GEFRAN

850 - 1650 - 1850

Double PID temperature controller

INSTALLATION AND INSTRUCTION MANUAL

CE

code: 80209B - 11-2018

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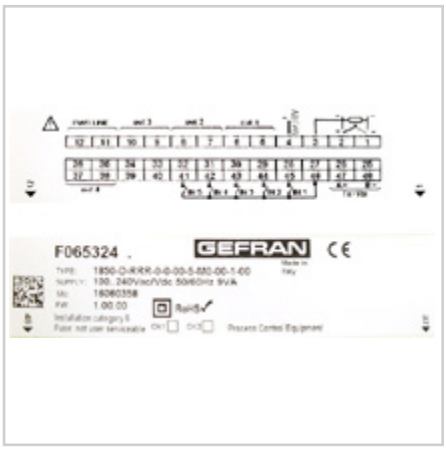
INTRODUCTION

Device data

In the space below, write the order code and other plate data shown on the label attached to the outside of the controller (see figure).
If you need technical assistance, this information must be given to Gefran Customer Service.



Serial number	**SN**	
Finished product code	**CODE**	
Order code	**TYPE**	
Supply voltage	**SUPPLY**	
Firmware version	**VERS.**	

Warnings and safety

Make sure that you always have the latest version of this manual, downloadable at no cost from Gefran's website (www.gefran.com).

The devices described in this manual must be installed by trained personnel in conformity to current laws and regulations, following all of the instructions in this manual.

Installers and/or maintenance personnel MUST read this manual and scrupulously follow all of the instructions contained herein and in the attachments.
Gefran will not be liable for any damage/harm caused to persons and/or property, or to the device itself, if all of such instructions are not followed.

This manual must always be available to people who use or work on the devices described herein.
Before using the 850-1650-1850 controllers, the operator must be adequately instructed with regard to operating, emergency, diagnostics, and maintenance procedures.

If the 850-1650-1850 controllers are used in applications with risk of harm to persons or damage to machines or materials, auxiliary alarm devices must be installed.
It is advisable to provide the possibility, during normal operation, of checking whether any alarms have tripped.

DO NOT touch the terminals when the device is powered.

In case of supposed malfunction, and before contacting Gefran Customer Service, we advise you to consult "Troubleshooting" in the Maintenance section and the F.A.Q. (Frequently Asked Questions) section on Gefran's website (www.gefran.com).

Typographical conventions used in this manual

Pay attention when you see these symbols in the manual.

Indicates very important information on correct product function or on safety, or an instruction that MUST be followed.

Indicates risk for the safety of the installer or user due to the presence of high voltage.

Indicates a point to which the reader's attention is called.

Indicates a suggestion that could be useful for better use of the device

Indicates a reference to other technical documents that can be downloaded from www.gefran.com.

Glossary

4...20 mA Current used as signal transmitted by certain sensors or in a specific way to control a device, such as a motorized valve.

Alarm Output that trips when a certain condition is reached, for example, a defined temperature.

Auto Tune Function that lets you calculate and easily set the P, I and D parameters thanks to the controller's self-learning.

Cool Control used for cooling.

Heat/Cool Control used for both heating and cooling (requires two control outputs).

Heat Control used for heating.

Hysteresis When, at a precise moment, the value of the controlled quantity depends not only on another reference quantity but also on the values that the controlled quantity had previously, there is hysteresis. Hysteresis can therefore be considered inertia that influences the control system, causing variable delays between the change of the reference quantity and the change of the controlled quantity.

ON-OFF Control procedure based on activation and deactivation of the output.
For heating, the output stays on until PV is less than SV by a certain quantity (offset), and then stays off until PV is not greater than SV by the same quantity (or different quantity, depending on controller configuration). For cooling, the output stays on until PV > SV - offset and stays off until PV < SV + offset.
This type of control is not intelligent, does not consider noise, and is not very accurate, but ensures a limited number of switchings of the output.

Overshoot Situation in which PV exceeds SV because the control action stopped too late.
The ON OFF controls have an overshoot greater than the PID controls.

PID Acronym for Proportional-Integration-Differentiation, indicating a system with negative feedback, i.e., a device that acquires a value from a process in input, compares it to a reference value, and uses the difference (error) to calculate the value of the controller output variable, which is the variable that controls the process.
The output is controlled based on the current value of the error (proportional action), on a set of previous error values (integral action), and on the speed of change of the error value (derivative action).

Pt100 A commonly used temperature measurement device. At 0°C its resistance is 100 ohm, and at room temperature about 106 ohm. The Pt100 can be tested for galvanic continuity and normal extension cables can be used.

PV Acronym for Process Value, i.e., the value that the process variable (temperature, valve opening, etc.) has at that moment.

Solid state relay Also known as SSR, this is a relay designed specifically for frequent switching.
It has no moving parts or mechanical contacts, but may still break or short circuit.
This type of relay is often used in temperature control systems such as PID.

Sensor Device that translates physical phenomena (such as change in resistance based on temperature) into electrical signals that can be acquired and processed by the controller.

Setpoint Set value (see SV).

SV Acronym for Set Value, i.e., the value that the process variable (temperature, valve opening, etc.) has to reach and maintain.

Thermocouple Sensor that transmits an electrical signal of a few millivolts. Cannot be tested for galvanic continuity. It needs specially designed extension cables.

Undershoot Situation in which PV does not reach SV because the control action stopped too soon. The ON OFF controls have an undershoot greater than the PID controls.

Control output Output that controls the process and is switched on and off as needed.

Disclaimer

Although all of the information in this manual has been carefully checked, Gefran S.p.A. assumes no liability regarding the presence of any errors or regarding damage to property and/or harm to individuals due to any improper use of this manual

Gefran S.p.A. also reserves the right to change the contents and form of this manual, as well as the characteristics of the devices described herein, at any time and without notice

The technical data and performance levels specified in this manual are to be considered a guide for the user in order to determine the device's suitability for a defined use, and do not constitute a guarantee. They may be the result of test conditions at Gefran S.p.A., and the user must compare them to his/her real application requirements.

Under no circumstances will Gefran S.p.A. be liable for any damage to property and/or harm to individuals due to tampering, incorrect or improper use, or use not conforming to the characteristics of the controller and to the instructions contained in this manual.

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1. GENERAL DESCRIPTION

1.1. Profile

850

1650

1850

The 850, 1650 and 1850 controllers are a family of devices designed to control temperature in industrial processes and to manage the positioning (without feedback) of motorized valves.

The 3 devices have the same main characteristics and the same range of functions. They differ in size (1/16, 1/8 and 1/4 DIN), the amount of information shown on the display, and the maximum number of digital inputs.

The displays show the process and setpoint values, plus multilingual scrolling messages for diagnostics, alarms and process state.

On models 1650 and 1850, a segmented double bar graph shows the percentage of the process variable in relation to the setpoint. Another segmented bar graph shows percentages of power, delivered current or valve position.

A scrolling alphanumeric, completely configurable and settable in 3 languages, shows 25 messages of up to 32 characters in length.
Thanks to language selection and clear scrolling messages for diagnostics, alarms, and process state, the controller speaks the user's language.

Configuration/local operation is done with keys (4 on the 850 and 1650, 6 on the 1850), to which dual-function LEDs are associated: feedback for pressed key and guide for permitted operations.

Commissioning is simplified by guided configuration for manual-free programming, with just a few indispensable parameters accompanied by inline help messages.

The configuration can be cloned among controllers without having to switch on the power supply thanks to the Zapper, a battery-operated portable mini-configurator (to be ordered separately).
With GF_eXpress software and PC, you can program the extended configuration, create work recipes and update the firmware without having to switch on the controllers.

The initial parameters can always be reset, both from the keypad and from the GF_eXpress software.

The devices offer complete diagnostics (broken or incorrect connection of sensor, total or partial load break, off-scale of variables and control loop faults), operation count, settable alarm limits (useful for scheduling preventive maintenance), and an internal energy counter to totalize energy consumption and cost to achieve continuous control.

Double Loop control, with two universal inputs configurable for Thermocouples, Resistance thermometers, Linear Inputs.
Singe Loop control: the second input can be configured as a remote setpoint.
Tuning is performed via advanced algorithms that ensure stable and accurate adjustments, even with critical or very fast heating systems, and that engage automatically when necessary.

Programmer (for applications with setpoint profiles): models are available with 128 steps groupable in sixteen different programs. Each step manages a ramp and a hold, with enable inputs and event outputs.
With double loop, you can enable a second programmer with asynchronous or synchronous time base.
The controller can be configured directly with the keys or graphically via GF_eXpress software.

Thirty AND, OR and Timer Function Blocks let you create customizable logic sequences for complete and flexible machine control. The controller's HW resources are exploited completely, without any need for external devices such as timers and small PLCs.

Eight math Function Blocks let you configure analog variables.
On the model 1850, an additional 8 digital inputs/outputs and 8 relay outputs are available, managed by Function Blocks.

The controllers offer the RS485 Modbus RTU for **connectivity**.

Maintenance of the system in which the device is installed is made easier by the ability to replace the controller at any time simply by removing it from the faceplate.
No additional steps are needed.

1.2. Differences among models

	850	1650	1850
Display dimensions	35 × 30 mm	37 × 68 mm	83 × 68 mm
PV display	4 digit, 7 seg., H = 17 mm	4 digit, 7 seg., H = 17 mm	4 digit, 7 seg., H = 23 mm
SV display	5 digit, 14 seg., H = 7,5 mm	4 digit, 7 seg., H = 14 mm	4 digit, 7 seg., H = 11 mm
Display F	n/a	5 digit, 14 seg., H = 9 mm	7 digit, 14 seg., H = 9 mm
Bargraph PV/SP	n/a	dual, 11 segments	dual, 11 segments
Configurable Bargraph	n/a	11 segments	11 segments
Keys	4	4	6
Max. digital inputs	3	5	5 + 8
Power dissipation	10 W	10 W	12 W
Dimensions	48 × 48 mm (1/16 DIN)	48 × 96 mm (1/8 DIN)	96 × 96 mm (1/4 DIN)
Weight	0,16 kg	0,24 kg	0,35 kg

n/a = not available

1.3. 850 Controller

Dimensions 48 × 48 × 100 mm (1/16 DIN)

Main features

- Operator interface with large LCD Display
- Scrolling diagnostics messages, configurable, in the selected language
- Easy, guided configuration, copy/paste parameters even with power off
- Preventive maintenance with energy counters (kWh) and load switching
- 32 function block applications
- 8 Math application blocks
- Timer, setpoint and algorithm programmer for controlling motorized valves
- Advanced tuning of control parameters
- Different password levels
- 2 configurable universal inputs for Thermocouples, Resistance Thermometers, Linear inputs
- 2 PID control loops
- 2 Setpoint programmers (128 steps in 16 programs
- Relay, logic, isolated analog outputs
- Up to two TA inputs for interrupted load diagnostics
- RS485 serial communication in Modbus RTU
- Removable faceplate for immediate replacement
- Accuracy 0.2%, sampling time 60 ms

1.3.1. Display and keys

1 Unit of measurement or number of program running or number of loop displayed.

2 State of outputs OUT1, OUT2, OUT3, OUT4.

3 Controller function states:
- RUN = functioning (flashing = normal functioning, steady on = program running);
- _/- = setpoint ramp active;
- TUN = PID parameters tuning active;
- MAN = manual/automatic (off = automatic control, on = manual control);
- REM = remote setpoint enabled;
- SP1/2 = setpoint active (off = setpoint 1, on = setpoint 2).

4 Work mode key (manual/automatic) in standard mode. A function can be assigned via parameter but1. The key is active only when the display shows the process variable (HOME)..

5 Up/down keys: raise/lower the value of the parameter displayed on the SV or PV display.

6 F key: lets you navigate among controller menus and parameters. Confirms the parameter value and selects the next parameter..

7 Key pressed signals.

8 SV display: setpoint value, description of parameters, diagnostics and alarm messages. Configurable with parameter dS.SP (default = setpoint).

9 PV display: process variable, parameter values.

Figure 1 - Description of 850 display and keys

1.3.2. Drilling dimensions and templates

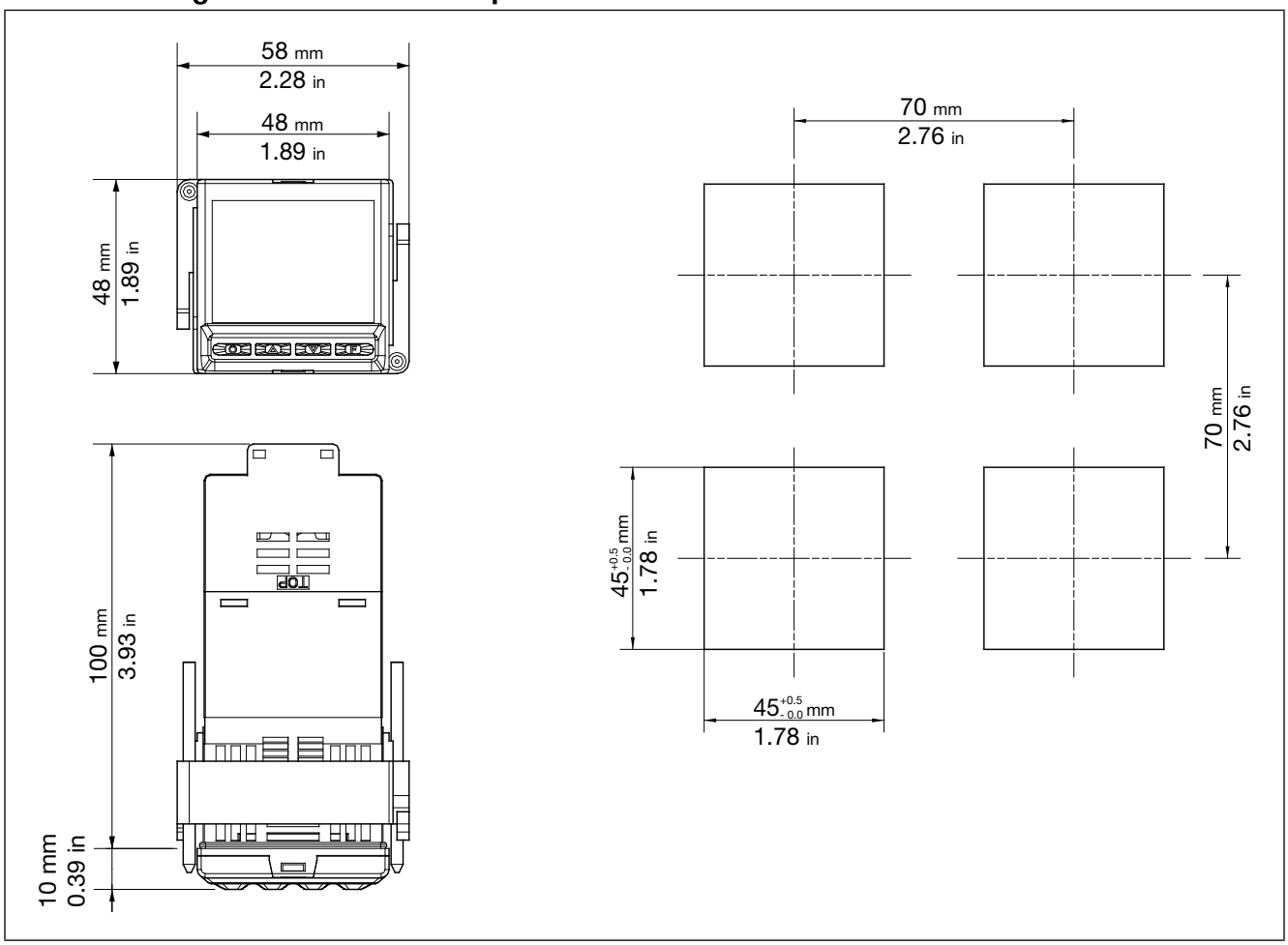


Figure 2 - 850 drilling dimensions and templates

1.4. 1650 Controller

Dimensions 48 × 96 × 80 mm (1/8 DIN

Main features

- Operator interface with large LCD Display and three configurable bargraphs
- Scrolling diagnostics messages, configurable, in the selected language
- Easy, guided configuration, copy/paste parameters even with power off
- Preventive maintenance with energy counters (kWh) and load switching
- 32 function block applications
- 8 Math application blocks
- Timer, setpoint and algorithm programmer for controlling motorized valves
- Advanced tuning of control parameters
- Different password levels
- 2 configurable universal inputs for Thermocouples, Resistance thermometers, Linear inputs
- 2 PID control loops
- 2 Setpoint programmers (128 steps in 16 programs)
- Relay, logic, isolated analog outputs
- Up to two TA inputs for interrupted load diagnostics
- RS485 serial communication in Modbus RTU
- Removable faceplate for immediate replacement
- Accuracy 0.2%, sampling time 60 ms

1.4.1. Display and keys

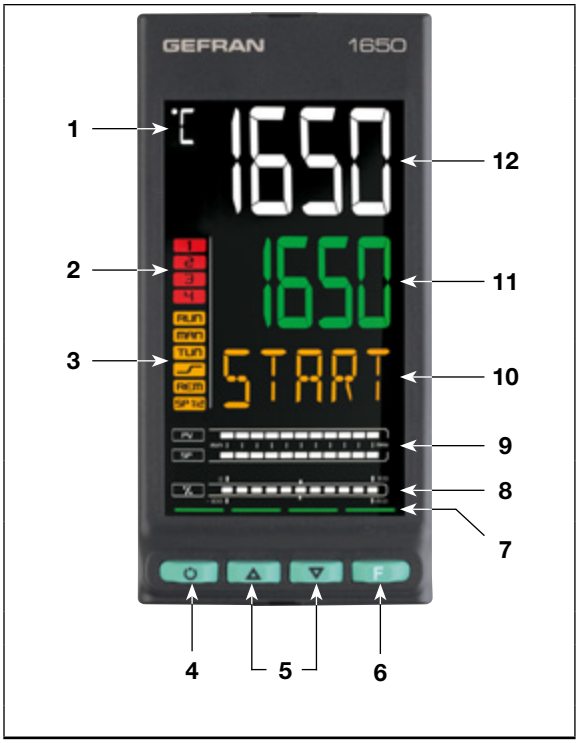


Figure 3 - Description of 1650 display and keys

1 Unit of measurement or number of program running or number of loop displayed.

2 State of outputs OUT1, OU2, OUT3, OUT4

3 Controller function states:
- RUN = functioning (flashing = normal functioning, steady on = program running);
- _/- = setpoint ramp active;
- TUN = PID parameters tuning active;
- MAN = manual/automatic (off = automatic control, on = manual control);
- REM = remote setpoint enabled;
- SP1/2 = setpoint active (off = setpoint 1, on = setpoint 2).

4 Work mode key (manual/automatic) in standard mode. A function can be assigned via parameter but1. The key is active only when the display shows the process variable (HOME).

5 Up/down keys: raise/lower the value of the parameter displayed on the SV or PV display.

6 F key: lets you navigate among controller menus and parameters. Confirms the parameter value and selects the next parameter.

7 Key pressed signals.

8 Displays percentage of power or current, configurable with parameter bAr.3.

9 Display of percentage of process variable and of setpoint.

10 F display: parameters, diagnostics and alarm messages. Configurable with parameter dS.F (default = % control power).

11 SVdisplay: parameter values. Configurable with parameter dS.SP (default = setpoint).

12 PV display: process variable.

1.4.2. Drilling dimensions and templates

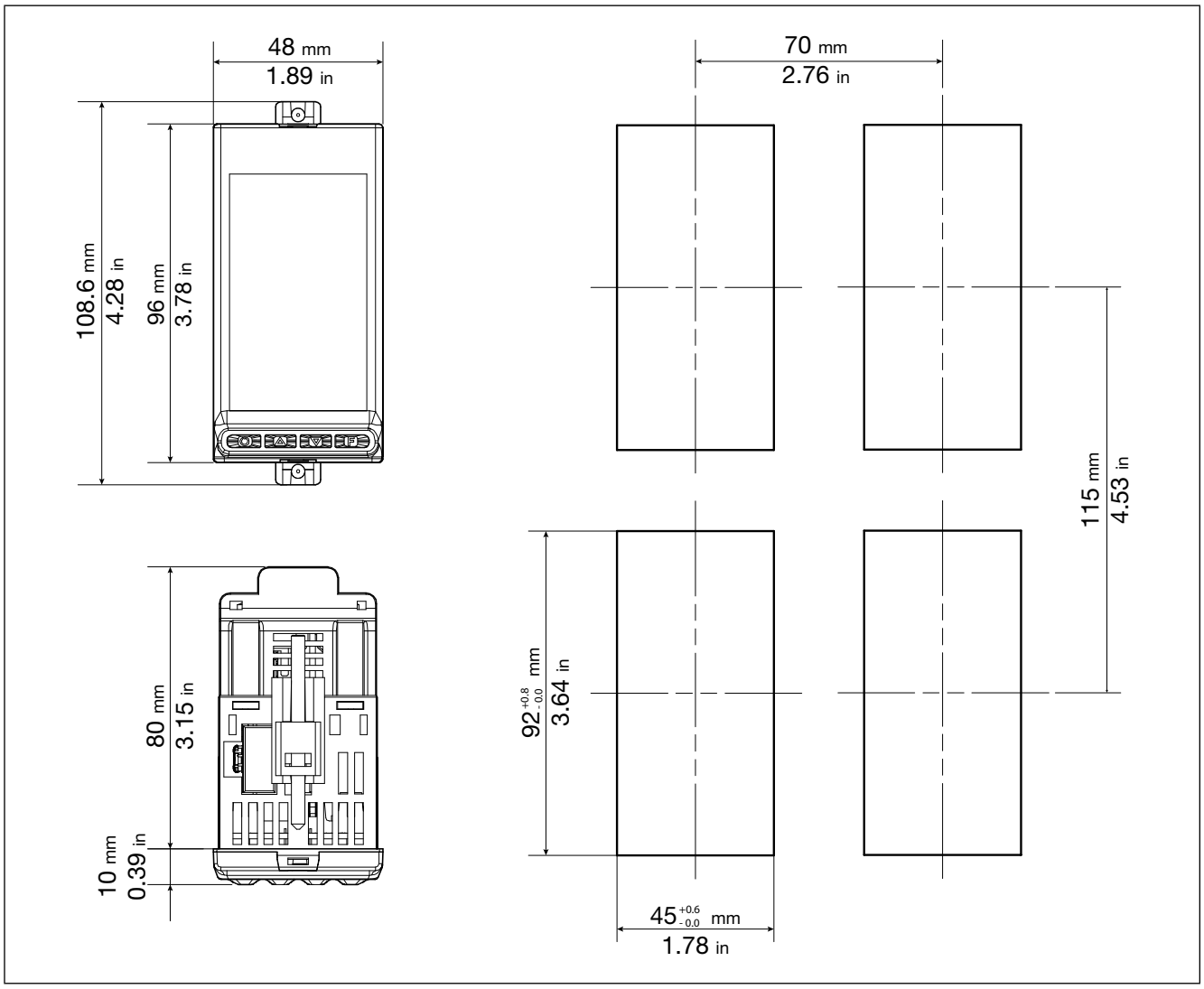


Figure 4 - 1650 drilling dimensions and templates

1.5. 1850 Controller

Dimensions 96 × 96 × 80 mm (1/4 DIN)

Main features

- Operator interface with large LCD Display and three configurable bargraphs
- Scrolling diagnostics messages, configurable, in the selected language
- Easy, guided configuration, copy/paste parameters even with power off
- Preventive maintenance with energy counters (kWh) and load switching
- 32 function block applications
- 8 Math application blocks
- Timer, setpoint and algorithm programmer for controlling motorized valves
- Advanced tuning of control parameters
- Different password levels
- 2 configurable universal inputs for Thermocouples, Resistance Thermometers, Linear inputs
- 2 PID control loops
- 2 Setpoint programmers (128 steps in 16 programs)
- Relay, logic, isolated analog outputs
- Up to two TA inputs for interrupted load diagnostics
- RS485 serial communication in Modbus RTU
- Removable faceplate for immediate replacement
- Accuracy 0.2%, sampling time 60 ms

1.5.1. Display and keys

Figure 5 - Descrizions display e tasti 1850

1 Unit of measurement or number of program running or number of loop displayed.

2 State of outputs OUT1, OU2, OUT3, OUT4.

3 Displays program number, step number, unit of measurement (%, A, kW, kWh).

4 Controller function states:
- RUN = functioning (flashing = normal functioning, steady on = program running);
- _/- = setpoint ramp active;
- TUN = PID parameters tuning active;
- MAN = manual/automatic (off = automatic control, on = manual control);
- REM = remote setpoint enabled;
- SP1/2 = setpoint active (off = setpoint 1, on = setpoint 2).

5 Work mode key (manual/automatic) in standard mode. A function can be assigned via parameter but1. The key is active only when the display shows the process variable.

6 Key function configurable with parameters but2 and but3. The keys are active only when the display shows the process variable (HOME).

7 Up/down keys: raise/lower the value of the parameter displayed on the SV or PV display.

8 F key: lets you navigate among controller menus and parameters. Confirms the parameter value and selects the next parameter.

9 Key pressed signals.

10 Displays percentage of power or current, configurable with parameter bAr3.

11 Display of percentage of process variable and of setpoint

12 F display: parameters, diagnostics and alarm messages. Configurable with parameter dS.F (default = % control power).

13 SV display: parameter values. Configurable with parameter dS.SP (default = setpoint).

14 PV display = Process variable

15 Display of inputs/outputs state (only with 8 INS/OUTS and/or 8 relays).

1.5.2. Drilling dimensions and templates

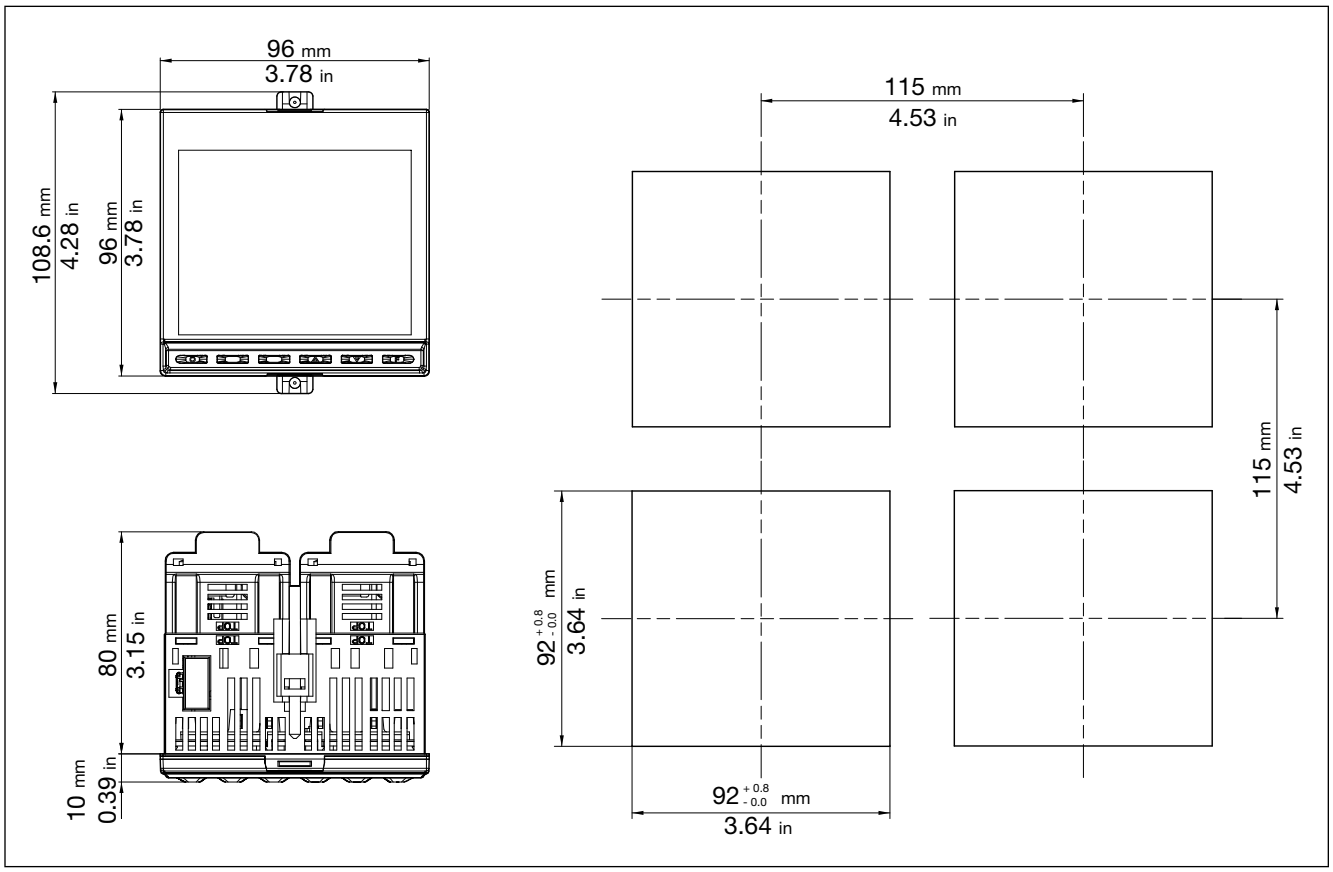


Figure 6 - 1850 drilling dimensions and templates

2. INSTALLATION

Attention! The devices described in this manual must be installed by trained personnel in conformity to current laws and regulations, following all of the instructions in this manual.

Before installing, check that the controller is in perfect condition and was not damaged in shipment. Make sure that the package contains all of the accessories listed on the accompanying document, especially the gasket and the fastening brackets.

Check that the order code matches the configuration required for the intended application (supply voltage, number and type of inputs and outputs). See Chapter 10 - Ordering code - to check the configuration corresponding to each order code.

Attention! If even one of the requirements mentioned above (trained technician in, device in perfect condition, correct configuration) is not satisfied, interrupt the installation and contact your Gefran dealer or Gefran Customer Service.

2.1. Mounting the controller

2.1.1. General installation rules

The controller is designed for permanent indoor installation. It must be mounted on electrical panels or on panels controlling machines or production process plants that are able to protect the exposed terminals on the rear of the controller.

Attention! DO NOT install the controller in a potentially inflammable or explosive atmosphere. It can be connected to elements that work in such atmospheres only by means of appropriate interfaces that conform to safety regulations in force in the country of installation.

Attention! the controller is used in applications with risk of harm/damage to persons/property, it MUST be connected to dedicated alarm devices.
It is advisable to provide the possibility, during normal functioning of the controller and of the system or equipment that it controls, of checking whether any alarms have tripped.

The controller must be installed in a location that is not subject to sudden temperature changes or to freezing or condensation, and no corrosive gases must be present.

The controller can work in Pollution Degree 2 environments (presence of non-conductive dust, only temporarily conductive due to possible condensation).
Do not allow scrap or metal particles from machining or condensation products to reach the device.

The controller is sensitive to strong electromagnetic fields. Do not position it near radio devices or other equipment that may generate electromagnetic fields, such as power contactors, relays, thyristor power units (especially phase angle), motors, solenoids, transformers, high-frequency welders, etc.

2.1.2. Drilling dimensions

For correct installation, respect the dimensions of each hole and the distance between adjacent holes shown in the figures for each model (“Figure 2 - 850 drilling dimensions and templates” on page 13, “Figure 4 - 1650 drilling dimensions and templates” on page 15, “Figure 6 - 1850 drilling dimensions and templates” on page 17).

Attention! The support on which the operator panel is mounted must:

- be sufficiently rigid and robust to support the device without bending during use;
- be from 1 to 4 mm thick to allow the device to be fastened with the supplied bracket.

2.1.3. Protection against infiltration of dust and water

The front of the controller has an IP65 protection index, so the device can be installed without problems in rooms that are very dusty or subject to splashing water provided:

- the housing in which the device is inserted is dust-tight and watertight;
- the support on which the device is installed is perfectly smooth and without undulations on the front;
- the hole on the support scrupulously respects the specified drilling dimensions;
- the device is fully tightened to the support to ensure that the gasket inserted between the device and the panel is watertight

Attention! If not adequately protected, the controller has an IP20 protection index (rear container and terminal board.

2.1.4. Vibrations

The controller can support vibrations from 10 to 150 Hz, 20 m/s^2 (2 g),in all directions (X, Y and Z).
If the device is mounted on a support that exceeds these limits, it is advisable to provide a suspension system to reduce vibrations.

2.1.5. Minimum space for ventilation

The temperature in the housing containing the controller must NEVER exceed 55°C.
NEVER block the ventilation slits.

Advice. The lower the temperature in which the device works, the longer the life of its electronic components.

Attention! Forced cooling (for example, with a fan) of the rear of the controller may cause measurement errors

2.1.6. Positioning

The controller must be positioned so that the display is not subject to direct sunlight or to very strong sources of light. If necessary, filter direct light, for example, with a reflective screen.
The controller must be tilted between 30° and 120°, as shown in the figure

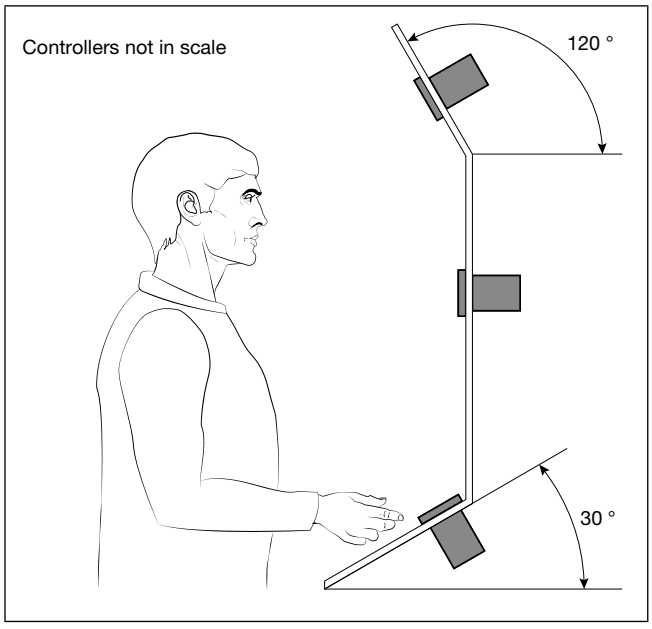


Figure 7 - Positioning the controller

2.1.7. Fastening to the panel

1. Insert the die-cut rubber gasket between the controller and the panel. The gasket (supplied) is indispensable for ensuring the declared protection index of the faceplate.
2. Insert the device into the hole previously made on the panel.
3. Place the supplied bracket(s) onto the rear of the controller.
4. Tighten the screws to fasten the device to the panel. The tightening torque must be between 0,3 and 0,4 N m

The following figures show how to fasten the three controller models.

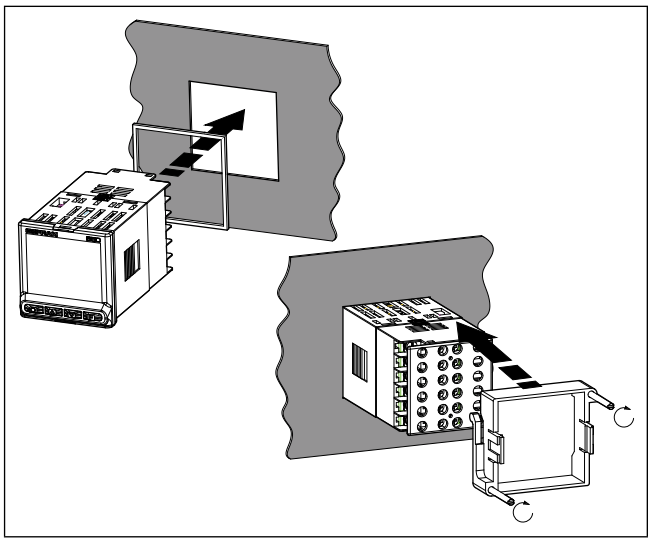


Figure 8 - Fastening the 850

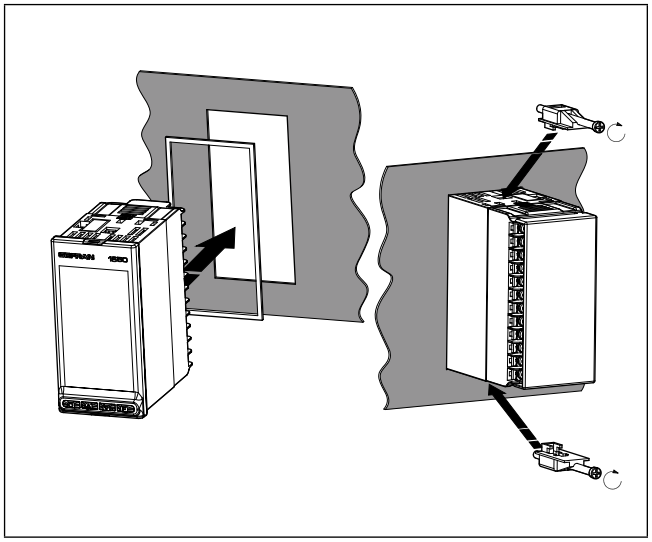


Figure 9 - Fastening the 1650

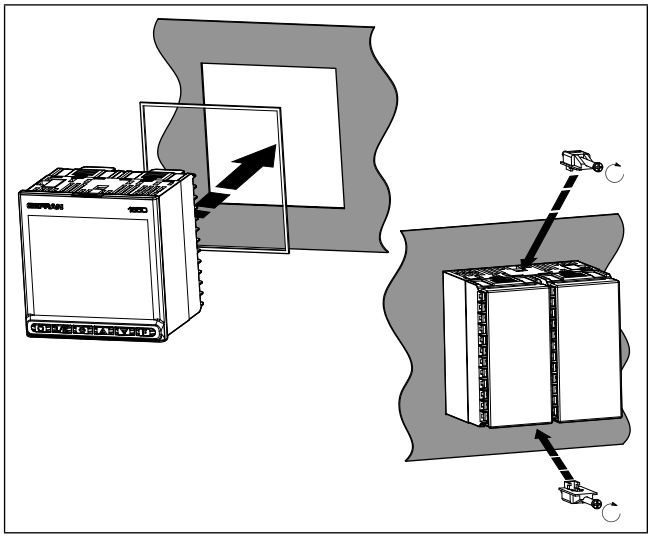


Figure 10 - Fastening the 1850

2.2. Connections

Attention! Failure to follow the instructions in this section may cause problems in electrical safety and electromagnetic compatibility, in addition to voiding the warranty.

2.2.1. General rules for connections

1. Connected external circuits must have double isolation.
2. In case of shielded cables, the shield must be grounded at a single point, possibly near the controller.
3. Input cables must be physically separated from power cables, output cables, and power connections.
4. Do not connect unused terminals.
5. Tighten the terminals without forcing. Loose terminals may cause sparks and fires.
   The recommended tightening torque is 0.5 Nm.
6. When making connections, respect polarity where required.
7. Do not bend or twist the cables beyond the limits specified by the manufacturers.
8. After connecting the cables, apply the transparent cover to protect the terminals.
   The terminal teeth limit and define the correct direction for applying the cover.

2.2.2. Electromagnetic compatibility (EMC)

For electromagnetic conformity, the strictest general rules have been applied, using the following test configuration:

Connection	Cable section	Length
Power supply	1 mm²	1 m
Relay	1 mm²	3,5 m
Serial port	0,35 mm²	3,5 m
Thermocouple	0,8 mm²	5 m compensated
Potentiometer, linear, “PT100” resistance thermometer	1 mm²	3 m
Analog retransmission output	1 mm²	3,5 m
Digital input/outputs	1 mm²	3,5 m

2.2.3. Cables

Always use cables appropriate for the voltage and current limits specified in the Technical Characteristics.

Use copper cables with 60/75°C insulation.
Use twisted and shielded cables for non-power connections.

The controller’s terminal board has screw terminals (M3) that accept stripped cables and crimped terminals for a tightening torque of 0.5 N m.
Two ring or crimped fork terminals can be connected on each terminal

The following table shows the characteristics of the cables and terminals that can be used.

Cable / terminal	Cable / terminal section	Terminal size
Rigid cable	0,8...2,5 mm² (18...14 AWG)	
Twisted	0,8...2,5 mm² (18...14 AWG)	
Tag terminal (to be crimped)	0,25...2,5 mm² (23...14 AWG)	
Fork terminal (to be crimped)		5,8 mm max
Ring terminal (to be crimped)		5,8 mm max

Attention! Anchor the cables, at least in pairs, so that mechanical stresses do not discharge on the terminal connections.

2.2.4. Power supply

Attention! Before powering the controller, make sure that the supply voltage matches the one shown on the controller data plate.

Because the controller does not have a switch, a bipolar switch with fuse must be inserted upline. The switch, or isolator, must be positioned in the immediate vicinity of the device and must be easily reached by the operator.
A single switch can control multiple controllers.

The controller must be powered by a line separated from the one used for electromechanical power devices (relays, contactors, solenoids, etc).

It is advisable to install a ferrite core on the power line, as close as possible to the device, to limit the controller’s susceptibility to electromagnetic noise.

If the controller’s power line is heavily disturbed by the switching of thyristor power units or by motors, it is advisable to use an isolation transformer only for the controller, grounding the shield.

Use appropriate line filters in the vicinity of high-frequency generators or arc welders.
Use a voltage stabilizer if there are wide shifts in line voltage.

20...27 VAC/VDC models must be powered by a class II or low-voltage limited-energy source.
The power supply must use a line separated from the one used for electromechanical power devices, and low-voltage power cables must run along a path separated from the system or machine power cables.

Attention! Make sure the ground connection is efficient. Absent or inefficient grounding can make the device unstable due to excessive noise.
Specifically, check that:
- voltage between mass and ground is < 1 V;
- resistance is < 6 Ω.

2.2.5. Connecting inputs and outputs

The controller's input and output lines must be separated from the power line.
To prevent noise, the controller's input and output cables must be kept away from the power cables (high voltages or high currents).
The input and output cables and the power cables must not be placed parallel to one another.
Use shielded cables or separate cable trays.

To connect the output to an inductive load (relay, contactor, electrovalve, motor, fan, solenoid, etc.) that works in AC, mount a snubber, i.e., an RC group (resistor and condenser in series) placed parallel to the load. Installing this filter lengthens the life of the relays.

NOTE: All condensers must conform to VDE (class X2) standards and support voltage ≥ 220 VAC.
The power of the resistor must be ≥ 2 W.

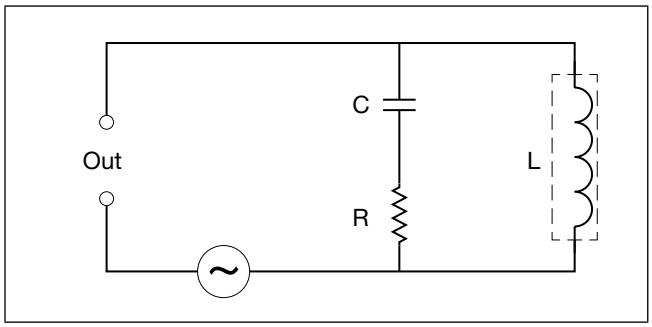


Figure 11 - Snubber connection diagram (AC)

For inductive loads that work in DC, mount a 1N4007 diode parallel to the coil.

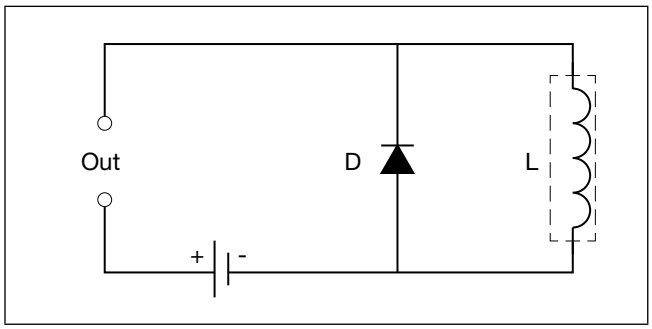


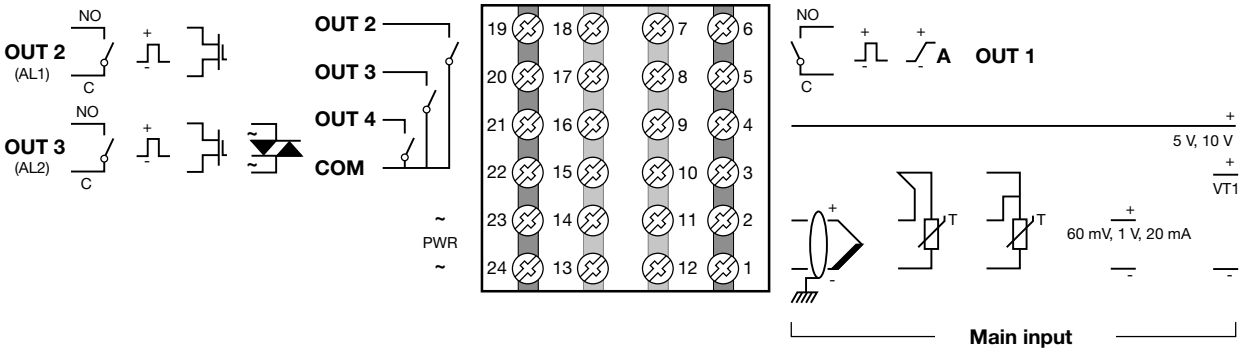
Figure 12 - Snubber connection diagram (DC)

The filters must be connected as close as possible to the controller.

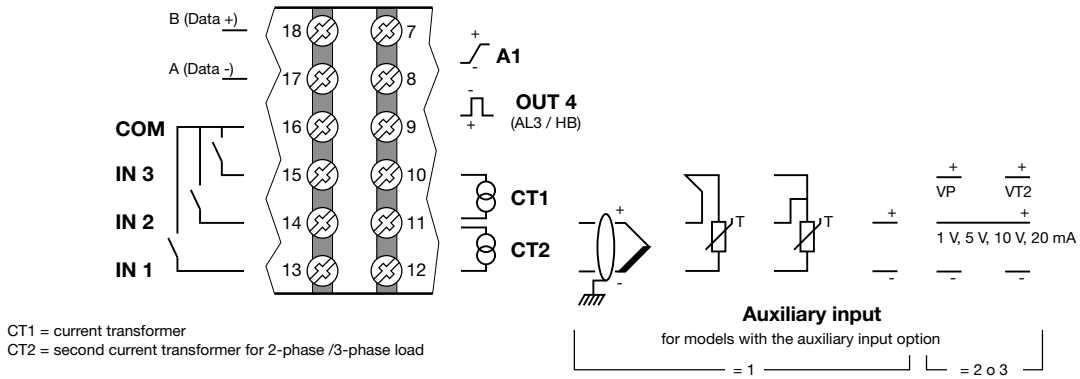
Attention! If the controller is connected to devices that are NOT electrically isolated (such as thermocouples), ground with a specific conductor to prevent grounding directly through the machine structure.

2.3. 850 connection diagrams

2.3.1. General diagram

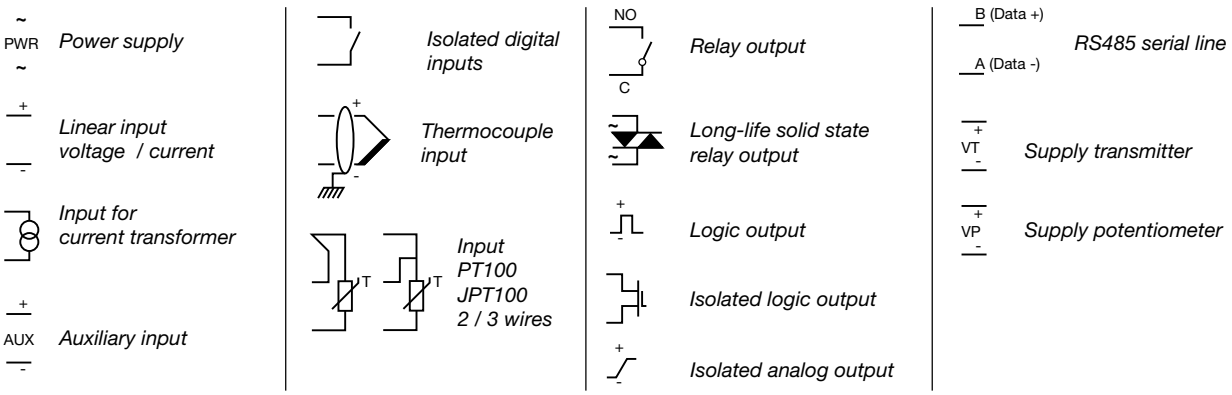


with Modbus communication option RTU (M) = M0



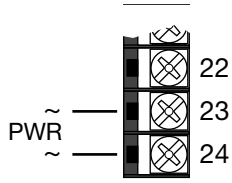
CT1 = current transformer
CT2 = second current transformer for 2-phase /3-phase load

LEGEND



2.3.2. Power supply

Power supply



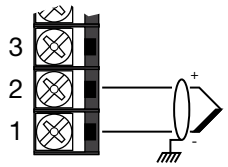
Standard: 100...240 VAC/VDC ± 10%
50/60 Hz, max 10 W

Optional: 20...27 VAC/VDC ± 10%
50/60 Hz, max 10 W

(*) ground connection for option 20...27 V AC/DC only

2.3.3. Inputs

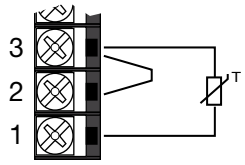
TC Input



Available thermocouples:
J,K,R,S,T,C,D B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh
ITS90 or custom linearization

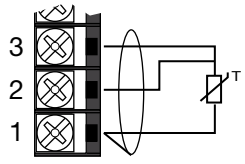
Respect polarity
For extensions, use a compensated cable suitable for the type of TC used

Input PT100/JPT100 - 2-wires connection



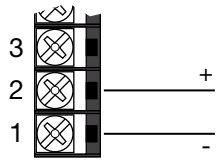
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate.

Input PT100/JPT100 - 3-wires connection



Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.
The resistance of the three wires must be equal, the line resistance must be less than 20 ohm.

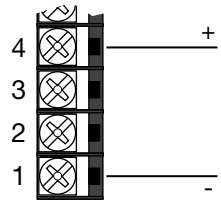
Linear input (V, I)



Linear input voltage
0...60 mV Ri > 70 kΩ
0...1 V Ri > 15 kΩ

Linear input in direct current
0/4...20mA, Ri = 50 Ω.

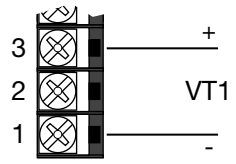
Linear input (V)



Linear input in direct voltage
0...5 V / 0...10 V Ri > 30kΩ

Transmitter supply (VT1)

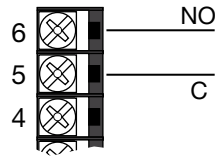
24 VDC ±10%, max 30 mA



2.3.4. Outputs

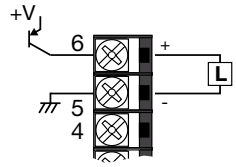
Characteristics of outputs are defined when the controller is ordered.

Output Out 1 - relay 5 A



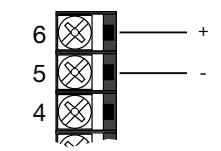
Relay 250 VAC, 5 A

Output Out 1 - logic



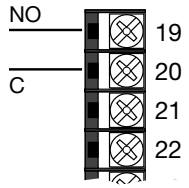
Logic 24 V ±10%
(min 10 V a 20 mA)

Output Out 1 - analog



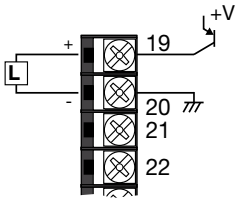
0...10 V, max 20 mA Rout > 500 Ω
0...20 mA / 4...20 mA Rout < 500 Ω

Output Out 2 - relay 5 A



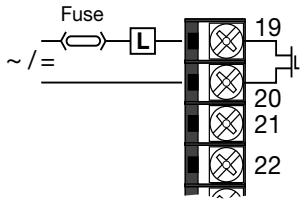
Relay 250 VAC, 5 A

Output Out 2 - logic



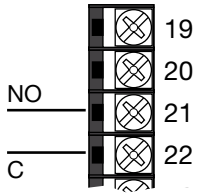
Logic 24 V ±10%
(min 10 V to 20 mA

Output Out 2 - logic isolated



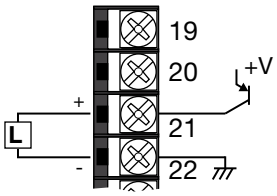
Logic 30 V AC/DC max
max 100 mA
Isolated 1500 V

Output Out 3 - relay 5 A



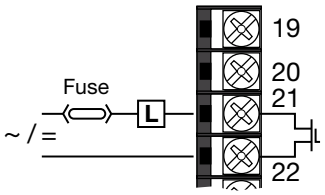
Relay 250 VAC, 5 A

Output Out 3 - logic



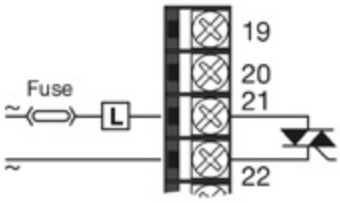
Logic 24 V ±10%
(min 10 V to 20 mA)

Output Out 3 -Isolated analog output



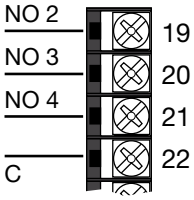
Logic 30 V AC/DC max
max 100 mA
Isolated 1500 V

Output Out 3 - Triac



Triac 75...240 VAC
max 1 A
Isolated 3 kV

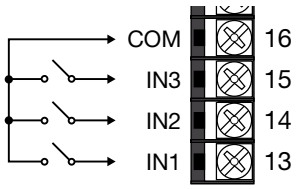
Outputs Out 2, Out 3, Out 4 - relay 5 A



Relay 250 VAC, 5 A

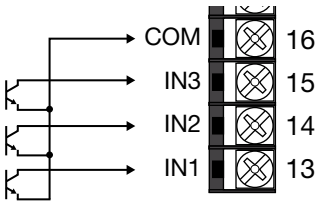
2.3.5. Digital inputs

Digital inputs



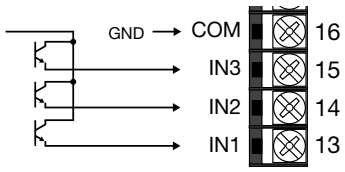
Digital inputs
voltage-free contact

Digital inputs



NPN digital input
24 V, 4,5 mA

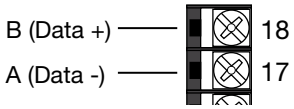
Digital inputs



PNP digital inputs
+12/24 V max 3,6 mA

2.3.6. Serial line

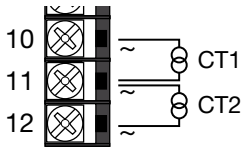
Serial line [with (M) = M0 communication option]



Serial line
RS485 2-wires

2.3.7. CT inputs

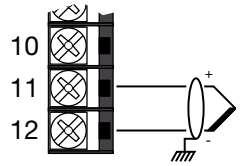
CT inputs [option]



Current transformer
50 mA, 10 Ω, 50/0 Hz
second current transformer
for 2-phase /3-phase load

2.3.8. Auxiliary inputs

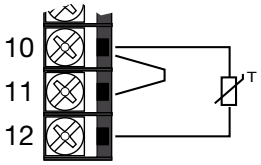
TC auxiliary input
[[Available only if the main input is configured with Option TC type (H-I) = 01]



Available thermocouples:
J,K,R,S,T,C,D B, E, L, L-GOST, U, G, N,
Pt20Rh-Pt40Rh
ITS90 or custom linearization

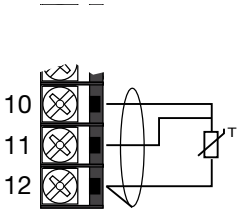
Respect polarity
For extensions, use a compensated cable.

PT100/JPT100 Auxiliary input - 2-wires connection
[with option (H-I) = 01]



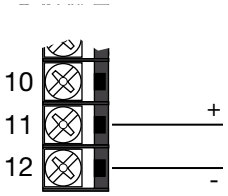
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.

PT100/JPT100 Auxiliary input - 3-wires connection
[with option (H-I) = 01]



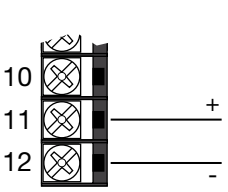
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.
The resistance of the three wires must be equal, the line resistance must be less than 20 ohm.

Auxiliary linear input (V) [with option (H-I) = 01]



linear input voltage
0...60 mV Ri > 10 MΩ

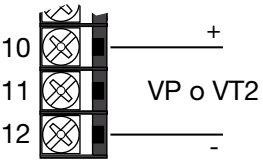
Auxiliary linear input (V, I) [with option (H-I) = 02, 03]



linear input voltage
0...1 V Ri > 300 KΩ
0...5 V / 0...10 V Ri > 300 KΩ

Linear input in direct current
0/4...20 mA Ri = 50 KΩ

Potentiometer VP or transmitter VT2 supply

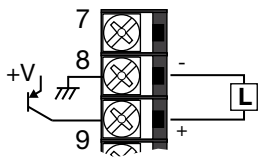


VP = 1 VDC ±1%, max 30 mA
[with option (H-I) = 02]

VT2 = 24 VDC ±10%, max 30 mA
[with option (H-I) = 03]]

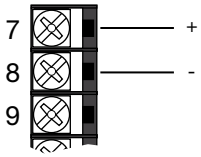
2.3.9. Auxiliary outputs

Output Out 4 - logic



Logic 24 V ±10%
(min 10 V to 20 mA)

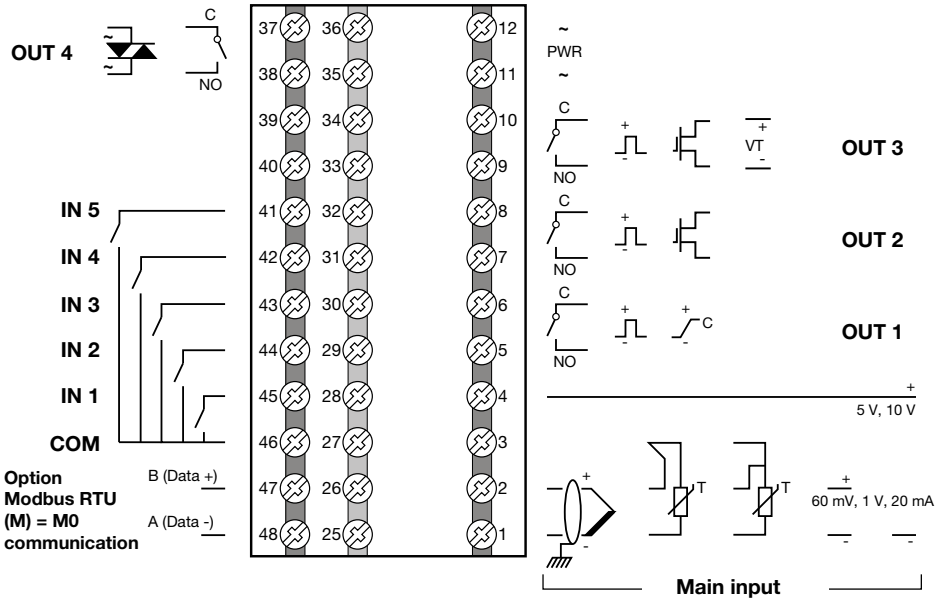
Output A1 - analogue

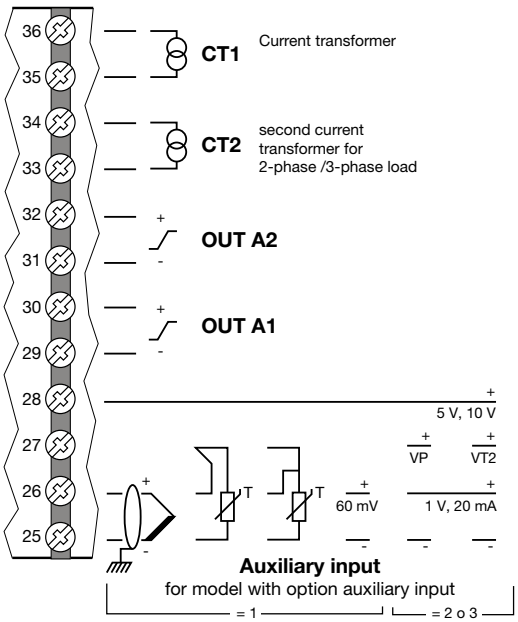


0...10 V, max 20 mA Rout > 500 Ω
0...20 mA / 4...20 mA Rout < 500 Ω

2.4. 1650 connection diagrams

2.4.1. General diagram





LEGEND

~ PWR ~ *Power supply*

Linear input in voltage / current

Input for current transformer

AUX *Auxiliary input*

Isolated digital inputs

Thermocouple input

Input PT100 JPT100 2 / 3wires

NO C *Relay output*

Long-life solid state relay output

Logic output

Isolated logic output

Isolated analog output

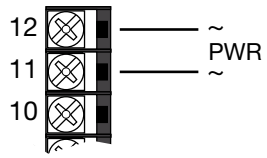
B (Data +) A (Data -) *RS485 serial line*

VT *Supply transmitter*

VP *Supply potentiometer*

2.4.2. Power supply

Powe supply



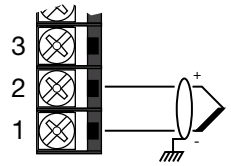
Standard:
100...240 VAC/VDC ± 10%
50/60 Hz, max 10W

Optional:
20...27 VAC/VDC ± 10%
50/60 Hz, max 10W

(*) ground connection for option 20...27 V AC/DC only

2.4.3. Inputs

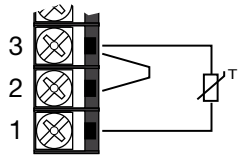
TC input



Available thermocouple:
J, K,R, S, T, C, D B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh
ITS90 or custom linearization

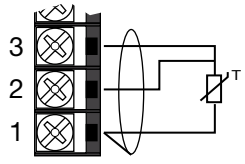
Respect polarity
For extensions, use a compensated cable

Input PT100/JPT100 - 2-wires connection



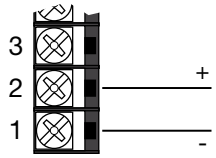
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.

Input PT100/JPT100 - 3-wires connection



Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.
The resistance of the three wires must be equal, the line resistance must be less than 20 ohm.

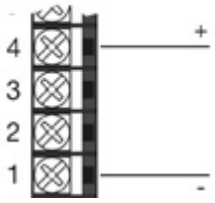
Linear input (V, I)



Linear input in direct voltage
0...60 mV Ri > 70 kΩ
0...1 V Ri > 15 kΩ

Linear input in direct current
0/4...20mA, Ri = 50 Ω.

Linear input (V)



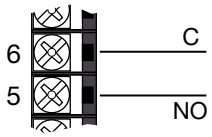
Linear input in direct voltage
0...5 V / 0...10 V Ri > 30kΩ

2.4.4. Outputs

Characteristics of outputs Out1, Out2, Out3, Out4 are defined when the controller is ordered.

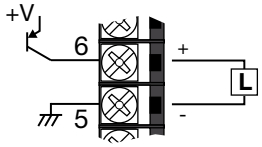
Output Out 1 - relay 5 A

Relay 250 VAC, 5 A

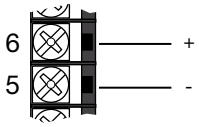


Output Out 1 - logic

Logic 24 V ±10%
(min 10 V to 20 mA)



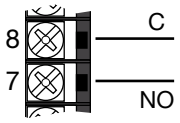
Output Out 1 - continuous



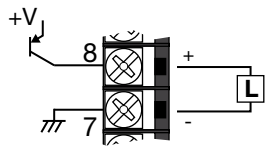
4...20 mA Rout < 500 Ω

Output Out 2 – relay 5 A

Relay 250 VAC, 5 A

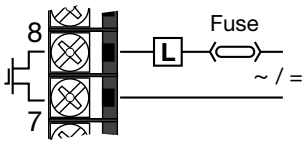


Output Out 2 – logic



Logic 24 V ±10%
(min 10 V to 20 mA)

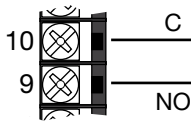
Output Out 2 - logic isolated



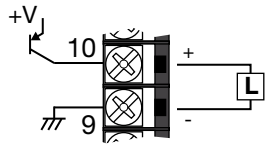
Logic 30 V AC/DC max
max 100 mA
Insulation 1500 V

Output Out 3 – relay 5 A

Relay 250 VAC, 5 A

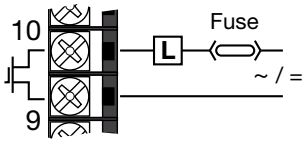


Output Out 3 – logic



Logic 24 V ±10%
(min 10 V to 20 mA)

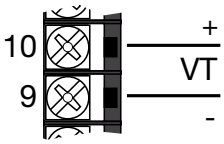
Output Out 3 - logic isolated



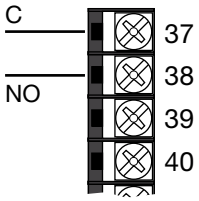
Logic 30 V AC/DC max
max 100 mA
Insulation 1500 V

Transmitter supply (VT)

24 VDC ±10%, max 30 mA

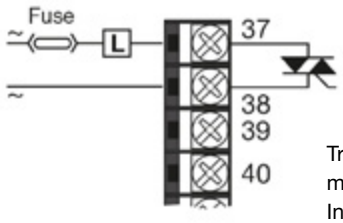


Output Out 4 – relay 5A



Relay 250 VAC, 5 A

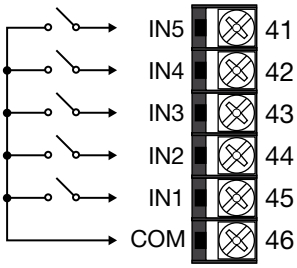
Output Out 4 –Triac



Triac 75...240 VAC
max 1 A
Insulation 3 KV

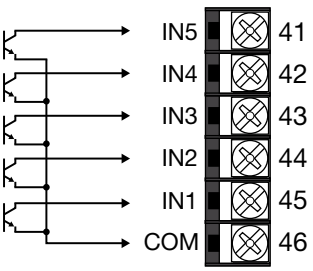
2.4.5. Digital inputs

Digital inputs



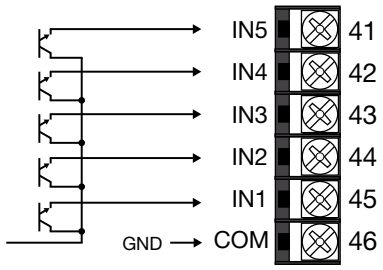
Digital inputs
voltage-free contact

Digital inputs



NPN Digital inputs
24 V, 4,5 mA

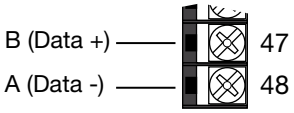
Digital inputs



PNP digital inputs
+12/24 V
max 3,6 mA

2.4.6. Serial line

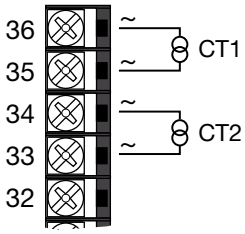
Serial line



Serial line
RS485 2-wires

2.4.7. CT Inputs

Inputs CT1, CT2

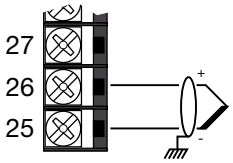


Current transformer
50 mAac, 10 , 50/60 Hz

Second current transformer
for 2-phase / 3-phase load

2.4.8. Auxiliary inputs

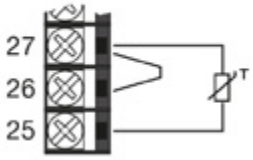
Input TC [with option auxiliary input = 1, Available only if the main input is configured type TC]



Available thermocouples:
J, K,R, S, T, C, D B, E, L, L-GOST, U, G, N,
Pt20Rh-Pt40Rh
ITS90 or custom linearization

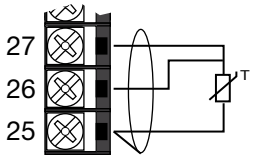
Respect polarity
For extensions, use a compensated cable

Input PT100/JPT100 - 2-wires connection
[with option auxiliary input = 1]



Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.

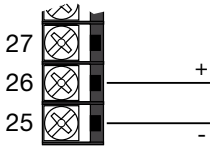
Input PT100/JPT100 - 3-wires connection
[with option auxiliary input = 1]



Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen. The resistance of the three wires must be equal, the line resistance must be less than 20 ohm.

Linear input (V) [with option auxiliary input = 1]

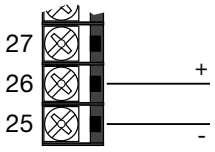
Linear input in direct voltage
0...60 mV Ri > 10 MΩ



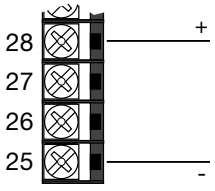
Linear input (V, I) [with option auxiliary input = 2 o 3]

Ingresso lineare in tensione continua
0...1 V Ri > 300 KΩ

Ingresso lineare in corrente continua
0/4...20 mA, Ri = 50 Ω.

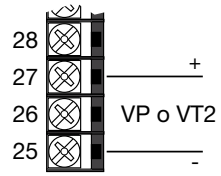


Linear input (V) [with option auxiliary input = 2 or 3]



Linear input in direct voltage
0...5 V / 0...10 V Ri > 300 KΩ

Potentiometer VP or transmitter VT2 supply

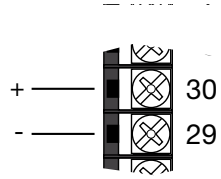


VP = 1 VDC ±1%, max 30 mA
[with option auxiliary input = 2]

VT2 = 24 VDC ±10%, max 30 mA
[with option auxiliary input = 3]

2.4.9. Analog outputs

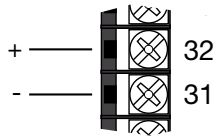
Analog output A1



0...10 V, max 20 mA Rout > 500 Ω

0...20 mA / 4...20 mA Rout < 500 Ω

Analog output A2

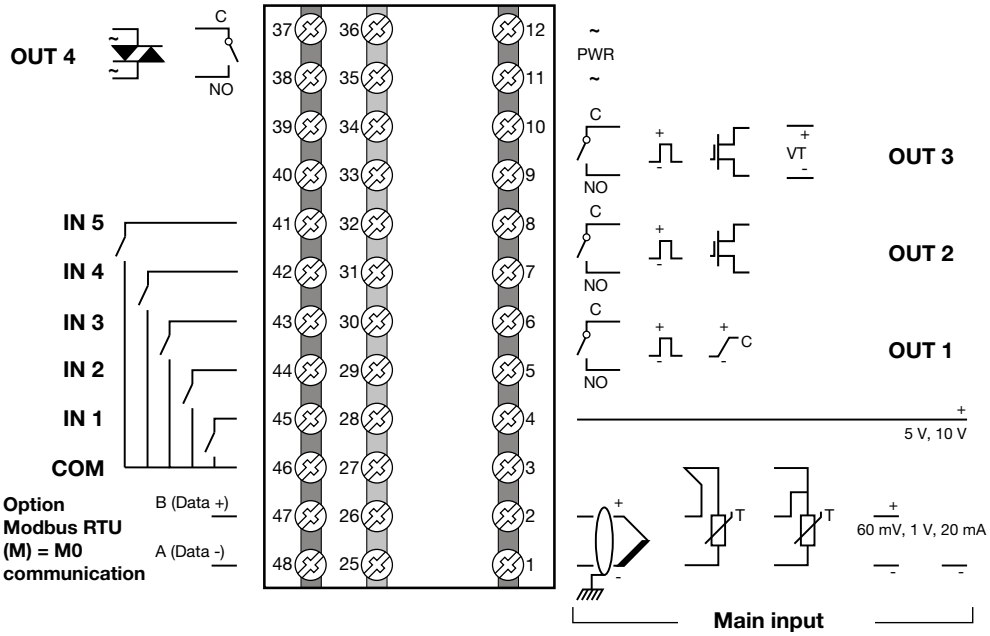


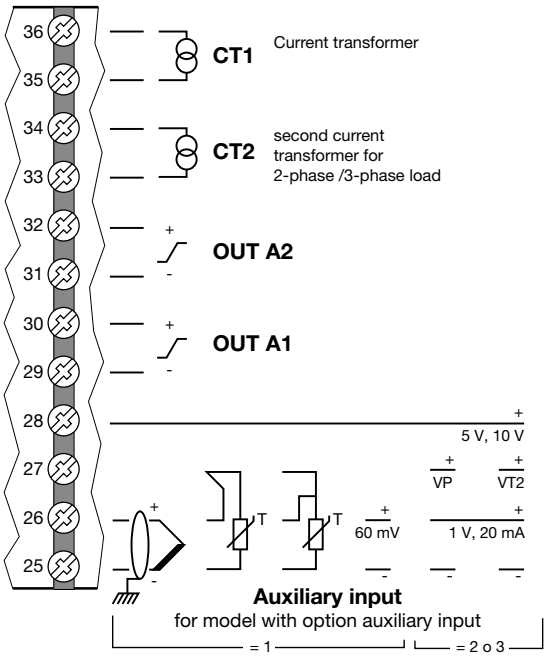
0...10 V, max 20 mA Rout > 500 Ω

0...20 mA / 4...20 mA Rout < 500 Ω

2.5. 1850 connection diagrams

2.5.1. General diagram





LEGEND

~ PWR ~ *Power supply*

Linear input in voltage / current

Input for current transformer

AUX *Auxiliary input*

Isolated digital inputs

Thermocouple input

Input PT100 JPT100 2 / 3wires

NO C *Relay output*

Long-life solid state relay output

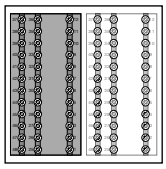
Logic output

Isolated logic output

B (Data +) A (Data -) *RS485 serial line*

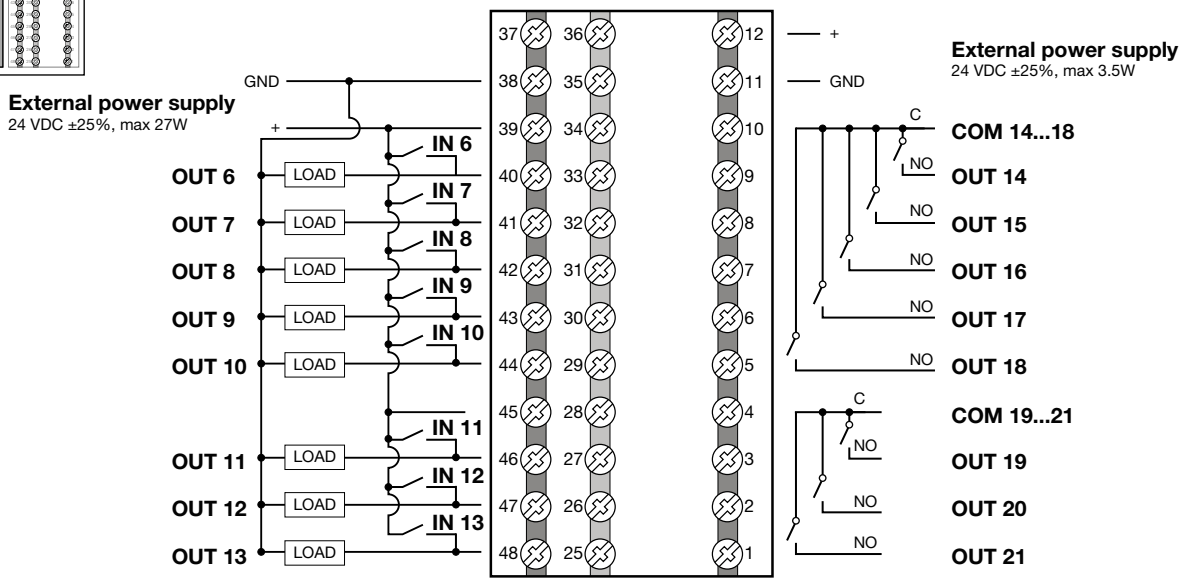
VT *Supply transmitter*

VP *Supply potentiometer*



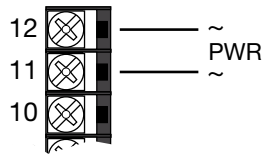
8 (PNP) digital Inputs/Outputs

8 Relays



2.5.2. Power supply

Power supply



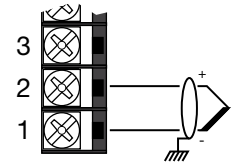
Standard:
100...240 VAC/VDC ± 10%
50/60 Hz, max 12W

Optional:
20...27 VAC/VDC ± 10%
50/60 Hz, max 12W

(*) ground connection for option 20...27 V AC/DC only

2.5.3. Inputs

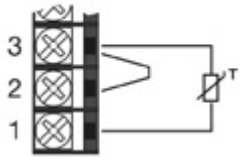
Input TC



Available thermocouples:
J, K,R, S, T, C, D B, E, L, L-GOST,
U, G, N, Pt20Rh-Pt40Rh
ITS90 or custom linearization

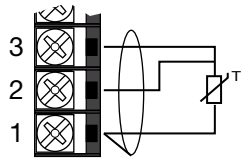
Respect polarity
For extensions, use
a compensated cable

Input PT100/JPT100 - 2-wires connection



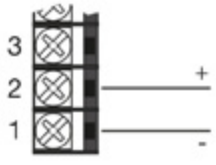
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate.

Input PT100/JPT100 - 3-wires connection



Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate.
The resistance of the three wires must be equal, the line resistance must be less than 20 ohm.

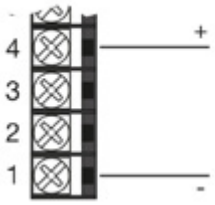
Linear input (V, I)



Linear input in direct voltage
0...60 mV Ri > 70 kΩ
0...1 V Ri > 15 kΩ

Linear input in direct current
0/4...20mA, Ri = 50 Ω

Linear input (V)

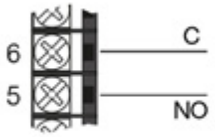


Linear input in direct voltage
0...5 V / 0...10 V Ri > 30kΩ

2.5.4. Outputs

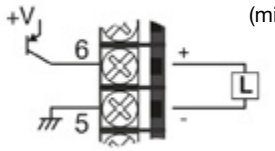
Characteristics of outputs Out1, Out2, Out3, Out4 are defined when the controller is ordered.

Output Out 1 - relay 5 A



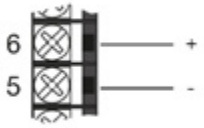
Relay 250 VAC, 5 A

Output Out 1 - logic



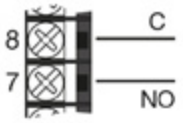
Logic 24 V ±10%
(min 10 V to 20 mA)

Output Out 1 - continuous



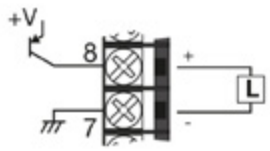
4...20 mA Rout < 500 Ω

Output Out 2 – relay 5 A



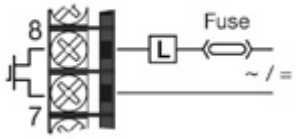
Relay 250 VAC, 5 A

Output Out 2 – logic



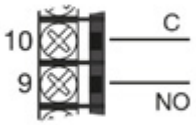
Logic 24 V ±10%
(min 10 V to 20 mA

Output Out 2 - logic isolated



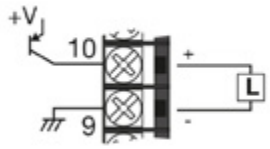
Logic 30 V AC/DC max
max 100 mA
Insulation 1500 V

Output Out 3 – relay 5 A



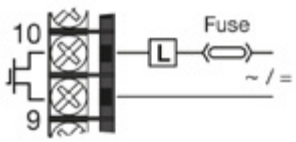
Relay 250 VAC, 5 A

Output Out 3 – logic



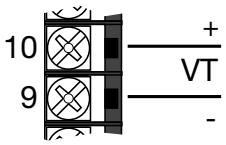
Logic 24 V ±10%
(min 10 V to 20 mA

Output Out 3 - logic isolated



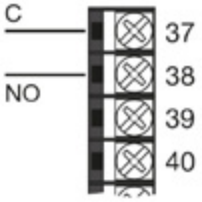
Logic 30 V AC/DC max
max 100 mA
Insulation 1500 V

Transmitter supply (VT)



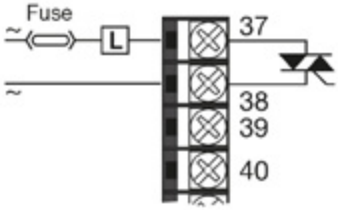
24 VDC ±10%,
max 30 mA

Output Out 4 – relay 5 A



Relè 250 VAC, 5 A

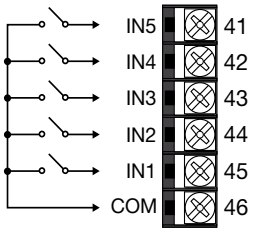
Output Out 4 – Triac



Triac 75...240 VAC
max 1 A
Insulation 3 KV

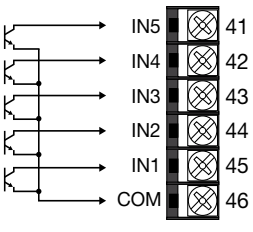
2.5.5. Digital inputs

Digital inputs



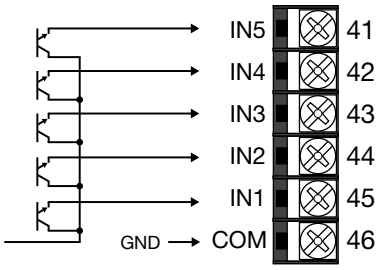
Digital input
voltage-free contact

Digital inputs



NPN Digital input
24 V, 4,5 mA

Digital inputs

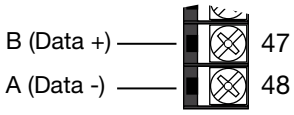


PNP Digital inputs
+12/24 V max 3,6 mA

2.5.6. Serial line

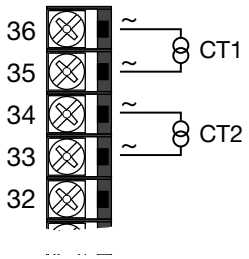
Serial line

Serial line
RS485 2-wires



2.5.7. CT Inputs

Inputs CT1, CT2

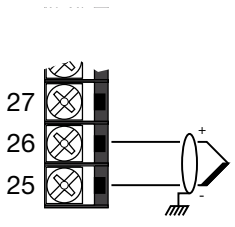


Current transformer
50 mAac, 10 , 50/60 Hz

Second current transformer
for 2-phase / 3-phase load

2.5.8. Auxiliary input

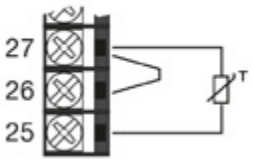
Input TC
[with option auxiliary input = 1,available only if the main input is configured Type TC]



Available thermocouples:
J, K,R, S, T, C, D B, E, L, L-GOST, U, G, N,
Pt20Rh-Pt40Rh
ITS90 or custom linearization

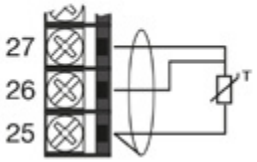
Respect polarity
For extensions, use a compensated cable

Input PT100/JPT100 - 2-wires connection
[with option auxiliary input = 1]



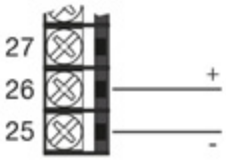
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.

Input PT100/JPT100 - 2-wires connection
[with option auxiliary input = 1]



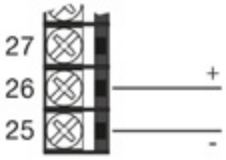
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen. The resistance of the three wires must be equal, the line resistance must be less than 20 ohm.

Linear input (V)
[with option auxiliary input = 1]



Linear input in direct voltage
0...60 mV Ri > 10 MΩ

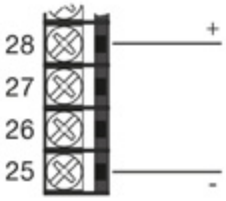
Linear input (V, I)
[with option auxiliary input = 2 or 3]



Linear input in direct voltage
0...1 V Ri > 300 KΩ

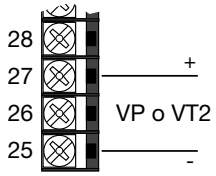
Linear input in direct current
0/4...20 mA, Ri = 50 Ω.

Linear input (V)
[with option auxiliary input = 2 or 3]



Linear input in direct voltage
0...5 V / 0...10 V Ri > 300 KΩ

Potentiometer VP or transmitter VT2 supply

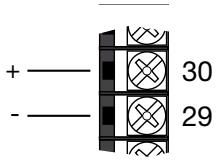


VP = 1 VDC ±1%, max 30 mA
[with option auxiliary input = 2]

VT2 = 24 VDC ±10%, max 30 mA
[with option auxiliary input = 3

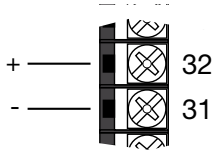
2.5.9. Analog outputs

Analog output A1



0...10 V, max 20 mA Rout > 500 Ω
0...20 mA / 4...20 mA Rout < 500 Ω

Analog output A2

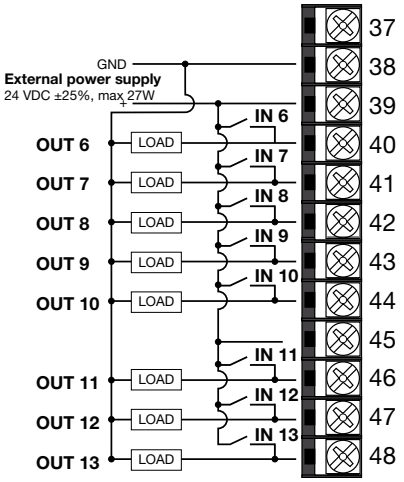


0...10 V, max 20 mA Rout > 500 Ω
0...20 mA / 4...20 mA Rout < 500 Ω

2.5.10. Connections with option optional I / O (N) =10, 01, 11

Characteristics of optional inputs and outputs are defined when the controller is ordered.

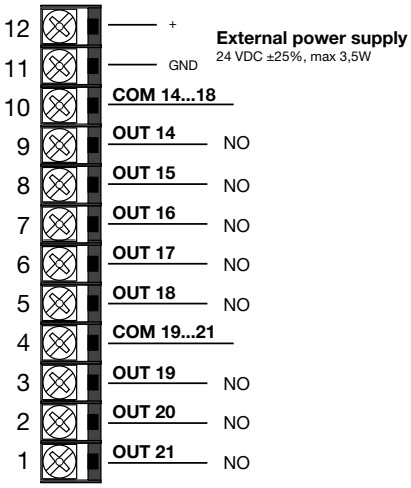
8 Inputs / Digital outputs (PNP)
[with option I/O = 10, 11]



PNP digital inputs
24 V,
max 5 mA

PNP digital outputs
24 V,
max 100 mA

8 Relay
[with option I/O = 01, 11]



Relay 5A (3A for certification UL), 250VAC

2.6. RS485 serial connection diagram

Up to 31 controllers (including different models) can be connected in parallel on the RS485 line.
The line must end with a resistor (120 Ω, 1/2 W).

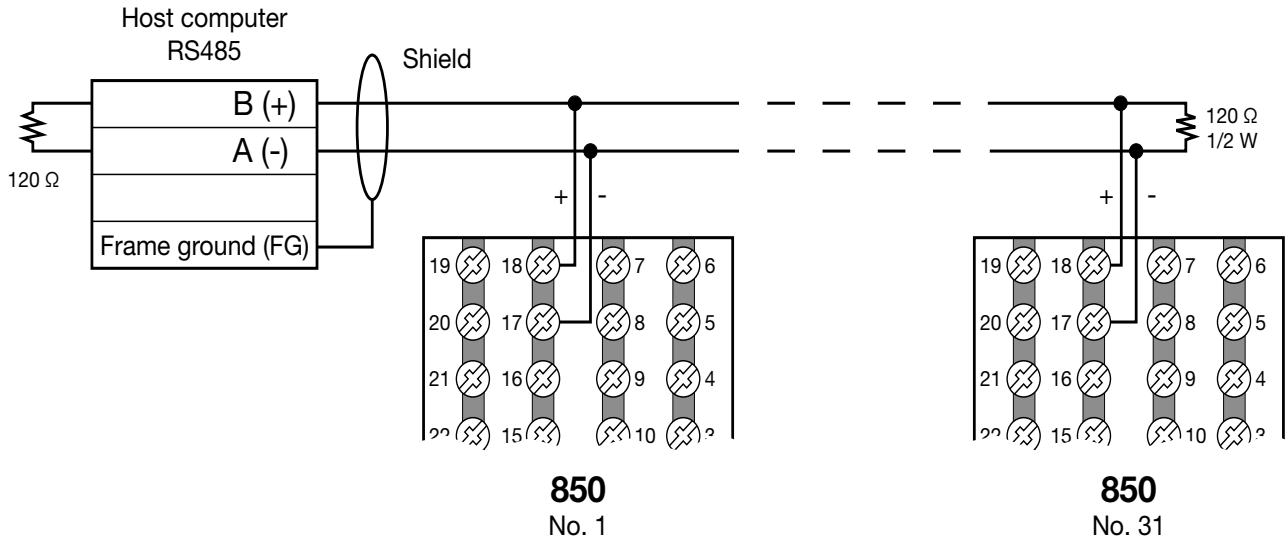


Figure 13 - RS485 connection for 850 controller with optional communication (M) = M0

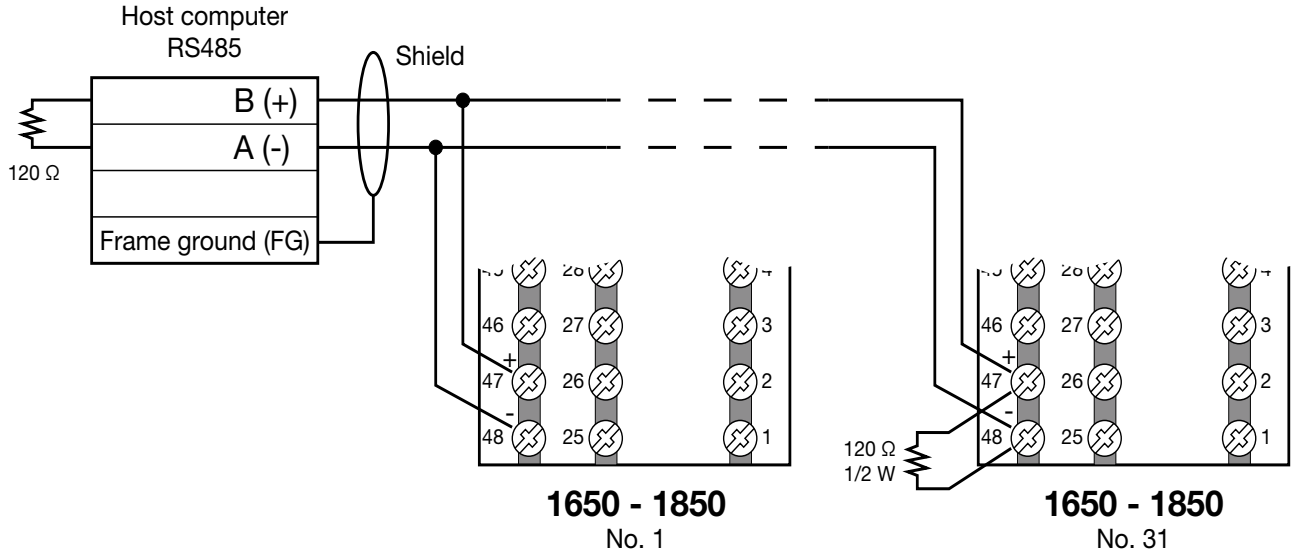


Figure 14 - RS485 connection for 1650 and 1850 controllers with optional communication (M) = M0

3. COMMISSIONING

3.1. Information on displays and use of keys

The general description of the displays and keys for each model is in paragraphs “1.3.1. Display and keys” on page 13 for the 850, “1.4.1. Display and keys” on page 15 for the 1650, and “1.5.1. Display and keys” on page 17 for the 1850.

3.1.1. Navigating the menus

4 keys are used for navigating the menus and submenus and for changing parameters and confirming choices.
Their function depends on the context and on how long they are pressed.

The LEDs above the keys not only give confirmation that each key has been pressed (by flashing), but also show which keys can be used in each situation.

The navigation functions assigned to the keys are:

F At first power-on, scrolls the fast configuration menu; otherwise, the user configuration menu (Setpoint, Alarm limits, Control output, etc.).
Each time you press the key, the value of the displayed parameter is confirmed and you go to the next menu item.
Keep the key pressed for more than 2 seconds to enter the Programming/Configuration menu.

Each time you press the key, you return to the previous menu item or to the higher menu level, as appropriate.
Keep the key pressed for more than 2 seconds to return to the Main menu.

Press the key to enter a submenu or to reduce the value of the displayed parameter, as appropriate.
Keep the key pressed to progressively increase the speed of reduction of the displayed parameter.

Press the key to raise the value of the displayed parameter.
Keep the key pressed to progressively increase the speed of raising the displayed parameter.

When the process variable is displayed, in standard configuration the key ⏻ switches the controller function mode (manual/automatics).

3.1.2. Displays

The controllers have 2 or 3 displays, depending on the model. The Main menu shows:
- PV display: value of process variable.
- SV display: value of parameter (default = setpoint, if parameter dS.SP = SETP).
- F Display (models 1650 and 1850 only): value of control output (if parameter dS.F = OUT.P).

On models 1650 and 1850, the percentage value of the control output is also shown graphically on a bargraph.
On model 1850, an additional display shows the program number, step number, and unit of measurement (%, A, kW, kWh).

According to the situation (programming, alarm, etc.), the controller displays can show other information, such as the name of the parameter, description of the parameter, diagnostics messages and alarm messages.

Attention! The displays show only the parameters and menus for a defined configuration.

3.1.2.1. Display characters

The displays reproduce the various characters by combining 7 or 14 segments. The following tables show the shape of the various characters.

	!	“	#	$	%	&	‘	(	)
*	+	,	-	.	/	0	1	2	3
4	5	6	7	8	9	:	;	<	=
>	?	@	A	B	C	D	E	F	G
H	I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z	[
\	]	^	_	`	a	b	c	d	e
f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y
z	|	~							

Figure 15 - 14-segment font

	!	“	#	$	%	&	‘	(	)
*	+	,	-	.	/	0	1	2	3
4	5	6	7	8	9	:	;	<	=
>	?	@	A	B	C	D	E	F	G
H	I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z	[

Figure 16 - 7-segment font

3.1.2.2. Scrolling messages

The SV (850) and F (1650 and 1850) displays can show scrolling alphameric messages.

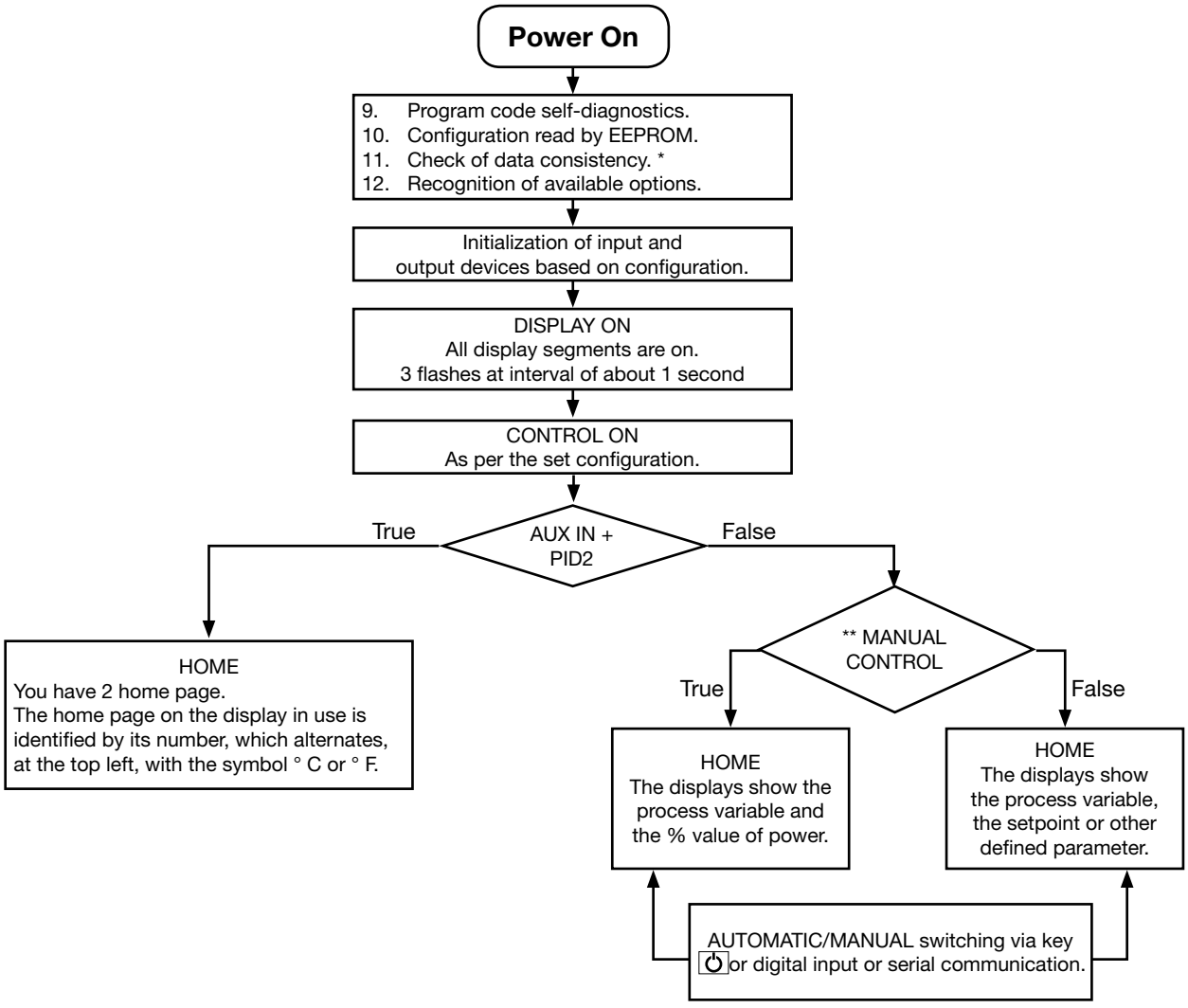
These messages, up to 32 characters in length, appear:
- during configuration, describing the active parameter;
- during functioning, after the tripping of alarms, digital inputs and logic function outputs, if the relative messages were enabled

Message texts can be set via PC with GF_eXpress software.

There are 3 message groups, one for each of the 3 languages LAnG provided, selectable from the HMI menu with the parameter.
Each group contains up to 25 messages.
Impostando LAnG=NONE si perde la suddivisione dei tre gruppi ottenendo una impostabilità fino a 75 messaggi

3.2. Sequence at power-on

The following diagram shows the controller sequence at power-on.
Note: the USB-TTL programming cable must be disconnected.

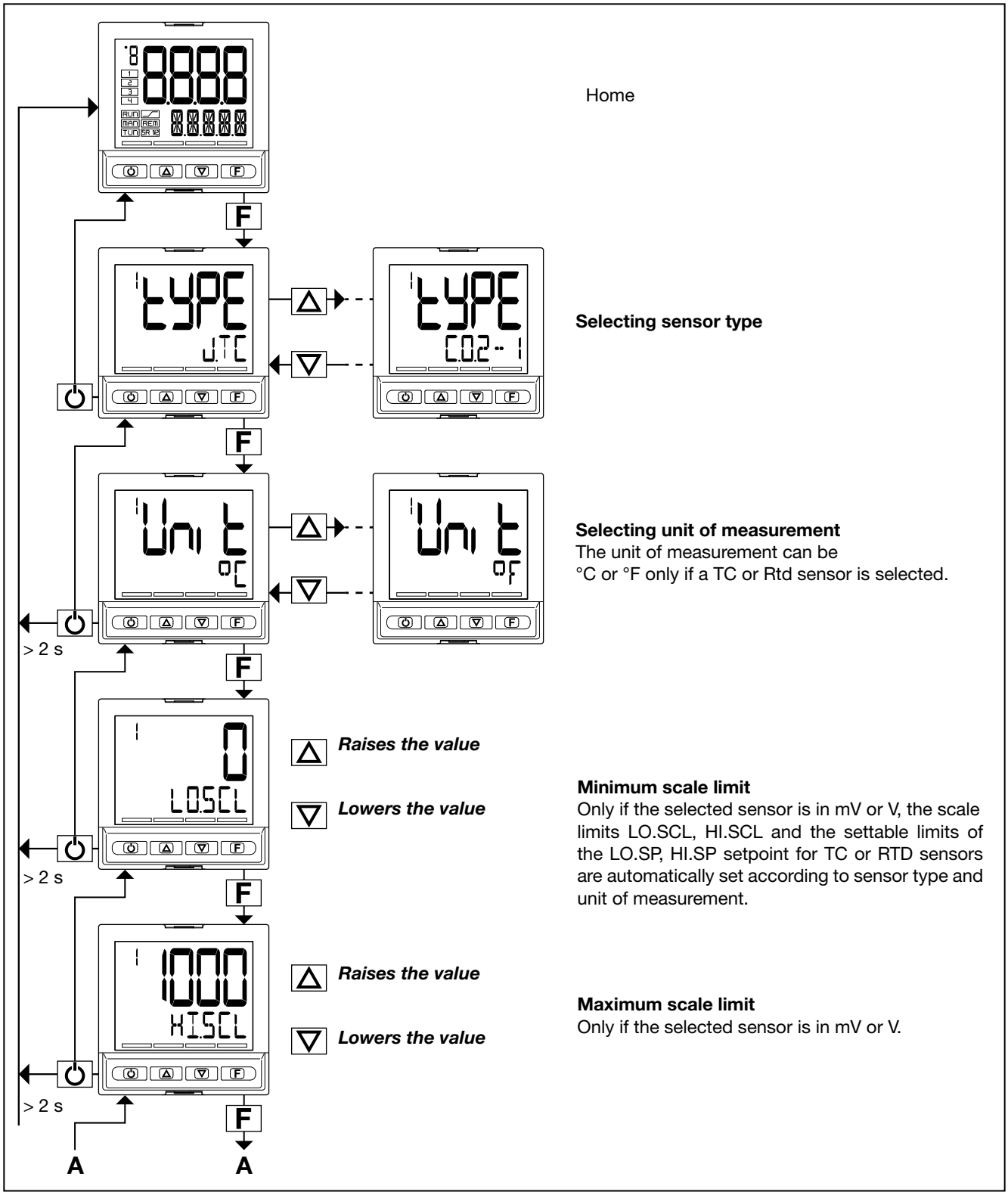


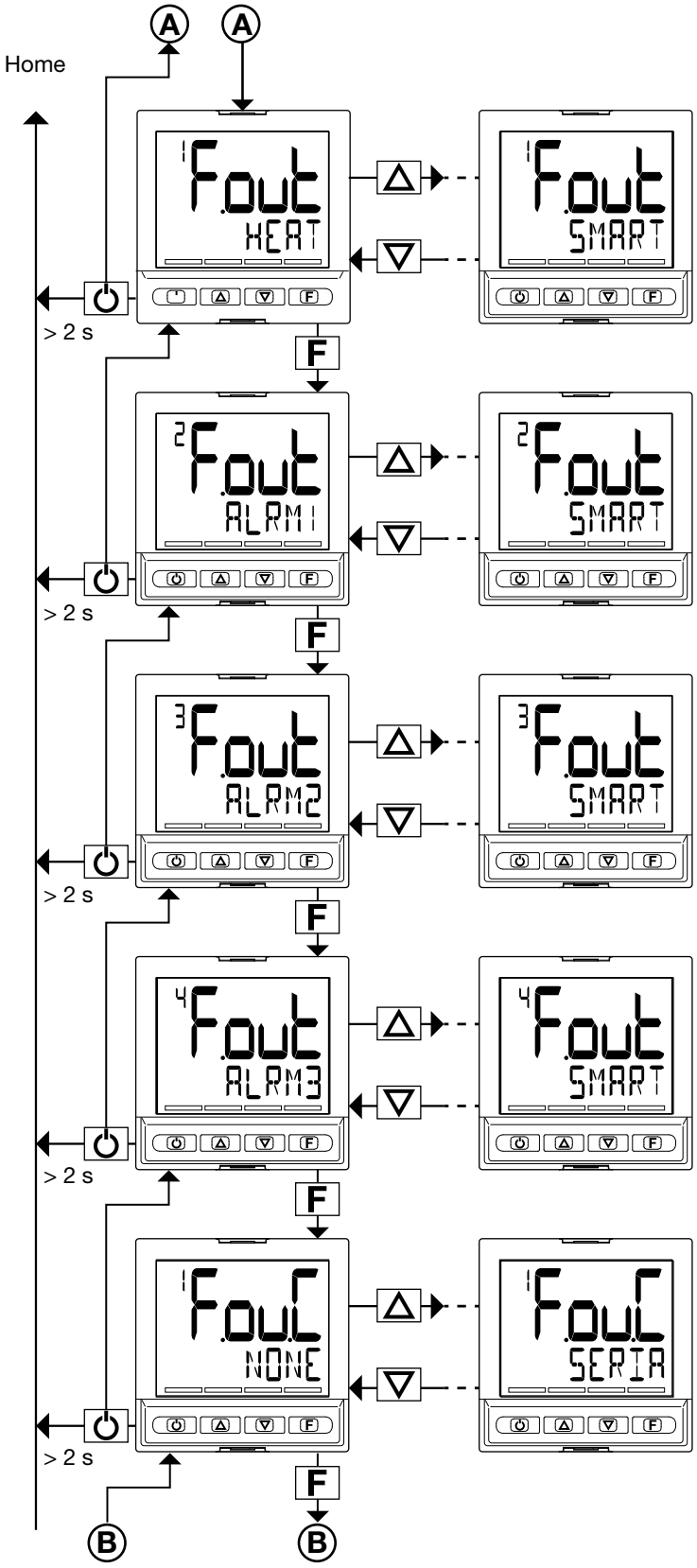
*) Any error is signaled by the message EEPROM CHECKSUM ERROR.
**) Only if MANUAL mode was used before the controller was powered off.

3.3. First power-on

At first power-on, after the controller has run the self-diagnostics test, press the **F** key to access the Fast Configuration Menu.
The parameters shown are a subset of all the controller parameters and let you rapidly configure the inputs and outputs.
The number and type of the parameters shown depends on the controller HW configuration and on the choices made with the parameters previously shown.
For example, minimum and maximum scale limits are shown only if you have chosen an mA or V type temperature sensor.
Fast Configuration also appears if the HMI menu is set to parameter QuiCk = On
Fast configuration is not enabled at first power-on with programmer or valve model, and is not present when the optional auxiliary input is available.

3.3.1. Fast configuration





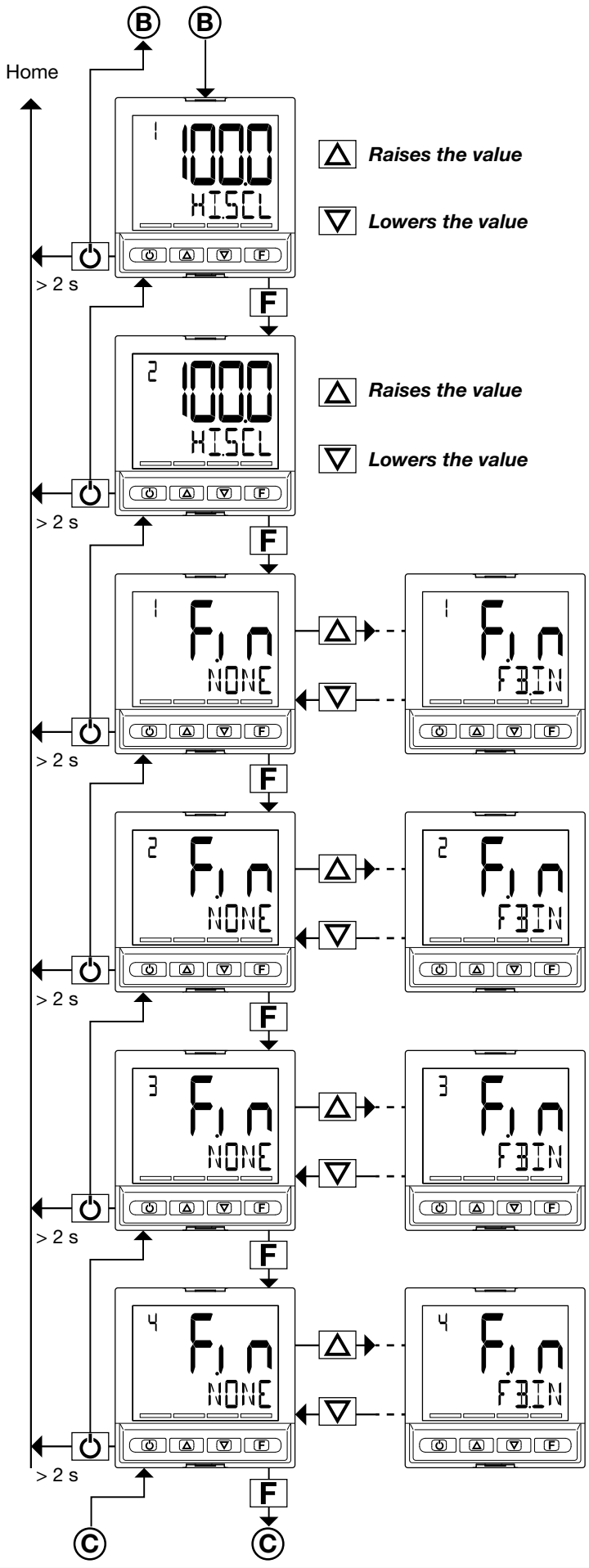
Selecting output 1 function
The proposed functions depend on output type (relay, logic).

Selecting output 2 function
The proposed functions depend on output type (relay, logic).

Selecting output 3 function
The menu item appears only if the optional output is availableis available.

Selecting output 4 function
The menu item appears only if the optional output is availableis available.

Selecting analog output function
The menu item appears only if the output continuous Out1 4-20mA.



Full-scale value of current transformer CT1
The menu item appears only if the optional input is available.

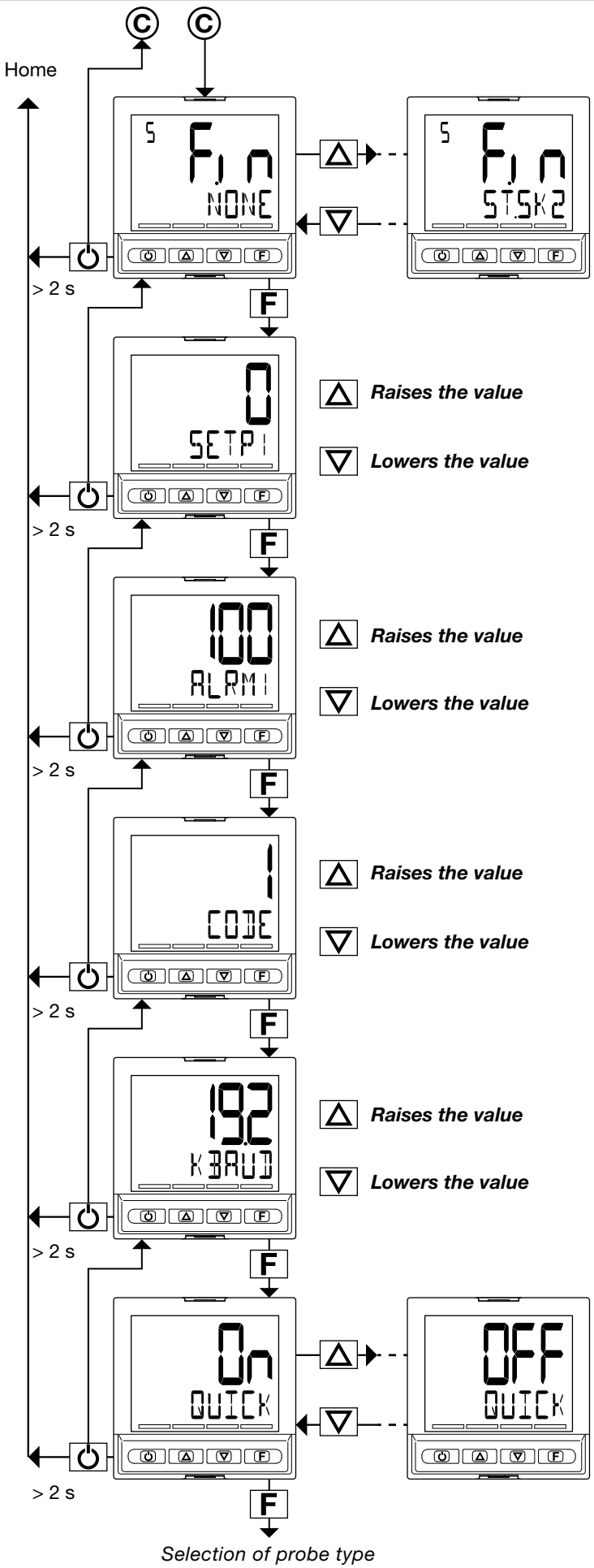
Full-scale value of current transformer CT2
The menu item appears only if the optional input is available.

Selecting digital input 1 function
The menu item appears only if the optional input is available.

Selecting digital input 2 function
The menu item appears only if the optional input is available.

Selecting digital input 3 function
The menu item appears only if the optional input is available.

Selecting digital input 4 function
The menu item appears only if the optional input is available (for models 1650 and 1850 only).



Selecting digital input 5 function
The menu item appears only if the optional input is available (for models 1650 and 1850 only).

Setting Setpoint

Setting Alarm 1

Setting Modbus address
The menu item appears only if the optional RS485 port is available.

Selecting baudrate
The menu item appears only if the optional RS485 port is available.

Enabling / Disabling Fast Configuration

3.4. Setting up quick configuration

The quick configuration menu lets you quickly configure and start a controller.

To do this, it uses default values for many of the parameters assigned to the functions and other parameters are not activated.

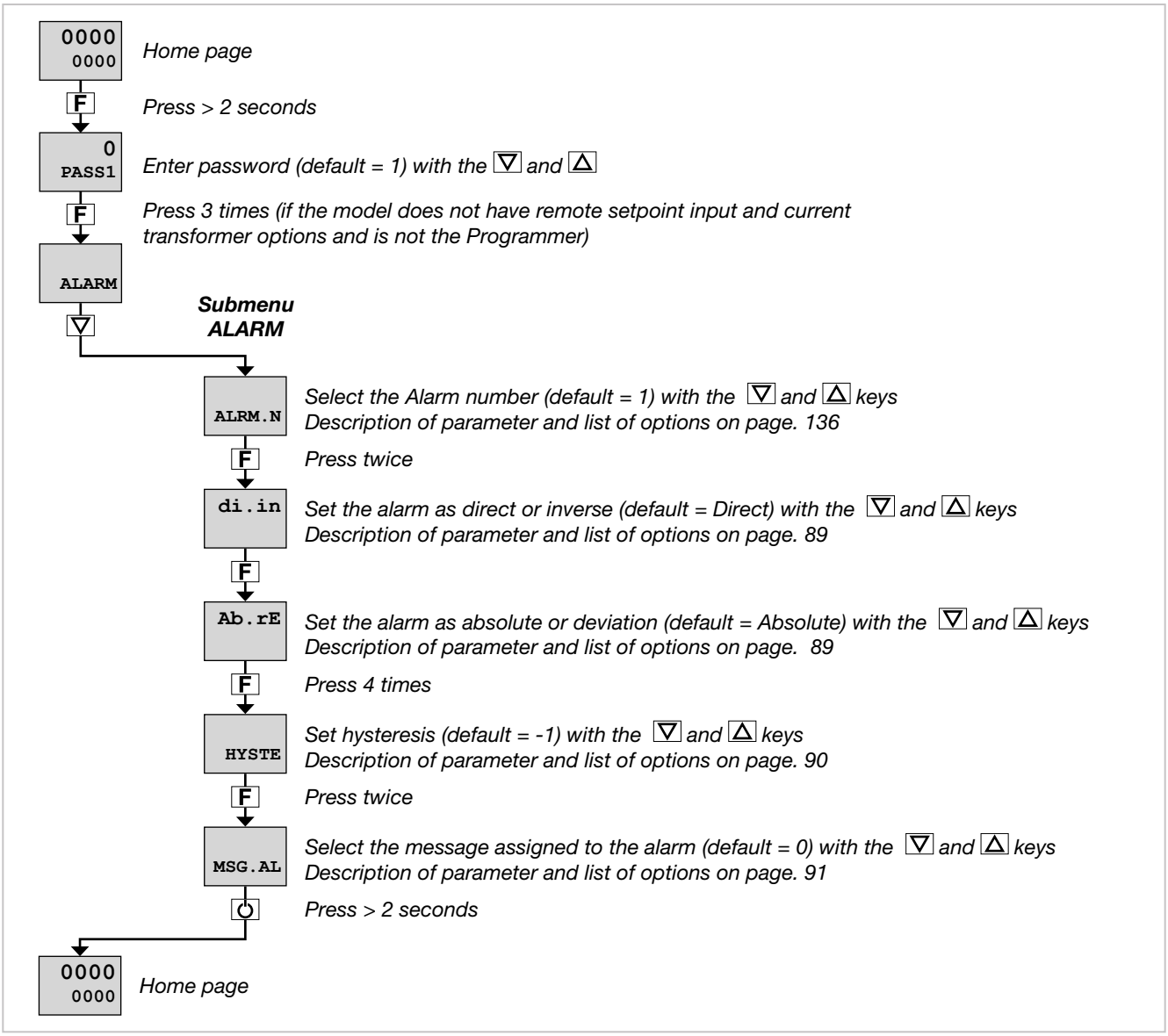
With this configuration, the controller can satisfy the majority of operating requirements.

You can set up the first configuration with the main configuration menu (see paragraph “4.1 Programming/Configuration Menu” on page 51), which gives access to all of the parameters.

For purposes of example, some of the controller’s main functions are listed below, with a list of parameters to be changed after running fast configuration to adapt the controller to specific working conditions.

3.4.1. Setting up the Alarm

If at least one output was configured as Alarm in the fast configuration.

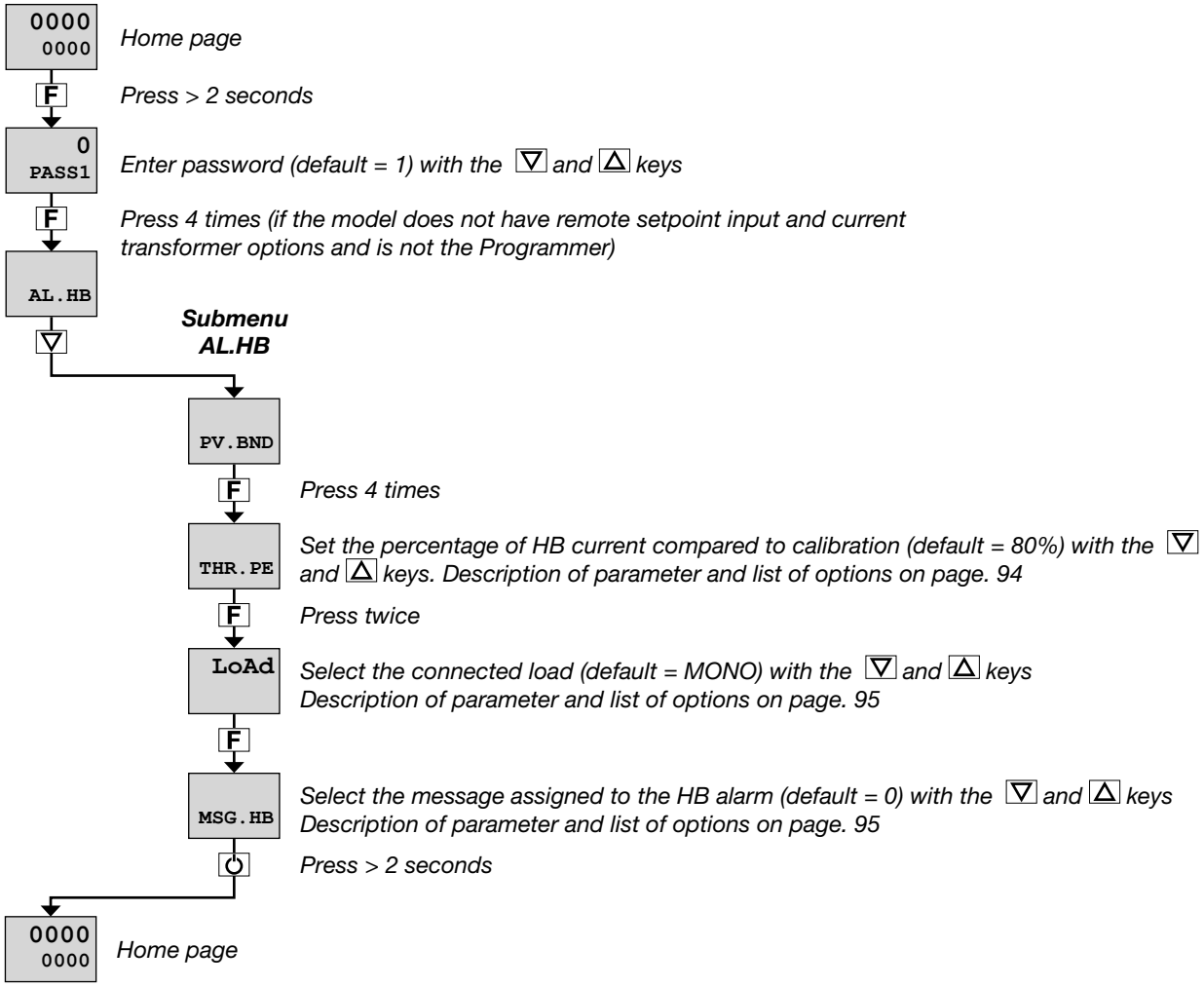


The ALARM submenu also lets you:

- select the input or value to be monitored for the alarm (parameter rEFE, default = PV);
- select the method for applying hysteresis (parameter no.Sy, default = NORML);
- enable or disable the power-on alarm (parameter PWON.E, default = OFF);
- latch/not latch the active alarm state (parameter LATCH, default = OFF);
- set the alarm trip delay (parameter DELAY, default = 0.00);
- activate or deactivate flashing of the PV display in case of alarm (parameter BLK.AL, default = OFF).

3.4.2. Setting up the Heater Break Alarm

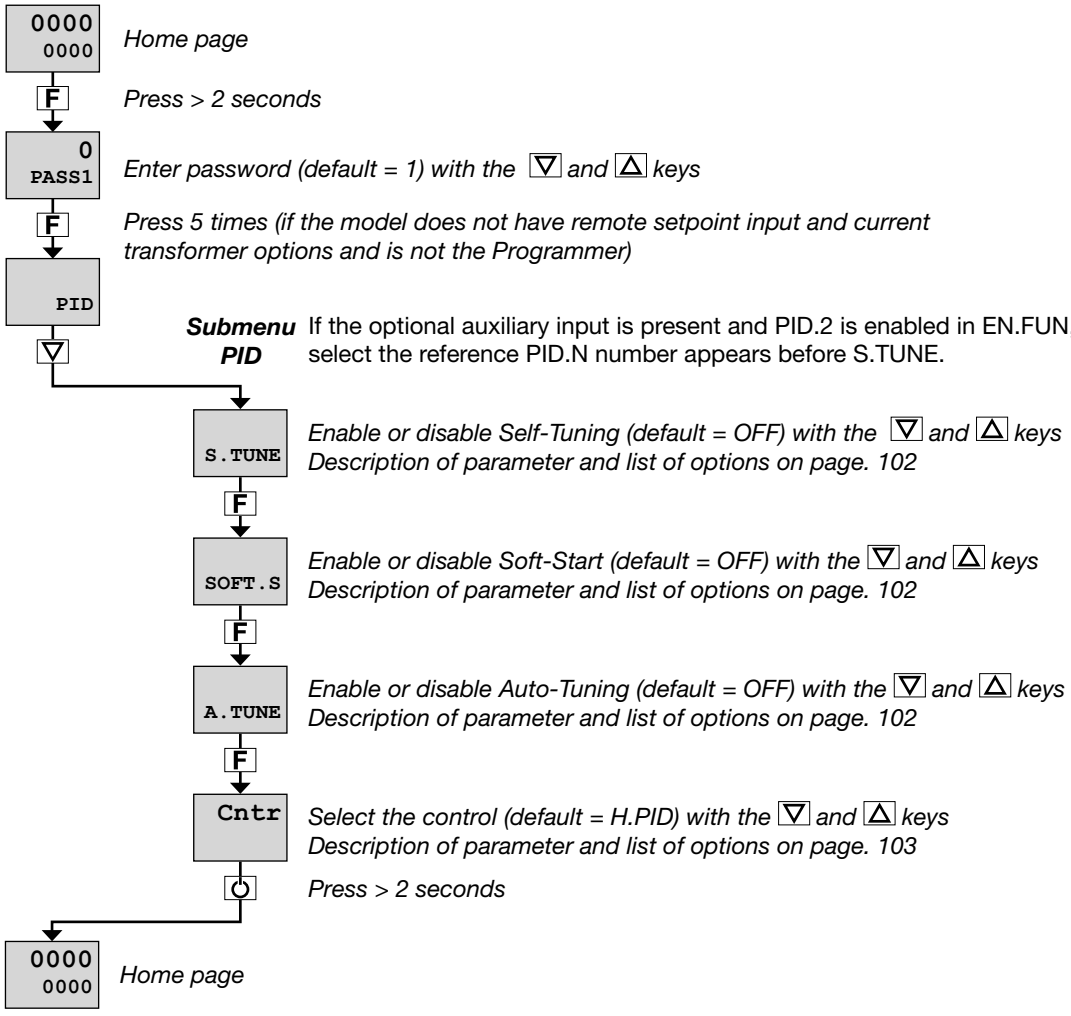
If at least one output was configured as Heater Break Alarm in the fast configuration.



The AL.HB submenu also lets you:

- set an HB alarm due to low current draw (parameter LOW.ON, default = 0.0);
- set an HB alarm due to high current draw (parameter HIG.ON, default = 0.0);
- set an HB alarm due to excess current draw (parameter HI.OFF, default = 0.0);
- set the HB alarm trip delay (parameter TIME, default = 0);
- select the control output assigned to the HB alarm (parameter OUT, default = 1);
- activate or deactivate flashing of the PV display in case of alarm (parameter BLK.AL, default = OFF).

3.4.3. Setting up the PID



The PID submenu also lets you:

- set the Soft-Start time (parameter SOFT.T, default = *0.0*);
- select the type of Auto-Tuning used (parameter Aut.t, default = *CONTI*);
- set the derivative time (parameter DERV.S, default = *1*);
- set the proportional heating band or hysteresis in ON-OFF control (parameter H.PB, default = *1.0*);
- set the integral heating time (parameter H.IT, default = *4.00*);
- set the derivative heating time (parameter H.DT, default = *1.00*);
- set the maximum heating power limit (parameter H.P.HI, default = *100.0*);
- set the minimum heating power limit (parameter H.P.LO, default = *0.0*);
- select the cooling fluid (parameter COOL, default = *FAN*);
- set the cooling setpoint compared to the heating setpoint (parameter C.SP, default = *0.0*);
- set the proportional cooling band or hysteresis in ON-OFF control (parameter C.PB, default = *1.0*);
- set the integral cooling time (parameter C.IT = *4.00*);
- set the derivative cooling time (parameter C.DT = *1.00*);
- set the maximum cooling power limit (parameter C.P.HI, default = *100.0*);
- set the minimum cooling power limit (parameter C.P.LO, default = *0.0*);
- set the Manual Reset value (parameter RESET, default = *0*);
- set the Reset Power value (parameter P.RST, default = *0.0*);
- set the Antireset value (parameter A.RST, default = *0*);
- set the Feedforward Power value (parameter, default = *0.0*);
- set the deadband (parameter DEAD.B, default = *0*);
- set the fault action power (parameter FAULT, default = *0.0*);
- set the setpoint gradient in raise (parameter GRAD.I, default = *0.0*);
- set the setpoint gradient in lower (parameter GRAD.D, default = *0.0*);
- select the gradient unit of measurement (parameter Unit, default = *DIG/S*);
- set the control output gradient (parameter GRAD.O, default = *0.0*);
- set the LBA alarm trip delay LBA (parameter LBA.TM, default = 30.0);
- set the value of power delivered when the LBA alarm trips (parameter LBA.PW, default = 25.0).

4. CONFIGURATION

The fast configuration described in the previous chapter lets you rapidly put the controller into operation.
To do this, the procedure configures the controller's main parameters only, which satisfies the most common application requirements.

On the other hand, to satisfy all application requirements and to configure the controller in detail, you have to set the parameters that are accessible only on the Programming/ Configuration menu.

This type of configuration is also useful for common applications (the ones covered by fast configuration), because optimum controller function depends a great deal on correct configuration and programming of the control parameters provided.

The controller can be configured with the buttons on its panel and from the PC with GF_eXpress software (see chapter "6. PROGRAMMING WITH PC" on page 211).

4.1. Programming/Configuration Menu

4.1.1. First: know what you're doing

Correctly setting the parameters needed to configure the controller requires thorough knowledge of the problems and techniques involved.

If you are unsure of your know-how, or are not fully aware of the consequences of incorrectly setting the parameters, we advise you not to configure the controller with this menu.

Attention! To prevent harm to persons and damage to property, the user must check that the parameters are correctly set before commissioning the controller.

In case of doubts, or if you need any explanations, please consult www.gefran.com or contact Gefran Customer Care.

4.1.2. Passwords

The configuration menu is protected by 2 passwords that allow access to two different menu sections.

The first section, accessed with password 1, groups the most operative submenus and parameters, i.e., the ones most involved in daily functioning of the controlled machine or system.

The second section, accessed with password 2, groups the submenus and parameters used to configure HW resources

The factory password settings are:
- Password 1 = 1
- Password 2 = 2

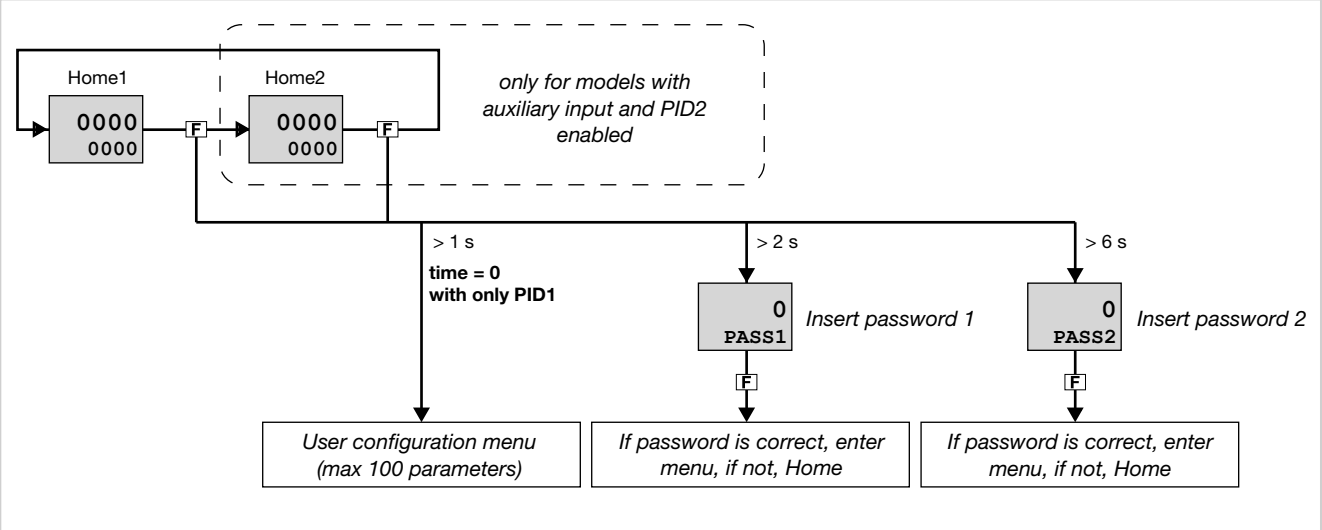
The passwords can be changed and even disabled if you want. See paragraphs "4.29. PASC1 - Setting level 1 password 1" on page 169 and "4.30. PASC2 - Setting level 2 password 2" on page 169

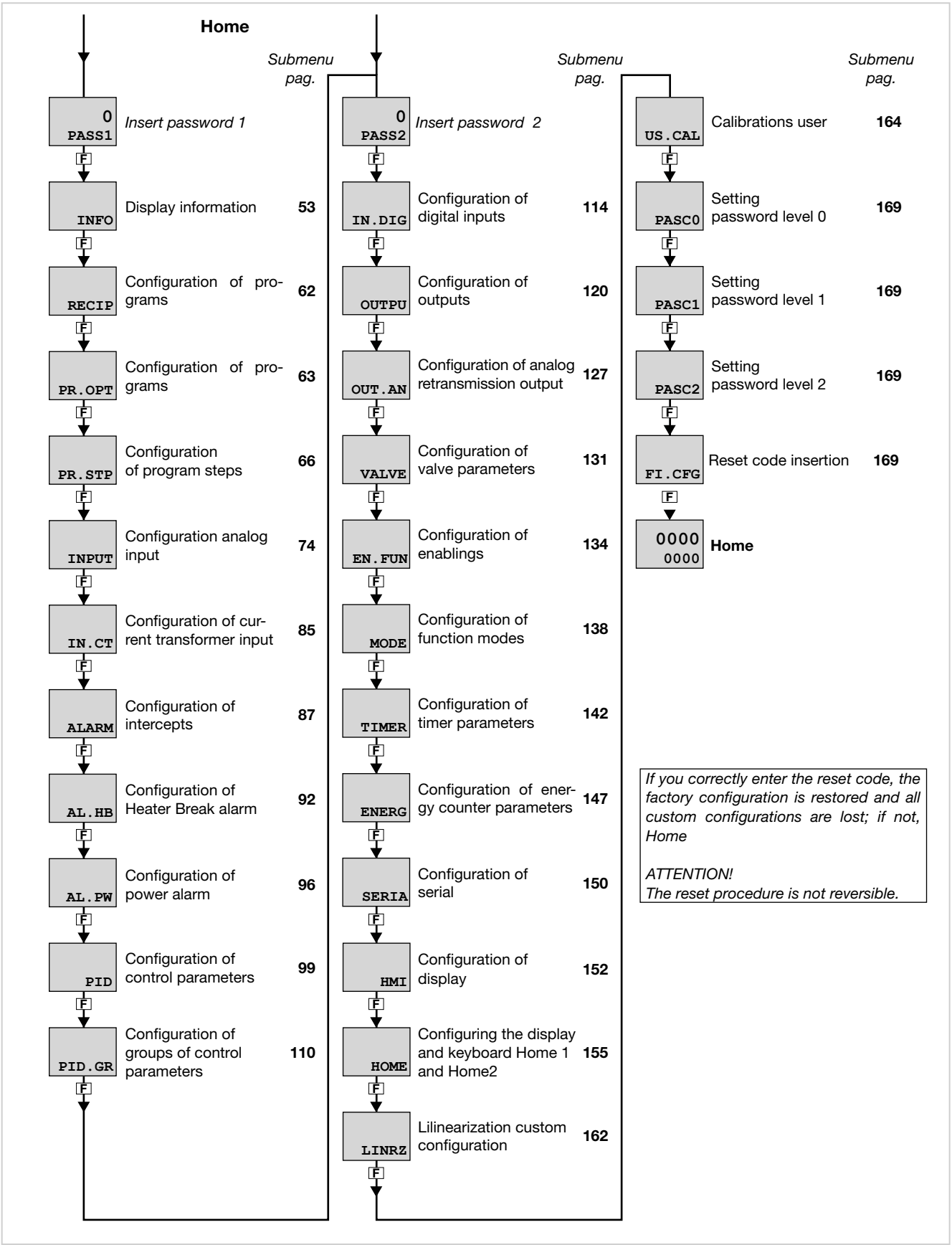
4.1.3. Password in the User Menu

Two passwords can be entered in the User menu, respectively:
- Password 0 (default = 1 See paragraphs "4.28. PASC0 - Setting level 0 password 0" on page 169)
- Password 1 to inhibit navigation to parameters in positions subsequent to that assigned to the password.

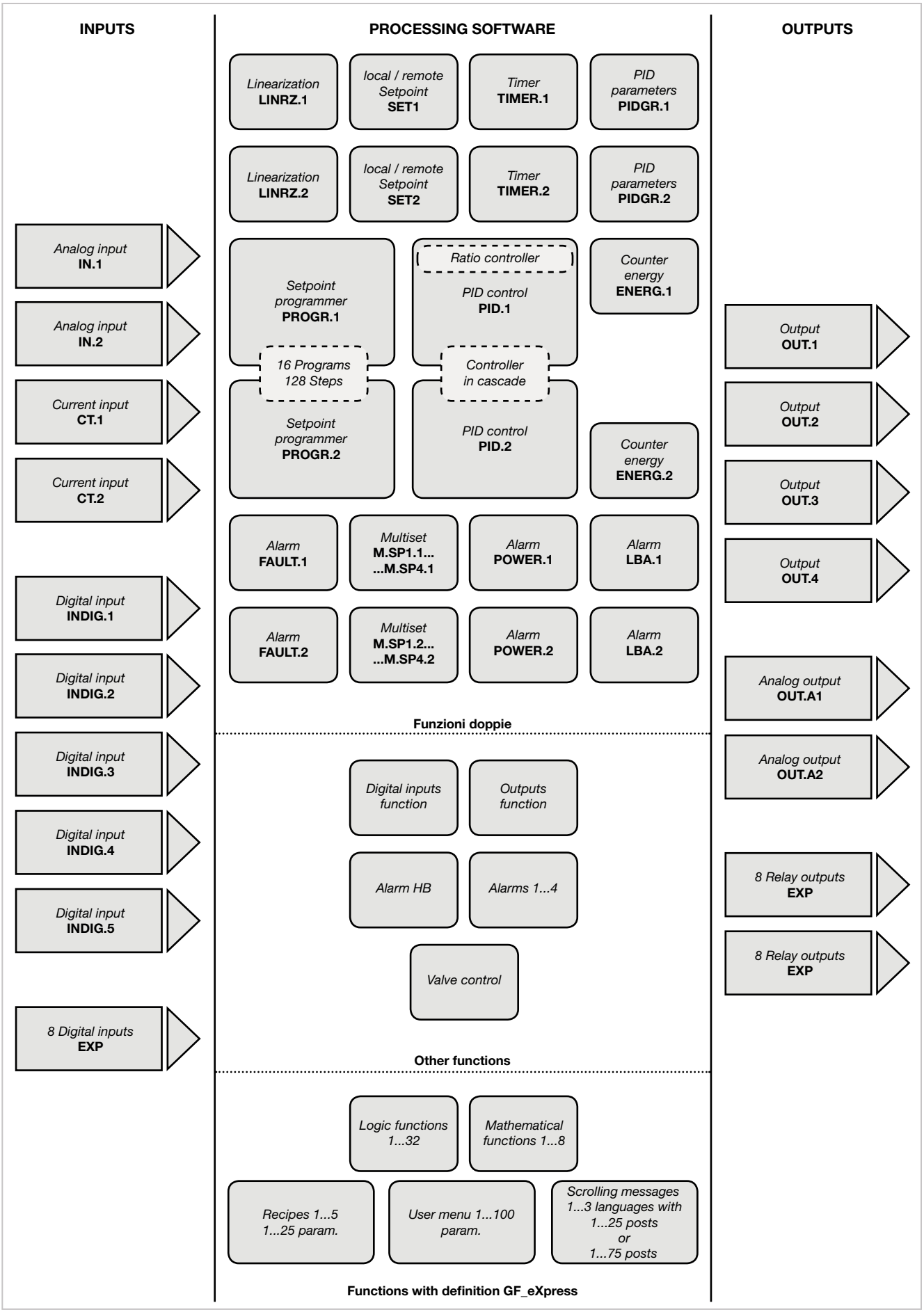
Once one of the two passwords is reached:
- if the value entered matches the value expected, navigation continues in the User Menu
- if the value entered does not match the value expected, the Home screen will be displayed

4.2. Main menu


Home1
0000
0000
F
Home2
0000
0000
F
only for models with auxiliary input and PID2 enabled
> 1 s
time = 0
with only PID1
> 2 s
0
PASS1
Insert password 1
F
> 6 s
0
PASS2
Insert password 2
F
User configuration menu (max 100 parameters)
If password is correct, enter menu, if not, Home
If password is correct, enter menu, if not, Home


Home
Submenu pag.
0 PASS1
Insert password 1
INFO
Display information
53
RECIP
Configuration of programs
62
PR.OPT
Configuration of programs
63
PR.STP
Configuration of program steps
66
INPUT
Configuration analog input
74
IN.CT
Configuration of current transformer input
85
ALARM
Configuration of intercepts
87
AL.HB
Configuration of Heater Break alarm
92
AL.PW
Configuration of power alarm
96
PID
Configuration of control parameters
99
PID.GR
Configuration of groups of control parameters
110
Submenu pag.
0 PASS2
Insert password 2
IN.DIG
Configuration of digital inputs
114
OUTPU
Configuration of outputs
120
OUT.AN
Configuration of analog retransmission output
127
VALVE
Configuration of valve parameters
131
EN.FUN
Configuration of enablings
134
MODE
Configuration of function modes
138
TIMER
Configuration of timer parameters
142
ENERG
Configuration of energy counter parameters
147
SERIA
Configuration of serial
150
HMI
Configuration of display
152
HOME
Configuring the display and keyboard Home 1 and Home2
155
LINRZ
Lilinearization custom configuration
162
Submenu pag.
US.CAL
Calibrations user
164
PASC0
Setting password level 0
169
PASC1
Setting password level 1
169
PASC2
Setting password level 2
169
FI.CFG
Reset code insertion
169
0000 0000
Home
If you correctly enter the reset code, the factory configuration is restored and all custom configurations are lost; if not, Home
ATTENTION!
The reset procedure is not reversible.

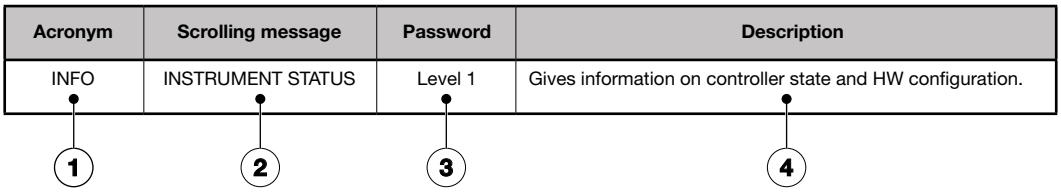
4.2.1. Functional schema



4.3. Legend for submenus and parameters

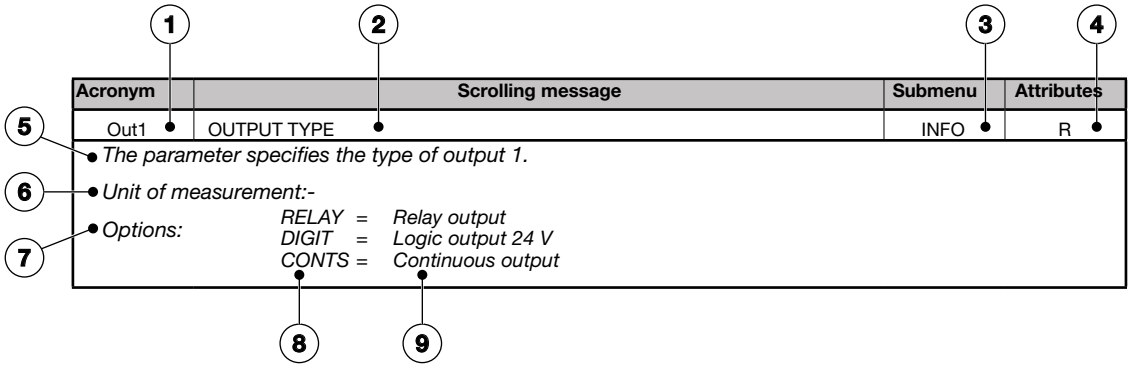
The purposes and characteristics of submenus and parameters are described and summarized in the following tables.

4.3.1. Submenu



1. Acronym of submenu as it appears on controller display.
2. Text of scrolling message as it appears on controller display.
3. Password needed to access submenu items.
4. Description of functions that manage submenu.

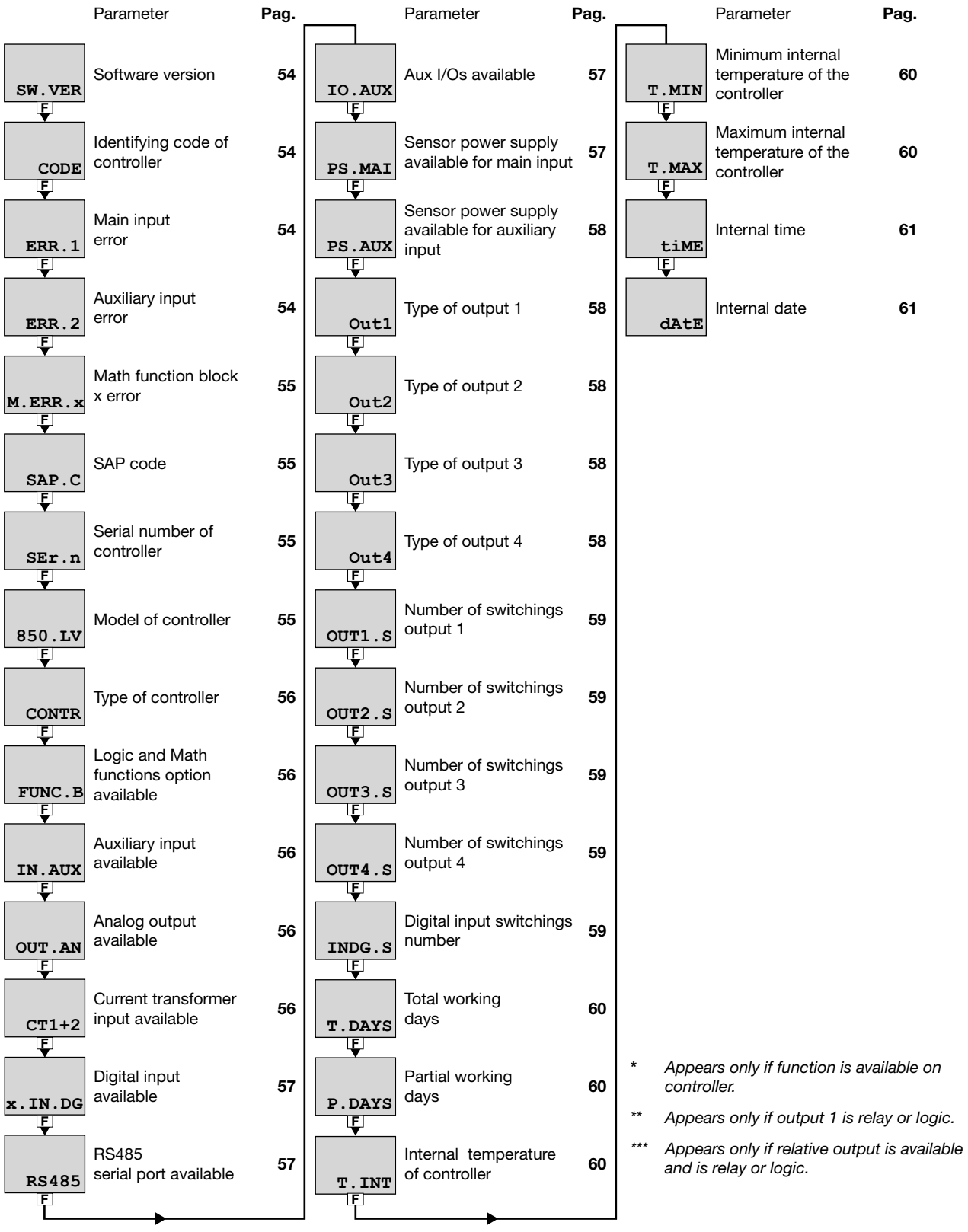
4.3.2. Parameter



1. Acronym of parameter as it appears on controller display.
2. Text of scrolling message as it appears on controller display.
3. Submenu to which parameter belongs.
4. Attributes of parameter: R = readable, W = writable. If only R, the operator or technician can read the parameter value but cannot change it.
5. Description of use of parameter, including any warnings or suggestions.
6. Unit of measurement of value managed by parameter. The unit of measurement can be unique or depend on other configuration choices, for example, the unit of measurement of temperature, which can be set in degrees Centigrade or Fahrenheit. Not all parameters require the use of units of measurement.
7. Description of parameter values or information that can be read or written, as appropriate.
8. Value that the parameter can have. Value can be two types: discrete or pertaining to an interval of values, typically numerical. For a discrete value, all possible values are listed as they appear on the controller display. For intervals of values, the minimum and maximum parameter values are shown.
9. Any additional description of value of individual parameter.

4.4. Submenu INFO - information display

Acronym	Scrolling message	Password	Description
INFO	INSTRUMENT STATUS	Level 1	Gives information on controller state and HW configuration.



* *Appears only if function is available on controller.*

** *Appears only if output 1 is relay or logic.*

*** *Appears only if relative output is available and is relay or logic.*

4.4.1. SW.VER - Software version

Acronym	Scrolling message	Password	Descrip-tion
SW.VER	SOFTWARE VERSION	INFO	R

The parameter shows the version (*major.minor*) of the controller software.

Unit of measurement: -

Options: **-**

4.4.2. CODE - Identifying code of controller

Acronym	Scrolling message	Password	Description
CODE	INSTRUMENT ID CODE FOR SERIAL COMM	INFO	R

The parameter shows identifying code of the device for serial communication.

Unit of measurement: -

Options: 0...247

4.4.3. ERR.1 - Main input error

Acronym	Scrolling message	Password	Description
ERR.1	MAIN INPUT ERROR	INFO	R

The parameter shows error detected by the main input.

Unit of measurement: -

Options:
- **Lou** = Value below minimum scale limit
- **HIGH** = Value above maximum scale limit
- **Err** = PT100 in short circuit or value below minimum limit (for example TC with wrong connection)
- **Sbr** = Sensor break or value above maximum limit
- **ECAL** = Calibration error
- **EAdC** = AD converter error

4.4.4. ERR.2 - Auxiliary input error

Acronym	Scrolling message	Password	Description
ERR.2	AUXILIARY INPUT ERROR	INFO	R

The parameter displays the error (if present) detected on the optional auxiliary input (if available).

Unit of measurement: -

Options:
- **Lou** = Value below minimum scale limit
- **HIGH** = Value above maximum scale limit
- **Err** = PT100 in short circuit or value below minimum limit (for example TC with wrong connection)
- **Sbr** = Sensor break or value above maximum limit
- **ECAL** = Calibration error
- **EAdC** = AD converter error

4.4.5. M.ERR.x* - Math function block x* error

Acronym	Scrolling message	Password	Description
M.ERR.x*	MATH FUNCTION BLOCK x ERROR	INFO	R

The parameter displays the error (if present) detected on math function block (MFB) x* only when MFB.x* has been configured.

Unit of measurement: -

Options:

Lou	= Value of an MFB input is below minimum scale limit
HIGH	= Value of an MFB input is above maximum scale limit
Err	= PT100 in short circuit or value of an MFB input is below minimum scale limit
Sbr	= Sensor break or value of an MFB input is above maximum scale limit
CALC	= MFB calculation error
O.Lou	= Value of MFB output is below minimum scale limit
O.HIG	= Value of MFB output is above maximum scale limit

*) x = 1...8

4.4.6. SAP.C - SAP Code

Acronym	Scrolling message	Password	Description
SAP.C	SAP ORDER CODE	INFO	R

The parameter shows the product number (Fxxxxxx).

Unit of measurement: -

Options: -

4.4.7. SER.N - Serial number of controller

Acronym	Scrolling message	Password	Description
SEr.n	SERIAL NUMBER	INFO	R

The parameter shows the serial number of the controller (number shown on data plate).
The serial number is displayed in the form *yy.ww nnnn*, where

yy	= last two digits of year of production
ww	= week of production
nnnn	= progressive in week of production

Unit of measurement: -

Options: -

4.4.8. xxxxx - Model of controller

Acronym	Scrolling message	Password	Description
xxxxx	MODEL	INFO	R

The parameter shows the model of the controller.
xxxxx indicates the controller model (850LV, 850HV, 1650LV, 1650HV, 1850LV, 1850HV).

Unit of measurement: -

Options:

850.LV	= 850 controller powered at 20...27 VAC/VDC
850.HV	= 850 controller powered at 100...240 VAC/VDC
165.LV	= 1650 controller powered at 20...27 VAC/VDC
165.HV	= 1650 controller powered at 100...240 VAC/VDC
185.LV	= 1850 controller powered at 20...27 VAC/VDC
185.HV	= 1850 controller powered at 100...240 VAC/VDC

4.4.9. xxxxx - Type of controller

Acronym	Scrolling message	Submenu	Attributes
xxxxx	MODEL OPTION	INFO	R

The parameter shows the type (xxxxx) of function of the controller.

Unit of measurement: -

Options:
CONTR = The device functions only as a controller
PROGR = The device functions as a programmer and controller
VALVE = The device functions as a controller with valve control
PR+VA = The device functions as a programmer and controller with valve control

4.4.10. FUNC.B - Logic and Math functions option available

Acronym	Scrolling message	Submenu	Attributes
FUNC.B	LOGIC AND MATH FUNCTIONS AVAILABLE	INFO	R

If present, the parameter indicates that the Logic and Math Functions option is installed on the controller.

Unit of measurement: -

Options: **-**

4.4.11. IN.AUX - Auxiliary input available

Acronym	Scrolling message	Submenu	Attributes
IN.AUX	AUXILIARY INPUT AVAILABLE	INFO	R

If present, the parameter indicates that an auxiliary input is installed on the controller.

Unit of measurement: -

Options: **-**

4.4.12. OUT.AN - Analog output available

Acronym	Scrolling message	Submenu	Attributes
OUT.AN	ANALOG OUTPUT AVAILABLE	INFO	R

If present, the parameter indicates that one or two analog outputs, configurable in voltage or current, are installed on the controller.

Unit of measurement: -

Options:
OUT.A1 = The device has 1 analog output
O.A1+2 = The device has 2 analog outputs

4.4.13. CTx - Current transformer input available

Acronym	Scrolling message	Submenu	Attributes
CTx	CURRENT TRASFORMER AVAILABLE	INFO	R

If present, the parameter indicates that one or more current transformer inputs are installed on the controller.

Unit of measurement: -

Options: **CT1+2** = The device has 2 current transformer inputs

4.4.14. x.IN.DG - Digital input available

Acronym	Scrolling message	Submenu	Attributes
x.IN.DG	DIGITAL INPUT AVAILABLE	INFO	R

If present, the parameter indicates how many digital inputs are installed on the controller.

Unit of measurement: -

Options: **3.IN.DG** = 3 digital inputs installed on the controller.
5.IN.DG = 5 digital inputs installed on the controller.

4.4.15. RS485 - RS485 serial port available

Acronym	Scrolling message	Submenu	Attributes
RS485	FIELDBUS AVAILABLE	INFO	R

If present, the parameter indicates that an RS485 is installed on the controller.

Unit of measurement: -

Options: -

4.4.16. IO.AUX – Auxiliary digital I/Os available

Acronym	Scrolling message	Submenu	Attributes
8.I/O	8.I/O EXPANSION AVAILABLE	INFO	R

If present, the parameter indicates that the 8 digital input/output expansion board is installed on the controller (model 1850 only).

Unit of measurement: -

Options: -

4.4.17. IO.RELE – Auxiliary relays available

Acronym	Scrolling message	Submenu	Attributes
8.RELY	8 RELAY EXPANSION AVAILABLE	INFO	R

If present, the parameter indicates that the 8 relay expansion board is installed on the controller (model 1850 only).

Unit of measurement: -

Options: -

4.4.18. PS.MAI – Sensor power supply available for main input

Acronym	Scrolling message	Submenu	Attributes
PS.MAI	MAIN SENSOR POWER SUPPLY AVAILABLE	INFO	R

If present, the parameter indicates that the controller has a transmitter power supply on the main input (model 850 only).

Unit of measurement: -

Options: **VT** = Power supply for 24V transmitter.

4.4.19. PS.AUX – Sensor power supply available for auxiliary input

Acronym	Scrolling message	Submenu	Attributes
PS.AUX	AUX SENSOR POWER SUPPLY AVAILABLE	INFO	R

If present, the parameter indicates that the controller has a transmitter power supply or potentiometer power supply on the auxiliary input.

Unit of measurement: -

Options: **VT2** = Power supply for 24V transmitter.
VP = 1V potentiometer power supply.

4.4.20. OUT1 - Type of output 1

Acronym	Scrolling message	Submenu	Attributes
Out1	OUTPUT TYPE	INFO	R

The parameter specifies the type of output 1.

Unit of measurement: -

Options: **RELAY** = Relay output
DIGIT = 24 V logic output
CONT.A = Continuous output configurable in current and voltage (model 850 only).
CONT.C = Continuous output in current (models 1650 and 1850 only).

4.4.21. OUT2 - Type of output 2

Acronym	Scrolling message	Submenu	Attributes
Out2	OUTPUT TYPE	INFO	R

If present, the parameter indicates that output 2 is available on the controller and specifies the type.

Unit of measurement: -

Options: **RELAY** = Relay output
DIGIT = 24 V logic output
MOS = Optomos isolated logic output

4.4.22. OUT3 - Type of output 3

Acronym	Scrolling message	Submenu	Attributes
Out3	OUTPUT TYPE	INFO	R

If present, the parameter indicates that output 3 is available on the controller and specifies the type.

Unit of measurement: -

Options: **RELAY** = Relay output
DIGIT = 24 V logic output
MOS = Optomos isolated logic output
TRIAC = Triac output (only for model 850)
VT24 = Power supply output for transmitter (models 1650 and 1850 only).

4.4.23. OUT4 - Type of output 4

Acronym	Scrolling message	Submenu	Attributes
Out4	OUTPUT TYPE	INFO	R

If present, the parameter indicates that output 4 is available on the controller and specifies the type.

Unit of measurement: -

Options: **RELAY** = Relay output
DIGIT = 24V logic output (model 850 only)
TRIAC = Triac output (only for models 1650 and 1850)

4.4.24. OUT1.S - Number of switchings output 1

Acronym	Scrolling message	Submenu	Attributes
OUT1.S	NUMBER X 1000 RELAY CYCLES	INFO	R
If output 1 is relay or logic, the parameter shows the number of switchings (in thousands). ***Unit of measurement***: Number (× 1000) ***Options***: -			

4.4.25. OUT2.S - Number of switchings output 2

Acronym	Scrolling message	Submenu	Attributes
OUT2.S	NUMBER X 1000 RELAY CYCLES	INFO	R
If output 2 is available on the controller, the parameter shows the number of switchings (in thousands). ***Unit of measurement***: Number (× 1000) ***Options***: -			

4.4.26. OUT3.S - Number of switchings output 3

Acronym	Scrolling message	Submenu	Attributes
OUT3.S	NUMBER X 1000 RELAY CYCLES	INFO	R
If output 3 is available on the controller, and if it is relay or logic, the parameter shows the number of switchings (in thousands). ***Unit of measurement***: Number (× 1000) ***Options***: -			

4.4.27. OUT4.S - Number of switchings output 4

Acronym	Scrolling message	Submenu	Attributes
OUT4.S	NUMBER X 1000 RELAY CYCLES	INFO	R
If output 4 is available on the controller, the parameter shows the number of switchings (in thousands). ***Unit of measurement***: Number (× 1000) ***Options***: -			

4.4.28. INDG.S - Digital input switchings number

Acronym	Scrolling message	Submenu	Attributes
INDG.S	NUMBER OF DIGITAL INPUT CYCLES	INFO	R
If a digital input with the F.in=CY.CNT function is configured on the controller, the parameter shows the number of switchings performed. ***Unit of measurement***: Number ***Options***: -			

4.4.29. T.DAYS - Total working days

Acronym	Scrolling message	Submenu	Attributes
T.DAYS	TOTAL DAYS OF OPERATION	INFO	R

The parameter shows total number of working days of the controller since first power-on. Each working day equals 24 hours of actual functioning.

Unit of measurement: Day

Options: 0...9999

4.4.30. P.DAYS - Partial working days

Acronym	Scrolling message	Submenu	Attributes
P.DAYS	PARTIAL DAYS OF OPERATION	INFO	R

The parameter shows the number of working days of the controller since the last counter reset, Each working day equals 24 hours of actual functioning.
The counter can be reset with the Us.cal function.

Unit of measurement: Day

Options: 0...9999

4.4.31. T.INT - Internal temperature of controller

Acronym	Scrolling message	Submenu	Attributes
T.INT	INTERNAL TEMPERATURE	INFO	R

The parameter shows the instantaneous internal temperature of the controller.

Unit of measurement: °C

Options: -

4.4.32. T.MIN - Minimum internal temperature of the controller

Acronym	Scrolling message	Submenu	Attributes
T.MIN	MIN INTERNAL TEMPERATURE	INFO	R

The parameter shows the minimum internal temperature of the controller measured during work.

Unit of measurement: °C

Options: -

4.4.33. T.MAX - Maximum internal temperature of the controller

Acronym	Scrolling message	Submenu	Attributes
T.MAX	MAX INTERNAL TEMPERATURE	INFO	R

The parameter shows the maximum internal temperature of the controller measured during work.

Unit of measurement: °C

Options: -

4.4.34. TIME - Internal time

Acronym	Scrolling message	Submenu	Attributes
tiME		INFO	R

The parameter shows the internal time in 24-hour format. Hours, minutes and seconds are shown with scrolling text: hours, minutes and seconds.

Unit of measurement: hh:mm:ss

Options: -

4.4.35. DATE - Internal date

Acronym	Scrolling message	Submenu	Attributes
dAtE		INFO	R

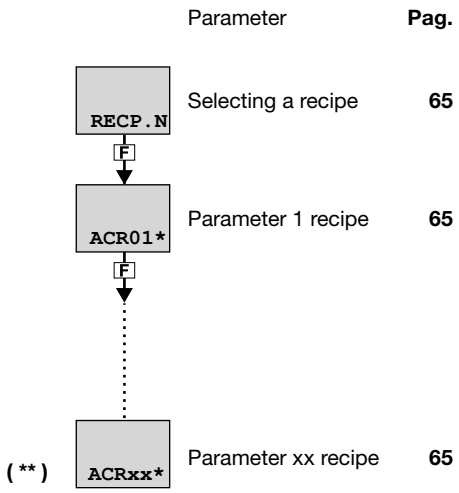
The parameter shows the complete internal date of the controller: month, day, year, day of week, with scrolling text.

Unit of measurement: MM / DD / YYYY

Options: -

4.5. RECIP Submenu - Configuring parameters recipes

Acronym	Scrolling message	Password	Description
RECIP	RECIPES CONFIGURATION	Level 1	Lets you display 5 recipes of 25 parameters each, user-definable with the GF_eXpress template. The Recipes function must previously be enabled with the EN.FUN menu, parameter RECP.N <> 0.



*) The acronym shown is that of the parameter set with GF_eXpress at element xx of the recipe template.

**) The description shown is the one for the parameter set with GF_eXpress at element xx of the recipe template.

4.5.1. RECP.N - Selecting a recipe

Acronym	Scrolling message	Submenu	Attributes
RECP.N	RECIPE NUMBER	RECIP	R W

Parameter n lets you select the recipe to be displayed.

Unit of measurement: -

Options: **1...5** = Number of recipe to display

4.5.2. ACRxx* - Parameter xx** of recipe

Acronym	Scrolling message	Submenu	Attributes
ACRxx*	RECIP.1 ***	RECIP	R W

Lets you display the value of parameter xx of the recipe selected with RECP.N.
The parameter appears if it is enabled for the recipe via the GF_eXpress application.

Unit of measurement: -

Options: **-** = -

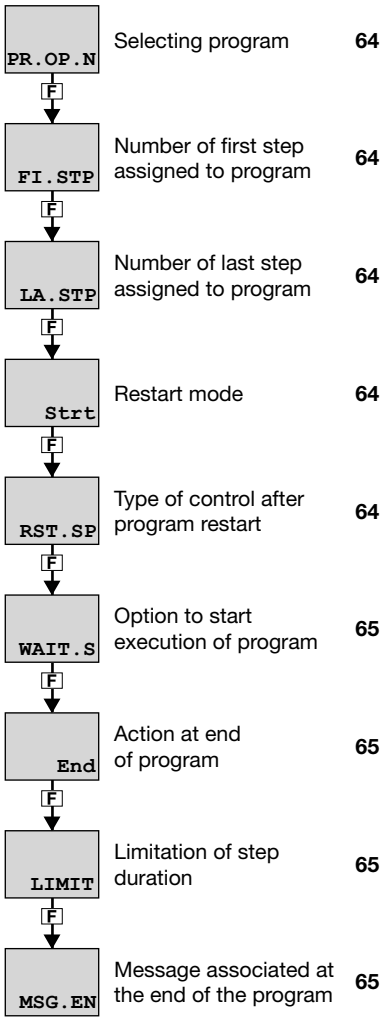
*) The acronym shown is that of the parameter set with GF_eXpress at element xx of the recipe template.

**) xx = 01...25

***) The description shown is the one for the parameter set with GF_eXpress at element xx of the recipe template.

4.6. Submenu PR.OPT - Configuring programs

Acronym	Scrolling message	Password	Description
PR.OPT	PROGRAMMER CONFIGURATION	Level 1	Lets you configure the 16 programs manageable by the programmer. The parameters are configured for each program to be used. The Programmer function must previously be enabled with the MODE.1 and/or MODE.2 menus, assigned, respectively, with PID.1 and PID.2, with parameter PROGR = On. For more information on configuring the programmer, see paragraph “5.13. Setpoint programmer” on page 184.



4.6.1. PR.OP.N - Selecting program

Acronym	Scrolling message	Submenu	Attributes
PR.OP.N	PROGRAM NUMBER	PR.OPT	R W

The parameter lets you select the program to be configured. During normal functioning, the controller shows the number of the program running and its state P.STAT, viewable in the User Configuration menu.

Unit of measurement: Number

Options: **1...16**

4.6.2. FI.STP - Number of first step assigned to program

Acronym	Scrolling message	Submenu	Attributes
FI.STP	PR.OPT.1 (o PR.OPT.2… PR.OPT.16) FIRST STEP OF PROGRAM	PR.OPT	R W

The parameter lets you select the first step of the program.

Unit of measurement: Number

Options: **1...128**

4.6.3. LA.STP - Number of last step assigned to program

Acronym	Scrolling message	Submenu	Attributes
LA.STP	PR.OPT.1 (o PR.OPT.2… PR.OPT.16) LAST STEP OF PROGRAM	PR.OPT	R W

The parameter lets you select the last step of the program.

ATTENTION: LA.STP cannot be less than FI.STP.

Unit of measurement: Number

Options: **FI.STP...128**

4.6.4. STRT - Restart mode

Acronym	Scrolling message	Submenu	Attributes
Strt	PR.OPT.1 (o PR.OPT.2… PR.OPT.16) RESTART TYPE AFTER POWER-ON	PR.OPT	R W

The parameter defines program restart mode after Power-on.

Unit of measurement: -

Options:
FI.STP = Program restarts from first step, with setpoint attributed or equal to PV based on the following parameter RST.SP
ST.STP = Program restarts from condition in which it stopped (last step in execution, setpoint
RSRCH = Program restarts with search for step (see programmer function...).

4.6.5. RST.SP - Type of control after program restart

Acronym	Scrolling message	Submenu	Attributes
RST.SP	PR.OPT.1 (or PR.OPT.2… PR.OPT.16) CONTROL TYPE AFTER RESET	PR.OPT	R W

The parameter defines the type of control that the controller runs after a reset while waiting for restart.
With RST.SP = On the setpoint takes the value of PV with reset command active.

Unit of measurement: -

Options:
OFF = The controller continues the control, maintaining the active setpoint
On = The setpoint assumes the value of the process variable (PV) by imposing the control output to zero.

4.6.6. WAIT.S - Option to start execution of program

Acronym	Scrolling message	Submenu	Attributes
WAIT.S	PR.OPT.1 (or PR.OPT.2… PR.OPT.16) DEF OF START EXEC PROGRAM	PR.OPT	R W

The parameter enables or disables the automatic execution of the time base reset the program after a switching STOP / START.

Unit of measurement: -

Options:
OFF = Disables automatic execution
On = Enables automatic execution

4.6.7. END - Action at end of program

Acronym	Scrolling message	Submenu	Attributes
End	PR.OPT.1 (or PR.OPT.2… PR.OPT.16) CONDITION AT END OF CYCLE	PR.OPT	R W

The parameter defines what happens when the program in execution ends (last step done).

Unit of measurement: -

Options:
NONE = Nothing happens. The controller continues control
RESE = switching in the RESET state, the control type will depend on the parameter RST.SP
LOOP = The program restarts from the first step
OFF = The program ends and puts the controller in the OFF position, with control output to zero

4.6.8. LIMIT - Limitation of step duration

Acronym	Scrolling message	Submenu	Attributes
LIMIT	PR.OPT.1 (or PR.OPT.2… PR.OPT.16) DEF OF STEP TIMING LIMITATION	PR.OPT	R W

The parameter enables or disables limitation of step duration. It is useful for quick execution of the program.
Eventuale HBB è disabilitato e l'uscita di controllo è forzate al valore di FAULT.

Unit of measurement: -

Options:
OFF = Disables limitation of step duration
On = Enables limitation of step duration: limits ramp times to 20 seconds and hold times to 10 seconds, in order to have a step time that never exceeds 30 seconds.

4.6.9. MSG.EN - Message assigned to end of program

Acronym	Scrolling message	Submenu	Attributes
MSG.EN	PR.OPT.1 (or PR.OPT.2… PR.OPT.16) SCROLLING MESSAGE AT THE END	PR.OPT	R W

The parameter shows and sets the number of the message assigned to the end of the program, i.e., the message that will be scrolled on the display at the end of the program.
The message is displayed if (and only if) parameter End is NONE or Off.
If the parameter is set to "0" no message will be displayed.

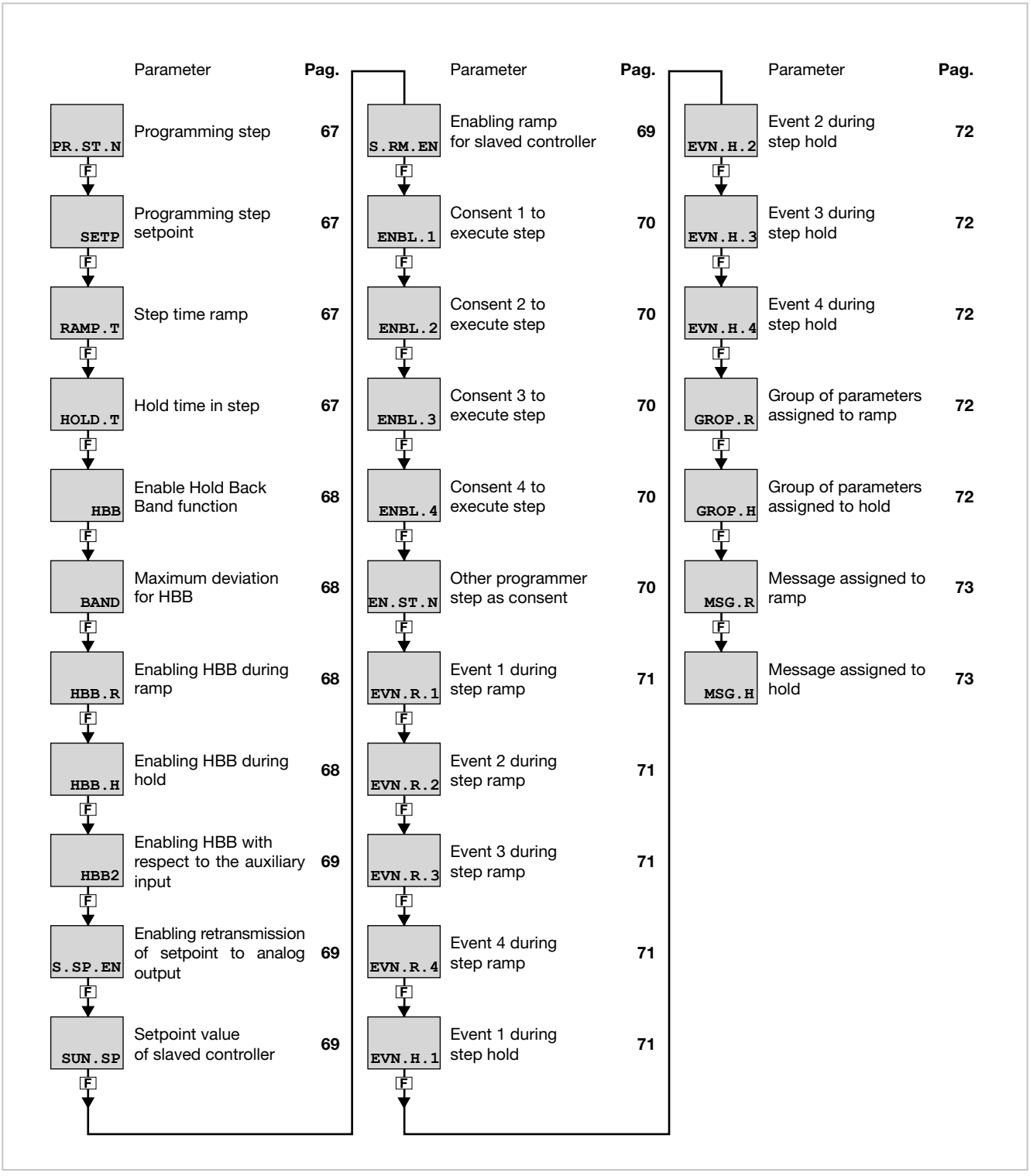
For more information on scrolling messages, see paragraph "3.1.2.2. Scrolling messages" on page 40.

Unit of measurement: Message number

Options:
0...25 (with LAnG=LANG1 or LANG2 or LANG3)
0…75 (with LAnG=NONE)

4.7. Submenu PR.STP - Configuration of program steps

Acronym	Scrolling message	Password	Description
PR.STP	STEP DEFINITION	Level 1	Lets you configure the steps that make up the program. The parameters are configured for each step to be used. The Programmer function must first be enabled with the MODE menu, parameter PROGR = On. For more information on configuring the programmer, see paragraph “5.13. Setpoint programmer” on page 184.



4.7.1. PR.ST.N - Programming step

Acronym	Scrolling message	Submenu	Attributes
PR.ST.N	PROGRAMMER ACTUAL STEP	PR.STP	R W

The parameter shows and sets the number of the programming step being configured.

Unit of measurement: Step number

Options: **1...128**

4.7.2. REFE – Step reference programmer

Acronym	Scrolling message	Submenu	Attributes
rEFE	REFERENCE PROGRAMMER	PR.STP	R W

The parameter shows and sets the step reference programmer.

Unit of measurement: Step number

Options: **BOTH** = Entrambi I programmatori
PROG1 = Programmer 1 only
PROG2 = Programmer 2 only

4.7.3. SETP - Programming step setpoint

Acronym	Scrolling message	Submenu	Attributes
SETP	PR.STP.1 (or PR.STP.2…PR.STP.128) SETPOINT	PR.STP	R W

The parameter shows and sets the setpoint for the current programming step.

Unit of measurement: °C, °F, % based on chosen scale

Options: **-1999...9999**

4.7.4. RAMP.T - Step time ramp

Acronym	Scrolling message	Submenu	Attributes
RAMP.T	PR.STP.1 (or PR.STP.2…PR.STP.128) RAMP TIME	PR.STP	R W

The parameter shows and sets the time taken to go from the previous setpoint to the setpoint of the current programming step.

Unit of measurement: hh.mm or mm.ss (hours.minutes or minutes.seconds). Depends on time base set with submenu MODE, parameter t.Pro

Options: **00.00...99.59**

4.7.5. HOLD.T - Hold time in step

Acronym	Scrolling message	Submenu	Attributes
HOLD.T	PR.STP.1 (or PR.STP.2…PR.STP.128) HOLD TIME	PR.STP	R W

The parameter shows and sets the time the program waits before going to the next step.

Unit of measurement: hh.mm or mm.ss (ore.minuti o minuti.secondi). Depends on time base set with submenu MODE, parameter t.Pro

Options: **00.00...99.59**

4.7.6. HBB - Enable Hold Back Band function

Acronym	Scrolling message	Submenu	Attributes
HBB	PR.STP.1 (or PR.STP.2…PR.STP.128) HOLD BACK BAND FUNCTION	PR.STP	R W

The parameter enables and disables the Hold Back Band function

The HBB function checks that the variable remains in the required tolerance interval. If the maximum deviation is exceeded, the program time base is stopped. The function is settable independently for each programming step. In addition, it can be enabled for the time ramp only, for the hold time only, or for both.

Unit of measurement: -

Options:
OFF = Disables HBB function
On = Enables HBB function (band symmetrical to SP)
On.P = Enables HBB function (band positive only with respect to SP)
On.n = Enables HBB function (band negative only with respect to SP)

4.7.7. BAND - Maximum deviation for HBB

Acronym	Scrolling message	Submenu	Attributes
BAND	PR.STP.1 (or PR.STP.2…PR.STP.128) HOLD BACK BAND VALUE	PR.STP	R W

If the HBB function is enabled, the parameter shows and sets the maximum deviation allowed for PV compared to SV.

Unit of measurement: °C, °F, % based on chosen scale

Options: **0...999**

4.7.8. HBB.R - Enabling HBB during ramp

Acronym	Scrolling message	Submenu	Attributes
HBB.R	PR.STP.1 (or PR.STP.2…PR.STP.128) ENABLE HOLD BACK BAND DURING STEP RAMP	PR.STP	R W

If the HBB function is enabled, the parameter enables and disables it during the step ramp time.

Unit of measurement: -

Options:
OFF = Disables HBB function during ramp time
On = Enables HBB function during ramp time

4.7.9. HBB.H - Enabling HBB during hold

Acronym	Scrolling message	Submenu	Attributes
HBB.H	PR.STP.1 (or PR.STP.2…PR.STP.128) ENABLE HOLD BACK BAND DURING STEP HOLD	PR.STP	R W

If the HBB function is enabled, the parameter enables and disables it during the step ramp time.

Unit of measurement: -

Options:
OFF = Disables HBB function during ramp time
On = Enables HBB function during ramp time

4.7.10. HBB2 - Enabling HBB with respect to the auxiliary input

Acronym	Scrolling message	Submenu	Attributes
HBB2	PR.STP.1 (o PR.STP.2…PR.STP.128) HOLD BACK BAND FUNCTION REFERRED TO AUX INP	PR.STP	R W

If the HBB function is enabled, the parameter enables and disables it with respect to the remote setpoint input, which can be enabled on the MODE submenu, SP.REM parameter = On
When the function is enabled with respect to the auxiliary input, if deviation PV1-IN2 exceeds BAND value, the program's time base is blocked.
The parameter is significant only if the step pertaining to PROGR.1 with optional auxiliary input is present and PID.2 and PROGR.2 are not enabled (parameter PID2.E=OFF and PROGR=On1 on EN.FUN submenu).

Unit of measurement: -

Options: **OFF** = Disables HBB function with respect to remote setpoint input
On = Enables HBB function with respect to remote setpoint input

4.7.11. S.SP.EN - Enabling retransmission of setpoint to analog output

Acronym	Scrolling message	Submenu	Attributes
S.SP.EN	PR.STP.1 (or PR.STP.2…PR.STP.128) SUBDUED SETPOINT RETRANSMITTED ENABLE	PR.STP	R W

The parameter enables and disables retransmission of the setpoint value to other slaved controllers.
The setpoint value is transmitted by analog output A1 or A2 if configured on submenu OUT.AN, parameter Func=SLV.S1 or Func=SLV.S2.

Unit of measurement: -

Options: **OFF** = Disables retransmission
On = Enables retransmission

4.7.12. Setpoint value of slaved controller

Acronym	Scrolling message	Submenu	Attributes
SUB.SP	PR.STP.1 (or PR.STP.2…PR.STP.128) SUBDUED SETPOINT ASSOCIATED TO STEP	PR.STP	R W

If the S.SP.EN function is enabled, the parameter shows and sets the setpoint value to be retransmitted as a percentage of the controller setpoint value

EXAMPLE If the setpoint of the main controller is 180°C and you want the setpoint of the secondary controller to be 85°C, then SUB.SP should be set to 47.2 (47.2% of 180 is about 85).

Unit of measurement: %

Options: **0.0...100.0**

4.7.13. S.RM.EN - Enabling ramp for slaved controller

Acronym	Scrolling message	Submenu	Attributes
S.RM.EN	PR.STP.1 (or PR.STP.2…PR.STP.128) SUBDUED SETPOINT RAMP ENABLE	PR.STP	R W

If the S.SP.EN function is enabled, the parameter enables and disables the setpoint ramp for the slaved controller.

Unit of measurement: -

Options: **OFF** = Disables setpoint ramp for slaved controller
On = Enables setpoint ramp for slaved controller

4.7.14. ENBL.1 - Consent 1 to execute step

Acronym	Scrolling message	Submenu	Attributes
ENBL.1	PR.STP.1 (or PR.STP.2…PR.STP.128) STEP ENABLE FOR STEP START	PR.STP	R W

The parameter shows and sets consent 1 condition to enable execution of the step.

The consents automatically check that certain conditions have been met before the program continues.
There are 4 different consents (1, 2, 3 and 4) and, at the start of the step, the state of each must match the programmed state.
Consents can be set via digital inputs, function block outputs, and the RS485 serial input.
If even one of the consents does not match the programmed state, the step is not executed.
If all consents are set to nonE, execution of the step is not conditioned and is always executed.

Unit of measurement: -

Options: **nonE** = Consent state is ignored, i.e., step is always executed
On = Consent must be on to execute step
OFF = Consent does not have to be on to execute step

4.7.15. ENBL.2 - Consent 2 to execute step

Acronym	Scrolling message	Submenu	Attributes
ENBL.2	PR.STP.1 (or PR.STP.2…PR.STP.128) STEP ENABLE FOR STEP START	PR.STP	R W

The parameter shows and sets consent 2 condition to enable execution of the step.

See ENBL.1 for details.

4.7.16. ENBL.3 - Consent 3 to execute step

Acronym	Scrolling message	Submenu	Attributes
ENBL.3	PR.STP.1 (or PR.STP.2…PR.STP.128) STEP ENABLE FOR STEP START	PR.STP	R W

The parameter shows and sets consent 3 condition to enable execution of the step.

See ENBL.1 for details.

4.7.17. ENBL.4 - Consent 4 to execute step

Acronym	Scrolling message	Submenu	Attributes
ENBL.4	PR.STP.1 (or PR.STP.2…PR.STP.128) STEP ENABLE FOR STEP START	PR.STP	R W

The parameter shows and sets consent 4 condition to enable execution of the step.

See ENBL.1 for details.

4.7.18. EN.ST.N - Other programmer step as consent to execute step

Acronym	Scrolling message	Submenu	Attributes
EN.ST.N	PR.STP.1 (or PR.STP.2…PR.STP.128) STEP FOR STEP START	PR.STP	R W

The parameter shows and sets step n of the other programmer used as consent to execute the step of the programmer being configured.
Value n = 0 disables the function.
The parameter is present only with double setpoint programmer.

Unit of measurement: -

Options: **1...128** = Number for start step

4.7.19. EVN.R.1 - Event 1 during step ramp

Acronym	Scrolling message	Submenu	Attributes
EVN.R.1	PR.STP.1 (or PR.STP.2…PR.STP.128) EVENT DURING STEP RAMP	PR.STP	R W

The parameter shows and sets the configuration of event 1 during the step ramp.

Unit of measurement: -

Options:
nonE = Event not modified
On = Event becomes active
OFF = Event becomes inactive

4.7.20. EVN.R.2 - Event 2 during step ramp

Acronym	Scrolling message	Submenu	Attributes
EVN.R.2	PR.STP.1 (or PR.STP.2…PR.STP.128) EVENT DURING STEP RAMP	PR.STP	R W

The parameter shows and sets the configuration of event 2 during the step ramp

Unit of measurement: -

Options:
nonE = Event not modified
On = Event becomes active
OFF = Event becomes inactive

4.7.21. EVN.R.3 - Event 3 during step ramp

Acronym	Scrolling message	Submenu	Attributes
EVN.R.3	PR.STP.1 (or PR.STP.2…PR.STP.128) EVENT DURING STEP RAMP	PR.STP	R W

The parameter shows and sets the configuration of event 3 during the step ramp.

Unit of measurement: -

Options:
nonE = Event not modified
On = Event becomes active
OFF = Event becomes inactive

4.7.22. EVN.R.4 - Event 4 during step ramp

Acronym	Scrolling message	Submenu	Attributes
EVN.R.4	PR.STP.1 (or PR.STP.2…PR.STP.128) EVENT DURING STEP RAMP	PR.STP	R W

The parameter shows and sets the configuration of event 4 during the step ramp.

Unit of measurement: -

Options:
nonE = Event not modified
On = Event becomes active
OFF = Event becomes inactive

4.7.23. EVN.H.1 - Event 1 during step hold

Acronym	Scrolling message	Submenu	Attributes
EVN.H.1	PR.STP.1 (or PR.STP.2…PR.STP.128) EVENT DURING STEP HOLD	PR.STP	R W

The parameter shows and sets the configuration of event 1 during the step hold.

Unit of measurement: -

Options:
nonE = Event not modified
On = Event becomes active
OFF = Event becomes inactive

4.7.24. EVN.H.2 - Event 2 during step hold

Acronym	Scrolling message	Submenu	Attributes
EVN.H.2	PR.STP.1 (o PR.STP.2…PR.STP.128) EVENT DURING STEP HOLD	PR.STP	R W

The parameter shows and sets the configuration of event 2 during the step hold.

Unit of measurement: -

Options:
nonE = Event not modified
On = Event becomes active
OFF = Event becomes inactive

4.7.25. EVN.H.3 - Event 3 during step hold

Acronym	Scrolling message	Submenu	Attributes
EVN.H.3	PR.STP.1 (or PR.STP.2…PR.STP.128) EVENT DURING STEP HOLD	PR.STP	R W

The parameter shows and sets the configuration of event 3 during the step hold.

Unit of measurement: -

Options:
nonE = Event not modified
On = Event becomes active
OFF = Event becomes inactive

4.7.26. EVN.H.4 - Event 4 during step hold

Acronym	Scrolling message	Submenu	Attributes
EVN.H.4	PR.STP.1 (or PR.STP.2…PR.STP.128) EVENT DURING STEP HOLD	PR.STP	R W

The parameter shows and sets the configuration of event 4 during the step hold.

Unit of measurement: -

Options:
nonE = Event not modified
On = Event becomes active
OFF = Event becomes inactive

4.7.27. GROP.R - Group of parameters assigned to ramp

Acronym	Scrolling message	Submenu	Attributes
GROP.R	PR.STP.1 (or PR.STP.2…PR.STP.128) CONTROL PARAMETER GROUP DURING STEP RAMP	PR.STP	R W

The parameter shows and sets the group of control parameters assigned to the step during the ramp.

Unit of measurement: Number

Options: **0...4**

4.7.28. GROP.H - Group of parameters assigned to hold

Acronym	Scrolling message	Submenu	Attributes
GROP.H	PR.STP.1 (or PR.STP.2…PR.STP.128) CONTROL PARAMETER GROUP DURING STEP HOLD	PR.STP	R W

The parameter shows and sets the group of control parameters assigned to the step during the hold.

Unit of measurement: Number

Options: **0...4**

4.7.29. MSG.R - Message associated with the ramp

Acronym	Scrolling message	Submenu	Attributes
MSG.R	PR.STP.1 (or PR.STP.2…PR.STP.128) SCROLLING MESSAGE DURING STEP RAMP	PR.STP	R W

The parameter displays and sets the message number associated with the step during the ramp, which is the message that will appear on the display to scroll to the step you are configuring
More information on the scrolling message can be found in the section “3.1.2.2. Scrolling messages” on page 40.
Setting it to “0” will not show any messages.

Unit of measurement: ID number of the message

Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.7.30. MSG.H - Message associated with the maintenance

Acronym	Scrolling message	Submenu	Attributes
MSG.H	PR.STP.1 (or PR.STP.2…PR.STP.128) SCROLLING MESSAGE DURING STEP HOLD	PR.STP	R W

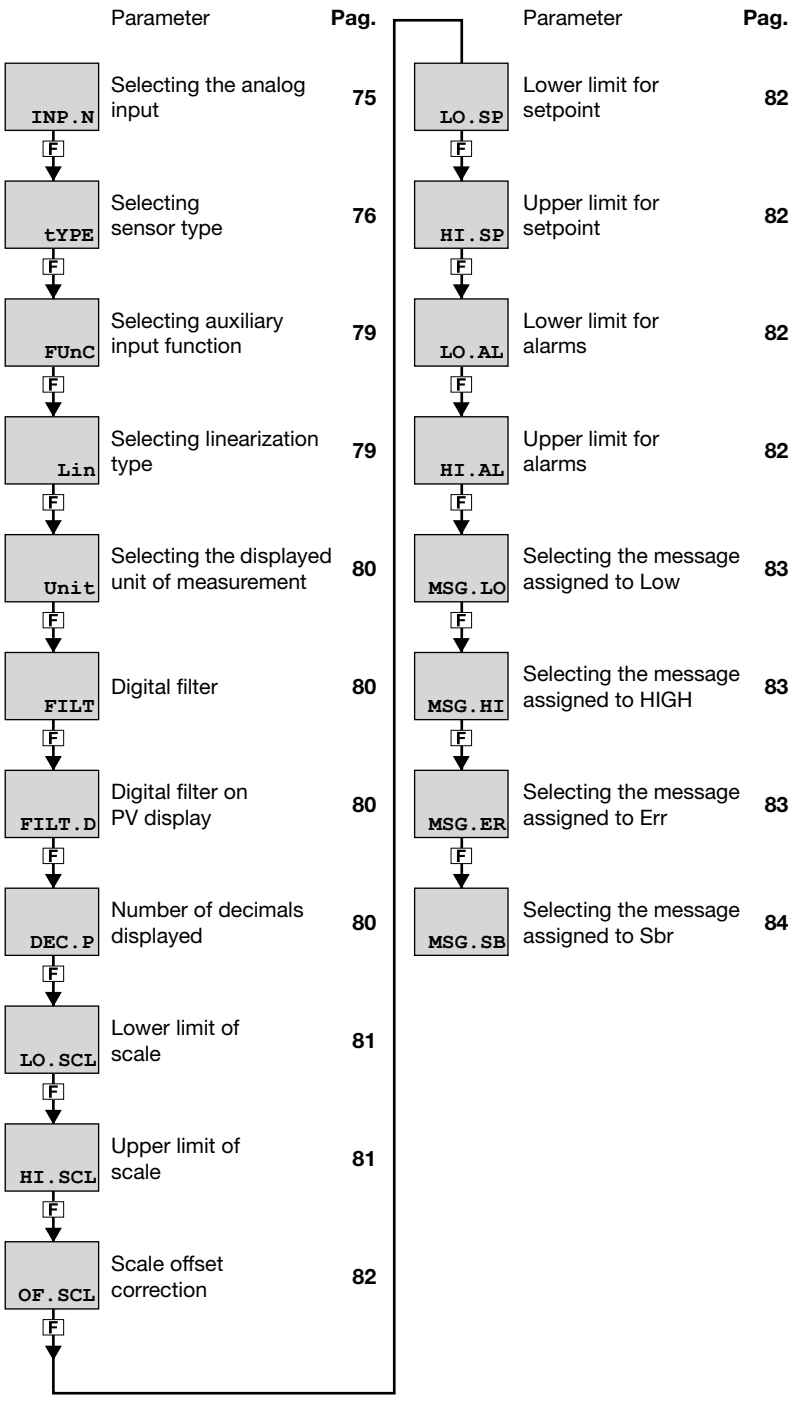
The parameter displays and sets the message number associated with the step during the ramp, which is the message that will appear on the display to scroll to the step you are configuring
More information on the scrolling message can be found in the section “3.1.2.2. Scrolling messages” on page 40.
Setting it to “0” will not show any messages.

Unit of measurement: ID number of the message

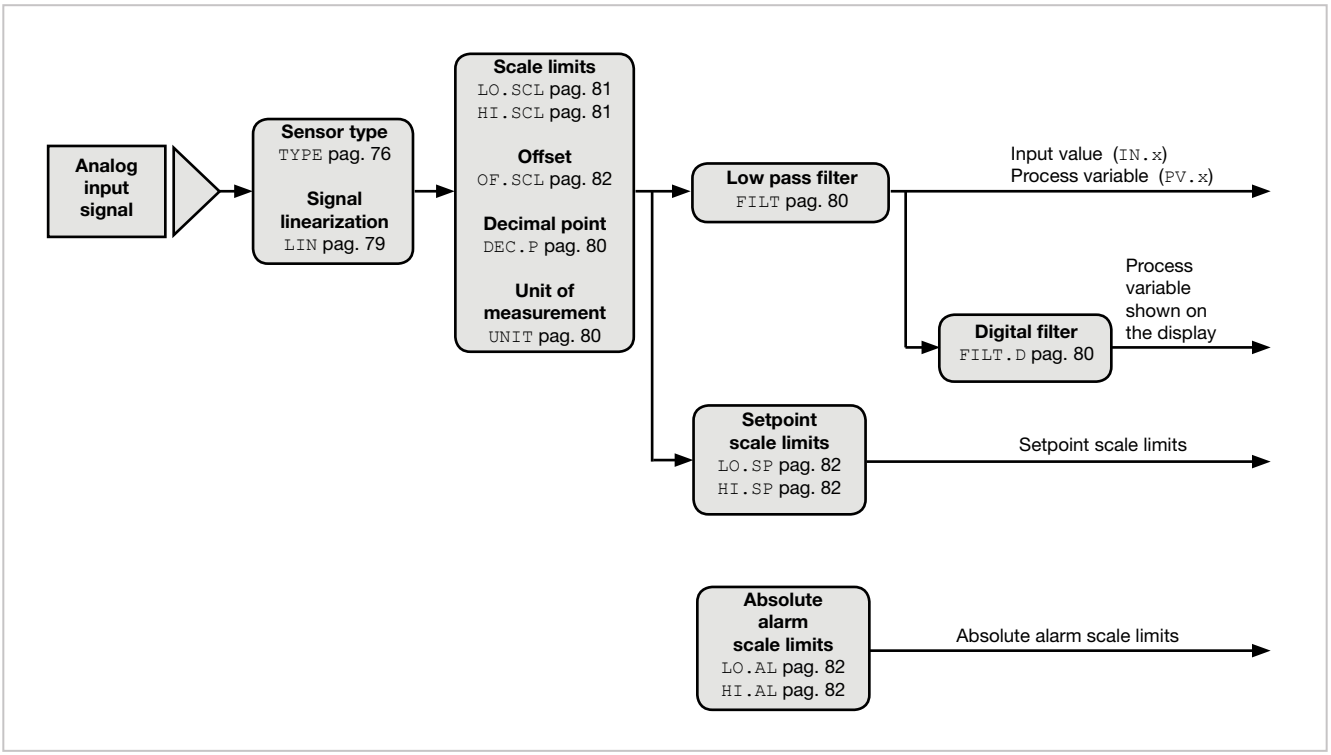
Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.8. Submenu INPUT - Configuring analog inputs

Acronym	Scrolling message	Password	Description
INPUT	INPUT CONFIG	Level 1	Lets you configure the controller's analog inputs (main and auxiliary).



4.8.1. Functional schema



4.8.2. INP.N - Selecting the analog input

Acronym	Scrolling message	Submenu	Attributes
INP.N	INPUT NUMBER	INPUT	R W
The parameter shows and sets the identifying number of the analog input. ***Unit of measurement***: Number ***Options***: 1...2			

4.8.3. TYPE - Selecting sensor type

Acronym	Scrolling message	Submenu	Attributes
tYPE	INPUT.1 (or INPUT.2) TYPE OF PROBE	INPUT	R W

The parameter shows and sets the sensor type of the main or auxiliary input.
The functions for calibrating Custom sensors are on the US.CAL menu.
When a 4...20 mA input is used and the current is less than 2 mA, an Err message is generated and the relay state specified with the FAUL.T parameters is activated.

The table shows the scale limits for each sensor type or input based on the set number of decimals.

Sensor type	Sensor	Unit of measurement	Scale limits for DEC.P = 0	Scale limits for DEC.P = 1	Error @ 25°C	
Thermocouple	J	°C	0...1000	0.0...999.9		
	K	°C	0...1300	0.0...999.9		
	R	°C	0...1750	0.0...999.9		
	S	°C	0...1750	0.0...999.9		
	T	°C	-200...400	-199.9...400.0		
	C	°C	0...2300	0.0...999.9		
	D	°C	0...2300	0.0...999.9		
	B	°C	44...1800	n.d.	> 600 °C	
	E	°C	-100...750	-100.0...750		
	L	°C	-200...900	-199.9...900.0		
	L-GOST	°C	0...600	0.0...600.0		
	U	°C	-200...400	-199.9...400.0		
	G	°C	0...2300	n.d.		
	N	°C	0...1300	0.0...999.9		
	Pt20Rh Pt40Rh	°C	0...1880	n.d.		
Infrared characteristic of the Tc K model *see note*	1	°C	10...70	10.0...70.0		
	2	°C	60...120	60.0...120.0		
	3	°C	115...165	115.0...165.0		
	4	°C	140...260	140.0...260.0		
Resistance thermometer	PT100	°C	-200...850	-199.9...850.0		
	PT100	°C	-50...250	-50.0...250.0		
	JPT100	°C	-200...600	-199.9...850.0		
Voltage /Current	0...60 mV		-1999...9999	-199.9...999.9		
	0...20 mA					
	4...20 mA					
	0...10 V					
	2...10 V					
	0...5 V					
	1...5 V					
	0...1 V					
	0.2...1 V					
Custom	RTD		-1999...9999	-199.9...999.9		
	0...60 mV					
	0...20 mA					
	4...20 mA					
	0...10 V					
	2...10 V					
	0...5 V					
	1...5 V					
	0...1 V					
	0.2...1 V					

Note: the infrared temperature sensor has an output in voltage for direct connection to the input terminals of the temperature controller. An external thermometer is needed in order to correct the sensor error.
After identifying the work temperature range (for example, 140 – 260°C), set an SP near the minimum scale value, and after reaching it make a note of value A1 indicated by the instrument and of value A2 indicated by the external thermometer. Set an SP near the maximum scale value, and after reaching it make a note of value B1 indicated by the instrument and of value B2 indicated by the external thermometer. Enable 4-point linearization (see Correcting 4-point input) and enter the four requested values (A1, B1 and A2, B2).

Unit of measurement: -

Options:

TYPE 1

J.TC = J thermocouple
K.TC = K thermocouple
R TC = R thermocouple
S TC = S thermocouple
T.TC = T thermocouple
C.TC = C thermocouple
D.TC = D thermocouple
B.TC = B thermocouple
E.TC = E thermocouple
L TC = L thermocouple
L.GO.TC = L.GOST thermocouple
U.TC = U thermocouple
G.TC = G thermocouple
N.TC = N thermocouple
PT2.TC = Pt20Rh / Pt40Rh thermocouple
INFR1 = IR sensor type 1
INFR2 = IR sensor type 2
INFR3 = IR sensor type 3
INFR4 = IR sensor type 4

without option VT1, only for 850 model:
PT100 = Pt100 resistance thermometer
PT.LIM = Pt 100 limitated resistance thermometer
JPT10 = JPT100 resistance thermometer

60MV = 0...60 mV Sensor
20MA = 0...20 mA Sensor
4-20M = 4...20 mA Sensor
10V = 0...10 V Sensor
2-10V = 2...10 V Sensor
5V = 0...5 V Sensor
1-5V = 1...5 V Sensor
1V = 0...1 V Sensor
0.2-1V = 0,2...1 V Sensor

without option VT1, only for 850 model:
C.RTD = RTD sensor with user linearization

C.60MV = 0...60 mV sensor with user calibration
C.20MA = 0...20 mA sensor with user calibration
C.4-20 = 4...20 mA sensor with user calibration
C.10V = 0...10 V sensor with user calibration
C.2-10 = 2...10 V sensor with user calibration
C.5V = 0...5 V sensor with user calibration
C.1-5V = 1...5 V sensor with user calibration
C.1V = 0...1 V sensor with user calibration
C.0.2-1 = 0,2...1 V sensor with user calibration

TYPE 2

without VP or VT2 options, only if Main 'input is configured thermocouple or infrared:
J.TC = J thermocouple
K.TC = K thermocouple
R TC = R thermocouple
S TC = S thermocouple
T.TC = T thermocouple
C.TC = C thermocouple
D.TC = D thermocouple
B.TC = B thermocouple
E.TC = E thermocouple
L TC = L thermocouple
L.GO.TC = L.GOST thermocouple
U.TC = U thermocouple
G.TC = G thermocouple

N.TC = N thermocouple
PT2.TC = Pt20Rh / Pt40Rh thermocouple
INFR1 = IR sensor type 1
INFR2 = IR sensor type 2
INFR3 = IR sensor type 3
INFR4 = IR sensor type 4

without VP or VT2 options:
PT100 = Termoresistenza Pt100
PT.LIM = Termoresistenza Pt 100 limitata
JPT10 = Termoresistenza JPT100
60MV = Sensore 0...60 mV

with VP or VT2 options:
20MA = 0...20 mA sensor
4-20M = 4...20 mA sensor
10V = 0...10 V sensor
2-10V = 2...10 V sensor
5V = 0...5 V sensor
1-5V = 1...5 V sensor
1V = 0...1 V sensor
0.2-1V = 0,2...1 V sensor

without VP or VT2 options
C.RTD = RTD sensor with custom linearization
C.60MV = 0...60 mV sensor with custom calibration

with VP or VT2 options:
C.20MA = 0...20 mA sensor with custom calibration
C.4-20 = 4...20 mA sensor with custom calibration
C.10V = 0...10 V sensor with custom calibration
C.2-10 = 2...10 V sensor with custom calibration
C.5V = 0...5 V sensor with custom calibration
C.1-5V = 1...5 V sensor with custom calibration
C.1V = 0...1 V sensor with custom calibration
C.0.2-1 = 0,2...1 V sensor with custom calibration

4.8.4. SBR.E - Enabling SBR error

Acronym	Scrolling message	Submenu	Attributes
SBR.E	INPUT.1 (o INPUT.2) SBR ENABLE	INPUT	R W

Enables open thermocouple probe error detection, also permitting infrared sensor management with maximum 4Kohm output impedance.
This parameter only appears when a thermocouple type input is selected.
When OFF, the parameter will be forced to ON (see options) at each Power On

Unit of measurement: -

Options: **OFF =** Disable SBR alarm
On = Enable SBR alarm
On.t = Enable SBR alarm with timing

FUNC - Selecting auxiliary input function

Acronym	Scrolling message	Submenu	Attributes
FUnC	FUNCTION OF AUX INPUT	INPUT	R W

The parameter shows and sets the function assigned to the auxiliary input.
The parameter is shown only for the auxiliary input.

Unit of measurement: -

Options:
NONE = No function (only IN2 display)
SETP = Remote setpoint of Process Value (PV1) for PID.1 (*)
POWER = Remote setpoint of Power for PID.1 (*)
RST.PW = Reset power for PID.1
RATIO = Ratio controller reference for PID.1 (**)

if model with Valve control:
VALV.P = Valve position signal

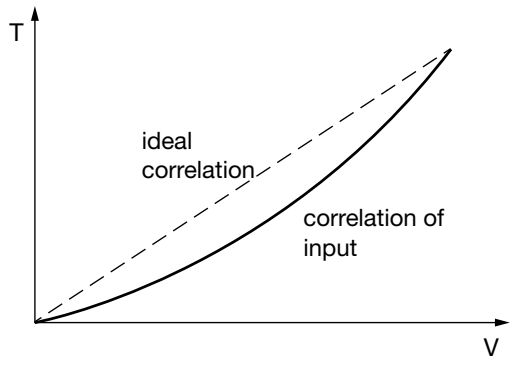
PV2 = Process Value (PV2) for PID.2

(*) Remote setpoint mode is obtained with function keys/digital inputs /Logic Function Blocks /serial after having enabled remote setpoint SP.rEM=On.
(**) In remote setpoint mode, the controller tends to maintain PV1 = SSP1 = IN2 x RATIO, where RATIO (range from 0.01 to 99.99) is the value of the ratio required between PV1 and IN2. It is calculated in manual switching manual > automatic (with MA.AU = BUMPL) and can be modified on the User menu.

4.8.5. LIN - Selecting linearization type

Acronym	Scrolling message	Submenu	Attributes
Lin	INPUT.1 (or INPUT.2) CUSTOM LINEARIZATION	INPUT	R W

The parameter sets linearization for the selected sensor type.
The function corrects any linearity and proportionality errors in the correlation between the value sent by the input and the actual value of the physical quantity measured..



This correction can be made with two different algorithms: 32-step linearization and 4-point linearization. Values are set (33 for 32-step linearization and 4 for 4-point linearization) with the LINRZ submenu parameters.

For an explanation of 4-point linearization, see paragraph “5.4. 4-point input correction” on page 174.

Unit of measurement: -

Options:
NONE = No linearization
32.STP = 32-step linearization
4.POIN = 4-point linearization

4.8.6. UNIT - Selecting the displayed unit of measurement

Acronym	Scrolling message	Submenu	Attributes
Unit	INPUT.1 (or INPUT.2) UNIT OF MEASURE	INPUT	R W

The parameter shows and sets the unit of measurement displayed for input in use. The unit appears on the Home.x page of the display.
For thermocouple or resistance thermometer inputs, the °C / °F selection automatically converts the temperature value; the related scale limits and setpoint limits must be set.

Unit of measurement: -

Options:
NONE = No unit of measurement
°C = Degrees Celsius
°F = Degrees Fahrenheit
CUST = Custom, settable with GF_eXpress

4.8.7. FILT - Digital filter

Acronym	Scrolling message	Submenu	Attributes
FILT	INPUT.1 (or INPUT.2) DIGITAL FILTER	INPUT	R W

The parameter shows and sets the value of the digital filter time constant.
With 0.00 no filter is applied.

Unit of measurement: Seconds

Options: **0.00...20.00**

4.8.8. FILT.D - Digital filter on PV display

Acronym	Scrolling message	Submenu	Attributes
FILT.D	INPUT.1 (or INPUT.2) DIGITAL FILTER ON DISPLAY PV	INPUT	R W

The parameter shows and sets the allowed tolerance between the real PV value and the value on the PV display: if the variation in real PV is within the interval displayed value - FILT.D... displayed value + FILT.D the displayed value does not change. With 0.00 no filter is applied..

Unit of measurement: The one set with the Unit parameter

Options: **0.0...9.9**

4.8.9. DEC.P - Number of decimals displayed

Acronym	Scrolling message	Submenu	Attributes
DEC.P	INPUT.1 (or INPUT.2) DECIMAL POINT POSITION	INPUT	R W

The parameter shows and sets the decimal point position for the process value (PV) displayed, i.e., defines its number of decimal figures.
The number of decimal set may reduce the limits of the measurement scale used.

Unit of measurement: Number

Options:
0...3 = Number of decimals displayed
0 / 1 = Number of decimals displayed, only for TC and RTD sensors

4.8.10. LO.SCL - Lower limit of scale

Acronym	Scrolling message	Submenu	Attributes
LO.SCL	INPUT.1 (or INPUT.2) INPUT LOW LIMIT	INPUT	R W

The parameter shows and sets the lower limit of the measurement scale used for the main or auxiliary input, based on input (or sensor) type, unit of measurement, and number of decimals selected.
The upper value of LO.SCL is not limited by the value of HI.SCL

Unit of measurement: The one set with the Unit parameter

Options: A numerical value within the temperature range of the input or sensor

	Unit = °C DEC.P = 0	Unit = °F DEC.P = 0
J.TC	0...1000	32...1832
K.TC	0...1300	32...2372
R TC	0...1750	32...3182
S TC	0...1750	32...3182
T.TC	-200...400	-328...752
C.TC	0...2300	32...4172
D.TC	0...2300	32...4172
B	44...1800	111...3272
E	-100...750	-148...1382
L	-200...900	-328...1652
L-GOST	0...600	32...1112
U	-200...400	-328...752
G	0...2300	32...4172
N	0...1300	32...4172
PT2.TC	0...1880	32...3416
INFR1	10...70	50...158
INFR2	60...120	140...248
INFR3	115...165	239...329
INFR4	140...260	284...500
PT100	-200...850	-328...1562
PT.LIM	-50...100	-58...212
JPT10	-200...600	-328...1112
60MV	-1999...9999	-1999...9999
20MA	-1999...9999	-1999...9999

	Unit = °C DEC.P = 0	Unit = °F DEC.P = 0
4-20M	-1999...9999	-1999...9999
10V	-1999...9999	-1999...9999
2-10V	-1999...9999	-1999...9999
5V	-1999...9999	-1999...9999
1-5V	-1999...9999	-1999...9999
1V	-1999...9999	-1999...9999
0.2-1V	-1999...9999	-1999...9999
C.RTD	-1999...9999	-1999...9999
C.60MV	-1999...9999	-1999...9999
C.20MA	-1999...9999	-1999...9999
C.4-20	-1999...9999	-1999...9999
C.10V	-1999...9999	-1999...9999
C.2-10	-1999...9999	-1999...9999
C.5V	-1999...9999	-1999...9999
C.1-5V	-1999...9999	-1999...9999
C.1V	-1999...9999	-1999...9999
C.0.2-1	-1999...9999	-1999...9999

4.8.11. HI.SCL - Upper limit of scale

Acronym	Scrolling message	Submenu	Attributes
HI.SCL	INPUT.1 (or INPUT.2) INPUT HIGH LIMIT	INPUT	R W

The parameter shows and sets the upper limit of the measurement scale used for the main or auxiliary input, based on input (or sensor) type, unit of measurement, and number of decimals selected.
The lower value of HI.SCL is limited by the value of LO.SCL.

Unit of measurement: The one set with the Unit parameter

Options: A value in the interval corresponding to the input or sensor type (see tables for LO.SCL parameter).

4.8.12. OF.SCL - Scale offset correction

Acronym	Scrolling message	Submenu	Attributes
OF.SCL	INPUT.1 (or INPUT.2) INPUT OFFSET	INPUT	R W

The parameter shows and sets the offset applied to the value read in input to make it correspond to the expected value for a certain temperature. It corrects any constant read error of the sensor.
This offset is applied linearly to all reads; therefore it cannot be used to correct any sensor linearity errors.

Unit of measurement: The one set with the Unit parameter

Options: **-999...999**

4.8.13. LO.SP - Lower limit for setpoint

Acronym	Scrolling message	Submenu	Attributes
LO.SP	INPUT.1 (or INPUT.2) LOW LIMIT FOR SETPOINT	INPUT	R W

The parameter shows and sets the lower limit for defining the setpoint, i.e., the minimum value for setting a setpoint.
The scale limit is ignored if the setpoint is assigned to an MFB output (or calculated by an MFB).

Unit of measurement: The one set with the Unit parameter

Options: **LO.SCL...HI.SCL**

4.8.14. HI.SP - Upper limit for setpoint

Acronym	Scrolling message	Submenu	Attributes
HI.SP	INPUT.1 (or INPUT.2) HIGH LIMIT FOR SETPOINT	INPUT	R W

The parameter shows and sets the upper limit for defining the setpoint, i.e., the maximum value for setting a setpoint.
The lower value of HI.SP is limited by the value of LO.SP.
The scale limit is ignored if the setpoint is assigned to an MFB output (or calculated by an MFB).

Unit of measurement: The one set with the Unit parameter

Options: **LO.SP...HI.SCL**

4.8.15. LO.AL - Lower limit for alarms

Acronym	Scrolling message	Submenu	Attributes
LO.AL	INPUT.1 (or INPUT.2) LOW LIMIT FOR ABSOLUTE ALARMS	INPUT	R W

The parameter shows and sets the lower limit for defining alarms, i.e., the minimum value for setting an alarm.

Unit of measurement: The one used for the alarm limit.

Options: **-1999...9999**

4.8.16. HI.AL - Upper limit for alarms

Acronym	Scrolling message	Submenu	Attributes
HI.AL	INPUT.1 (or INPUT.2) HIGH LIMIT FOR ABSOLUTE ALARMS	INPUT	R W

The parameter shows and sets the upper limit for defining alarms, i.e., the maximum value for setting an alarm.

Unit of measurement: The one used for the alarm limit.

Options: **-1999...9999**

4.8.17. MSG.LO - Selecting the message assigned to Low

Acronym	Scrolling message	Submenu	Attributes
MSG.LO	INPUT.1 (or INPUT.2) NUM SCROLLING MSG WHEN INPUT IS LOW ERR	INPUT	R W

The parameter shows and sets the number of the message assigned to Low (input < minimum scale limit), i.e., the scrolling message shown on the display..
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed for Lou.

As default, MSG.LO is assigned the message “1” (for LANG1 corresponds to “IN 1 (or IN 2) UNDER LOW LIMIT”, for LANG2 corresponds to “IN 1 (or IN 2) INFERIORE AL MINIMO”.

Unit of measurement: Message number

Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.8.18. MSG.HI - Selecting the message assigned to HIGH

Acronym	Scrolling message	Submenu	Attributes
MSG.HI	INPUT.1 (or INPUT.2) NUM SCROLLING MSG WHEN INPUT IS HI ERR	INPUT	R W

The parameter shows and sets the number of the message assigned to HIGH (input > maximum scale limit), i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed for Hi GH.

As default, MSG.HI is assigned the message “2” (for LANG1 corresponds to “IN 1 (or IN 2) OVER HIGH LIMIT ”, for LANG2 corresponds to “IN 1 (or IN 2) SUPERIORE AL MASSIMO”.

Unit of measurement: Message number

Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.8.19. MSG.ER - Selecting the message assigned to Err

Acronym	Scrolling message	Submenu	Attributes
MSG.ER	INPUT.1 (or INPUT.2) NUM SCROLLING MSG WHEN INPUT IS ERR ERR	INPUT	R W

The parameter shows and sets the number of the message assigned to Err (Pt100 in short circuit or input values below minimum limit), i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed for Err.

As default, MSG.ER is assigned the message “3” (for LANG1 corresponds to “INPUT SENSOR 1 (or SENSOR 2) FAIL CONNECTION”, for LANG2 corresponds to “ERRATA CONNESSIONE SONDA 1 (o SONDA 2)”.

Unit of measurement: Message number

Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.8.20. MSG.SB - Selecting the message assigned to Sbr

Acronym	Scrolling message	Submenu	Attributes
MSG.SB	INPUT.1 (or INPUT.2) NUM SCROLLING MSG WHEN INPUT IS SB ERR	INPUT	R W

The parameter shows and sets the number of the message assigned to Err (sensor break in short circuit or input values above maximum limit), i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed for Sbr.

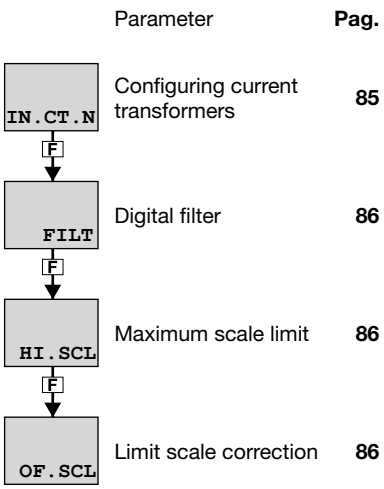
As default, MSG.SB is assigned the message “4” (for LANG1 corresponds to ““SENSOR BROKEN” 1 (or SENSOR 2) , for LANG2 corresponds to “SONDA 1 (o SONDA 2) APERTA”.

Unit of measurement: Message number

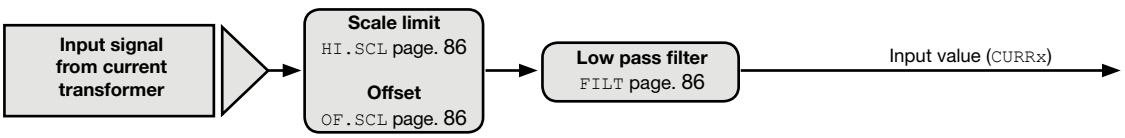
Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.9. Submenu IN.CT - Configuration of current inputs

Acronym	Scrolling message	Password	Description
IN.CT	CT INPUT CONFIG	Level 1	Lets you configure the inputs of the controller's current transformers.



4.9.1. Functional diagram



4.9.2. IN.CT.N – Configuring current transformers

Acronym	Scrolling message	Submenu	Attributes
IN.CT.N	CURRENT TRASFORMER NUMBER	IN.CT	R W

The parameter shows and sets the identifying number of the current transformer.

Unit of measurement: Number

Options: 1...2

4.9.3. FILT - Digital filter

Acronym	Scrolling message	Submenu	Attributes
FILT	IN.CT.1 (or IN.CT.2) DIGITAL FILTER	IN.CT	R W
The parameter shows and sets the value of the digital filter time constant applied to the input for current transformer CT.1 or CT2. ***Unit of measurement***: Seconds ***Options***: **0.00...20.00**			

4.9.4. HI.SCL - Maximum scale limit

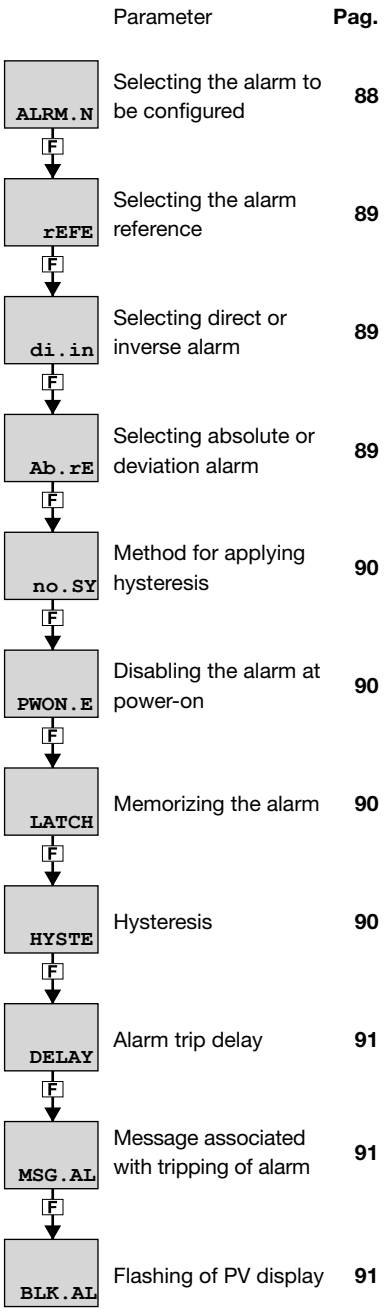
Acronym	Scrolling message	Submenu	Attributes
HI.SCL	IN.CT.1 (or IN.CT.2) HIGH LIMIT	IN.CT	R W
The parameter shows and sets the maximum scale limit of the input for current transformer CT1 or CT.2. ***Unit of measurement***: A ***Options***: **0.0...100.0**			

4.9.5. OF.SCL - Scale offset correction

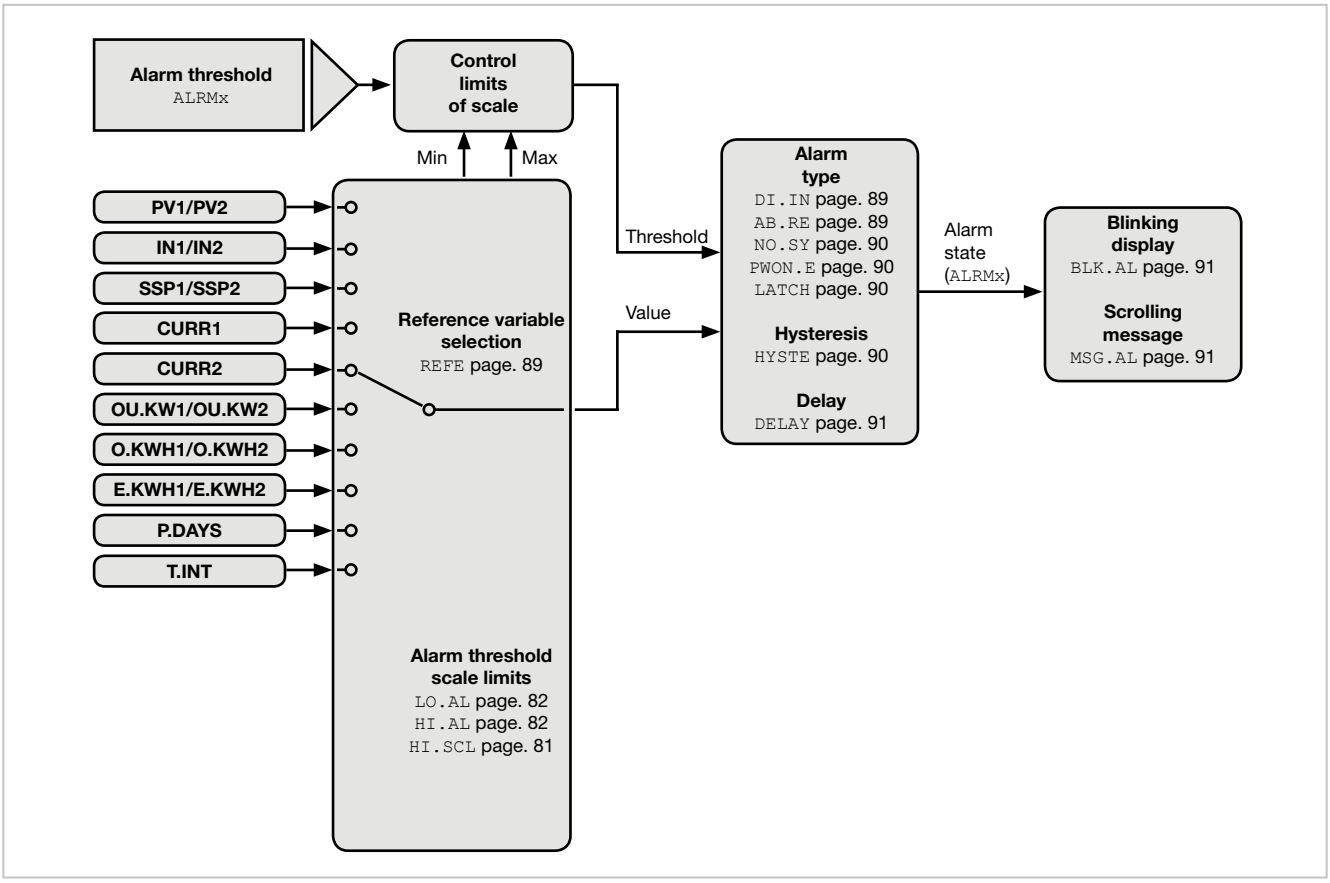
Acronym	Scrolling message	Submenu	Attributes
OF.SCL	IN.CT.1 (or IN.CT.2) OFFSET	IN.CT	R W
The parameter shows and sets the scale offset, i.e., the constant offset applied to all values measured by current transformer CT1 or CT2. ***Unit of measurement***: A ***Options***: **-99.9...99.9**			

4.10. Submenu ALARM - Configuration of alarms

Acronym	Scrolling message	Password	Description
ALARM	ALARM CONFIG	Level 1	Lets you configure the generic alarms.



4.10.1. Functional diagram



4.10.2. ALARM -Selecting the alarm to be configured

Acronym	Scrolling message	Submenu	Attributes
ALRM.N	ALARM NUMBER	ALARM	R W

The parameter shows and sets the alarm to be configured, identified by its number.

Unit of measurement: Number

Options: **1...ALRM.N** = Identifying number of alarm, where ALRM.N is the total number of alarms, setting by submenu MODE..

4.10.3. REFE - Selecting the alarm reference

Acronym	Scrolling message	Submenu	Attributes
rEFE	ALARM.1 (or ALARM.2…ALARM.4) SELECTING REFERENCE SIGNAL	ALARM	R W

The parameter shows and sets the reference of alarm number “x” selected with the previous parameter ALARM, where the reference can be an input or value to be monitored.

Unit of measurement: -

Options:

PV1 = Process variable for PID.1

if model with auxiliary input:
IN2 = Auxiliary input

SSP1 = Active Setpoint for PID.1

if model with CT1+CT2:
CURR1 = Current of current transformer CT1
CURR2 = Current of current transformer CT2

if energy count function is enabled in MODE.1:
OU.KW1 = Power transferred to the load ENERG.1
O.KWH1 = Energy transferred to load ENERG.1
E.KWH1 = Totalizer of energy transferred to load ENERG.1

T.INT = Temperatura interna
IN1 = Main input
P.DAYS = Partial working days

if PID2.E function is enabled in EN.FUN:
PV2 = Process variable PID.2
SSP2 = Active Setpoint for PID.2

if energy count function is enabled in MODE.2:
OU.KW2 = Power transferred to load ENERG.2
O.KWH2 = Energy transferred to load ENERG.2
E.KWH2 = Totalizer of energy transferred to load ENERG.2

4.10.4. DI.IN - Selecting direct or inverse alarm

Acronym	Scrolling message	Submenu	Attributes
di.in	ALARM.1 (or ALARM.2…ALARM.4) DIRECT/INVERSE DEFINITION	ALARM	R W

The parameter shows and sets the behavior of alarm number “x” with respect to the alarm limit and hysteresis.
Direct or inverse defines when the alarm has to trip.
For a detailed explanation of this behavior, see paragraph “5.6.1. AL1...AL4 Generic alarms” on page 175.

Unit of measurement: -

Options:

DIREC = Direct Alarm
INVRS = Inverse Alarm

4.10.5. AB.RE - Selecting absolute or deviation alarm

Acronym	Scrolling message	Submenu	Attributes
Ab.rE	ALARM.1 (or ALARM.2…ALARM.4) ABSOLUTE/RELATIVE DEFINITION	ALARM	R W

The parameter shows and defines the reference value of alarm number “x” for the alarm limit.
For a detailed explanation of the difference between absolute and deviation, see paragraph “5.6.1. AL1...AL4 Generic alarms” on page 175.

Unit of measurement: -

Options:

ABSLT = Absolute alarm
RELAT = Deviation alarm

4.10.6. NO.SY - Method for applying hysteresis

Acronym	Scrolling message	Submenu	Attributes
no.SY	ALARM.1 (or ALARM.2…ALARM.4) NORMAL/SYMMETRIC DEFINITION	ALARM	R W

The parameter shows and sets the method for applying hysteresis for alarm number “x” with respect to the alarm limit value.
With normal, hysteresis is added to / subtracted from the alarm limit(s) based on the general alarm configuration.
With symmetrical, hysteresis is added to / subtracted from the alarm limit itself. For a detailed explanation of the difference between normal and symmetrical, see paragraph “5.6.1. AL1...AL4 Generic alarms” on page 175.

Unit of measurement: -

Options: **NORML** = Normal alarm
SYMMT = Symmetrical alarm (window)

4.10.7. PWON.E - Disabling the alarm at power-on

Acronym	Scrolling message	Submenu	Attributes
PWON.E	ALARM.1 (or ALARM.2…ALARM.4) DISABLE AT SWITCH ON	ALARM	R W

The parameter shows and sets the behavior of the alarm (being configured) when the controller is powered on.
If the parameter is “OFF,” the alarm will trip when the controller is powered on if the process variable exceeds the alarm setpoint limits.
If the parameter is “On,” the alarm will not trip until the alarm limit value is reached at least once after the controller is powered on.

ATTENTION! The setpoint can be reached in increment or in decrement, or it may never be reached. Therefore, with “On” the alarm might never trip even if the value of the process variable exceeds the alarm setpoint limits.

Example – Minimum, inverse and absolute alarm
When the system is off, the process variable equals room temperature (20 °C). The alarm setpoint is set at 150°C ± 10°C. The controller powers on with the system.
So with “OFF” the alarm trips as soon as the controller is powered on because the temperature of the process variable exceeds the alarm setpoint limits.
Instead, with “On” the alarm trips only after the temperature of 150°C is reached at least once for the process variable.

Unit of measurement: -

Options: **OFF** = Alarm enabled at power-on
On = Alarm disabled at power-on (until setpoint is reached)

4.10.8. LATCH - Memorizing the alarm

Acronym	Scrolling message	Submenu	Attributes
LATCH	ALARM.1 (or ALARM.2…ALARM.4) MEMORY DEFINITION	ALARM	R W

The parameter shows and sets enabling of memorization of the alarm being configured.
Memorization maintains the active alarm state even after the alarm conditions are eliminated.
The alarm state can be deleted by from the digital input, serial input, or key.

Unit of measurement: -

Options: **OFF** = Alarm not latched
On = Alarm latched

4.10.9. HYSTE - Hysteresis

Acronym	Scrolling message	Submenu	Attributes
HYSTE	ALARM.1 (or ALARM.2…ALARM.4) HYSTERESIS	ALARM	R W

The parameter shows and sets the hysteresis applied to the alarm setpoint value for the alarm being configured.

Unit of measurement: Scale points

Options: **0...999** = For absolute (A.r.x = ABSLT) and symmetrical alarm (n.S.x = SYMMT)
-999...999 = For other types of alarms

4.10.10. DELAY - Alarm trip delay

Acronym	Scrolling message	Submenu	Attributes
DELAY	ALARM.1 (or ALARM.2…ALARM.4) DELAY OF ACTIVATION	ALARM	R W

The parameter shows and sets the alarm trip delay for the alarm being configured, i.e., the time that the value of the process variable has to exceed the alarm setpoint for the alarm to trip.
This parameter prevents repeated alarms due to instantaneous and insignificant exceeding of that value.
If the parameter is set to “0.00” the alarm will be instantaneous, regardless of the time in which the process variable exceeds the alarm setpoint.
For a detailed explanation of this behavior, see paragraph “5.6.1. AL1...AL4 Generic alarms” on page 175.

Unit of measurement: Minutes.seconds

Options: **0.00...99.59**

4.10.11. MSG.AL - Message associated with tripping of alarm

Acronym	Scrolling message	Submenu	Attributes
MSG.AL	ALARM.1 (or ALARM.2…ALARM.4) SCROLLING MESSAGE AT ALARM ACT	ALARM	R W

The parameter shows and sets the number of the message associated with tripping of the alarm being configured, i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed when the alarm trips.
The same message number can be assigned to different alarms

Unit of measurement: Message number

Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.10.12. BLK.AL - Flashing of PV display

Acronym	Scrolling message	Submenu	Attributes
BLK.AL	ALARM.1 (or ALARM.2…ALARM.4) BLINK DISPLAY PV DEF	ALARM	R W

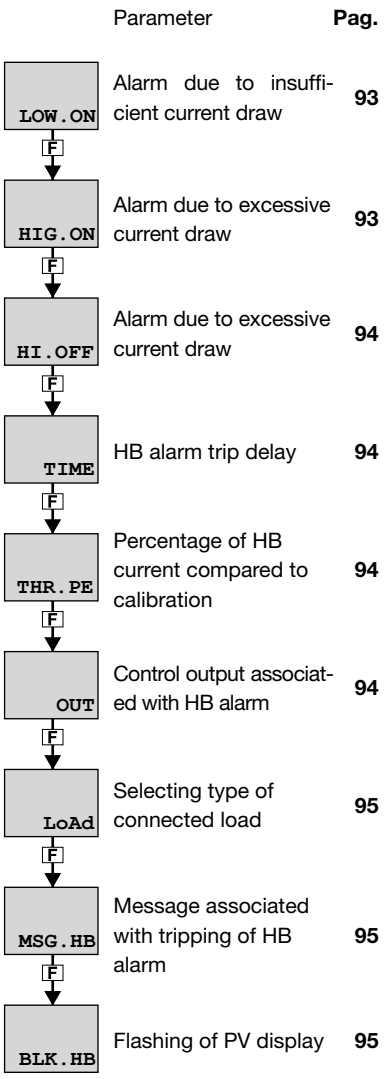
The parameter shows and sets the flashing of the PV display in case of alarm, for the alarm being configured.
If the parameter is “On,” the value shown on the PV display starts to flash in case of alarm.

Unit of measurement: -

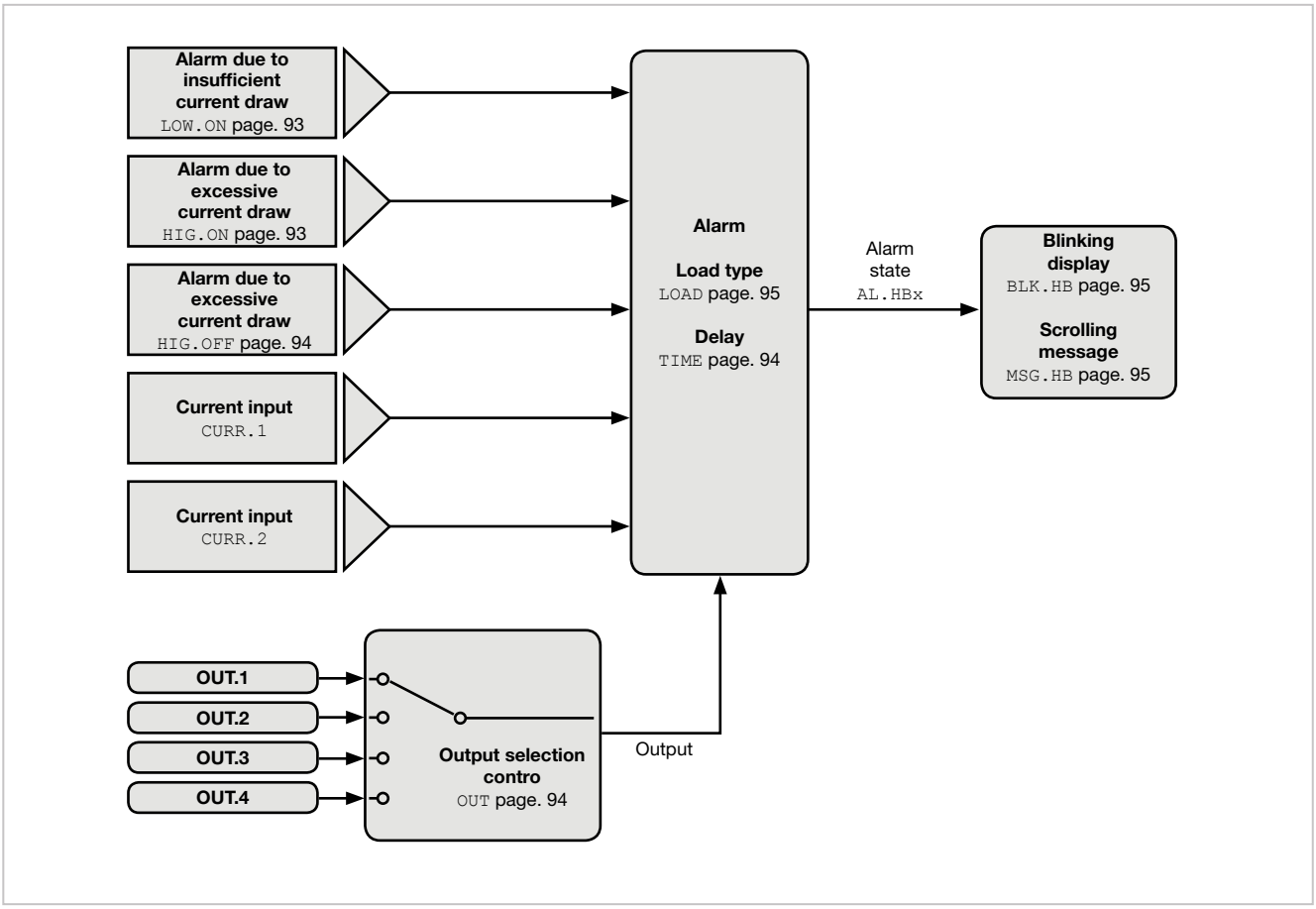
Options: **OFF** = PV display does not flash in case of alarm
On = PV display flashes in case of alarm

4.11. Submenu AL.HB - Configuring the Heater Break alarm

Acronym	Scrolling message	Password	Description
AL.HB	HEATER BREAK ALARM CONFIG	Level 1	Lets you configure the Heater Break alarm, i.e., the alarm that trips when the heating element is outside normal operating parameters. The submenu is present if the CT1+CT2 input option was previously selected.



4.11.1. Functional diagram



4.11.2. LOW.ON - Alarm due to insufficient current draw

Acronym	Scrolling message	Submenu	Attributes
LOW.ON	LOW LOAD CURR THRESH ON TIME	AL.HB	R W

The parameter shows and sets the current draw value below which the Heater Break alarm trips when the control output is ON.
If the draw is too low it is assumed that the heating element is broken. The signal may also be caused by a power failure on the heating element supply line.

Unit of measurement: A

Options: **0.0...999.9**

4.11.3. HIG.ON - Alarm due to excessive current draw

Acronym	Scrolling message	Submenu	Attributes
HIG.ON	HIGH LOAD CURR THRESH ON TIME	AL.HB	R W

The parameter shows and sets the current draw value above which the Heater Break alarm trips when the control output is ON.
If the draw is too high it is assumed that the heating element or its supply line is in short circuit.

Unit of measurement: A

Options: **0.0...999.9**

4.11.4. HI.OFF - Alarm due to excessive current draw

Acronym	Scrolling message	Submenu	Attributes
HI.OFF	HIGH LOAD CURR THRESH OFF TIME	AL.HB	R W

The parameter shows and sets the current draw value above which the Heater Break alarm trips when the control output is OFF.
If the draw is too high it is assumed that the heating element or its supply line (eg a module SSR) is in short circuit.

Unit of measurement: A

Options: **0.0...999.9**

4.11.5. TIME - HB alarm trip delay

Acronym	Scrolling message	Submenu	Attributes
TIME	WAITING TIME FOR ALHB TRIP	AL.HB	R W

The parameter shows and sets the minimum time in which the overrun defined by LOW.ON, HIG.ON and HI.OFF must persist before the HB alarm trips.
This parameter prevents false alarms caused by momentary positive or negative peaks in current draw.
If the value is set to “0” the alarm is immediate.

Unit of measurement: Seconds

Options: **0...999**

4.11.6. THR.PE - Percentage of HB current compared to calibration

Acronym	Scrolling message	Submenu	Attributes
THR.PE	PERCENTAGE HB ALARM SP IN HB CALIB	AL.HB	R W

The parameter shows and sets the current draw value for the Heater Break alarm.
This value is expressed as a percentage of the current draw value set during calibration.
For more information on this calibration, see paragraph LOW.ON.
See also paragraph “4.27. Submenu US.CAL - User calibrations” on page 164.

Unit of measurement: %

Options: **0.0...100.0** (default value = 80.0)

4.11.7. OUT - Control output associated with HB alarm

Acronym	Scrolling message	Submenu	Attributes
OUT	CONTROL OUTPUT HB AL	AL.HB	R W

The parameter shows and sets the number of the control output associated with the alarm.
This is the output whose ON/OFF state is checked, as indicated in the description of the LOW.ON, HIG.ON and HI.OFF parameters.

Unit of measurement: Number

Options: **1...4**

4.11.8. LOAD - Selecting type of connected load

Acronym	Scrolling message	Submenu	Attributes
LoAd	TYPE OF LOAD CONFIGURATION	AL.HB	R W

The parameter shows and sets the type of load connected to the control output.
For more information on load type, see paragraph “5.6.2. HB alarm” on page 176.

Unit of measurement: -

Options: **MONO** = Monophase power supply, with current transformer CT1 only (transformer CT2 present it is ignored)
STAR = 3-phase star power supply without neutre, with CT1 and CT2
DELTA = 3-phase delta power supply with CT1 and CT2

4.11.9. MSG.HB - Message associated with tripping of HB alarm

Acronym	Scrolling message	Submenu	Attributes
MSG.HB	SCROLLING MESSAGE AT HB ACT	AL.HB	R W

The parameter shows and sets the number of the message associated with tripping of the HB alarm, i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed when the alarm trips.
The same message number can be assigned to different alarms.

Unit of measurement: Message number

Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.11.10. BLK.HB - Flashing of PV display

Acronym	Scrolling message	Submenu	Attributes
BLK.HB	BLINK DISPLAY PV DEF HB AL	AL.HB	R W

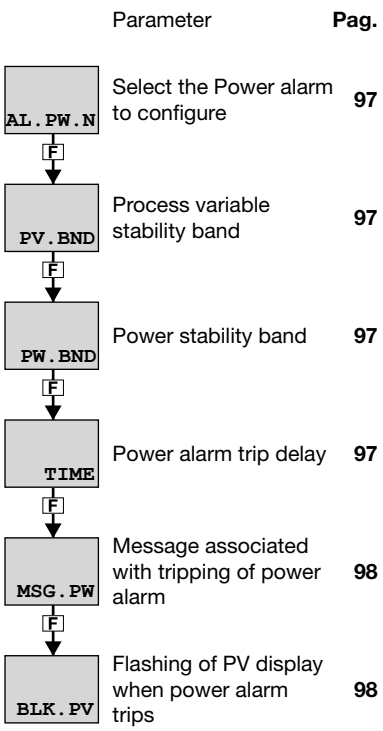
The parameter shows and sets the flashing of the PV display in case of HB alarm.
If the parameter is “On,” the value shown on the PV display starts to flash with backlight at full brightness in case of HB alarm.

Unit of measurement: -

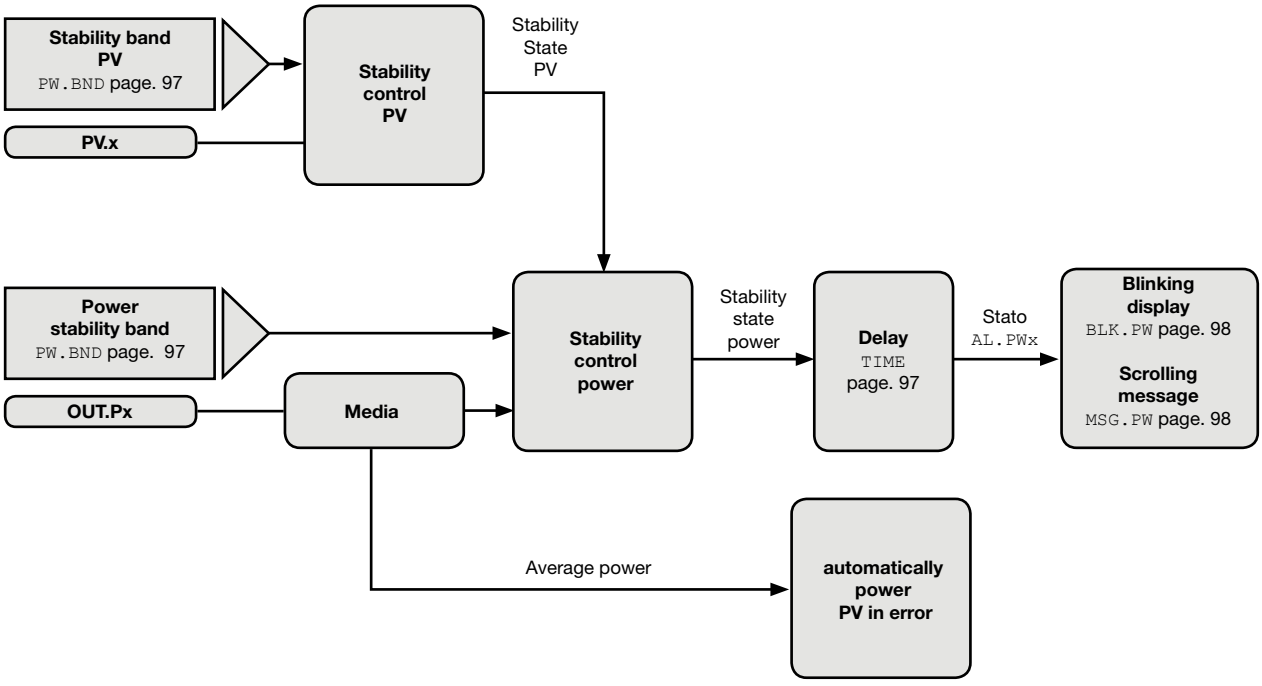
Options: **OFF** = PV display does not flash in case of alarm
On = PV display flashes in case of alarm

4.12. Submenu AL.PW - Configuring power alarm

Acronym	Scrolling message	Password	Description
AL.PW	POWER ALARM CONFIG	Level 1	Lets you configure the power alarm, i.e., the alarm that trips when average power deviates from a configurable stability band.



4.12.1. Functional diagram



4.12.2. AL.PW - Select the Power alarm to configure

Acronym	Scrolling message	Submenu	Attributes
AL.PW.N	POWER ALARM NUMBER	AL.PW	R W

The parameter shows and sets the alarm to be configured, identified by its number.

Unit of measurement: Number

Options: **1** = Select alarm referring to PID.1
2 = Select alarm referring to PID.2 (only with auxiliary input option)

4.12.3. PV.BND – Process variable stability band

Acronym	Scrolling message	Submenu	Attributes
PV.BND	AL.PW.1 (or AL.PW.2) PV STABILITY BAND	AL.PW	R W

The parameter shows and sets the value of the process variable stability band within which the alarm is assessed.
If the parameter is “0.0” the power alarm is disabled.

Unit of measurement: %

Options: 0.0...100.0

4.12.4. PW.BND – Power stability band

Acronym	Scrolling message	Submenu	Attributes
PW.BND	AL.PW.1 (or AL.PW.2) PW STABILITY	AL.PW	R W

The parameter shows and sets the value of the power stability band. When the process variable is in PV.BND stability band and average power exits PW.BND power stability band, the alarm activates after TIME. When the power alarm is active, it is automatically cancelled if the setpoint is changed, or by setting parameter AL.ACK = On on the user configuration menu, or by switching to Manual mode.

Unit of measurement: %

Options: 0.0...100.0

4.12.5. TIME - Power alarm trip delay

Acronym	Scrolling message	Submenu	Attributes
TIME	AL.PW.1 (or AL.PW.2) WAITING TIME FOR ALPW TRIP	AL.PW	R W

The parameter shows and sets the minimum time during which the power stability band has to be exceeded before the power alarm trips.
This parameter is used to avoid false alarms. If the value is set to “0” the alarm is immediate.

Unit of measurement: Seconds

Options: 0...999

4.12.6. MSG.PW - Message associated with tripping of power alarm

Acronym	Scrolling message	Submenu	Attributes
MSG.PW	AL.PW.1 (or AL.PW.2) SCROLLING MESSAGE AT PW ACT	AL.PW	R W

The parameter shows and sets the number of the message associated with tripping of the power alarm, i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed when the alarm trips. The same message number can be assigned to different alarms.

Unit of measurement: Message number

Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.12.7. BLK.PW - Flashing of PV display when power alarm trips

Acronym	Scrolling message	Submenu	Attributes
BLK.PW	AL.PW.1 (or AL.PW.2) BLINK DISPLAY PV DEF PW AL	AL.PW	R W

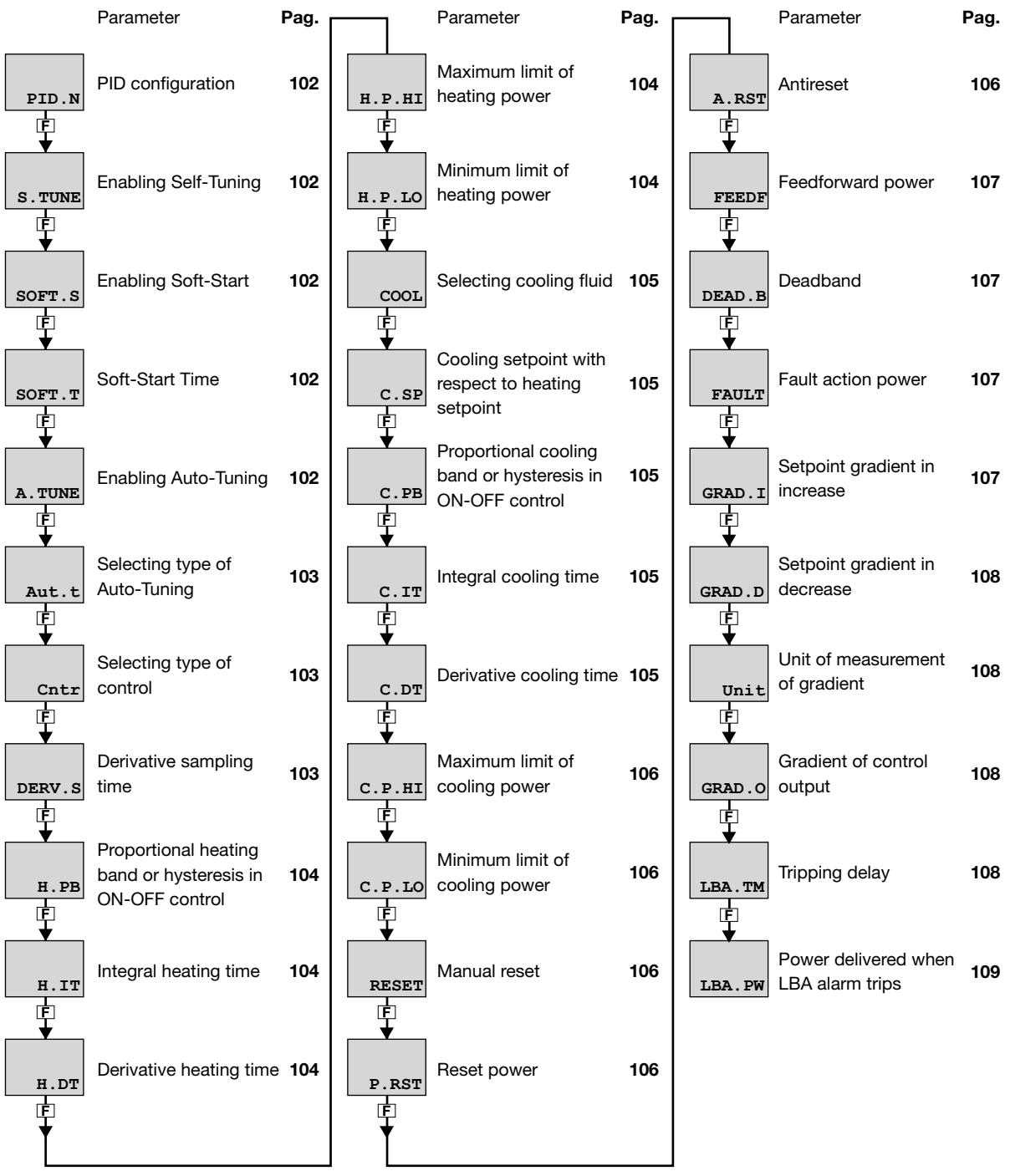
The parameter shows and sets the flashing of the PV display in case of power alarm.
If the parameter is “On,” in case of HB alarm the value on the PV display flashes with backlight at maximum brightness.

Unit of measurement: -

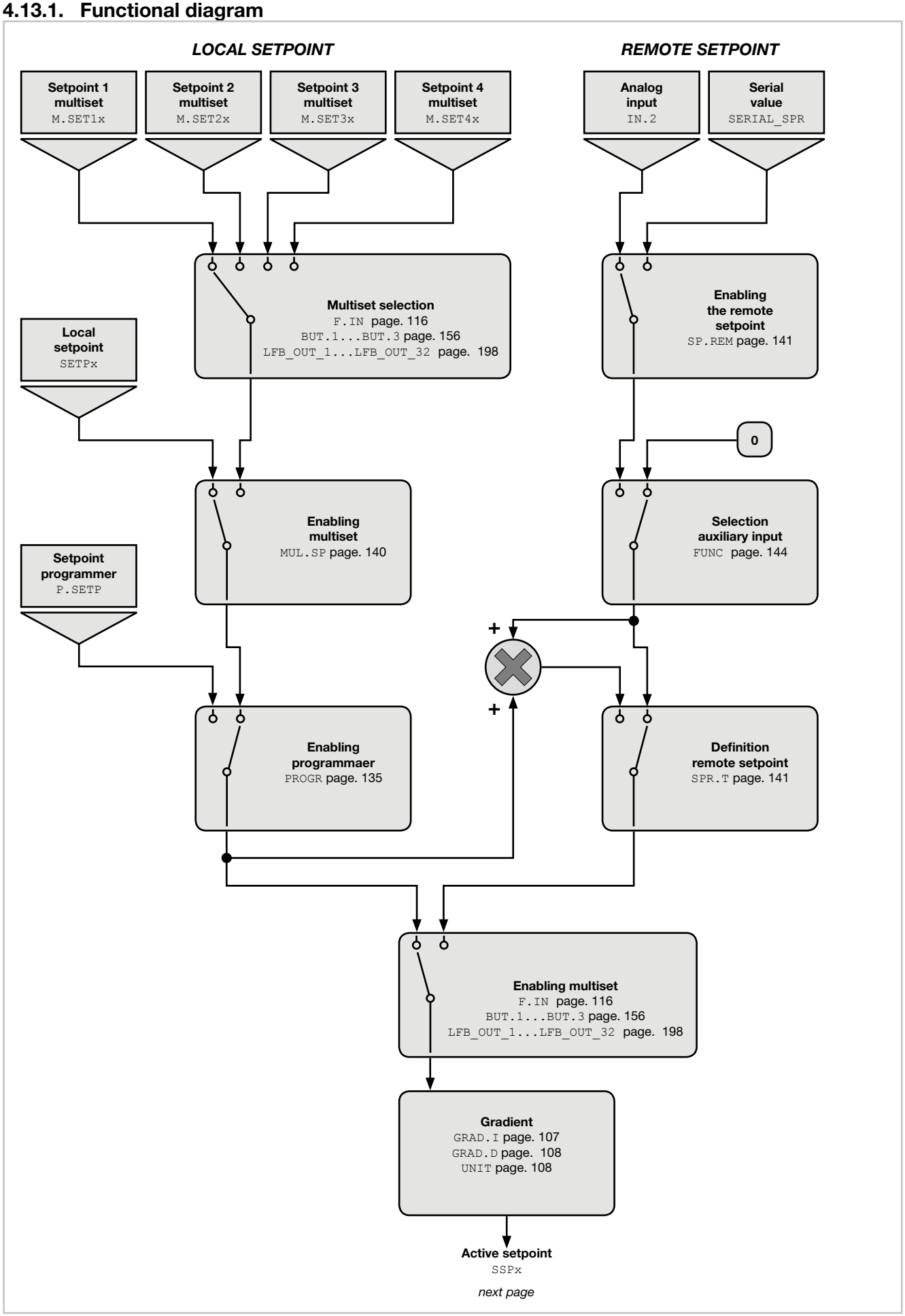
Options: **OFF** = PV display does not flash in case of alarm
On = PV display flashes in case of alarm

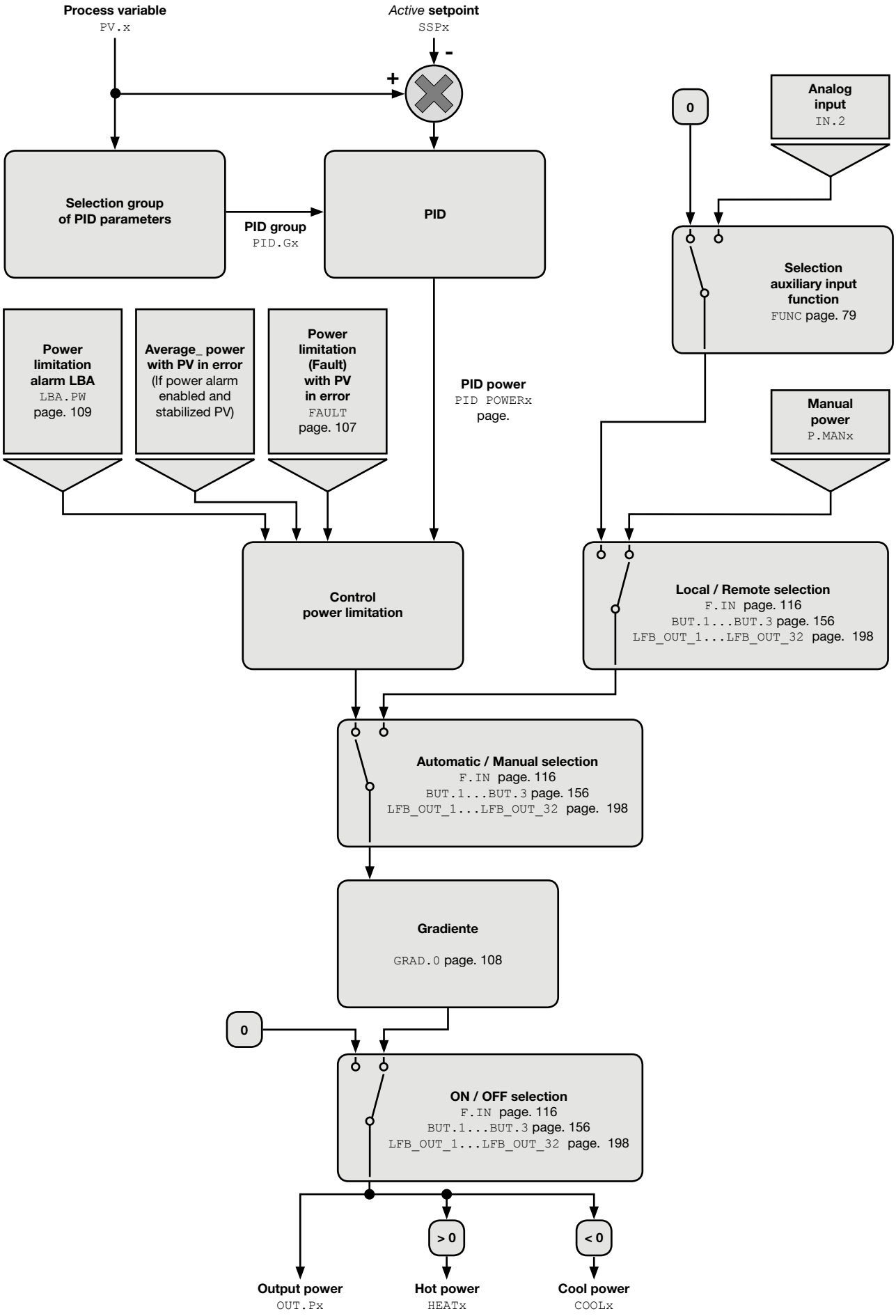
4.13. Submenu PID - Configuring control parameters

Acronym	Scrolling message	Password	Description
PID	PID CONFIG	Level 1	Lets you configure the control parameters.



4.13.1. Functional diagram




Process variable
PV.x
Active setpoint
SSPx
+
-
Selection group of PID parameters
PID group
PID.Gx
PID
0
Analog input
IN.2
Selection auxiliary input function
FUNC page. 79
Power limitation alarm LBA
LBA.PW
page. 109
Average_ power with PV in error
(If power alarm enabled and stabilized PV)
Power limitation (Fault) with PV in error
FAULT
page. 107
PID power
PID POWERx
page.
Manual power
P.MANx
Control power limitation
Local / Remote selection
F.IN page. 116
BUT.1...BUT.3 page. 156
LFB_OUT_1...LFB_OUT_32 page. 198
Automatic / Manual selection
F.IN page. 116
BUT.1...BUT.3 page. 156
LFB_OUT_1...LFB_OUT_32 page. 198
Gradiente
GRAD.0 page. 108
0
ON / OFF selection
F.IN page. 116
BUT.1...BUT.3 page. 156
LFB_OUT_1...LFB_OUT_32 page. 198
> 0
< 0
Output power
OUT.Px
Hot power
HEATx
Cool power
COOLx

4.13.2. PID.N – PID Configuration

Acronym	Scrolling message	Submenu	Attributes
PID.N	PID NUMBER	PID	R W

The parameter shows and sets the identifying number of the available PID.

Unit of measurement: Number

Options: 1...2

4.13.3. S.TUNE - Enabling Self-Tuning

Acronym	Scrolling message	Submenu	Attributes
S.TUNE	PID.1 (or PID.2) SELF TUNING ENABLE	PID	R W

The parameter shows and sets enabling of Self-Tuning.
For more information on the Self-Tuning function, see paragraph “5.10.3. Self-Tuning” on page 178.

Unit of measurement: -

Options:
OFF = Self-Tuning disabled
On = Self-Tuning enabled at next power-on only
On.AL = Self-Tuning enabled at all power-on

4.13.4. SOFT.S - Enabling Soft-Start

Acronym	Scrolling message	Submenu	Attributes
SOFT.S	PID.1 (or PID.2) SOFT START ENABLE	PID	R W

The parameter shows and sets enabling of Soft-Start.
For more information on the Self-Start function, see paragraph “5.9. Soft-Start” on page 177.
This parameter appears only if S.TUNE = OFF.

Unit of measurement: -

Options:
OFF = Soft-Start disabled
On = Soft-Start enabled at next power-on only

4.13.5. SOFT.T - Soft-Start Time

Acronym	Scrolling message	Submenu	Attributes
SOFT.T	PID.1 (or PID.2) SOFT START TIME	PID	R W

The parameter shows and sets Soft-Start time, i.e., the time that the control output needs to reach the value required by the PID.
This parameter appears only if SOFT.S = On.

Unit of measurement: Minutes

Options: **0.0...500.0**

4.13.6. A.TUNE - Enabling Auto-Tuning

Acronym	Scrolling message	Submenu	Attributes
A.TUNE	PID.1 (or PID.2) AUTO TUNING ENABLE	PID	R W

The parameter shows and sets enabling of Auto-Tuning.
For more information on the Auto-Tuning function, see paragraph “5.10.4. Auto-Tuning” on page 179.

Unit of measurement: -

Options:
OFF = Auto-Tuning disabled
On = Auto-Tuning enabled

4.13.7. AUT.T - Selecting type of Auto-Tuning

Acronym	Scrolling message	Submenu	Attributes
Aut.t	PID.1 (or PID.2) AUTO TUNING SELECTION	PID	R W

The parameter shows and sets the type of Auto-Tuning used.

Unit of measurement: -

Options:

CONTI = Continuous Auto-Tuning
O.SHOT = One-shot Auto-Tuning
DEV0.5 = One-shot Auto-Tuning with activation when |SP-PV| > 0,5% of full scale of main or auxiliary input
DEV1 = One-shot Auto-Tuning with activation when |SP-PV| > 1% of full scale of main or auxiliary input
DEV2 = One-shot Auto-Tuning with activation when |SP-PV| > 2% of full scale of main or auxiliary input
DEV4 =One-shot Auto-Tuning with activation when |SP-PV| > 4% of full scale of main or auxiliary input

4.13.8. CNTR - Selecting type of control

Acronym	Scrolling message	Submenu	Attributes
Cntr	PID.1 (or PID.2) TYPE OF CONTROL	PID	R W

The parameter shows and sets the type control performed by the controller.
For more information on the control function, see paragraph “5.10. Controls” on page 140.

Unit of measurement: -

Options:

H.PROP = Proportional heating
H.PI = Proportional/integral heating
H.PID = Proportional integral/derivative heating
C.PROP = Proportional cooling
C.PI = Proportional/integral cooling
C.PID = Proportional integral/derivative cooling
HC.P = Proportional heating/cooling
HC.PI = Proportional/integral heating/cooling
HC.PID = Proportional integral/derivative heating/cooling
H.ONOF = Heating ON-OFF
C.ONOF = Cooling ON-OFF
HC.ONO = Heating/cooling ON-OFF
HP.CON = PID heating / cooling ON-OFF
HON.CP = Heating ON-OFF / PID cooling
PID.RG = Heating / PID cooling with relative gain

4.13.9. DERV.S - Derivative sampling time

Acronym	Scrolling message	Submenu	Attributes
DERV.S	PID.1 (or PID.2) DERIVATIVE SAMPLE TIME	PID	R W

The parameter shows and sets the derivative sampling time.
The parameter is shown if the derivative action was enabled with parameter Cntr.

Unit of measurement: Seconds

Options:

0.240
1
4
8

4.13.10. H.PB - Proportional heating band or hysteresis in ON-OFF control

Acronym	Scrolling message	Submenu	Attributes
H.PB	PID.1 (or PID.2) HEATING PROPORTIONAL BAND OR ON/OFF HYST	PID	R W

The parameter shows and sets the proportional heating band or hysteresis in the ON-OFF control, calculated as a percentage of full scale of the main or auxiliary input.

Unit of measurement: %

Options: **0.0...999.9**

4.13.11. H.IT - Integral heating time

Acronym	Scrolling message	Submenu	Attributes
H.IT	PID.1 (or PID.2) HEATING INTEGRAL TIME	PID	R W

The parameter shows and sets the integral heating time.

Unit of measurement: Minutes

Options: **0.00...99.99**

4.13.12. H.DT - Derivative heating time

Acronym	Scrolling message	Submenu	Attributes
H.DT	PID.1 (or PID.2) HEATING DERIVATIVE TIME	PID	R W

The parameter shows and sets the derivative heating time.

Unit of measurement: Minutes

Options: **0.00...99.99**

4.13.13. H.P.HI - Maximum limit of heating power

Acronym	Scrolling message	Submenu	Attributes
H.P.HI	PID.1 (or PID.2) HEATING POWER HIGH LIMIT	PID	R W

The parameter shows and sets the maximum limit of heating power.

Unit of measurement: %

Options: **0.0...100.0**

4.13.14. H.P.LO - Minimum limit of heating power

Acronym	Scrolling message	Submenu	Attributes
H.P.LO	PID.1 (or PID.2) HEATING POWER LOW LIMIT	PID	R W

The parameter shows and sets the minimum limit of heating power.
Not available for dual action. The power of PID heating/cooling control (called dual action) is limited by the values of H.P.HI and C.P.HI.

Unit of measurement: %

Options: **0.0...100.0**

4.13.15. COOL - Selecting cooling fluid

Acronym	Scrolling message	Submenu	Attributes
COOL	PID.1 (or PID.2) COOLING MEDIA	PID	R W

The parameter shows and sets the fluid used for cooling.
The parameter appears if the parameter Cntr = PID.RGn was selected.

Unit of measurement: -

Options:
FAN = Air (relative gain H.PB/C.PB = 1)
OIL = Oil (relative gain H.PB/C.PB = 0,8)
H2O = Water (relative gain H.PB/C.PB = 0,4)

4.13.16. C.SP - Cooling setpoint with respect to heating setpoint

Acronym	Scrolling message	Submenu	Attributes
C.SP	PID.1 (or PID.2) COOLING SETPOINT RELEVANT TO HEATING SETP	PID	R W

The parameter shows and sets the cooling setpoint as a percentage change of the heating setpoint.
Negative values superimpose cooling on heating.

Unit of measurement: %, of full scale of main or auxiliary input

Options: **-25.0...25.0**

4.13.17. C.PB - Proportional cooling band or hysteresis in ON-OFF control

Acronym	Scrolling message	Submenu	Attributes
C.PB	PID.1 (or PID.2) COOLING PROPORTIONAL BAND OR ON/OFF HYST	PID	R W

The parameter shows and sets the proportional cooling band or hysteresis in the ON-OFF control, calculated as a percentage of full scale of the main or auxiliary input.

Unit of measurement: %

Options: **0.0...999.9**

4.13.18. C.IT - Integral cooling time

Acronym	Scrolling message	Submenu	Attributes
C.IT	PID.1 (or PID.2) COOLING INTEGRAL TIME	PID	R W

The parameter shows and sets the integral cooling time.

Unit of measurement: Minutes

Options: **0.00...99.99**

4.13.19. C.DT - Derivative cooling time

Acronym	Scrolling message	Submenu	Attributes
C.DT	PID.1 (or PID.2) COOLING DERIVATIVE TIME	PID	R W

The parameter shows and sets the derivative cooling time.

Unit of measurement: Minutes

Options: **0.00...99.99**

4.13.20. C.P.HI - Maximum limit of cooling power

Acronym	Scrolling message	Submenu	Attributes
C.P.HI	PID.1 (or PID.2) COOLING POWER HIGH LIMIT	PID	R W

The parameter shows and sets the maximum limit of cooling power.

Unit of measurement: %

Options: **0.0...100.0**

4.13.21. C.P.LO - Minimum limit of cooling power

Acronym	Scrolling message	Submenu	Attributes
C.P.LO	PID.1 (or PID.2) COOLING POWER LOW LIMIT	PID	R W

The parameter shows and sets the lower limit of cooling power.
Not available for dual action. The power of PID heating/cooling control (called dual action) is limited by the values of H.P.HI and C.P.HI.

Unit of measurement: %

Options: **0.0...100.0**

4.13.22. RESET - Manual reset

Acronym	Scrolling message	Submenu	Attributes
RESET	PID.1 (or PID.2) MANUAL RESET	PID	R W

The parameter shows and sets the Manual reset value, i.e., the value which, when added to setpoint, becomes the reference for the control. It is useful in a PID control with non-variable setpoint to compensate the error at full scale.

Unit of measurement: Scale points of main or auxiliary input

Options: **-999...999**

4.13.23. P.RST - Power reset

Acronym	Scrolling message	Submenu	Attributes
P.RST	PID.1 (or PID.2) RESET POWER	PID	R W

The parameter shows and sets the Reset power value, i.e., the value added to the control power.
For example, in proportional control it corresponds to the output at zero value (PV = SV).

Unit of measurement: %

Options: **-100.0...100.0**

4.13.24. A.RST - Antireset

Acronym	Scrolling message	Submenu	Attributes
A.RST	PID.1 (or PID.2) ANTIRESET	PID	R W

The parameter shows and sets the Antireset value.
If set to other than “0”, it defines band width (below the setpoint if heating, above the setpoint if cooling) within which the integral action is applied, if provided (PI or PID control).

Unit of measurement: Scale points of main or auxiliary input

Options: **0...9999**

4.13.25. FEEDF - Feedforward power

Acronym	Scrolling message	Submenu	Attributes
FEEDF	PID.1 (or PID.2) FEEDFORWARD	PID	R W

The parameter shows and sets the feedforward power value, i.e., the value that generates an additional factor at the control output based on the setpoint value.

U =

Unit of measurement: %

Options: **-100.0...100.0**

4.13.26. DEAD.B - Deadband

Acronym	Scrolling message	Submenu	Attributes
DEAD.B	PID.1 (or PID.2) DEAD BAND	PID	R W

The parameter shows and sets the deadband.
The deadband is symmetrical to the setpoint. If the process value (PV) stays in this band, the control output keeps the required power value constant.

Unit of measurement: Scale points of main or auxiliary input.

Options: **0...999**

4.13.27. FAULT - Fault action power

Acronym	Scrolling message	Submenu	Attributes
FAULT	PID.1 (or PID.2) FAULT ACTION POWER	PID	R W

The parameter shows and sets the fault action power, supplied if the sensor is broken.

Example
If Cntr = HP.CON (Proportional Heat, ON/OFF Cool), the option is On, OFF, 0.0...100.0, i.e., if you set FAULT = On the cooling output will be ON in case of fault.

Unit of measurement: %

Options: **-100.0...100.0** for P or PI or PID action
On, OFF for ON / OFF action

4.13.28. GRAD.I - Setpoint gradient in increase

Acronym	Scrolling message	Submenu	Attributes
GRAD.I	PID.1 (or PID.2) SETPOINT GRADIENT IN INCREMENT	PID	R W

The parameter shows and sets the gradient used when the setpoint value is increased.
If the parameter is “0.0” the gradient is disabled.

Unit of measurement: digit/second or digit/minute, depending on unit parameter setting

Options: **0.0...999.9**

4.13.29. GRAD.D - Gradiente di setpoint in decremento

Acronym	Scrolling message	Submenu	Attributes
GRAD.D	PID.1 (or PID.2) SETPOINT GRADIENT IN DECREMENT	PID	R W

The parameter shows and sets the gradient used when the setpoint value is decreased.
If the parameter is “0.0” the gradient is disabled.

Unit of measurement: digit/second or digit/minute, depending on unit parameter setting

Options: **0.0...999.9**

4.13.30. UNIT - Unit of measurement of gradient

Acronym	Scrolling message	Submenu	Attributes
Unit	PID.1 (or PID.2) GRADIENT UNIT OF MEASURE	PID	R W

The parameter shows and sets the unit of measurement of gradient GRAD.I and GRAD.D.
The parameter appears only if GRAD.I or GRAD.D are greater than “0.0”.

Unit of measurement: -

Options: **DIG/S** = Digit/second
DIG/M = Digit/minute

4.13.31. GRAD.O - Gradient of control output

Acronym	Scrolling message	Submenu	Attributes
GRAD.O	PID.1 (or PID.2) CONTROL OUTPUT GRADIENT	PID	R W

The parameter shows and sets the gradient used by the control output.
The gradient is used to limit rapid changes in the control output.
If the parameter is “0.0” the gradient is disabled.

Unit of measurement: % / second

Options: **0.0...100.0**

4.13.32. LBA.TM - Tripping delay

Acronym	Scrolling message	Submenu	Attributes
LBA.TM	PID.1 (or PID.2) WAITING TIME FOR LBA ALARM TRIP	PID	R W

The parameter shows and sets the delay time for tripping of the LBA alarm.
If the parameter is “0.0” the LBA alarm is disabled.
When the LBA alarm is active, it is automatically cancelled if the PV rises (in heating) or lowers (in cooling), or by setting the parameter AL.ACK = On on the user configuration menu or by switching to Manual mode.
This parameter will not appear in the presence of ON-OFF control (of heating, cooling and heating, and heating/cooling).

Unit of measurement: Minutes

Options: **0.0...500.0**

4.13.33. LBA.PW - Power delivered when LBA alarm trips

Acronym	Scrolling message	Submenu	Attributes
LBA.PW	PID.1 (or PID.2) POWER LIMITS BY LBA ALARM CONDITION	PID	R W

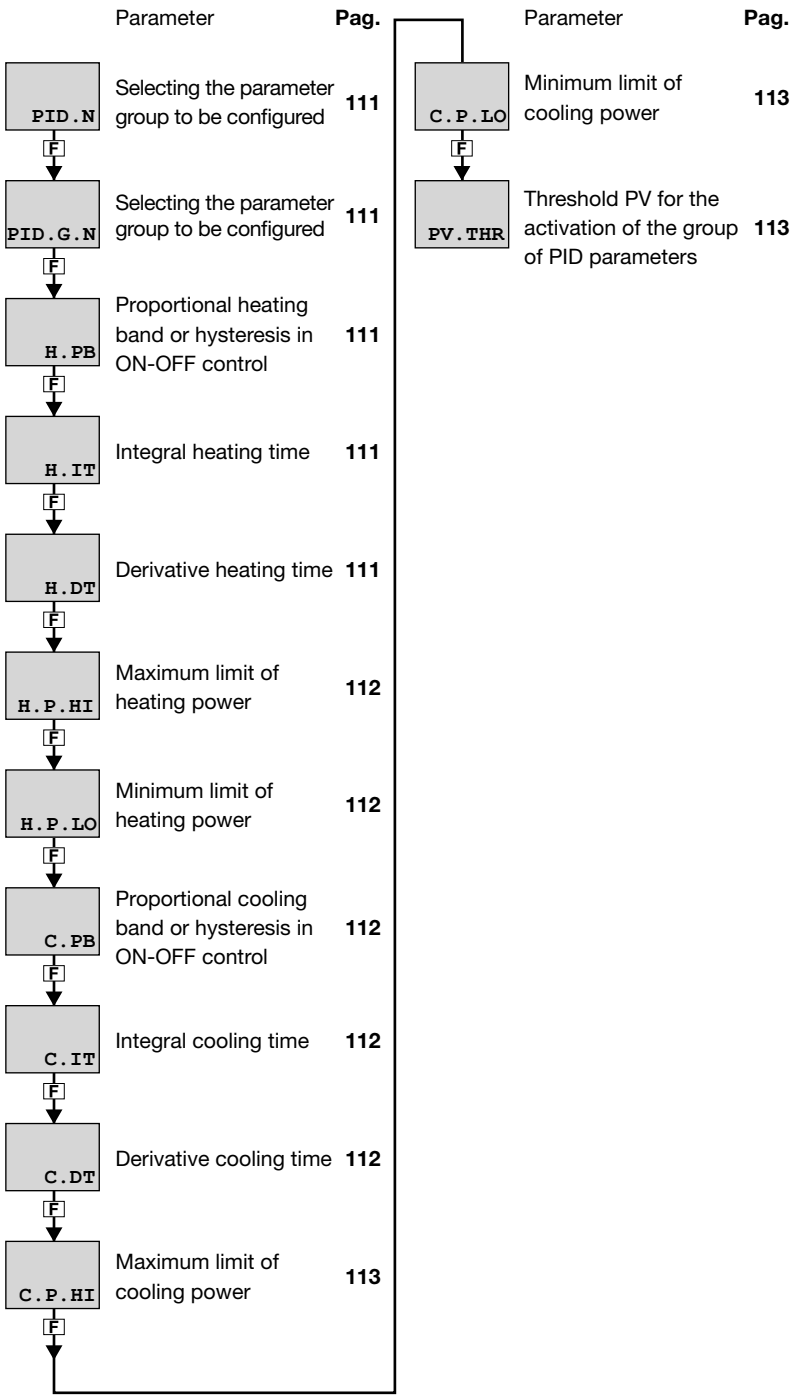
The parameter shows and sets the power value delivered when the LBA alarm trips.
This parameter will not appear in the presence of ON-OFF control (of heating, cooling and heating, and heating/cooling).
In the presence of PID control with ON-OFF heating or cooling, power . may be set for the PID part only

Unit of measurement: %

Options: **-100.0...100.0**

4.14. Submenu PID.GR - Configuring groups of control parameters

Acronym	Scrolling message	Password	Description
PID.GR	PID GROUP PARAMETERS CONFIG	Level 1	Lets you configure groups of control parameters. Groups of control parameters must be enabled with the parameter PID. GN = .1...4 on the MODE menu (the menu is not shown if PID. GN = 0). Groups are used to preconfigure sets of function parameters that can be easily called when needed, without having to re-configure the PID parameters every time. The number of parameters available in groups is less than the number on the PID submenu. The number of parameters available in groups is limited to those for PID heating and/or cooling control.



4.14.1. PID.N - Selecting PID for parameters to be configured

Acronym	Scrolling message	Submenu	Attributes
PID.N	PID NUMBER	PID.GR	R W

The parameter shows and sets the identifying number of the available PID.

Unit of measurement: Number

Options: **1...2**

4.14.2. PID.G.N - Selecting PID for parameters group to be configured

Acronym	Scrolling message	Submenu	Attributes
PID.G.N	PID PARAMETERS GROUP NUMBER	PID.GR	R W

The parameter shows and sets the parameter group to be configured, identified by its number.

Unit of measurement: Number

Options: **1...PD.G.N** = Numerical identification where PID.G.N is the total number of groups of parameters set on the MODE submenu

4.14.3. H.PB - Proportional heating band or hysteresis in ON-OFF control

Acronym	Scrolling message	Submenu	Attributes
H.PB	PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING PROPORTIONAL BAND OR ON/OFF HYST	PID.GR	R W

The parameter shows and sets the proportional heating band or hysteresis in the ON-OFF control, calculated as a percentage of full scale of the main or auxiliary input.

Unit of measurement: %

Options: **0.0...999.9**

4.14.4. H.IT - Integral heating time

Acronym	Scrolling message	Submenu	Attributes
H.IT	PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING INTEGRAL TIME	PID.GR	R W

The parameter shows and sets the integral heating time.

Unit of measurement: Minutes

Options: **0.00...99.99**

4.14.5. H.DT - Derivative heating time

Acronym	Scrolling message	Submenu	Attributes
H.DT	PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING DERIVATIVE TIME	PID.GR	R W

The parameter shows and sets the derivative heating time.

Unit of measurement: Minutes

Options: **0.00...99.99**

4.14.6. H.P.HI - Maximum heating power

Acronym	Scrolling message	Submenu	Attributes
H.P.HI	PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING POWER HIGH LIMIT	PID.GR	R W
The parameter shows and sets the maximum limit of heating power. ***Unit of measurement:*** % ***Options***: **0.0...100.0**			

4.14.7. H.P.LO - Minimum limit of heating power

Acronym	Scrolling message	Submenu	Attributes
H.P.LO	PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING POWER LOW LIMIT	PID.GR	R W
The parameter shows and sets the minimum limit of heating power. For details, see paragraph “4.13.14. H.P.LO - Minimum limit of heating power” on page 104. ***Unit of measurement:*** % ***Options***: **0.0...100.0**			

4.14.8. C.PB - Proportional cooling band or hysteresis in ON-OFF control

Acronym	Scrolling message	Submenu	Attributes
C.PB	PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING PROPORTIONAL BAND OR ON/OFF HYST	PID.GR	R W
The parameter shows and sets the proportional cooling band or hysteresis in the ON-OFF control, calculated as a percentage of full scale of the main or auxiliary input. ***Unit of measurement:*** % ***Options***: **0.0...999.9**			

4.14.9. C.IT - Integral cooling time

Acronym	Scrolling message	Submenu	Attributes
C.IT	PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING INTEGRAL TIME	PID.GR	R W
The parameter shows and sets the integral cooling time. ***Unit of measurement:*** Minutes ***Options***: **0.00...99.99**			

4.14.10. C.DT - Derivative cooling time

Acronym	Scrolling message	Submenu	Attributes
C.DT	PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING DERIVATIVE TIME	PID.GR	R W
The parameter shows and sets the derivative cooling time. ***Unit of measurement***: Minutes ***Options***: **0.00...99.99**			

4.14.11. C.P.HI - Maximum limit of cooling power

Acronym	Scrolling message	Submenu	Attributes
C.P.HI	PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING POWER HIGH LIMIT	PID.GR	R W
The parameter shows and sets the maximum limit of cooling power. ***Unit of measurement***: % ***Options***: **0.0...100.0**			

4.14.12. C.P.LO - Minimum limit of cooling power

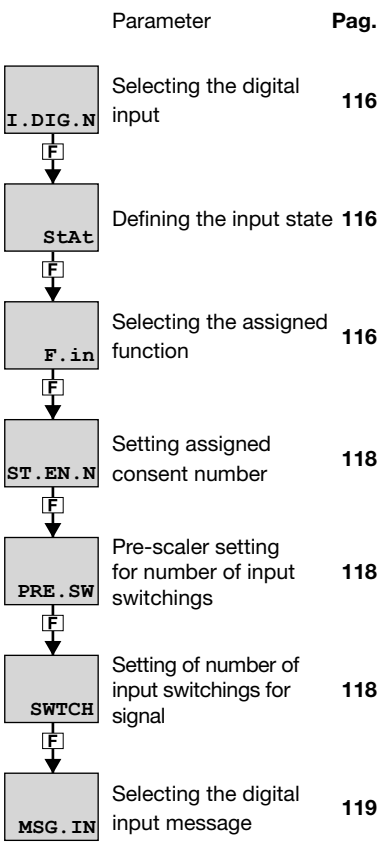
Acronym	Scrolling message	Submenu	Attributes
C.P.LO	PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING POWER LOW LIMIT	PID.GR	R W
The parameter shows and sets the minimum limit of cooling power. For details, see paragraph “4.13.21. C.P.LO - Minimum limit of cooling power” on page 106. ***Unit of measurement:*** % ***Options***: **0.0...100.0**			

4.14.13. PV.THR - Threshold PV for the activation of the group of PID parameters

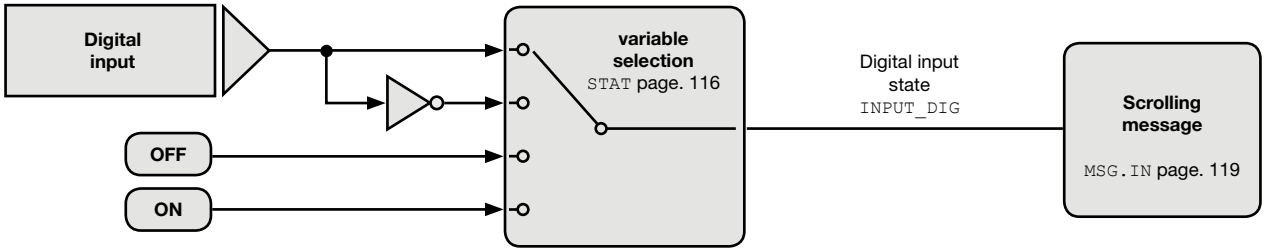
Acronym	Scrolling message	Submenu	Attributes
PV.THR	PID.GR.1 (or PID.GR.2…PID.GR.4) PV BEYOND WHICH THE GROUP IS ACTIVE	PID.GR	R W
The parameter shows and sets the PV over which the group of PID parameters is active. The parameter is shown only if the respective programmer is not enabled. ***Unit of measurement:*** Scale points of main or auxiliary input ***Options***: **LO.SCL...HI.SCL**			

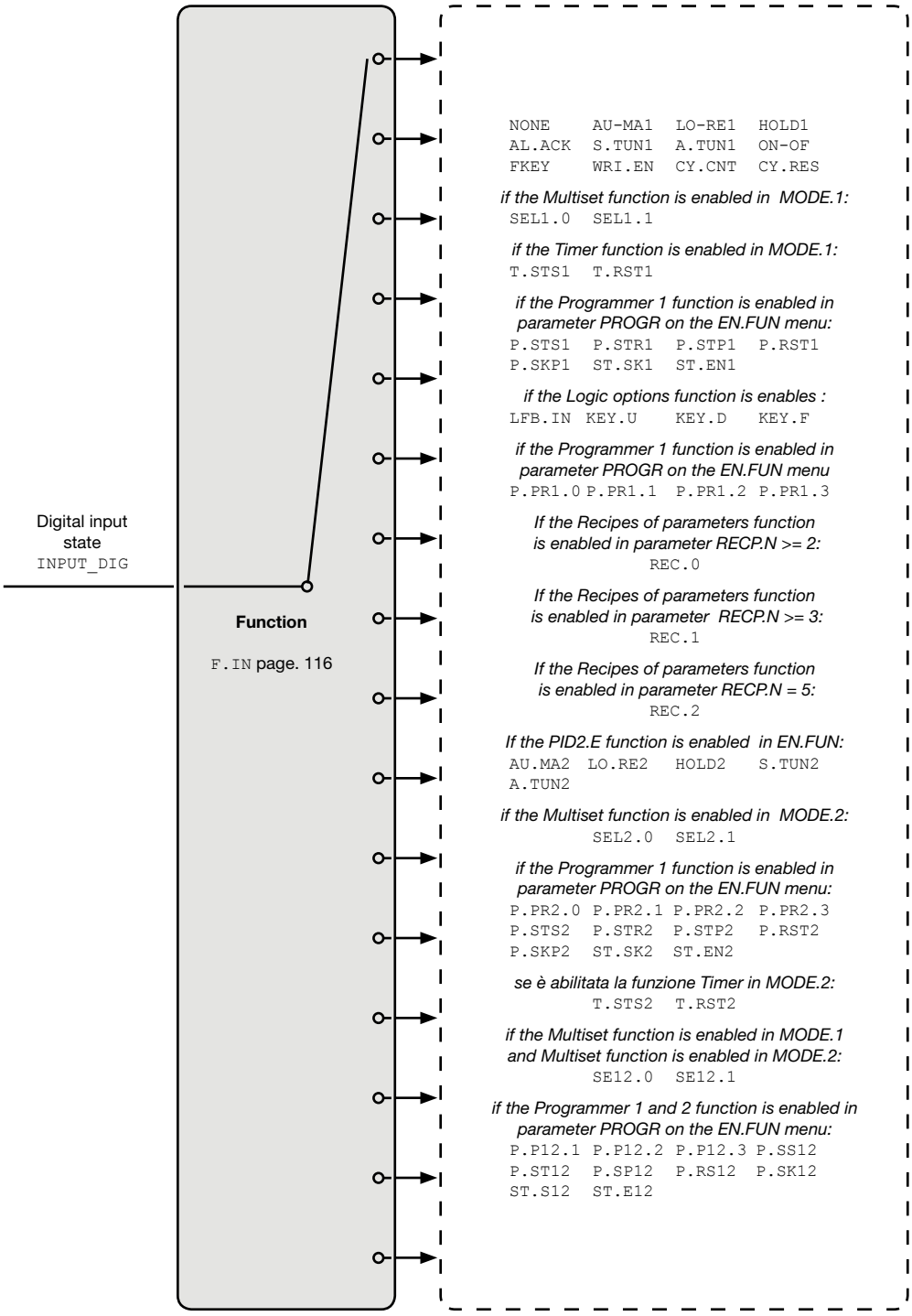
4.15. Submenu IN.DIG - Configuring digital inputs

Acronym	Scrolling message	Password	Description
IN.DIG	DIGITAL INPUT CONFIG	Level 2	Lets you configure the controller's digital inputs. The menu is present if there are digital inputs.



4.15.1. Functional diagram





4.15.2. I.DIG.N - Selecting the digital input

Acronym	Scrolling message	Submenu	Attributes
I.DIG.N	DIGITAL INPUT NUMBER	IN.DIG	R W

The parameter shows and sets the identifying number of the digital input to be configured.

Unit of measurement: Number

Options:
1...3 for model 850 with 3 digital inputs option
1...5 for models 1650 and 1850 with 5 digital inputs option

4.15.3. STAT - Defining the input state

Acronym	Scrolling message	Submenu	Attributes
StAt	IN.DIG.1 (or IN.DIG.2 … IN.DIG.5) DIGITAL INPUT STATUS	IN.DIG	R W

The parameter shows and sets the state of the input with identifying number “x”.
The direct digital input is active when there is current in the digital input or the contact is closed.
The inverse digital input is active when there is no current in the digital input or the contact is open.
Digital inputs can be forced so that they are always on or off.

Unit of measurement: -

Options:
DIREC = Direct digital input
INVRS = Inverse digital input
OFF = Digital input forced off
ON = Digital input forced on

4.15.4. F.IN - Selecting the assigned function

Acronym	Scrolling message	Submenu	Attributes
F.in	IN.DIG.1 (or IN.DIG.2 … IN.DIG.5) DIGITAL INPUT FUNCTION	IN.DIG	R W

The parameter shows and sets the function assigned to the digital input with identifying number “x”.

Unit of measurement: -

Options:
NONE = No assigned function
AU.MA1 = Automatic-Manual control for PID.1
LO.RE1 = Local-Remote setpoint mode for PID.1
HOLD1 = IN.1 Hold value of main input
AL.ACK = Reset alarm latches
S.TUN1 = Activate Self-Tuning for PID.1
A.TUN1 = Activate Auto-Tuning for PID.1
ON-OF = Software ON-OFF
FKEY = Block F key
WRI.EN = Enable writing of configuration parameters

if the Multiset function is enabled in MODE.1:
SEL1.0 = Setpoint M.SP1.1/M.SP2.1 or M.SP1.1…M.SP4.1 bit 0
SEL1.1 = Setpoint M.SP1.1…M.SP4.1 bit 1

if the Timer function is enabled in MODE.1:
T.STS1 = START/STOP timer TIMER.1
T.RST1 = RESET timer TIMER.1

if the Programmer 1 function is enabled in parameter PROGR on the EN.FUN menu :
(for details, see paragraph "5.13. Setpoint programmer" on page 184*):*
P.STS1 = START/STOP PROGR.1 programmer time base
P.STR1 = START PROGR.1 programmer time base
P.STP1 = STOP PROGR.1 programmer time base
P.RST1 = RESET PROGR.1 programmer time base
P.SKP1 = SKIP to end program (end cycle) PROGR.1
ST.SK1 = SKIP to end step PROGR.1
ST.EN1 = STEP ENABLE 1: input with consent function at start of PROGR.1 step

if the Logic Options function is enabled:
LFB.IN = Function Blocks Logic Input
KEY.U = Repetition of UP button
KEY.D = Repetition of DOWN button
KEY.F = Repetition of F button

if the Programmer 1 function is enabled in parameter PROGR on the EN.FUN menu:
(for details, see paragraph "5.13. Setpoint programmer" on page 184*):*
P.PR1.0 = Select program for PROGR.1 bit 0
P.PR1.1 = Select program for PROGR.1 bit 1
P.PR1.2 = Select program for PROGR.1 bit 2
P.PR1.3 = Select program for PROGR.1 bit 3

CY.CNT = Activate switching cycle count shown in INDG.S (INFO menu) *
CY.RES = Reset switching cycle count shown in INDG.S (INFO menu)

if the Parameters recipe function RECP.N >= 2 is enabled (for details, see paragraph "5.18. Recipe management" on page 210):
REC.0 = Select parameters recipe bit 0

if the Parameters recipe function RECP.N >= 3 is enabled (for details, see paragraph "5.18. Recipe management" on page 210):
REC.1 = Select parameters recipe bit 1

if the Parameters recipe function RECP.N = 5 is enabled (for details, see paragraph "5.18. Recipe management" on page 210):
REC.2 = Select parameters recipe bit 2

if PID2.E function is enabled in EN.FUN:
AU.MA2 = Automatic-Manual control for PID.2
LO.RE2 = Local-Remote setpoint mode for PID.2
HOLD2 = Hold value of input IN.2
S.TUN2 = Activate Self-Tuning for PID.2
A.TUN2 = Activate Auto-Tuning for PID.2

if the Multiset funcion is enabled in MODE.2:
SEL2.0 = Select setpoint M.SP1.2/M.SP2.2 or M.SP1.2…M.SP4.2 bit 0
SEL2.1 = Select setpoint M.SP1.2…M.SP2.2 bit 1

if the Programmer 2 function is enabled in parameter PROGR on the EN.FUN menu:
(for details, see paragraph "5.13. Setpoint programmer" on page 184*):*
P.PR2.0 = Select program for PROGR.2 bit 0
P.PR2.1 = Select program for PROGR.2 bit 1
P.PR2.2 = Select program for PROGR.2 bit 2
P.PR2.3 = Select program for PROGR.2 bit 3
P.STS2 = START/STOP PROGR.2 programmer time base
P.STR2 = START PROGR.2 programmer time base
P.STP2 = STOP PROGR.2 programmer time base
P.RST2 = RESET PROGR.2 programmer time base
P.SKP2 = SKIP to end program (end cycle) PROGR.2
ST.SK2 = SKIP to end step PROGR.2
ST.EN2 = STEP ENABLE 2: input with consent function at start of PROGR.2 step

if the Timer function is enabled in MODE.2:
T.STS2 = START/STOP timer TIMER.2
T.RST2 = RESET timer TIMER.2

	if the Multiset function in MODE.1 and the Multiset function in MODE.2 are enabled: **SE12.0** = Select setpoint M.SP1.1/M.SP2.1 and M.SP1.2/M.SP2.2 or M.SP1.1…M.SP4.1 bit 0 and M.SP1.2…M.SP4.2 bit 0 **SE12.1** = Select setpoint M.SP1.1…M.SP4.1 bit 1 and M.SP1.2…M.SP4.2 bit 1 *if the Programmer 1 and 2 function is enabled in parameter PROGR on the EN.FUN menu:* *(for details, see paragraph* "5.13. Setpoint programmer" on page 184*):* **P.P12.1** = Select program for PROGR.1 and for PROGR.2 bit 1 **P.P12.2** = Select program for PROGR.1 and for PROGR.2 bit 2 **P.P12.3** = Select program for PROGR.1 and for PROGR.2 bit 3 **P.SS12** = START/STOP PROGR.1 and PROGR.2 programmer time base **P.ST12** = START PROGR.1 and PROGR.2 programmer time base **P.SP12** = STOP PROGR.1 and PROGR.2 programmer time base **P.RS12** = RESET PROGR.1 and PROGR.2 programmer time base **P.SK12** = SKIP to end program (end cycle) PROGR.1 and PROGR.2 **ST.S12** = SKIP to end step PROGR.1 and PROGR.2 **ST.E12** = STEP ENABLE 1/2: input with consent function at start of PROGR.1 and PROGR.2 step

4.15.5. ST.EN.N - Setting assigned consent number

Acronym	Scrolling message	Submenu	Attributes
ST.EN.N	IN.DIG.1 (or IN.DIG.2 … IN.DIG.5) ENABLE NUMBER	IN.DIG	R W

The parameter shows and sets the consent number assigned to the digital input identified by I.DIG.N.
The parameter appears if the parameter F.in.x = ST.EN1, ST.EN2 or ST.E12.

Unit of measurement: Number

Options: **1...4**

4.15.6. PRE.SW - Prescaler setting for number of input switchings

Acronym	Scrolling message	Submenu	Attributes
PRE.SW	IN.DIG.1 (or IN.DIG.2 … IN.DIG.5) PRESCALER FOR SWITCHING CYCLES	IN.DIG	R W

The parameter shows and sets the prescaler for the number of switchings of the digital input with CY.CNT function.

Unit of measurement: Number

Options: **1...9999**

4.15.7. SWTCH - Number of input switching setting for signaling

Acronym	Scrolling message	Submenu	Attributes
SWTCH	IN.DIG.1 (or IN.DIG.2 … IN.DIG.5) NUMBER OF SWITCHING CYCLES	IN.DIG	R W

The parameter shows and sets the number of switchings of the digital input with CY.CNT function, which if exceeded generates the scrolling message DIGITAL INPUT SWITCH ALARM.
The function is disabled if the parameter equals "0".

Unit of measurement: Number

Options: **1...9999**

4.15.8. MSG.IN - Selecting the digital input message

Acronym	Scrolling message	Submenu	Attributes
MSG.IN	IN.DIG.1 (or IN.DIG.2 … IN.DIG.5) NUMBER OF SCROLLING MESSAGE AT INPUT ACT	IN.DIG	R W

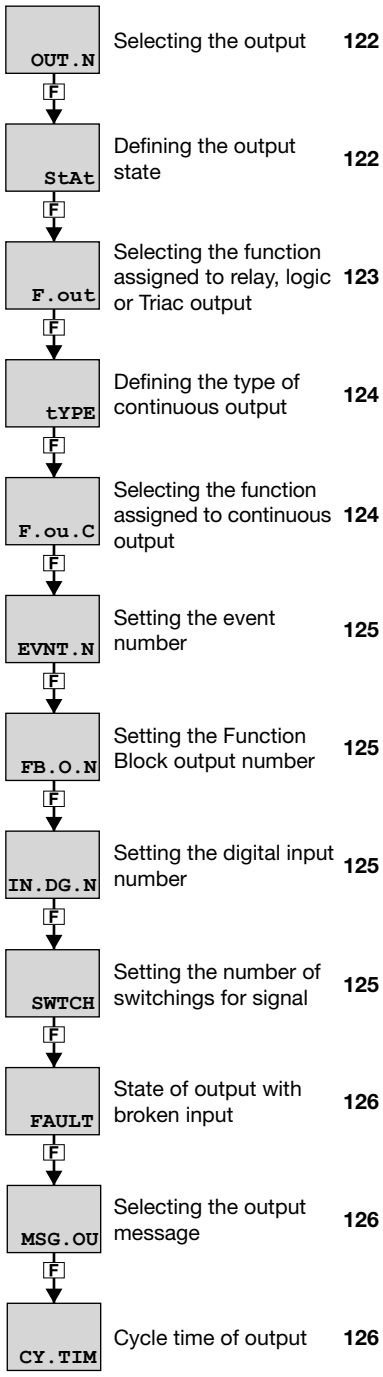
The parameter shows and sets the number of the message assigned to activation of the digital input, i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 34.
If the parameter is set to “0” no message will be displayed when the digital input is activated.
The same message number can be assigned to different inputs.

Unit of measurement: Message number

Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

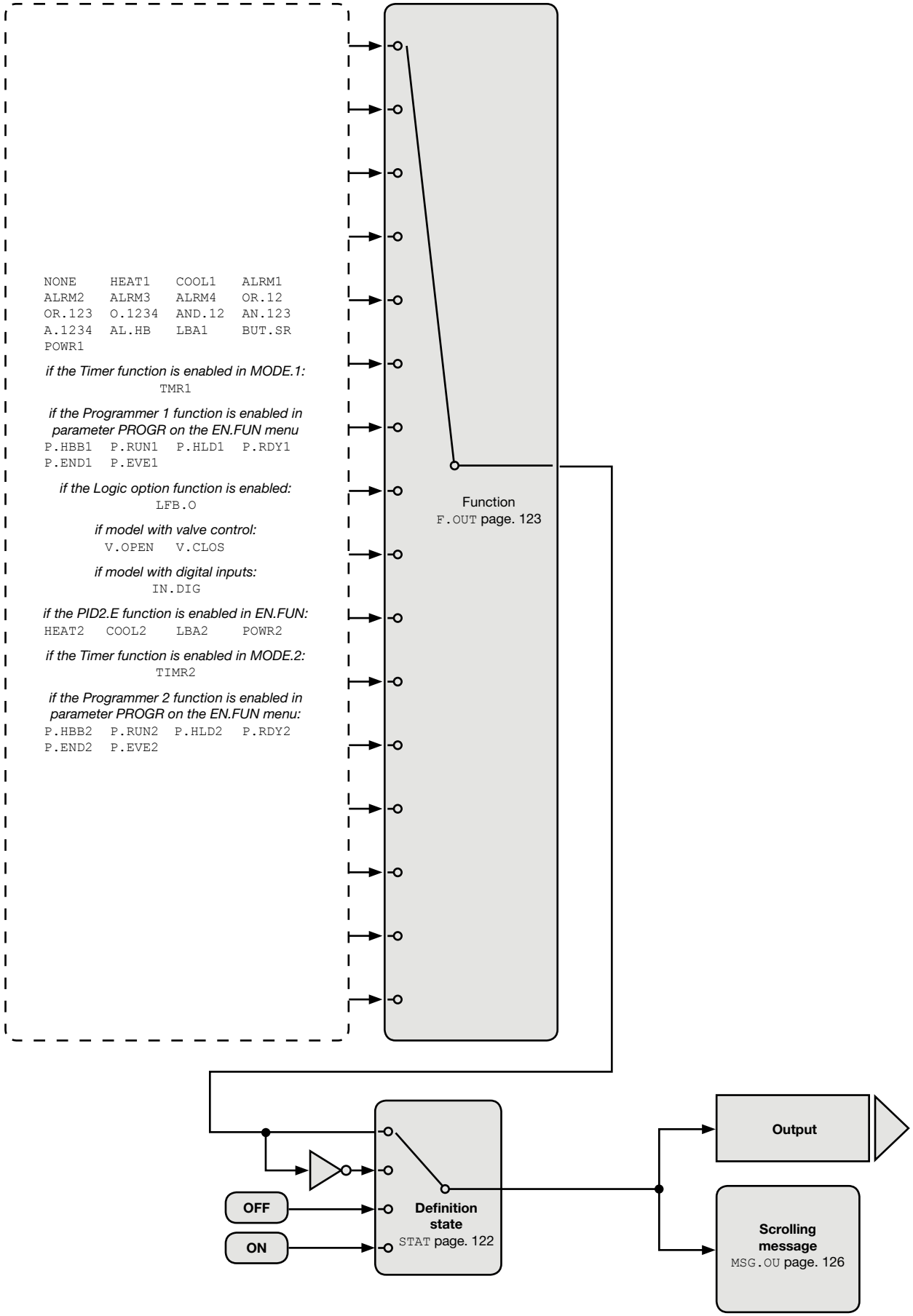
4.16. Submenu OUTPU - Configuring outputs

Acronym	Scrolling message	Password	Description
OUTPU	OUTPUT CONFIG	Level 2	Lets you configure the controller outputs.



Parameter	Pag.
Selecting the output	122
Defining the output state	122
Selecting the function assigned to relay, logic or Triac output	123
Defining the type of continuous output	124
Selecting the function assigned to continuous output	124
Setting the event number	125
Setting the Function Block output number	125
Setting the digital input number	125
Setting the number of switchings for signal	125
State of output with broken input	126
Selecting the output message	126
Cycle time of output	126

4.16.1. Functional diagram



4.16.2. OUT.N - Selecting the output

Acronym	Scrolling message	Submenu	Attributes
OUT.N	OUTPUT NUMBER	OUTPU	R W

The parameter shows and sets the identifying number of the output to be configured.

Unit of measurement: Number

Options: **1...4**

4.16.3. STAT - Defining the output state

Acronym	Scrolling message	Submenu	Attributes
StAt	OUTPU.1 (or OUTPU.2… OUTPU.4) DIGITAL OUTPUT STATUS	OUTPU	R W

The parameter shows and sets the state of the output with identifying number "x".
The active direct output corresponds to the relay, logic, or trial output ON (conducting).
The active inverse output corresponds to the relay, logic, or trial output OFF.
If the output is continuous, direct corresponds to minimum = 4mA and maximum = 20 mA, while inverse corresponds to minimum = 20 mA and maximum = 4 mA.
The outputs can be forced so that they are always on or off.

On models 1650-1850, if the VT option is present, the parameter is ON.

Unit of measurement: -

Options:
DIREC = Direct output
INVRS = Inverse output
OFF = Output forced off
ON = Output forced on

4.16.4. F.OUT - Selecting the function assigned to relay, logic or Triac output

Acronym	Scrolling message	Submenu	Attributes
F.out	OUTPU.1 (or OUTPU.2… OUTPU.4) OUTPUT FUNCTION	OUTPU	R W

The parameter shows and sets the function assigned to the output with identifying number “x”, if the output is relay, logic or Triac and is direct or inverse.

Unit of measurement: -

Options:

NONE = No assigned function
HEAT1 = Heat control output of PID.1
COOL1 = Cool control output of PID.1
ALRM1 = Output for Alarm 1
ALRM2 = Output for Alarm 2
ALRM3 = Output for Alarm 3
ALRM4 = Output for Alarm 4
OR.12 = Alarm 1 OR Alarm 2
OR.123 = Alarm 1 OR Alarm 2 OR Alarm 3
O.1234 = Alarm 1 OR Alarm 2 OR Alarm 3 OR Alarm 4
AND.12 = Alarm 1 AND Alarm 2
AN.123 = Alarm 1 AND Alarm 2 AND Alarm 3
A.1234 = Alarm 1 AND Alarm 2 AND Alarm 3 AND Alarm 4
AL.HB = Output for HB alarm
LBA1 = Output for LBA alarm of PID.1
BUT.SR = Set/Reset from key

if the Timer function is enabled in MODE.1:
TIMR1 = Timer state (end of count)

if the Programmer 1 function is enabled in parameter PROGR on the EN.FUN menu:
P.HBB1 = HBB alarm of programmer of PROGR.1
P.RUN1 = RUN state of programmer of PROGR.1
P.HLD1 = STOP state of programmer of PROGR.1
P.RDY1 = READY state of programmer (after reset of time base) of PROGR.1
P.END1 = END state of programmer of PROGR.1
P.EVE1 = EVENT state of programmer of PROGR.1

if model with Logic Operations:
LFB.O = Output of Function Blocks

if model with valve control:
V.OPEN = Output for the opening of the valve
V.CLOS = Output for the closure of the valve

if model with digital inputs:
IN.DIG = Repetition of a digital input

POWR1 = Output for PID.1 power alarm

if PID2.E function is enabled in EN.FUN:
HEAT2 = PID.2 heat control output
COOL2 = PID.2 cool control output
LBA2 = PID.2 LBA alarm output
POWR2 = Output for PID.2 power alarm

if the Timer function is enabled in MODE.2:
TIMR2 = TIMER.2 timer state (end count)

if the Programmer 2 function is enabled in parameter PROGR on the EN.FUN menu:
P.HBB2 = PROGR.2 programmer HBB alarm
P.RUN2 = PROGR.2 programmer RUN state
P.HLD2 = PROGR.2 programmer STOP state
P.RDY2 = PROGR.2 programmer READY state (after reset of time base)
P.END2 = PROGR.2 programmer END state
P.EVE2 = PROGR.2 programmer EVENT state

4.16.5. TYPE - Defining the type of continuous output

Acronym	Scrolling message	Submenu	Attributes
tYPE	CONTINUE OUTPUT TYPE	OUTPU	R W

The parameter shows and sets the definition of continuous output.

The parameter applies only to Output 1 of CONT.A

Unit of measurement: -

Options:
20MA = 0...20 mA output
4-20M = 4...20 mA output
10V = 0...10 V output
2-10V = 2...10 V output
C.20MA = 0...20 mA custom output
C.4-20 = 4...20 mA custom output
C.10V = 0...10 V custom output
C.2-10 = 2...10 V custom output

4.16.6. F.OU.C - Selecting the function assigned to continuous output

Acronym	Scrolling message	Submenu	Attributes
F.ou.C	REFERENCE SIGNAL CONTINUE OUTPUT	OUTPU	R W

The parameter shows and sets the function assigned to continuous output 1, direct or inverse.

The parameter applies only to Output 1 of CONT.A. or CONT.C.

Unit of measurement: -

Options:
NONE = No assigned function
HEAT1 = Heat control output of PID.1
COOL1 = Cool control output of PID.1
PV1 = Process variable 1
SSP1 = Active setpoint of PID.1
SETP1 = Local setpoint of PID.1
DEVI1 = Deviation |SSp-PV| of PID.1
SERIA = Value set from serial line
H+C1 = PID.1 heat/cool control output

if PID2.E function is enabled in EN.FUN:
HEAT2 = PID.2 heat control output
COOL2 = PID.2 control output
H+C2 = PID.2 heat/cool control output
PV2 = Process variable 2
SSP2 = PID.2 active setpoint
SETP2 = PID.2 local setpoint
DEVI2 = PID.2 deviation |SSp-PV|

IN1 = Main input

if the model with auxiliary input:
IN2 = Auxiliary imput

4.16.7. EVNT.N - Setting the event number

Acronym	Scrolling message	Submenu	Attributes
EVNT.N	OUTPU.1 (or OUTPU.2… OUTPU.4) EVENT NUMBER	OUTPU	R W

The parameter shows and sets the event number.
The parameter appears if the parameter F.out = P.EVE1, P.EVE2.

Unit of measurement: Number

Options: **1...4**

4.16.8. FB.O.N - Setting the Function Block output number

Acronym	Scrolling message	Submenu	Attributes
FB.O.N	OUTPU.1 (or OUTPU.2 … OUTPU.4) FUNCTION BLOCK OUTPUT NUMBER	OUTPU	R W

The parameter shows and sets the number of the Function Block assigned to the output.
The parameter appears if the parameter F.out = LFB.O.

Unit of measurement: Number

Options: **1...32**

4.16.9. IN.DG.N - Setting the digital input number

Acronym	Scrolling message	Submenu	Attributes
IN.DG.N	OUTPU.1 (or OUTPU.2 … OUTPU.4) DIGITAL INPUT NUMBER	OUTPU	R W

The parameter shows and sets the number of the digital input assigned to the output.
The parameter appears if the parameter F.out = IN.DIG.

Unit of measurement: Number

Options: **1...3** Model 850 with option 3 digital inputs
1...5 Models 1650 and 1850 with option 5 digital inputs

4.16.10. SWTCH - Setting the number of switchings for signal

Acronym	Scrolling message	Submenu	Attributes
SWTCH	OUTPU.1 (or OUTPU.2 … OUTPU.4) NUMBER OF SWITCHING CYCLES	OUTPU	R W

The parameter shows and sets the number of switchings (x1000) of the relay, exceeding which the signal is generated OUTX.SWITCH ALARM where X is the number of output 1 or 2 or 3 or 4 if the output is relay, logic or triac.
The function is disabled if the parameter equals “0”.

Unit of measurement: Number

Options: **0...9999**

4.16.11. FAULT - State of output with broken input

Acronym	Scrolling message	Submenu	Attributes
FAULT	OUTPU.1 (or OUTPU.2 … OUTPU.4) FAULT OUTPUT STATE	OUTPU	R W

The parameter shows and sets the state (ON, OFF) that the output assumes in case of sensor fault (Err, Sbr, ...), on main input IN.1 or auxiliary input IN.2, if the output is direct or inverse and automatic operation mode.

Unit of measurement: -

Options:
OFF.1 = Output OFF in case of fault on main input IN.1
On.1 = Output ON in case of fault on main input IN.1
nOnE = Output continues to function normally
if the model with auxiliary input:
OFF.2 = Output OFF in case of fault on auxiliary input IN.2
On.2 = Output ON in case of fault on auxiliary input IN.2
OF.12 = Output OFF in case of fault on input IN.1 or IN.2
On.12 = Output ON in case of fault on input IN.1 or IN.2

4.16.12. MSG.OU - Selecting the output message

Acronym	Scrolling message	Submenu	Attributes
MSG.OU	OUTPU.1 (or OUTPU.2 … OUTPU.4) NUMBER OF SCROLLING MESSAGE AT OUTPUT ACT	OUTPU	R W

The parameter shows and sets the number of the message assigned to activation of the output, i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed when the output is activated.
The same message number can be assigned to different outputs.

Unit of measurement: Message number

Options:
0...25 (with LAnG=LANG1 or LANG2 or LANG3)
0…75 (with LAnG=NONE)

4.16.13. CY.TIM - Cycle time of output

Acronym	Scrolling message	Submenu	Attributes
CY.TIM	OUTPU.1 (or OUTPU.2 … OUTPU.4) CYCLE TIME	OUTPU	R W

The parameter shows and sets the slicing period of the output.
The parameter appears if the parameter F.ou.x = HEAT1, HEAT2 or F.ou.x = COOL1, COOL2.

The slicing period is the cycle time, i.e., the sum of ON time and OFF time proportional to the value of Heat or Cool power.

Example
If Heat power is 25% and the 25% the cycle time is 10.0 seconds, the output is active for 2.5 seconds and inactive for 7.5 seconds.

Burst Firing (BF) mode has a variable cycle time, optimized to transfer power as quickly as possible. The minimum interval for ON or OFF equals the electrical cycle (20 ms at 50 Hz).
The ON and OFF times are multiples of the minimum time.

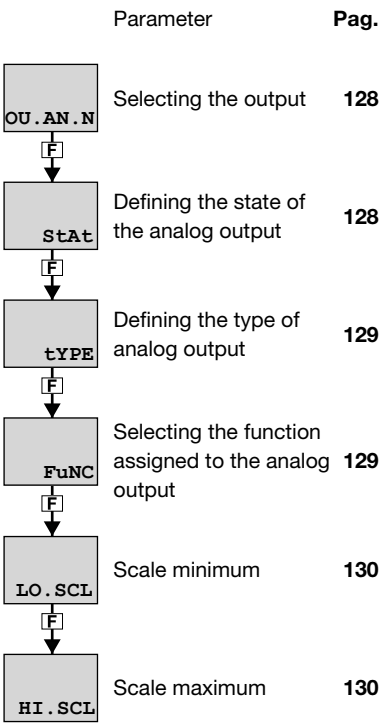
Example
If Heat power is 25% and the line frequency is 50 Hz, the cycle time is 80 ms. The output is active for 20 ms and inactive for 60 ms (= 3 × 20 ms, equal to the remaining 75% of the cycle time).

Unit of measurement: Seconds

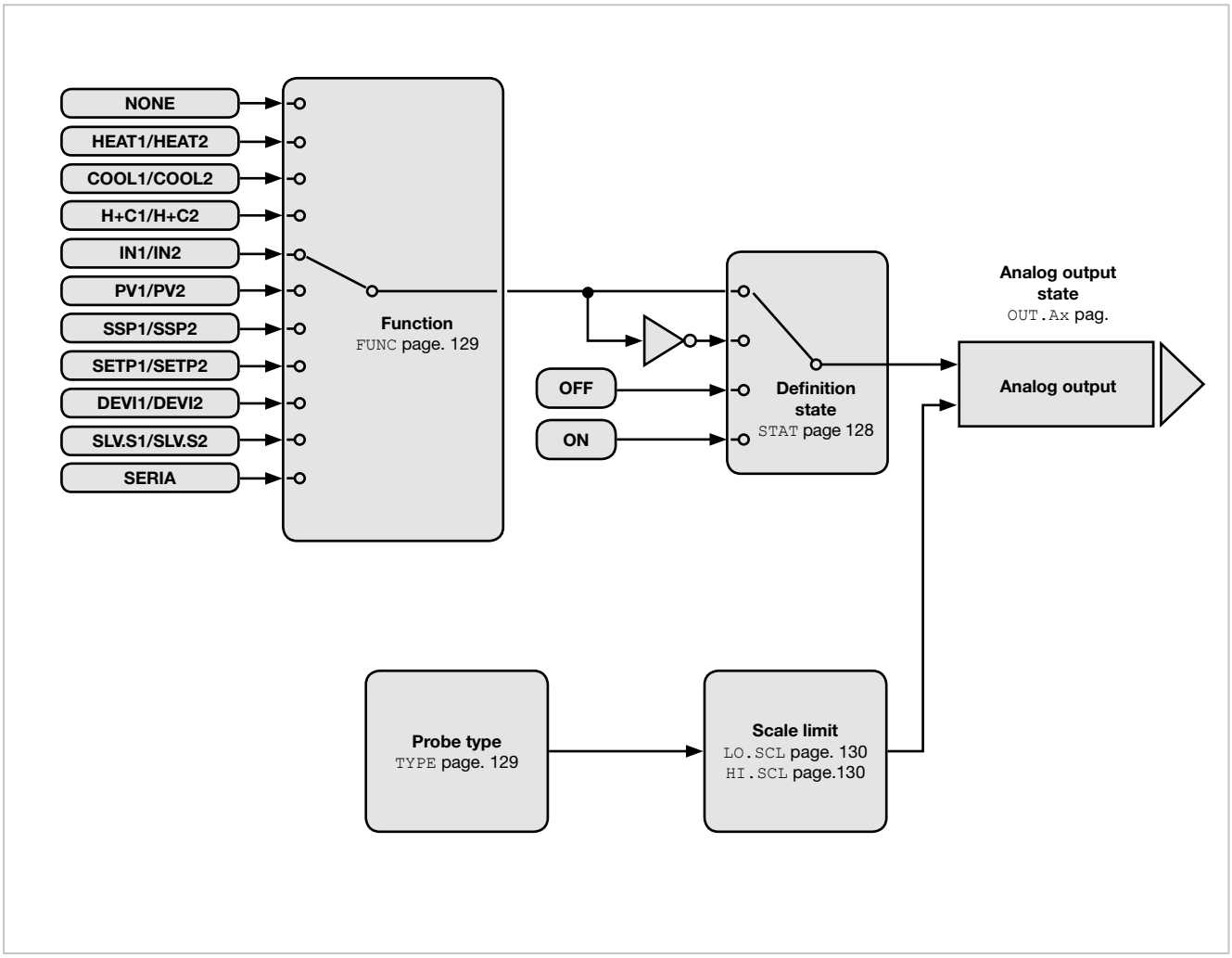
Options:
0.0...20.0 for digital and Triac outputs. There is Burst Firing (BF) with 0.0.
1...200 for relay output

4.17. Submenu OUT.AN - Configuring the analog retransmission output

Acronym	Scrolling message	Password	Description
OUT.AN	ANALOG RETRASMISSION OUTPUT CONFIG	Level 2	Lets you configure the analog output used for retransmission of analog values. The submenu appears if the analog retransmission output is present on the controller.



4.17.1. Functional diagram



4.17.2. OU.AN.N - Selecting the output

Acronym	Scrolling message	Submenu	Attributes
OU.AN.N	ANALOG OUTPUT NUMBER	OUT.AN	R W

The parameter shows and sets the identifying number of the output to be configured.

Unit of measurement: Number

Options: **1...2**

4.17.3. STAT - Defining the state of the analog output

Acronym	Scrolling message	Submenu	Attributes
StAt	OUT.AN.1 (o OUT.AN.2) ANALOG OUTPUT STATUS	OUT.AN	R W

The parameter shows and sets the state of analog retransmission output A1 or A2.
The active direct output corresponds to minimum with the minimum output value in voltage or current.
The active inverse output corresponds to minimum with the maximum output value in voltage or current.
The outputs can be forced so that they are always on or off.

Unit of measurement: -

Options:
DIREC = Direct output
INVRS = Inverse output
OFF = Forced output inactive (minimum voltage or current value)
ON = Forced output active (maximum voltage or current value)

4.17.4. TYPE - Defining the type of analog output

Acronym	Scrolling message	Submenu	Attributes
tYPE	OUT.AN.1 (or OUT.AN.2) ANALOG OUTPUT TYPE	OUT.AN	R W

The parameter shows and sets the definition of analog output A1 or A2.

Unit of measurement: -

Options:
20MA = 0...20 mA Output
4-20M = 4...20 mA Output
10V = 0...10 V Output
2-10V = 2...10 V Output
C.20MA = 0...20 mA Custom output
C.4-20 = 4...20 mA Custom output
C.10V = 0...10 V Custom output
C.2-10 = 2...10 V Custom output

4.17.5. FUNC - Selecting the function assigned to the analog output

Acronym	Scrolling message	Submenu	Attributes
FuNC	OUT.AN.1 (or OUT.AN.2) REFERENCE SIGNAL ANALOG OUTPUT	OUT.AN	R W

The parameter shows and sets the function assigned (retransmission of values) to analog output A1 or A2.

Unit of measurement: -

Options:
NONE = No assigned function
HEAT1 = Heat control power of PID.1
COOL1 = Cool control power of PID.1
PV1 = Process variable 1
SSP1 = Active setpoint of PID.1
SETP1 = Local setpoint of PID.1
DEVI1 = Deviation |SSp-PV| of PID.1
SERIA = Value set from serial line

if the Programmer 1 function is enabled in parameter PROGR on the EN.FUN menu:
SLV.S1 = Slaved setpoint of PROGR.1

H+C1 = PID.1 heat/cool control output

if PID2.E function is enabled in EN.FUN:
HEAT2 = PID.2 heat control output
COOL2 = PID.2 cool control output
H+C2 = PID.2 heat/cool control output
PV2 = Process variable 2
SSP2 = PID.2 active setpoint
SETP2 = PID.2 local setpoint
DEVI2 = PID.2 deviation |SSp-PV|

if the Programmer 2 function is enabled in parameter PROGR on the EN.FUN menu:
SLV.S2 = Slaved setpoint of PROGR.2

IN1 = Main input

if the model with auxiliary input:
IN2 = Auxiliary input

4.17.6. LO.SCL - Scale minimum

Acronym	Scrolling message	Submenu	Attributes
LO.SCL	OUT.AN.1 (or OUT.AN.2) LOW LIMIT ANALOG OUTPUT	OUT.AN	R W

The parameter shows and sets the scale minimum, which corresponds to minimum output value in voltage or current.
Each time you set the power control output on parameter FuNC, the parameter value is forced to 0.
The scale limit is ignored if the output is assigned to an MFB output (or calculated directly by an MFB).

Unit of measurement: Scale points of quantity assigned to analog output.

Options: **-1999...9999**

4.17.7. HI.SCL - Scale maximum

Acronym	Scrolling message	Submenu	Attributes
HI.SCL	OUT.AN.1 (or OUT.AN.2) HIGH LIMIT ANALOG OUTPUT	OUT.AN	R W

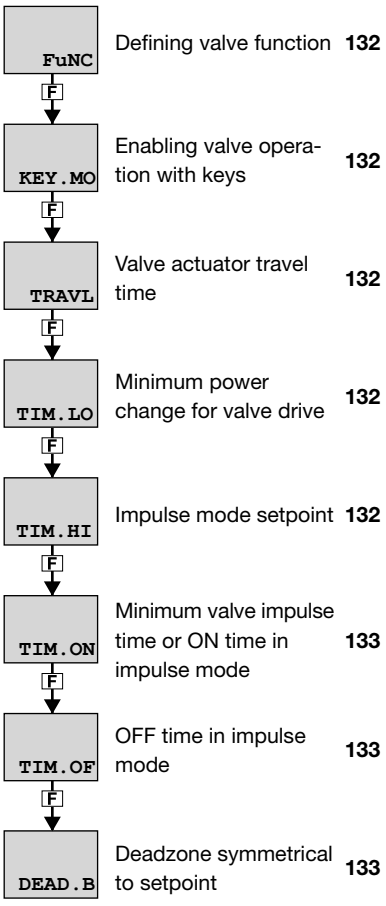
The parameter shows and sets the scale maximum, which corresponds to minimum output value in voltage or current.
Each time you set the power control output on parameter FuNC, the parameter value is forced to 1000.
The scale limit is ignored if the output is assigned to an MFB output (or calculated directly by an MFB).

Unit of measurement: Scale points of quantity assigned to analog output.

Options: **-1999...9999**

4.18. Submenu VALVE - Configuring valve parameters

Acronym	Scrolling message	Password	Description
VALVE	VALVE MANAGER	Level 2	Lets you configure control parameters for motorized valves. The submenu appears if the controller is set for valve control.



4.18.1. FUNC - Defining valve function

Acronym	Scrolling message	Submenu	Attributes
FuNC	VALVE CONTROL FUNCTION	VALVE	R W

The parameter shows and sets the valve function, i.e., if it controls a heating or cooling system.

Unit of measurement: -

Options: **HEAT1** = PID.1 heat control power
COOL1 = PID.1 cool control power

if it is enabled PID2.E in EN.FUN function:
HEAT2 = PID.2 heat control power
COOL2 = PID.2 cool control power

4.18.2. KEY.MO - Enabling valve operation with keys

Acronym	Scrolling message	Submenu	Attributes
KEY.MO	VALVE OPEN/CLOSE FROM IN/DEC BUTT ENABLE	VALVE	R W

The parameter shows and sets enabling of valve opening and closing with controller keys △ and ▽ in manual mode.

Unit of measurement: -

Options: **OFF** = Keys do not act directly on valve opening and closing
On = Keys enabled for manual valve opening and closing

4.18.3. TRAVL - Valve actuator travel time

Acronym	Scrolling message	Submenu	Attributes
TRAVL	ACTUATOR TRAVEL TIME	VALVE	R W

The parameter shows and sets the time taken by the actuator to bring the valve from “full open” position to “full closed” position or vice versa.
The time is obtained by trial or deduced from the valves technical data.

Unit of measurement: Seconds

Options: **0...2000**

4.18.4. TIM.LO - Minimum power change for valve drive

Acronym	Scrolling message	Submenu	Attributes
TIM.LO	MINIMUM PULSE TIME	VALVE	R W

The parameter shows and sets the minimum power change needed to drive the valve.
The parameter is calculated as a percentage of the TRAVL parameter and serves to prevent excess activity of the valve, with consequent electromechanical stress.
The control function is explained in detail in paragraph “5.14. Managing motorized valves” on page 193.

Unit of measurement: % of TRAVL

Options: **0.0...25.0**

4.18.5. TIM.HI - Impulse mode setpoint

Acronym	Scrolling message	Submenu	Attributes
TIM.HI	IMPULSIVE MODE INTERVENTION THRESHOLD	VALVE	R W

The parameter shows and sets the impulse mode setpoint as a percentage of valve opening time TRAVL.
The control function is explained in detail in paragraph “5.14. Managing motorized valves” on page 193.

Unit of measurement: % di TRAVL

Options: **0.0...100.0**

4.18.6. TIM.ON - Minimum valve impulse time or ON time in impulse mode

Acronym	Scrolling message	Submenu	Attributes
TIM.ON	ON TIME FOR IMPULSIVE MODE	VALVE	R W

The parameter shows and sets the minimum valve impulse time or ON time in impulse mode as a percentage of valve opening time TRAVL.

Unit of measurement: % di TRAVL

Options: **0.0...100.0**

4.18.7. TIM.OF - OFF time in impulse mode

Acronym	Scrolling message	Submenu	Attributes
TIM.OF	OFF TIME FOR IMPULSIVE MODE	VALVE	R W

The parameter shows and sets OFF time in impulse mode as a percentage of valve opening time TRAVL.
A value below TIM.ON is forced to TIM.ON.
The TIM.On and TIM.OF functions are both excluded if the parameter equals “0.0”.

Unit of measurement: % of TRAVL

Options: **0.0...100.0**

4.18.8. DEAD.B - Deadzone symmetrical to setpoint

Acronym	Scrolling message	Submenu	Attributes
DEAD.B	DEAD ZONE	VALVE	R W

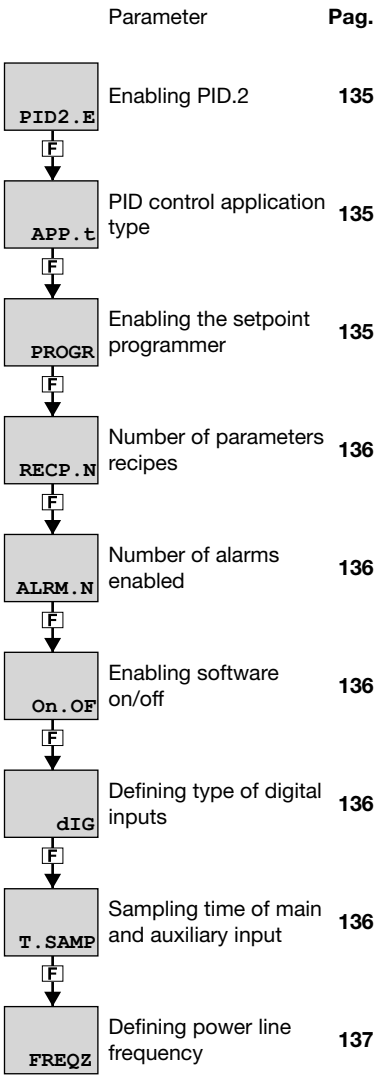
The parameter shows and sets a band symmetrical to the setpoint. If PV is in this band, valve activity and the related integral action is stopped.
It prevents frequent corrections of the valve position, with consequent electromechanical stress, following small changes in the value of the PV.

Unit of measurement: % of full scale of main or auxiliary input

Options: **0.0...25.0**

4.19. Submenu EN.FUN - Configuration of enablings

Acronym	Scrolling message	Password	Description
EN.FUN	ENABLE FUNCTIONS	Level 2	Lets you configure other controller functions.



4.19.1. PID2.E – Enabling PID.2

Acronym	Scrolling message	Submenu	Attributes
PID2.E	ENABLE OF PID 2	EN.FUN	R W

The parameter shows and sets enabling of second PID.

The parameter appears only if the optional auxiliary input is available and if option PV2 on the FUNC parameter of the INPUT.2 menu has been selected.

Unit of measurement: -

Options: **OFF** = PID.2 disabled
On = PID.2 enabled

4.19.2. APP.T – PID control application type

Acronym	Scrolling message	Submenu	Attributes
APP.t	PID APPLICATION CONTROL TYPE	EN.FUN	R W

The parameter shows and sets the PID control application type.

The parameter appears only if the optional auxiliary input is available, if option PV2 on the FUNC parameter of the INPUT.2 was selected, and if parameter PID2.E is On.

Unit of measurement: -

Options: **2.PID** = For using the two PIDs (1 and 2) independently
CAS.HE = PID.1 and PID.2 in cascade. PID.1 HEAT control output = setpoint for PID.2*
CAS.CO = PID.1 and PID.2 in cascade. PID.1 COOL control output = setpoint for PID.2*
CAS.HC = PID.1 and PID.2 in cascade. PID.1 HEAT + COOL control output = setpoint for PID.2*

(*) PID.1 control tends to maintain PV1 = SSP1 automatically; PID.2 control tends to maintain PV2 = OUT.P1 in remote setpoint mode. Remote setpoint mode is obtained with function keys/digital inputs /Logic Function Blocks /serial after having enabled remote setpoint SP.rEM=On.

4.19.3. CAS.R – Cascade control reference

Acronym	Scrolling message	Submenu	Attributes
CAS.r	CASCADE CONTROL REFERENCE	EN.FUN	R W

This parameter shows and sets the reference for cascade control, required for scaling of PID.1 power in the remote PID.2 setpoint.

This parameter is shown only if APP.t = CAS.HE or = CAS.CO or = CAS.HC.

Unit of measurement: -

Options: **IN.SCL** = PID.2 input scale
SP.SCL = PID.2 setpoint scale

4.19.4. PROGR - Enabling the setpoint programmer

Acronym	Scrolling message	Submenu	Attributes
PROGR	PROGRAMMER ENABLE	EN.FUN	R W

The parameter shows and sets enabling of the setpoint programmer for models P or PV.

Unit of measurement: -

Options: **OFF** = Setpoint programmers 1 and 2 disabled
On1 = Setpoint programmer 1 enabled

if model with auxiliary input and function FUNC=PV2, with parameters PID2.E=On and APP.t=2.PID
On2 = Setpoint programmers 1 and 2 enabled
On.S = Synchronous setpoint programmers 1 and 2 enabled

4.19.5. RECP.N - Number of parameters recipes

Acronym	Scrolling message	Submenu	Attributes
RECP.N	NUM OF PARAMETER RECIPES	EN.FUN	R W

The parameter shows and sets the number of parameters recipes for which the template is defined via GF_eXpress.
If the parameter is “0” the parameters recipes are disabled.

Unit of measurement: Number

Options: **0...5**

4.19.6. ALRM.N - Number of alarms enabled

Acronym	Scrolling message	Submenu	Attributes
ALRM.N	NUM OF ENABLE ALARMS	EN.FUN	R W

The parameter shows and sets the number of alarms enabled.
No alarm is enabled if the parameter equals “0”.

Unit of measurement: Number

Options: **0...4**

4.19.7. ON.OF - Enabling software on/off

Acronym	Scrolling message	Submenu	Attributes
On.OF	SOFTWARE ON/OFF ENABLE	EN.FUN	R W

The parameter shows and sets enabling of on/off of the controller’s software.
The software ON-OFF function is explained in detail in paragraph “5.8. Switching the software on/off” on page 177.

Unit of measurement: -

Options: **ENABL** = Controller software on/off enabled
DISAB = Controller software on/off disabled

4.19.8. DIG - Defining type of digital inputs

Acronym	Scrolling message	Submenu	Attributes
dIG	DIGITAL INPUT TYPE	EN.FUN	R W

The parameter shows and sets the type of digital inputs.

Unit of measurement: -

Options: **NPN** = NPN digital inputs or voltage-free contact
PNP = PNP digital inputs

4.19.9. T.SAMP - Main and Auxiliary input sample time

Acronym	Scrolling message	Submenu	Attributes
T.SAMP	MAIN INPUT SAMPLE TIME	EN.FUN	R W

The parameter shows and sets the main and auxiliary input sample time.

Unit of measurement: Milliseconds

Options: **60**
120

4.19.10. FREQZ - Defining power line frequency

Acronym	Scrolling message	Submenu	Attributes
FREQZ	LINE FREQUENCY	EN.FUN	R W

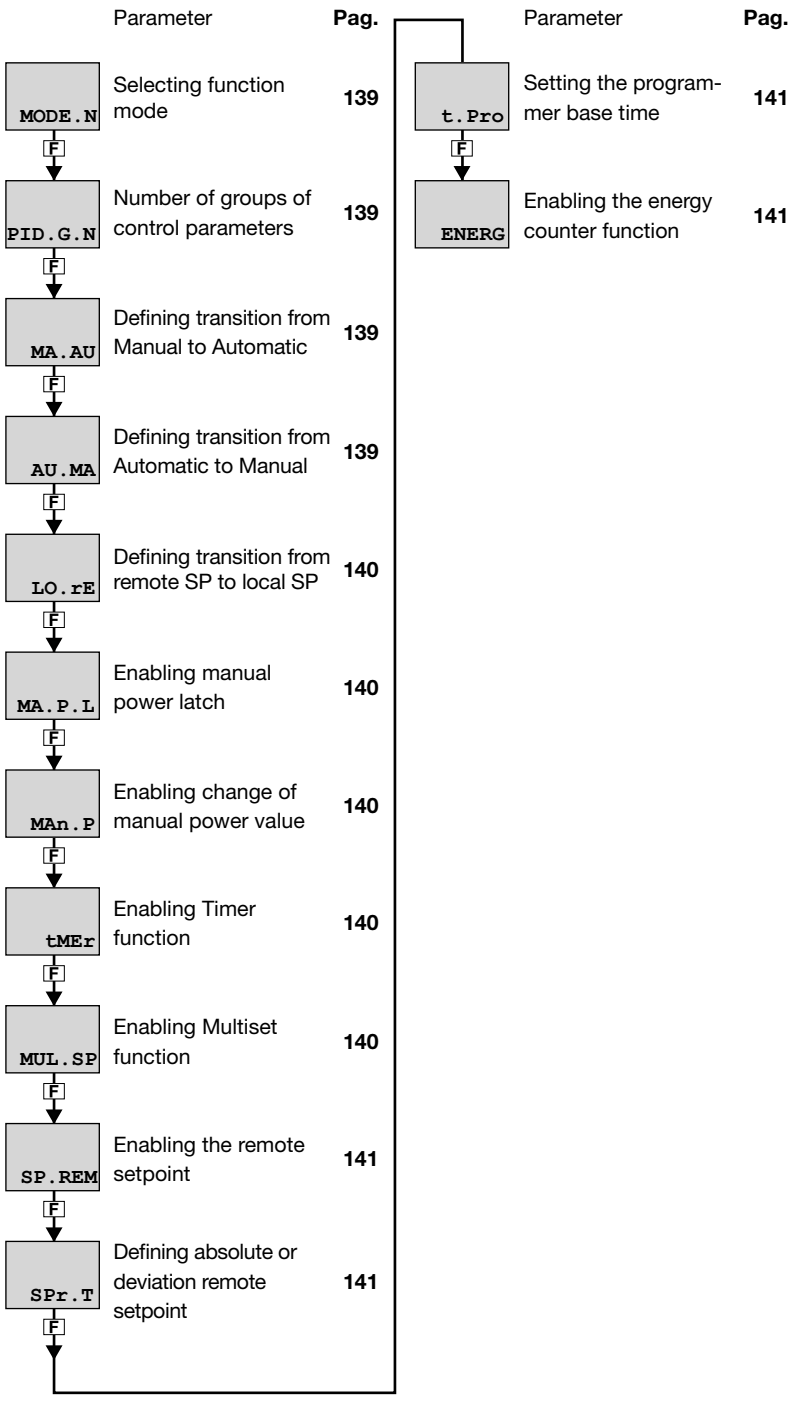
The parameter shows and sets the power line frequency

Unit of measurement: Hz

Options: **50**
60

4.20. Submenu MODE - Configuring functioning mode

Acronym	Scrolling message	Password	Description
MODE	FUNCTION MODE MANAGER	Level 2	Lets you configure the controller's functioning mode.



4.20.1. MODE.N - Selecting function mode

Acronym	Scrolling message	Submenu	Attributes
MODE.N	MODE NUMBER	MODE	R W

The parameter shows and sets the identifying number of the functions to be configured.

Unit of measurement: Number

Options: **1** = Select modes for PID.1
2 = Select modes for PID.2 (only with auxiliary input option and PID.2 enabled via PID2.E=On)

4.20.2. PID.G.N - Number of groups of control parameters

Acronym	Scrolling message	Submenu	Attributes
PID.G.N	MODE.1 (or MODE.2) NUM OF CONTROL PARAMETERS GROUP	MODE	R W

The parameter shows and sets the number of the groups of PID parameters.
The groups of control parameters are disabled if the parameter equals “0”.

Unit of measurement: Number

Options: **0...4**

4.20.3. MA.AU - Defining transition from Manual to Automatic

Acronym	Scrolling message	Submenu	Attributes
MA.AU	MODE.1 (or MODE.2) MANUAL TO AUTOMATIC TRANSITION TYPE	MODE	R W

The parameter shows and sets controller behavior when switching from manual to automatic mode.

With STAND, the POWER output assumes the value calculated by the PID based on the local or remote SP (bumpless PID with integral action based on actual PV-SP and power values).

With BUMPL, the local setpoint assumes the PV value (bumpless PID with integral action based on actual power value). PV-SP = 0. With PID.1 enabled as controller of the MAN/AUTO switching ratio, RATIO = PV1 / IN2 is calculated.

Unit of measurement: -

Options: **STAND**
BUMPL

4.20.4. AU.MA - Defining transition from Automatic to Manual

Acronym	Scrolling message	Submenu	Attributes
AU.MA	MODE.1 (or MODE.2) AUTOMATIC TO MANUAL TRANSITION TYPE	MODE	R W

The parameter shows and sets controller behavior when switching from automatic to manual mode.

With STAND, the control output assumes the local or remote POWER value.

With BUMPL, the value of the control output does not change. In case of remote manual control, the control acts in raise/lower mode.

Unit of measurement: -

Options: **STAND**
BUMPL

4.20.5. LO.RE - Defining transition from remote SP to local SP

Acronym	Scrolling message	Submenu	Attributes
LO.rE	MODE.1 (or MODE.2) REMOTE TO LOCAL TRANSITION TYPE	MODE	R W

The parameter shows and sets controller behavior when switching from remote to local setpoint, and is significant only with Func = SETP or RATIO.

With STAND, the setpoint switches to the value of the selected local SP or multiset, possibly with setpoint gradient (if set).

With BUMPL, the remote SP value is memorized in the selected local SP or multiset.

Unit of measurement: -

Options: **STAND**
BUMPL

4.20.6. MA.P.L - Enabling manual power latch

Acronym	Scrolling message	Submenu	Attributes
MA.P.L	MODE.1 (or MODE.2) MANUAL POWER LATCH ENABLE	MODE	R W

The parameter shows and sets enabling of memorization (in non-volatile memory) of the manual power value.

Unit of measurement: -

Options: **LATCH** = Latch enabled
NO.LAT = Latch disabled. After Power-on, Manual power value is reset

4.20.7. MAN.P - Enabling change of manual power value

Acronym	Scrolling message	Submenu	Attributes
MAn.P	MODE.1 (or MODE.2) MANUAL POWER MODIFY ENABLE	MODE	R W

The parameter shows and sets enabling of change of the manual power value.

Unit of measurement: -

Options: **MODIF** = Change allowed
NO.MOD = Change not allowed

4.20.8. TMER - Enabling Timer function

Acronym	Scrolling message	Submenu	Attributes
tMEr	MODE.1 (or MODE.2) TIMER ENABLE	MODE	R W

The parameter shows and sets enabling of the Timer function.
The Timer function is explained in detail in paragraph “5.11. Timer” on page 182.

Unit of measurement: -

Options: **OFF** = Timer disabled
ON.SEC = Timer enabled with time base Seconds
ON.MIN = Timer enabled with time base Minutes

4.20.9. MUL.SP - Enabling Multiset function

Acronym	Scrolling message	Submenu	Attributes
MUL.SP	MODE.1 (or MODE.2) MULTISET ENABLE	MODE	R W

The parameter shows and sets enabling of the Multiset function.
The MULTISET function is explained in detail in paragraph “5.12. Multiset, setpoint gradient” on page 184.

Unit of measurement: -

Options: **OFF** = Multiset disabled
On = Multiset enabled

4.20.10. SP.REM - Enabling the remote setpoint

Acronym	Scrolling message	Submenu	Attributes
SP.REM	MODE.1 (or MODE.2) REMOTE SP ENABLE	MODE	R W

The parameter shows and sets enabling of the remote setpoint.

Unit of measurement: -

Options:
OFF = Remote setpoint disabled
On = Remote setpoint enabled from analog input
SEr = Remote setpoint enabled from serial

4.20.11. SPR.T - Defining absolute or deviation remote setpoint

Acronym	Scrolling message	Submenu	Attributes
SPr.t	MODE.1 (or MODE.2) REMOTE SP TYPE	MODE	R W

The parameter shows and defines the setpoint as absolute or deviation.
The absolute remote setpoint replaces the local setpoint in the control.
The deviation remote setpoint is added algebraically to the local setpoint in the control.
The parameter appears only if the parameter SP.REM is different from OFF.

Unit of measurement: -

Options:
ABSLT = Absolute remote setpoint
RELAT = Deviation remote setpoint

4.20.12. T.PRO - Setting the programmer base time

Acronym	Scrolling message	Submenu	Attributes
t.Pro	MODE.1 (or MODE.2) PROGRAMMER BASE TIME DEFINITION	MODE	R W

The parameter shows and sets the base time used by the programmer.
The parameter appears if the parameter PROGR = On.

Unit of measurement: -

Options:
HH.MM = Base time calculated in hours:minutes
MM.SS = Base time calculated in minutes:seconds

4.20.13. ENERG - Enabling the energy counter function

Acronym	Scrolling message	Submenu	Attributes
ENERG	MODE.1 (or MODE.2) ENERGY COUNTER ENABLE	MODE	R W

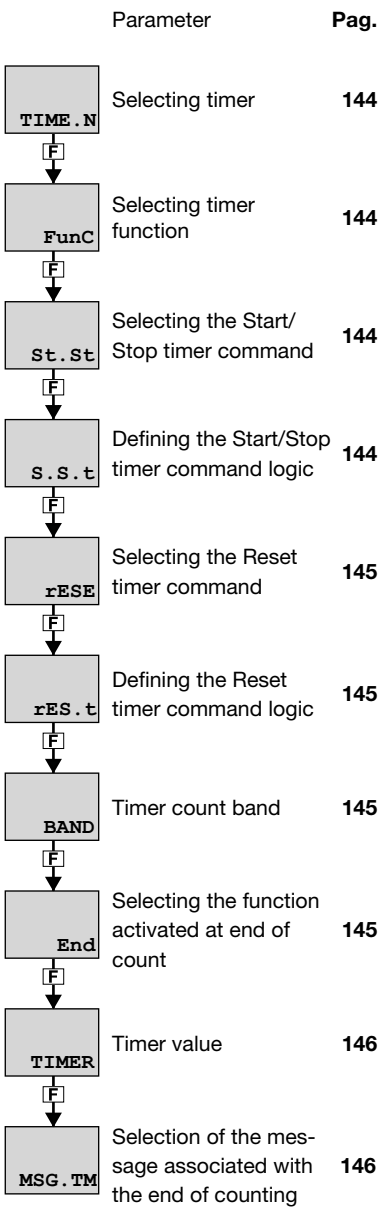
The parameter shows and sets enabling of the energy counter function.
The Energy Counter function is explained in detail in paragraph “5.15. Energy counter” on page 197.

Unit of measurement: -

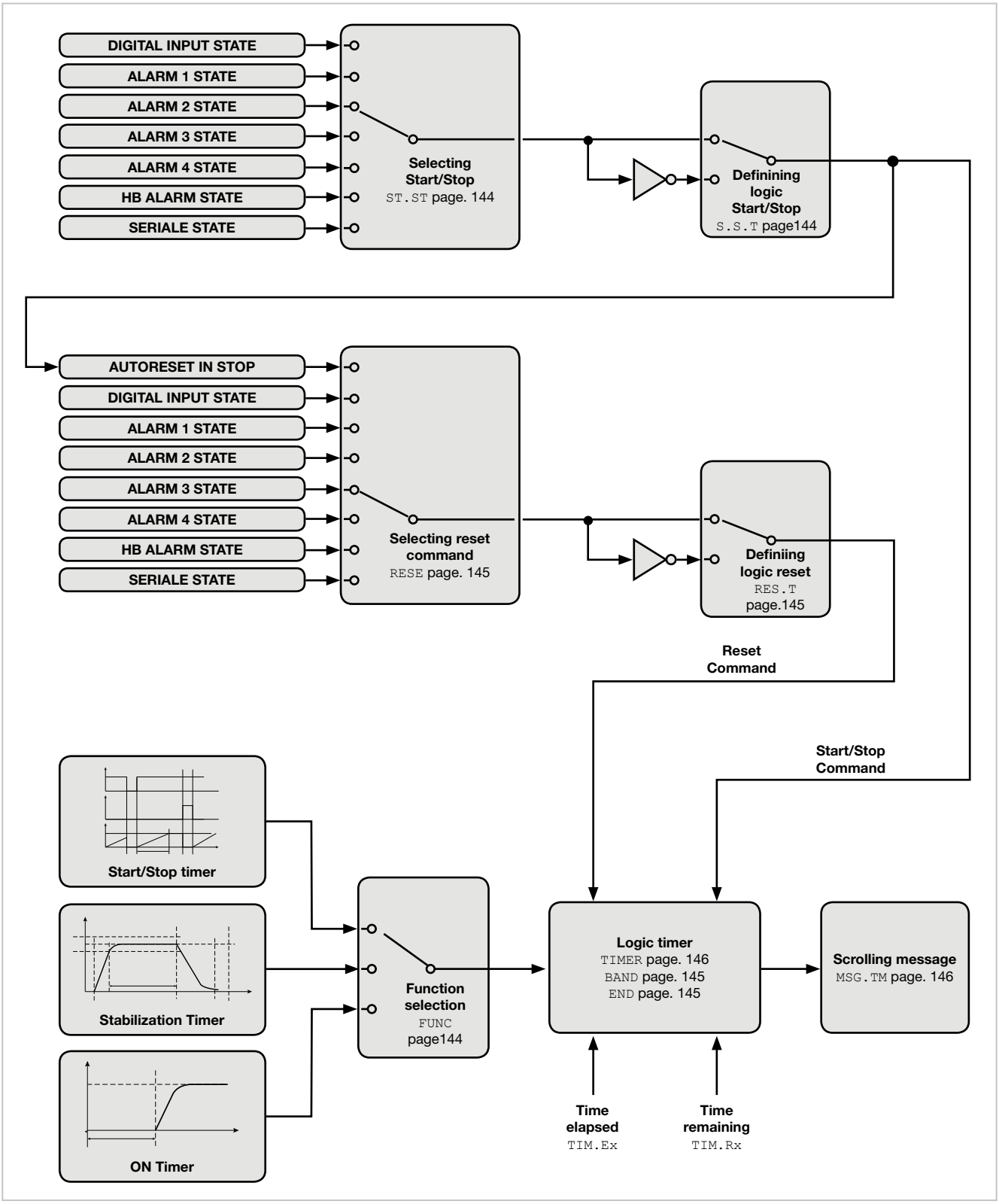
Options:
OFF = Energy counter disabled
On = Energy counter enabled

4.21. Submenu TIMER - Timer configuration parameters

Acronym	Scrolling message	Password	Description
TIMER	TIMER MANAGER	Level 2	Lets you configure the timer parameters. The submenu appears only if the Timer function was enabled on the MODE submenu.



4.21.1. Functional diagram



4.21.2. TIME.N - Selecting timer

Acronym	Scrolling message	Submenu	Attributes
TIME.N	TIMER NUMBER	TIMER	R W

The parameter shows and sets the identifying number of the timer to be configured.

Unit of measurement: Number

Options: **1...2**

4.21.3. FUNC - Selecting Timer function mode

Acronym	Scrolling message	Submenu	Attributes
FunC	TIMER.1 (or TIMER.2) TIMER FUNCTION	TIMER	R W

The parameter shows and sets the timer function mode.
The Timer function is explained in detail in paragraph “5.11. Timer” on page 182.

Unit of measurement: -

Options:
ST.STP = Start/Stop Timer
STABL = Stabilization Timer
SWITC = Power-on Timer

4.21.4. ST.ST - Selecting the Start/Stop timer command

Acronym	Scrolling message	Submenu	Attributes
St.St	TIMER.1 (or TIMER.2) TIMER START STOP	TIMER	R W

The parameter shows and sets the “object” that commands timer Start/Stop and stabilization.

Unit of measurement: -

Options:
IN.DIG = From digital input
ALRM1 = From alarm 1
ALRM2 = From alarm 2
ALRM3 = From alarm 3
ALRM4 = From alarm 4
AL.HB = From HB alarm
SERIA = From serial

4.21.5. S.S.T - Defining the Start/Stop timer command logic

Acronym	Scrolling message	Submenu	Attributes
S.S.t	TIMER.1 (or TIMER.2) LOGIC TYPE OF TIMER START/STOP	TIMER	R W

The parameter shows and sets the type of logic used to command timer Start/Stop.
With positive logic, timer start corresponds to “object” active if IN.DIG input active.
With negative logic, timer start corresponds to “object” inactive if IN.DIG input inactive.

Unit of measurement: -

Options:
POSIT = Positive logic
NEGAT = Negative logic

4.21.6. RESE - Selecting the Reset timer command

Acronym	Scrolling message	Submenu	Attributes
rESE	TIMER.1 (or TIMER.2) TIMER RESET	TIMER	R W

The parameter shows and sets the “object” that commands Reset of the timer.

Unit of measurement: -

Options:
AUT.RS = For autoreset with timer in Stop
IN.DIG = From digital input with T.RST function
ALRM1 = From alarm 1
ALRM2 = From alarm 2
ALRM3 = From alarm 3
ALRM4 = From alarm 4
AL.HB = From HB alarm
SERIA = From serial

4.21.7. RES.T - Defining the timer reset command logic

Acronym	Scrolling message	Submenu	Attributes
rES.t	TIMER.1 (or TIMER.2) LOGIC TYPE OF TIMER RESET	TIMER	R W

The parameter shows and sets the type of logic used to command the timer reset.
With positive logic, the timer is reset with “object” active.
With negative logic, the timer is reset with “object” inactive.

Unit of measurement: -

Options:
POSIT = Positive logic
NEGAT = Negative logic

4.21.8. BAND - Band for timer count

Acronym	Scrolling message	Submenu	Attributes
BAND	TIMER.1 (or TIMER.2) SYMM SP BAND WHERE TIMER IS ACTIVE	TIMER	R W

The parameter shows and sets the symmetrical band around the setpoint within which the timer count is on.
The parameter appears if the parameter F.tiM = STABL
If the parameter equals “0.0” the count is immediate as soon as the setpoint is reached for the first time.

Unit of measurement: % of full scale of main or auxiliary input

Options: **0.0...25.0**

4.21.9. END - Selecting the function activated at end of count

Acronym	Scrolling message	Submenu	Attributes
End	TIMER.1 (or TIMER.2) FUNCTION WHERE TIMER IS OVER	TIMER	R W

The parameter shows and sets the function that is activated when the timer ends the count.
The parameter appears if the parameter F.tiM = ST.STP or STABL.

Unit of measurement: -

Options:
NONE = None: control continues with actual setpoint
OFF = Software off
if the Multiset function is enabled:
SP1-2 = Change setpoint SP1/SP2

4.21.10. TIMER - Timer value

Acronym	Scrolling message	Submenu	Attributes
TIMER	TIMER.1 (or TIMER.2) ACTUAL TIME	TIMER	R W

The parameter shows and sets the timer value.

Unit of measurement: Minutes or Seconds according to the selection set in the MODE submenu, parameter tMEr

Options: **0...9999**

4.21.11. MSG.TM - Selecting message assigned to end of count

Acronym	Scrolling message	Submenu	Attributes
MSG.TM	TIMER.1 (or TIMER.2) MSG NUMBER WHEN TIMER OVER	TIMER	R W

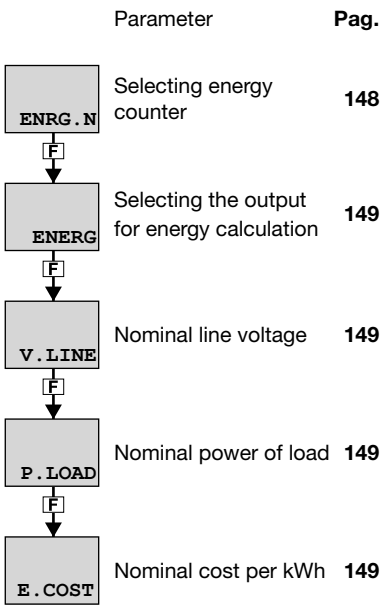
The parameter shows and sets the number of the message assigned to end of count condition of the timer, i.e. the scrolled message seen on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 40.
If the parameter is set to “0” no message will be displayed at the end of the timer count.

Unit of measurement: Message number

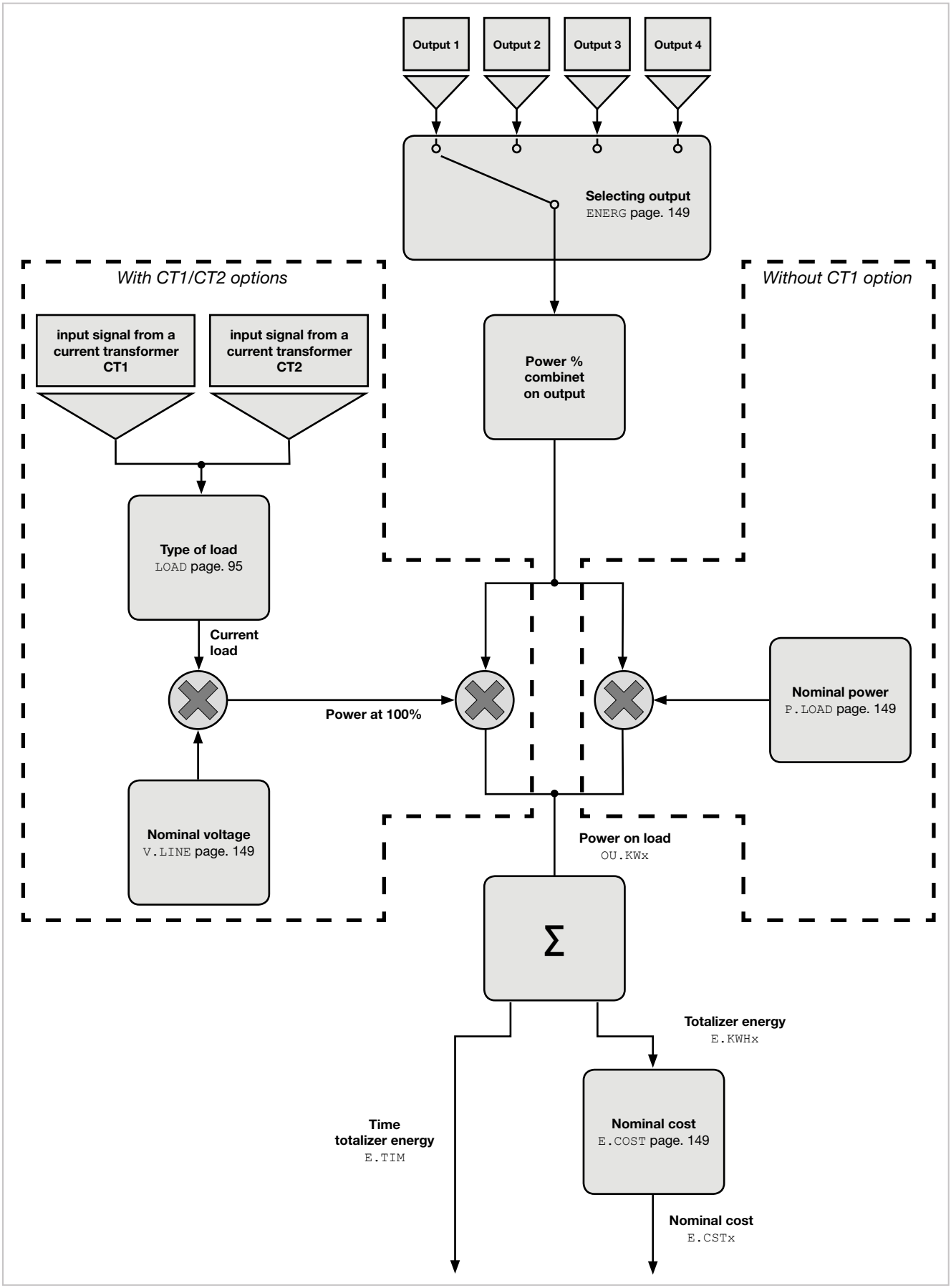
Options: **0...25 (with LAnG=LANG1 or LANG2 or LANG3)**
0…75 (with LAnG=NONE)

4.22. Submenu ENERG - Configuring energy counter parameters

Acronym	Scrolling message	Password	Description
ENERG	ENERGY COUNTER MANAGER	Level 2	Lets you configure the energy counter parameters. The submenu appears if the energy counter function was enabled on the MODE submenu.



4.22.1. Functional diagram



4.22.2. ENRG.N - Selecting energy counter

Acronym	Scrolling message	Submenu	Attributes
ENRG.N	ENERGY COUNTER NUMBER	ENERG	R W

The parameter shows and sets the identifying number of the energy counter to be configured.

Unit of measurement: Number

Options: **1...2**

4.22.3. ENERG - Selecting the output for energy calculation

Acronym	Scrolling message	Submenu	Attributes
ENERG	ENERG.1 (or ENERG.2) ENERGY COUNTER ENABLE	ENERG	R W

The parameter shows and sets the output to be used for the energy calculation.
The controller totalizes the time during which the output is active and uses it for the energy calculation.

Unit of measurement: -

Options:
OUt1 = Output 1
OUt2 = Output 2
OUt3 = Output 3
OUt4 = Output 4

4.22.4. V.LINE - Nominal line voltage

Acronym	Scrolling message	Submenu	Attributes
V.LINE	ENERG.1 (or ENERG.2) NOMINAL VOLTAGE	ENERG	R W

The parameter shows and sets the nominal line voltage to be used for the energy calculation.

Unit of measurement: V

Options: **0...999**

4.22.5. P.LOAD - Nominal power of load

Acronym	Scrolling message	Submenu	Attributes
P.LOAD	ENERG.1 (or ENERG.2) LOAD NOMINAL POWER	ENERG	R W

The parameter shows and sets the nominal power of the load controlled by the output.
If the parameter is set to “0.00” the data used is the RMS current measured with the CT1 or CT1 + CT2 current transformer (optional).

Unit of measurement: kW

Options: **0.00...99.99**

4.22.6. E.COST - Nominal cost per kWh

Acronym	Scrolling message	Submenu	Attributes
E.COST	ENERG.1 (or ENERG.2) ENERGY COST / KWH	ENERG	R W

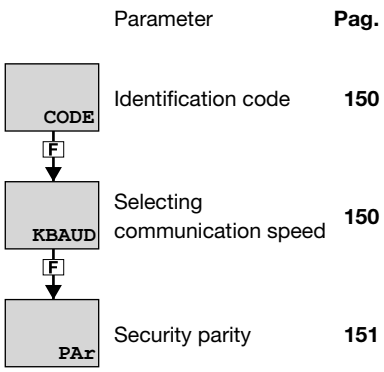
The parameter shows and sets the nominal cost of energy per kWh.

Unit of measurement: Number

Options: **0.000...9.999**

4.23. Submenu SERIA - Configuring serial communication

Acronym	Scrolling message	Password	Description
SERIA	SERIAL COMMUNICATION CONFIG	Level 2	Lets you configure serial communication.



4.23.1. CODE - Identification code

Acronym	Scrolling message	Submenu	Attributes
CODE	INSTRUMENT ID CODE FOR SERIAL COMM	SERIA	R W

The parameter shows and sets the identifying code of the controller in a Modbus serial network.

Unit of measurement: Number

Options: **1...247**

4.23.2. KBAUD - Selecting communication speed

Acronym	Scrolling message	Submenu	Attributes
KBAUD	COMMUNICATION SPEED	SERIA	R W

The parameter shows and sets the communication speed for the serial port.

Unit of measurement: kbaud

Options:
1.2 = 1200 baud
2.4 = 2400 baud
4.8 = 4800 baud
9.6 = 9600 baud
19.2 = 19200 baud
38.4 = 38400 baud
57.6 = 57600 baud
115.2 = 115200 baud

4.23.3. PAR - Selecting parity

Acronym	Scrolling message	Submenu	Attributes
PAr	PARITY	SERIA	R W

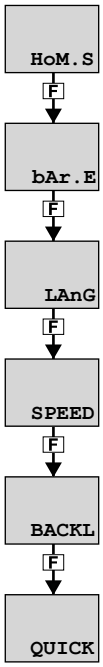
The parameter shows and sets the parity used in serial communication.

Unit of measurement: -

Options:
NONE = No parity
ODD = Odd parity
EVEN = Even parity

4.24. Submenu HMI - Display configuration

Acronym	Scrolling message	Password	Description
HMI	DISPLAY CONFIG	Level 2	Lets you configure the controller's display.



Parameter	Pag.
Selecting Home page	**153**
Enable bargraph display on Home menus	**153**
Selecting language for messages	**154**
Message scrolling speed	**154**
Backlighting level	**154**
Quick configuration menu	**154**

4.24.1. HOM.S - Selecting Home page

Acronym	Scrolling message	Submenu	Attributes
HoM.S	HOME SELECT	HMI	R W

The parameter shows and sets the Home page at power-on.
The parameter appears only if the optional auxiliary input is available and PID2 is enabled.

Unit of measurement: -

Options: **HOME1** = Display Home1 at power-on and Home2 enabled
HOME2 = Display Home2 at power-on and Home2 enabled
NO.HO2 = Display Home1 at power-on and Home2 disabled

4.24.2. BAR.E - Enable bargraph display on Home menus

Acronym	Scrolling message	Submenu	Attributes
bAr.E	BARGRAPH ENABLE	HMI	R W

The parameter enables the display of bargraphs. The parameter appears only if the controller is 1650 or 1850.

Unit of measurement: -

Options: **OFF** = Disables display of three bargraphs bAr.1, bAr.2, bAr.3, of IN/OUT frame (only for 1850), and of figures from 1 to 8 (only for 1850)

ON.ALL = Enables display of three bargraphs bAr.1, bAr.2 and bAr.3 including frames (default)

NO.FRA = Enables display of three bargraphs bAr.1, bAr.2 and bAr.3 without frames

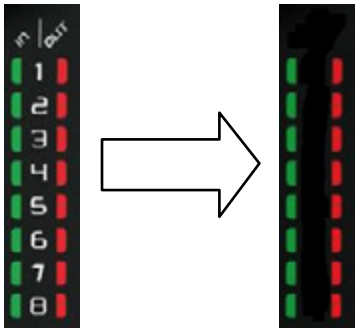
ON.3LY = Enables display of bargraph bAr.3 only

Only for 1850

ON.AL1 = Enables display of three bargraphs bAr.1, bAr.2 and bAr.3 including frames (default).
Disables display of IN/OUT frame and of figures from 1 to 8.

NO.FR1 = Enables display of three bargraphs bAr.1, bAr.2 and bAr.3 without frames.
Disables display of IN/OUT frame and of figures from 1 to 8.

ON.3L1 = Enables display of bargraph bAr.3 only.
Disables display of IN/OUT frame and of figures from 1 to 8.



4.24.3. LANG - Selecting language for messages

Acronym	Scrolling message	Submenu	Attributes
LAnG	MESSAGE LANGUAGE	HMI	R W

The parameter shows and sets the language for the scrolling messages.

Unit of measurement: -

Options:
LANG1 = Language 1 (English)
LANG2 = Language 2 (Italian)
LANG3 = Language 3
NONE = No language

4.24.4. SPEED - Message scrolling speed

Acronym	Scrolling message	Submenu	Attributes
SPEED	SCROLLING MESSAGE SPEED	HMI	R W

The parameter shows and sets the message scrolling speed.
"1" corresponds to maximum scrolling speed, "10" to minimum speed.
With "0" the message does not scroll and the display shows first 5 characters (on models 850 and 1650) or the first 7 characters (on model 1850).

Unit of measurement: -

Options: **0...10** (default = 3)

4.24.5. BACKL - Backlighting level

Acronym	Scrolling message	Submenu	Attributes
BACKL	BACKLIGHT LEVEL	HMI	R W

The parameter shows and sets the backlight level on the display (when the controller is on) 10 seconds after the last key has been pressed.
With "0," the backlight does not switch off, but goes to the minimum useful level for reading the display.
The backlight goes to maximum level when any key is pressed.

Unit of measurement: -

Options: **0...10** (default = 8)

4.24.6. QUICK - Quick configuration menu

Acronym	Scrolling message	Submenu	Attributes
QUICK	QUICK CONFIG ENABLE	HMI	R W

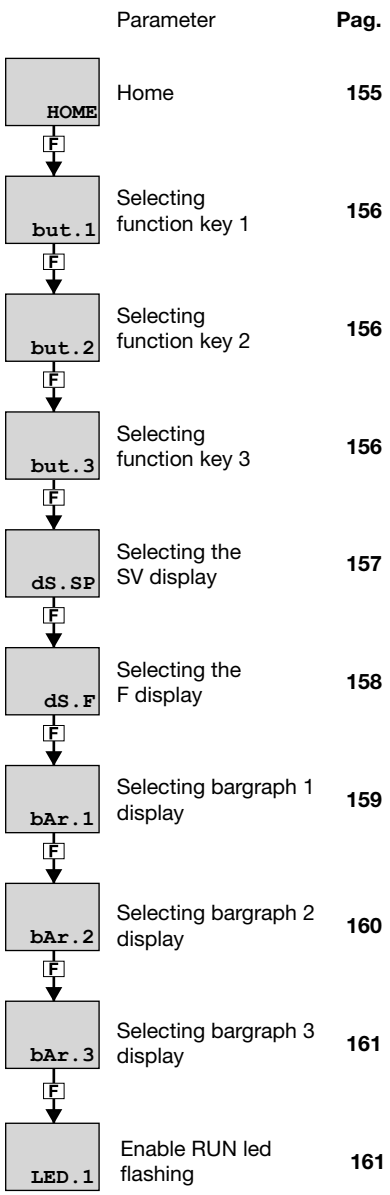
The parameter shows and sets enabling of the quick configuration menu.
The parameter appears only if the optional auxiliary input is NOT available.
At first power-on, the fast configuration menu is displayed on the controller model but is disabled for programmer or valve models.

Unit of measurement: -

Options:
OFF = Quick configuration menu is not displayed
On = Quick configuration menu is displayed

4.25. Submenu HOME - Configuration of display and keyboard in Home1 and Home2

Acronym	Scrolling message	Password	Description
HOME	HOME DISPLAY AND KEYBOARD	Level 2	Lets you configure the controller's display and keys in Home1 and Home2.



4.25.1. HOME - Selecting Home

Acronym	Scrolling message	Submenu	Attributes
HOME.N	HOME NUMBER	HOME	R W

The parameter shows and sets the identifying number of Home to configure.

Unit of measurement: Number

Options: **1...2**

4.25.2. BUT.1 - Selecting function key 1

Acronym	Scrolling message	Submenu	Attributes
but.1	HOME.1 (or HOME.2) KEY FUNCTION	HOME	R W

The parameter shows and sets the function assigned to key 1 (⏻) of the controller.

Unit of measurement: -

Options:

NONE = No function assigned
AU-MA = Automatic-Manual control
LO-RE = Local-remote setpoint mode
HOLD = Hold main input value
AL.ACK = Reset alarm latches
S.TUNE = Activate Self-Tuning
A.TUNE = Activate Auto-Tuning
OUT.S.R = Set/reset outputs set with BUT.SR function
INT.RS = Integral reset
CAL.HB = Calibrate HB alarm

if the Multiset function is enabled:
SP.SEL = Select setpoint M.SP1.1/M.SP2.1

if enabled Options Logics:
LFB.IN = Input logic Function Blocks

4.25.3. BUT.2 - Selecting function key 2

Acronym	Scrolling message	Submenu	Attributes
but.2	HOME.1 (or HOME.2) KEY FUNCTION	HOME	R W

The parameter shows and sets the function assigned to key 2 (L/R) of the 1350 controller.

Unit of measurement: -

Options: As per **but.1**

4.25.4. BUT.3 - Selecting function key 3

Acronym	Scrolling message	Submenu	Attributes
but.3	HOME.1 (or HOME.2) KEY FUNCTION	HOME	R W

The parameter shows and sets the function assigned to key 3 (✳) of the 1350 controller.

Unit of measurement: -

Options: As per **but.1**

4.25.5. DS.SP - Selecting the SV display

Acronym	Scrolling message	Submenu	Attributes
dS.SP	HOME.1 (or HOME.2) SV DISPLAY FUNCTION	HOME	R W

The parameter shows and sets the display assigned to the SV display.

Unit of measurement: -

Options:

NONE = NONE = Display off
SETP = Local setpoint / manual power or active setpoint (read only), in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled).
SSP = Active setpoint (read only)

if the model with auxiliary input
IN2 = Auxiliary input
OUT.P = Power control output (on 1850 LED % on)
SP-PV = Deviation |SP-PV|
HEAT = Heating power output with 0...100% control (on 1850 LED % on)
COOL = Cooling power output with 0...100% control (on 1850 LED % on)
HE+CO = Power control output -100...100% (positive for heating, negative for cooling) (on 1850 LED % on)

if the model with CT1+CT2:
CURR1 = Current input CT1 (on 1850 LED A on)
CURR2 = Current input CT2 (on 1850 LED A on)

if ENERG function enabled and model with CT1+CT2:
CURR = Load current (on 1850 LED A on)

if the ENERG function is enabled
OUT.KW = Power on load (on 1850 LED KW on)
EN.KWH = Energy transferred to load ((on 1850 LED KWh on)
if the Timer function is enabled:
TIM.RE = Remaining timer value
TIM.EL = Timer value lapsed

if controller model with valve control:
V.POSI = Valve position (on 1850 LED % on)

if the Programmer function is enabled in parameter PROGR on the EN.FUN menu:
P.TIME = Current step time (ramp or hold)
P.T.TIM = Program total theoretical time (only for model 850)
P.E.TIM = Program total real time (only for model 850)
P.T.TIM = Program total theoretical residual time (only for model 850)

IN1 = Main input

4.25.6. DS.F - Selecting the F display

Acronym	Scrolling message	Submenu	Attributes
dS.F	HOME.1 (or HOME.2) F DISPLAY FUNCTION	HOME	R W

The parameter shows and sets the display assigned to the F display.
The parameter appears only if the controller is 1650 or 1850.

Unit of measurement: -

Options:

NONE = No message (display off)
SETP = Local setpoint / manual power or active setpoint (read only), in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled).
SSP = Active setpoint (read only)

if model with auxiliary input:
IN2 = Auxiliary input

OUT.P = Power control output
SP-PV = Deviation |SP-PV|
HEAT = Heating power output with 0...100% control
COOL = Cooling power output with 0...100% control
HE+CO = Power control output -100...100% (positive for heating, negative for cooling)

if model with CT1+CT2:
CURR1 = Current input CT1
CURR2 = Current input CT2

if ENERG function enabled and model with CT1+CT2:
CURR = Load current

if the ENERG function is enabled
OUT.KW = Power on load
EN.KWH = Energy transferred to load

if the Timer function is enabled:
TIM.RE = Remaining timer value
TIM.EL = Timer value elapsed

if controller model with valve control:
V.POSI = Valve position

if the Programmer function is enabled in parameter PROGR on the EN.FUN menu:
P.TIME = Current step time (ramp or hold)
P.T.TIM = Program total theoretical time
P.E.TIM = Program total real time
P.R.TIM = Program total theoretical residual time

IN1 = Main input

4.25.7. BAR.1 - Selecting bargraph 1 display

Acronym	Scrolling message	Submenu	Attributes
bAr.1	HOME.1 (or HOME.2) BARGRAPH FUNCTION	HOME	R W

The parameter shows and sets the display assigned to the bargraph 2.
The parameter appears only if the controller is 1650 or 1850.
The parameter appears only if parameter bAr.E is at
- ON.ALL and NO.FRA (on 1650)
- ON.ALL, ON.AL1, NO.FRA and NO.FR1(on 1850)

Unit of measurement: -

Options:

PV = Process variable (the PV LED will light up only if this item is selected)
SETP = Local setpoint / manual power or active setpoint, in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled).
SSP = Active setpoint

if model with auxiliary input:
IN2 = Auxiliary input

OUT.P = Power control output
SP-PV = Deviation |SP-PV|
HEAT = Heating power output with 0...100% control
COOL = Cooling power output with 0...100% control
HE+CO = Power control output -100...100% (positive for heating, negative for cooling)

if model with CT1+CT2:
CURR1 = Current input CT1
CURR2 = Current input CT2

if ENERG function enabled and model with CT1+CT2:
CURR = Load current

if the ENERG function is enabled:
OUT.KW = Power on load
EN.KWH = Total energy transferred to load

if the Timer function is enabled:
TIM.RE = Remaining timer value
TIM.EL = Timer value elapsed

if controller model with valve control:
V.POSI = Valve position

if the Programmer function is enabled in parameter PROGR on the EN.FUN menu:
P.TIME = Current step time (ramp or hold))
P.T.TIM = Program total theoretical time
P.R.TIM = Program total theoretical residual time

IN1 = Main input

4.25.8. BAR.2 - Selecting bargraph 2 display

Acronym	Scrolling message	Submenu	Attributes
bAr.2	HOME.1 (or HOME.2) BARGRAPH FUNCTION	HOME	R W

The parameter shows and sets the display assigned to the bargraph 2.
The parameter appears only if the controller is 1650 or 1850.
The parameter appears only if parameter bAr.E is at
- ON.ALL and NO.FRA (on 1650)
- ON.ALL, ON.AL1, NO.FRA and NO.FR1(on 1850)

Unit of measurement: -

Options:

PV = Process variable
SETP = Local setpoint / manual power or active setpoint, in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled) (LED SP on)
SSP = Active setpoint (LED SP on)

if model with auxiliary input:
IN2 = Auxiliary input

OUT.P = Power control output
SP-PV = Deviation |SP-PV|
HEAT = Heating power output with 0...100% control
COOL = Cooling power output with 0...100% control
HE+CO = Power control output -100...100% (positive for heating, negative for cooling)

if model with CT1+CT2:
CURR1 = Current input CT1
CURR2 = Current input CT2

if ENERG function enabled and model with CT1+CT2:
CURR = Load current

if the ENERG function is enabled:
OUT.KW = Power on load
EN.KWH = Total energy transferred to load

if the Timer function is enabled:
TIM.RE = Remaining timer value
TIM.EL = Timer value elapsed

if controller model with valve control:
V.POSI = Valve position

if the Programmer function is enabled in parameter PROGR on the EN.FUN menu:
P.TIME = Current step time (ramp or hold))
P.T.TIM = Program total theoretical time
P.R.TIM = Program total theoretical residual time

IN1 = Main input

4.25.9. BAR.3 - Selecting bargraph 3 display

Acronym	Scrolling message	Submenu	Attributes
bAr.3	HOME.1 (or HOME.2) BARGRAPH FUNCTION	HOME	R W

The parameter shows and sets the display assigned to the bargraph 3.
The parameter appears only if the controller is 1650 or 1850.
The parameter appears only if parameter bAr.E is at
- ON.ALL, NO.FRA and ON.3LY (on 1650)
- ON.ALL, ON.AL1, NO.FRA, NO.FR1, ON.3LY and ON.3L1 (on 1850)

Unit of measurement: -

Options:

PV = Process variable
SETP = Local setpoint / manual power or active setpoint, in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled).
SSP = Active setpoint

se modello con ingresso ausiliario:
IN2 = Auxiliary input

OUT.P = Power control output (when this item is selected the % LED will light up)
SP-PV = Deviation |SP-PV|
HEAT = Heating power output with 0...100% control
COOL = Cooling power output with 0...100% control
HE+CO = Power control output -100...100% (positive for heating, negative for cooling)

if model with CT1+CT2:
CURR1 = Current input CT1
CURR2 = Current input CT2

if ENERG function enabled and model with CT1+CT2:
CURR = Load current

if the ENERG function is enabled:
OUT.KW = Power on load
EN.KWH = Total energy transferred to load

if the Timer function is enabled:
TIM.RE = Remaining timer value
TIM.EL = Timer value elapsed

if controller model with valve control:
V.POSI = Valve position

if the Programmer function is enabled in parameter PROGR on the EN.FUN menu:
P.TIME = Current step time (ramp or hold))
P.T.TIM = Program total theoretical time
P.R.TIM = Program total theoretical residual time

IN1 = Main input

4.25.10. LED.1 - Enable RUN led flashing

Acronym	Scrolling message	Submenu	Attributes
LED.1	ABLE OF RUN LED BLINKING	HOME	R W

The parameter enables and disabled RUN led flashing

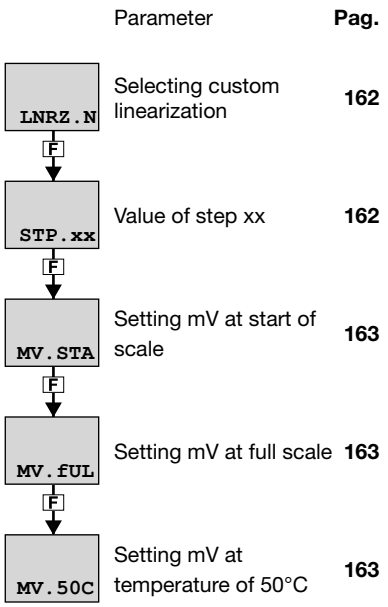
Unit of measurement: -

Options:

OFF = Disables RUN led flashing
On = Enables RUN led flashing

4.26. Submenu LINRZ - Configuring custom linearization

Acronym	Scrolling message	Password	Description
LINRZ	CUSTOM LINEARIZATION CONFIG	Level 2	Lets you configure the parameters for custom linearization in 32 steps or 4 points. The submenu is visible only if custom linearization was enabled in the configuration of the main input or of the auxiliary input.



4.26.1. LNRZ.N - Selecting custom linearization

Acronym	Scrolling message	Submenu	Attributes
LNRZ.N	CUSTOM LINEARIZATION NUMBER	LINRZ	R W

The parameter shows and sets the identifying number of the custom linearization to be configured.

Unit of measurement: Number

Options: **1...2**

4.26.2. STP.xx - Value of step xx

Acronym	Scrolling message	Submenu	Attributes
STP.xx	LINRZ.1 (or LINRZ.2) CUSTOM LINEARIZATION STEP	LINRZ	R W

The parameter shows and sets the value of the various steps, with xx from 0 to 32.
The start scale value goes in STP.00 and the full-scale value in STP.32.

The value of the nth step corresponds to the input: mV start scale + n*ΔmV con ΔmV = (mV full scale - mV start scale)/32.

Unit of measurement: Scale points

Options: **-1999...9999**

4.26.3. MV.STA - Setting mV at start of scale

Acronym	Scrolling message	Submenu	Attributes
MV.STA	LINRZ.1 (or LINRZ.2) MV START SCALE	LINRZ	R W

The parameter shows and sets the value in millivolts at start of scale if the input is a thermocouple.
The parameter appears only if 32-step linearization has been selected (see paragraph “4.8.5. LIN – Selecting linearization type” on page 82)

Unit of measurement: mV

Options: **-19.99...99.99**

4.26.4. MV.FUL - Setting mV at full scale

Acronym	Scrolling message	Submenu	Attributes
MV.FUL	LINRZ.1 (or LINRZ.2) MV FULL SCALE	LINRZ	R W

The parameter shows and sets the value in millivolts at full scale if the input is a thermocouple.
The parameter appears only if 32-step linearization has been selected (see paragraph “4.8.5. LIN – Selecting linearization type” on page 82)

Unit of measurement: mV

Options: **MV.STA + 1...99.99**

4.26.5. MV.50c - Setting mV at temperature of 50 °C

Acronym	Scrolling message	Submenu	Attributes
MV.50C	LINRZ.1 (or LINRZ.2) MV AT 50 ‘C	LINRZ	R W

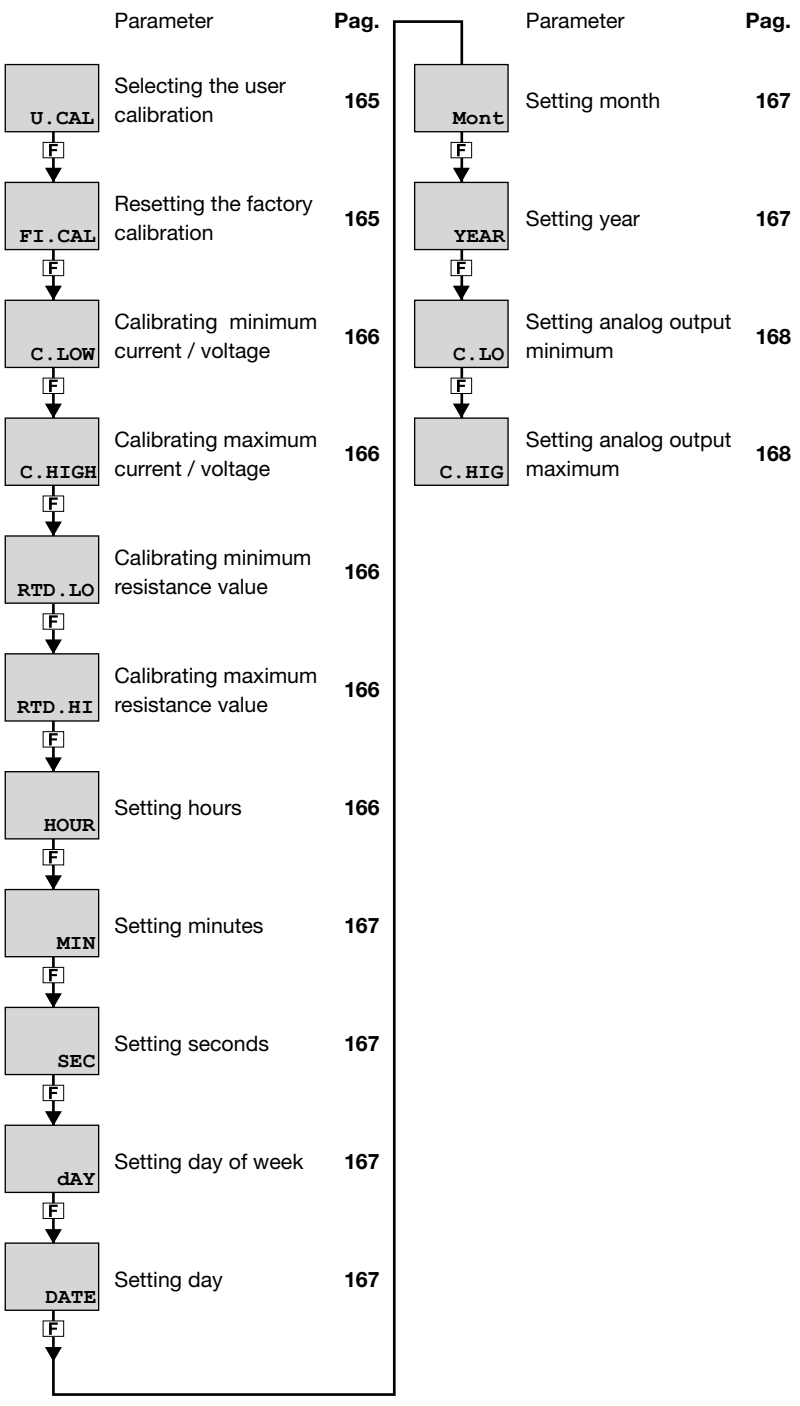
The parameter shows and sets the value in millivolts at 50°C if the input is a thermocouple.
The parameter appears only if 32-step linearization has been selected (see paragraph “4.8.5. LIN – Selecting linearization type” on page 82)

Unit of measurement: mV

Options: **-1.999...9.999**

4.27. Submenu US.CAL - User calibrations

Acronym	Scrolling message	Password	Description
US.CAL	USER CALIBRATION MANAGER	Level 2	Lets the user calibrate the controller with regard to Custom main input, HB alarm setpoints, energy reset, and partial day count.



4.27.1. U.CAL - Selecting the user calibration

Acronym	Scrolling message	Submenu	Attributes
U.CAL	USER CALIBRATION TYPE	US.CAL	R W

The parameter shows and sets the parameter, input or output to which calibration will be applied.

Unit of measurement: -

Options:

NONE = No calibration

AL.HB = HB alarm calibration. It is made up of 3 progressive phases:
Phase 1: OUTPUT SWITCH ON message, the output is 100% on when the button is pressed F (set in parameter OUT in sub-menu AL.HB) and switch to phase 2.
Phase 2: CALIBRATION RUNNING message, the percent current value (set in parameter THR.PE in sub-menu AL.HB) is calculated and saved in parameter LOW.ON when the button is pressed F and switch to phase 3.
Phase 3: END CALIBRATION message, calibration ends when the button is pressed F.

RTC = Real Time Clock setting
the data in the RTC at each power-on are initialized to:
HOUR = 0 MIN = 0 SEC = 0
dAY = MONDA DATE = 1 Mont = JANUA
YEAR = 00

ENRG1 = Reset energy count 1 (totalizer EN.KWH1 and time EN.TIM1)

P.DAYS = Reset partial day count

I.MAIN = Calibration of custom main input (selected with parameter TYPE on INPUT.1 menu)

I.AUX = Calibration of remote setpoint input (selected with parameter TYPE on INPUT.2 menu)

I.CT1 = CT1 input custom calibration

I.CT2 = CT2 input custom calibration

OUT.A1 = Calibration of custom retransmission output (selected with parameter t.o.A1 on OUT.AN menu)

OUT.A2 = Calibration of custom retransmission output (selected with parameter t.o.A2 on OUT.AN menu)

OUT.C = Calibration of continuous output (OUT.A for 850 - OUT.C for 1650-1850)

ENRG2 = Reset energy count 2 (E.KWH2 totalizer and E.TIM2 time)

CY.RES = Reset switching cycle count shown in INDG.S

VALV.P = Auxiliary input calibration with valve position function.
It is made up of 6 progressive phases:
Phase 1: START CALIBRATION message, switch to phase 2 after approximately 4 sec.
Phase 2: VALVE OPEN message and indication of increasing percent progress, output V.OPEN is on for the time set in parameter TRAVL in sub-menu VALVE increased by 10% and switch to phase 3.
Phase 3: SAVE MAX message, the maximum auxiliary input calibration value is saved and switch to phase 4.
Phase 4: VALVE CLOSE message and indication of decreasing percent progress, output V.CLOS is on for the time set in parameter TRAVL in sub-menu
VALVE increased by 10% and switch to phase 5.
Phase 5: SAVE MIN message, the minimum auxiliary input calibration value is saved and switch to phase 6.
Phase 6: END CALIBRATION message, calibration ends after approximately 4 sec.
Calibration only occurs for the valve model with auxiliary input, linear custom type FUnC=VALV.P function, and with an output set as V.OPEN and output set as V.CLOS.
Calibration can be aborted at any time by pressing the regulator key ⏻.

4.27.2. FI.CAL - Resetting the factory calibration

Acronym	Scrolling message	Submenu	Attributes
FI.CAL	FACTORY CALIBRATION	US.CAL	R W

The parameter shows and sets resetting of the factory calibration.
This operation can be done only for inputs and outputs, if U.CAL corresponds to I.MAIN, I.AUX, I.CT1, I.CT2, OUT.A1, OUT.A2 or OUT.C..

Unit of measurement: -

Options:

no = Keep user calibration

YES = Reset factory calibration

4.27.3. C.LOW - Calibrating minimum current / voltage

Acronym	Scrolling message	Submenu	Attributes
C.LOW		US.CAL	R W

The parameter appears if you are calibrating a main input or custom auxiliary input in current or voltage.
To calibrate:
- apply the current or voltage value corresponding to minimum scale value to the selected input;
- press the F key to acquire the calibration value.

Unit of measurement: -

Options: -

4.27.4. C.HIGH - Calibrating minimum current / voltage

Acronym	Scrolling message	Submenu	Attributes
C.HIGH		US.CAL	R W

The parameter appears if you are calibrating a main input or custom auxiliary input in current or voltage.
To calibrate:
- apply the current or voltage value corresponding to minimum scale value to the selected input;
- press the F key to acquire the calibration value.

Unit of measurement: -

Options: -

4.27.5. RTD.LO - Calibrating minimum resistance value

Acronym	Scrolling message	Submenu	Attributes
RTD.LO		US.CAL	R W

The parameter appears if you are calibrating a main input or custom RTD auxiliary input.
To calibrate:
- apply a resistance corresponding to minimum scale value to the main input (for example, 18.52 Ω for Pt100 ;
- press the F key to acquire the calibration value.

Unit of measurement: -

Options: -

4.27.6. RTD.HI - Calibrating maximum resistance value

Acronym	Scrolling message	Submenu	Attributes
RTD.HI		US.CAL	R W

The parameter appears if you are calibrating a main input or custom RTD auxiliary input.
To calibrate:
- apply a resistance corresponding to maximum scale value to the main input (for example, 390.48 Ω for Pt100);
- press the F key to acquire the calibration value.

Unit of measurement: -

Options: -

4.27.7. HOUR - Setting hours

Acronym	Scrolling message	Submenu	Attributes
HOUR		US.CAL	R W

The parameter shows and sets the hours on the Real Time Clock, if U.CAL = RTC.

Unit of measurement: Hours

Options: **0...23**

4.27.8. MIN - Setting minutes

Acronym	Scrolling message	Submenu	Attributes
MIN		US.CAL	R W

The parameter shows and sets the minutes on the Real Time Clock, if U.CAL = RTC.

Unit of measurement: Minutes

Options: **0...59**

4.27.9. SEC - Setting seconds

Acronym	Scrolling message	Submenu	Attributes
SEC		US.CAL	R W

The parameter shows and sets the seconds on the Real Time Clock, if U.CAL = RTC.

Unit of measurement: Seconds

Options: **0...59**

4.27.10. DAY - Setting day of week

Acronym	Scrolling message	Submenu	Attributes
dAY		US.CAL	R W

The parameter shows and sets the day of the week on the Real Time Clock, if U.CAL = RTC.

Unit of measurement: Day of week

Options: **MONDA...SUNDA**

4.27.11. DATE - Setting day

Acronym	Scrolling message	Submenu	Attributes
DATE		US.CAL	R W

The parameter shows and sets the day on the Real Time Clock, if U.CAL = RTC.

Unit of measurement: Number of day

Options: **1...31**

4.27.12. MONT - Setting month

Acronym	Scrolling message	Submenu	Attributes
Mont		US.CAL	R W

The parameter shows and sets the month on the Real Time Clock, if U.CAL = RTC.

Unit of measurement: Month

Options: **JANUA...DECEM**

4.27.13. YEAR - Setting year

Acronym	Scrolling message	Submenu	Attributes
YEAR		US.CAL	R W

The parameter shows and sets the year on the Real Time Clock, if U.CAL = RTC.

Unit of measurement: Year

Options: **0...99**

4.27.14. C.LO - Setting analog output minimum

Acronym	Scrolling message	Submenu	Attributes
C.LO		US.CAL	R W

The parameter shows and sets the minimum analog output value.
You can change the displayed value with the [△] and [▽] keys.
To check the real voltage/current value on the output during calibration, measure it with a voltmeter/ammeter.

Unit of measurement: Converter points

Options: **0...65535**

4.27.15. C.HIG - Setting analog output maximum

Acronym	Scrolling message	Submenu	Attributes
C.HIG		US.CAL	R W

The parameter shows and sets the maximum analog output value.
You can change the displayed value with the [△] and [▽] keys.
To check the real voltage/current value on the output during calibration, measure it with a voltmeter/ammeter.

Unit of measurement: Converter points

Options: **0...65535**

4.28. PASC0 - Setting level 0 password 0

Acronym	Scrolling message	Submenu	Attributes
PASC0	SET PASS0	Level 2	R W

This parameter may be used to set the password to access User Menu parameters.
Default code: 10.

Unit of measurement: Number

Options: **0...9999**

4.29. PASC1 - Setting level 1 password 1

Acronym	Scrolling message	Submenu	Attributes
PASC1	SET PASS1	Level 2	R W

This parameter may be used to set the password to access the level 1 configuration submenu and User Menu parameters.
Default code: 1.

Unit of measurement: Number

Options: **0...9999**

4.30. PASC2 - Setting level 2 password 2

Acronym	Scrolling message	Submenu	Attributes
PASC2	SET PASS2	Level 2	R W

The parameter lets you set the password for accessing level 2 configuration submenus.
Default code: 2.

Unit of measurement: Number

Options: **0...9999**

4.31. FI.CFG - Entering the reset code

Acronym	Scrolling message	Submenu	Attributes
FI.CFG	ENTER DEFAULT CONFIGURATION PASS	Level 2	R W

The parameter lets you set the code for resetting the controller to factory configuration, which will delete all changes made.
Default code: 99.

ATTENTION! After you have set code 99, when you press the F key the controller runs the Power-on procedure, as described in paragraph “3.2. Sequence at power-on.”

Unit of measurement: Number

Options: **0...9999**

5. EXAMPLES AND APPLICATION NOTES

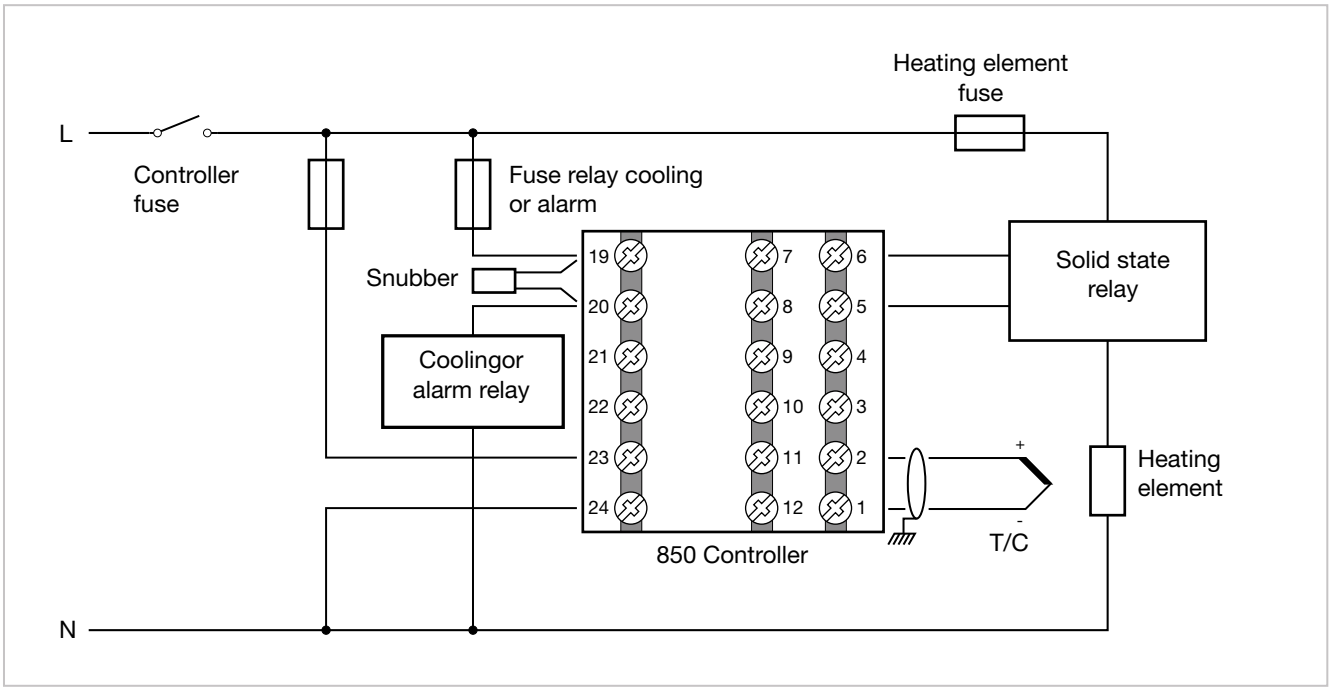
5.1. Heat/cool control application

A 850 controller (model 850–D-R00-00000-1) controls a heating element via a solid-state relay connected to a logic output.
A TC sensor measures the temperature.
Each branch of the circuit is protected by a fuse.
The cooling or alarm relay is protected by a snubber.
The following diagram shows the various connections.
One switch can control more than one controller.

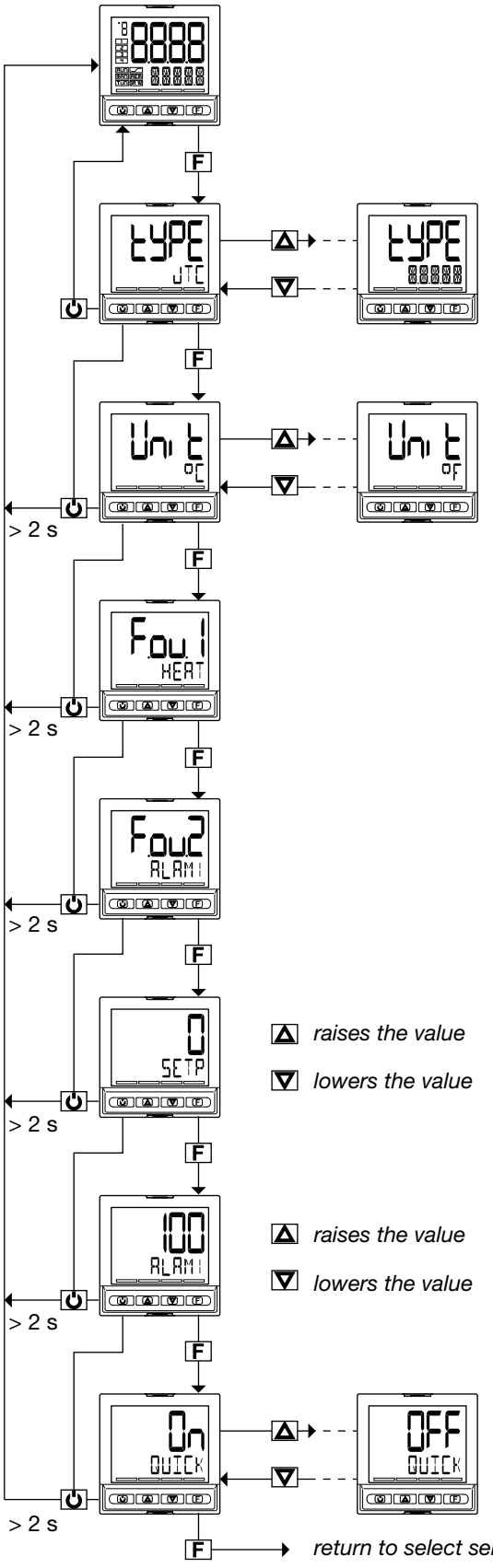
With Quick Configuration you set:

- sensor type (TC);
- unit of measurement of temperature (°C);
- the logic output function (HEAT);
- the relay output function (ALRM1);
- the setpoint, i.e. the temperature to be maintained (SETP);
- the temperature value that trips the alarm (ALRM1)

5.1.1. Connection diagram



5.1.2. Quick configuration procedure for model 850–D-R00-00000-1



Home

Selecting sensor type

Selecting unit of measurement
The unit of measurement can be °C or °F only if a TC or RTD sensor is selected

Select output 1 function
The functions proposed are based on type of logic output.

Select output 2 function
The functions proposed are based on type of logic output.

Setting Setpoint

Setting Alarm 1
Default: direct maximum absolute

Enable/disable quick configuration

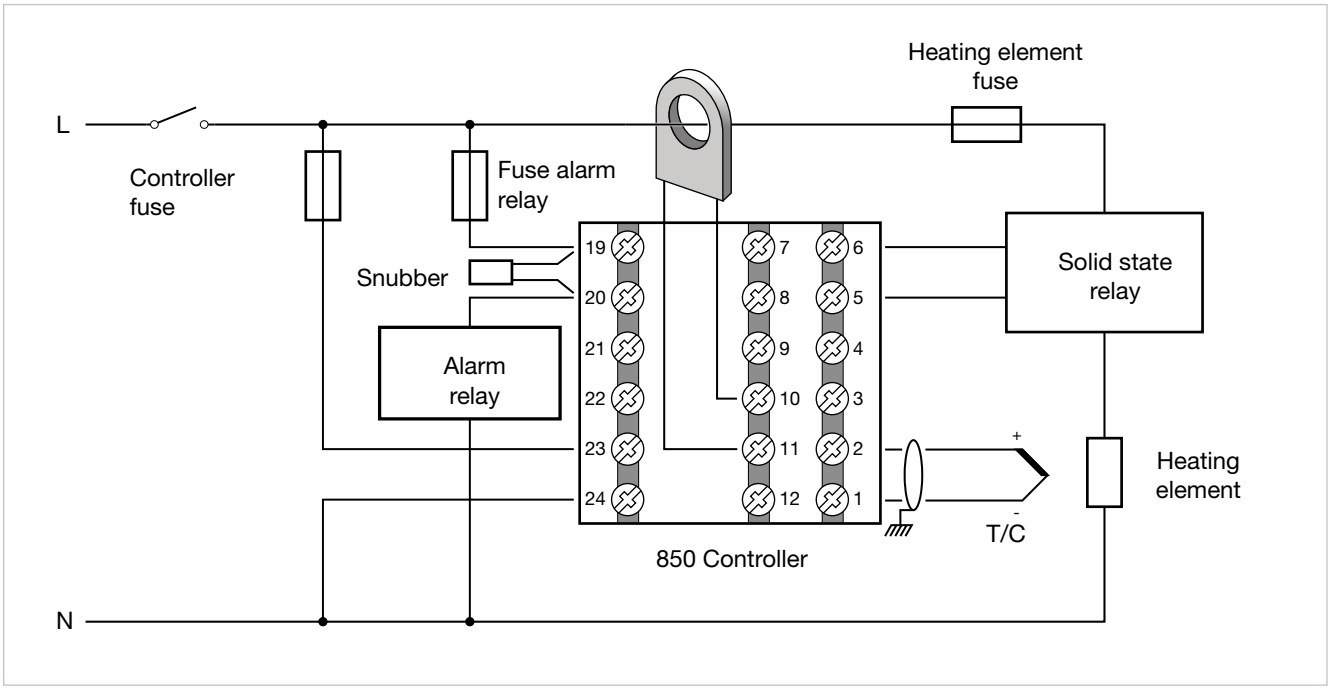
5.2. Heating control and current (CT) application

A 850 controller (model 850–D-R00-00100-1) controls a heating element via a solid-state relay connected to a logic output.
A TC sensor measures the temperature.
Each branch of the circuit is protected by a fuse.
The alarm relay is protected by a snubber.
A current transformer is connected to a dedicated input to indirectly measure electrical consumption.
The following diagram shows the various connections.
One switch can control more than one controller.

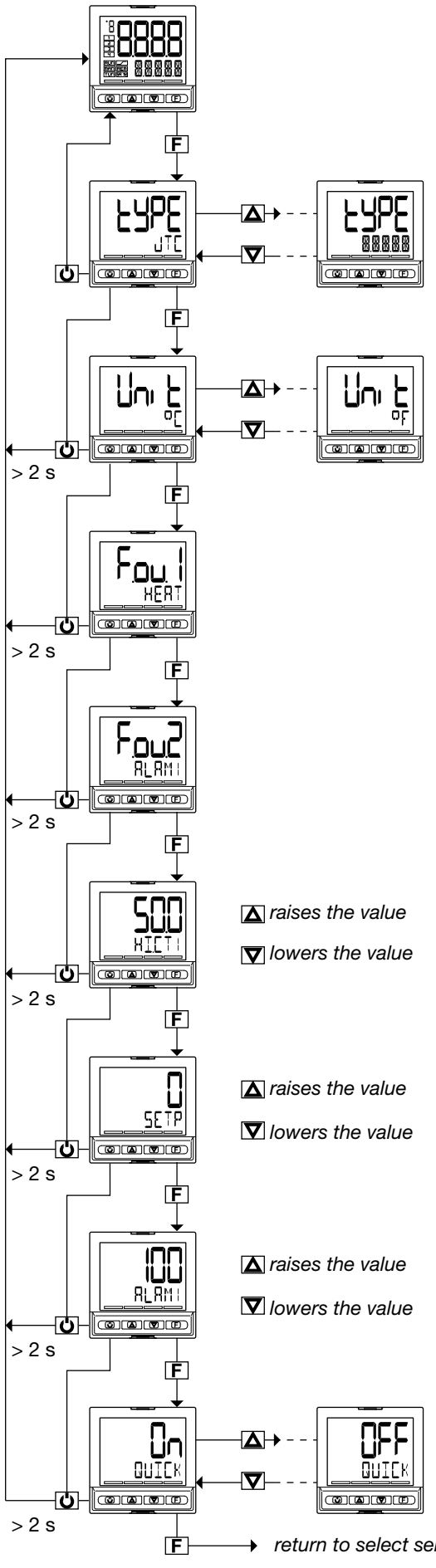
With Quick Configuration you set:

- sensor type (TC);
- unit of measurement of temperature (°C);
- the logic output function (HEAT);
- the relay output function (ALRM1);
- the full-scale value of the CT1 current transformer (HI.CT1)
- the setpoint, i.e. the temperature to be maintained (SETP);
- the temperature value that trips the alarm (ALRM1).

5.2.1. Connection diagram



5.2.2. Quick configuration procedure for model 850-D-R00-00100-1



Home

Selecting sensor type

Selecting unit of measurement
The unit of measurement can be °C or °F only if a TC or Rtd sensor is selected

Select output 1 function
The functions proposed are based on type of logic output.

Select output 2 function
The functions proposed are based on type of logic output.

Full-scale of the CT1 current transformer

Setting Setpoint

Setting Alarm 1
Default: direct maximum absolute

Enable/disable quick configuration

5.3. Auxiliary Input

The value of the auxiliary analog input is shown in parameter IN2.

The function can be:
- display only (with settable alarms if required);
- process variable for PID.2;
- reference for the PID.1 ratio controller if in REMOTE mode;
- process variable (PV) setpoint for PID.1 if the controller is in REMOTE mode;
- POWER setpoint for PID.1 if the controller is in MANUAL and REMOTE mode;
- reset power for PID.1
- valve position

The scale limit values of the input are settable on the configuration menu with parameters LO.SCL and HI.SCL (INPUT.2 menu).

The parameter IN2 is shown in read-only on the user configuration menu..

5.4. 4-point input correction

The 4-point input correction lets you correct the read of the main input and/or of the auxiliary input by setting four values: A1, B1, A2 and B2.
To enable the function, set parameter Lin at 4.POIN (INPUT.1 menu for main input or INPUT.2 for auxiliary input).

The limitations are:
- B1 must always be larger than A1;
- B1-A1 must be 10% larger than the full scale of the selected sensor.

The setting is limited within the defined scale LO.SCL... HI.SCL (INPUT.1 menu for main input or INPUT.2 for auxiliary input). The offset function (parameter OF.SCL, I.MAIN menu) remains enabled.

By using this function for linear scales (60 mV, 1 V, 5 V, 10 V, 20 mA) you can invert the scale.
The four values are set on the LINRZ menu as follows:
- A1 = STP.00
- B1 = STP.01
- A2 = STP.02
- B2 = STP.03

Example
Select Pt100 input with Lin = 4.POIN to obtain an RTD sensor with 4-point input correction.

Input Pt100 with:
- Lin = 4.POIN (Pt100 natural scale -200...850),
- DEC.P = 0
- LO.SCL = 0
- HI.SCL = 400

The reference points on the real curve (input) are:
- A1 = STP.00 = 50,
- B1 = STP.01 = 350,

B1-A1 = 300, which is larger by 85 (10% of 850).

The corresponding points on the corrected curve (indication) are:
- A2 = STP.02 = 120,
- B2 = STP.03 = 220.

With the corrected curve an input value of 200 is displayed as 170.

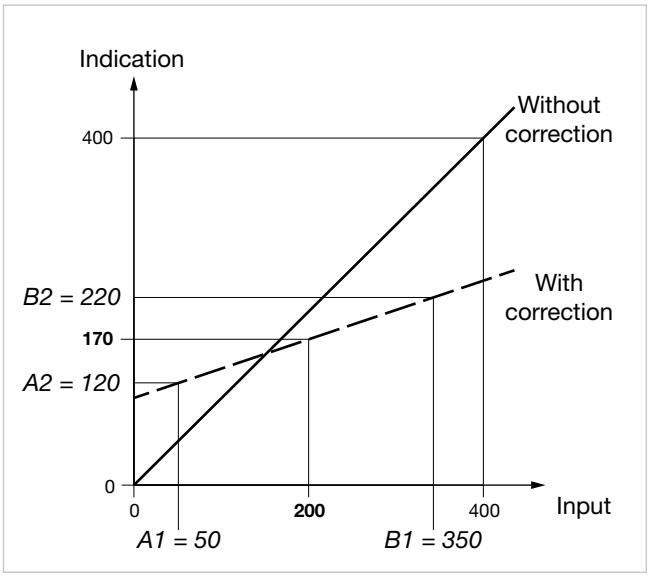


Figure 17 - Diagram of 4-point input correction, for the example (Pt100 input)

5.5. Current inputs

The values of current inputs CT1 and CT2 are shown in parameters CURR1 and CURR2.

These values are used in generic alarms AL1… AL4 and especially for the HB alarm

The maximum scale value of the input is shown by parameter HI.CT1 on submenu I.CT1 for CT1, and by parameter HI.CT2 on submenu I.CT2 for CT2

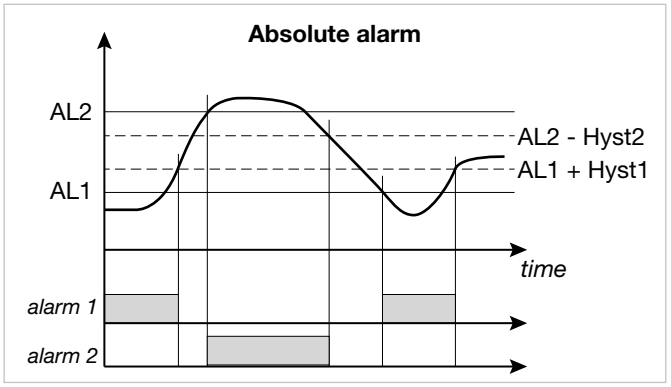
5.6. Alarms

5.6.1. AL1...AL4 Generic alarms

Generic alarms AL1…AL4 can be mainly 4 types, as described below:

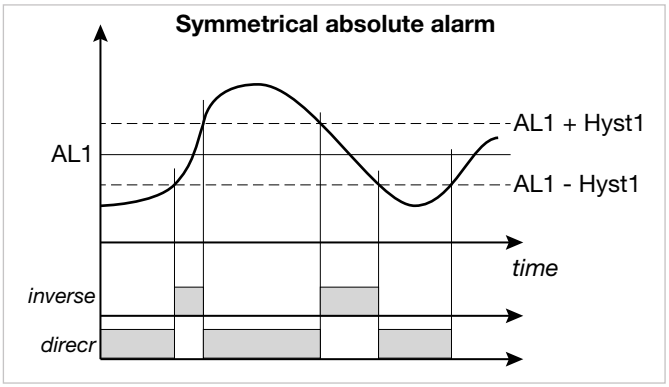
Absolute alarm

AL1 inverse and absolute, AL2 direct and absolute.
Two alarm setpoints, AL1 (lower setpoint) and AL2 (upper setpoint) are set, corresponding to two specific hysteresis values, Hyst1 (positive) and Hyst2 (negative).
The alarm trips when the measured value remains less than AL1 or greater than AL2 for the set delays.
The alarm condition ends when the measured value is greater than AL1 + Hyst 1, or less than AL2 - Hyst2.
This prevents repeated alarms caused by slight changes in the measured value.
Any alarm message at power-on, when the equipment is not at full speed, can be avoided by setting disable at power-on.



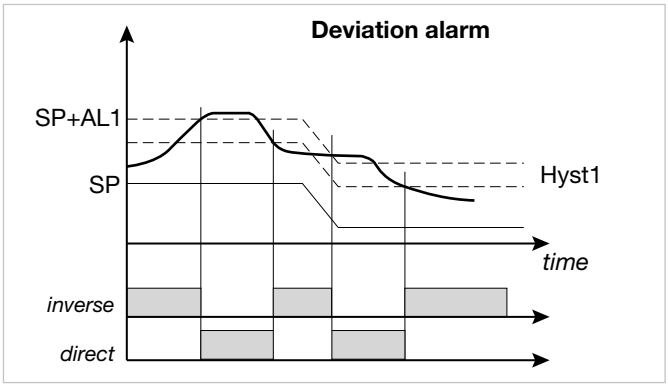
Symmetrical absolute alarm

A single alarm setpoint AL1 and a single hysteresis value Hyst1 are set.
When a direct alarm is set, the alarm trips when the measured value is less than AL1 - Hyst1 or greater than AL1 + Hyst1 for the set delay.
When a inverse alarm is set, the alarm trips when the measured value is greater than AL1 - Hyst1 or less than AL1 + Hyst1 for the set delay.



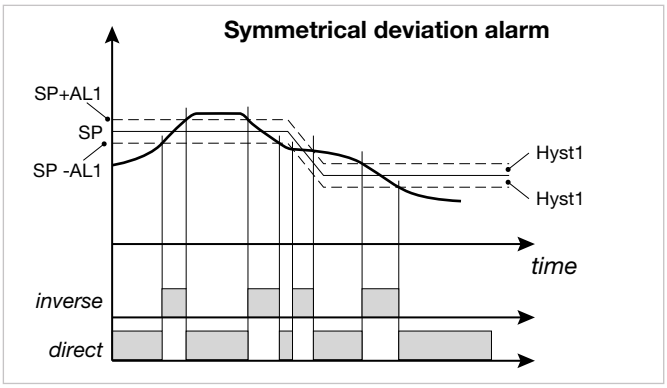
Deviation alarm

A single alarm setpoint AL1 and a single hysteresis value Hyst1 (negative) are set.
When a direct alarm is set, the alarm trips when the measured value is greater than SP + AL1 for the set delay.
The alarm condition ends when the measured value is less than SP + AL1 - Hyst1.
When a inverse alarm is set, the alarm trips when the measured value is less than SP + AL1 - Hyst1 for the set delay.
The alarm condition ends when the measured value exceeds SP + AL1.
The deviation alarm lets you implement dynamic setpoints that automatically follow the trend.



Symmetrical deviation alarm

A single alarm setpoint AL1 and a single hysteresis value Hyst1 are set.
When a direct alarm is set, the alarm trips when the measured value is less than SP - AL1 or greater than SP + AL1.
When an inverse alarm is set, the alarm trips when the measured value is between SP - AL1 and SP + AL2



5.6.2. HB alarm

This type of alarm calls for the use of the current transformer input (I.CT1 / I.CT2), which is assigned to a control output, from which the ON and OFF phases are considered.

The alarm signals changes in load draw, discriminating the value of currents for current inputs I.CT1 and I.CT2.

The alarm is active if the rms current value:
- is below set value LOW.ON in the ON time of the of the assigned control output,
- is above set value HIG.ON in the ON time of the of the assigned control output,
- is above set value HI.OFF in the OFF time of the of the assigned control output.

Single tests are disabled by setting a value of “0.0”.

The HB alarm trips if one of the above setpoints is exceeded for the set TIME.
Each of the three conditions may indicate a problem in the process managed by the assigned control output.

HB alarm tests are activated only with ON times of the assigned output longer than 0.4 seconds.

The alarm resets automatically if the condition that caused it is eliminated.

The load current is shown by parameters CURR1 and CURR2 on the user configuration menu.

Note:
ON/OFF times refer to the cycle time set for the control output selected in OUT.

During configuration, you have to indicate load type with LoAd, specifying if it is a monophase load with only one current transformer CT1 (MONO), a 3-phase star load no neutre with CT1 and CT2 (STAR), or a 3-phase delta load with CT1 and CT2 (DELTA).

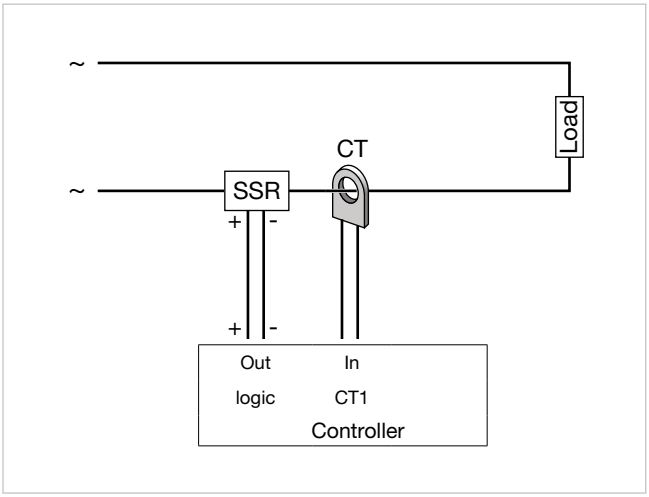


Figure 18 - HB alarm with monophase load

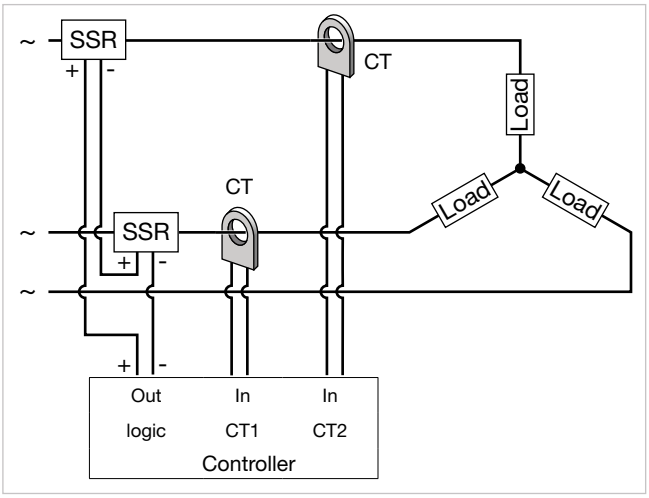


Figure 19 - HB alarm with 3-phase star load without Neutral

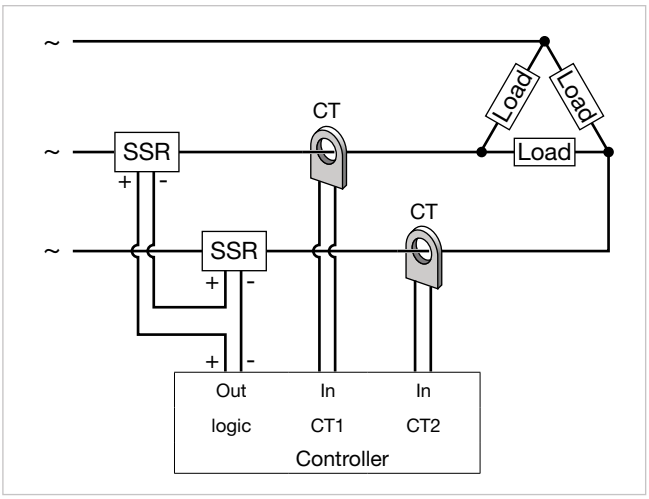


Figure 20 - HB alarm with 3-phase delta load

A 3-phase load can be controlled by means of a logic output connected in series to two SSR modules.

HB alarm calibration
Calibration is possible:
- using U.CAL = AL.HB user calibration (with output selected in OUT 100% on)
- as a function of the settable front key (but.1 for model 850, but.1 or but.2 or but.3 for models 1650 and 1850): to acquire the current value, the automatic or manual power must be > 10%; press the key to confirm the current percent value (set in parameter THR.PE) that is saved in parameter LOW ON

5.6.3. LBA alarm

This alarm signals an interrupt in the control loop as a possible consequence of a sensor in short circuit, an inverted sensor, or a load break.

It trips an alarm if the variable does not increase its value in heating (or does not decrease it in cooling) when maximum power is supplied for settable time LBA.TM.
LBA alarm in the presence of ON-OFF control (of heating, cooling and heating, and heating/cooling).
In the presence of PID control with ON-OFF heating or

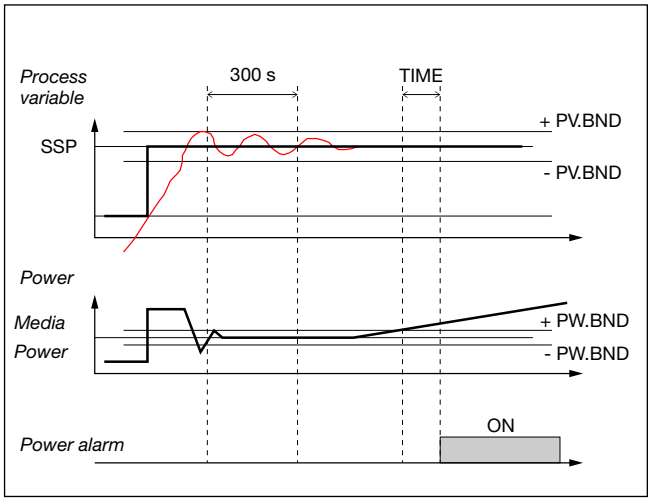
cooling, LBA.PW can only be set for the PID part.

5.6.4. Power alarm

The power alarm can be linked to each PID, PID1 and PID2 control LOOP.
The alarm is inactive if the control is ON/OFF during Self-Tuning and in Manual.
The alarm signals possible power changes (OUT.P1 or OUT. P2) after the process variable (PV) has stabilized on the setpoint (SSP active).
The process variable is considered stable after 300 seconds.
The reference power is refreshed only at power-on or after a setpoint change.
If the process variable exits the stabilization band after an initial stabilization, this has no effect on the alarm.

In case of PV in SBR or Err error:
- if the PV has not yet stabilized, FAULT power is supplied;
- if the PV has stabilized, the average power for the last 5 minutes is supplied.

Set a power alarm as follows:
- If necessary, assign an output (OUTPU.1 …OUTPU.4) for the power alarm (POWR1 for PID1 or POWR2 for PID2).
- Set the band (PV.BND) within which the process variable is considered stable after 300 seconds have elapsed.
- Set the band (PW.BND) outside of which the alarm is activated after TIME has elapsed.
  The reference power is the active power after 300 seconds.



The alarm is reset and the reference power is refreshed only at power-on or after a change of the SSP setpoint.

5.7. Retransmission output

The retransmission output is used mainly to retransmit the OUT.PW control power.

The percentage of actuation value is shown by read-only parameter OUT. AN on the user configuration menu.

5.8. Switching the software on/off

5.8.1. How to switch it off

Keep the F and △ keys pressed for 5 seconds to deactivate the controller.
The device goes to an “OFF” state and assumes the behavior of a controller switched off.

The voltage is not switched off: the process variable (PV) display stays on, but the SV display is off.

All outputs (control and alarms) are OFF (logic level 0, relays de-energized) and all controller functions are inhibited except “POWER-UP”, serial communication and the Math Function Blocks.

The programmers are suspended in their current condition.

5.8.2. How to switch it on

Keep the F key pressed for 5 seconds: the controller goes from “OFF” to “ON” state.

At exit from software off condition, the programmers resume execution at the point where they stopped when software was shut off.

If voltage is switched off during the “OFF” state, at the next Power-up the controller returns to “OFF” state (the controller latches the “ON/OFF”).

Functioning is normally enabled. To disable it, set the parameter On.OF = disab. on the MODE configuration menu.
This function can be assigned to a digital input (F.in.x, parameter ON-OF), excluding deactivation from the keypad.

5.9. Soft-Start

If enabled (by setting SOFT.S = ON on the PID configuration menu), the Soft-Start function slices power based on the percentage of time lapsed since controller power-on compared to the time set in the parameter SOFT.T

Soft-Start is an alternative to Self-Tuning and is activated after every controller power-on.
The Soft-Start action is reset in Automatic-Manual switching.

5.10. Tuning

5.10.1. Tuning actions

Tuning actions are divided into 3 categories:
- **Proportional**: action in which the contribution on the output is proportional to the deviation in input.
- **Derivative**: action in which the contribution on the output is proportional to the speed of change of the deviation in input.
- **Integral**: action in which the contribution on the output is proportional to the integral in time of the deviation in input.

The deviation is the offset between the measured value of the controlled variable and the setpoint.
Tuning actions let you achieve optimum tuning of the controlled process in every phase.

5.10.1.1. Influence of Proportional, Derivative and Integral actions on response of controlled process

The response of the controlled process depends on the type of control action set. Specifically:
- Increasing the Proportional Band reduces oscillations but increases the deviation.
- Decreasing the Proportional Band reduces the deviation but causes oscillations of the controlled variable (excessively low Proportional Band values make the system unstable).
- Increasing the Derivative Action, corresponding to an increase in Derivative Time, reduces the deviation and prevents oscillations up to a critical value of Derivative Time, beyond which it increases the deviation and causes prolonged oscillations.
- Increasing the Integral Action, corresponding to a decrease in Integral Time, tends to cancel the deviation at full speed between the controlled variable and the setpoint.
- If the Integral Time value is too long (weak Integral action), there may be persistence of the deviation between the controlled variable and the setpoint.

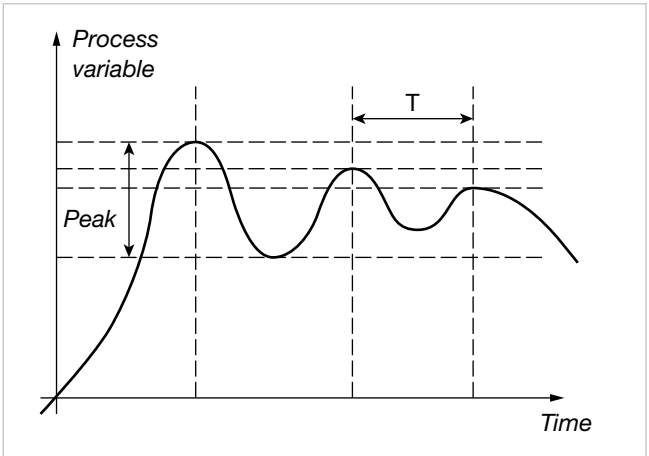
For more information on tuning actions, contact Gefran Customer Care.

5.10.2. Manual tuning

Manual tuning is done as follows:
1. Set the setpoint to the working value.
2. Set the Proportional Band to 0.1% (with ON-OFF control).
3. Switch to automatic and watch the behavior of the variable.
   There will be behavior similar to that shown in the following figure.
4. Calculate the PID parameters:
   - Proportional Band P.B. value

$$P.B. = \frac{Peak}{V_{max} - V_{min}} \times 100$$

   where $V_{max} - V_{min}$ is the scale interval.
   - Integral Time value It = 1.5 x T
   - Derivative Time value dt = It / 4



5. Switch the controller to manual.
6. Set the calculated parameters (re-enable PID control by setting a cycle time for relay output if necessary).
7. Switch to automatic.
8. To check optimization of the parameters, change the setpoint value if possible and check transitory behavior: if oscillation persists, increase the Proportional Band value; on the other hand, if the response is too slow, decrease the value.

5.10.3. Self-Tuning

Self-Tuning is a simplified and automatic tuning mode based on the process state.
The purpose of Self-Tuning is to calculate optimum control parameters at the start of the process.
The variable (for example, temperature) must be the one measurable at zero power (room temperature).

You can automatically start tuning at every power-on or start it by means of the appropriately configured ( ) key.
The procedure runs automatically by optimizing the approach in relation to the real temperature value, in case of (relay, solid-state, Triac) control output, with automatic calculation of optimal cycle time CY.TIM.

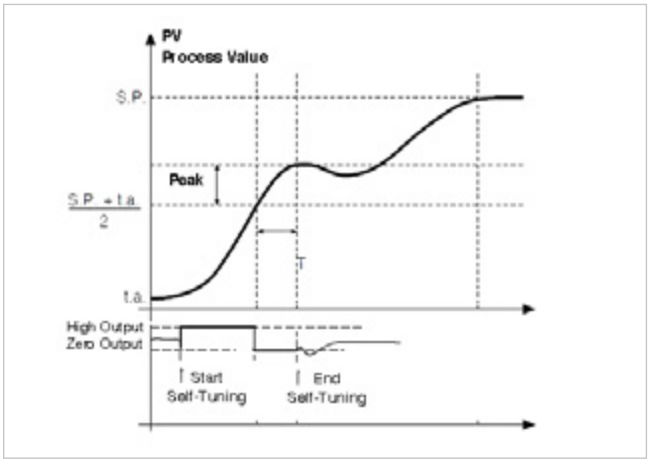
At the end of the procedure, the following new PID parameters are saved:
- proportional band,
- integral and derivative times, calculated for the current action (heat or cool). In case of dual action (heat + cool) the parameters are calculated automatically separately for the two actions.

Active tuning condition is signaled on the display by an LED.

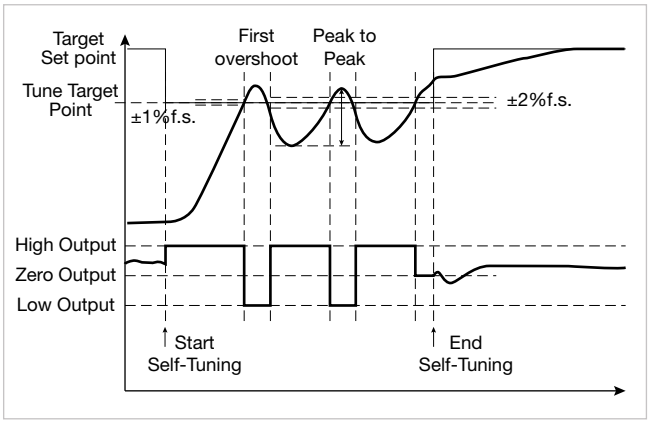
Attention! Self-Tuning is not applicable with an ON/OFF control.

Notes

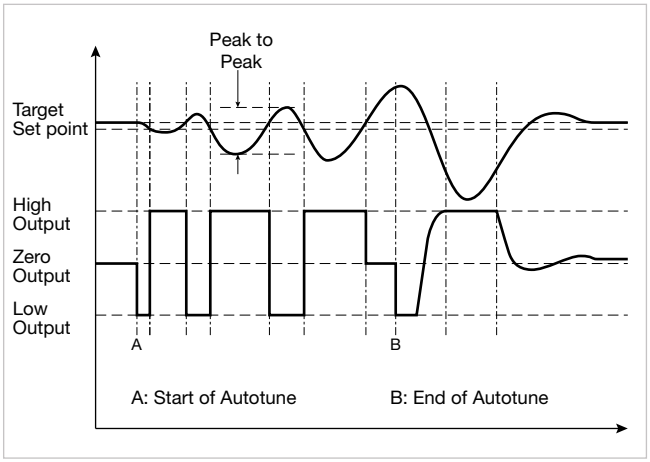
- For the programmer model, if Self-Tuning starts when the controller is powered-on, the program is in STOP.
- If SP-PV deviation is less than 0.3% f.s., Self-Tuning switches to “one shot” Auto-Tuning; otherwise it calculates a point at 75% of deviation around which to start “one shot” Auto-Tuning, considering a single Heat or Cool action or a dual Heat/Cool action based on the type of set control.



Example single action, PV less SP/4



Example dual heat/cool action, PV greater than SP/4



Example with SP-PV deviation less than 0.3% f.s. dual heat/cool action

5.10.4. Auto-Tuning

Enabling the Auto-Tuning function blocks the settings of the PID parameters.
There are two types: continuous and one-shot.

Continuous Auto-Tuning constantly measures system oscillations, immediately searching for PID parameter values that reduce the current oscillation.
It does not act if the oscillations drop to values below 1.0% of the Proportional Band.
It is interrupted if the setpoint changes and automatically resumes with a constant setpoint.
The calculated parameters are not latched if the device switches off, if it goes into manual, or if the configuration code is disabled.

The controller resumes with the parameters programmed before enabling Auto-Tuning.
The calculated parameters are latched when the function, enabled from digital input or key ⏻ , is disabled.
One-shot” Auto-Tuning can be started manually or automatically.

It is useful for calculating PID parameters when the system is around the setpoint.

“One-shot” Auto-Tuning produces a change in the control output up to a maximum of ± 100% of current control power (limited with H.P.HI...H.P.LO for heat and with C.P.HI...C.P.LO for cool) and evaluates the effects in time overshoot.

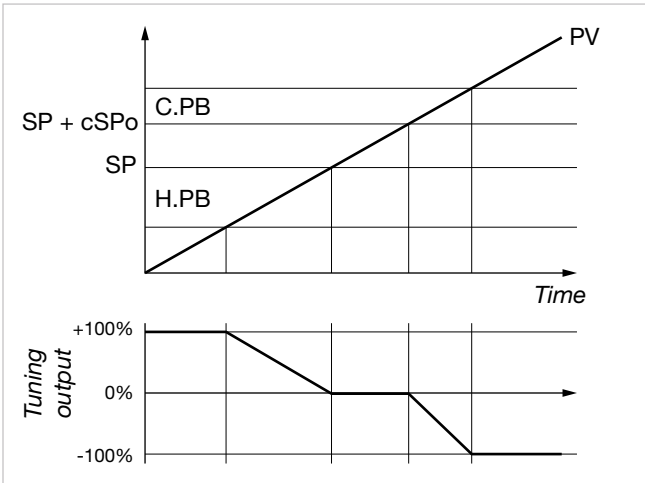
The calculated parameters are latched. It starts manually via digital input or via Tuning key after an undershoot/overshoot. It starts automatically (with error band of 0.5%) when the PV-SP error goes beyond the set band (programmable at 0.5%,1%, 2%, 4% of full-scale).

Attention! At power-on or after a setpoint change, automatic start is inhibited for a time equal to five times the integral time (with minimum of 5 minutes). The same time has to pass after running “One-shot” Auto-Tuning.

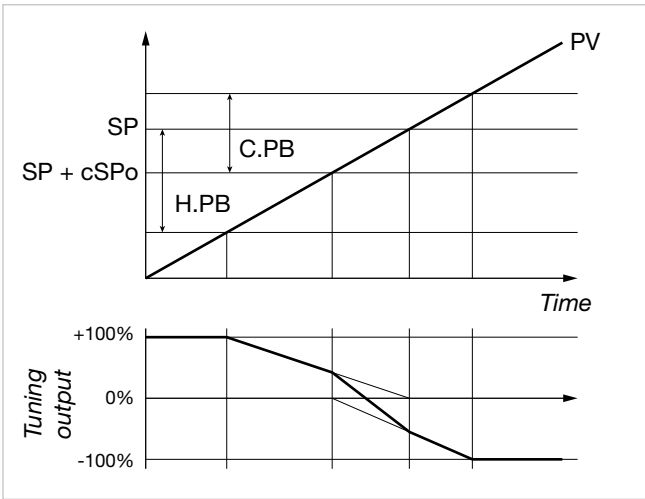
5.10.5. Examples of tuning

The two diagrams below show the time change in the monitored value and the change in the controlled tuning output.

- PV = Process variable
- SP + cSPo = cooling setpoint
- cSPo = C.SP (HI.SCL - LO.SCL) / 100
- C.PB = Proportional cooling band
- SP = heating setpoint
- H.PB = Proportional heating band



Tuning output only with proportional action in case of proportional heating band separate from cooling band.



Tuning output only with proportional action in case of proportional heating band superimposed on cooling band.

5.10.6. Heat/Cool tuning with relative gain

For this tuning mode (enabled on the PID menu with parameter Cntr = PID.RG) you have to specify the cooling type (COOL parameter).
The PID cooling parameters are calculated starting from heating parameters in the specified ratios:

- **Air** relative gain H.PB / C.PB = 1
- **Water** relative gain H.PB / C.PB = 0.8
- **Oil** relative gain H.PB / C.PB = 0.4

Example
Starting with the following heat data:
- COOL = oil
- H.PB = 10.0
- H.IT = 4.00
- H.DT = 1.00

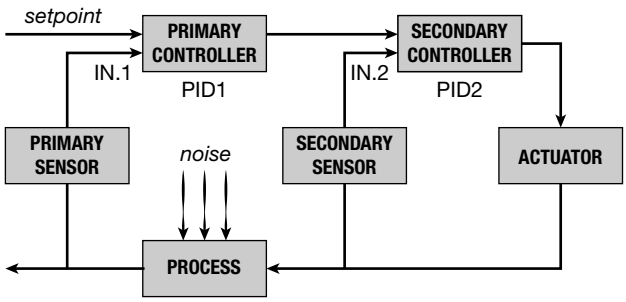
there will be the following cool data:
- C.PB = 12.5
- C.IT = 4.00
- C.DT = 1.00

For slicing cycle times for outputs, the following values should be set:

- **Air** CY.TIM Cycle T Cool = 10 seconds
- **Water** CY.TIM Cycle T Cool = 2 seconds
- **Oil** CY.TIM Cycle T Cool = 4 seconds

Attention! Cool parameters cannot be changed in this mode.

5.10.7. Cascade controls



Two controllers are arranged in cascade when the output signal from the first becomes the input signal to the second, which in turn sends a signal to the control unit.
The primary controller compares the controlled variable to the setpoint, while the secondary controller compares the value of the controlled variable to the signal from the primary controller.

Cascade control provides faster control of the primary variable value.
In addition, the primary variable is less subject to deviations. The secondary controller keeps the flow constant, changing it only when instructed by the primary controller.

The cascade controller is used especially in very slow processes. In these processes, the error is recovered over a long time, and when noise enters the process, you have to wait a long time before the error is revealed and before corrective action begins; therefore, the corrective action does not start immediately. After the action has started, you have to wait a long time for the result.

A cascade control is built by finding intermediate controlled variables that can perform rapid corrective actions in case of noise.
The primary and secondary controllers are arranged in cascade: each has its own process variable but only the secondary one has an output that commands the process.

The main advantages of cascade control are:
- noise in the secondary loop is corrected by the secondary controller before it can affect the primary variable;
- delays in the secondary part of the process are significantly reduced by the secondary loop, and this increases primary loop response speed;
- gain changes in the secondary part are compensated in its chain;
- the secondary loop lets the primary controller act precisely on the flow of material or energy.

Cascade control is very useful when you require highly efficient control in the event of noise or when the secondary part of the process involves a long delay.

Cascade control has two controllers (a primary and a secondary); normally, the choice of control actions, based on process speed, is made as follows:

- **Generally fast processes**: for precise control, integral action in the primary and only proportional in the secondary is sufficient (primary controller PI, secondary controller P).
- **Generally, very slow processes**: for best system readiness, precision, and stability, configure the primary controller PID and the secondary controller PI.

The simplest example of a cascade control is a controller on a valve positioner: in this application the positioner is used to overcome hystereses and to reduce valve time constants. Cascade control is normally not required in fast control loops (flow rates, pressures, etc.) and is more useful in temperature controls.
On series 850, 1650, 1850 controllers, the PID.1 control output is the setpoint for PID.2.

5.10.7.1. Tuning two PIDs configured for cascade control

If you need to tune two PIDs configured for cascade control (parameter APP.t=CAS.HE\CAS.CO\CAS.HC on EN.FUN menu), do as follows:

1. Set the primary PID to Manual (for example with the Automatic\Manual button on home page Home.1), and keep the secondary PID in Automatic
2. Set the value of power delivered by the primary PID (secondary PID setpoint).
3. Start the Self-Tuning procedure for the secondary PID (see paragraph “5.10.3. Self-Tuning” on page 178)
4. When the Self-Tuning procedure for the secondary PID is done, return the primary PID to Automatic (for example with the Automatic\Manual button on home page Home.1)
5. Start the Self-Tuning procedure for the primary PID (see paragraph “5.10.3. Self-Tuning” on page”5.10.3. Self-Tuning” on page 178).

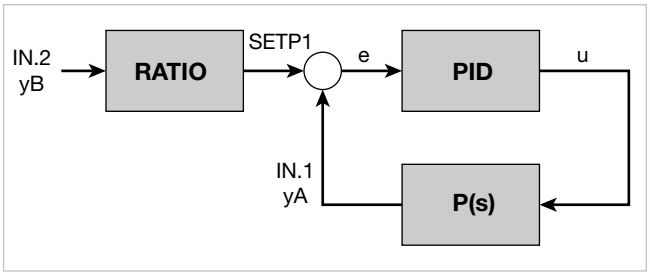
5.10.8. Ratio control

In ratio control, the variable to be controlled is not a physical quantity but instead its ratio with another quantity, whose value must obviously be available.

This type of control is commonly used, for example, in processes where a reactor has to be fed with two reagents in a fixed ratio.

In practical applications, the primary variable is not controlled or externally controlled, as in the case of mixing two fluids (Fluid1/Fluid2).

The control is obtained by simply calculating the setpoint of substance A (Fluid1), which can be controlled, as a product of substance B (Fluid2) multiplied by an appropriate coefficient (RAT.CO), which expresses the ratio to be maintained between the two substances.



RATIO is the ratio required between IN1 (PV1) and IN2 (range from 0.01 to 99.99), i.e.

RATIO = IN.1 / IN.2

This ratio is automatically calculated in the transition from manual -> automatic and can be changed on the User menu.

The PID control controls IN.1 so that it is always:

IN.1 = SETP1= IN.2 x RAT.CO.

5.10.8.1. Activating the ratio controller

Activate ratio controller work mode as follows:

- Enable the remote setpoint (parameter SP.REM on MODE menu = On).
- Configure the auxiliary input as reference for the ratio controller for PID.1 (Parameter FUNC on INPUT menu = RATIO).

5.11. Timer

The timer is enabled on the MODE configuration menu by selecting tMEr = ON.SEC o tMEr = ON.MIN according to the time base to be adopted.
To enable, select the function FunC on the TIMER submenu, choosing from among:

- ST.STP: Start/Stop timer
- STABL: stabilization timer
- SWITC: power-on timer

If you set both timers with function FunC=SWITC (= Start Timer after a POWER ON), the device will switch on (with SW start) after the time set on the shorter timer has lapsed.

When the count is on, you can see the timer value on the SV display, on the F display, or on the bargraph by setting the parameters dS.SP = TIM.EL, dS.F = TIM.EL or bArG = TIM. EL, respectively.

You can assign a message to be displayed at the end of the timer count.

When the set TIMER time is reached, you can:

- activate an OUT1…OUT4 output configured with F.out = TIMR1 or TIMR2,
- go to software off with End = OFF,
- select setpoint 2 with End = SP1-2.

Controlling timer from keyboard

In the absence of enabled digital inputs, the timer is controlled when TIM.EL is displayed by using the △ and ▽ , keys as follows:

- △ pressed with timer stopped = START
- ▽ pressed with timer on = STOP
- △ + ▽ pressed for 2 seconds = RESET

5.11.1. Start/Stop Timer

By selecting the options, you can alternately assign the StSt start/ stop timer function to:

- a digital input IN.DIG;
- an active alarm ALRM1 or ALRM2 or ALRM3 or ALRM4 or AL.HB;
- a serial SERIA.

You can select the true POSIT state or false NEGAT state for the start/stop command.

With parameter rESE, you can alternately select the timer reset mode:

- autoreset with timer in stop AUT.RS;
- from digital input IN.DIG;
- from active alarm ALRM1 or ALRM2 or ALRM3 or ALRM4 or AL.HB;
- a serial SERIA.

You can select the true POSIT state or false NEGAT state for the reset command.
The timer setpoint is settable with a full-scale of 9999 seconds.
The reset function, always active on the state, resets the Timer value and keeps it blocked even if start is present.
In the absence of enabling (stop), the autoreset condition can be active, which resets the timer at every stop.

The timer can also be controlled (start, stop and reset) with Function Blocks. In this case, the start and reset commands are in OR with the ones defined with the StSt and rESE parameters.

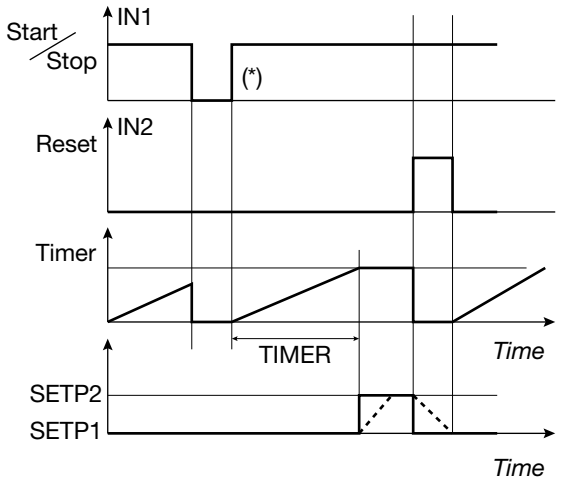
The following diagrams show timer behavior when enabling from digital input and from alarm are used.

Switching between SETP1 and SETP2 is based on the value of the up gradient GRAD.I (if SETP2 > SETP1) or down gradient GRAD.D (if SETP2 < SETP1).

Switching is immediate if the gradient is set to 0 (zero).

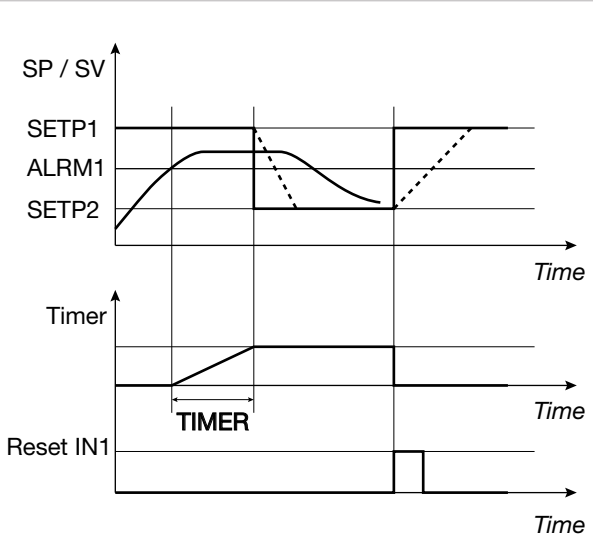
MSP1/MSP2 are managed only if the Multiset function is enabled, as indicated in the End parameter

Enabling from digital input



(*) if the auto reset function is enabled

Enabling from alarm



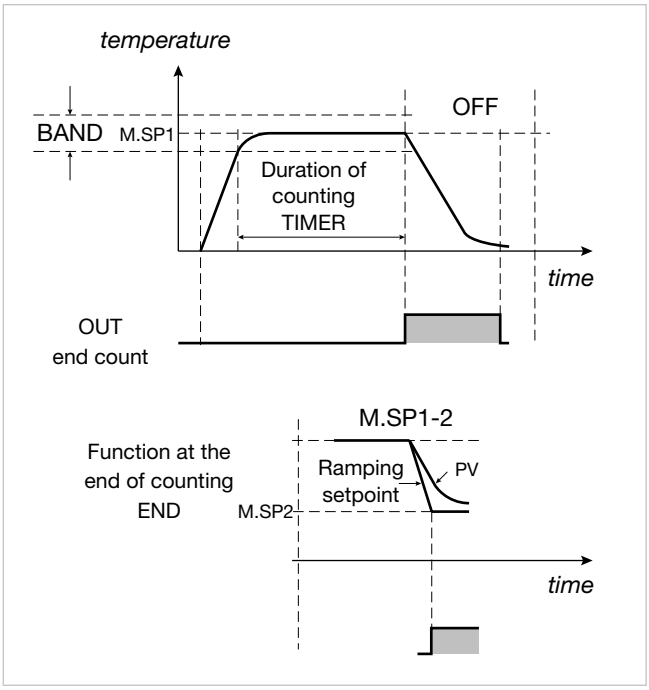
5.11.2. Stabilization timer

The stabilization timer is used to control a process at a certain temperature for a certain time.

The band defining stabilization of the temperature is settable in BAND (from 0.0% to 25.0 % f.s.); the time is set in TIMER. With the band set to 0.0% the count starts the first time the setpoint is reached.

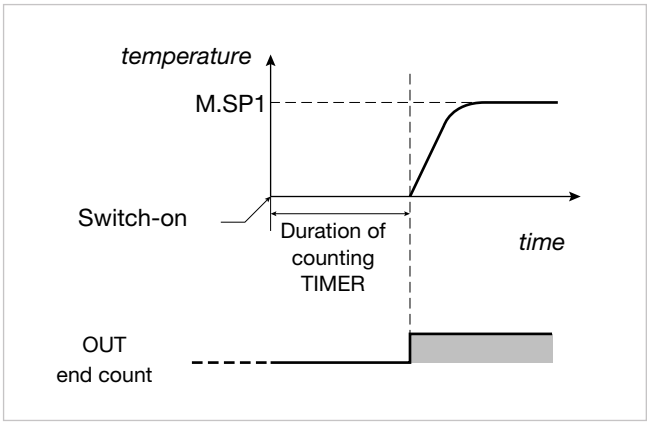
When the function at end of count is End = SP1-2, the end count state activates when the setpoint reaches value SETP2 based on the value of the up gradient GRAD.I (if SETP2 > SETP1) or down gradient GRAD.D (if SETP2 < SETP1). Switching is immediate if the gradient is set to 0 (zero).

The following diagrams show how the stabilization timer works and the state of the end count output.



5.11.3. Start timer

The start timer is used to start the control a certain time after the controller is powered-on.
The delay after start/power-on is settable in TIMER.
The following diagrams show how the start timer works and the state of the end count output.



5.11.4. Variables available for the user configuration menu

The variables available for the timer are TIM.RE, which shows remaining time, and TIM.EL, which shows lapsed time.

5.12. Multiset, setpoint gradient

The Multiset function is enabled on the MODE configuration submenu by selecting MUL.SP = On.

This function allows to set:

- 2 setpoints (M.SP1 and M.SP2) by using a digital input with function F.in.x = SEL1.0 (for PID1) or SEL2.0 (for PID2) or SE12.0 (for PID1 and PID2) or a configurable faceplate key (but.1 for model 850, but.1 or but.2 or but.3 for models 1650 and 1850) setting the option but.x = SP.SEL on the HMI submenu.
- 4 setpoints (M.SP1, M.SP2, M.SP3 and M.SP4) by using two digital inputs, one with function F.in.x = SEL1.0 (for PID1) or SEL2.0 (for PID2) or SE12.0 (for PID1 and PID2) and the other with function F.in.x = SEL1.1 (for PID1) or SEL2.1 (for PID2) or SE12.1 (for PID1 and PID2).

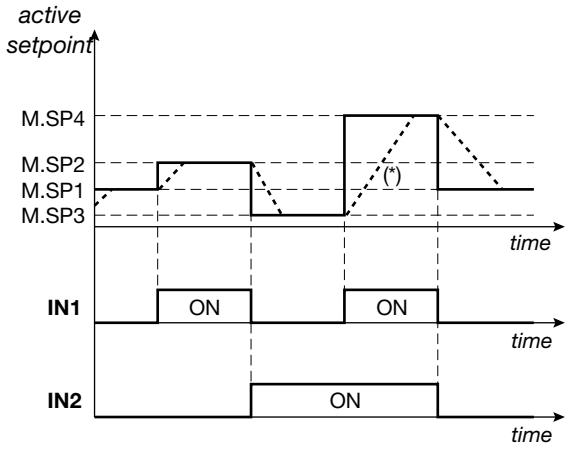
The selection of M.SP1 and M.SP2 is shown on the display via LED.

The setpoint gradient function is enabled on the PID submenu by setting the GRAD.I (up gradient setpoint) and/or GRAD.D (down gradient setpoint) parameters with a value other than 0.

At start and at Automatic/Manual switching, the setpoint is assumed equal to PV. With set gradient it reaches the Local/Remote setpoint or the setpoint selected in case of Multiset function.

Each change of setpoint is subject to a gradient: GRAD.I. for change from lower to higher setpoint, GRAD.D. for change from higher to lower setpoint.

The setpoint gradient is inhibited at start when Self-Tuning is enabled. The control setpoint reaches the set value with a speed defined by the gradient.



(*) in case it is set to the setpoint gradient

5.13. Setpoint programmer

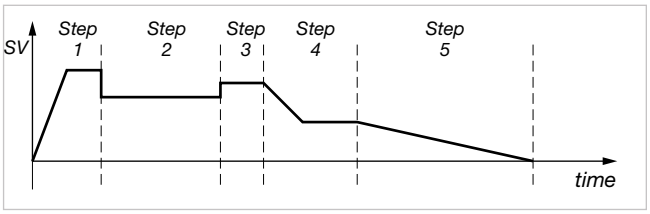
5.13.1. What is a program

A program is a set of steps, each having a number of parameters, that let you control the value of a process or of a device based on lapsed time, on specific conditions, and on reference values saved in the controller or supplied to it from the outside.

In its simplest form, a step has two parts, represented on the graphs by two segments:

- a (possible) ramp, i.e., a variable change in the setpoint value time;
- a hold, i.e., a time in which the process value is held constant after it has reached the setpoint value.

A program can have a maximum of 128 steps and up to 16 programs can be saved in the controller.
Each program is defined by the number of its first and last step.
A program can be selected from the keypad, digital input, Logic Function Block or serial line.
The program can be controlled from the keys, digital inputs (START/STOP, RESET, end program), serial line, or events (output of Function Block).



The program can be run by one of the two programmers (PROGRAMMER 1 or PROGRAMMER 2) (see paragraph “5.13.3. Programmer functions” on page 185).

5.13.2. Example of setting a program from digital inputs

If there is a single programmer

a) Using the digital input functions:

F.in for digital input 1 = **P.PR1.0** = select program for PROGRAMMER bit 0
F.in for digital input 2 = **P.PR1.1** = select program for PROGRAMMER bit 1
F.in for digital input 3 = **P.PR1.2** = select program for PROGRAMMER 1 bit 2

b) With state of digital inputs:

state of digital input 1 = active
state of digital input 2 = inactive
state of digital input 3 = active

binary value = 5

select program 6

If double programmer is enabled

a) Using the digital input functions:

F.in for digital input 1 = **P.P12.1** = Select program for PROGRAMMER 1 and for PROGRAMMER 2 bit 1
F.in for digital input 2 = **P.P12.2** = Select program for PROGRAMMER 1 and for PROGRAMMER 2 bit 2
F.in for digital input 3 = **P.P12.3** = Select program for PROGRAMMER 1 and for PROGRAMMER 2 bit 3

b) With state of digital inputs:

state of digital input 1 = active
state of digital input 2 = inactive
state of digital input 3 = active

binary value = 10
select program 11 for PROGRAMMER 1
select program 12 for PROGRAMMER 2

c) With state of digital inputs:

state of digital input 1 = active
state of digital input 2 = inactive
state of digital input 3 = active

binary value = 12
select program 13 for PROGRAMMER 1
select program 14 for PROGRAMMER 2

d) With state of digital inputs:

state of digital input 1 = active
state of digital input 2 = inactive
state of digital input 3 = active

binary value = 14
select program 15 for PROGRAMMER 1
select program 16 for PROGRAMMER 2

5.13.3. Programmer functions

Depending on the model, the controller can combine the two functions of controller and single loop programmer (PROGRAMMER 1) and double loop programmer (PROGRAMMER 1 and PROGRAMMER 2).
Base time accuracy is 4 seconds every 10 hours.

Programmer stop and restart modes
The programmer can be started or stopped from:

- digital input;
- key [△] (START), [▽] (STOP) and [△] + [▽] (RESET) in the absence of other enablings;
- alarm state (ON = START);
- different restart modes after a Power-off; (Power Off);
- setpoint preceding a Power-off;
- process variable value at time of Power-on;
- optimal search for setpoint forward/back in time;
- wait for Start.

Changes possible in stop state
When the programmer is stopped, you can set or change:

- program number;
- the active setpoint;
- the time assigned to the active phase of the step (ramp or hold).
- step number;
- phase or segment (ramp or hold);
- change the work mode of the programmers from ASYNCHRONOUS=>SYNCHRONOUS (if and only if both programmers are in STOP);
- change the work mode of the programmers from SYNCHRONOUS =>ASYNCHRONOUS.

You can:

- make a single change of the program number. This change will take effect only after a reset command.
- make a single change of the time assigned to the active phase of the step (parameter P.TIME_x).

- Behavior when the programmer restarts is linked to the phase of the step that the programmer is in :
  - o programmer ramp phase:
    - if programmed time 0<= P.TIME_x <= RAMP.T of step in execution: start from new time
    - if programmed time P.TIME_x > RAMP.T of step in execution: start from hold phase
  - o programmer in hold phase:
    - if programmed time 0 <= P.TIME_x <= HOLD.T of step in execution: start from new time
    - if programmed time P.TIME_x > HOLD.T of step in execution: start from ramp phase, next step
- make a single change of the step number.
  At restart, the programmer goes to the step programmed at the beginning of the ramp. Program time will equal ramp phase start time. If the programmed step is greater than the last step of the program, it goes to the last step of the program.
- make a single change of the phase (ramp or hold)
  Programmer action at restart is linked to the type of switch performed:
  - o going from ramp to hold, the programmer goes to the start of the hold phase of the active step in hold status. Program time will equal hold phase start time.
  - o going from hold to ramp, the programmer goes to the start of the ramp phase of the active step. Program time will equal ramp phase start time.
- make a single change of work mode (from ASYNCHRONOUS to SYNCHRONOUS and vice versa).
  Going from ASYNCHRONOUS to SYNCHRONOUS mode, the second programmer will take programmer 1 time as program time (at restart)
- make a combined change of step and phase in order to obtain the following:
  - o if you change the step number and phase equals ramp => you go to the start of the ramp of the set step, with time P.TIME_x (= duration of ramp\ hold phase) set to 0.
  - o if you change the step number and phase equals hold => you go to the start of the hold phase of the set step, with time P.TIME_x (= duration of ramp\hold phase) set to 0.
  - o if you change the step number and phase goes from ramp->hold => you go to the start of the hold phase of the set step, with time P.TIME_x (=duration of ramp\hold phase) set to 0.
  - o if you change the step number and phase goes from hold->ramp => you go to the start of the ramp phase of the set step, with time P.TIME_x (=duration of ramp\hold phase) set to 0.

Changing programmer work mode from ASYNCHRONOUS to SYNCHRONOUS invalidates any simultaneous change of:
- the time assigned to the active phase of the step (ramp or hold).
- step number;
- the phase or segment (ramp or hold); run on programmer 2.

But if you make the same combined change on programmer 1 (change of mode\time assigned to active phase of step or change of mode\number of step or change of mode\phase), the two actions have an effect and also affect programmer 2 (following SYNCHRONOUS mode).

With asynchronous programmers (parameter PROGR = On2), if the programs assigned to the two programmers do not have steps in common, then:
- you can edit only the steps (submenu PR.STP) of the program that is not in RUN (those in RUN can only be displayed together with all the others). All of the steps will become “editable” again only when both programmers are not in RUN (analogous to the case with synchronous programmers);
- you cannot change the structure of the two programs assigned to the two programmers (or the structure of the other 14) until at least one of the two programmers is in RUN (=> the parameters of the PR.OPT submenu are in display-only). All of the programs will become “editable” again only when both programmers are not in RUN (analogous to the case with synchronous programmers);

On the other hand, if the two programs assigned to the two programmers have at least one step in common, the same control is maintained in case of synchronous programmers, i.e., during the RUN phase:
- all parameters of single steps (PR.STP submenu) and
- all parameters of single programs (PR.OPT submenu) are available in display-only.

Consents

You can assign up to 4 consents to each step:
- a wait step, other than the one in question, run by the other programmer.

The beginning of the step can therefore be conditioned by:
- a special state of consents;
- the start of the step indicated by the other programmer

If both of the above conditions are not satisfied, the time base stops. If the state agrees with the programmed state, execution proceeds with restart of the time base. Each digital input can be assigned to one consent.

Events

You can assign up to 4 events to each step. At the start of the ramp and at the start of the hold of each step, the events are changed as programmed. Each digital output can be assigned to one event.

Other functions
- End program signal, with or without forcing of control outputs.
- Setting of a tolerance band relative to the setpoint. If the variable is outside the band, the time base is stopped (HBB alarm, Hold Back Band).
- Setpoint slaved with the same time base to manage a slaved controller via analog retransmission output A1.
- Total modularity of functions and parameters, with easy exclusion of ones not required.

5.13.4. Programmer behavior

The change in local setpoint, which occurs during a program stop phase, causes the restart of the step in execution, with conservation of the set ramp time.

If the controller is switched off and then on again, program execution can continue, or restart from the first step, or search for the step with the setpoint closest to process variable PV.

Behavior at restart is defined by the value of the parameter Strt on the PR.OPT submenu.
STOP/START switching at end of program resets the program and restarts the program.

The Autoreset function implies that programmer reset is active in the stop phase, with consequent acquisition of PV value as active setpoint and resetting of the time base.
With the controller in manual, or with remote absolute setpoint, the programmer time base is stopped.

When switching from remote to local setpoint, the setpoint assumes the value of the remote setpoint at the time of switching if the parameter LO.rE = BUMPL.

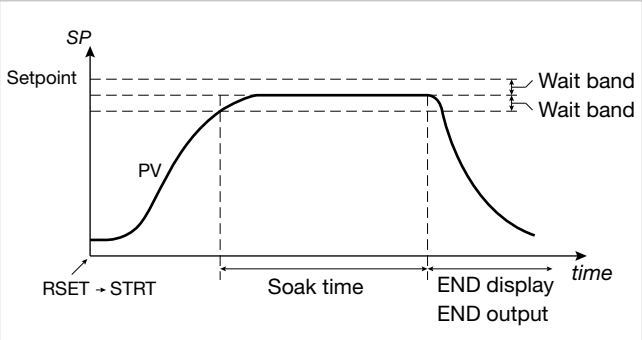
When the programmer reaches the END state, the third bargraph, used for example on models 1650-1850 to display delivered power, lights up completely.

At exit from programmer END state, the third bargraph once again shows the value of the quantity set in parameter bAr.3 (HOME.1 menu or HOME.2 menu).

5.13.5. Program examples

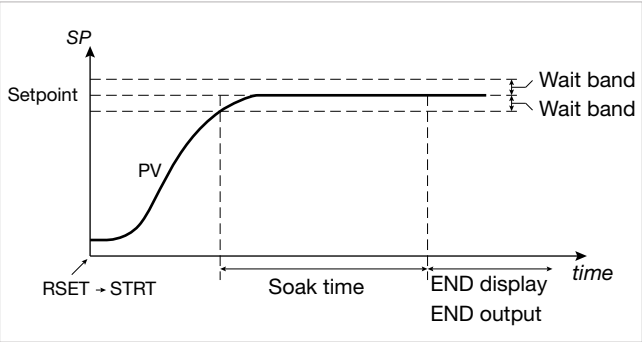
5.13.5.1. ONE STEP program

Project conditions:
- ramp time = 0;
- hold;
- HBB enabling;
- switch-off



5.13.5.2. ONE STEP program

Project conditions:
- ramp time = 0;
- hold;
- HBB enabling;
- hold at end of program



5.13.5.3. Program with assigned events

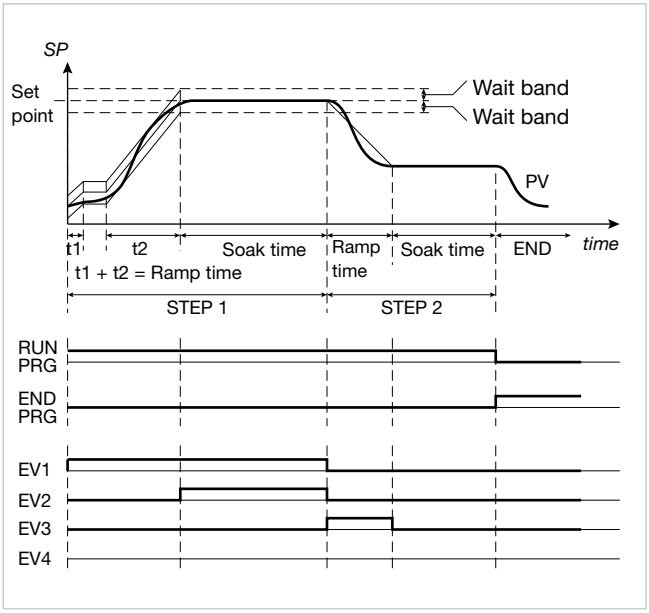
Project conditions:
- Evnt.1 On during STEP1;
- Evnt.2 On during hold of STEP1;
- Evnt.3 On during ramp of STEP2;
- Evnt.4 not used.

STEP1 - setting events at start of step:
- EVN.r.1 = On
- EVN.r.2 = OFF
- EVN.r.3 = OFF
- EVN.r.4 = nonE

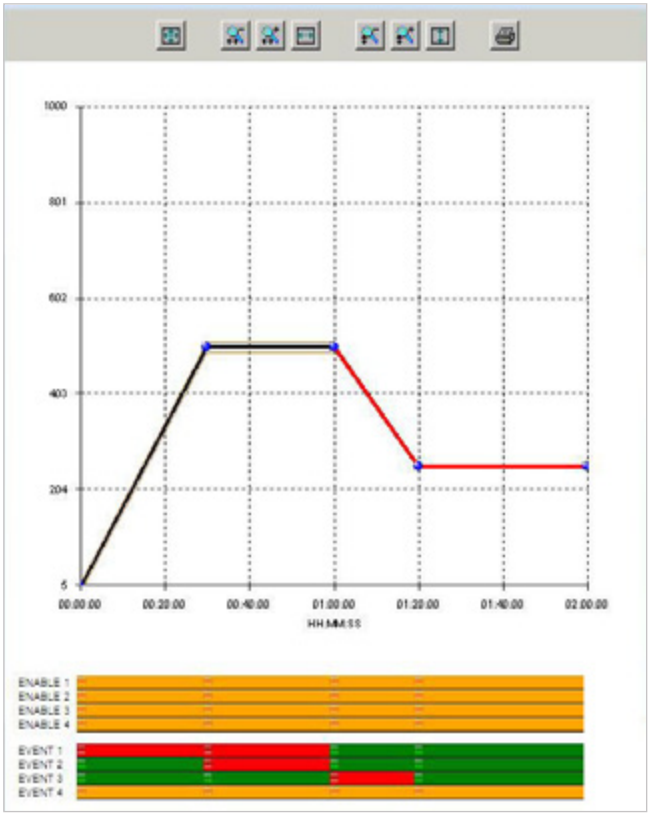
STEP1 - setting events at start of hold:
- EVN.h.1 = nonE
- EVN.h.2 = On
- EVN.h.3 = nonE

STEP2 - setting events at start of step:
- EVN.r.1 = OFF
- EVN.r.2 = OFF
- EVN.r.3 = On
- EVN.r.4 = nonE

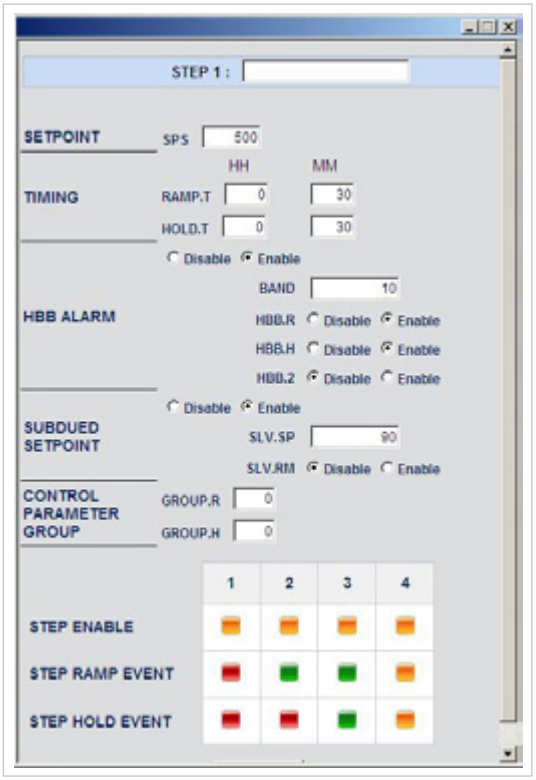
STEP2 - setting events at start of hold:
- EVN.h.1 = nonE
- EVN.h.2 = nonE
- EVN.h.3 = OFF
- EVN.h.4 = nonE



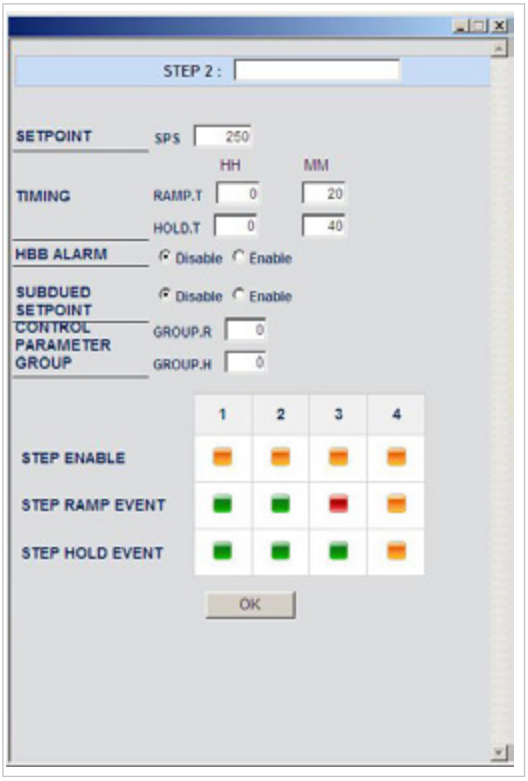
Using GF_eXpress software for the configuration, the displayed pages would be:



Program diagram

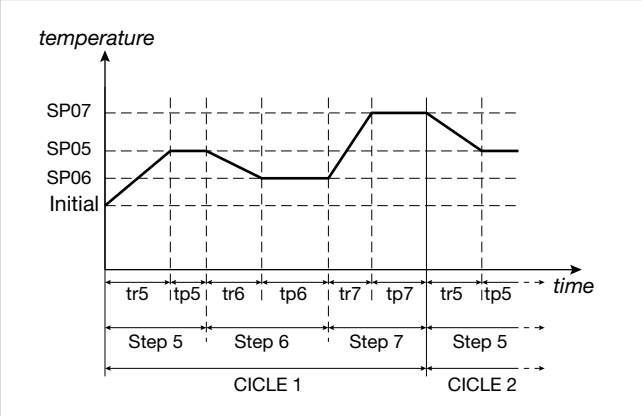


Configuration of STEP1

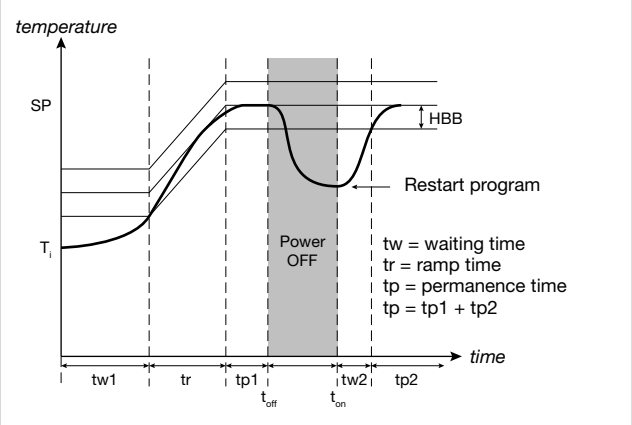


Configuration of STEP2

5.13.5.4. Cyclical program with 3 setpoints and 3 steps



5.13.5.5. Program with HBB (hold back band) function



5.13.6. Fast simulation of program

You can easily check a selected program by launching it in fast simulation mode. Enable it by setting the parameter LIMIT = On on the PR.OPT submenu.

The program will run with ramp time limited to 20 seconds and with hold time limited to 10 seconds. If the set values are smaller they are used. In this way the maximum duration of a step is 30 seconds.

During functioning in fast simulation, the HBB alarm is inhibited and the control output assumes the FAULT value on the PID submenu.

All other enabled functions (restart, start/stop, reset, manual/automatic, end cycle or continuous cycle, event outputs, consent from digital inputs, second channel setpoint, etc.) are active.

5.13.7. Controlling the program from the keypad

In the absence of enablings from digital inputs , the program is controlled when programmer state is displayed using the △, ▽ keys, with the following modes:

- △ pressed with program stopped = START;
- ▽ pressed with program running = STOP;
- ▽ + △ pressed for 2 seconds = RESET (condition maintained with key pressed);

5.13.8. Programmer Reset mode

By setting RST.SP = ON provides that with active reset command the setpoint assumes the value of process variable PV and power is forced to zero.
Setting RST.SP = OFF maintains the active setpoint (prior to reset) and power control.

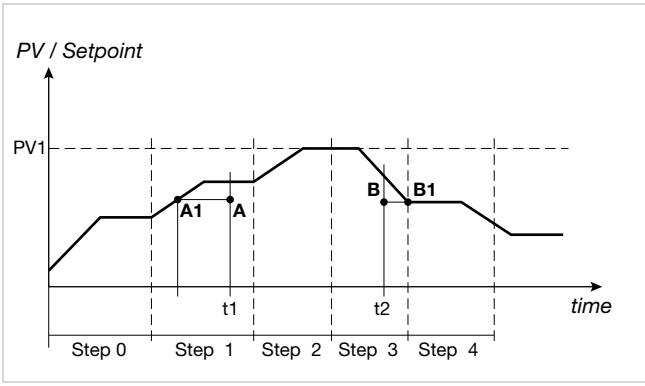
This function is valid in case of reset from digital inputs or enabled keys, as well as in case of reset following a program change (possible only in STOP) or STOP/START switching at end of program.

5.13.9. Restart with step search

If configured, in case of restart the programmer can try to restart nor from the first program step but from the point of the program that corresponds, or is closest to, the value of the active process variable PV.
This function mode is called “restart with step search.”

At start, if Strt = RSCH was set on the PR.OPT submenu, the program searches for the setpoint with value equal to variable PV.
The search is conducted by shifting the current time forward or back and skipping phases or steps.

The following diagram shows a typical 5-step program profile and explains how restart with step search works.



If the variable has values lower than the ones requested during a setpoint raise phase (point A, t1), restart is conducted by lowering the active time base until the setpoint profile (point A1) is intercepted.

If the variable has values lower than the ones requested during a setpoint lower phase (point B, t2), restart is conducted by raising the active time base until the setpoint profile (point B1) is intercepted.

If interception is impossible, as in the case of variable at value PV1, the program is restarted from the active setpoint and time.

If the HBB control is on, programmer base times remain in effect until the variable re-enters the set tolerance band, symmetrical to the setpoint value.

5.13.10. Managing a double programmer

The second input and the second PID let you activate a second programmer identical to the one described above.
The two programmers can work in:

- Asynchronous mode (parameter PROGR = On2), or
- Synchronous mode (parameter PROGR = On.S).

5.13.10.1. Programmers in asynchronous mode

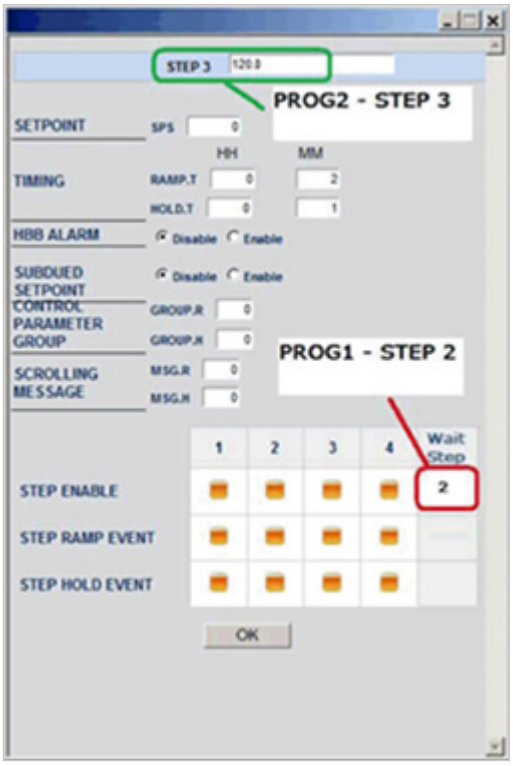
In this work mode the two programmers have independent time bases, therefore the Start-Stop, Skip step, Skip to end of program, and Reset commands are separate for each programmer.

With asynchronous programmers:

- Consents, i.e. step enable conditions (ENABLE), are the ones defined by the single programmer for the step it is executing, i.e., only the consents for the step that the first programmer (PROG1) is executing for the process managed by PROG1 and only the consents for the step that the second programmer (PROG2) is executing for the process managed by PROG2.
- You can subordinate execution of PROG2 steps to the execution of PROG1 steps. This is done by means of the PROG2 wait step, configurable with GF_eXpress.
  The result obtained depends on the states of PROG1 and PROG2 programs when the set condition occurs.

Example
You want to configure a wait so that PROG2 does not start executing STEP 3 until PROG1 has started executing STEP 2.

Set the Wait Step as follows with GF_eXpress:



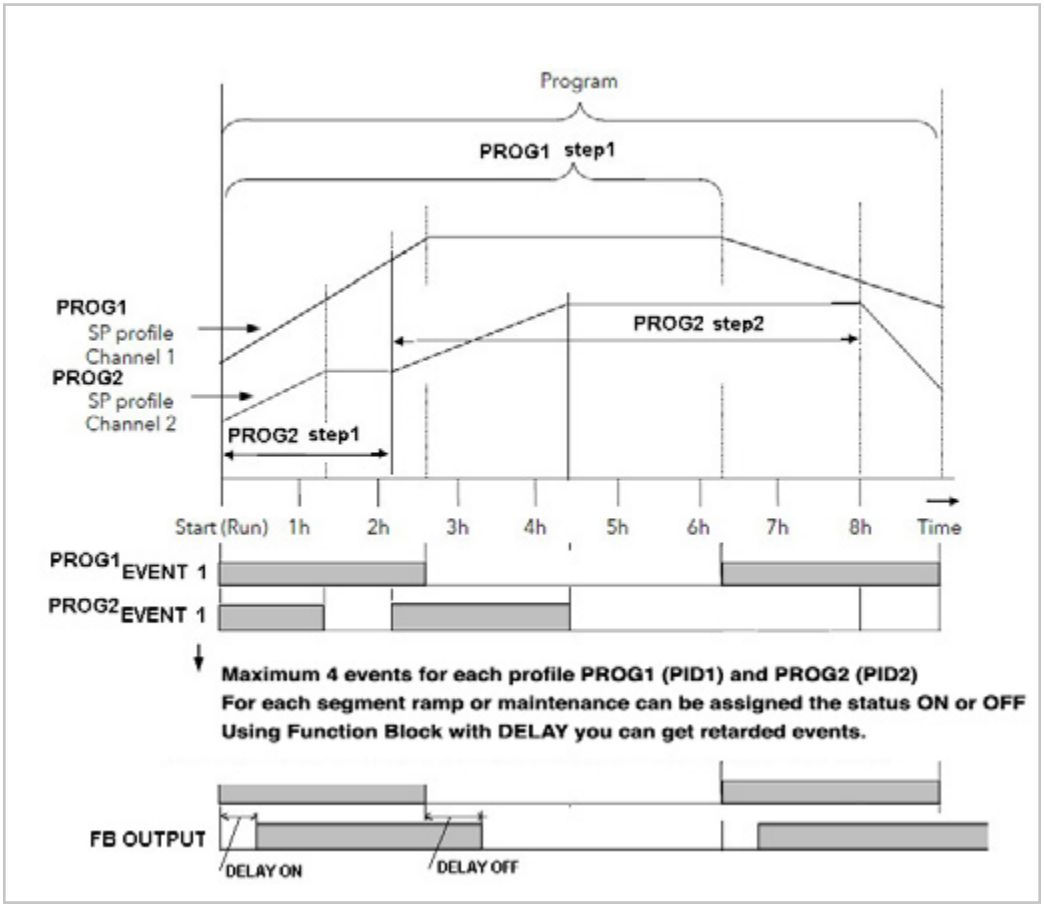
The following cases are possible:

1. PROG.1 is already executing STEP 2 when PROG2 is about to start executing STEP 3: PROG2 continues to run STEP2 without any wait.
2. PROG.1 is already executing a step subsequent to STEP 2 when PROG2 is about to start executing STEP 3: PROG2 continues to run STEP2 without any wait.
3. PROG.1 is in one of the following states:
   - READY (programmer never started or has already ended the program and was configured to return to READY, parameter End=rESE);
   - END (programmer has already run the program and was configured to stay in this condition, parameter End=NONE or End=Off); and so PROG2 is suspended until PROG1 arrives at STEP 2.
     When PROG1 starts STEP 2, PROG2 starts executing STEP 3

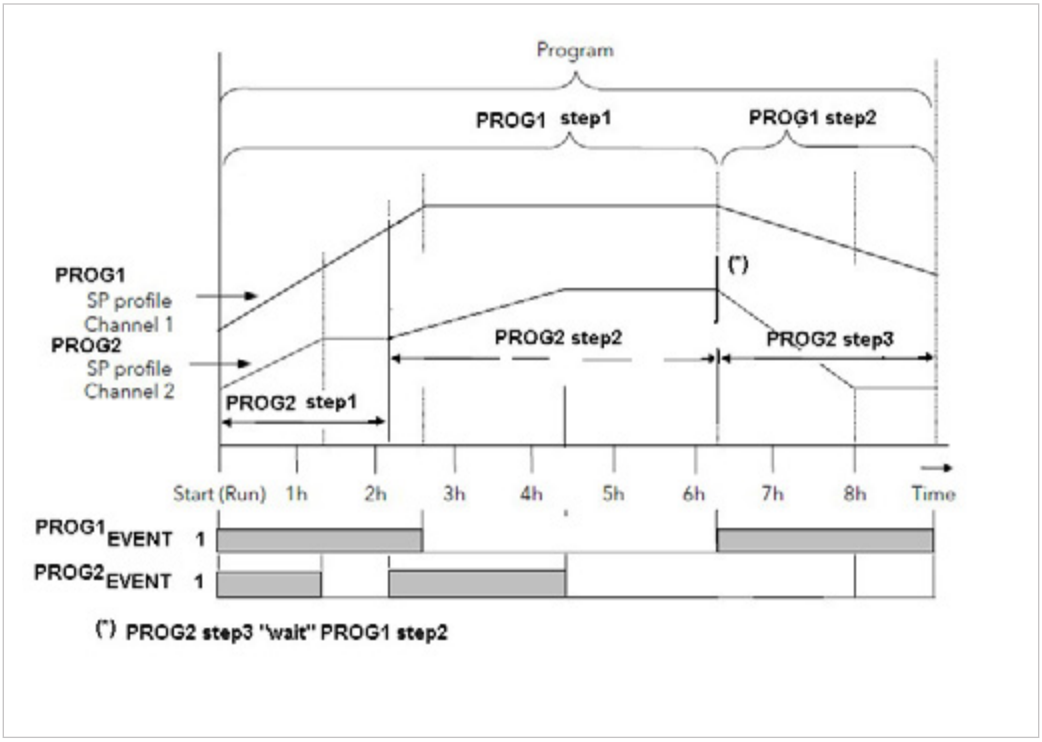
The start step and start hold events are the ones for the step in execution by its programmer.

The settings for SUBDUED SETPOINT and for HBB (ENABLE, BAND, HBB.R, HBB.H) are the ones for the step in execution by its programmer.

Since the programmers are asynchronous it follows that, in case of HBB, only the time base of the programmer affected by the alarm will stop when the alarm trips, while the other program keeps working normally.



Example of asynchronous PROG1 and PROG2 programmers



Example of asynchronous PROG1 and PROG2 programmers with step wait setting

5.13.10.2. Programmers in synchronous mode

In this work mode the two programmers have the same time base, and the ramp and hold times of each step of the second programmer (PROG2) are therefore the same as those of the first programmer (PROG1).
Consequently, the Start-Stop, Skip step, Skip to end program, and Reset commands are common to both programmers.
If PROG1 has to run a number of steps higher than those of PROG2, PROG2 will maintain the state of its last programmed setpoint.
If PROG1 has to run a number of steps lower than those of PROG2, PROG2 will interrupt its program in advance without ending it.
Consents, i.e. step enable conditions (ENABLE), are the ones defined by the programmers for the step they are executing, i.e.:

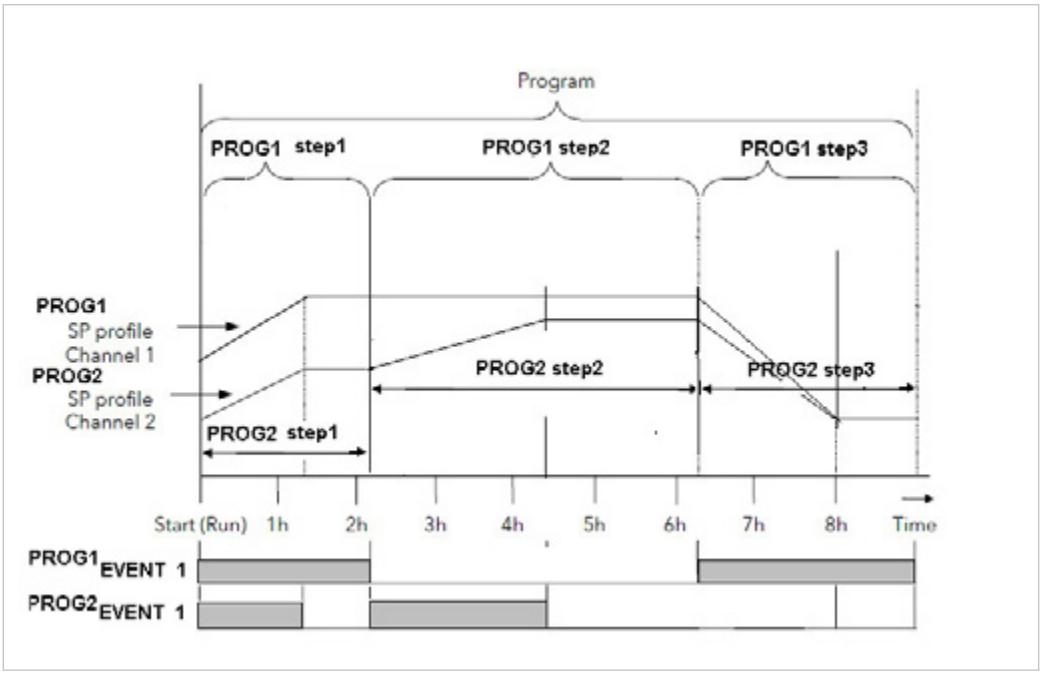
- consents for the step that the first programmer (PROG1) is executing;
- consents for the step that the second programmer (PROG2) is executing.

It follows that the time base is suspended until all of the consents are checked (those for the step in execution in PROG1 and those for the step in execution in PROG2).

The start step and start hold events are the ones for the step in execution by its programmer.

The settings for SUBDUED SETPOINT are the ones for the step in execution by the respective programmer. There are no conflicts because it is decided a priori which of the two outputs each programmer will manage.

The settings for HBB (ENABLE, BAND, HBB.R, HBB.H) are the ones for the step in execution by its programmer.
Since the programmers are synchronous it follows that, in case of HBB, the time base stops when the alarm trips on one or both of the programmers, blocking both programs.



Example of synchronous PROG1 and PROG2 programmers

5.13.11. Program times

For each programmer, the User menu and Home page can display the following time values:

- **Programmer theoretical time**
  Displayable with parameters P.t.t1 and P.t.t2, the time elapsed from the START command to END condition. This time resets after a programmer RESET.
  This time stops in case of an HB alarm or lack of consent.
  The time goes from 0 to TotalTheoreticalTime $= \sum_i$ (ramp time + hold time)i ,with which it varies from 1 to N (where N = number of steps).

- **Programmer Real time**
  Displayable with parameters P.E.t1 and P.E.t2, the time elapsed from the START command to END condition. This time resets after a programmer RESET.
  As opposed to Theoretical time, Real time continues to run even in case of an HB alarm or lack of consent.

- **Programmer residual theoretical time**
  Displayable with parameters P.r.t1 and P.r.t2, the difference between TotalTheoreticalTime and Theoretical time elapsed in the programmer.

After the controller is powered off and then powered on, Theoretical time and Real time elapsed for each programmer resumes at the value derived from the step search (zero if the programmer is configured to start at the beginning).

5.14. Managing motorized valves

In a control procedure, a motorized valve varies the flow rate of a fluid based on the signal from the controller.
In an industrial process, the fluid may be a fuel, often corresponding to the thermal energy introduced into the process.

To change the flow rate, the valve has an actuator that modifies the valve's opening value, overcoming the resistance produced by the fluid flowing in it.

Control valves vary the flow rate in a modulated manner, producing finite variations in the fluid flow section corresponding to finite changes in the input signal from the actuator.

A typical actuator consists of an electric motor connected to the valve gate by means of a gearbox and a mechanical drive system.

The actuator ca be integrated with various auxiliary components, such as mechanical and electrical safety limit switches, manual drive systems, and position readers.

If available, valve position is normally measured with a potentiometer (feedback valve) to obtain more accurate control.
The connection diagram with controller includes open/close relay commands.

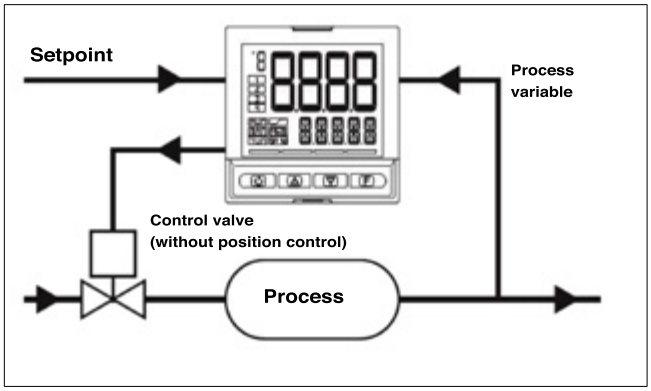


Figure 21 - Connection diagram for floating valve

If available, the auxiliary input of the controller can be configured for the valve position function.

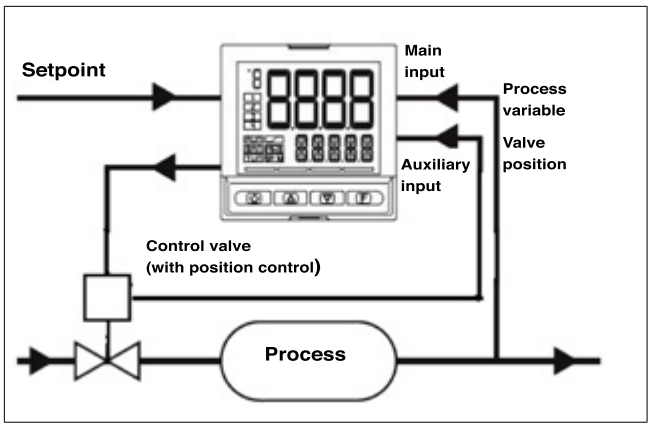


Figure 22 - Connection diagram for feedback valve

Based on process dynamics, the controller determines the output value that drives the valve actuator so that valve opening maintains the required process variable value.

5.14.1. Valve control parameters

The controller controls the valves with the following parameters of the VALVE submenu:

- **TRAVL Actuator travel time**: the time the valve takes to go from completely open to completely closed (or vice versa). Settable with resolution of one second, this is a mechanical characteristic of the valve + actuator group.
  NOTE: if the actuator stroke is mechanically limited, reduce the TRAVL value proportionally.
- **TIM.LO Minimum impulse**: expressed as a percentage (with resolution of 0.1%) of actuator time, represents the minimum change in valve position corresponding to the minimum change in power supplied by the controller (power below which the actuator physically does not respond to the command).
  Raising TIM.LO lowers wear on the actuator to the detriment of precise positioning. Minimum impulse duration is settable in TIM.ON as a percentage of actuator time.
- **TIM.HI Impulse setpoint**: expressed as a percentage (with resolution of 0.1%) of actuator time, represents the deviation in position (requested position – real position) below which the maneuver request becomes impulsive. TIM.HI is only active with TIM.OF=0
  Impulse approach allows fine tuning of the position valve, which is especially useful in case of high mechanical inertia.
  Setting TIM.HI = 0 excludes positioning modulation.
- **TIM.ON**: it is the shortest time accepted for the valve command pulse, expressed as percentage of the "actuator time"
- **TIM.OF**: it is the shortest time between two Valve ON pulse command, expressed as percentage of the "actuator time".
  - Setting TIM.OF=0 this function is excluded.
  - Setting TIM.OFF≠0 the Valve movement becomes pulsing; ON pulse time= TIM.ON and OFF pulse time= TIM.OF
    If the value TIM.OF<TIM.ON the value is forced to TIM.ON.
- **DEAD.B Deadband**: this is a deviation band between the control setpoint and the process variable within which the controller does not supply any command to the valve (Open = OFF; Close = OFF).
  It is expressed as a percentage of full-scale and is symmetrical to the setpoint. Once the process is defined, the deadband is used to prevent stressing the actuator with repeated commands that would be irrelevant to the control.
  By setting DEAD.B = 0 the deadband is excluded.

5.14.2. Valve control modes

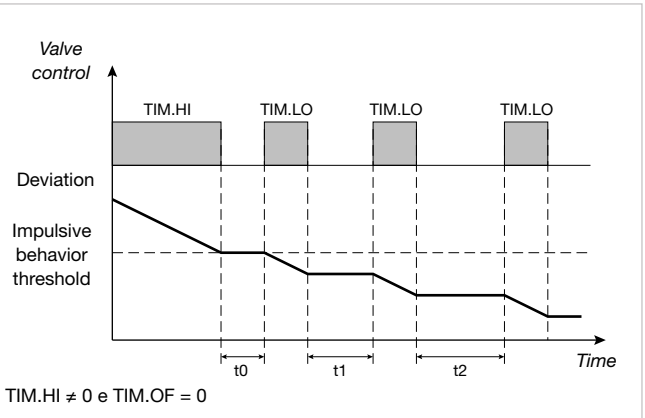
In valve control, every request for a maneuver greater than minimum impulse is sent to the actuator via the relays with function V.OPEN / V.CLOS.

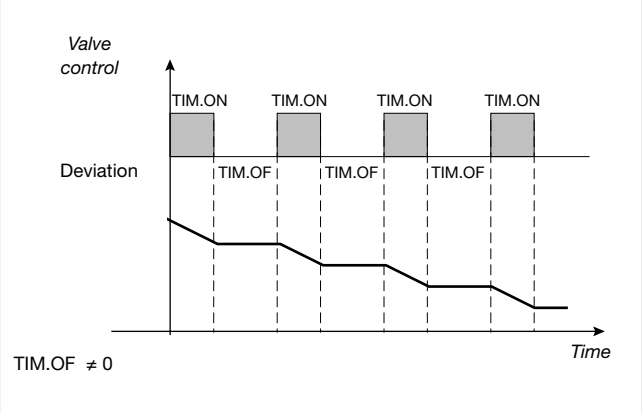
In the case of floating valve each action updates the assumed position of the virtual potentiometer calculated on the basis of declared actuator travel time. This mode always provides an assumed valve position, which is compared with the controller's position request.
After reaching an assumed end position (fully open or fully closed determined by the virtual potentiometer), the controller supplies an additional command in the same direction, thereby ensuring that the real end position is reached.
With feedback valve, the actual position is acquired via the auxiliary analog input of the controller, which reparameterizes the value as a percentage (0.0 - 100.0%), compares it to the required position, then sends the appropriate command to the valve.
Calibration is required to store the minimum and maximum positions of the potentiometer.
The actuators are normally protected against an OPEN command in fully open position or a CLOSE command in fully closed position.
There are two setpoint approach modes:

- **Non-impulsive behavior**
  Set TIM.HI = 0 and TIM.OF=0 for non-impulsive behavior: every request greater than TIM.LO is continually sent to the actuator via the V.OPEN / V.CLOS outputs.
  The shortest pulse time is settable in TIM.ON as percentage of the "actuator time", it is recommended to set TIM.ON=TIM.LO
  With power equal to 100.0% or to 0.0%, the corresponding output remains on.

- **Impulsive behavior**
  Set TIM.HI ≠ 0 and TIM.OF=0 for impulsive behavior.
  every request greater than TIM.LO is sent to the actuator via the V.OPEN / V.CLOS outputs with impulses having a duration of TIM.ON.
  TIM.HI defines the deviation within which the movement becomes pulsing.
  With power equal to 100.0% or to 0.0%, the corresponding output remains on.

  With TIM.OF ≠ 0, every request greater than TIM.LO is sent to the actuator via the V.OPEN / V.CLOS outputs with impulses having a duration of TIM.ON and TIM.OF.
  In the case of floating valve, with power ≤ 10.0%, or ≥ 90.0%, the impulses are independent of TIM.LO.
  With power equal to 100.0% or to 0.0%, the corresponding output remains in modulation.



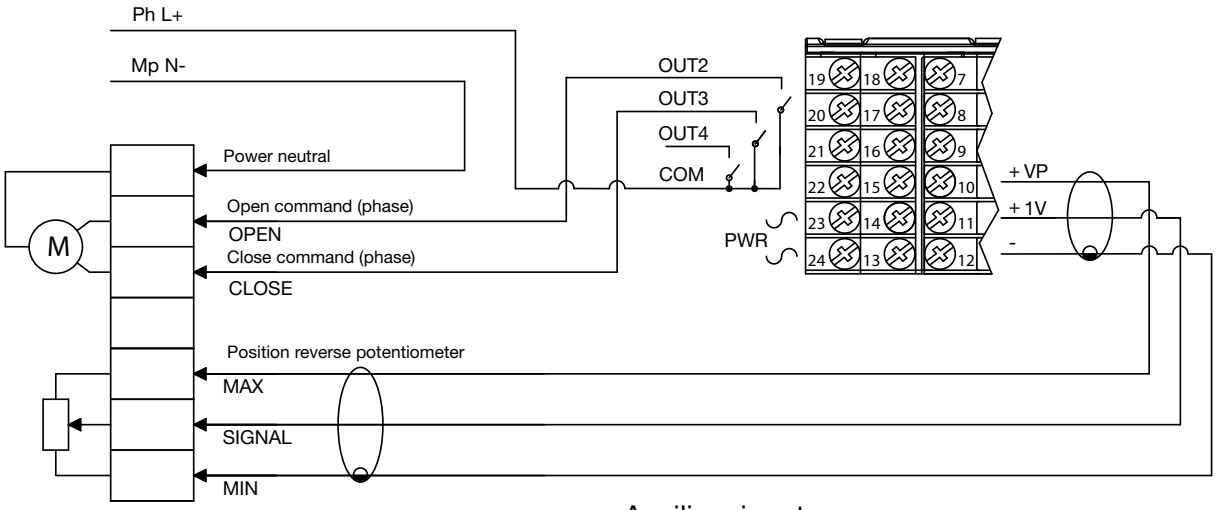


Impulsive behavior

With the controllers in manual, setting parameter KEY.MO = On allows direct control of the valve open and close commands with the △ and ▽ only when HOME is displayed.
When the controller goes to automatic mode, with a floating valve, the assumed position is calculated starting from the set manual power.

Valve connection diagram
for models 850V (or 850PV)-X-RR-R...

default OUT2 (OPEN), OUT3 (CLOSE)



VALVE CONNECTION

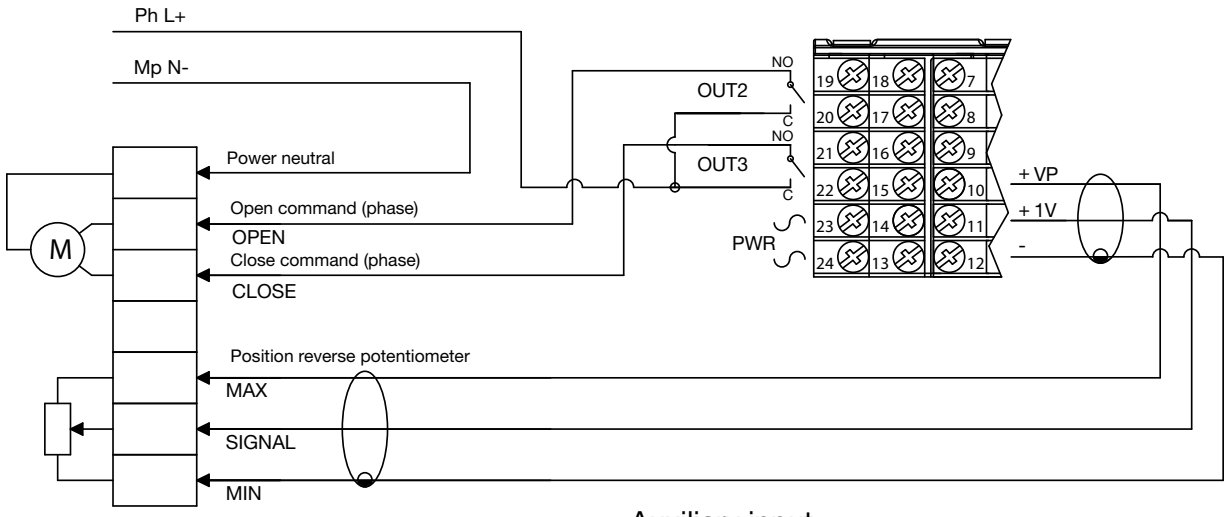
Auxiliary input

for models with Auxiliary Input option = 2

NOTE:
To enable the valve position control,
set parameter FUnC=VALV.P for the auxiliary input

Valve connection diagram for models 850V
(or 850PV)-X-RR-0... / 850V (or 850PV)-X-RR-D...

default OUT2 (OPEN), OUT3 (CLOSE)

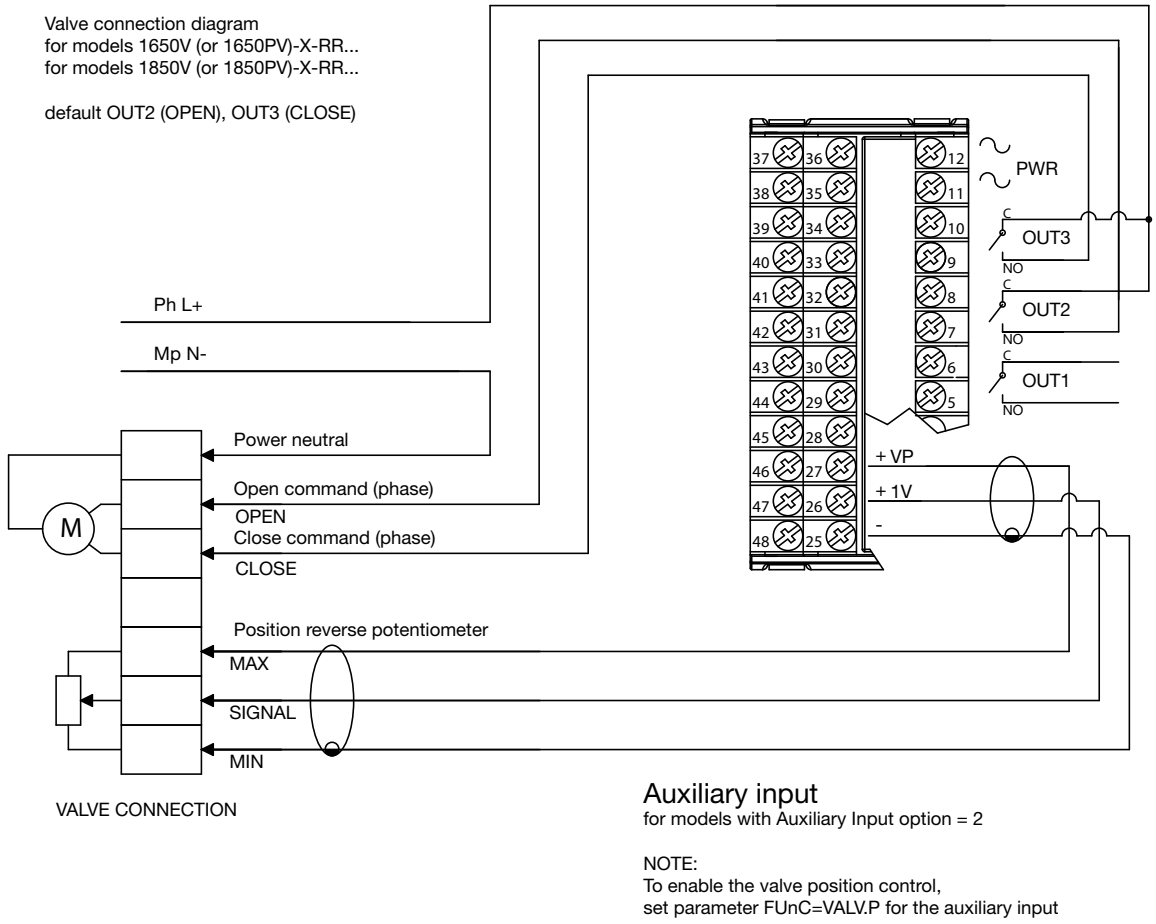


VALVE CONNECTION

Auxiliary input

for models with Auxiliary Input option = 2

NOTE:
To enable the valve position control,
set parameter FUnC=VALV.P for the auxiliary input


Valve connection diagram
for models 1650V (or 1650PV)-X-RR...
for models 1850V (or 1850PV)-X-RR...
default OUT2 (OPEN), OUT3 (CLOSE)
Ph L+
Mp N-
Power neutral
Open command (phase)
OPEN
Close command (phase)
CLOSE
Position reverse potentiometer
MAX
SIGNAL
MIN
M
VALVE CONNECTION
37 36 12
38 35 11
39 34 10
40 33 9
41 32 8
42 31 7
43 30 6
44 29 5
45 28
46 27
47 26
48 25
PWR
C
OUT3
NO
C
OUT2
NO
C
OUT1
NO
+ VP
+ 1V
-
Auxiliary input
for models with Auxiliary Input option = 2
NOTE:
To enable the valve position control,
set parameter FUnC=VALV.P for the auxiliary input

5.15. Energy counter

The Energy Counter function lets you calculate the total energy transferred to the load and estimate its cost.
The Energy Counter function can be linked to two controller outputs. The count is run only if the chosen output has HEAT / COOL function.
You can display the following information on the user configuration menu:

- Load current (parameter CURR). This is measured directly if the CT1 or CT1+CT2 option is present. CURR is expressed in amperes and can have values from 0.0 to 99.9.
- Power on load, parameter OU.KW_1 (or OU.KW_2), calculated in kW. Power is calculated:
  - o if nominal power is not zero, based on nominal power P.LOAD_1 (identical for P.LO_AD_2), as % of same
  - o if nominal power is zero, by using line voltage V.LINE_1 (or V.LINE_2) and current (here as well, considering PID power %)

  OU.KW_1 (identical for OU.KW_2) can have values from 0.00 to 99.99.
- Time taken to count energy (parameter E.TIM_1 or E.TIM_2) value from 0 to 999 hours
- Energy on load (parameter O.KWH_1 or O.KWH_2) value from 0.00 to 99.99 kWh
- Energy counter transferred to load (parameter E.KWH_1 or E.KWH_2), calculated in kWh.

  E.KWH_1 (identical for E.KWH_2) can have values from 0 to 9999.

The energy count does not depend on the output type, and is also done for continuous outputs (A for 850 and C for 1650 /1850).
The energy count stops when it reaches the maximum of 9999 kWh or maximum time E.TIM_1 (or E.TIM_2) at 999 hours. The count is not linked to output type.

- Cost of energy transferred to load (parameter E.CST_1 or E.CST_2). Cost is calculated based on nominal cost of energy per kWh (parameter E.COST_1 or E.COST_2) by using the formula E.CST_1 = E.KWH_1 × E.COST_1 (or E.CST_2 = E.KWH_2 × E.COST_2). E.CST_1 (identical for E.CST_2) can have values from 0 to 9999 (with rounding-off to 0.5).

5.16. Logic Operations

5.16.1. Function logic blocks

By means of Logic Function Blocks, the Logic Operations function processes the values of input variables to obtain values for the output variables.
This lets you control the processes very precisely, because you can make a number of actions subject to a series of essential requisites.

The Function Blocks are run every 100msec in sequence, from LFB1 to LFB32.
Function block execution is suspended in Software OFF conditions.
Typical maximum delay from activation of an input and corresponding output = 100msec.

The Function Blocks are programmed with GF_eXpress software.
There is a maximum of 32 Logic Function Blocks. Each Logic Block manages up to 4 input variables and 1 variable output.
Four types of logic operations on input variables **a, b, c** and **d** can be performed on the Function Blocks

- (**a** AND **b**) OR (**c** AND **d**)
- (**a** OR **c**) AND (**b** OR **d**)
- **a** OR **b** OR **c** OR **d**
- **a** AND **b** AND **c** AND **d**

where the AND operator means that the linked operands must evaluate to “true” for the result to be “true,” whereas with the OR operator is it sufficient for only one linked operand to evaluate to “true” for the result to be “true”.

Parentheses change the order of evaluation of the expressions, i.e., expressions in parentheses are evaluated first, and the result is then used for expressions outside parentheses.

The input variables (**a**, **b**, **c**, **d**) to each Function Block can refer to:
- digital inputs (3 for model 850, 5 for models 1650 and 1850),
- auxiliary digital inputs (for model 1850),
- state of alarms,
- state of control output,
- state of controller,
- LFB_OUT_1...LFB_OUT_32,
- state of setpoint programmer,
- variables LFB_OUT_01…LFB_OUT_32 from other Function Blocks.
-

The result of the Logic Operations function can act on:
- state of controller,
- state of setpoint programmer,
- state of alarms,
- outputs, by directly setting the state.

5.16.2. Groups of variables

The controller provides a large number of variables that can be used in input for Logic Operations.
The controller has the following groups of homogeneous variables:

State Keys
BUT1
BUT2
BUT3
UP
DOWN

State of digital inputs
DIGITAL INPUT 1
DIGITAL INPUT 2
DIGITAL INPUT 3
DIGITAL INPUT 4
DIGITAL INPUT 5

Status of auxiliary digital Inputs
AUX DIGITAL INPUT 1
AUX DIGITAL INPUT 2
AUX DIGITAL INPUT 3
AUX DIGITAL INPUT 4
AUX DIGITAL INPUT 5
AUX DIGITAL INPUT 6
AUX DIGITAL INPUT 7
AUX DIGITAL INPUT 8

State of digital outputs
OUTPUT 1
OUTPUT 2
OUTPUT 3
OUTPUT 4

Status of auxiliary digital Outputs
AUX OUTPUT 1
AUX OUTPUT 2
AUX OUTPUT 3
AUX OUTPUT 4
AUX OUTPUT 5
AUX OUTPUT 6
AUX OUTPUT 7
AUX OUTPUT 8

Status of auxiliary relay Outputs
AUX RELAY 1
AUX RELAY 2
AUX RELAY 3
AUX RELAY 4
AUX RELAY 5
AUX RELAY 6
AUX RELAY 7
AUX RELAY 8

Menu navigation status
HOME1 MENU
HOME2 MENU

Function commands	
AU-MA1	(select Automatic / Manual for PID.1)
LO-RE1	(select Local / Remote for PID.1)
HOLD1	(variable hold of main input for PID.1)
A.TUNE1	(activate Auto-Tuning for PID.1)
S.TUNE1	(activate Self-Tuning forPID.1)
AU-MA2	(select Automatic / Manual for PID.2)
LO-RE2	(select Local / Remote for PID.2)
HOLD2	(variable hold of main input for PID.2)
A.TUNE2	(activate Auto-Tuning for PID.2)
S.TUNE2	(activate Self-Tuning for PID.2)
AL ACK	(reset alarms latch)
ON-OF	(ON-OFF software)
FKEY	(block F key)
WRI.EN	(enable write configuration parameter)
REC.0	(Select parameter recipe bit 0) (see chapter “Managing recipes”)
REC.1	(Select parameter recipe bit 1) (see chapter “Managing recipes”)
REC.2	(Select parameter recipe bit 2) (see chapter “Managing recipes”)
SEL1.0	(Select setpoint M.SP1.1/M.SP2.1 or M.SP1.1…M.SP4.1 bit 0 for PID.1)
SEL2.0	(Select setpoint M.SP1.2/M.SP2.2 or M.SP1.2…M.SP4.2 bit 0 for PID.2)
SEL1.1	(Select setpoint M.SP1.1…M.SP4.1 bit 1 for PID.1)
SEL2.1	(Select setpoint M.SP1.2…M.SP4.2 bit 1 for PID.2)
SE12.0	(Select setpoint M.SP1.1/M.SP2.1 and M.SP1.2/M.SP2.2 r M.SP1.1…M.SP4.1 bit 0 and M.SP1.2/M.SP4.2 bit 0)
SE12.1	(Select setpoint M.SP1.1…M.SP4.1 bit 1 and M.SP1.2…M.SP4.2 bit 1)
T.STST1	(start/stop timer for TIMER1)
T.RST1	(reset timer for TIMER1)
T.STST2	(start/stop timer for TIMER2)
T.RST2	(reset timer for TIMER2)
P.PR1.0	(start/stop programmer for PROGR.1 bit 0)
P.PR1.1	(start/stop programmer for PROGR.1 bit 1
P.PR1.2	(start/stop programmer for PROGR.1 bit 2)
P.PR1.3	(start/stop programmer for PROGR.1 bit 3)
P.STST1	(start/stop programmer for PROGR.1)
P.STRT1	(start programmer for PROGR.1)
P.STOP1	(stop programmer for PROGR.1)
P.RST1	(reset programmer for PROGR.1)
P.SKP1	(skip to end program for PROGR.1
ST.SKP1	(skip to end step for PROGR.1)
ST.EN1.1	(consent 1 to start step for PROGR.1)
ST.EN1.2	(consent 2 to start step for PROGR.1)
ST.EN1.3	(consent 3 to start step for PROGR.1)
ST.EN1.4	(consent 4 to start step for PROGR.1)
P.PR2.0	(Select program for PROGR.2 bit 0)
P.PR2.1	(Select program for PROGR.2 bit 1)
P.PR2.2	(Select program for PROGR.2 bit 2)
P.PR2.3	(Select program for PROGR.2 bit 3)
P.STST2	(start/stop programmer for PROGR.2)
P.STRT2	(start programmer for PROGR.2)
P.STOP2	(stop programmer for PROGR.2)
P.RST2	(reset programmer for PROGR.2)
P.SKP2	(skip to end program for PROGR.2)
ST.SKP2	(skip to end step for PROGR.2)
ST.EN2.1	(consent 1 to start step for PROGR.2)
ST.EN2.2	(consent 2 to start step for PROGR.2)
ST.EN2.3	(consent 3 to start step for PROGR.2)
ST.EN2.4	(consent 4 to start step for PROGR.2)

LED.GREEN.1	
LED.GREEN.2	
LED.GREEN.3	
LED.GREEN.4	
LED.GREEN.5	
LED.GREEN.6	
LED.GREEN.7	
LED.GREEN.8	
LED.RED.1	
LED.RED.2	
LED.RED.3	
LED.RED.4	
LED.RED.5	
LED.RED.6	
LED.RED.7	
LED.RED.8	
LED.OUT.1	
LED.OUT.2	
LED.OUT.3	
LED.OUT.4	
LED.RUN	
LED.MANUAL	
LED.TUNE	
LED.RAMP	
LED.REMOTE	
LED.SP1/2	

CY.RES	(Reset switching cycle count shown in INDG.S)

Function state	
PID heating for PID.1	
PID cooling for PID.1	
PID zero for PID.1	
ON/OFF heating for PID.1	
ON/OFF cooling for PID.1	
ON/OFF zero for PID.1	
PID heating for PID.2	
PID cooling for PID.2	
PID zero for PID.2	
ON/OFF heating for PID.2	
ON/OFF cooling for PID.2	
ON/OFF zero for PID.2	
OR OF ALARMS	(state active alarms)
AL1…AL4	(Alarm AL1…4 state)
PW ALARM 1	(Power Alarm state for PID.1)
PW ALARM 2	(Power Alarm state for PID.2)
LBA ALARM 1	(LBA Alarm state for PID.1)
LBA ALARM 2	(LBA Alarm state for PID.2)
HB ALARM	(HB alarm state)
LO ALARM 1	(input in LOW state for main input)
LO ALARM 2	(input in LOW state for auxiliary input)
LO ALARM MATH1	(input in LOW state for math function block 1)
LO ALARM MATH2	(input in LOW state for math function block 2)
LO ALARM MATH3	(input in LOW state for math function block 3)
LO ALARM MATH4	(input in LOW state for math function block 4)

LO ALARM MATH5	(input in LOW state for math function block 5)
LO ALARM MATH6	(input in LOW state for math function block 6)
LO ALARM MATH7	(input in LOW state for math function block 7)
LO ALARM MATH8	(input in LOW state for math function block 8)
HI ALARM 1	(input in HIGH state for main input)
HI ALARM 2	(input in HIGH state for auxiliary input)
HI ALARM MATH1	(input in HIGH state for math function block 1)
HI ALARM MATH2	(input in HIGH state for math function block 2)
HI ALARM MATH3	(input in HIGH state for math function block 3)
HI ALARM MATH4	(input in HIGH state for math function block 4)
HI ALARM MATH5	(input in HIGH state for math function block 5)
HI ALARM MATH6	(input in HIGH state for math function block 6)
HI ALARM MATH7	(input in HIGH state for math function block 7)
HI ALARM MATH8	(input in HIGH state for math function block 8)
ERR ALARM 1	(input in ERR state for main input)
ERR ALARM 2	(input in ERR state for auxiliary input)
ERR ALARM MATH1	(input in ERR state for math function block 1)
ERR ALARM MATH2	(input in ERR state for math function block 2)
ERR ALARM MATH3	(input in ERR state for math function block 3)
ERR ALARM MATH4	(input in ERR state for math function block 4)
ERR ALARM MATH5	(input in ERR state for math function block 5)
ERR ALARM MATH6	(input in ERR state for math function block 6)
ERR ALARM MATH7	(input in ERR state for math function block 7)
ERR ALARM MATH8	(input in ERR state for math function block 8)
SBR 1	(input in SBR state for main input)
SBR 2	(input in SBR state for auxiliary input)
SBR ALARM MATH1	(input in SBR state for math function block 1)
SBR ALARM MATH2	(input in SBR state for math function block 2)
SBR ALARM MATH3	(input in SBR state for math function block 3)
SBR ALARM MATH4	(input in SBR state for math function block 4)
SBR ALARM MATH5	(input in SBR state for math function block 5)
SBR ALARM MATH6	(input in SBR state for math function block 6)
SBR ALARM MATH7	(input in SBR state for math function block 7)
SBR ALARM MATH8	(input in SBR state for math function block 8)
O.LO ALARM MATH1	(output in LOW state for math function block 1)
O.LO ALARM MATH2	(output in LOW state for math function block 2)
O.LO ALARM MATH3	(output in LOW state for math function block 3)
O.LO ALARM MATH4	(output in LOW state for math function block 4)
O.LO ALARM MATH5	(output in LOW state for math function block 5)
O.LO ALARM MATH6	(output in LOW state for math function block 6)
O.LO ALARM MATH7	(output in LOW state for math function block 7)
O.LO ALARM MATH8	(output in LOW state for math function block 8)
O.HI ALARM MATH1	(output in HIGH state for math function block 1)
O.HI ALARM MATH2	(output in HIGH state for math function block 2)
O.HI ALARM MATH3	(output in HIGH state for math function block 3)
O.HI ALARM MATH4	(output in HIGH state for math function block 4)
O.HI ALARM MATH5	(output in HIGH state for math function block 5)
O.HI ALARM MATH6	(output in HIGH state for math function block 6)
O.HI ALARM MATH7	(output in HIGH state for math function block 7)
O.HI ALARM MATH8	(output in HIGH state for math function block 8)
CALC ALARM MATH1	(output in CALCULATION error state for math function block 1)
CALC ALARM MATH2	(output in CALCULATION error state for math function block 2)
CALC ALARM MATH3	(output in CALCULATION error state for math function block 3)
CALC ALARM MATH4	(output in CALCULATION error state for math function block 4)
CALC ALARM MATH5	(output in CALCULATION error state for math function block 5)
CALC ALARM MATH6	(output in CALCULATION error state for math function block 6)
CALC ALARM MATH7	(output in CALCULATION error state for math function block 7)
CALC ALARM MATH8	(output in CALCULATION error state for math function block 8)
STATUS AUTOMATIC for PID.1	

STATUS MANUAL for PID.1
STATUS LOCAL for PID.1
STATUS REMOTE for PID.1
STATUS AUTOMATIC for PID.2
STATUS MANUAL for PID.2
STATUS LOCAL for PID.2
STATUS REMOTE for PID.2

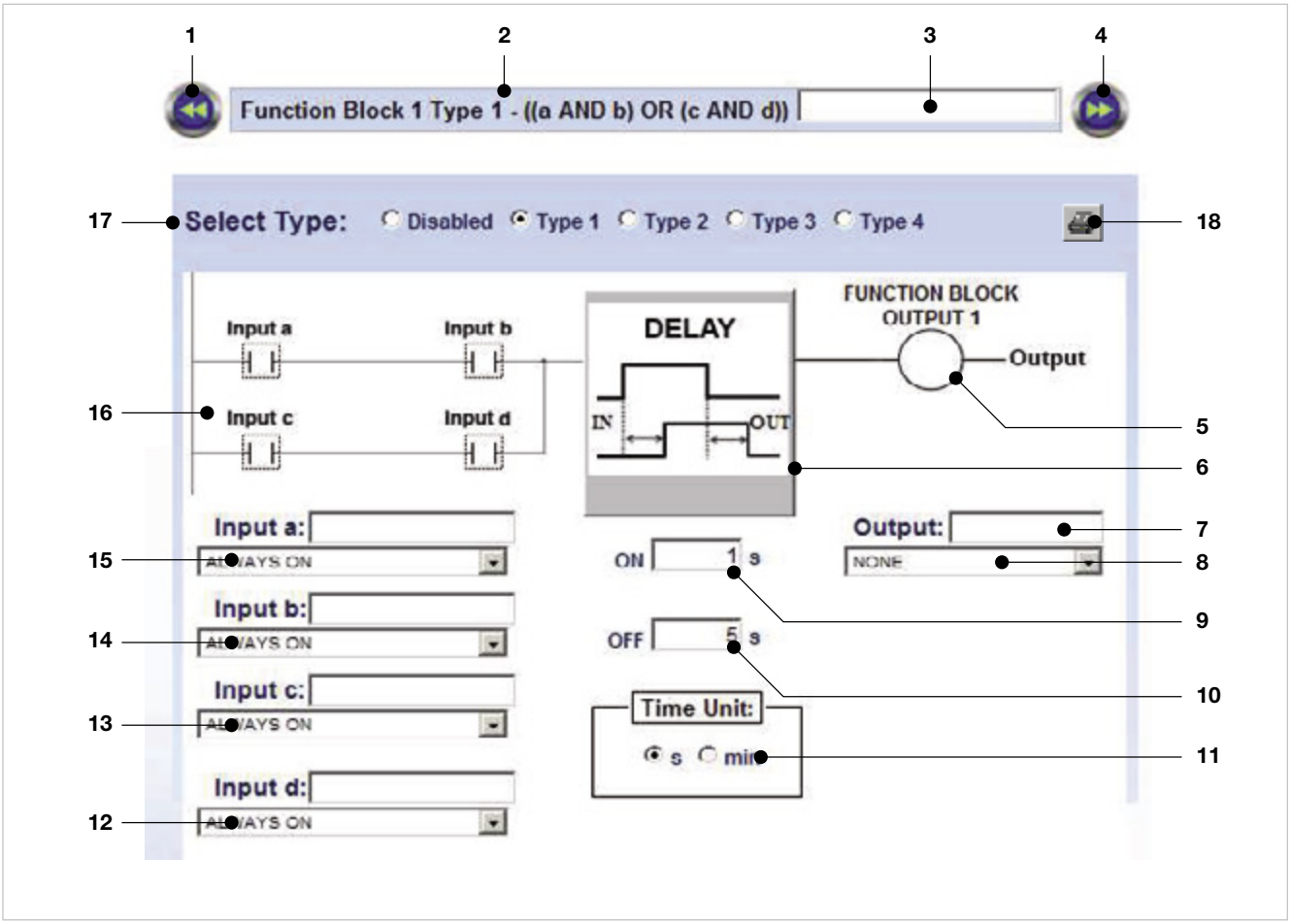
OUT1 SWITCH ALARM	(OUT1.S count exceeded with output 1 SWITCH threshold)
OUT2 SWITCH ALARM	(OUT2.S count exceeded with output 2 SWITCH threshold)
OUT3 SWITCH ALARM	(OUT3.S count exceeded with output 3 SWITCH threshold)
OUT4 SWITCH ALARM	(OUT4.S count exceeded with output 4 SWITCH threshold)
DIGITAL INPUT SWITCH ALARM	(INDG.S count exceeded with SWITCH threshold)

MESSAGE 01 (show message at scroll 1)
MESSAGE 02 (show message at scroll 2)
MESSAGE 03 (show message at scroll 3)
MESSAGE 04 (show message at scroll 4)
MESSAGE 05 (show message at scroll 5)
MESSAGE 06 (show message at scroll 6)
MESSAGE 07 (show message at scroll 7)
MESSAGE 08 (show message at scroll 8)
MESSAGE 09 (show message at scroll 9)
MESSAGE 10 (show message at scroll 10)
MESSAGE 11 (show message at scroll 11)
MESSAGE 12 (show message at scroll 12)
MESSAGE 13 (show message at scroll 13)
MESSAGE 14 (show message at scroll 14)
MESSAGE 15 (show message at scroll 15)
MESSAGE 16 (show message at scroll 16)
MESSAGE 17 (show message at scroll 17)
MESSAGE 18 (show message at scroll 18)
MESSAGE 19 (show message at scroll 19)
MESSAGE 20 (show message at scroll 20)
MESSAGE 21 (show message at scroll 21)
MESSAGE 22 (show message at scroll 22)
MESSAGE 23 (show message at scroll 23)
MESSAGE 34 (show message at scroll 24)
MESSAGE 25 (show message at scroll 25)
MESSAGE 26 (show message at scroll 26)
MESSAGE 27 (show message at scroll 27)
MESSAGE 28 (show message at scroll 28)
MESSAGE 29 (show message at scroll 29)
MESSAGE 30 (show message at scroll 30)
MESSAGE 31 (show message at scroll 31)
MESSAGE 32 (show message at scroll 32)
HOME 1/2 MENU (set HOME1 or HOME2 if in HOME menu)
per i modelli di regolatore con programmatore si hanno inoltre:
PROGRAMMER IN HBB ALARM for PROGR.1
PROGRAMMER IN RUN for PROGR.1
PROGRAMMER IN HOLD for PROGR.1
PROGRAMMER IN READY for PROGR.1
PROGRAMMER IN END for PROGR.1
STEP EVENT 1 for PROGR.1
STEP EVENT 2 for PROGR.1
STEP EVENT 3 for PROGR.1
STEP EVENT 4 for PROGR.1
PROGRAMMER IN HBB ALARM for PROGR.2
PROGRAMMER IN RUN for PROGR.2
PROGRAMMER IN HOLD for PROGR.2
PROGRAMMER IN READY for PROGR.2
PROGRAMMER IN END for PROGR.2
STEP EVENT 1 for PROGR.2
STEP EVENT 2 for PROGR.2
STEP EVENT 3 for PROGR.2
STEP EVENT 4 for PROGR.2

5.16.3. Programming logic Function Blocks

5.16.3.1. Configuration page

The GF_eXpress program's Logic Function Blocks configuration page lets you configure and debug the blocks

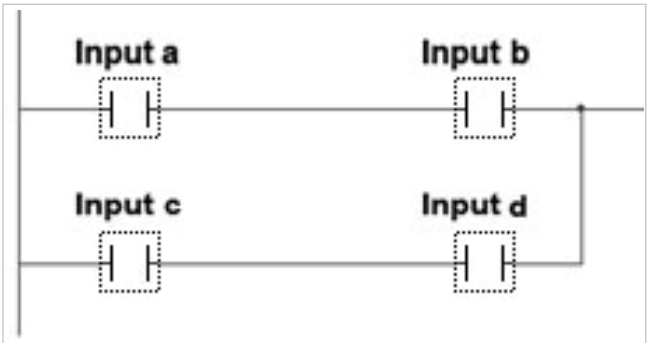


1. Button to return to previous function block.
2. Number of function block and type of logic operations run.
3. Name of function block. You can insert an optional descriptive name of the function block.
4. Button to go to next function block.
5. Output value when result of function operations is true.
6. Graph of DELAY TIMER.
7. Name of output. You can insert an optional descriptive name of the output.
8. Type or variable of activated output.
9. Duration of ON delay.
10. Duration of OFF delay.
11. Unit of measurement of delays (seconds or minutes).
12. Type or variable of input evaluated for input **d**. The Input d box is used to insert an optional descriptive name of input **d**.
13. Type or variable of input evaluated for input **c**.
14. Type or variable of input evaluated for input **b**. The Input d box is used to insert an optional descriptive name of input **b**.
15. Type or variable of input evaluated for input **a**. The Input a box is used to insert an optional descriptive name of input **a**.
16. Graph of logic operation run. The input boxes also show the value that the input must assume in order to be considered "true".
17. Selection of logic function applied to function block.
18. Button to print Logic Function Block in use.

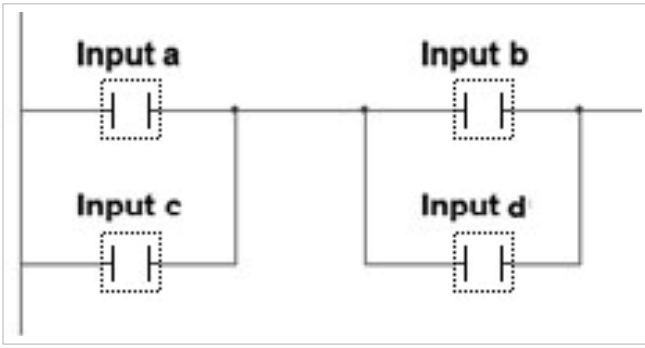
5.16.3.2. Enabling logic function block and selecting the type of logic function

The logic function block page is enabled automatically as soon as you select a type of logic function.

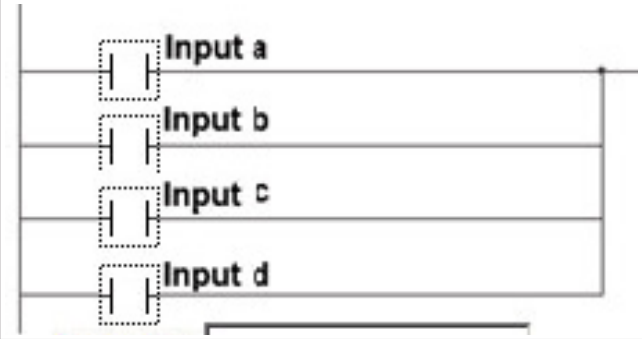
When you select the type of logic function assigned to the logic function block, its symbol changes as well, as shown in the figures below.



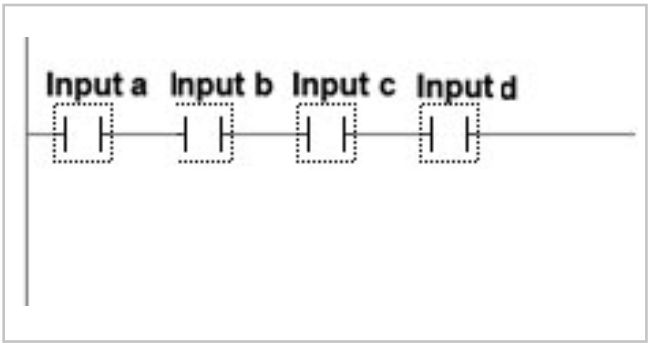
TYPE 1 - (**a** AND **b**) OR (**c** AND **d**)



TYPE 2 - (**a** OR **c**) AND (**b** OR **d**)



TYPE 3 - **a** OR **b** OR **c** OR **d**



TYPE 4 - **a** AND **b** AND **c** AND **d**

You can name the logic function block so that it can be easily recognized for future use

The name will be saved as part of the “configuration recipe” only on the PC. If you copy the configuration to other controllers, the controller to which the configuration is copied will not contain these descriptive names.

5.16.3.3. Configuring input variables

Configure the four input variables **a, b**, **c** and **d**, one at a time. On the pull-down menu, select the variable to be assigned to the input.
The options are:

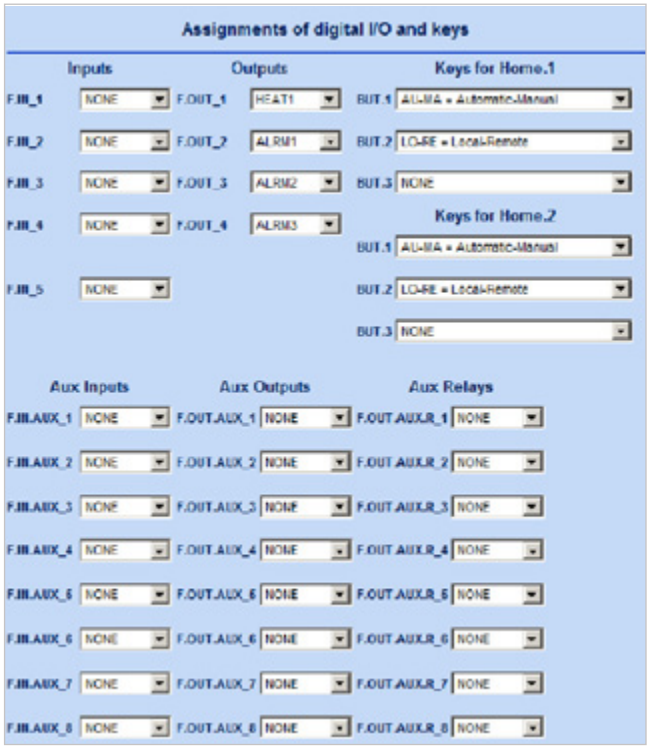
- ON, input always ON;
- OFF, input always OFF;
- one of the values in the groups of Digital input state, Digital output state, and Function state variables listed above in paragraph “5.16.2. Groups of variables” on page 198.

By clicking the input’s icon you can reverse its reference state from normally open (NO) to normally closed (NC) and vice versa.
This cannot be done if you chose ON or OFF on the pull-down menu..

NO NC

If digital inputs IN1, IN2, IN3, IN4, IN5 are among inputs **a**, **b**, **c** and **d**, and you want them to be used only in Function Blocks, you have to configure the function Func = LFB.IN for them.

If you want to transmit the output state of a logic function block (LOGIC FUNCTION BLOCK OUTPUT 1…16) to an output OUT1…OUT4 of the controller, you have to configure the function F.out = LFB.O for these outputs and specify in FB.O.N the number of the function block output.



Complete the configuration by giving a descriptive name to each input so that it can be easily recognized for future use.

The name will be saved as part of the “configuration recipe” only on the PC and will not be transferred to the controller.
Therefore, when the controllers are cloned, the controller to which the configuration was copied will not contain this descriptive name.

5.16.3.4. Configuring the output

Configure the output by selecting on the pull-down menu one of the values listed in the Function Commands group shown above in paragraph “5.16.2. Groups of variables” on page 198.
This will be the output variable whose value will be changed by the result of the logic operation processed with the input variables data.

If the function given the output of the function block is the same assigned to a digital input, the state of this input has priority.

By clicking the output’s icon you can reverse, from normally open (NO) to normally closed (NC) and vice versa, the transmitted state if the result of the logic operation is “true.”

NO NC

End the configuration by giving a descriptive name to the output so that it can be easily recognized for future use.

The name will be saved as part of the “configuration recipe” only on the PC and will not be transferred to the controller.
Therefore, when the controllers are cloned, the controller to which the configuration was copied will not contain this descriptive name.

5.16.3.5. Configuring delays

You can insert a delay between the result of the logic operation and the change in value of the output variable.
These delays, which can differ from the “true” result and the “false” result of the logic operation, are set on the DELAY TIMER.
Delays can be counted in seconds or in minutes

Configure both delays:

- ON, which indicates how long after a “true” result of the logic operation the value of the output variable is changed.
- OFF, which indicates how long after a “false” result of the logic operation the value of the output variable is changed

When the time is set to 0 (zero), the change in value of the output variable is instantaneous.

If both delays for ON and OFF equal 0, the DELAY TIMER is ignored

5.17. Math operations

5.17.1. Math function blocks

The math operations function processes (with Math Function Blocks) the values of input variables to obtain values for output variables.
Math function blocks are programmed with GF_eXpress software.

Math function blocks are executed every 60 ms, in sequence from MFB1 to MFB8. Therefore, the maximum delay between the change of an input and the update of its output is 60 ms.
Math function blocks continue to be executed even in Software OFF conditions.
A maximum of 8 function blocks are provided, each of which can manage up to 2 variables in input and 1 variable in output.

Input variables (**a**, **b**) can refer to:
- analog inputs,
- setpoint,
- alarm thresholds,
- control powers,
- support coefficients settable from serial or user menu,
- variables MFB_OUT_01… MFB_OUT_08 from other function blocks,
- LFB_OUT_1...LFB_OUT_32.

Input variable (**c**) refers to variables
LFB_OUT_01… LFB_OUT_32 from logic function blocks.

2 types of operations on inputs variables **a, b** can be executed on math function blocks:
- Type 1: MATH FUNCTION (a, b);
- Type 2: MATH FUNCTION (a) + LOGIC RESET COMMAND (c).

The result of the Math Operations function can act on:
- process variables,
- local setpoint,
- value of analog outputs.

5.17.2. Groups of variables

The controller offers many variables that can be used in input for math operations.
These include the following groups of homogeneous variables:

Analog inputs

IN1	Main input
IN2	Auxiliary input
CURR1	input from current transformer CT1
CURR2	input from current transformer CT2

Process variables

PV.1 Process variable for PID.1
PV.2 Process variable for PID.2

Local setpoint

NOTE: When the SETP.x is managed as a Math Function Block output, the parameter can no longer be changed from the display or by serial connection.

SETP1 local setpoint for PID.1
SETP2 local setpoint for PID.2

Multiset setpoint

M.SET1.1 multiset setpoint 1 for PID.1
M.SET2.1 multiset setpoint 2 for PID.1
M.SET3.1 multiset setpoint 3 for PID.1
M.SET4.1 multiset setpoint 4 for PID.1
M.SET1.2 multiset setpoint 1 for PID.2
M.SET2.2 multiset setpoint 2 for PID.2
M.SET3.2 multiset setpoint 3 for PID.2
M.SET4.2 multiset setpoint 4 for PID.2

Alarm thresholds

ALRM1 alarm 1 threshold
ALRM2 alarm 2 threshold
ALRM3 alarm 3 threshold
ALRM4 alarm 4 threshold

Control powers

OUT.P1 for PID.1
OUT.P2 for PID.2

Analog outputs

OUT.C continuous output
OUT.A1 analog output 1
OUT.A2 analog output 2

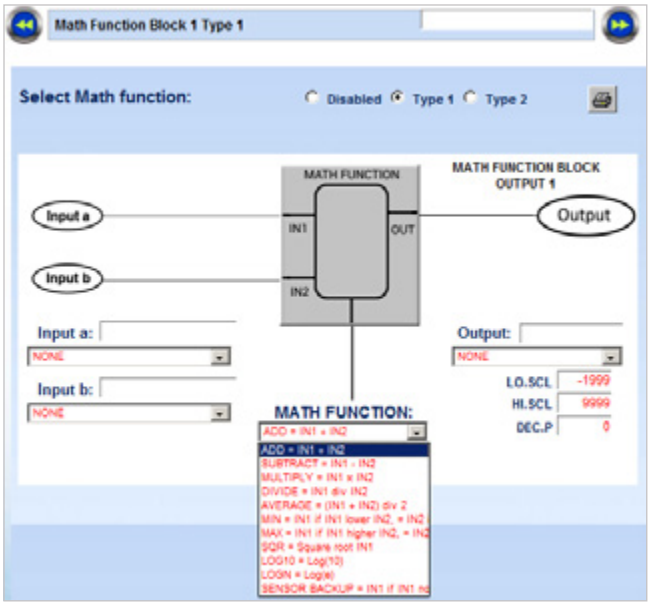
Support coefficients (displayable and settable on User menu)

M.C1 math coefficient 1 (with setting of decimal point position in MFB_COEFF_DECP_1)
M C2 math coefficient 2 (with setting of decimal point position in MFB_COEFF_DECP 2)
M.C3 math coefficient 3 (with setting of decimal point position in MFB_COEFF_DECP 3)
M.C4 math coefficient 4 (with setting of decimal point position in MFB_COEFF_DECP 4)

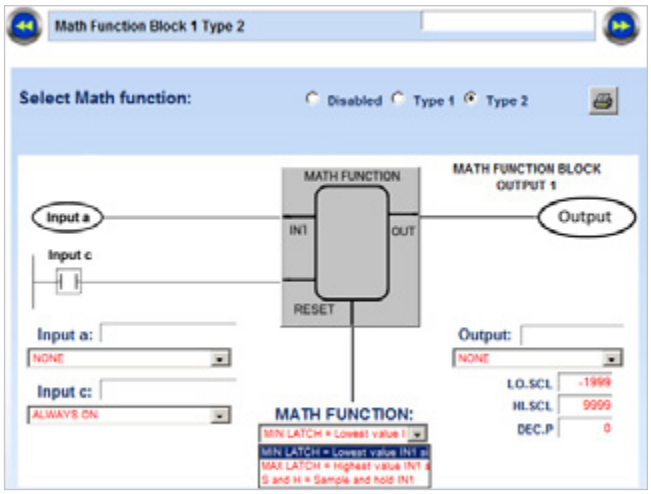
5.17.3. Programming Math Function Blocks

5.17.3.1. Configuration page

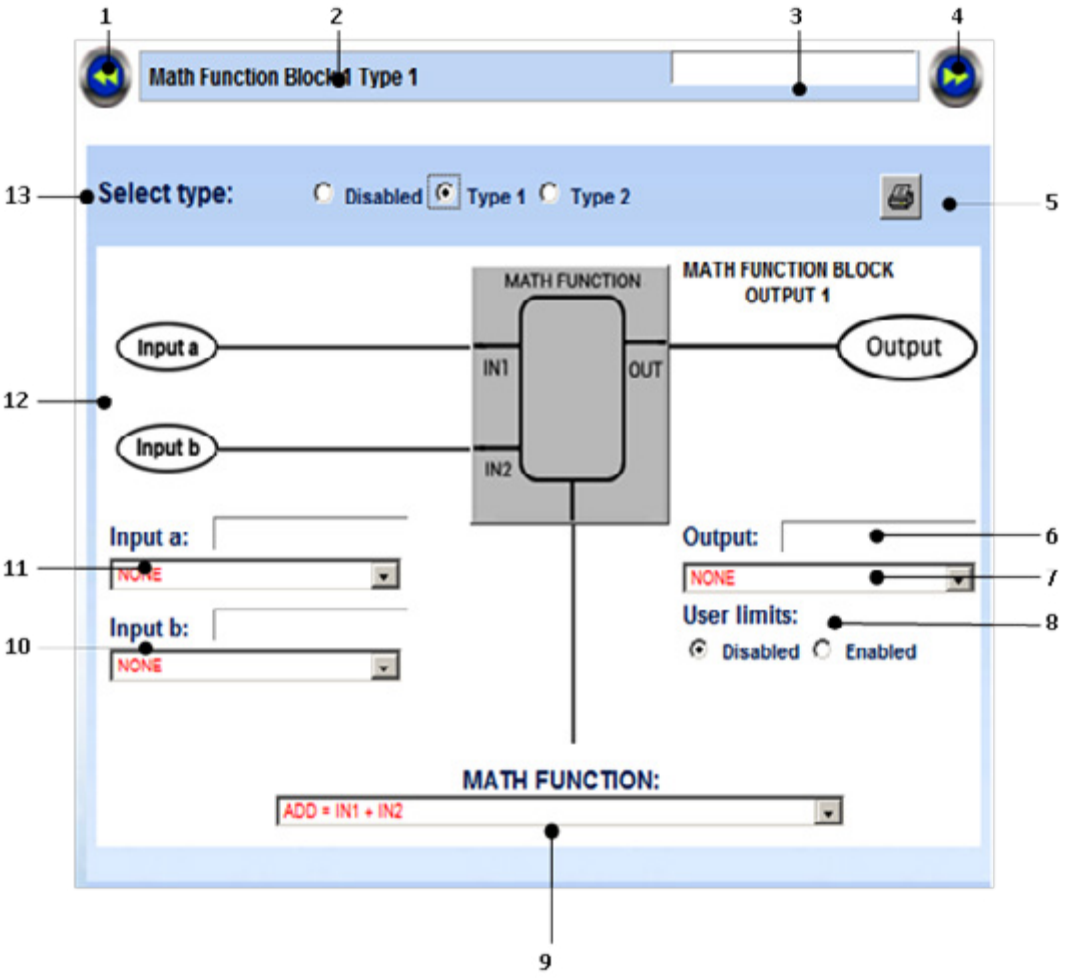
The GF_eXpress program's Math Function Blocks configuration pages let you configure and debug the blocks. There are two different pages, one for each type of operation.



Type 1 operations
MATH FUNCTION (a, b)



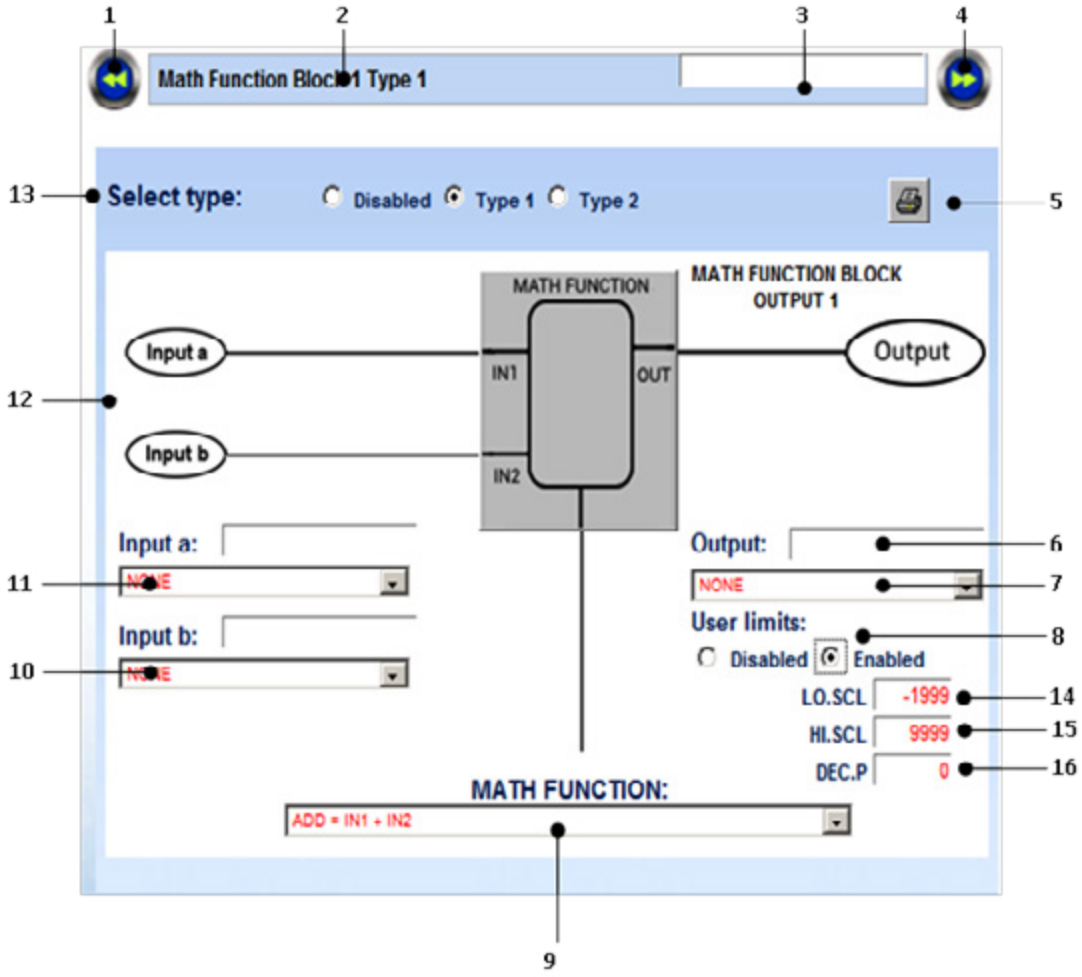
Type 2 operations
MATH FUNCTION (a) + LOGIC RESET COMMAND (c)



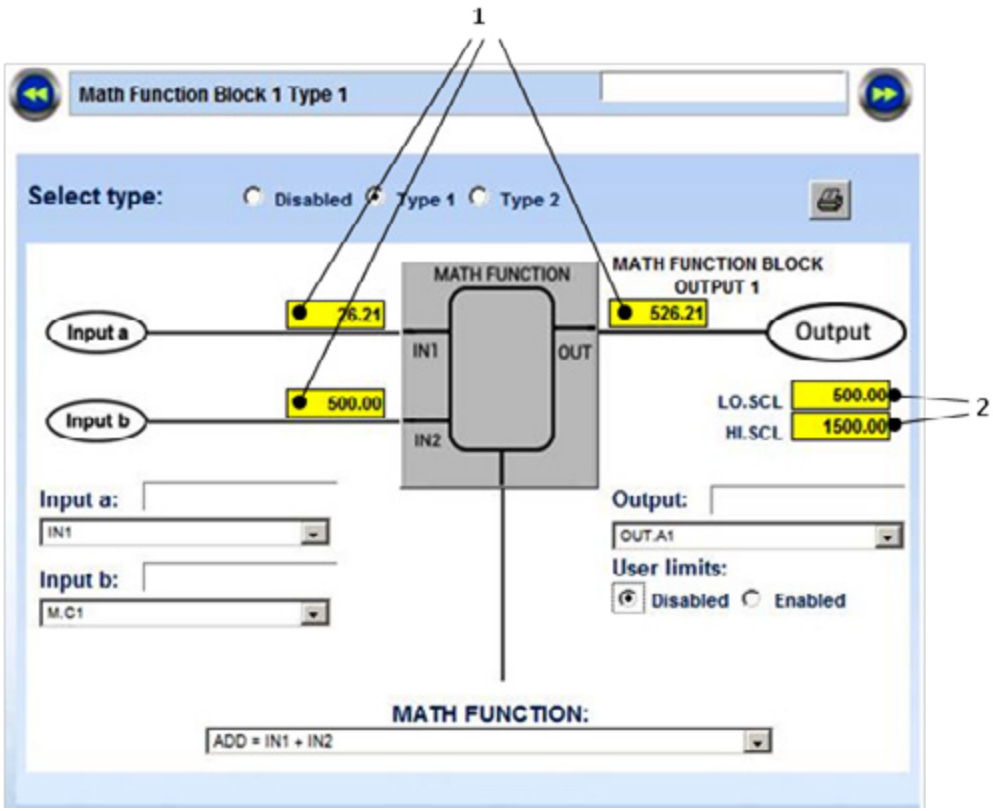
1. Button to return to previous Math Function Block.
2. Number of Math Function Block.
3. Name of Math Function Block. You can enter an optional descriptive name of the Math Function Block.
4. Button to go to next Math Function Block.
5. Button to print Math Function Block in use.
6. Name of output. You can enter an optional descriptive name of the output.
7. Output type or variable activated.
8. Setting limits control mode (Disabled => Limits calculated automatically, Enabled => Limits set by user)
9. Type of operation executed by Math Function Block in use.
10. Input type or variable evaluated for input b. Input b box is used for entering an optional descriptive name of input b.
11. Input type or variable evaluated for input a. Input a box is used for entering an optional descriptive name of input a.
12. Graphic representation of type of inputs (analog or digital) used by Math Function Block in use.
13. Selection of type of Math Function Block

By enabling manual mode for setting maximums and minimums, you see the following:

14. Minimum value that Math Function Block output can assume.
15. Maximum value that Math Function Block output can assume.
16. Value of decimal figures attributable to output.



When onLine mode is activated, the virtual values of the respective quantities, including the minimum and maximum limits used (see yellow fields) will be shown for the analog input and output terminals.



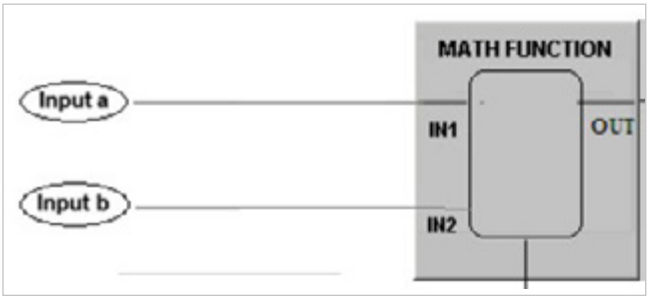
Following a reboot of the controller after a Power ON, type 2 math function blocks always restart at their initial value. Specifically:

- 9999 for the block that memorizes the minimum,
- -1999 for the block that memorizes the maximum,
- 0 for Sample and Hold.

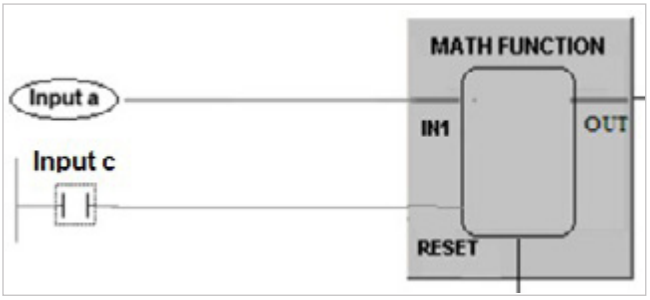
5.17.3.2. Enabling a function block and selecting the type of math function

The function block page is enabled automatically as soon as a type of math function is selected.
The page is not cancelled if you select Disabled. The input and output configuration stays memorized in the program software, ready to be reused without requiring a new configuration.

When you select the type of math function assigned to the function block, its symbol changes as well as shown in the figures below.



TIPO 1



TYPE 2

You can name the function block so that it can be easily recognized for future use.

The name will be memorized as part of the “configuration recipe” only on the PC. If you copy the configuration to another controller, the controller to which the configuration is copied will not contain the descriptive name.

5.17.3.3. Configuring input variables

Configure the input variables (**a, b**) or (**a, c**), by selecting (on the pull-down menu) which variable will be assigned to the input.

In case of logic input c, by clicking the input’s symbol you can invert its reference state between normally open (NO) and normally closed (NC).
This cannot be done if you have selected ON or OFF on the pull-down menu.

NO

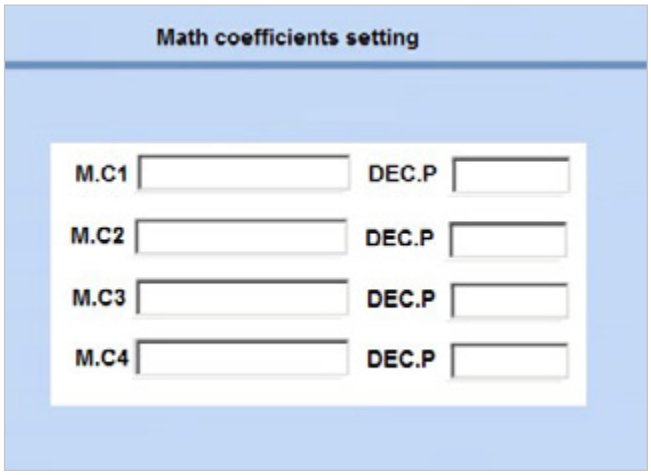
NC

ATTENTION: Following a reboot of the controller after a Power ON, type 2 math function blocks always restart at their initial value. Specifically:

- 9999 for the block that memorizes the minimum,
- -1999 for the block that memorizes the maximum,
- 0 for Sample and Hold.

If you want to transmit the output state of a math function block (MATH FUNCTION BLOCK OUTPUT 1…8) to an analog output of the controller, simply assign the selected analog output to the MFB output.

If you select support coefficients as input variables, you have to set their value in the field provided.



Complete the configuration by giving a descriptive name to each input so that it can be easily recognized for future use.

The name will be memorized as part of the “configuration recipe” only on the PC and will not be transferred to the controller.
Therefore, when the controllers are cloned, the controller to which the configuration is copied will not contain the descriptive name.

5.17.3.4. Configuring the output

Configure the output by selecting (on the pull-down menu) one of the possible values listed in the Function Commands groups shown above in “5.17.2. Groups of variables” on page 201
This will be the output variable whose value will be changed by the result of the logic operation conducted with the input variables data.

End the configuration by giving a descriptive name to the output so that it can be easily recognized for future use.

The name will be memorized as part of the “configuration recipe” only on the PC and will not be transferred to the controller.

Therefore, when the controllers are cloned, the controller to which the configuration is copied will not contain the descriptive name.

5.18. Recipe management

5.18.1. Defining parameters recipes

Parameters recipes are defined so that the user can compile a list of N parameters (with N ≤ 25), selected from all of the parameters provided by the controller, and assign each one up to 5 values.

When the user has to use one of the five groups of parameters, he/she can select the recipe and load it in memory.

The parameters recipe list is defined in GF_eXpress by:
- the GF_eXpress RECIPE EDITOR wizard, “Template” tab (recommended);
- the GF_eXpress “Recipe template” menu by assigning, in the “Name”\”Value” column, the IPA of the parameter to be added.

Parameters values in the nth recipe will be set:
- in the GF_eXpress RECIPE EDITOR wizard, Recipe_x tab (recommended);
- in the “RECIP_X” submenus of the GF_eXpress “RECIP” menu.

The RECIPE submenu on the configuration menu will show only the values contained in the recipes (Read Only parameters).

You can run a check of correct configuration of the Recipes template by clicking the icon in GF_eXpress (or the “Check user recipes template coherence” command on the GF_eXpress Service menu).

5.18.2. Setting the active recipe

The active recipe is set by:
- parameter REC.AC inserted in the User menu;
- digital input function;
- Logic Function Block function

The recipe is loaded after every change of parameter REC.AC (directly by the parameter, by digital input or by Logic Function Block).

Congruity between parameters in execution on the controller and recipe parameters is checked during loading.

If a value is rejected, the fault is signaled with a clear scrolling message that cannot be changed by the user (“Error on recipe 1”, “Error on recipe 2”, “Error on recipe 3”, “Error on recipe 4“ and “Error on recipe 5”).

Exampled of setting from digital input and LFB

if the Parameters recipe function RECP.N >= 2 is enabled:
REC.0 = Select parameters recipe bit 0
with RECP.N=2 select recipe 1 or recipe 2
with RECP.N=3 select recipe 1…recipe 3 bit 0
with RECP.N=4 select recipe 1…recipe 4 bit 0
with RECP.N=5 select recipe 1…recipe 5 bit 0

if the Parameters recipe function RECP.N >= 3 is enabled:
REC.1 = Select parameters recipe bit 1
with RECP.N=3 select recipe 1…recipe 3 bit 1
with RECP.N=4 select recipe 1…recipe 4 bit 1

if the Parameters recipe function RECP.N >= 5 is enabled:
REC.2 = Select parameters recipe bit 2
with RECP.N=5 select recipe 1…recipe 5 bit 2

5.18.3. Saving parameters in active recipe

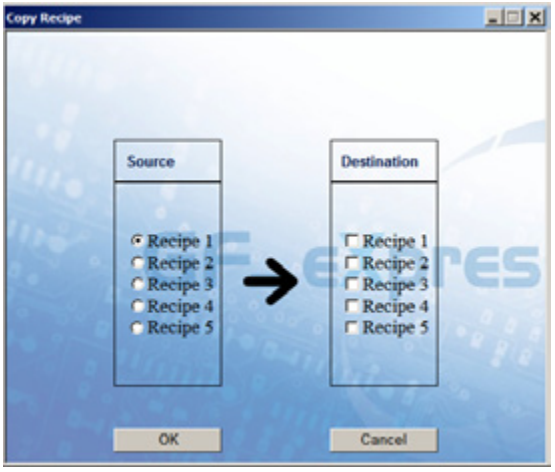
You can save values assigned to recipe parameters in the active recipe (shown in parameter REC.AC) by using parameter REC.SV (settable on the User Menu and by GF_eXpress).

5.18.4. Copying recipes

With GF_eXpress, you can also copy the contents of one of the 5 recipes to the other 4 (from 1 to 4), by clicking:

- the icon
- the “Copy Recipes” command on the Service menu

You will see a form on which you can select the source recipe (single) and the destination recipe(s).



6. PROGRAMMING WITH PC

6.1. Controller-PC connection

The controller has a port to connect the device to a PC.
The following photos show where the port is located on the different controller models.
Models 1650 and 1850 differ only in the size of the case.

The connection requires a special accessory cable (code F060800), which acts as a USB-serial interface/converter and communicates as a Virtual COM Port with a USB port on the computer.

Attention! To use this interface you have to install the VCP driver, downloadable from: **www.gefran.com/en/products/261-gf_express#-downloads.**

When the controller is connected to the PC you can configure it rapidly even when it is not powered.
The instrument configuration memory is powered by the USB connection.
Connecting the controller to the primary power supply while the USB cable is still connected DOES NOT activate normal Power-on. You must first disconnect the controller from the PC and then apply primary power.

6.2. Programming Tool

6.2.1. GF_eXpress

The GF_eXpress software lets you:
- read and write the configuration of controller (set of parameters);
- save recipes on the PC (recipe archive);
- display as graph / set all parameters needed for the Programmer function;
- display/set Logic Operations (Function Blocks);
- display/set math Operations (function blocks);
- set structure of parameters recipes;
- set sequence and parameters of user configuration menu;
- set message strings (3 selectable languages);
- transfer any firmware updates

The software is available on CD-rom (code F043958).
The program can be updated automatically from www.gefran.com.

6.2.1.1. System requirements

	Minimum	Recommended
Operating system	Windows XP SP2 or Windows Vista or Windows 7 (32 bit)	Windows 7 (64 bit)
Processor	Intel Pentium 1 GHz	Intel Core i5 2,5 Ghz or higher
RAM	2 GB	4 GB or higher
Free space on Hard Disk	2 GB	4 GB or higher
Resolution	XGA (1024 x 768 pixel)	SXGA (1280 x 1024 pixel) or higher
Browser	Microsoft Internet Explorer 8.0	Microsoft Internet Explorer 9.0 or higher
Ethernet port	1 RJ45	1 RJ45
DVD reader	Yes	Yes
USB port	1 USB 2.0	1 USB 2.0

7. OPERATOR GUIDE

7.1. Displays and keys

The display and keys for each model are described in paragraphs “1.3.1. Display and keys” on page 13 for the 850, “1.4.1. Display and keys” on page 15 for the 1650, and “1.5.1. Display and keys” on page 17 for the 1850.

7.1.1. Navigating the menus

Keys are used for navigating menus and submenus, changing parameters, and confirming choices.
Their function depends on the context and on how long they are pressed.

The LEDs above the keys not only give confirmation that each key has been pressed (by flashing), but also show which keys can be used in each situation.

The following navigation functions are assigned to the keys:

F Scroll User Configuration menu (Setpoint, Alarm setpoints, Control output, etc.).
Each time the key is pressed, it confirms the value of the displayed parameter and goes to the next item on the menu.
Keep the key pressed for more than 2 seconds to enter the Programming/Configuration Menu.

Each time the key is pressed, you go back to the previous menu item or to the higher menu level, according to the context.
Keep the key pressed for more than 2 seconds to return to the Home page.

Press the key to enter a submenu or to lower the displayed parameter value, according to the context.
Keep the key pressed to progressively increase the speed of lowering the displayed parameter.

Press the key to raise the value of the displayed parameter.
Keep the key pressed to progressively increase the speed of raising the displayed parameter.

When the process variable is displayed, in standard configuration the ( ) key switches the controller function mode (manual/automatic).

7.2. Power-on

The controller runs a self-diagnostics test immediately after power-on.
During the test all segments of the display flash and a checksum is run.
The hardware resources present are also acquired.

If the self-diagnostics test detects no errors, the controller enters normal functioning state (display shows Home page).

If any system errors are detected, the controller displays the related information.
If the error is caused by a damaged program, update the firmware.
If the error is caused by incorrect configuration, reconfigure the controller with PC and GF_eXpress software.

Errors are saved in a register and can be displayed with the Error function on the INFO menu.

7.3. Operation as controller

The device’s normal operating mode is controller-only.

The display shows the following information:
- PV displays the process variable value;
- SV displays the setpoint value (if dS.Sp = setp);
- models 1650 and 1850 also display the control output value (if dS.F = OUT.P);
- by pressing the F key the PV display shows, in sequence the significant values that condition controller function: setpoint, alarm setpoints, control output, etc., which can be changed if necessary (parameters in the user menu).

Keep the F key pressed for more than 2 seconds to enter the Programming/Configuration menu.

Use the △ and ▽ keys to raise and lower the setpoint to the value required.

Press the F key to save the SP value; otherwise, the set value is saved about 15 seconds after the last change

7.4. Operation as programmer

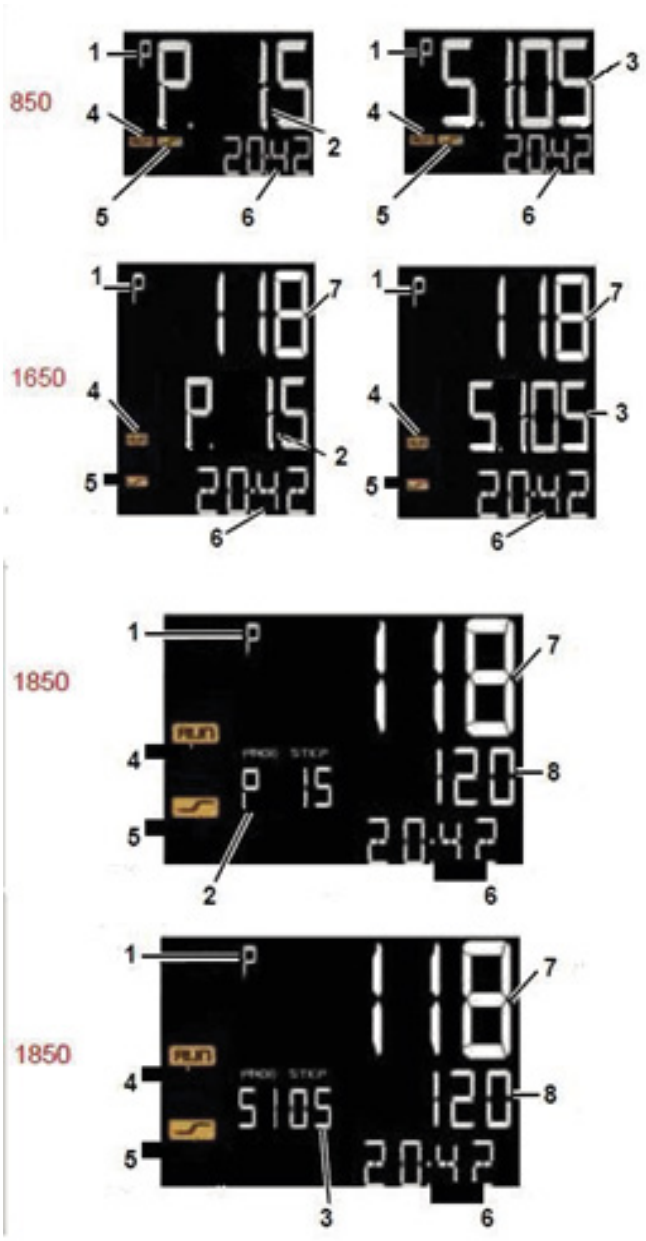
7.4.1. Activating the programmer

To enable the Programmer function, set parameter PROGR = On1, On2, On.S. on the EN.FUNC menu.
The following parameters are entered as default on the user menu:

- PROG.STATUS_1 which lets you request the display/ check of PROGRAMMER 1
- PROG.STATUS_2, which lets you request the display/ check of PROGRAMMER 2

7.4.2. Display indication

The different controller models display programmer status information in different ways.
The following examples show how the same information is displayed on the 850, 1650, and 1850 controllers.
Compared to the model 850, models 1650 and 1850 also show the process variable value (PV_1 PROG.STATUS_1 and PV_2 PROG.STATUS_2).
Compared to the other two models, the model 1850 also shows the setpoint value of the active step.
1. Indication of programmer status. When on, programmer is on.
2. Number of program running (number 2 in example).
3. Number of program step running (number 5 in example).
4. LED RUN: on indicates that program is running; flashing indicates that program is in STOP, END or HOLD, and that the time base is stopped.
5. LED RAMP: on indicates that program is running the ramp segment of the step; off means that it is in the hold segment of the step or at end of program (in example: running ramp of step 5).
6. Current time of segment (ramp or hold) of step. The time value depends on the set base times, hh:mm or mm:ss (in example: elapsed time is 20 minutes and 42 seconds).
7. Process variable PV_1 or PV_2 depending on whether you are in PROG.STATUS_1 or in PROG.STATUS_2 (in example: 118).
8. Setpoint of current step, i.e. the value to be reached (in example: 120).



7.5. Errors during operation

If errors occur during normal operation, the HOME.x pages will show:

- the name of the error on the PV display
- the value of the setpoint or control output on the SV display (only on models 1650 and 1850).
- a scrolling message with errors detected, on display SV (model 850) or on display F (models 1650 and 1850).

The most common error messages are:

Lou Process variable is below minimum scale limit (parameter LO.SCL on I.MAIN).

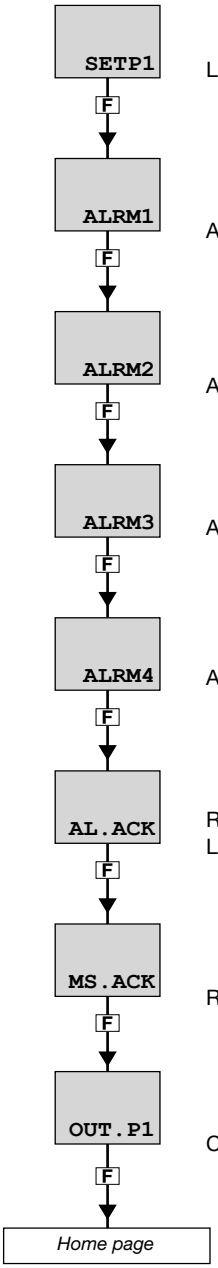
High Process variable is above maximum scale limit (parameter HI.SCL on I.MAIN).

Err PT100 in short circuit or input values below minimum limits (for example, thermocouple with incorrect connection) or 4...20 mA transmitter broken or not powered.

Sbr Sensor broken or input values above maximum limit.

7.6. Configuration (User menu)

Every operator has a freely accessible menu (no password required) on which he can configure some controller parameters.
The User Configuration menu can be built according to need with the GF_express software, grouping up to 100 parameters from those available for controller configuration (see chapter “4. Configuration” on page “4. CONFIGURATION” on page 48).
Among the parameters selected to build the menu of user configuration is PASS 1; it may be useful to submit a password to the parameters of the user menu.
The controller leaves the factory with a preconfigured user configuration menu (shown below for models: 850-x-xxx-00000-x-xxx and 1650-x-xxx-00000-x-xxx).
This menu can subsequently be modified. The related parameters are shown for models with options; the complete list of parameters is shown on the GF_eXpress user menu page.
Press the F key to access the User Configuration menu.
GF_eXpress can be used to set the generic user menu parameter to set automatic back to PV\Home when positioned on the parameter and no key is pressed within 15 seconds.



Description	Unit of measurement	Valid values	Notes
Local setpoint 1	scale points	LO.SP1...HI.SP1	
Alarm 1 limit	scale points	LO.AL1...HI.AL1 -999...999	If absolute alarm. If deviation alarm.
Alarm 2 limit	scale points	LO.AL1...HI.AL1 -999...999	If absolute alarm. If deviation alarm.
Alarm 3 limit	scale points	LO.AL1...HI.AL1 -999...999	If absolute alarm. If deviation alarm.
Alarm 4 limit	scale points	LO.AL1...HI.AL1 -999...999	If absolute alarm. If deviation alarm.
Reset alarms latch and LBA alarm		Off On	Appears if at least one alarm with latch was set or if LBA alarm was enabled. The reset command is temporary and is not saved.
Reset scrolling message		Off On	Appears if a scrolling message is present. The reset command is temporary and is not saved.
Control output value 1		-100.0...100.0 On / OFF	Value Read Only

You can enter the following on the user menu:

- simple parameters (for example, software version SW.Ver or password 1 PASS1);
- single instances of indexed parameters (for example, configuration of main channel type tYPE.1 and of auxiliary channel type tYPE.2) ;
- subsets of parameters pertaining to an indexed configuration menu (for example, some parameters of the step configuration menu of the PR.STP program, such as the Setpoint of the SETP programming step, the Ramp Time of the rAMP.T step, and the Hold Time of the HOLD.T step).

To enter subsets of parameters pertaining to an indexed configuration menu, the objects in the diagram at the right must be entered IN THE FOLLOWING ORDER:

1. the Modbus object for the indexed configuration menu (in the example, PR.STP);
2. the Modbus object for the index selector of the indexed configuration menu (in the example, PR.STP.N);
3. the Modbus object for the first instance of the first parameter to be managed on the User Menu, pertaining to the configuration menu specified at point 1 (in the example, SETP.1);
4. the Modbus object for the first instance of the second parameter to be managed on the User Menu, pertaining to the configuration menu specified at point 1 (in the example, rAMP.T.1);
5. the Modbus object for the first instance of the third parameter to be managed on the User Menu, pertaining to the configuration menu specified at point 1 (in the example, HOLD.T.1);
6. the Modbus object for the first instance of the nth parameter to be managed on the User Menu, pertaining to the configuration menu specified at point 1.

If you try to enter:

- a Modbus object that does not pertain to the configuration menu specified at point 1, or
- a Modbus object for an instance other than the first, even if pertaining to the specified configuration menu,

you will exit the indexed configuration menu.

Failure to follow points 1 and 2 will block correct navigation of the indexed configuration menu.

You can run a check of correct configuration of the Recipes template by clicking the icon in GF_eXpress (or the “Check user recipes template coherence” command on the GF_eXpress Service menu).

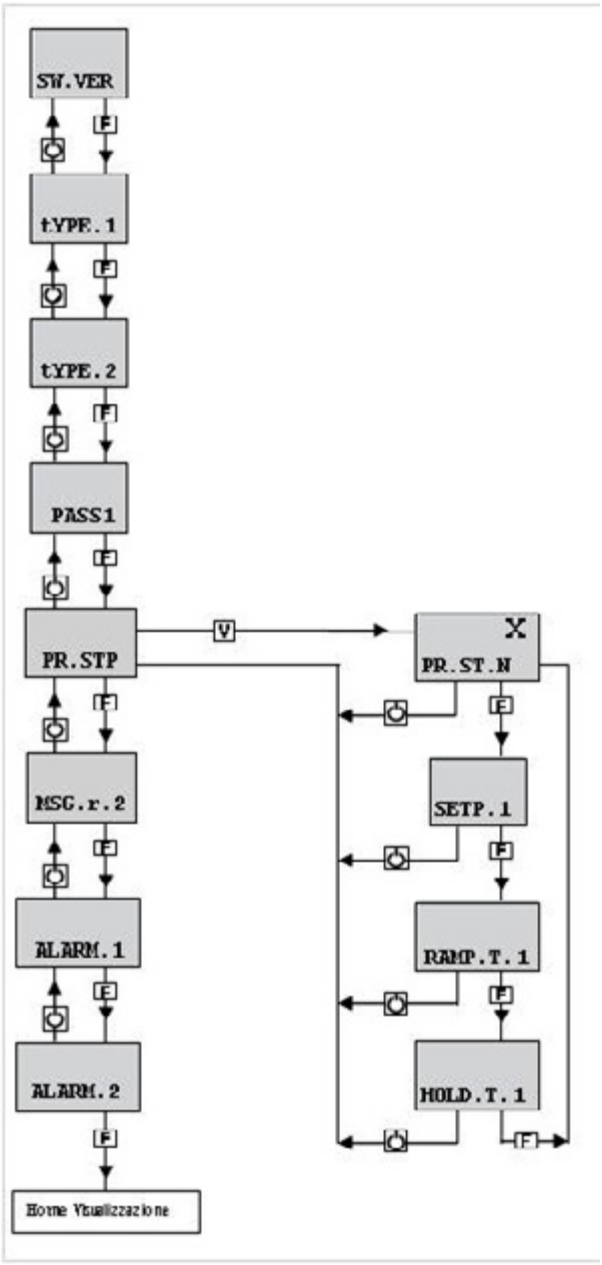
If:

- the value 0, or
- a wrong Modbus address

is entered in the Value column of the GF_eXpress User Menu, navigation on the User Menu interrupts and you return to the Home.1 page.

During navigation on an indexed menu, when you return to the menu with index (parameter PR.STP.N in the following figure), the number of the indexed submenu is always 1.

If the user changes the User Menu configuration while the controller is working in this menu (i.e., the display is showing one of the User Menu parameters), the switch to Home.1 is automatically forced.



8. MAINTENANCE

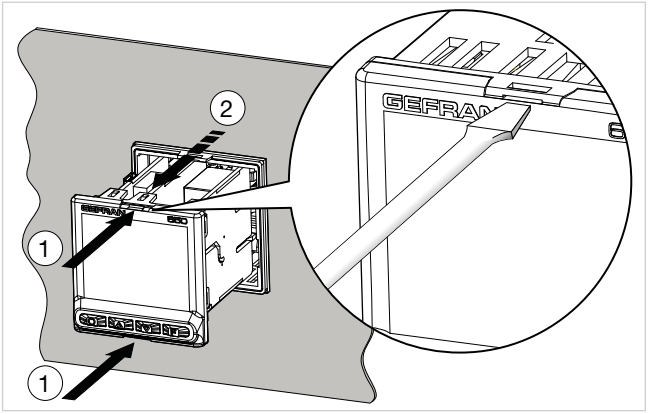
Attention!
The controller must be repaired only by technicians trained and authorized by Gefran. Any attempt by unauthorized personnel to repair or change the hardware characteristics of the controller will void the warranty..

8.1. Replacing the controller

The instrument (display + electronic circuits) can be replaced without having to remove the entire controller from the panel and disconnect its cables.

First switch off the power supply to the controller and to the other devices connected to it.
Then release the top and bottom of the faceplate and remove the instrument (see figure).
Insert the new instrument and switch on the power supply.

Attention! Replace the entire controller if the blade contacts inside the instrument or the protective case show traces of burns or are not in perfect condition.



8.2. Replacing the gasket

The gasket may lose efficiency over time and due to environmental conditions.

To maintain IP65 faceplate protection, replace the gasket (between faceplate and case and between case and panel) at regular intervals.

To replace the gasket between the case and the panel you have to disassemble the controller from the panel and then reassemble it; to replace the gasket between the faceplate and the case, follow the instructions for replacing the controller).

8.3. Cloning the configuration

The configuration of one controller can be cloned to another controller by means of a PC or the optional ZAPPER accessory.

With a PC (and GF_eXpress software):
1. With the appropriate cable, connect the controller (with the configuration to be cloned) to the PC.
2. Read all of the controller configuration parameters and save them in a file (recipe).
3. Disconnect the controller.
4. Connect the controller to be configured to the PC.
5. Download the saved configuration to the controller.
6. Disconnect the configured controller

With the ZAPPER accessory:
1. Connect the ZAPPER to the controller with the configuration to be cloned.
2. Press the read key on the ZAPPER: the green LED starts flashing. DO NOT disconnect the ZAPPER while the LED is flashing.
3. After a short time the green LED lights up steadily. A rapidly flashing red LED means that the read procedure failed. Disconnect the controller.
4. Connect the ZAPPER to the controller to be configured.
5. Press the write key on the ZAPPER: the green LED starts flashing. DO NOT disconnect the ZAPPER while the LED is flashing.
6. After a short time the green LED lights up steadily. A rapidly flashing red LED means that the write procedure failed.
7. Disconnect the configured controller.

8.4. Cleaning

To clean the faceplate and the case, use only a soft cloth dampened with water or alcohol. DO NOT use hydrocarbon solvents (trichloroethylene, gasoline, etc.).

Do not use compressed air to remove dust from the electronic cards. If necessary, use a clean brush with soft bristles.

You can also clean the inside of the controller if necessary. To do this, first switch off the power supply to the controller and to the other devices connected to it.

Then slide out the controller as explained in paragraph ”8.1. Replacing the controller” to access and clean the inside of the case (page 217).

8.5. Troubleshooting

The following table shows the most common controller faults and their remedies.

Message or problem	Possible cause	Remedy

9. TECHNICAL DATA

9.1. Controller 850

OPERATOR INTERFACE		
DISPLAY	Type	LCD black background
	Screen area (L x H)	35 × 30 mm
	Lighting	Backlit with LEDs, life > 40.000 hours @ 25 °C (with brightness level backl = 8)
	PV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 17 mm Color: white
	SV display	Number of digits: 5 to 14 segments, with decimal point Digit height: 7.5 mm Color: green
	Unit of measurement	Selectable, °C, °F or custom [1] Color: same as PV display
	Controller state signals	Number: 6 (RUN, MAN, _/-, REM, SP1/2) Color: amber
	Output state signals	Number: 4 (1, 2, 3, 4) Color: red
KEYPAD		Number of keys: 4 silicon (Man/Auto, INC, DEC, F) Type: mechanical
INPUTS		
MAIN INPUT	Sensor type	TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor
	Accuracy	**TC input** Calibration accuracy: < ± (0,25% of reading in °C +0,1°C) Linearization accuracy: 0,1% of reading Cold junction accuracy: < ± 1°C a 25°C ambient temperature Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **RTD input** Calibration accuracy: < ± (0,15% of reading in °C +0,4°C) Temperature drift: < ± (0,005% of reading in °C +0,015°C)/°C from 25°C ambient temperature Linearization accuracy: 0,1% of reading **Linear input**: Calibration accuracy: < 0,1% F.S. Temperature drift: < ± 0,005% F.S. /°C from 25°C ambient temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit of measurement	Degrees C / F, selectable from keypad
	Signal interval	Type: linear Scale: -1999...9999, settable decimal point
	TC (thermocouple) input	Thermocouple: J, K, R, S, T, C, D B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh Linearization: ITS90 or custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 30 kΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 70 kΩ 0...1 V input impedance (Ri): > 15 kΩ 0...5 V / 0...10 V input impedance (Ri): > 30 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom

1) Programming is done with the GF_eXpress configuration program

AUXILIARY INPUT	Sensor type	TC, RTD (PT100, JPT100), sensor IR ES1B, linear DC
	Accuracy	**<u>TC input</u>** Calibration accuracy: < ± (0,25% of reading in °C +0,1°C) Linearization accuracy: 0,1% of reading Cold junction accuracy: < ± 1°C a 25°C ambient temperature Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **<u>RTD input</u>** Calibration accuracy: < ± (0,15% of reading in °C +0,4°C) Temperature drift: < ± (0,005% of reading in °C +0,015°C)/°C from 25°C ambient temperature Linearization accuracy: 0,1% of reading **<u>Linear input</u>**: Calibration accuracy: < 0,1% F.S. Temperature drift: < ± 0,005% F.S. /°C from 25°C ambient temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit	°C / °F, selectable from keyboard
	Range of indication	Type: linear Range: -1999...9999, decimal point position
	TC (thermocouple) input	Thermocouples: J, K, R, S, T, C, D B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh Linearization: ITS90 or custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 10 MΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 10 MΩ 0...1 V input impedance (Ri): > 300 kΩ 0...5 V / 0...10 V input impedance (Ri): > 300 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom
	Isolation	Functional isolation
CT (ammeter) INPUT	Type	Isolated via external transformer
		Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
	Accuracy	±2% f.s. ±1 digit @25 °C
DIGITAL INPUTS	Type	voltage-free contact, or NPN 24 V - 4,5 mA, o PNP 12/24 V - max 3,6 mA *for detail see electrical connections*
	Isolation	250 V
	Number	3 max

OUTPUTS		
	Relay (R)	Number: 3 max (4 max with 3 relays with contact in common) Type of relay contact: NO Max. current: 5A (2A for certification UL), 250VAC Minimum load: 5 V, 10 mA Life cycle: > 100.000 operations Double isolation
	Logic (D)	Number: 4 max Type: for solid-state relays Voltage: 24 V ±10% (min 10 V @20 mA) Isolated from main input
	Isolated logic (M)	Number: 2 max Type: MOS optically isolated inputs for PLC and AC / DC Voltage: 30 V AC/DC max Current: 100 mA max Resistance ON: 0,8 Ω max Isolation: 1500 V
	Triac (long life relay) (T)	Number: 1 max Load: resistive Voltage: 75...240 VAC Current max: 1 A Isolation 3 kV snubber circuit integrated zero crossing switching
	Continue (A)	Number: 1 max 0...10 V, max 20 mA, R_{out}: > 500 Ω 0...20 mA, 4...20 mA, R_{out}: < 500 Ω Resolution: 12 bit Insulation compared to main input
	Analog retransmission (A1)	Number: 1 max 0...10 V, max 20 mA, R_{out}: > 500 Ω 0...20 mA, 4...20 mA, R_{out}: < 500 Ω Resolution: 12 bit Insulation compared to main input
ALARMS	Number of alarm functions	4 max, assignable to an output
	Possible configurations	Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, HB HBB Hold Back Band if enabled with Programmer function Power variation alarm
POWER SUPPLY	For sensor VT1, VT2	Voltage: 24 VDC ±10% Current max: 30 mA
	For potentiometer VP	Voltage: 1 VDC ±1% Current max: 30 mA
CONTROL FUNCTIONS		
CONTROL	Type	Single loop, double loop
	Control	PID, ON/OFF, single action heat or cool, double action heat/cool
	Control output	Continuous or ON/OFF Cycle time: constant or optimized (BF)
	Control output for motorized valves	OPEN/CLOSE for floating motorized valve or with feedback with position control by potentiometer on Relay, Solid-state, Triac outputs.
SETPOINT PROGRAMMER (double Programmer if double loop)	Number of programs	Max 16 (if double loop 8 + 8) Start / Stop / Reset / Skip via digital inputs and/or outputs from logic operations Output state: Run /Hold / Ready / End
	Number of steps	Max 128, each with own setpoint, ramp time and hold time Times settable in HH:MM or MM:SS Max 4 consents, configurable for ramp and for hold Max 4 events, configurable in ramp and in hold
MULTIPLE SETPOINTS	Number of setpoints	Max 4, selectable from digital input Each setpoint change is subject to set ramp, different for up and down ramp
LOGIC OPERATIONS [1]	Digital function blocks	Max 32, with 4 input variables per block. The result can act on the state of the controller, of the programmer on alarms and outputs. Each function has an AND, OR with TIMER block.

OPERATIONS MATHEMATICAL [1]	Analog function blocks	Max 8, with 2 input variables per block, with operators such as + , - , × , : , average, square root, ... The result may act on analog variables in input to PID loops (controlled variable, setpoint) or analog outputs .
TIMER FUNCTION	Number timer	Standard: 1 If double loop: 2 independent
	Modes	START / STOP STABILIZATION (timer is on when PV enters a band set around set-point; at end of count you can activate an output, shut down SW or change SP1/SP2) FIRING (timed activation of control after power on)
ENERGY COUNTER		Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT
DIAGNOSTIC		Short circuit or open circuit (LBA alarm) Interrupted or partially interrupted load (HB alarm) Short circuit of control output (SSR alarm)
RETENTIVE MEMORY	Type	FRAM
	Writes	Max. number: > 10^{10} cycles Retention: > 10 years
GENERAL DATA		
POWER SUPPLY	Operating voltage	100...240 VAC/VDC ±10%, 50/60 Hz (20...27 VAC/VDC ±10%, 50/60 Hz)
	Power dissipation	10 W max
	Protections	Overvoltage 300 V / 35 V
	Connection	Screw terminals and crimp connector, max. wire section 1 mm^2
CONNECTIONS	Serial configuration port	Connector: microUSB
	RS485 (option)	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Insulation respect to main input Screw terminals and crimp connector, max. wire section 2,5mm^2
	Inputs and outputs	Screw terminals and crimp connector, max. wire section 2,5 mm^2
AMBIENT CONDITIONS	Use	Internal
	Altitude	2000 m max
	Operating temperature	-10 ... +55 °C (as per IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (as per IEC 68-2-14)
	Relative humidity	20...85% RH non-condensing (as per IEC 68-2-3)
PROTECTION LEVEL		IP 65 on front panel (as per IEC 68-2-3)
ASSEMBLY	Positioning	On panel, removable faceplate
	Installation regulations	Installation category: II Pollution degree: 2 Isolation: double
DIMENSIONS		48 X 48 mm (1/16 DIN), Depth: 100 mm
WEIGHT		0,16 kg
CE STANDARDS	EMC conformity (electromagnetic compatibility)	Conforms to Directive 2014/30/EU norme EN 61326-1 Emissions in industrial environment classe A
	LVD safety	Conforms to Directive 2014/35/EU norme EN 61010-1

1) Programming is done with the GF_eXpress configuration program

9.2. Controller 1650

OPERATOR INTERFACE		
DISPLAY	Type	LCD black background
	Screen area (L x H)	37 × 68 mm
	Lighting	Backlit with LEDs, life > 40.000 hours @ 25 °C (with brightness level backl = 8)
	PV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 17 mm Color: white
	SV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 14 mm Color: green
	F display	Number of digits: 5 to 14 segments, with decimal point Digit height: 9 mm Color: amber
	Unit of measurement	Selectable, °C, °F or custom [1] Color: same as PV display
	Controller state signals	Number: 6 (RUN, MAN, _/-, REM, SP1/2) Color: amber
	Output state signals	Number: 4 (1, 2, 3, 4) Color: red
	Bargraph indicator, configurable	Type: graphic bargraph,11 segments Power indication: 0 ... 100% o -100 ... 100% Current indication: 0 ... 100% f.s. Valve position indication: 0 ... 100%
	Bargraph indicator	Type: double bar, 11 segments Indication of process variable and setpoint: 0...100% f.s.
KEYPAD		Keys number: 4, silicone (Man/Auto, INC,DEC,F) Type: mechanical
INPUTS		
MAIN INPUT	Sensor type	TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor
	Accuracy	**TC input** Calibration accuracy: < ± (0,25% of reading in °C +0,1°C) Linearization accuracy: 0,1% of reading Cold junction accuracy: < ± 1°C at 25°C ambient temperature Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **RTD input** Calibration accuracy: < ± (0,15% of reading in °C +0,4°C) Temperature drift: < ± (0,005% of reading in °C +0,015°C)/°C from 25°C ambient temperature Linearization accuracy: 0,1% of reading **Linear input**: Calibration accuracy: < 0,1% F.S. Temperature drift: < ± 0,005% F.S. /°C from 25°C ambient temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit of measurement	Degrees C / F, selectable from keypad
	Signal interval	Type: linear Scale: -1999...9999, settable decimal point
	TC (thermocouple) input	Thermocouple: J, K, R, S, T, C, D B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh Linearization: ITS90 or custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 30 kΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 70 kΩ 0...1 V input impedance (Ri): > 15 kΩ 0...5 V / 0...10 V input impedance (Ri): > 30 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom

AUXILIARY INPUT	Sensor type	TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor
	Accuracy	**TC input** Calibration accuracy: < ± (0,25% of reading in °C +0,1°C) Linearization accuracy: 0,1% of reading Cold junction accuracy: < ± 1°C at 25°C ambient temperature Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **RTD input** Calibration accuracy: < ± (0,15% of reading in °C +0,4°C) Temperature drift: < ± (0,005% of reading in °C +0,015°C)/°C from 25°C ambient temperature Linearization accuracy: 0,1% of reading **Linear input**: Calibration accuracy: < 0,1% F.S. Temperature drift: < ± 0,005% F.S. /°C from 25°C ambient temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit of measurement	Gradi C / F, selectable from keypad
	Signal interval	Type: linear Scale: -1999...9999, settable decimal point
	TC (thermocouple) input	Thermocouple: J, K, R, S, T, C, D B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh Linearization: ITS90 o custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 10 MΩ Linearization: DIN 43760 or custom Max. line resistance:: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 10 MΩ 0...1 V input impedance (Ri): > 300 kΩ 0...5 V / 0...10 V input impedance (Ri): > 300 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom
	Isolation	Functional isolation 250 V
CT (ammeter) input	Type	Isolated via external transformer
		Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
	Accuracy	±2% f.s. ±1 digit @25 °C
DIGITAL INPUTS	Number	5 max
	Type	Voltage-free contact, or NPN 24 V - 4,5 mA, o PNP 12/24 V - max 3,6 mA *For detail see electrical connections*
	Isolation	250 V

OUTPUTS		
	Relay (R)	Number: 4 max Type of relay contact: NO Max. current: 5A (2A at ambient temperature up to 45 ° C for certification UL), 250VAC / 30 VDC, cosφ = 1 Minimum load: 5 V, 10 mA Life cycle: > 100.000 operations Double isolation
	Logic (D)	Number: 2 max Type: for solid-state relays Voltage: 24 V ±10% (min 10 V @20 mA) Isolated from main input
	Isolated logic (M)	Number: 2 max Type: MOS optoisolated for PLC inputs and AC/DC load Voltage: 30 V AC/DC max Current: 100 mA max Resistance ON: 0,8 Ω max Isolation: 1500 V
	Triac (long life relè) (T)	Number: 1 max Load: resistive Voltage: 75...240 VAC Current max: 1 A Isolation 3 kV snubber circuit integrated zero crossing switching
	Continuous (C)	Number: 1 max Current: 4...20mA R_{out} < 500 Ω Resolution: 12 bit Isolated from main input
	Analog retransmission (A1) (A2)	Number: 2 max 0...10 V, max 20 mA, R_{out}: > 500 Ω 0...20 mA, 4...20 mA, R_{out}: < 500 Ω Resolution: 12 bit Isolated from main input
ALARMS	Number of alarm functions	4 max, assignable to an output
	Possible configurations	Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, HB, HBB Hold Back Band if enabled with Programmer function, alarm after power variation at full power
POWER SUPPLY	For sensor VT, VT2	Voltage: 24 VDC ±10% Current max: 30 mA VT option of Out3
	For potentiometer VP	Voltage: 1 VDC ±1% Current max: 30 mA
CONTROL FUNCTIONS		
CONTROL	Type	Single loop, double loop
	Control	PID, ON/OFF, single action heat or cool, double action heat/cool
	Control output	Continuous or ON/OFF Cycle time: constant or optimized (BF)
	Control output for motorized valves	OPEN/CLOSE for floating motorized valve or with feedback with position control by potentiometer on Relay, Solid-state, Triac outputs.
SETPOINT PROGRAMMER (Double programmer if double loop)	Number of programs	Max 16 (if double loop 8 + 8) Start / Stop / Reset / Skip via digital inputs and/or outputs from logic operations Output state: Run /Hold / Ready / End
	Number of steps	Max 128, each with own setpoint, ramp time and hold time Times settable in HH:MM or MM:SS Max 4 consents, configurable for ramp and for hold Max 4 events, configurable in ramp and in hold

MULTIPLE SETPOINTS	Number of setpoints	Max 4, selectable from digital input Each setpoint change is subject to set ramp, different for up and down ramp
LOGIC OPERATIONS [1]	Digital function blocks	Max 32, with 4 input variables per block. The result can act on the state of the controller, of the programmer on alarms and outputs. Each function contains a block type AND, OR with TIMER
OPERATIONS MATHEMATICAL [1]	Analog function blocks	Max 8, with 2 input variables per block, with operators such as + , - , × , : , average, square root, ... The result may act on analog variables in input to PID loops (controlled variable, setpoint) or analog outputs .
TIMER FUNCTION	Modes	START / STOP (2 timer if double loop) STABILIZATION (timer is on when PV enters a band set around setpoint; at end of count you can activate an output, shut down SW or change SP1/SP2) FIRING (timed activation of control after power on)
ENERGY COUNTER		Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT
DIAGNOSTIC		Short circuit or open circuit (LBA alarm) Interrupted or partially interrupted load (HB alarm) Short circuit of control output (SSR alarm)
RETENTIVE MEMORY	Type	FRAM
	Max. number of writes	Number max: > 10^{10} cycles Retention: > 10 anni
GENERAL DATA		
POWER SUPPLY	Operating voltage	100...240 VAC/VDC ±10%, 50/60 Hz (20...27 VAC/VDC ±10%, 50/60 Hz)
	Power dissipation	10 W max
	Protections	Overvoltage 300 V / 35 V
	Connection	Screw terminals and crimp connector, max. wire section 1 mm^2
CONNECTIONS	Serial configuration port	Connector: microUSB
	RS485 (option)	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Insulation compared to main entrance Screw terminals and crimp connector, max. wire section 2.5mm^2
	Inputs and outputs	Screw terminals and crimp connector, max. wire section 2.5mm^2
AMBIENT CONDITIONS	Use	Indoor
	Altitude	2000 m max
	Operating temperature	-10 ... +55 °C (as per IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (as per IEC 68-2-14)
	Relative humidity	20...85% RH non-condensing (as per IEC 68-2-3)
PROTECTION LEVEL		IP 65 on front panel (as per IEC 68-2-3)
ASSEMBLY	Positioning	On panel, removable faceplate
	Installation regulations	Installation category: II Pollution degree: 2 Isolation: double
DIMENSIONS		48 X 96 mm (1/8 DIN) Depth: 80 mm
WEIGHT		0,24 kg
CE STANDARDS	EMC conformity (electromagnetic compatibility)	Conforms to Directive 2014/30/EU norme EN 61326-1 Emissions in industrial environment classe A
	LVD safety	Conforms to Directive 2014/35/EU norme EN 61010-1

1) Programming is done with the GF_eXpress configuration program.

9.3. Controller 1850

OPERATOR INTERFACE		
DISPLAY	Type	LCD black background
	Screen area (L x H)	83 × 68 mm
	Lighting	Backlit with LEDs, life > 40,000 hours @ 25°C (with brightness level backl = 0.8)
	PV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 23 mm Color: white
	SV display	Number of digits: 4 to 7 segments, with decimal point Digit height: 11 mm Color: green
	F display	Number of digits: 7 to 14 segments, with decimal point Digit height: 9 mm Color: amber
	Unit of measurement	Selectable, °C, °F or custom [1] Color: same as PV display
	Controller state signals	Number: 6 (RUN, MAN, _/-, REM, SP1/2) Color: amber
	Output state signals	Number: 4 (1, 2, 3, 4) Color: red
	Bargraph indicator, configurable	Type: graphic bargraph,11 segments Power indication: 0...100% or -100...100% Current indication: 0...100% f.s. Valve position indication: 0...100%
	Bargraph indicator	Type: double bar, 11 segments Indication of process variable and setpoint: 0...100% f.s.
	Inputs/outputs state signal (only with option)	Number: 8 inputs, 8 outputs Color: green for inputs, red for outputs Control via FB outputs
KEYPAD		Keys number: 6, silicone (Man/Auto, L/R, *, INC, DEC, F) Type: mechanical
INPUTS		
MAIN INPUT	Sensor type	TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor
	Accuracy	**<u>TC input</u>** Calibration accuracy: < ± (0,25% of reading in °C +0,1°C) Linearization accuracy: 0,1% of reading Cold junction accuracy: < ± 1°C a 25°C ambient temperature Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **<u>RTD input</u>** Calibration accuracy: < ± (0,15% of reading in °C +0,4°C) Temperature drift: < ± (0,005% of reading in °C +0,015°C)/°C from 25°C ambient temperature Linearization accuracy: 0,1% of reading **<u>Linear input</u>**: Calibration accuracy: < 0,1% F.S. Temperature drift: < ± 0,005% F.S. /°C from 25°C ambient temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit of measurement	Degrees C / F, selectable from keypad
	Signal interval	Type: linear Scale: -1999...9999, settable decimal point
	TC thermocouple) input	Thermocouple: J, K, R, S, T, C, D B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh Linearization: ITS90 or custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 30 kΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 70 kΩ 0...1 V input impedance (Ri): > 15 kΩ 0...5 V / 0...10 V input impedance (Ri): > 30 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom

AUXILIARY INPUT	Sensor type	TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor
	Accuracy	**TC input** Calibration accuracy: < ± (0,25% of reading in °C +0,1°C) Linearization accuracy: 0,1% of reading Cold junction accuracy: < ± 1°C a 25°C ambient temperature Cold junction compensation: > 30:1 rejection to the change of the ambient temperature **RTD input** Calibration accuracy: < ± (0,15% of reading in °C +0,4°C) Temperature drift: < ± (0,005% of reading in °C +0,015°C)/°C from 25°C ambient temperature Linearization accuracy: 0,1% of reading **Linear input**: Calibration accuracy: < 0,1% F.S. Temperature drift: < ± 0,005% F.S. /°C from 25°C ambient temperature
	Sampling time	60 ms / 120 ms, selectable
	Digital filter	0,0...20,0 s
	Temperature unit of measurement	Degrees C / F, selectable from keypad
	Signal interval	Type: linear Scale: -1999...9999, settable decimal point
	TC (thermocouple) input	Thermocouple: J, K, R, S, T, C, D B, E, L, L-GOST, U, G, N, Pt20Rh-Pt40Rh Linearization: ITS90 or custom
	RTD (resistance thermometer) input	Resistance thermometer: PT100, JPT100 Input impedance (Ri): ≥ 10 MΩ Linearization: DIN 43760 or custom Max. line resistance: 20 Ω
	DC linear input	0...60 mV input impedance (Ri): > 10 MΩ 0...1 V input impedance (Ri): > 300 kΩ 0...5 V / 0...10 V input impedance (Ri): > 300 kΩ 0/4...20 mA input impedance (Ri): 50 Ω Linearization: linear or custom
	Isolation	Functional isolation 250 V
CT (ammeter) input	Type	Isolated via external transformer
		Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
	Accuracy	±2% f.s. ±1 digit @25 °C
DIGITAL INPUTS	Numero	5 max
	Type	voltage-free contact, or NPN 24 V - 4,5 mA, o PNP 12/24 V - max 3,6 mA *For detail see electrical connections*
	Isolation	250 V

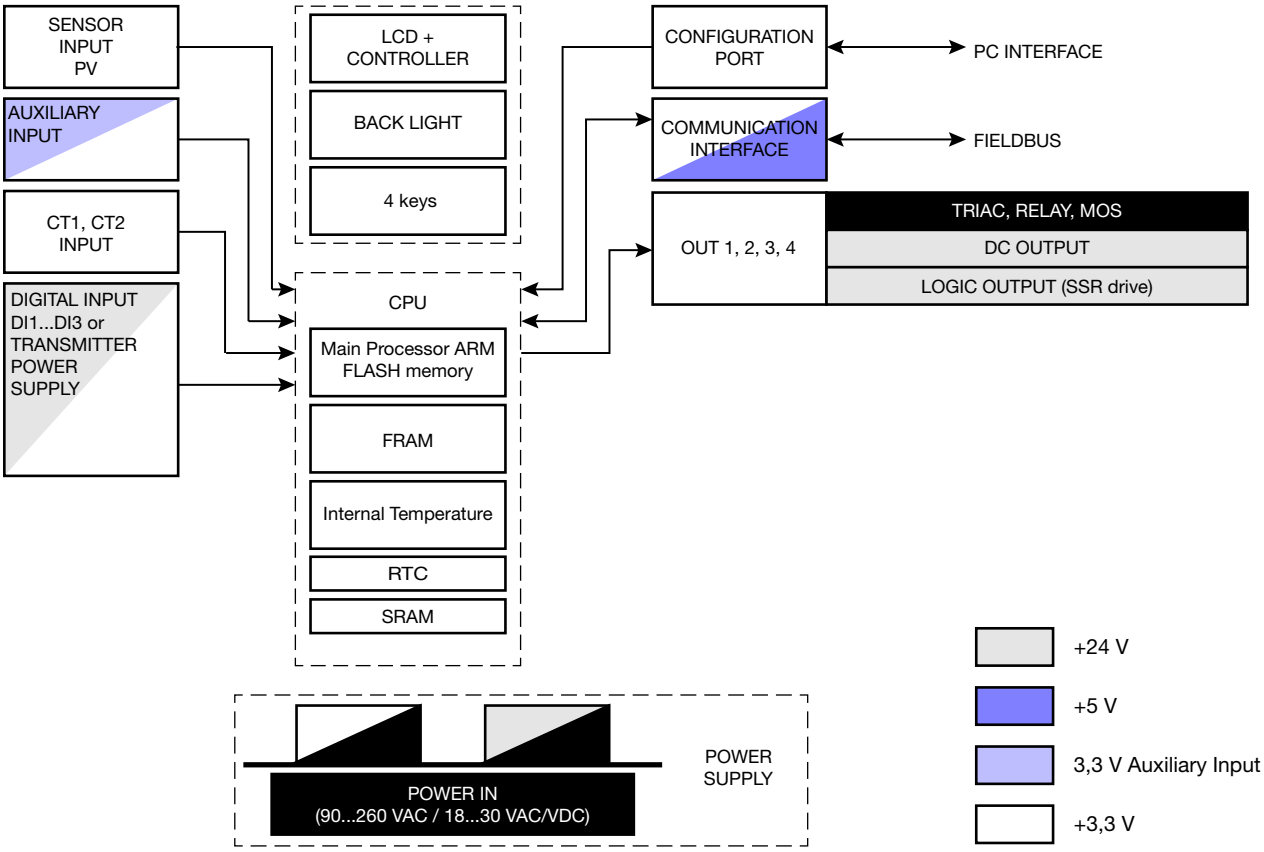
OUTPUTS		
	Relay (R)	Number: 4 max Type of relay contact: NO Max. current: 5A (2A at ambient temperature up to 45 ° C for certification UL), 250VAC /30 VDC, cosφ = 1 Minimum load: 5 V, 10 mA Life cycle: > 100.000 operations Double isolation
	Logic (D)	Number: 2 max Type: for solid-state relays Voltage: 24 V ±10% (min 10 V @20 mA) Isolated from main input
	Isolated logic (M)	Number: 2 max Type: MOS optoisolated for PLC inputs and AC/DC load Voltage: 30 V AC/DC max Current: 100 mA max Resistance ON: 0,8 Ω max Isolation: 1500 V
	Triac (long life relè) (T)	Number: 1 max Load: resistive Voltage: 75...240 VAC Current max: 1 A Isolation 3 kV snubber circuit integrated zero crossing switching
	Continuous (C)	Number: 1 max Current: 4...20mA R_{out} < 500 Ω Resolution: 12 bit Isolated from main input
	Analog retransmission (A1) (A2)	Number: 2 max 0...10 V, max 20 mA, R_{out}: > 500 Ω 0...20 mA, 4...20 mA, R_{out}: < 500 Ω Resolution: 12 bit Isolated from main input
ALARMS	Number of alarm functions	4 max, assignable to an output
	Possible configurations	Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, HB, HBB Hold Back Band if enabled with Programmer function, alarm after power variation at full power
POWER SUPPLY	For sensor VT, VT2	Voltage: 24 VDC ±10% Current max: 30 mA VT option of Out3
	For potentiometer VP	Voltage: 1 VDC ±1% Current max: 30 mA
INPUTS / OUTPUTS		
	Digital Inputs/Outputs	Number: 8, in two groups (5 + 3 with separate power supply) Input: PNP 24 VDC, 5 mA Output: PNP with 24 VDC external power supply, ±25%, max 100 mA, short circuit protection with PTC Isolation: 250 V
	Relay	Number: 8, in two groups (5 + 3 relays with common contact) Type of relay contact: NO Max. current: 5A (at ambient temperature up to 45 ° C for certification UL), 250VAC / 30VDC, cosφ =1 Max. current for each common: 5 A Life cycle: > 100.000 operations Double isolation
CONTROL FUNCTIONS		

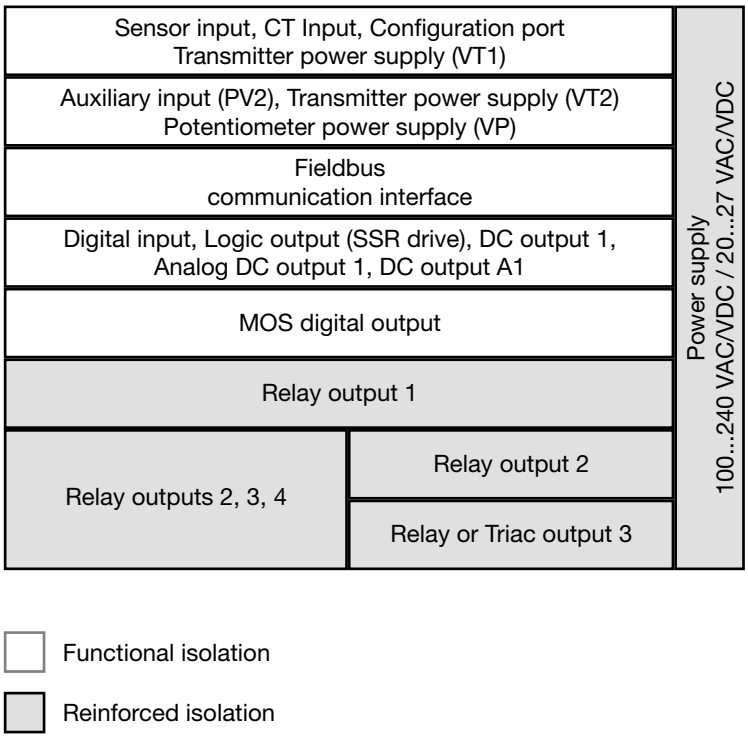
CONTROL	Type	Single/Double loop
	Control	PID, ON/OFF, single action heat or cool, double action heat/ cool
	Control output	Continuous or ON/OFF Cycle time: constant or optimized (BF)
	Control output for motorized valves	OPEN/CLOSE for floating motorized valve or with feedback with position control by potentiometer on Relay, Solid-state, Triac outputs.
SETPOINT PROGRAMMER (Double programmer if double loop)	Number of programs	Max 16 (if double loop 8 + 8) Start / Stop / Reset / Skip via digital inputs and/or outputs from logic operations Output state: Run /Hold / Ready / End
	Number of steps	Max 128, each with own setpoint, ramp time and hold time Times settable in HH:MM or MM:SS Max 4 consents, configurable for ramp and for hold Max 4 events, configurable in ramp and in hold
MULTIPLE SETPOINTS	Number of setpoints	Max 4, selectable from digital input Each setpoint change is subject to set ramp, different for up and down ramp
LOGIC [1] OPERATIONS	Digital function blocks	Max 32, with 4 input variables per block. The result can act on the state of the controller, of the programmer on alarms and outputs. Each function has an AND, OR with TIMER block
OPERATIONS MATHEMATICAL [1]	Analog function blocks	Max 8, with 2 input variables per block, with operators such as + , - , × , : , average, square root, ... The result may act on analog variables in input to PID loops (controlled variable, setpoint) or analog outputs .
TIMER FUNCTION	Modes	START / STOP (2 timer if double loop) STABILIZATION (timer is on when PV enters a band set around setpoint; at end of count you can activate an output, shut down SW or change SP1/SP2) FIRING (timed activation of control after power on)
ENERGY COUNTER		Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT
DIAGNOSTIC		Short circuit or open circuit (LBA alarm) Interrupted or partially interrupted load (HB alarm) Short circuit of control output (SSR alarm)
RETENTIVE MEMORY	Type	FRAM
	Writes	Number max: > 10^{10} cycles Retention: > 10 years
GENERAL DATA		
POWER SUPPLY	Operating voltage	100...240 VAC/VDC ±10%, 50/60 Hz (20...27 VAC/VDC ±10%, 50/60 Hz)
	Power dissipation	12 W max
	Protections	Overvoltage 300 V / 35 V
	Connection	Screw terminals and crimp connector, max. wire section 1 mm^2
CONNECTIONS	Serial configuration port	Connector: microUSB
	RS485 (option)	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Insulation compared to main entrance Screw terminals and crimp connector, max. wire section 2.5 mm^2
	Inputs and outputs	Screw terminals and crimp connector, max. wire section 2.5 mm^2

AMBIENT CONDITIONS	Use	Internal
	Altitude	2000 m max
	Operating temperature	-10 ... +55 °C (as per IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (as per IEC 68-2-14)
	Relative humidity	20...85% RH non condensante (as per IEC 68-2-3)
PROTECTION LEVEL		IP 65 on front panel (as per IEC 68-2-3)
ASSEMBLY	Positioning	On panel, removable faceplate
	Installation regulations	Installation category: II Pollution degree: 2 Isolation: double
DIMENSIONS		96 X 96 mm (1/4 DIN) Depth: 80 mm
WEIGHT		0,24 kg
CE STANDARDS	EMC (electromagnetic compatibility)	Conforms to Directive 2014/30/EU norme EN 61326-1 Emissions in industrial environment classe A
	LVD safety	Conforms to Directive 2014/35/EU norme EN 61010-1

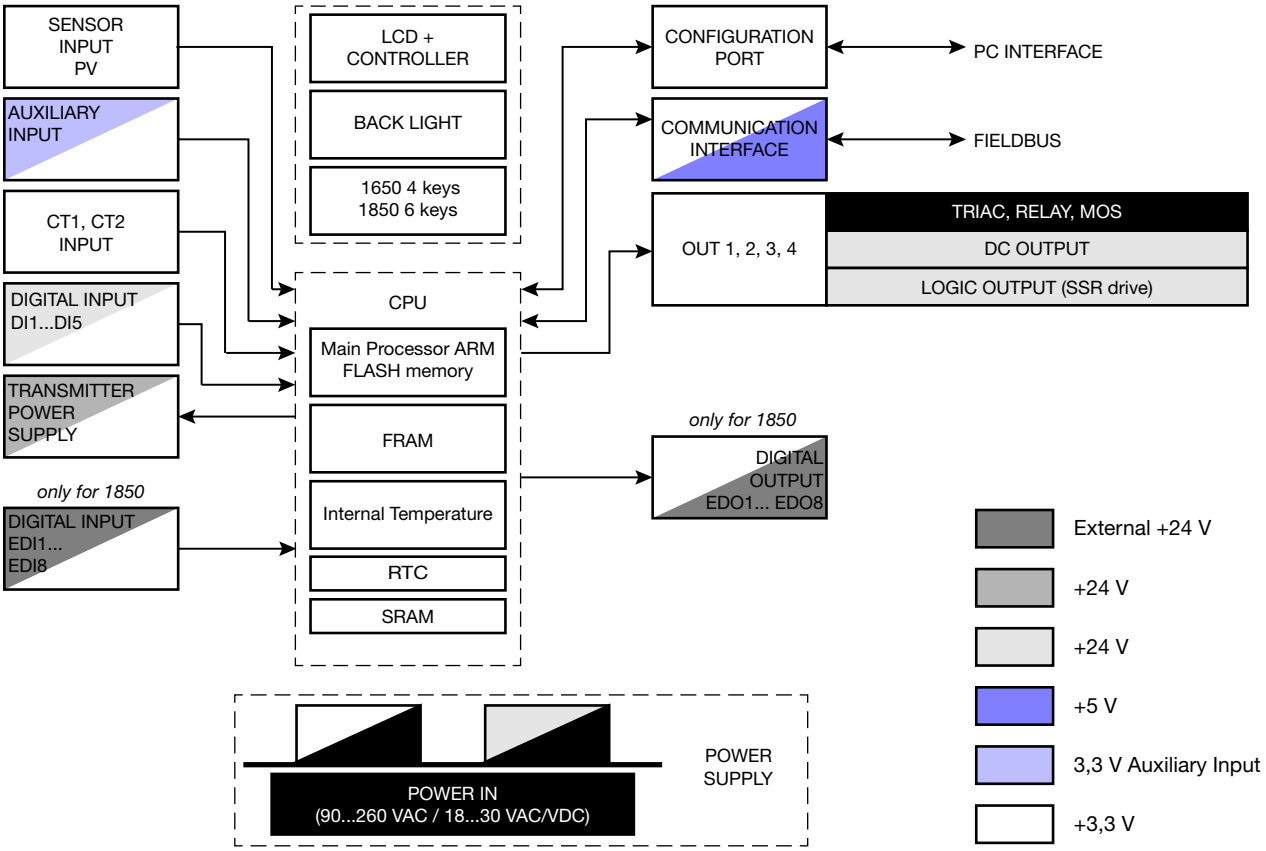
1) Programming is done with the GF_eXpress configuration program.

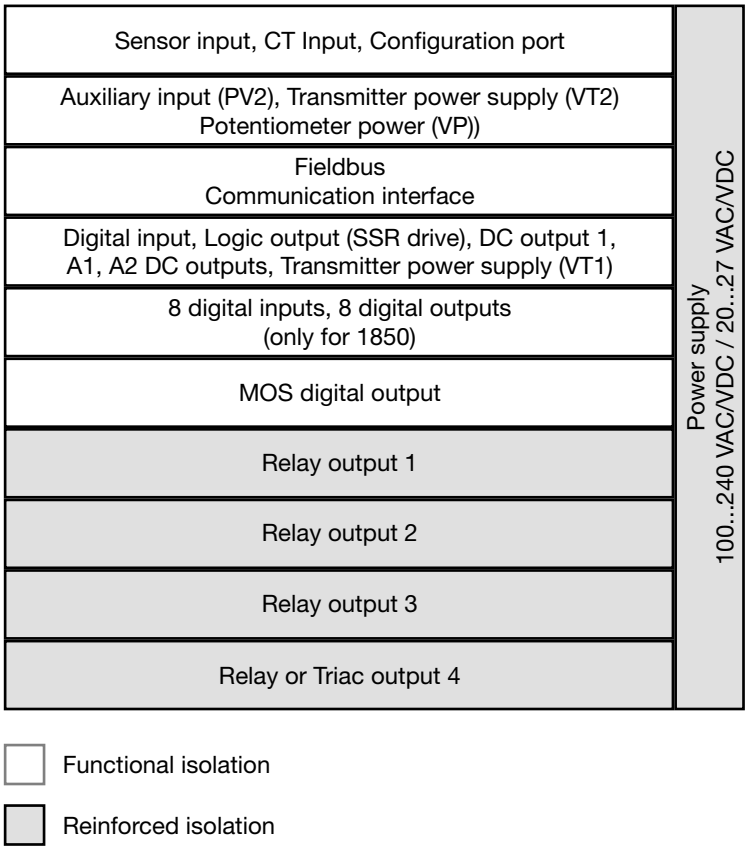
9.4. Isolation block diagram 850





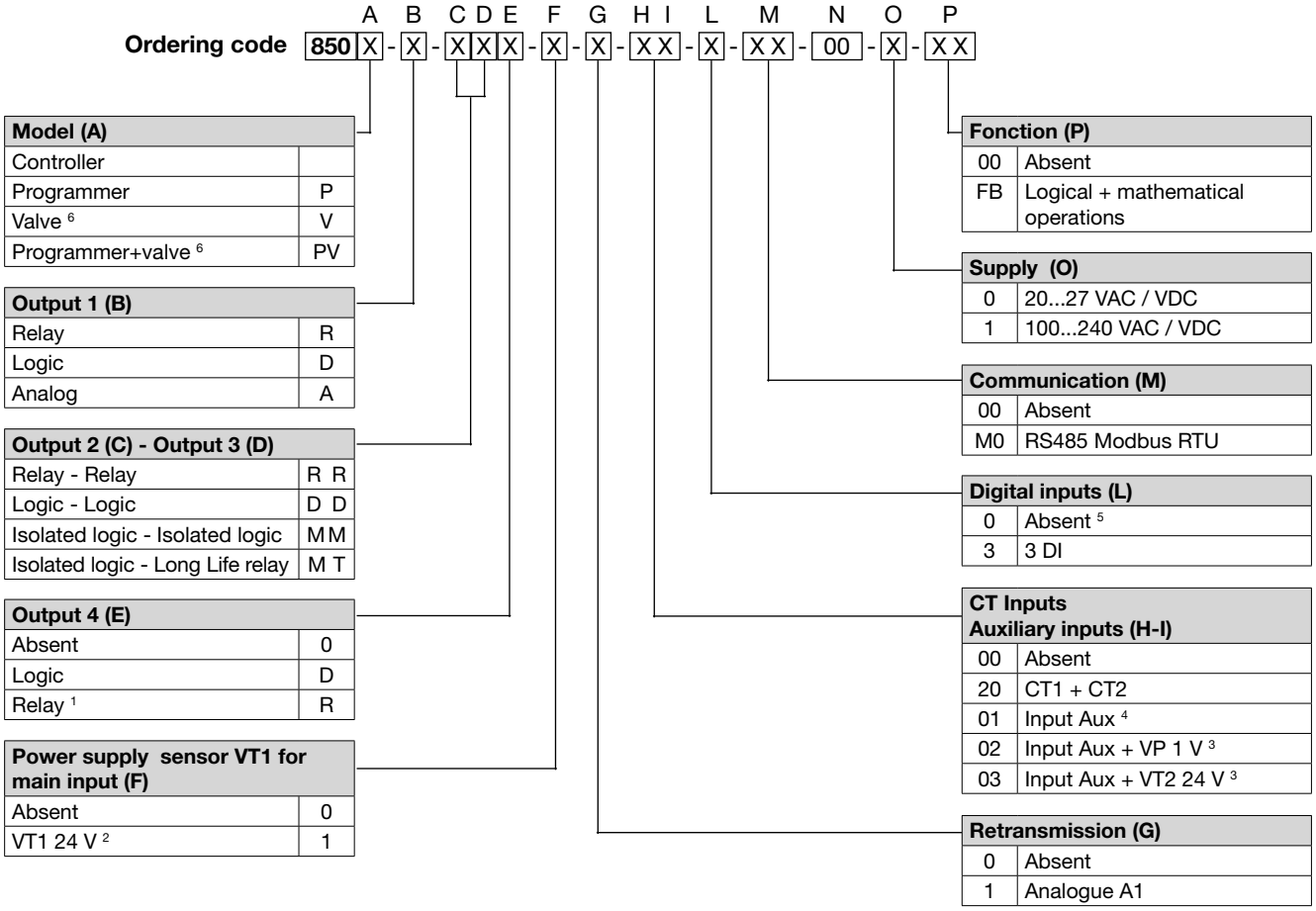
9.5. Isolation block diagram 1650 - 1850





10. ORDER METHODS

10.1. Controller 850



Model (A)	
Controller	
Programmer	P
Valve [6]	V
Programmer+valve [6]	PV

Output 1 (B)	
Relay	R
Logic	D
Analog	A

Output 2 (C) - Output 3 (D)	
Relay - Relay	R R
Logic - Logic	D D
Isolated logic - Isolated logic	M M
Isolated logic - Long Life relay	M T

Output 4 (E)	
Absent	0
Logic	D
Relay [1]	R

Power supply sensor VT1 for main input (F)	
Absent	0
VT1 24 V [2]	1

Fonction (P)	
00	Absent
FB	Logical + mathematical operations

Supply (O)	
0	20...27 VAC / VDC
1	100...240 VAC / VDC

Communication (M)	
00	Absent
M0	RS485 Modbus RTU

Digital inputs (L)	
0	Absent [5]
3	3 DI

CT Inputs Auxiliary inputs (H-I)	
00	Absent
20	CT1 + CT2
01	Input Aux [4]
02	Input Aux + VP 1 V [3]
03	Input Aux + VT2 24 V [3]

Retransmission (G)	
0	Absent
1	Analogue A1

Notes
1) Only with: (C) = R and (D) = R
2) Alternative PT100
3) Input Aux type 1V/5V/10V/20mA
4) Input Aux type TC/RTD/60mV
5) Only with option H-I = 0
6) V and PV models require option (CD) = RR

Check before each request a list of codes available on the following pages

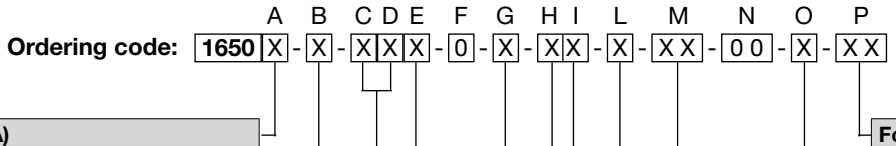
Power supply 100...240 VAC

Code F	Model	Valves	Programmer	Inputs					Outputs							Communica-tions			Mathematical + logic functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	Isolated logic		Analog V/I	Sensor supply	RS485 modbus RTU					
F067072	850-A-DD0-0-0-00-0-M0-00-1-00										2			1		•					
F067073	850-R-DD0-0-0-01-3-00-00-1-FB			3		•			1		2								•		
F067074	850-R-DD0-0-0-03-3-00-00-1-FB			3				•	1		2								•		
F067075	850-R-DD0-0-0-01-3-M0-00-1-FB			3		•			1		2					•			•		
F067076	850-R-DD0-0-0-03-3-M0-00-1-FB			3				•	1		2					•			•		
F064460	850-D-RR0-1-0-00-0-00-00-1-00								2		1				•						3 outputs
F064461	850-A-RR0-0-0-00-0-00-00-1-00								2					1							
F064489	850P-D-RR0-0-0-01-3-M0-00-1-00		•	3		•			2		1					•					
F067078	850P-D-RR0-0-0-03-3-M0-00-1-00		•	3				•	2		1					•					
F064459	850-R-RR0-1-0-00-0-00-00-1-00								3						•						
F064477	850-R-RR0-1-0-00-3-M0-00-1-00			3					3						•	•					
F064484	850-A-RRD-1-0-00-3-00-00-1-00			3					2		1			1	•						4 outputs
F067080	850-D-RRD-1-0-01-3-M0-00-1-00			3		•			2		2				•	•					
F067081	850-D-RRD-1-0-03-3-M0-00-1-00			3				•	2		2				•	•					
F064606	850-A-RR0-0-1-01-3-00-00-1-FB			3		•			2					2					•		
F067082	850-A-RR0-0-1-03-3-00-00-1-FB			3				•	2					2					•		
F064607	850-A-RR0-0-1-01-3-M0-00-1-FB			3		•			2					2		•			•		
F067083	850-A-RR0-0-1-03-3-M0-00-1-FB			3				•	2					2		•			•		
F064482	850-D-RRR-1-0-00-3-00-00-1-00			3					3		1				•						
F064481	850-R-RRR-1-0-00-3-00-00-1-00			3					4						•						
F064493	850V-R-RRR-1-0-00-3-00-00-1-00	•		3					4						•						
F064616	850V-R-RRR-0-0-02-3-00-00-1-FB	•		3			•		4										•		
F064486	850-A-RRD-1-1-01-3-00-00-1-00			3		•			2		1			2	•						5 outputs
F067084	850-A-RRD-1-1-03-3-00-00-1-00			3				•	2		1			2	•						
F064487	850-A-RRD-1-1-01-3-M0-00-1-00			3		•			2		1			2	•	•					
F067085	850-A-RRD-1-1-03-3-M0-00-1-00			3				•	2		1			2	•	•					
F064494	850V-R-RRR-1-1-00-3-00-00-1-00	•		3					4					1	•						

Power supply 20...27 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs							Communica-tions			Mathematical + logic functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	Isolated logic		Analog V/I	Sensor supply	RS485 modbus RTU					
F067088	850-A-DD0-0-0-00-0-M0-00-0-00										2			1		•					3 outputs
F067089	850-R-DD0-0-0-01-3-00-00-0-FB			3		•			1		2								•		
F067090	850-R-DD0-0-0-03-3-00-00-0-FB			3				•	1		2								•		
F067091	850-R-DD0-0-0-01-3-M0-00-0-FB			3		•			1		2					•			•		
F067092	850-R-DD0-0-0-03-3-M0-00-0-FB			3				•	1		2					•			•		
F064498	850-D-RR0-1-0-00-0-00-00-0-00								2		1				•						
F064499	850-A-RR0-0-0-00-0-00-00-0-00								2					1							
F064514	850P-D-RR0-0-0-01-3-M0-00-0-00		•	3		•			2		1					•					
F067094	850P-D-RR0-0-0-03-3-M0-00-0-00		•	3				•	2		1					•					
F064500	850-R-RR0-1-0-00-0-00-00-0-00								3						•						
F064501	850-R-RR0-1-0-00-3-M0-00-0-00			3					3						•	•					
F064508	850-A-RRD-1-0-00-3-00-00-0-00			3					2		1			1	•						4 outputs
F067096	850-D-RRD-1-0-01-3-M0-00-0-00			3		•			2		2				•	•					
F067097	850-D-RRD-1-0-03-3-M0-00-0-00			3				•	2		2				•	•					
F064625	850-A-RR0-0-1-01-3-00-00-0-FB			3		•			2					2					•		
F067098	850-A-RR0-0-1-03-3-00-00-0-FB			3				•	2					2					•		
F064626	850-A-RR0-0-1-01-3-M0-00-0-FB			3		•			2					2		•			•		
F067099	850-A-RR0-0-1-03-3-M0-00-0-FB			3				•	2					2		•			•		
F064506	850-D-RRR-1-0-00-3-00-00-0-00			3					3		1				•						
F064505	850-R-RRR-1-0-00-3-00-00-0-00			3					4						•						
F064517	850V-R-RRR-1-0-00-3-00-00-0-00	•		3					4						•						
F064635	850V-R-RRR-0-0-02-3-00-00-0-FB	•		3			•		4										•		
F064510	850-A-RRD-1-1-01-3-00-00-0-00			3		•			2		1			2	•						5 outputs
F067100	850-A-RRD-1-1-03-3-00-00-0-00			3				•	2		1			2	•						
F064511	850-A-RRD-1-1-01-3-M0-00-0-00			3		•			2		1			2	•	•					
F067101	850-A-RRD-1-1-03-3-M0-00-0-00			3				•	2		1			2	•	•					
F064518	850V-R-RRR-1-1-00-3-00-00-0-00	•		3					4					1	•						

10.2. Controller 1650



Model (A)	
Controller	
Programmer	P
Valve	V
Programmer+valve [4]	PV

Output 1 (B)	
Relay	R
Logic	D
Analog	C

Output 2 (C) Output 3 (D)	
Relay - Relay	R R
Logic - Logic	D D
Isolated logic - Isolated logic	M M
Relay - VT 24 V	R V
Logic - VT 24 V	D V
Isolated logic - VT 24 V	M V

Output 4 (E)	
Absent	0
Relay	R
Long Life relay	T

Retransmission (G)	
Absent	0
Analogue A1	1
Analogue A1 + A2	2

Fonction (P)	
00	Absent
FB	Logical + mathematical operations

Supply (O)	
0	20...27 VAC / VDC
1	100...240 VAC / VDC

Communication (M)	
00	Absent
M0	RS485 Modbus RTU

Digital inputs (L)	
0	Absent [3]
5	5 DI

Auxiliary input (I)	
0	Absent
1	Input Aux [2]
2	Input Aux + VP 1 V [1]
3	Input Aux + VT2 24 V [1]

CT Input (H)	
0	Absent
2	CT1 + CT2

Note
1) Auxiliary input type 1 V / 5 V / 10 V / 20 mA
2) Auxiliary input type TC / RTD / 60 mV
3) Only with option H-I = 0
4) I modelli V e PV richiedono opzione (CD) = RR

Check before each request a list of codes available on the following pages

Power supply 100...240 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs								Communi-cations			Mathematical + logic functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	solated logic		Analog I	Analog V/I	Sensor supply	RS485 modbus RTU					
F064820	1650-D-RVR-0-0-00-5-00-00-1-00			5					2		1					•						3 outputs
F064823	1650-R-RVR-0-0-00-5-00-00-1-00			5					3							•						
F064824	1650-R-RR0-0-0-02-5-00-00-1-00			5			•		3													
F067102	1650-R-DDR-0-0-01-5-00-00-1-FB			5		•			2		2									•		4 outputs
F067103	1650-R-DDR-0-0-03-5-00-00-1-FB			5				•	2		2									•		
F067104	1650-R-DDR-0-0-01-5-M0-00-1-FB			5		•			2		2						•			•		
F067105	1650-R-DDR-0-0-03-5-M0-00-1-FB			5				•	2		2						•			•		
F067108	1650-R-RR0-0-1-01-5-M0-00-1-00			5		•			3						1		•					
F064832	1650-R-RR0-0-1-03-5-M0-00-1-00			5				•	3						1		•					
F064851	1650V-D-RRR-0-0-02-5-M0-00-1-00	•		5			•		3		1						•					
F067109	1650P-D-RRR-0-0-01-5-00-00-1-00		•	5		•			3		1											
F064840	1650P-D-RRR-0-0-03-5-00-00-1-00		•	5				•	3		1											
F067110	1650P-R-RR0-0-1-01-5-M0-00-1-00		•	5		•			3						1		•					
F064842	1650P-R-RR0-0-1-03-5-M0-00-1-00		•	5				•	3						1		•					
F067111	1650P-D-RRR-0-0-01-5-00-00-1-FB		•	5		•			3		1									•		
F064868	1650P-D-RRR-0-0-03-5-00-00-1-FB		•	5				•	3		1									•		
F064873	1650PV-D-RRR-0-0-02-5-00-00-1-FB	•	•	5			•		3		1									•		
F067116	1650-C-RRR-0-0-01-5-00-00-1-FB			5		•			3					1						•		
F067117	1650-C-RRR-0-0-03-5-00-00-1-FB			5				•	3					1						•		
F064849	1650V-R-RRR-0-0-02-5-00-00-1-00	•		5			•		4													
F067118	1650V-R-RRR-0-0-01-5-00-00-1-00	•		5		•			4													
F064850	1650V-R-RRR-0-0-03-5-00-00-1-00	•		5				•	4													

Note: Please, contact GEFRAN sales people for the codes availability.

Power supply 100...240 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs								Communi-cations			Mathematical + logic functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	solated logic		Analog I	Analog V/I	Sensor supply	RS485 modbus RTU					
F064833	1650-D-RR0-0-2-02-5-00-00-1-00			5			•		2		1				2							5 outputs
F067119	1650-D-RVR-0-2-01-5-00-00-1-00			5		•			2		1				2	•						
F064822	1650-D-RVR-0-2-03-5-00-00-1-00			5				•	2		1				2	•						
F064845	1650P-D-RR0-0-2-20-5-M0-00-1-00		•	5	2				2		1				2		•					
F067121	1650-R-RR0-0-2-01-5-M0-00-1-00			5		•			3						2		•					
F064834	1650-R-RR0-0-2-03-5-M0-00-1-00			5				•	3						2		•					
F067122	1650-R-RVR-0-2-01-5-M0-00-1-00			5		•			3						2	•	•					
F064987	1650-R-RVR-0-2-03-5-M0-00-1-00			5				•	3						2	•	•					
F064855	1650V-R-RR0-0-2-00-0-00-00-1-00	•							3						2							
F064854	1650V-D-RRR-0-1-02-5-00-00-1-00	•		5			•		3		1				1							
F064853	1650V-D-RRR-0-1-02-5-M0-00-1-00	•		5			•		3		1				1		•					
F067123	1650V-D-RRR-0-1-01-5-M0-00-1-00	•		5		•			3		1				1		•					
F064852	1650V-D-RRR-0-1-03-5-M0-00-1-00	•		5				•	3		1				1		•					
F064843	1650P-D-RRR-0-1-02-5-M0-00-1-00		•	5			•		3		1				1		•					
F067124	1650-R-RRR-0-1-01-5-00-00-1-00			5		•			4						1							
F064835	1650-R-RRR-0-1-03-5-00-00-1-00			5				•	4						1							
F067127	1650-R-DDR-0-2-01-5-00-00-1-FB			5		•			2		2				2					•		6 outputs
F067128	1650-R-DDR-0-2-03-5-00-00-1-FB			5				•	2		2				2					•		
F067129	1650-R-DDR-0-2-01-5-M0-00-1-FB			5		•			2		2				2		•			•		
F067130	1650-R-DDR-0-2-03-5-M0-00-1-FB			5				•	2		2				2		•			•		
F067131	1650-R-RRR-0-2-01-5-00-00-1-00			5		•			4						2							
F064836	1650-R-RRR-0-2-03-5-00-00-1-00			5				•	4						2							
F067132	1650P-R-RRR-0-2-01-5-M0-00-1-00		•	5		•			4						2		•					
F064846	1650P-R-RRR-0-2-03-5-M0-00-1-00		•	5				•	4						2		•					

Note: Please, contact GEFRAN sales people for the codes availability.

Power supply 20...27 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs								Communi-cations			Mathematical + logic functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	solated logic		Analog I	Analog V/I	Sensor supply	RS485 modbus RTU					
F064876	1650-D-RVR-0-0-00-5-00-00-0-00			5					2		1					•						3 outputs
F064879	1650-R-RVR-0-0-00-5-00-00-0-00			5					3							•						
F064880	1650-R-RR0-0-0-02-5-00-00-0-00			5			•		3													
F067133	1650-R-DDR-0-0-01-5-00-00-0-FB			5		•			2		2									•		4 outputs
F067134	1650-R-DDR-0-0-03-5-00-00-0-FB			5				•	2		2									•		
F067135	1650-R-DDR-0-0-01-5-M0-00-0-FB			5		•			2		2						•			•		
F067136	1650-R-DDR-0-0-03-5-M0-00-0-FB			5				•	2		2						•			•		
F067139	1650-R-RR0-0-1-01-5-M0-00-0-00			5		•			3						1		•					
F064888	1650-R-RR0-0-1-03-5-M0-00-0-00			5				•	3						1		•					
F064907	1650V-D-RRR-0-0-02-5-M0-00-0-00	•		5			•		3		1						•					
F067140	1650P-D-RRR-0-0-01-5-00-00-0-00		•	5		•			3		1											
F064896	1650P-D-RRR-0-0-03-5-00-00-0-00		•	5				•	3		1											
F067141	1650P-R-RR0-0-1-01-5-M0-00-0-00		•	5		•			3						1		•					
F064898	1650P-R-RR0-0-1-03-5-M0-00-0-00		•	5				•	3						1		•					
F067142	1650P-D-RRR-0-0-01-5-00-00-0-FB		•	5		•			3		1									•		
F064924	1650P-D-RRR-0-0-03-5-00-00-0-FB		•	5				•	3		1									•		
F064929	1650PV-D-RRR-0-0-02-5-00-00-0-FB	•	•	5			•		3		1									•		
F067147	1650-C-RRR-0-0-01-5-00-00-0-FB			5		•			3					1						•		
F067148	1650-C-RRR-0-0-03-5-00-00-0-FB			5				•	3					1						•		
F064905	1650V-R-RRR-0-0-02-5-00-00-0-00	•		5			•		4													
F067149	1650V-R-RRR-0-0-01-5-00-00-0-00	•		5		•			4													
F064906	1650V-R-RRR-0-0-03-5-00-00-0-00	•		5				•	4													

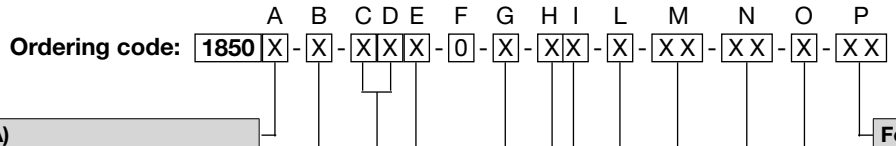
Note: Please, contact GEFRAN sales people for the codes availability.

Power supply 20...27 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs								Communi-cations			Mathematical + logic functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	solated logic		Analog I	Analog V/I	Sensor supply	RS485 modbus RTU					
F064889	1650-D-RR0-0-2-02-5-00-00-0-00			5			•		2		1				2							5 outputs
F067150	1650-D-RVR-0-2-01-5-00-00-0-00			5		•			2		1				2	•						
F064878	1650-D-RVR-0-2-03-5-00-00-0-00			5				•	2		1				2	•						
F064901	1650P-D-RR0-0-2-20-5-M0-00-0-00		•	5	2				2		1				2		•					
F067152	1650-R-RR0-0-2-01-5-M0-00-0-00			5		•			3						2		•					
F064890	1650-R-RR0-0-2-03-5-M0-00-0-00			5				•	3						2		•					
F067153	1650-R-RVR-0-2-01-5-M0-00-0-00			5		•			3						2	•	•					
F064988	1650-R-RVR-0-2-03-5-M0-00-0-00			5				•	3						2	•	•					
F064911	1650V-R-RR0-0-2-00-0-00-00-0-00	•							3						2							
F064910	1650V-D-RRR-0-1-02-5-00-00-0-00	•		5			•		3		1				1							
F064909	1650V-D-RRR-0-1-02-5-M0-00-0-00	•		5			•		3		1				1		•					
F067154	1650V-D-RRR-0-1-01-5-M0-00-0-00	•		5		•			3		1				1		•					
F064908	1650V-D-RRR-0-1-03-5-M0-00-0-00	•		5				•	3		1				1		•					
F064899	1650P-D-RRR-0-1-02-5-M0-00-0-00		•	5			•		3		1				1		•					
F067155	1650-R-RRR-0-1-01-5-00-00-0-00			5		•			4						1							
F064891	1650-R-RRR-0-1-03-5-00-00-0-00			5				•	4						1							
F067158	1650-R-DDR-0-2-01-5-00-00-0-FB			5		•			2		2				2					•		6 outputs
F067159	1650-R-DDR-0-2-03-5-00-00-0-FB			5				•	2		2				2					•		
F067160	1650-R-DDR-0-2-01-5-M0-00-0-FB			5		•			2		2				2		•			•		
F067161	1650-R-DDR-0-2-03-5-M0-00-0-FB			5				•	2		2				2		•			•		
F067162	1650-R-RRR-0-2-01-5-00-00-0-00			5		•			4						2							
F064892	1650-R-RRR-0-2-03-5-00-00-0-00			5				•	4						2							
F067163	1650P-R-RRR-0-2-01-5-M0-00-0-00		•	5		•			4						2		•					
F064902	1650P-R-RRR-0-2-03-5-M0-00-0-00		•	5				•	4						2		•					

Note: Please, contact GEFRAN sales people for the codes availability.

10.3. Controller 1850



Model (A)	
Controller	
Programmer	P
Valve [5]	V
Programmer+valve [5]	PV

Output 1 (B)	
Relay	R
Logic	D
Analog	C

Output 2 (C) - Output 3 (D)	
Relay - Relay	R R
Logic - Logic	D D
Isolated logic - Isolated logic	M M
Relay - VT 24 V	R V
Logic - VT 24 V	D V
Isolated logic - VT 24 V	M V

Output 4 (E)	
Absent	0
Relay	R
Long Life relay	T

Retransmission (G)	
Absent	0
Analogue A1	1
Analogue A1 + A2	2

Fonction (P)	
00	Absent
FB	Logical + mathematical operations

Supply (O)	
0	20...27 VAC / VDC
1	100...240 VAC / VDC

I/O optional (N) [4]	
00	Absent
10	8 IN/OUT
01	8 relay
11	8 IN/OUT + 8 relay

Communication (M)	
00	Absent
M0	RS485 Modbus RTU

Digital inputs (L)	
0	Absent [3]
5	5 DI

Auxiliary input (I)	
0	Absent
1	Input Aux [2]
2	Input Aux + VP 1 V [1]
3	Input Aux + VT2 24 V [1]

CT Input (H)	
0	Absent
2	CT1 + CT2

Note

1) Auxiliary input type 1 V / 5 V / 10 V / 20 mA
2) Auxiliary input type TC / RTD / 60 mV
3) Only for option H-I = 0
4) The N options require P = FB option
5) I modelli V e PV richiedono opzione (CD) = RR

Check before each request a list of codes available on the following pages

Power supply 100...240 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs								I/O AUX		Communica-tions			Logic + mathematical functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	Logic isolated		Analog I	Analog V/I	Power supply sensor	Digital Inputs / Outputs	Outputs relay	RS485 modbus RTU					
F065321	1850-D-RVR-0-0-00-5-00-00-1-00			5					2		1					•								3 outputs
F065322	1850-R-RVR-0-0-00-5-00-00-1-00			5					3							•								
F067164	1850-R-DDR-0-0-01-5-00-00-1-FB			5		•			2		2											•		4 outputs
F065331	1850-R-DDR-0-0-03-5-00-00-1-FB			5				•	2		2											•		
F067165	1850-R-DDR-0-0-01-5-M0-00-1-FB			5		•			2		2								•			•		
F065332	1850-R-DDR-0-0-03-5-M0-00-1-FB			5				•	2		2								•			•		
F067167	1850-C-RRR-0-0-01-5-00-00-1-FB			5		•			3					1								•		
F067168	1850-C-RRR-0-0-03-5-00-00-1-FB			5				•	3					1								•		
F065334	1850-D-RRR-0-0-20-0-M0-00-1-00				2				3		1								•					
F065350	1850V-D-RRR-0-0-02-5-M0-00-1-00	•		5			•		3		1								•					
F065355	1850P-D-RRR-0-0-00-5-00-00-1-00		•	5					3		1													
F067169	1850P-D-RRR-0-0-01-5-00-00-1-FB		•	5		•			3		1											•		
F065361	1850P-D-RRR-0-0-03-5-00-00-1-FB		•	5				•	3		1											•		
F065370	1850PV-D-RRR-0-0-02-5-00-00-1-FB	•	•	5			•		3		1											•		
F065330	1850-R-RRR-0-0-02-5-00-00-1-00			5			•		4															
F065348	1850V-R-RRR-0-0-02-5-00-00-1-00	•		5			•		4															
F067172	1850V-R-RRR-0-0-01-5-00-00-1-00	•		5		•			4															
F065349	1850V-R-RRR-0-0-03-5-00-00-1-00	•		5				•	4															
F067173	1850-R-DDR-0-2-01-5-00-10-1-FB			5		•			2		2				2		•					•		4 (+8) outputs
F067174	1850-R-DDR-0-2-03-5-00-10-1-FB			5				•	2		2				2		•					•		
F067175	1850-R-DDR-0-2-01-5-M0-01-1-FB			5		•			2		2				2			•	•			•		
F067176	1850-R-DDR-0-2-03-5-M0-01-1-FB			5				•	2		2				2			•	•			•		
F065368	1850P-R-RRR-0-0-00-5-00-10-1-FB		•	5					4								•					•		
F067179	1850-R-RVR-0-2-01-5-M0-00-1-00			5		•			3						2	•			•					5 outputs
F065340	1850-R-RVR-0-2-03-5-M0-00-1-00			5				•	3						2	•			•					
F065351	1850V-D-RRR-0-1-02-5-00-00-1-00	•		5			•		3		1				1									
F065352	1850V-D-RRR-0-1-02-5-M0-00-1-00	•		5			•		3		1				1				•					
F067180	1850V-D-RRR-0-1-01-5-M0-00-1-00	•		5		•			3		1				1				•					
F065353	1850V-D-RRR-0-1-03-5-M0-00-1-00	•		5				•	3		1				1				•					
F065354	1850V-R-RR0-0-2-00-0-00-00-1-00	•							3						2									
F065364	1850P-D-RRR-0-1-02-5-M0-00-1-00		•	5			•		3		1				1				•					
F067181	1850-R-RRR-0-1-01-5-00-00-1-00			5		•			4						1									
F065338	1850-R-RRR-0-1-03-5-00-00-1-00			5				•	4						1									
F067182	1850-R-RRR-0-1-01-5-M0-00-1-00			5		•			4						1				•					
F065339	1850-R-RRR-0-1-03-5-M0-00-1-00			5				•	4						1				•					
F067183	1850P-R-RRR-0-1-01-5-M0-00-1-00		•	5		•			4						1				•					
F065365	1850P-R-RRR-0-1-03-5-M0-00-1-00		•	5				•	4						1				•					

Note: Please contact GEFRAN for information on available codes.

Power supply 100...240 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs								I/O AUX		Communications			Logic + mathematical functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	Logic isolated		Analog I	Analog V/I	Power supply sensor	Digital Inputs / Outputs	Outputs relay	RS485 modbus RTU					
F065341	1850-D-RRR-0-2-02-5-00-00-1-00			5			•		3		1				2									6 outputs
F067184	1850P-D-RRR-0-2-01-5-00-00-1-00		•	5		•			3		1				2									
F065366	1850P-D-RRR-0-2-03-5-00-00-1-00		•	5				•	3		1				2									
F065367	1850P-D-RRR-0-2-20-5-M0-00-1-00		•	5	2				3		1				2				•					
F067185	1850-R-RRR-0-2-01-5-M0-00-1-00			5		•			4						2				•					
F065342	1850-R-RRR-0-2-03-5-M0-00-1-00			5				•	4						2				•					
F067187	1850P-R-RRR-0-2-01-5-M0-10-1-FB		•	5		•			4						2		•		•			•		6 (+8) outputs
F065369	1850P-R-RRR-0-2-03-5-M0-10-1-FB		•	5				•	4						2		•		•			•		

Note: Please contact GEFRAN for information on available codes.

Power supply 20...27 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs								I/O AUX		Communications			Logic + mathematical functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	Logic isolated		Analog I	Analog V/I	Power supply sensor	Digital Inputs / Outputs	Outputs relay	RS485 modbus RTU					
F065269	1850-D-RVR-0-0-00-5-00-00-0-00			5					2		1					•								3 outputs
F065270	1850-R-RVR-0-0-00-5-00-00-0-00			5					3							•								
F067188	1850-R-DDR-0-0-01-5-00-00-0-FB			5		•			2		2											•		4 outputs
F065279	1850-R-DDR-0-0-03-5-00-00-0-FB			5				•	2		2											•		
F067189	1850-R-DDR-0-0-01-5-M0-00-0-FB			5		•			2		2								•			•		
F065280	1850-R-DDR-0-0-03-5-M0-00-0-FB			5				•	2		2								•			•		
F067191	1850-C-RRR-0-0-01-5-00-00-0-FB		•	5		•			3					1								•		
F067192	1850-C-RRR-0-0-03-5-00-00-0-FB		•	5				•	3					1								•		
F065282	1850-D-RRR-0-0-20-0-M0-00-0-00				2				3		1								•					
F065298	1850V-D-RRR-0-0-02-5-M0-00-0-00	•		5			•		3		1								•					
F065303	1850P-D-RRR-0-0-00-5-00-00-0-00		•	5					3		1													
F067193	1850P-D-RRR-0-0-01-5-00-00-0-FB		•	5		•			3		1											•		
F065309	1850P-D-RRR-0-0-03-5-00-00-0-FB		•	5				•	3		1											•		
F065318	1850PV-D-RRR-0-0-02-5-00-00-0-FB	•	•	5			•		3		1											•		
F065278	1850-R-RRR-0-0-02-5-00-00-0-00			5			•		4															
F065296	1850V-R-RRR-0-0-02-5-00-00-0-00	•		5			•		4															
F067196	1850V-R-RRR-0-0-01-5-00-00-0-00	•		5		•			4															
F065297	1850V-R-RRR-0-0-03-5-00-00-0-00	•		5				•	4															
F067197	1850-R-DDR-0-2-01-5-00-10-0-FB			5		•			2		2				2		•					•		4 (+8) outputs
F067198	1850-R-DDR-0-2-03-5-00-10-0-FB			5				•	2		2				2		•					•		
F067199	1850-R-DDR-0-2-01-5-M0-01-0-FB			5		•			2		2				2			•	•			•		
F067200	1850-R-DDR-0-2-03-5-M0-01-0-FB			5				•	2		2				2			•	•			•		
F065316	1850P-R-RRR-0-0-00-5-00-10-0-FB		•	5					4								•					•		
F067203	1850-R-RVR-0-2-01-5-M0-00-0-00			5		•			3						2	•			•					5 outputs
F065288	1850-R-RVR-0-2-03-5-M0-00-0-00			5				•	3						2	•			•					
F065299	1850V-D-RRR-0-1-02-5-00-00-0-00	•		5			•		3		1				1									
F065300	1850V-D-RRR-0-1-02-5-M0-00-0-00	•		5			•		3		1				1				•					
F067204	1850V-D-RRR-0-1-01-5-M0-00-0-00	•		5		•			3		1				1				•					
F065301	1850V-D-RRR-0-1-03-5-M0-00-0-00	•		5				•	3		1				1				•					
F065302	1850V-R-RR0-0-2-00-0-00-00-0-00	•							3						2									
F065312	1850P-D-RRR-0-1-02-5-M0-00-0-00		•	5			•		3		1				1				•					
F067205	1850-R-RRR-0-1-01-5-00-00-0-00			5		•			4						1									
F065286	1850-R-RRR-0-1-03-5-00-00-0-00			5				•	4						1									
F067206	1850-R-RRR-0-1-01-5-M0-00-0-00			5		•			4						1				•					
F065287	1850-R-RRR-0-1-03-5-M0-00-0-00			5				•	4						1				•					
F067207	1850P-R-RRR-0-1-01-5-M0-00-0-00		•	5		•			4						1				•					
F065313	1850P-R-RRR-0-1-03-5-M0-00-0-00		•	5				•	4						1				•					

Note: Please contact GEFRAN for information on available codes.

Power supply 20...27 VAC/VDC

Code F	Model	Valves	Programmer	Inputs					Outputs								I/O AUX		Communica-tions			Logic + mathematical functions		Total Number of Outputs
				Digital	CT	AUX (TC/RTD/60mV)	AUX (1V/5V/10V/20mA) +VP	AUX (1V/5V/10V/20mA) +VT	Relay	Triac	Logic SSR	Logic isolated		Analog I	Analog V/I	Power supply sensor	Digital Inputs / Outputs	Outputs relay	RS485 modbus RTU					
F065289	1850-D-RRR-0-2-02-5-00-00-0-00			5			•		3		1				2									6 outputs
F067208	1850P-D-RRR-0-2-01-5-00-00-0-00		•	5		•			3		1				2									
F065314	1850P-D-RRR-0-2-03-5-00-00-0-00		•	5				•	3		1				2									
F065315	1850P-D-RRR-0-2-20-5-M0-00-0-00		•	5	2				3		1				2				•					
F067209	1850-R-RRR-0-2-01-5-M0-00-0-00			5		•			4						2				•					
F065290	1850-R-RRR-0-2-03-5-M0-00-0-00			5				•	4						2				•					
F067211	1850P-R-RRR-0-2-01-5-M0-10-0-FB		•	5		•			4						2		•		•			•		6 (+8) outputs
F065317	1850P-R-RRR-0-2-03-5-M0-10-0-FB		•	5				•	4						2		•		•			•		

Note: Please contact GEFRAN for information on available codes.

11. ACCESSORIES

Code	Description	Compatible		
		850	1650	1850
F060800	Cable for programming with PC, USB-TTL 3 V with USB – microUSB connectors, length 1.8 m	•	•	•
F043958	“GF_eXpress” software CD	•	•	•
F060909	Configuration kit for new instruments GF_eXK-3-0-0	•	•	•
51968	Rubber gasket 48×48 front-box	•		
51969	Rubber gasket 48×96 front-box		•	
51970	Rubber gasket 96×96 front-box			•
51292	Rubber gasket 48×48 box-panel	•		
51068	Rubber gasket 48×96 box-panel		•	
51069	Rubber gasket 99×96 box-panel			•
51250	Fastening box to panel	•		
49030	Fastening box to panel		•	•
51294	Protection of contacts at box bottom	•		
51328	Protection of contacts at box bottom		•	•
51454	18 contacts at box bottom	•		
51453	24 contacts at box bottom	•		
51738	36 contacts at box bottom		•	•
330200	Current transformer (CT) 50/0.05 A	•	•	•
330201	Current transformer (CT) 25/0.05 A	•	•	•