Hexadecimal	R.W.S[9]	Word scale	Description of the words
00	00	RW	Min. / Max. input 1	Input n°1
01	01	RW	Min. / Max. input 2	Input n°2
02	02	RWS	Bits on address 0x800 to 0x80F (see bits description board)	
03	03	RXS	Bits on address 0x810 to 0x81F (see bits description board)	
04	04	RWS	Bits on address 0x820 to 0x82F (see bits description board)	
05 to 08	05 to 08	RWS	-999 / 9999	Alarm threshold 1 to 4 in engineering units
09 to 12	09 to 0C	RWS	0 / 9999	Alarm Hysteresis 1 to 4 in engineering unit
16	10	R	Min. / max. control	Process variable
17	11	R	Min. / max. control	Set point in progress
18	12	RWS	0 à 1	Continuous control
			0: Off; 1: On	ON / OFF control
			0: Off; 1: Mid; 2: high	ON / OFF 3 position
			0: Off; 1: ----; 2: On	Servo drive control without feedback potentiometer
20	14	RW	Min. / max. control	Set point n°1 (SP.1)
21	15	RW	Min. / max. control	Set point n°2 (SP.2)
32	20	RWS	Min. / max. control	ON 3 Po. Algorithm on threshold in engineering unit
33	21	RWS	0 to 0,2	ON / OFF and ON / OFF 3 Po. Algorithm control: Hysteresis in %
34	22	RWS	0,2 to 999,9	PD and PID Algorithm: proportional band Bp in %
35	23	RWS	0,02 to 99.99	PID algorithm: integrative time; Ti in minutes
36	24	RWS	0 to 2000	PD and PID Algorithm: derivative time Td in seconds
37	25	RWS	0 to 1	PD algorithm: band centering So in %
38	26	RWS	1 to 2000	PID discontinuous algorithm: cycle time in seconds
48	30	RW	Reading or keyboard simulation (Strong Weight → Key value, low weight → 0) Keys Value : A/M=0xFE =↓0xFD ↑=0xFB ↵= 0xF7 Keys arrangement are performed with a OR between the values	
60	3C	RWS	• MSB: Cycle number of the profile generator between 0 and 255 • LSB: Segment number of the profile generator between 1 and 12	
61	3D	RWS	Bit n°X: n°X segment gradient fixed (1) or not (0) on difference	
62	3E	RWS	Bit n°X: n°X segment soak, fixed (1) or no t (0) on difference...	
63	3F	RWS	0,001 to 9999	Absolute value, in Eng. Unit, of admitted difference – free band
64 to 75	40 to 4B	RWS	0,1 to 999,0	Segment gradient value n°1 to 12 in engineering unit s per minute
79 to91	50 to 5B	RWS	-999 to 9999	Segment soak value n°1 to 12 in engineering units
96 to 107	60 to 6B	RWS	0,1 to 999,0	Segment soak time n°1 to 12 in minute
112 to 123	70 to 7B	RWS	• MSB: Flag profile generator on segment gradient n°1 t o 12 (bit 0: Flag 1, bit 7: Flag 8) • LSB: Flag profile generator on segment soak n°1 to 12 (bit 0: Flag 1, bit 7: Flag 8)	

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RWS: Parameter you can read and write (100000 time only because saved in E2prom).

Addresses Decimal	Hexadecimal	R.W.S[10]	Description of the words
1	1	R	CNOMO Process variable * 10^décimal point position
2	2	RW	CNOMO set point * 10^ decimal point position
3	3	R	CNOMO control output
6	6	RWS	CNOMO proportional band* 10
7	7	R	CNOMO control sense = 0
8	8	RWS	CNOMO Ti * 100
9	9	RWS	CNOMO Td
10	A	RWS	CNOMO Modulation time
11	B	R	CNOMO Minimum scale * 10^ decimal point position
12	C	R	CNOMO Maximum scale * 10^ decimal point position
13	D	RWS	CNOMO Alarm n°1 threshold * 10^ decimal po int position
121	79	R	Manufacturer Identification: 0x0D00
122	7A	R	Tag number: 0x2800
123	7B	R	Apparatus version Example: V2.52 =>pFort=2 pFaible=52
57856	E200	RWS	• Writing of (X-1) registers from the OFFSET E2prom 1er register: OFFSET E2prom Following Registers: Value E2prom from OFFSET Example of frame to write to offset 20h of E2prom 4 bytes (12h 34h 56h 78h) Adr 10 E200 0003 06 0020 1234 5678 Chk • Reading of X registers from the OFFSET E2prom Example of frame to read to the offset 20h from l'E2prom 4 bytes: Adr 06 E200 0020 Chk (adjust the offset) Adr 03 E200 0002 Chk (Reading of 2 registers)
57859	E203	W	Reset apparatus with register value to 55Aah
57860	E204	RW	Reading of displays ASCII on 4 registers and writing only of the low display in ASCII: Example of frame to display the message « Good» on the low display: Adr 10 E204 0004 08 47 6F 6F 64 00 00 00 00 Chk

[10] R: Parameter you can only read.
RW: Parameter you can read and write but not saved in E2prom (Reset on supply failure).
RWS: Parameter you can read and write (100000 time only because saved in E2prom).