GEFRAN

850 - 1650 - 1850

Double PID temperature controller

INSTALLATION AND INSTRUCTION MANUAL

CE

code: 80290E - 06-2021

80290E_MHW_850-1650-1850_06-2021_ENG

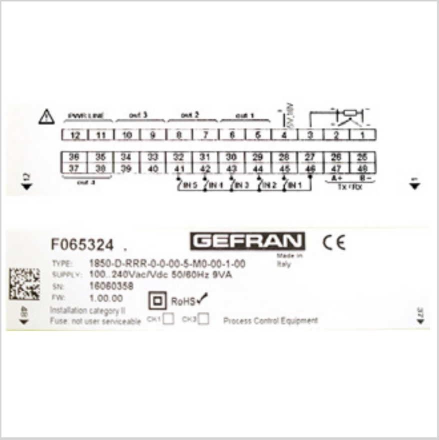
CONTENTS

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.



F065324 .

TYPE: 1850-D-RRR-0-0-00-5-M0-00-1-00

SUPPLY: 100..240Vac/Vdc 50/60Hz 9VA

SN: 16060358

FW: 1.00.00

Installation category II

Fuse: not user serviceable

CH1 ☐ CH3 ☐

Numero di matricola	**SN**	
Codice prodotto finito	**CODE**	
Codice di ordinazione	**TYPE**	
Tensione di alimentazione	**SUPPLY**	
Versione firmware	**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
WWW	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.
Allarme	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 cable.
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.
Controll 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

Operator Interface
Large backlit LCD screen with high visibility and high contrast. Two to three rows on the screen display variables, setpoints and alphanumerical information, scrolling up to 75 configurable messages of 32 characters each in three different languages. The selection of languages and easily comprehensible scrolling texts regarding diagnostics, alarms, and process statuses ensure that the controllers speak the users' language.

Control
One or two PID control loops with two universal inputs configurable for thermocouples, thermoresistances and linear inputs. They may be used independently to manage two different forms of control or they may interact with cascade or ratio control. An optional third linear analogue input may be used to acquire signals such as remote setpoints or retroactive valve feedback, while also supplying the necessary potentiometer power supply.
If the appropriate four-point calibration is performed in the field, the controller meets the requirements of standard AMS2750E and may be used in applications requiring the NADCAP directive.

Easy Configuration
Set-up wizard for manual-free programming with only a few indispensable parameters, commented by online help messages. Opportunity to create your own password-protected "User menu" containing only the parameters required for the application.
Advanced set-up and work recipe creation can be achieved via PC and GF_eXpress software, even without powering the controllers. GF_eXpress may be used to define, for each menu and parameter, which values will be shown to the controller to ensure easy use in the field.
Controllers can still be configured directly in the field using only four keys, associated with led lights that provide feedback when a button is pressed and guide the user by indicating the appropriate operations. Factory settings can be restored if necessary, either on the keyboard or using the GF_eXpress software tool. Diagnostics, preventive maintenance and consumption monitoring.
Exhaustive diagnostics for breakage or incorrect connection of probes, total or partial load breakdown, off-scale variables and anomalies in the control ring. Counters for the number of relay and comparator switches, with alarm thresholds, permit scheduling of preventive maintenance to replace worn actuators. Two internal energy counters with alarms for anomalous variations count total energy consumption in kWh and its cost, permitting ongoing energy monitoring.

Diagnostics, preventive maintenance and consumption monitoring.
Exhaustive diagnostics in the event of breakage or incorrect connection of probes, total or partial breakage of the load, off-scale variables and anomalies in the adjustment ring. Relay switch counters and comparators with alarm signals permit planning of preventive maintenance work for replacement of worn actuators. Two internal energy counters with alarms for signalling anomalous variations totalise energy consumption in kWh and its cost, permitting uninterrupted energy monitoring.

Functional application blocks
Thirty-two logical AND, OR, Flip-Flop, Comparator, Counter and Timer Function Blocks permit creation of customised logical sequences for complete, flexible machine control. Eight mathematical Function Blocks permit processing of analogue variables and calculation of differences, sums, multiplication and division, averages, top and bottom values, square root calculation and logarithms. Function Blocks also permit management of 8+8 additional inputs/outputs available for models 1850 ¼ DIN.

Tuning
Advanced tuning algorithms refined over time guarantee stable, accurate control even with critical or very rapid thermal systems, automatically activated when necessary.

Timers
Three different types of timer permitting waiting times to be set before activating control, maintenance times on setpoint values, and scheduled set changes over time.

Setpoint programmers
Up to 192 steps are available for applications with setpoint profiles, each with a ramp and maintenance time, which can freely be grouped into up to 16 programmes. Each segment may be associated with enabling inputs, event outputs, and configurable messages to be displayed. In models 1850, the display also permanently shows the step number and programme number underway. Double programmer mode, with a synchronous or asynchronise timing base, permits activation of two different setpoint profiles which may be independent of one another and may be associated with two control loops. The clock/weekly calendar function with a real-time clock and buffer battery facilitate starting and stopping of various programmes in default automatic mode.
Simplified keyboard configuration permits creation and editing of simple programmes with only three parameters per step, with no need for a PC, cables, or configuration software, while the extended configuration with Gf_ eXpress also offers graphic functions for displaying the profiles created.

Valve positioner
Models are available for motorised valve control, with or without position feedback. The position of floating valves is calculated; for valves with potentiomenters, auxiliary inputs can be used to control valve position and display it in numerical form or in one of 3 configurable bar graphs (for models 1650/1850)

Connectivity
850/1650/1850 “Performance” controllers have three different levels of communication with automation and supervision devices:
-RS485 Modbus RTU slave serial communication for interface with Master Modbus
-RS485 Modbus RTU master serial communication for reading/writing information toward Modbus slave devices such as power controllers or other controllers
-RJ45 Ethernet Modbus TCP port, which can also be used as a bridge toward Modbus RTU slave devices.
An Ethernet connection may be used to access the Web Server service offering a number of monitoring, diagnostics and configuration pages, accessible via local or remote networks with an ordinary browser and two password levels.

General features
Performance controllers are entirely configurable using the software and keyboard, without accessing their internal electronics, but the controller can be replaced at any time by simply pulling it out from the front, with no further operations, maintaining IP65 protection for the front.

Main features
- Models 1/16 DIN (850); 1/8 DIN (1650); ¼ DIN (1850)
- Accuracy 0.1%, AMS2750E compliance
- Sampling time 60ms
- Operator interface with large LCD display and three configurable bar graphs (mod. 1650/1850)
- Diagnostic scroll messages, configurable, in the selected language
- Easy setup, wizard, copy/paste parameters even without power
- Preventive maintenance, with energy counters (kWh) and load switching
- 32 logical application blocks
- 8 mathematical application blocks
- Timers, setpoint programmers and algorithms to control motorised valves
- Advanced control parameter tuning
- Differentiated password levels
- 2 universal inputs configurable for thermocouples, thermoresistances, linear inputs
- 3rd linear input for remote setpoint and potentiometer feedback (mod. 1650/1850)
- 2 PID control loops
- • 2 setpoint programmers (192 steps in 16 programs, or 12 programs with 16 fixed steps each)
- Relay, logic, isolated analogue outputs
- Up to two TA inputs for interrupted load diagnostics
- Modbus RTU Master and Slave communication
- Ethernet Modbus TCP and Modbus bridge communication
- Weekly clock\calendar with RTC
- Extractable from the front for immediate replacement

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 (192 steps in 16 programs, or 12 programs with 16 fixed steps each)
- Relay, logic, isolated analog outputs
- Up to two TA inputs for interrupted load diagnostics
- RS485 serial communication in Modbus RTU slave
- RS485 serial communication in Modbus RTU master for reading/writing information to Modbus slave devices
- Ethernet Modbus TCP communication in Slave mode
- Web server for browser access to web pages residing in the device, for monitoring and setting parameters
- Bridge function for creation of Modbus RTU 485 sub-network
- Weekly clock\calendar with RTC
- Removable faceplate for immediate replacement
- Accuracy 0,1%, sampling time 60 ms

1.3.1. Display and keys

Figure 1 - Description of 850 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);
- _/- = rsetpoint 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 TUp/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.

1.3.2. Drilling dimensions and templates

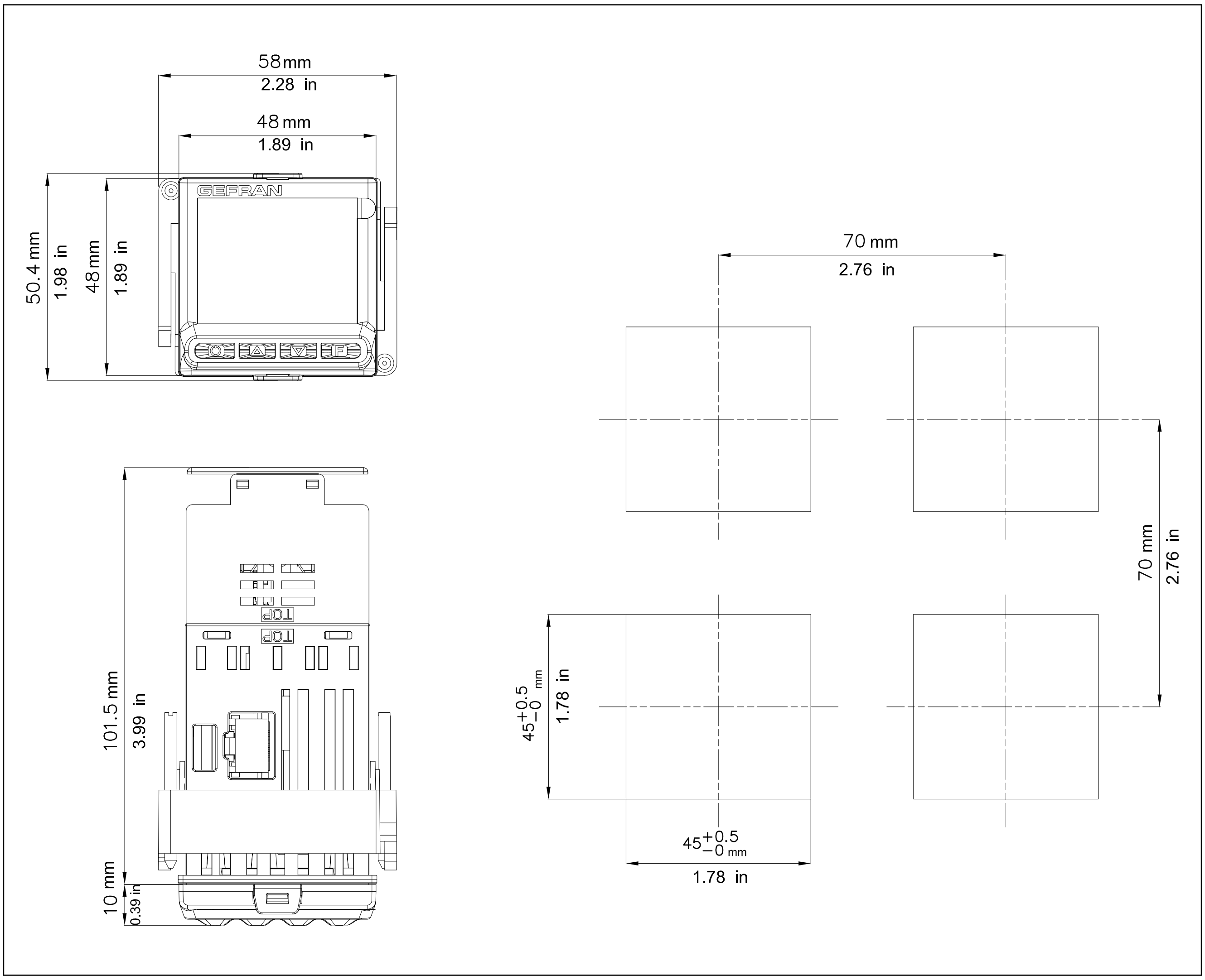


Figure 2 - 850 drilling dimensions and templates

Note : the electronic components of a 850 instrument made after January 2020 cannot be inserted in the casing of an instrument made prior to this date. If it should be necessary to replace an 850 controller manufactured before January 2020 with a similar controller manufactured after this date, the casing anchored to the panel must also be replaced.

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 withe 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
- 1 ingresso analogico lineare configurabile per funzioni ausiliarie
- 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 slave
- • RS485 serial communication in Modbus RTU master for reading/writing information to Modbus slave devices
- Ethernet Modbus TCP communication in Slave mode
- Web server for browser access to web pages residing in the devvice, for monitoring and setting parameters
- Bridge function for creation of Modbus RTU 485 sub-network
- Weekly clock\calendar with RTC
- Removable faceplate for immediate replacement
- Accuracy 0,1%, 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, OU3, 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

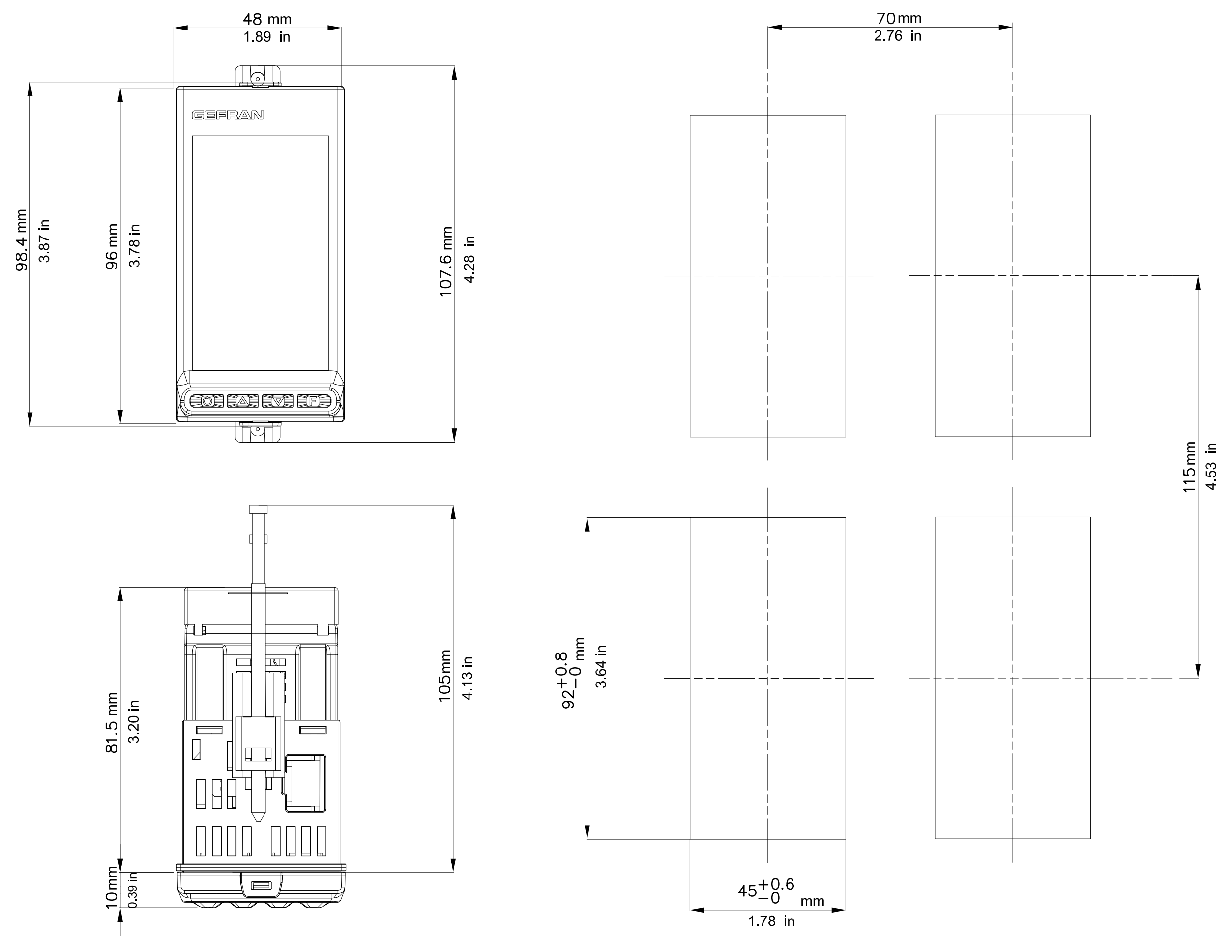


Figure 4 - 1650 drilling dimensions and templates

Note : the electronic components of a 1650 instrument made after January 2020 cannot be inserted in the casing of an instrument made prior to this date. If it should be necessary to replace an 1650 controller manufactured before January 2020 with a similar controller manufactured after this date, the casing anchored to the panel must also be replaced.

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
- 1 linear analogue input configurable for auxiliary functions
- 2 PID control loops
- 2 setpoint programmers (192 steps in 16 programs, or 12 programs with 16 fixed steps each)
- Relay, logic, isolated analog outputs
- Up to two TA inputs for interrupted load diagnostics
- RS485 serial communication in Modbus RTU slave
- RS485 serial communication in Modbus RTU master for reading/ writing information to Modbus slave devices• Ethernet Modbus TCP communication in Slave mode
- Web server for browser access to web pages residing in the device, for monitoring and setting parameters
- Bridge function for creation of Modbus RTU 485 sub-network
- Weekly clock\calendar with RTC
- Removable faceplate for immediate replacement
- Accuracy 0,1%, sampling time 60 ms

1.5.1. Display and keys

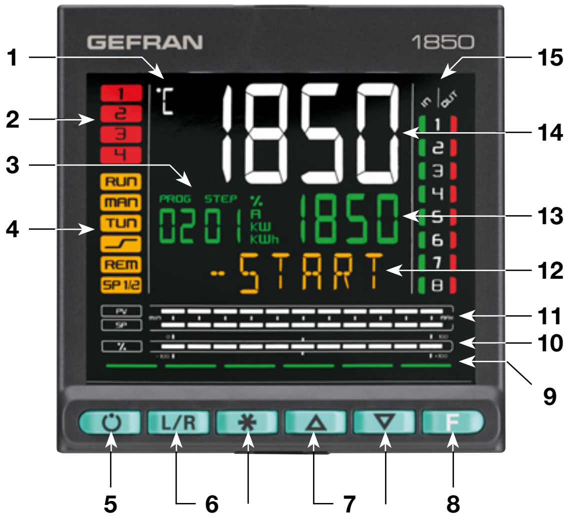


Figure 5 - Description of 1850 display and keys

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

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

3 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

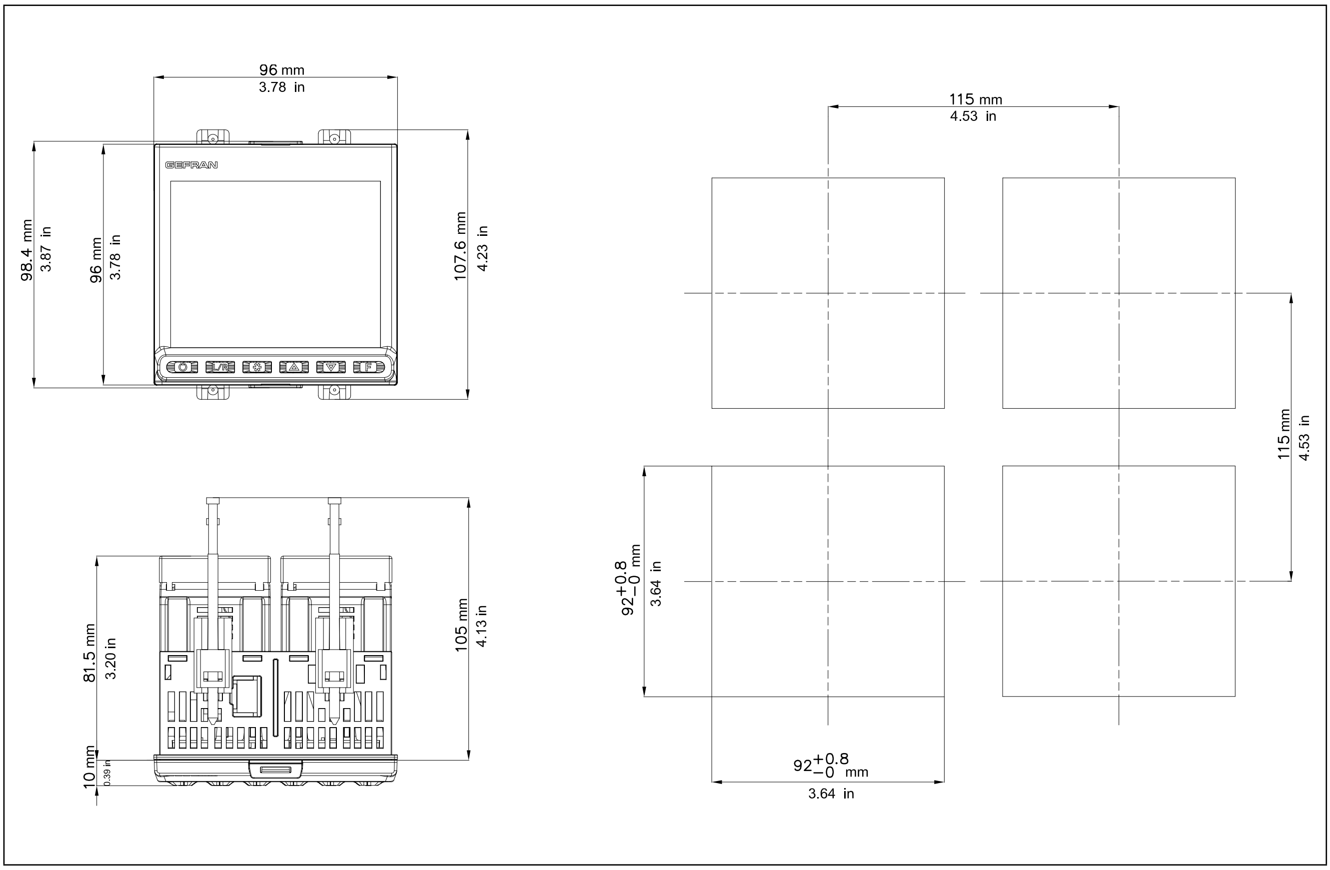


Figure 6 - 1850 drilling dimensions and templates

Note : the electronic components of a 1850 instrument made after January 2020 cannot be inserted in the casing of an instrument made prior to this date. If it should be necessary to replace an 1850 controller manufactured before January 2020 with a similar controller manufactured after this date, the casing anchored to the panel must also be replaced.

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 14, Figure 4 - 1650 drilling dimensions and templates 17, Figure 6 - 1850 drilling dimensions and templates 20).

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/s2 (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.

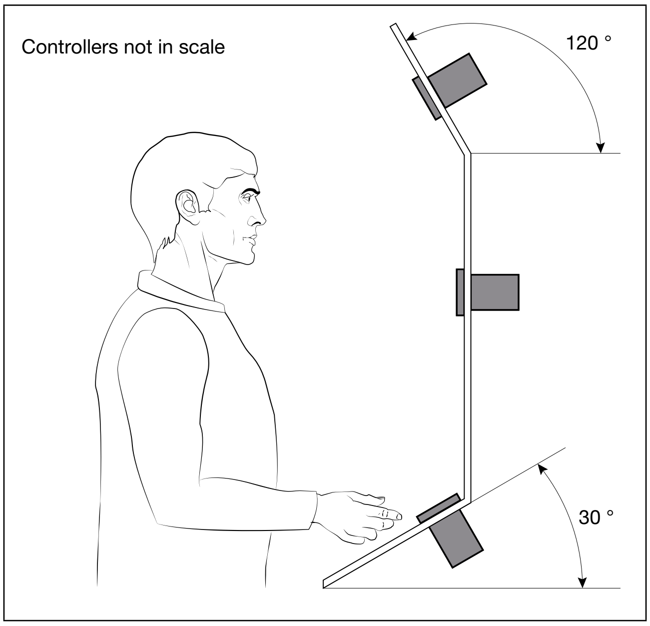


Figure 7 - Positioning the controller

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.

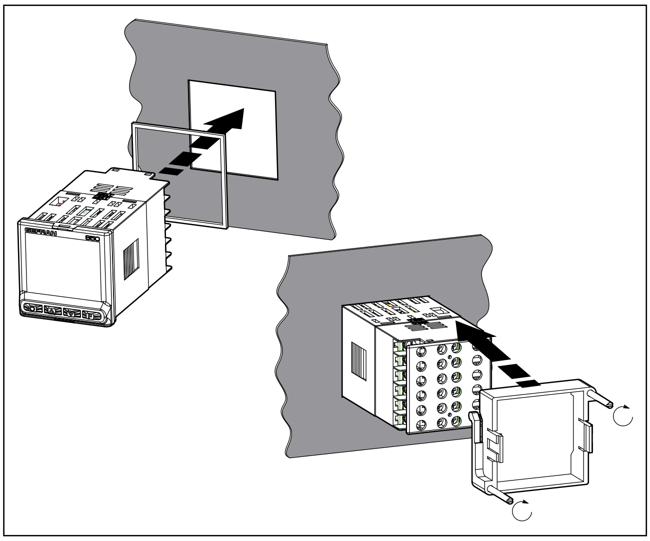


Figure 8 - Fastening the 850

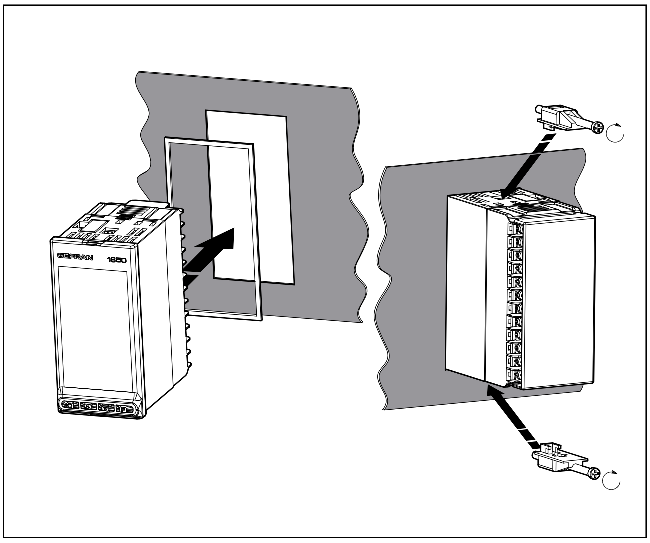


Figure 9 - Fastening the 1650

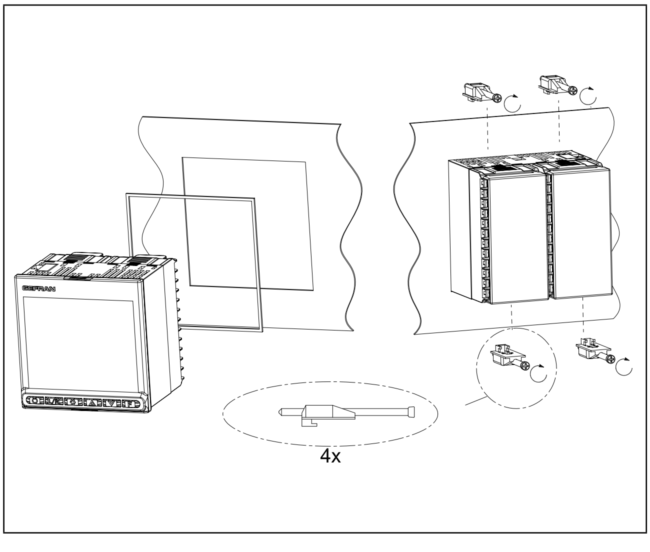


Figure 10 - Fastening the 1850

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 mm^2	1 m
Relay	1 mm^2	3,5 m
Serial port	0,35 mm^2	3,5 m
Thermocouple	0,8 mm^2	5 m compensated
Potentiometer, linear, “PT100” resistance thermometer	1 mm^2	3 m
Analog retransmission output	1 mm^2	3,5 m
Digital input/outputs	1 mm^2	3,5 m
Ethernet port	UTP 4x2xAWG24 cat 6	4 m

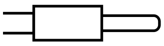
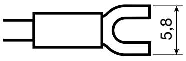
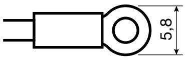
2.2.3. Cables

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 mm^2 (18...14 AWG)	
Twisted	0,8...2,5 mm^2 (18...14 AWG)	
 Tag terminal (to be crimped)	0,25...2,5 mm^2 (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.

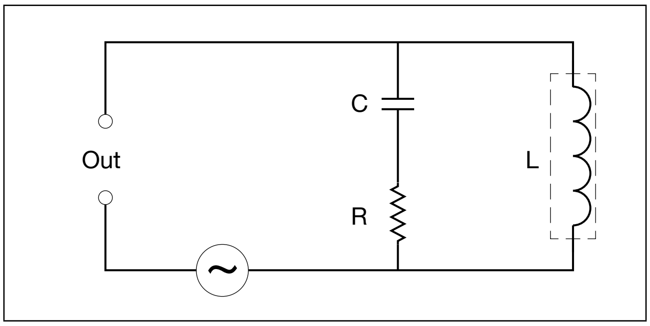


Figure 11 - Snubber connection diagram (AC)

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

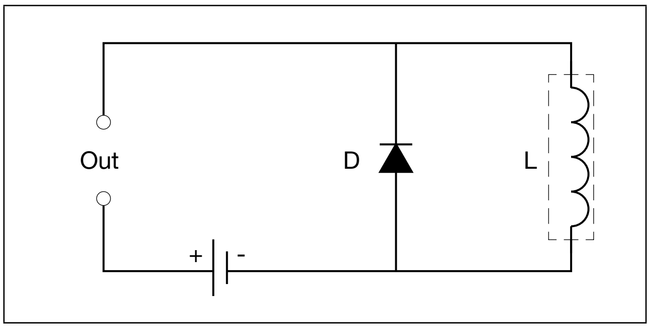


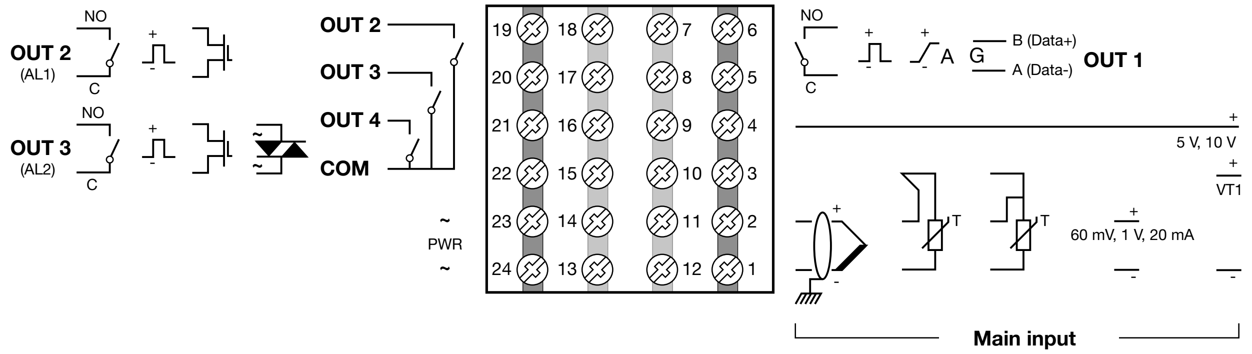
Figure 12 - Snubber connection diagram (DC)

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

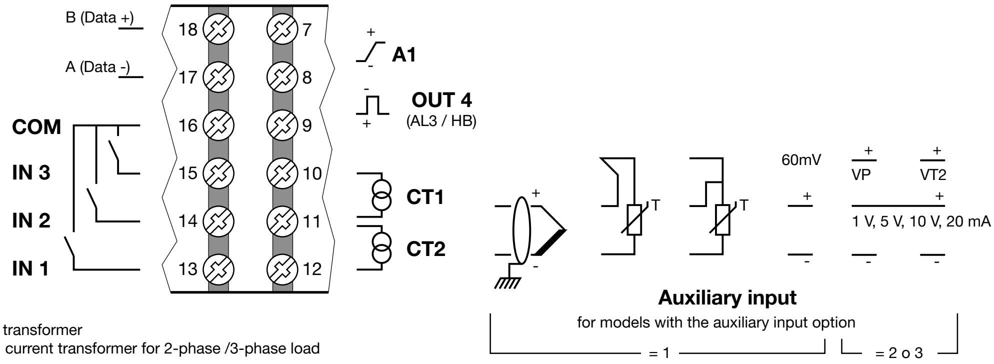
Attention! If the controller is connected to devices that are NOT electrically isolated (such as thermocouples), ground with a specific conductor to prevent grounding directly through the machine structure.

2.3. 850 connection diagrams

2.3.1. General diagram

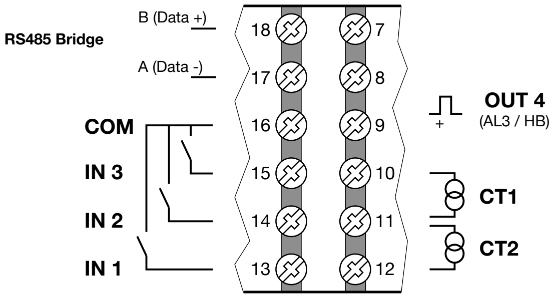


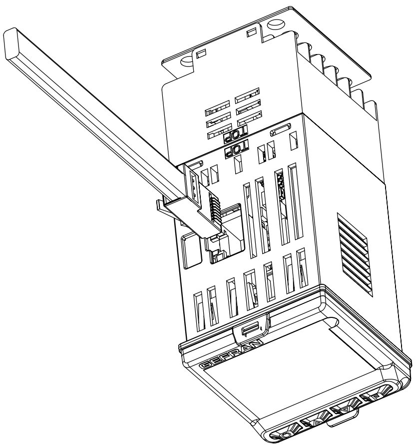
Without Ethernet communication option



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

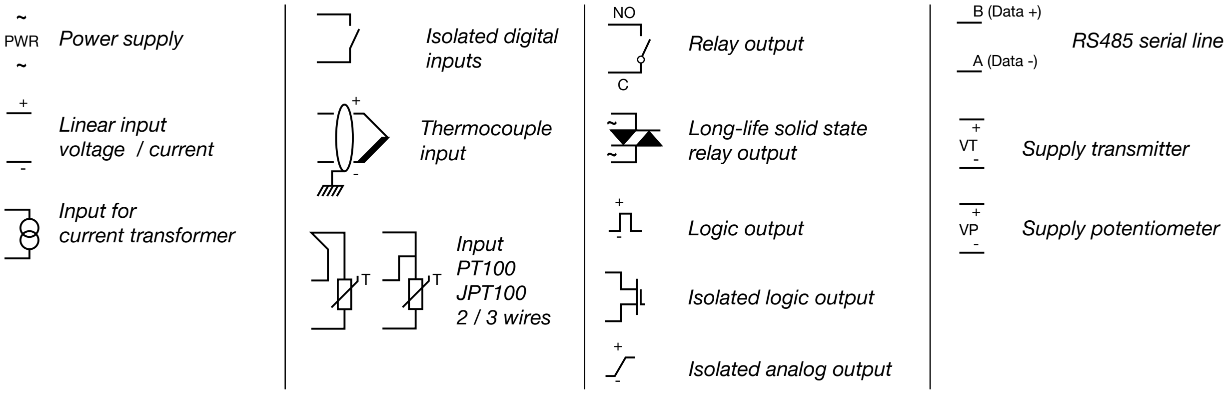
With Ethernet communication option





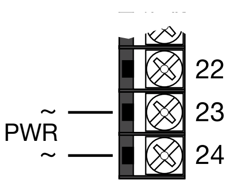
CT1 = current transformer
CT2 = second current transformer for 2-phase /3-phase load

LEGEND



2.3.2. Power supply

Power supply



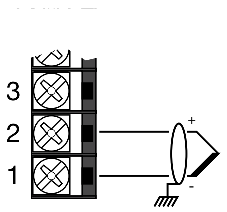
Standard: 100...240 VAC/VDC ± 10%
50/60 Hz, max 10 W

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

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

2.3.3. Inputs

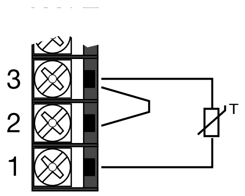
TC Inputs



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

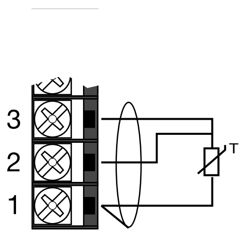
Respect polarity
For extensions, use a compensated cable suitable for the type of TC used

Input PT100/JPT100 - 2-wires connection



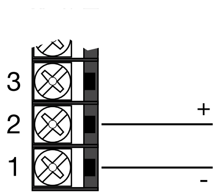
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate.

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.

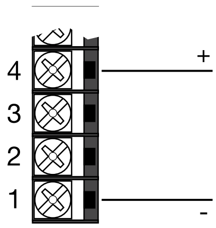
Linear input (V, I)



Linear input voltage
0...60 mV
0...1 V Ri > 100 MΩ

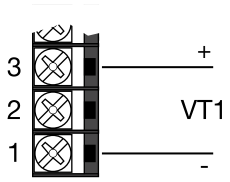
Linear input in direct current
0/4...20mA, Ri = 50 Ω.

Linear input (V)



Linear input in direct voltage
0...5 V / 0...10 V Ri > 400kΩ

Transmitter supply (VT1)

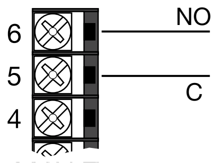


24 VDC ±10%, max 30 mA

2.3.4. Outputs

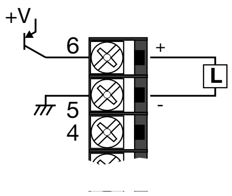
Characteristics of outputs are defined when the controller is ordered.

Output Out 1 - relay 5 A



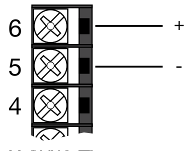
Relay 250 VAC, 5 A

Output Out 1 - logic



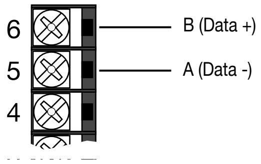
Logic 24 V ±10%
(min 10 V a 20 mA)

Output Out 1 - analogue



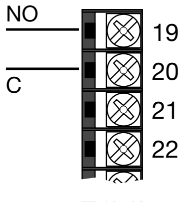
0...10 V, max 20 mA Rout > 500 Ω
0...20 mA / 4...20 mA Rout < 500 Ω

OUT1 - Master Modbus output [with optional Output 1 (B) = G]



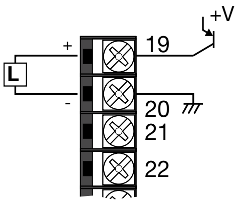
Master Modbus RS485

Output Out 2 - relay 5 A



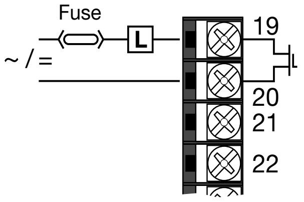
Relay 250 VAC, 5 A

Output Out 2 - logic



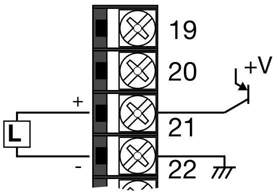
Logic 24 V ±10%
(min 10 V a 20 mA9)

Output Out 2 - logic isolated



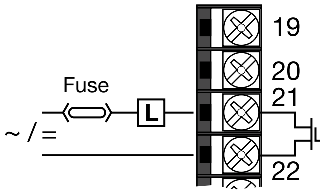
Logic 30 V AC/DC max
max 100 mA
Isolated 1500 V

Output Out 3 - logic



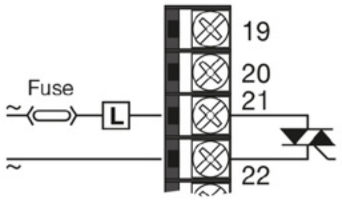
Logic 24 V ±10%
(min 10 V a 20 mA)

Output Out 3 - logic isolated



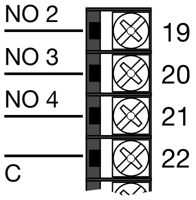
Logic 30 V AC/DC max
max 100 mA
Isolated 1500 V

Output Out 3 - Triac



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

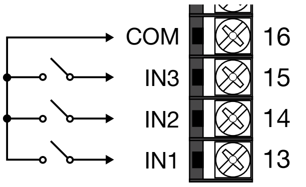
Output Out 2, Out 3, Out 4 - relay group 5 A



Relay 250 VAC, 5 A

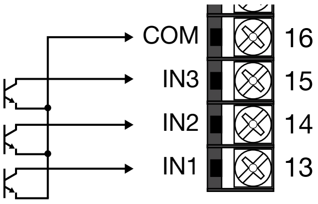
2.3.5. Digitali inputs

Digital inputs



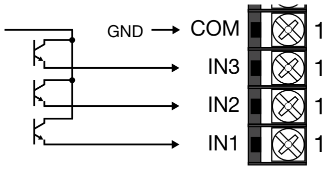
Digital inputs
voltage-free contact

Digital inputs



NPN digital input
24 V, 4,5 mA

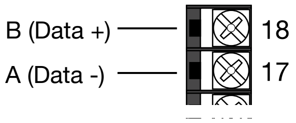
Digital inputs



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

2.3.6. Serial line

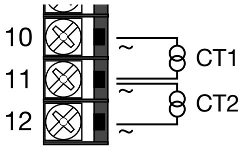
Serial line [with (M) = M0 communication option]



Serial line
RS485 2-wires

2.3.7. CT Inputs

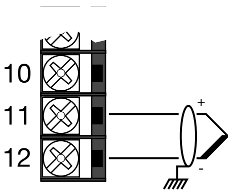
CT inputs [option]



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

2.3.8. Auxiliary inputs

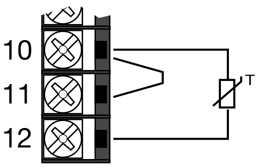
TC auxiliary input
with options (H-I) = 01



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.

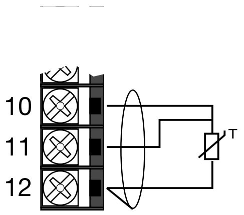
PT100/JPT100 Auxiliary input - 2-wires connection
[with options (H-I) = 01]



0... 60 mV	Ri > 100 MΩ

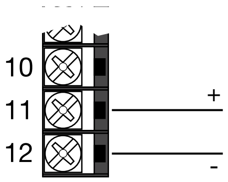
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen

PT100/JPT100 Auxiliary input - 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. The resistance of the three wires must be equal, the line resistance must be less than 20 ohm.

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



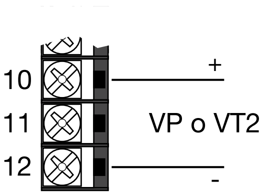
linear input voltage

0...1 V	Ri > 400 KΩ
0...5 V / 0...10 V	Ri > 400 KΩ

Linear input in direct current

0/4...20 mA	Ri = 50 KΩ

Potentiometer VP or transmitter VT2 supply

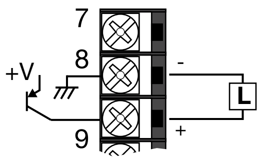


VP = 1 VDC ±1%, max 30 mA
[with option (H-I) = 02]

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

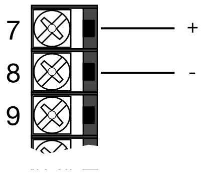
2.3.9. Auxiliary outputs

Output Out 4 - logic



Logic 24 V ±10%
(min 10 V a 20 mA)

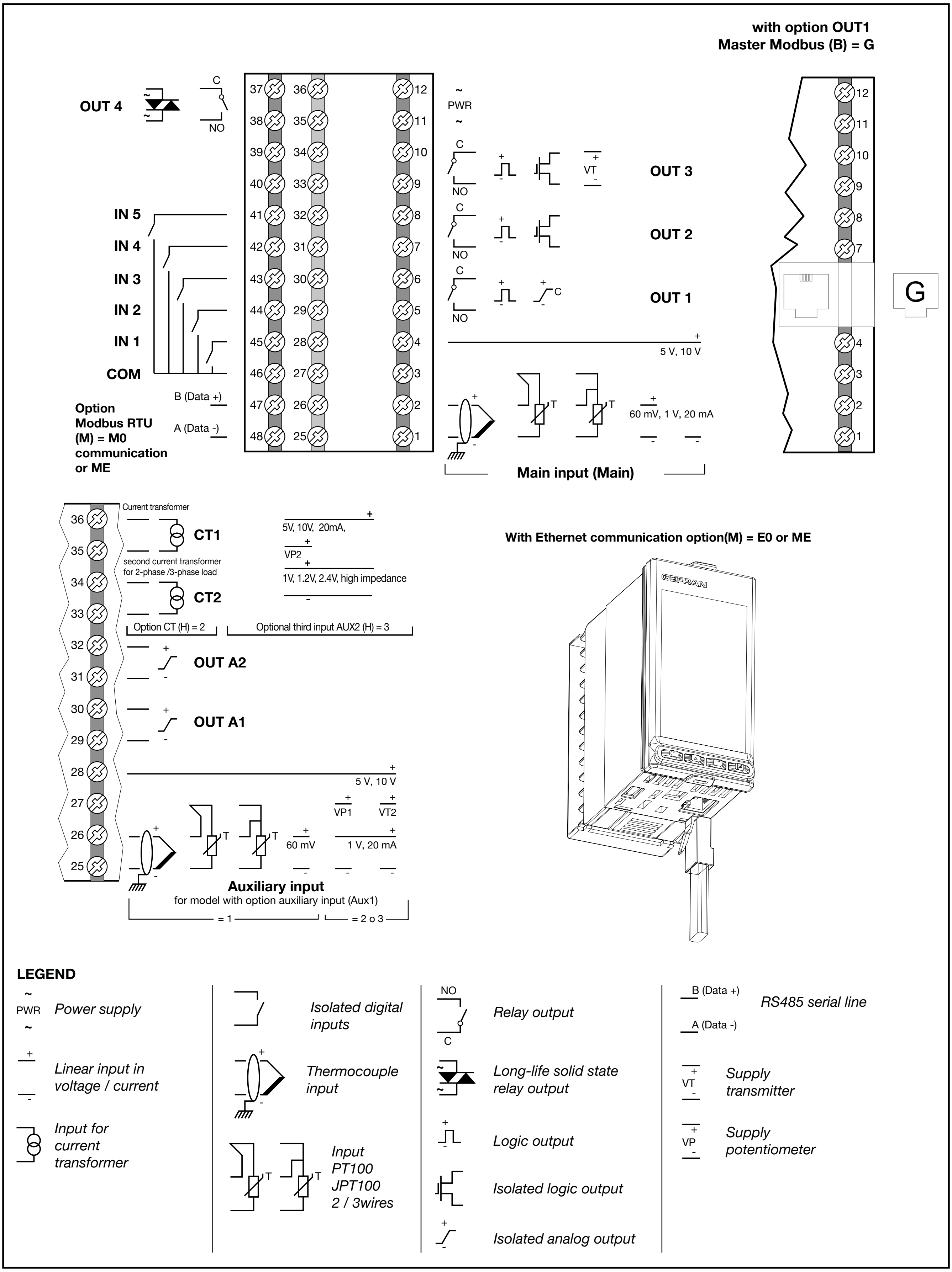
Output A1 - analogue



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

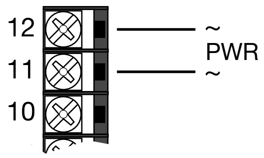
2.4. 1650 connection diagrams

2.4.1. General diagram



2.4.2. Power supply

Power supply



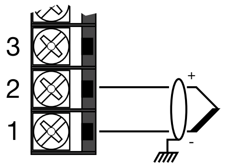
Standard:
100...240 VAC/VDC ± 10%
50/60 Hz, max 10W

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

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

2.4.3. Main input (MAIN)

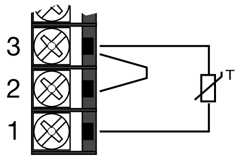
TC Input



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

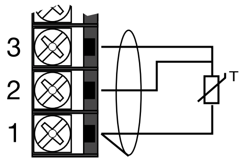
Respect polarity
For extensions, use a compensated cable

Input PT100/JPT100 - 2-wires connection



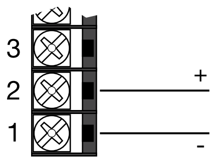
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.

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.

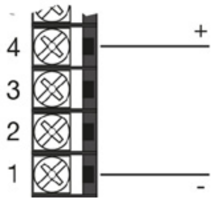
Linear input (V, I)



Linear input in direct voltage
0...60 mV
0...1 V Ri

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

Linear input (V)



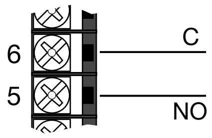
Linear input in direct voltage
0...5 V / 0...10 V Ri > 400kΩ

2.4.4. Outputs

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

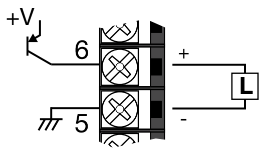
Outputs Out 1 - relay 5 A

Relè 250 VAC, 5 A

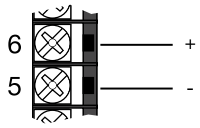


Outputs Out 1 - logic

Logic 24 V ±10%
(min 10 V a 20 mA)

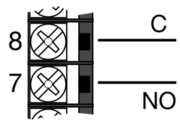


Outputs Out 1 - continuous



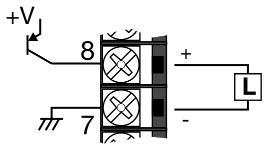
4...20 mA Rout < 500 Ω

Outputs Out 2 – relay 5 A



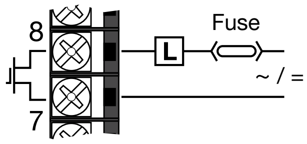
Relay 250 VAC, 5 A

Output Out 2 – logic



Logic 24 V ±10%
(min 10 V a 20 mA)

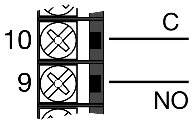
Output Out 2 - logic isolated



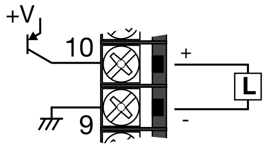
Logic 30 V AC/DC max
max 100 mA
Isolated 1500 V

Output Out 3 – relay 5 A

Relay 250 VAC, 5 A

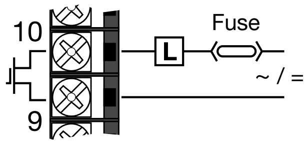


Output Out 3 – logic



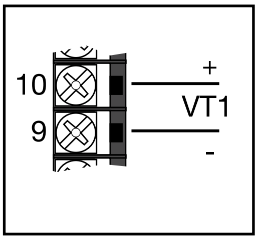
Logic 24 V ±10%
(min 10 V a 20 mA)

Output Out 3 - logic isolated



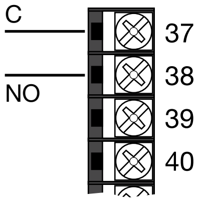
Logic 30 V AC/DC max
max 100 mA
Isolated 1500 V

Transmitter supply VT1



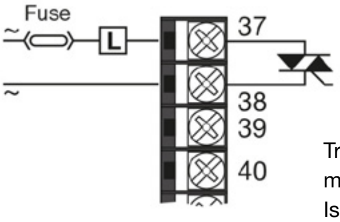
24 VDC ±10%, max 30 mA

Output Out 4 – relay 5 A



Relay 250 VAC, 5 A

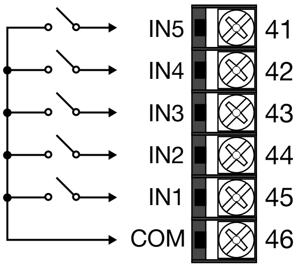
Output Out 4 –Triac



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

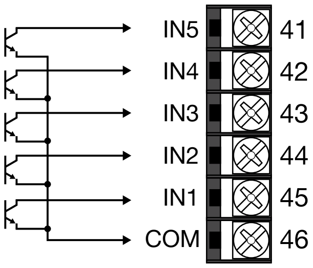
2.4.5. Digital inputs

Digital inputs



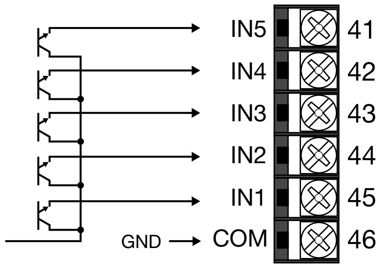
Digital inputs
voltage-free contact

Digital inputs



NPN Digital inputs
24 V, 4,5 mA

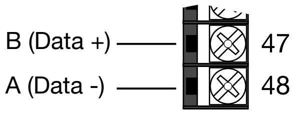
Digital inputs



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

2.4.6. Serial line

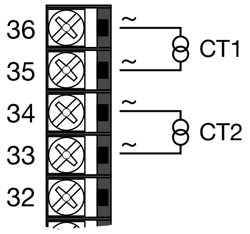
Serial line



Serial line
RS485 2-wires

2.4.7. CT Inputs

Inputs CT1, CT2

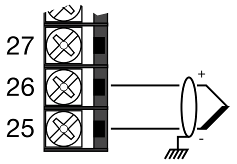


Current transformer
50 mAac, 10 , 50/60 Hz

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

2.4.8. Auxiliary inputs (AUX1)

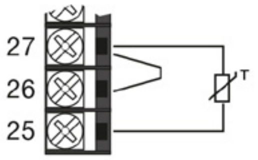
Input TC [with option auxiliary input = 1]



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

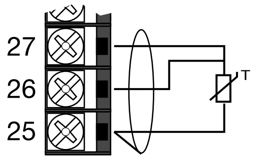
Respect polarity
For extensions, use a compensated cable

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.

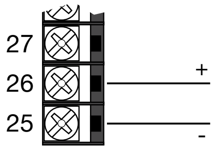
Input PT100/JPT100 - 3-wires connection
[with option auxiliary input = 1]



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]

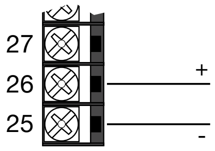
Linear input in direct voltage
0...60 mV Ri > 100 MΩ



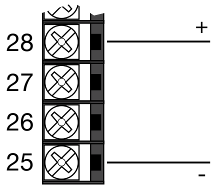
Linear input (V, I) [with option auxiliary input = 2 o 3]

Linear input in direct voltage
0...1 V Ri > 400 KΩ

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

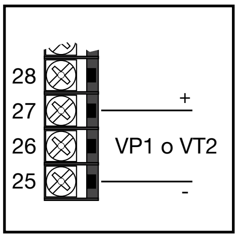


Linear input (V) [with option auxiliary input = 2 o 3]



Linear input in direct voltage
0...5 V / 0...10 V Ri > 400 KΩ

Potentiometer VP1 or transmitter VT2 supply

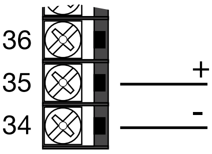


VP1 = 1 VDC ±1%, max 30 mA
[with option auxiliary input = 2]

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

2.4.9. Third Analogue input (AUX2)

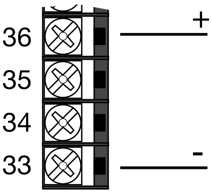
High impedance linear input (V)
[with third input option (H) = 3].



Linear input with direct voltage

0...1V	Ri >100MΩ
0…1.2V	Ri>100MΩ
0…2.4V	Ri>100MΩ

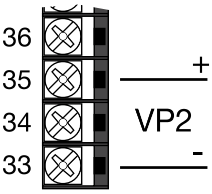
Linear input (V/I) [with third input option (H) = 3]



Linear input with direct voltage and current

0…1V / 0…5V / 0…10V	Ri>400kΩ
0…20mA / 4…20mA	Ri=50Ω

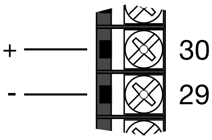
VP2 potentiometer power supply



VP2= 1VDC + - 1% max 30mA

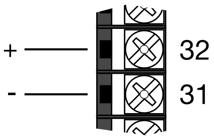
2.4.10. Analog outputs

Analog output A1



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

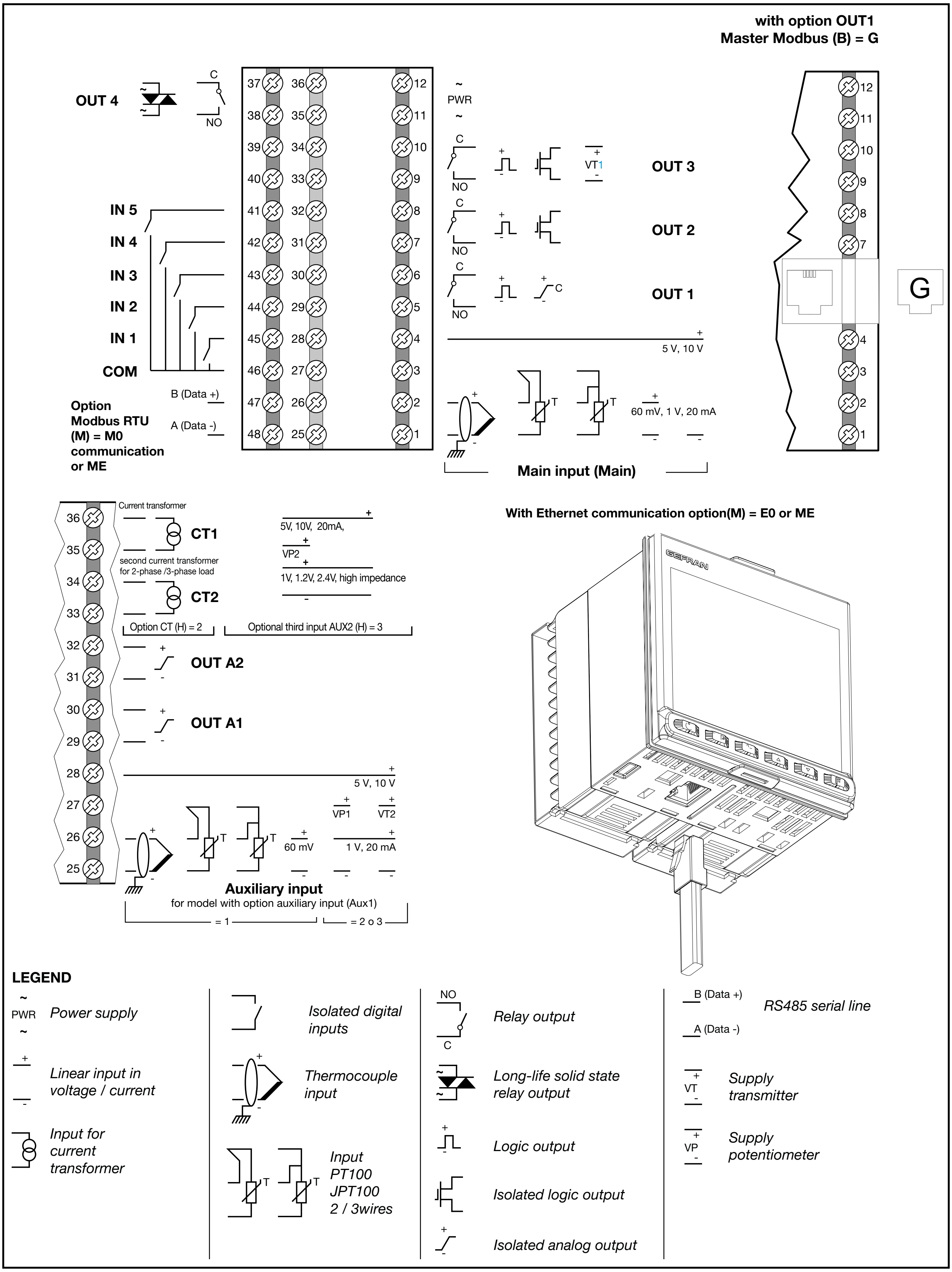
Analog output A2

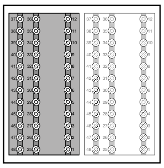


0...10 V, max 20 mA	Rout > 500 Ω
0...20 mA / 4...20 mA	Rout < 500 Ω

2.5. 1850 connection diagrams

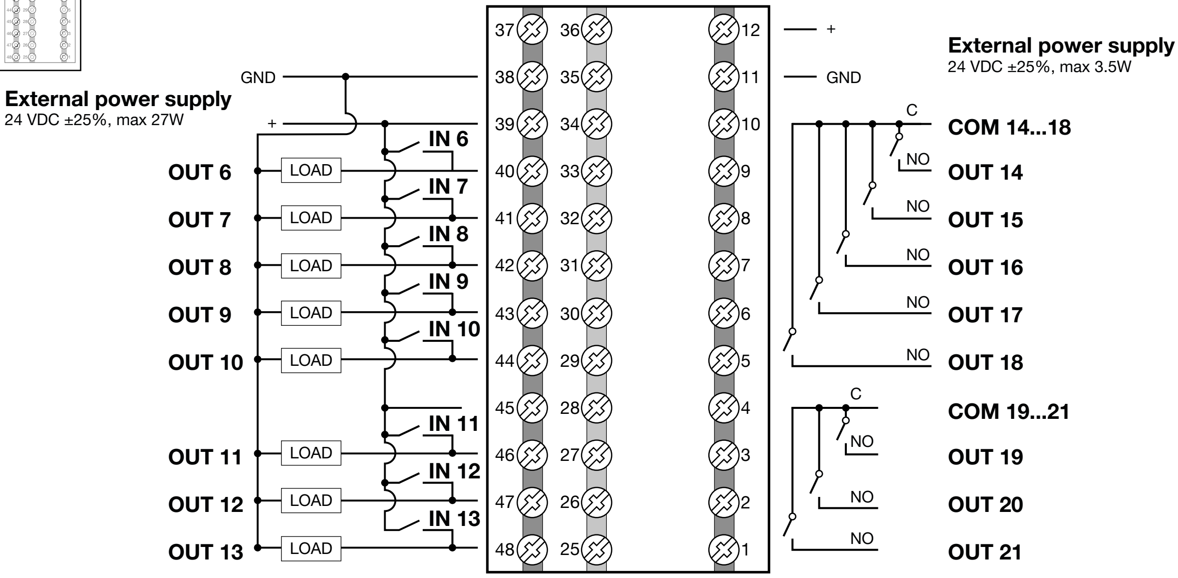
2.5.1. General diagram





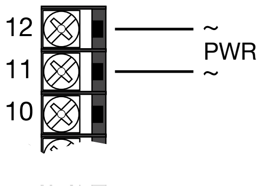
8 (PNP) digital Inputs/Outputs

8 Relays



2.5.2. Power supply

Power supply



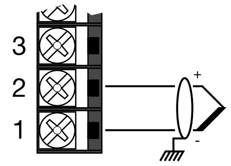
Standard:
100...240 VAC/VDC ± 10%
50/60 Hz, max 12W

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

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

2.5.3. Main input (MAIN)

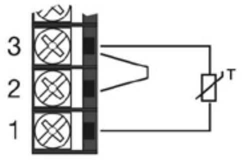
Input TC



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

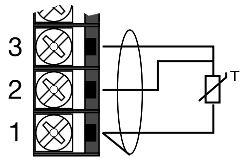
Respect polarity
For extensions, use a compensated cable

Input PT100/JPT100 - -2 wires connection



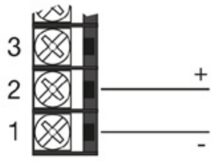
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate.

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.

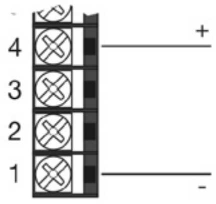
Linear input (V, I)



Linear input in direct voltage
0...60 mV Ri > 100MΩ
0...1 V Ri > 100MΩ

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

Linear input (V)

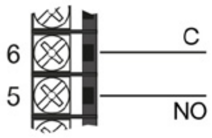


Linear input in direct voltage
0...5 V / 0...10 V Ri > 400kΩ

2.5.4. Output

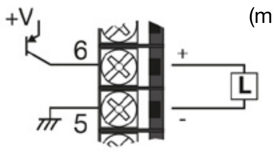
Characteristics of outputs Out1, Out2, Out3, Out4 are defined when the controller is ordered.

Output Out 1 - relay 5 A



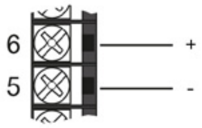
Relay 250 VAC, 5 A

Output Out 1 - logic



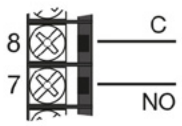
Logic 24 V ±10%
(min 10 V a 20 mA)

Output Out 1 - continuous



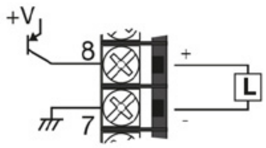
4...20 mA Rout < 500 Ω

Output Out 2 – relè 5 A



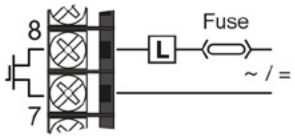
Relay 250 VAC, 5 A

Output Out 2 – logic



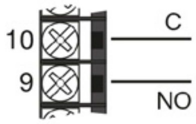
Logic 24 V ±10%
(min 10 V a 20 mA

Output Out 2 – logic isolated



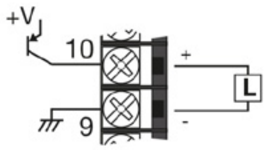
Logic 30 V AC/DC max
max 100 mA
Isolated 1500 V

Output Out 3 – relay 5 A



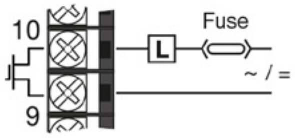
Relay 250 VAC, 5 A

Output Out 3 – logic



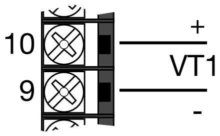
Logic 24 V ±10%
(min 10 V a 20 mA

Output Out 3 – logic isolated



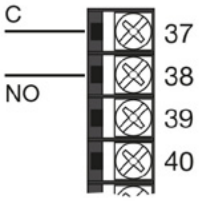
Logic 30 V AC/DC max
max 100 mA
Isolated 1500 V

Transmitter supply (VT1)



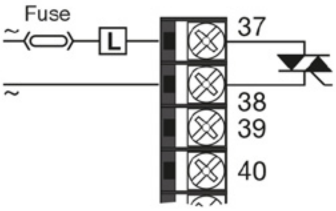
24 VDC ±10%, max 30 mA

Output Out 4 – relay 5 A



Relay 250 VAC, 5 A

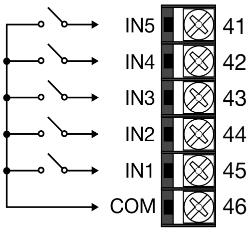
Output Out 4 – Triac



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

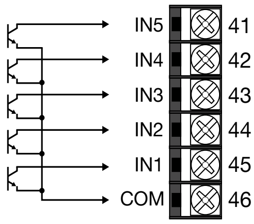
2.5.5. Digital inputs

Digital inputs



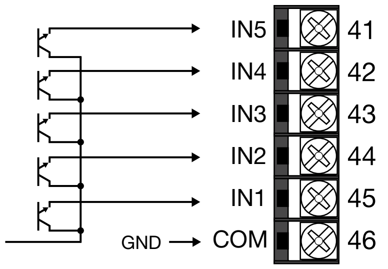
Digital input
voltage-free contact

Digital inputs



NPN Digital input
24 V, 4,5 mA

Digital inputs

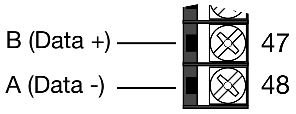


PNP Digital inputs
+12/24 V max 3,6 mA

2.5.6. Serial line

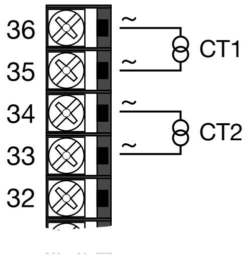
Serial Line

Serial line
RS485 2-wires



2.5.7. CT Inputs

Inputs CT1, CT2

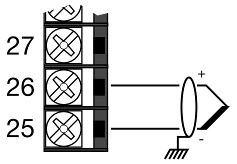


Current transformer
50 mAac, 10 , 50/60 Hz

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

2.5.8. Auxiliary input (AUX1)

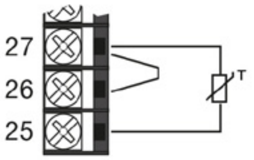
Input TC
[with option auxiliary input = 1,available only if the main input is configured Type TC]



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

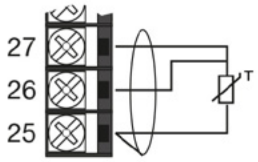
Respect polarity
For extensions, use a compensated cable

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



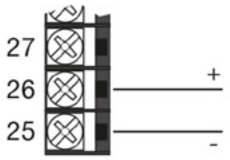
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen.

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



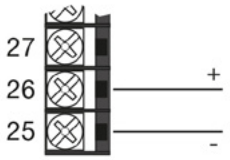
Attention:
with this type of connection the line resistance can introduce measurement error, we recommend that you use wires of adequate screen. The resistance of the three wires must be equal, the line resistance must be less than 20 ohm.

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



Linear input in direct voltage
0...60 mV Ri > 100 MΩ

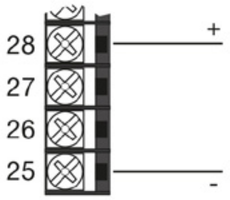
Linear Inputs (V, I)
[with option auxiliary input = 1]



Linear input in direct voltage
0...1 V Ri > 400 KΩ

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

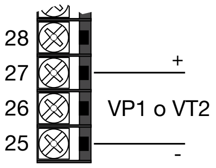
Linear Inputs (V)
[with option auxiliary input = 2 o 3]



Linear input in direct voltage

0...5 V / 0...10 V Ri > 400 KΩ

Potentiometer VP1 or transmitter VT2 supply

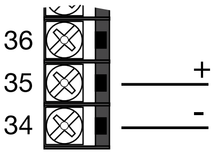


VP1 = 1 VDC ±1%, max 30 mA
[with option auxiliary input = 2]

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

2.5.9. THIRD ANALOGUE INPUT (AUX2)

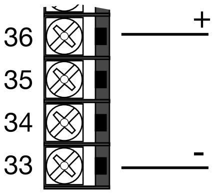
High impedance linear input (V)
[with third input option (H) = 3]



Linear input with direct voltage

0…1V	Ri>100MΩ
0…1.2V	Ri>100MΩ
0…2.4V	Ri>100MΩ

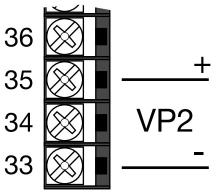
Linear input (V/I) [with third input option (H) = 3]



Linear input with direct voltage and current

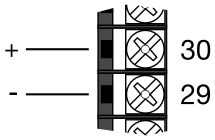
0…1V / 0…5V / 0…10V	Ri>400kΩ
0…20mA / 4…20mA	Ri=50Ω

VP2 potentiometer power supply
[VP2 = 1 VDC +- 1%, max 30mA]



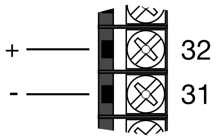
2.5.10. Analog outputs

Analog outputs A1



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

Analog outputs A2

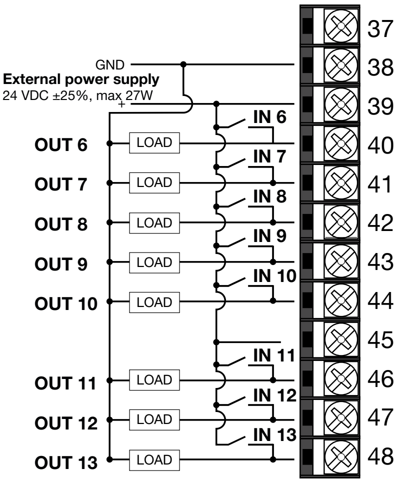


0...10 V, max 20 mA	Rout > 500 Ω
0...20 mA / 4...20 mA	Rout < 500 Ω

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

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

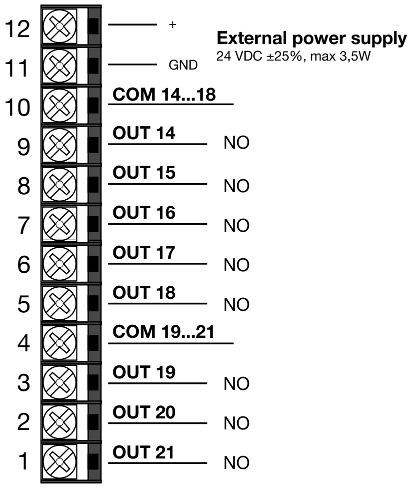
8 Inputs / Digital outputs (PNP)
[with option I/O = 10, 11]



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. Serial RS485 Wiring Diagram

Up to 31 controllers may be connected in parallel on physical line RS485, independently of which option is selected (Master Modbus (G), rete bridge RS485 (ME), Modbus RTU Slave (M0)); they may even be of different models.
The line must be terminated with a resistor (120 Ω, 1/2 W) at each end.

Output 1 type G options have an integrated 120 Ohm termination, while options M0 and ME require addition of termination outside the instrument.

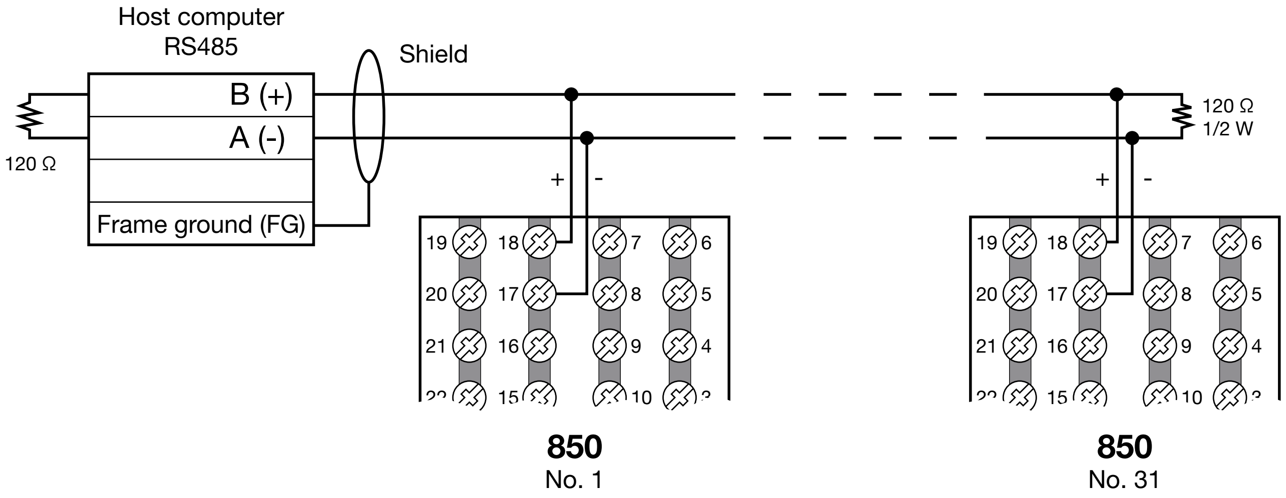


Figure 13 - RS485 connection for 850 controller with optional communication (M) = M0

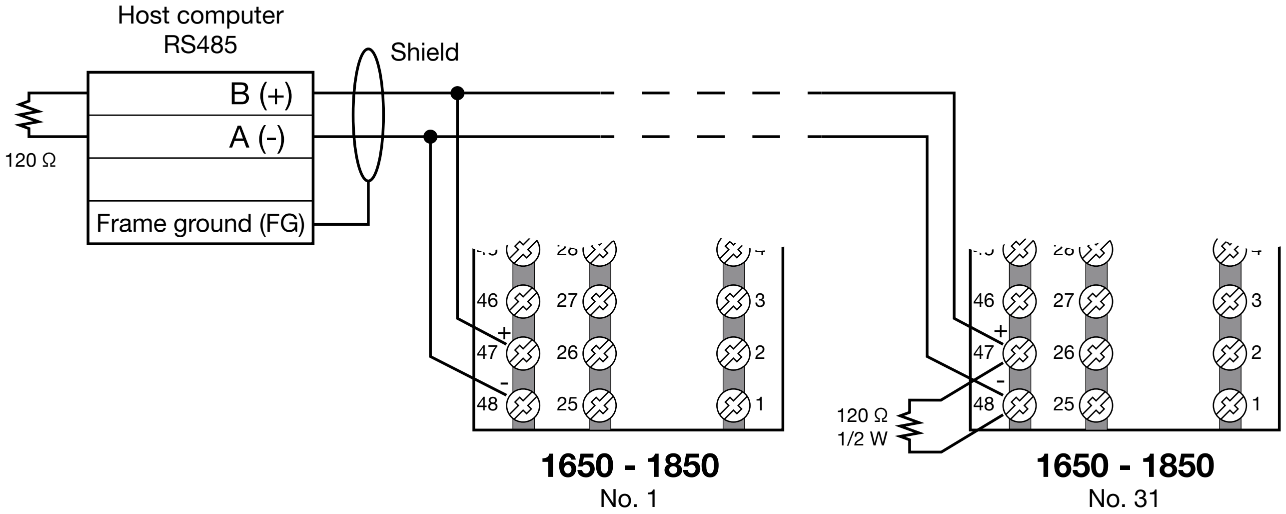


Figure 14 - RS485 connection for 1650 and 1850 controllers with optional communication (M) = M0

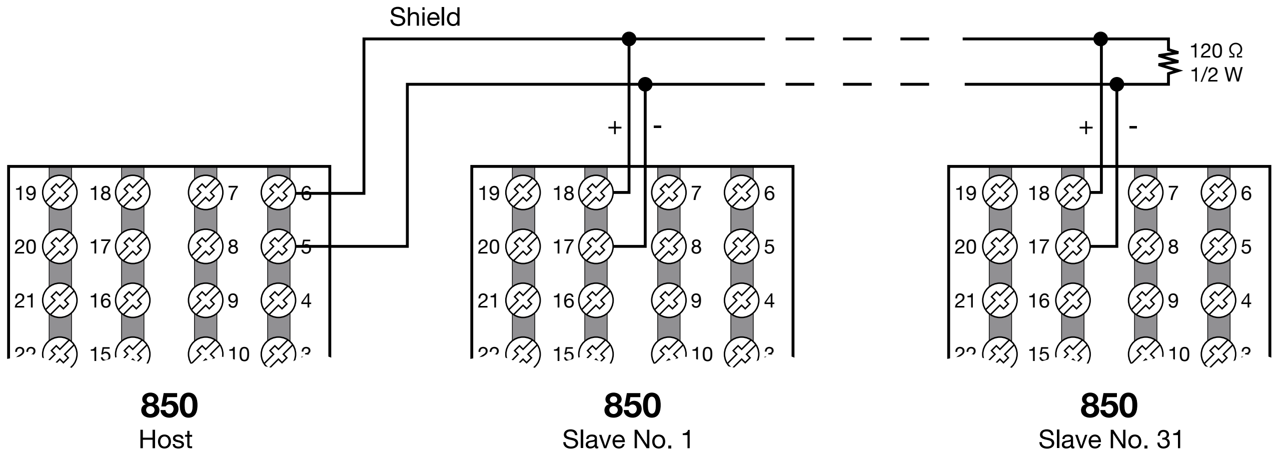


Figure 15 - Master Modbus connection of 850 controllers with option Output 1 (B) = G

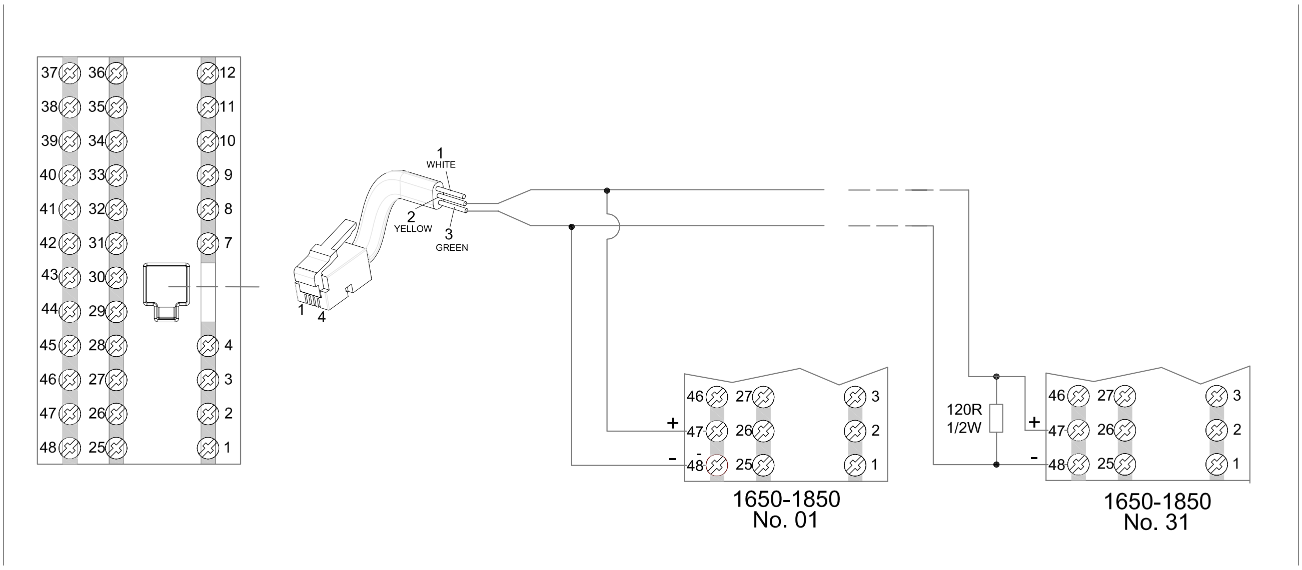


Figure 16 - Pin Output_CVP cable

The accessories listed in the table may be used for connection of the Master Modbus port with other devices.

Pinout	Rif. accessory	Lenght
	CVP-03 Cod. F081138	0,3m
	CVP-1 Cod. F081140	1m

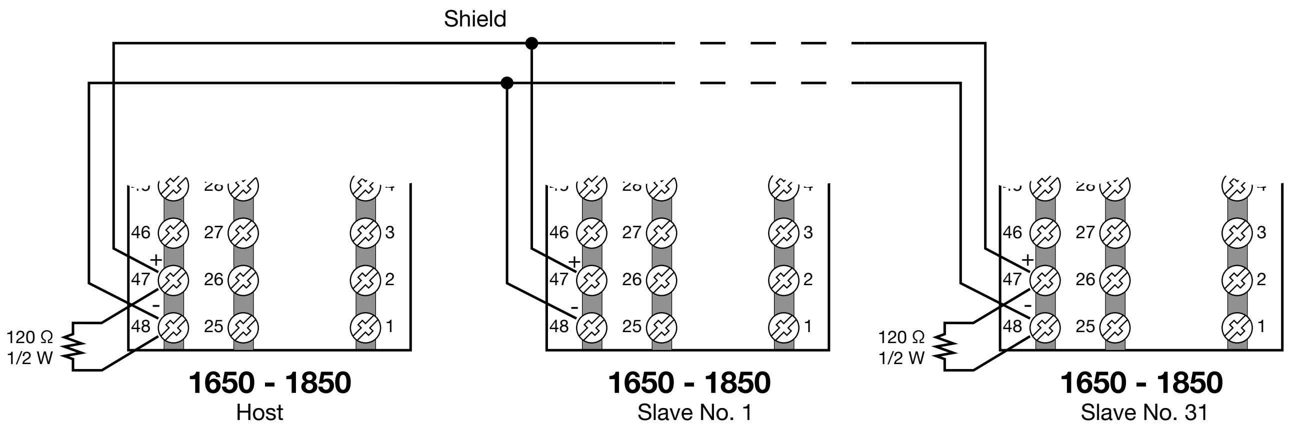


Figure 17 - RS485 bridge connection of controllers 1650 and 1850 with communication option (M) = ME

2.7. Ethernet port wiring diagram

Controllers 850, 1650 and 1850 may, on request, be equipped with an Ethernet 10/100BaseT port with direct connection via RJ45 connector.

For this connection, use a type UTP cable of category 5 or greater, crimped with a standard non-shielded RJ45 connector.

The instrument automatically recognises the polarity of the cable used, and so you may use either a straight or a cross cable equally well for point-to-point connections with a PC or to a switch.

The maximum connection length supported is 100m, according to standard IEEE 802.3u; if segments longer than 100 m are required, insert signal repeaters (switches) to break up the network.

Connector RJ45 has two signal and diagnostics LEDs:

- Amber LED: when steady on, indicates the presence of the signal carrier (link)
- Green LED: when flashing, indicates data exchange underway on port (activity).

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 16 for the 1650, and “1.5.1. Display and keys” on page 19 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.

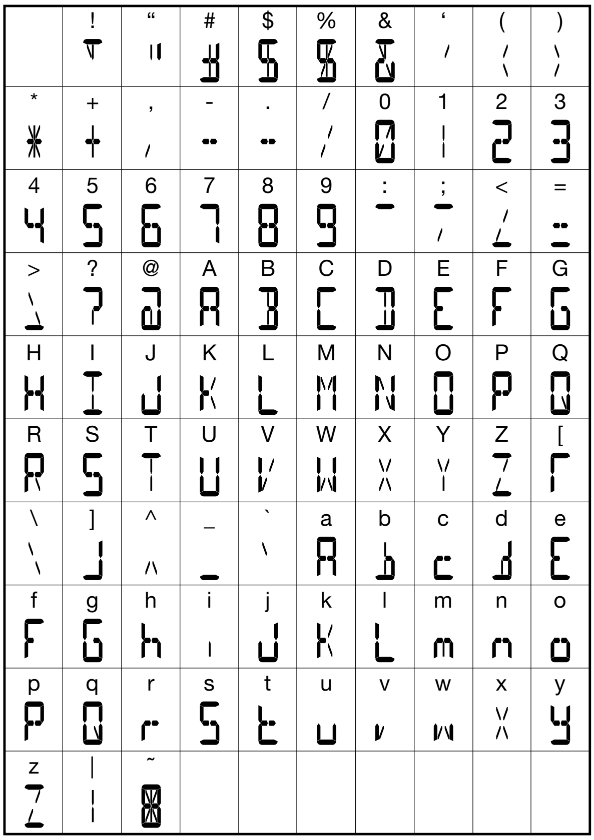


Figure 18 - 14-segment font

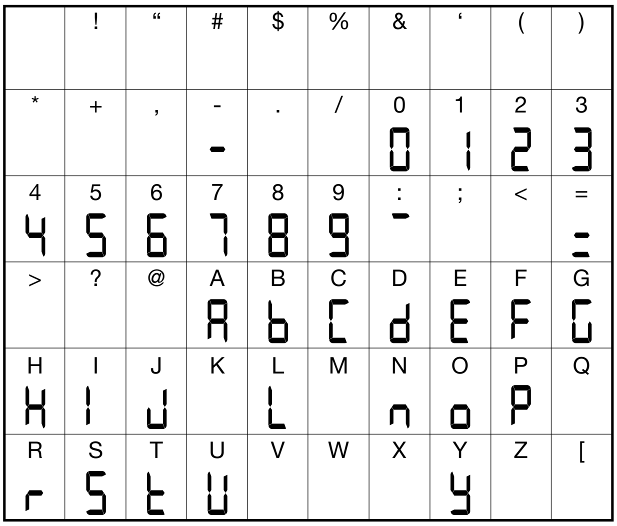


Figure 19 - 7-segment font

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:

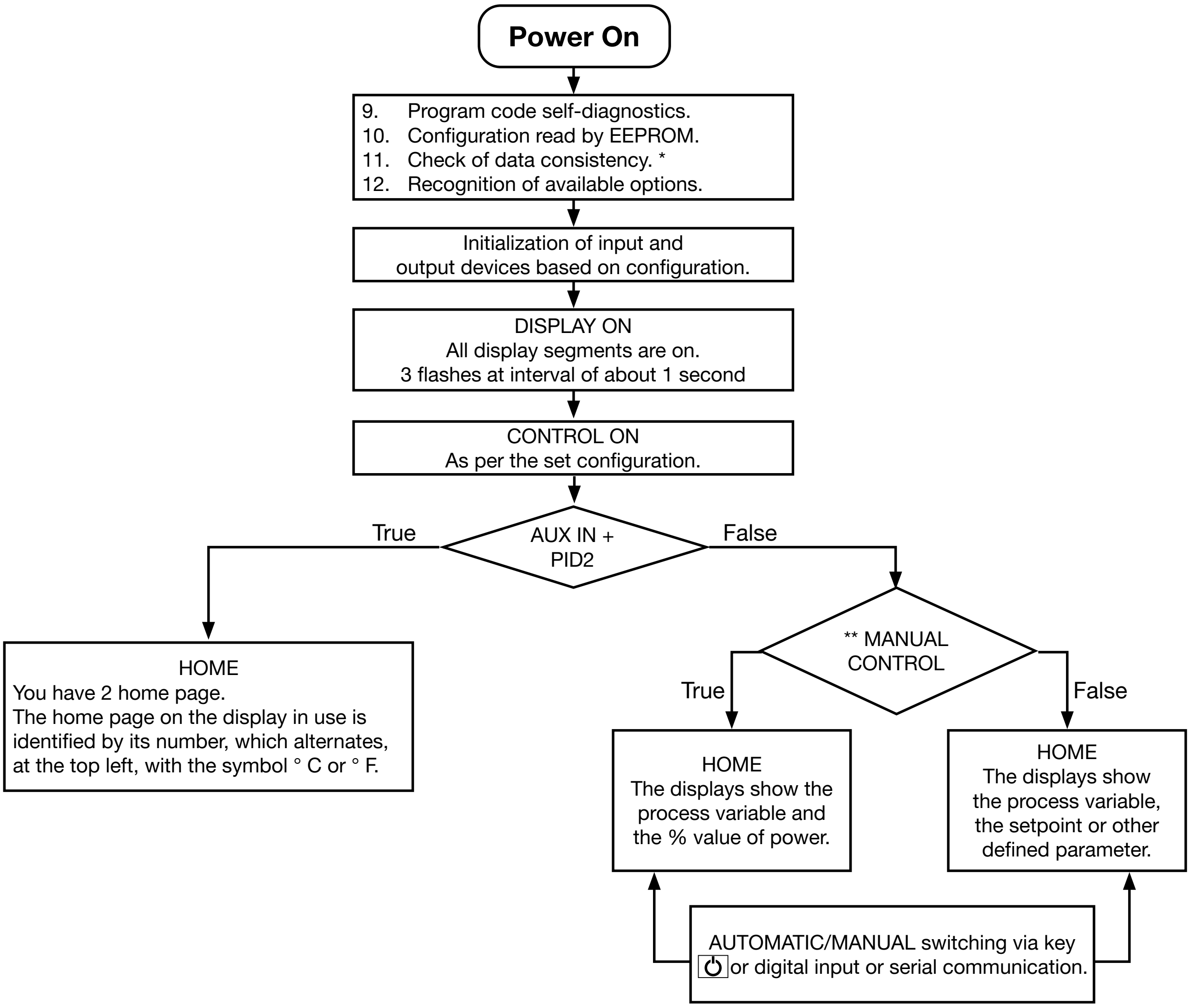
- during configuration, describing the active parameter;
- during functioning, after the tripping of alarms, digital inputs and logic function outputs, if the relative messages were enabled

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.
By setting LAnG=NONE the subdivision of the three groups is lost, obtaining up to 75 messages settability

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.

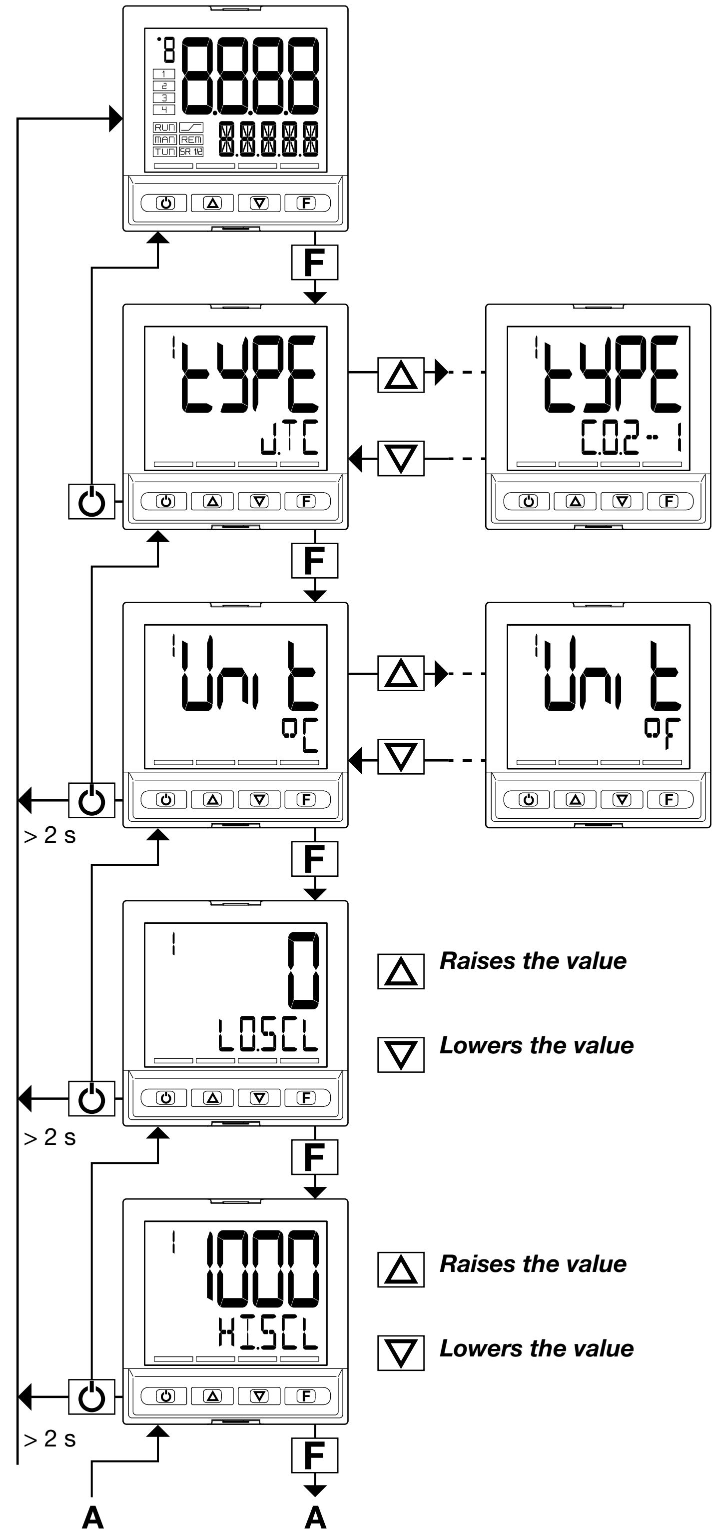


(*) Any error is signaled by the message EEPROM CHECKSUM ERROR.
(**) Only if MANUAL mode was used before the controller was powered off.

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



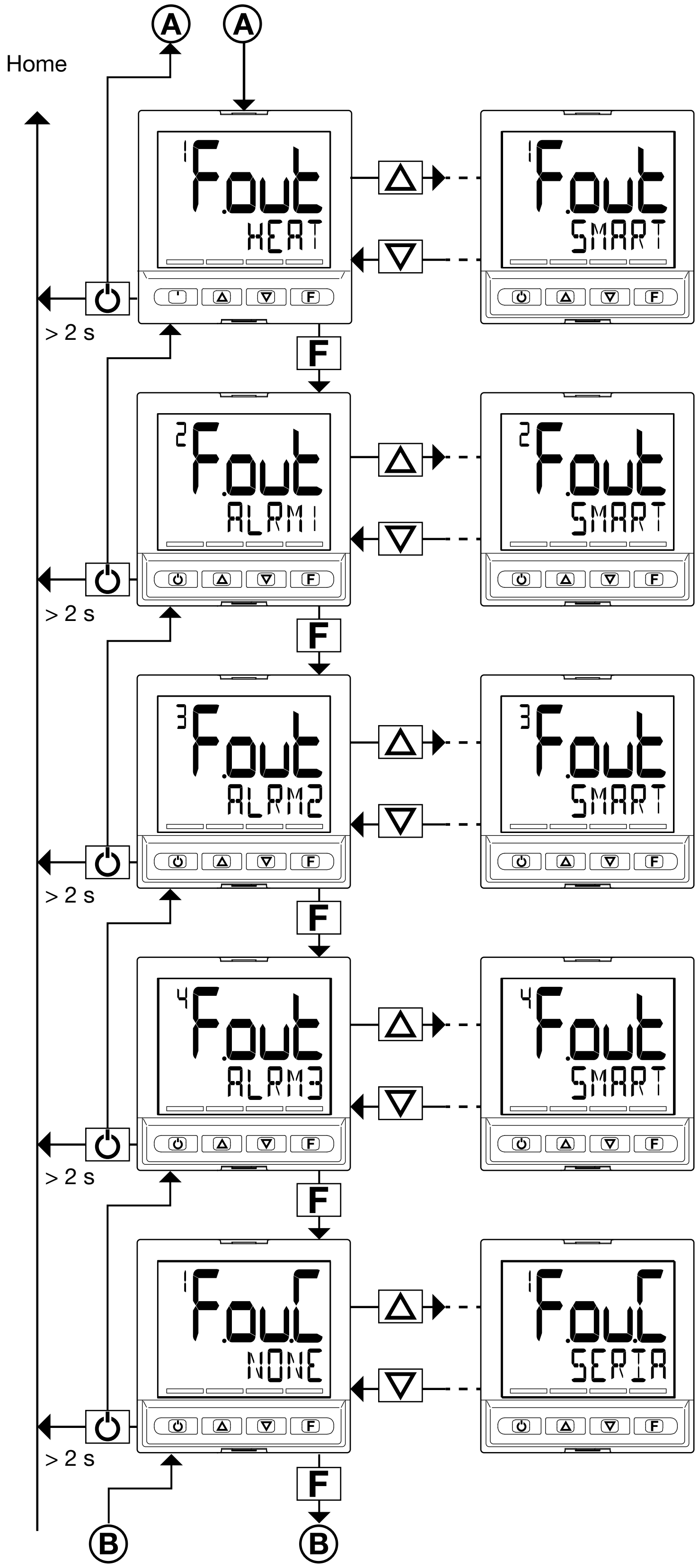
Home

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.

Minimum scale limit
Only if the selected sensor is in mV or V, the scale limits LO.SCL, HI.SCL and the settable limits of the LO.SP, HI.SP setpoint for TC or RTD sensors are automatically set according to sensor type and unit of measurement.

Maximum scale limit
Only if the selected sensor is in mV or V.



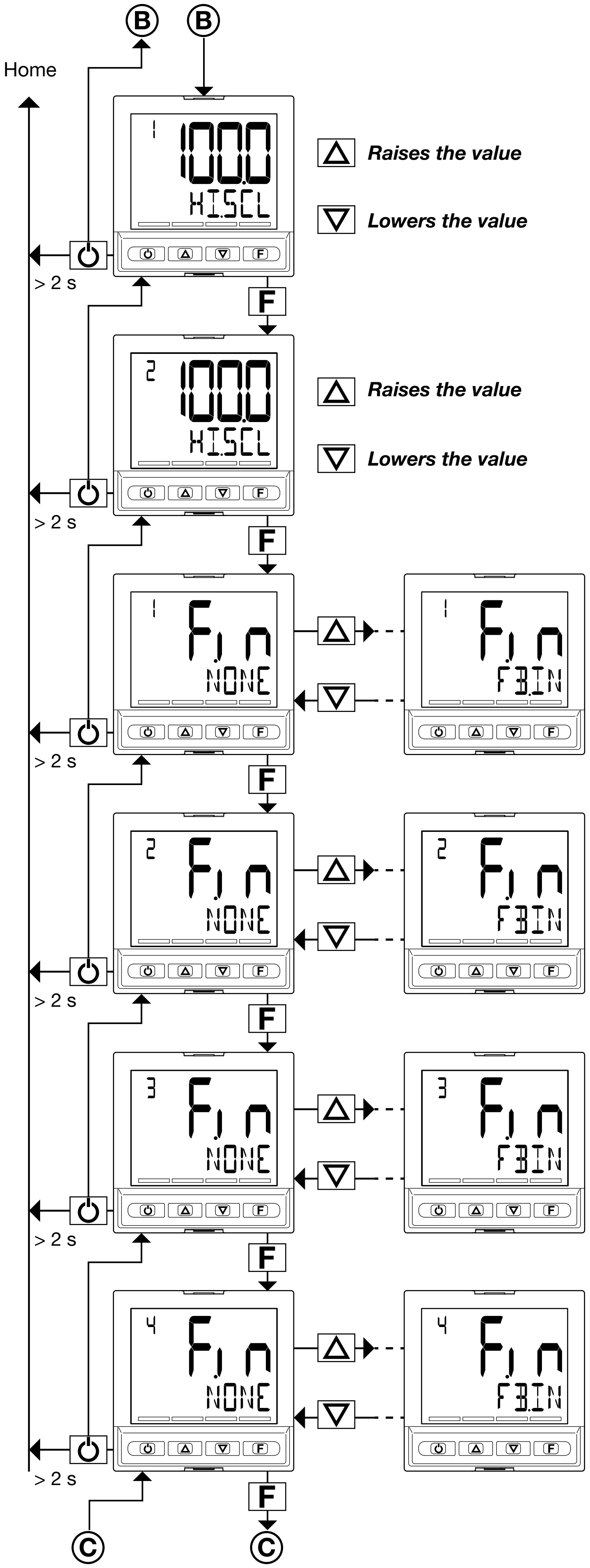
Selecting output 1 function
The proposed functions depend on output type (relay, logic).

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.

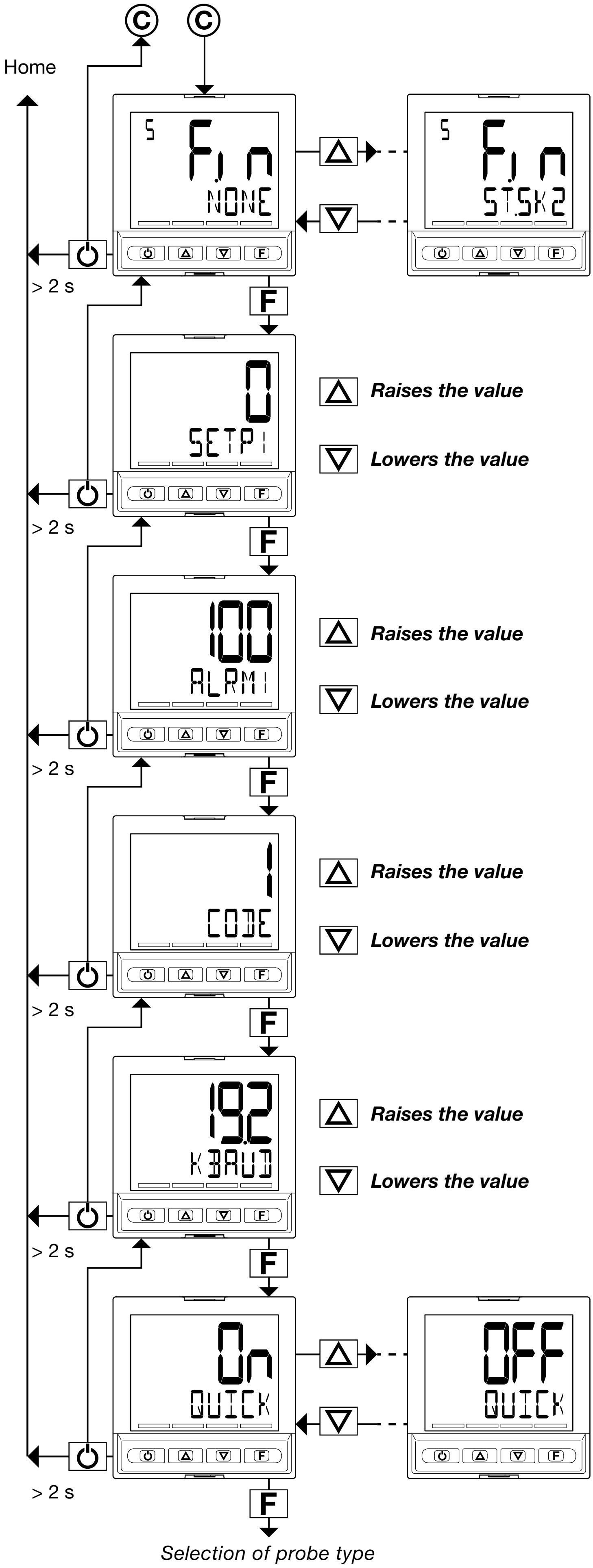
Full-scale value of current transformer CT2
The menu item appears only if the optional input is available.

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 Allarms 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.

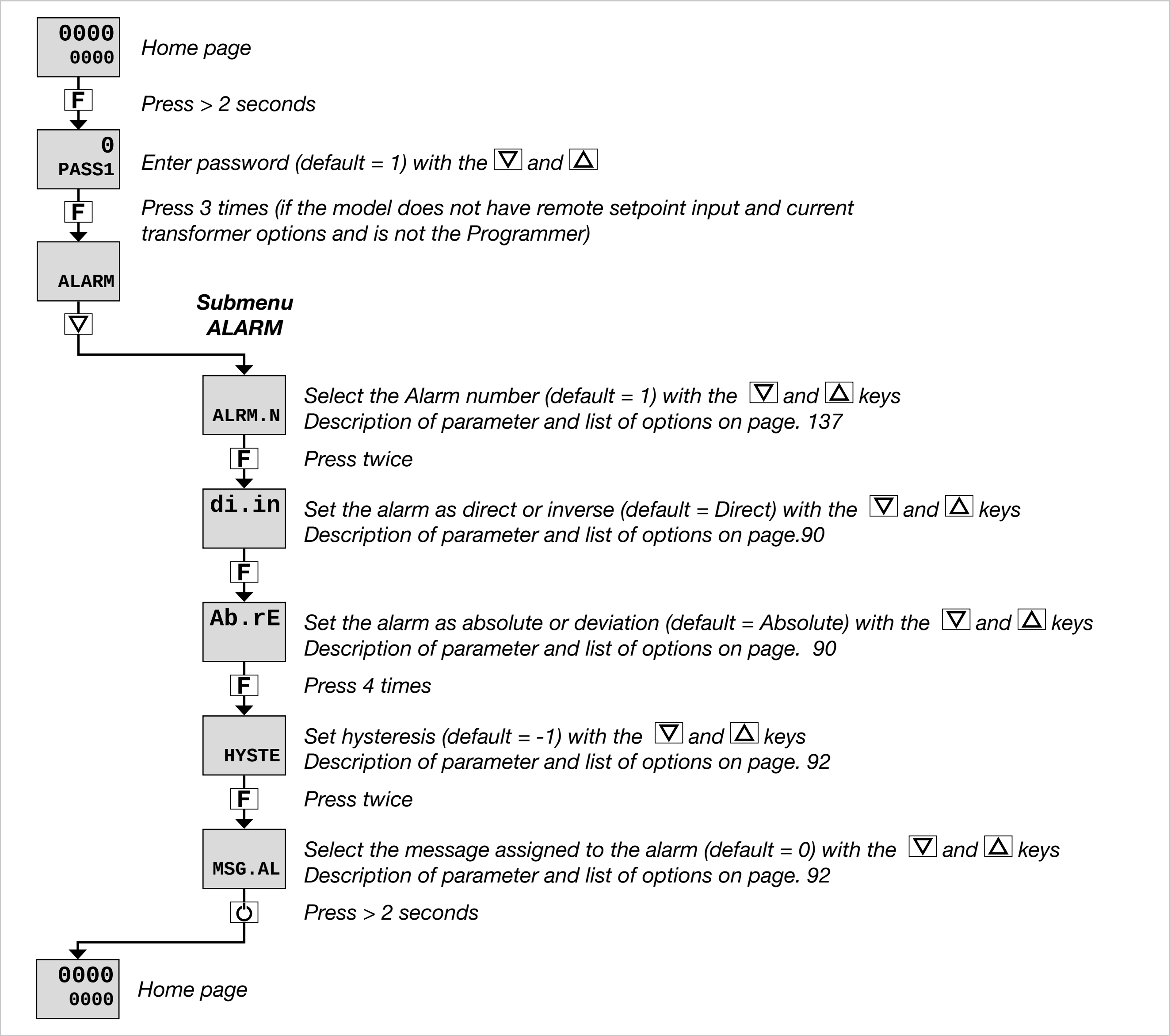
With this configuration, the controller can satisfy the majority of operating requirements.

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.



Home page

Press > 2 seconds

Enter password (default = 1) with the ▽ and △

Press 3 times (if the model does not have remote setpoint input and current transformer options and is not the Programmer)

Submenu ALARM

Select the Alarm number (default = 1) with the ▽ and △ keys
Description of parameter and list of options on page. 137

Press twice

Set the alarm as direct or inverse (default = Direct) with the ▽ and △ keys
Description of parameter and list of options on page.90

Set the alarm as absolute or deviation (default = Absolute) with the ▽ and △ keys
Description of parameter and list of options on page. 90

Press 4 times

Set hysteresis (default = -1) with the ▽ and △ keys
Description of parameter and list of options on page. 92

Press twice

Select the message assigned to the alarm (default = 0) with the ▽ and △ keys
Description of parameter and list of options on page. 92

Press > 2 seconds

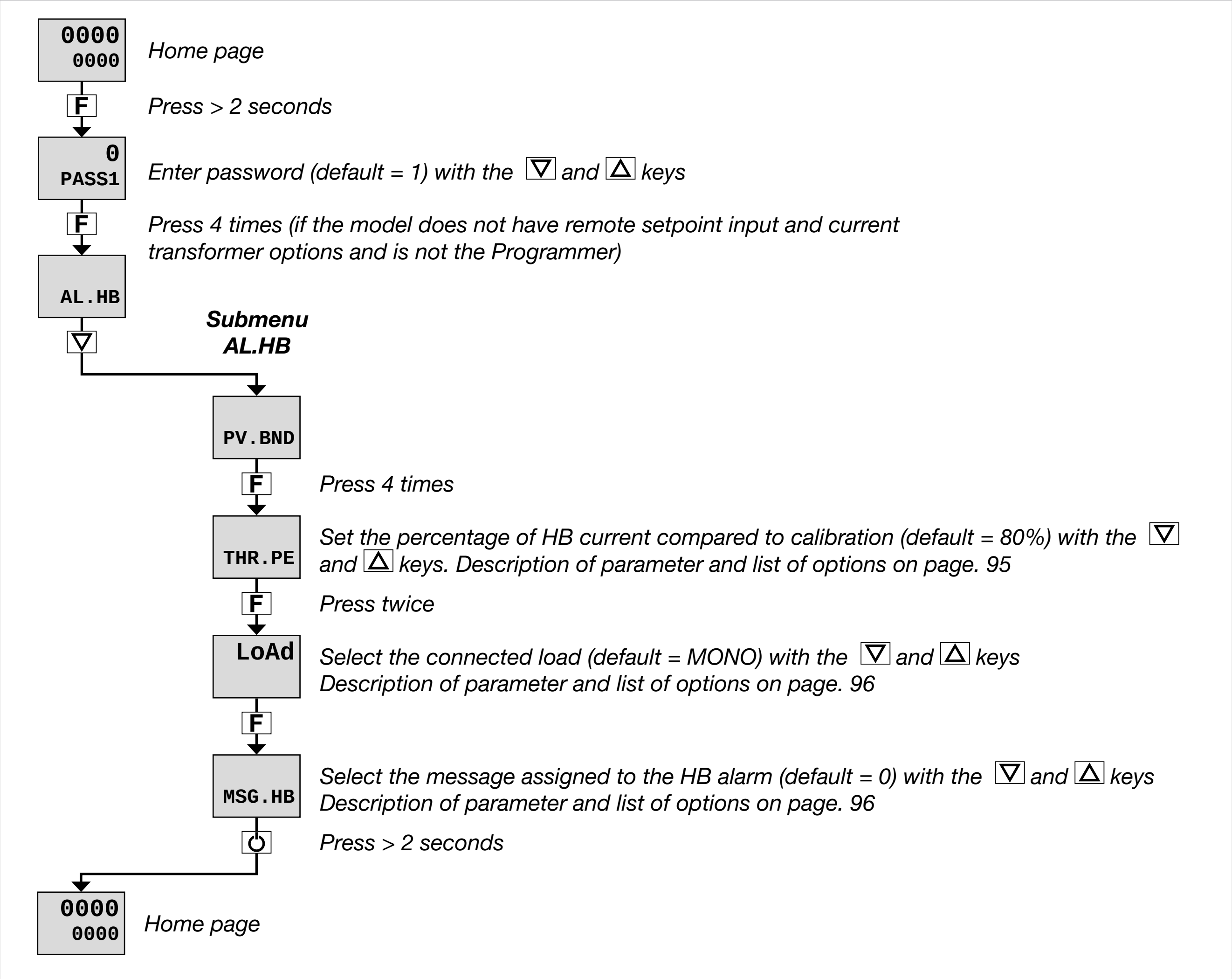
Home page

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.



Home page

Press > 2 seconds

Enter password (default = 1) with the ▽ and △ keys

Press 4 times (if the model does not have remote setpoint input and current transformer options and is not the Programmer)

Submenu AL.HB

Press 4 times

Set the percentage of HB current compared to calibration (default = 80%) with the ▽ and △ keys. Description of parameter and list of options on page. 95

Press twice

Select the connected load (default = MONO) with the ▽ and △ keys Description of parameter and list of options on page. 96

Select the message assigned to the HB alarm (default = 0) with the ▽ and △ keys Description of parameter and list of options on page. 96

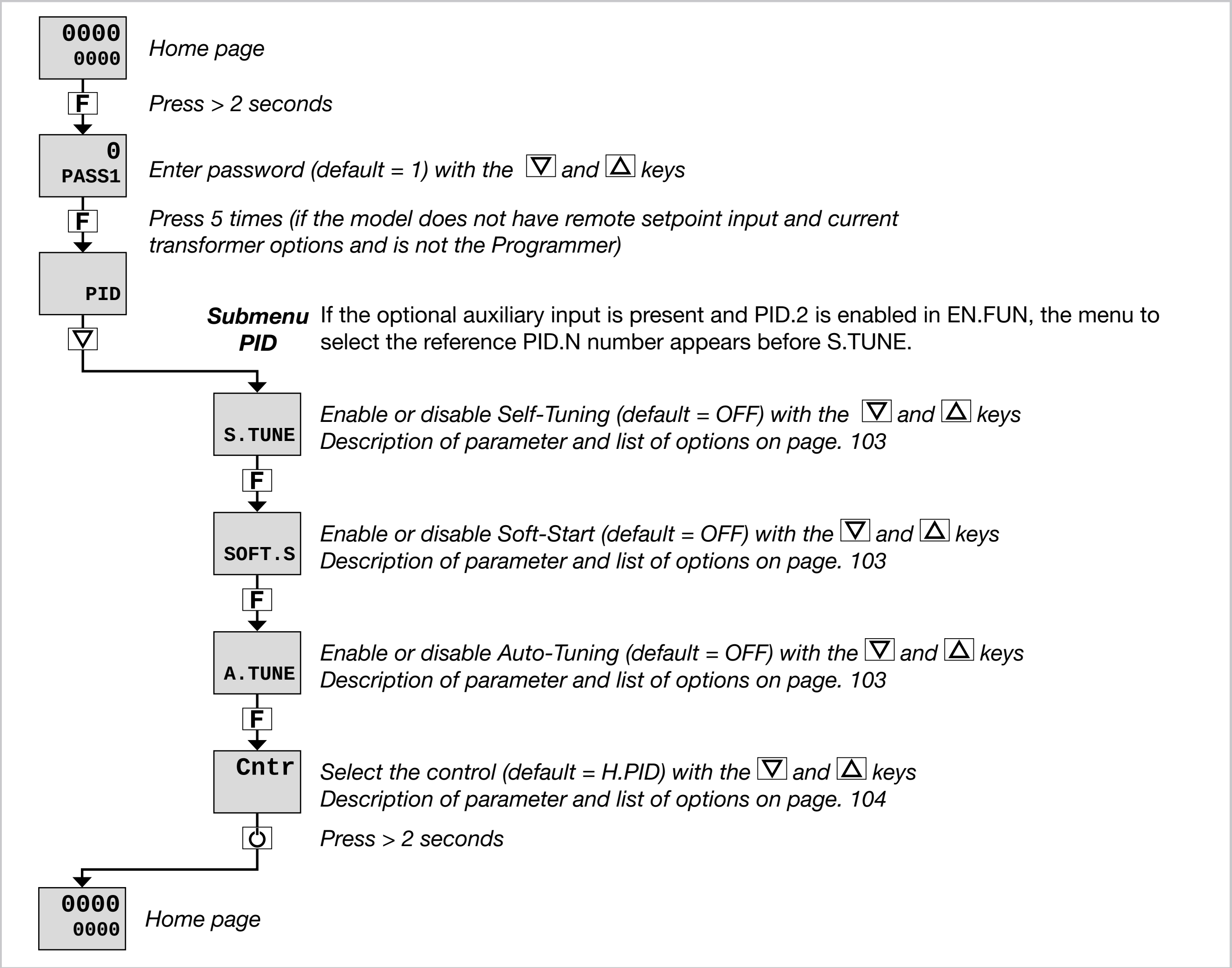
Press > 2 seconds

Home page

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



Home page

Press > 2 seconds

Enter password (default = 1) with the ▽ *and* △ *keys*

Press 5 times (if the model does not have remote setpoint input and current transformer options and is not the Programmer)

Submenu PID If the optional auxiliary input is present and PID.2 is enabled in EN.FUN, the menu to select the reference PID.N number appears before S.TUNE.

Enable or disable Self-Tuning (default = OFF) with the ▽ *and* △ *keys*
Description of parameter and list of options on page. 103

Enable or disable Soft-Start (default = OFF) with the ▽ *and* △ *keys*
Description of parameter and list of options on page. 103

Enable or disable Auto-Tuning (default = OFF) with the ▽ *and* △ *keys*
Description of parameter and list of options on page. 103

Select the control (default = H.PID) with the ▽ *and* △ *keys*
Description of parameter and list of options on page. 104

Press > 2 seconds

Home page

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"6. PROGRAMMING WITH PC" on page 267).

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 "4.35. PASC1 - Setting level 1 password" on page 197 and "4.36. PASC2 - Setting level 2 password" on page 197.

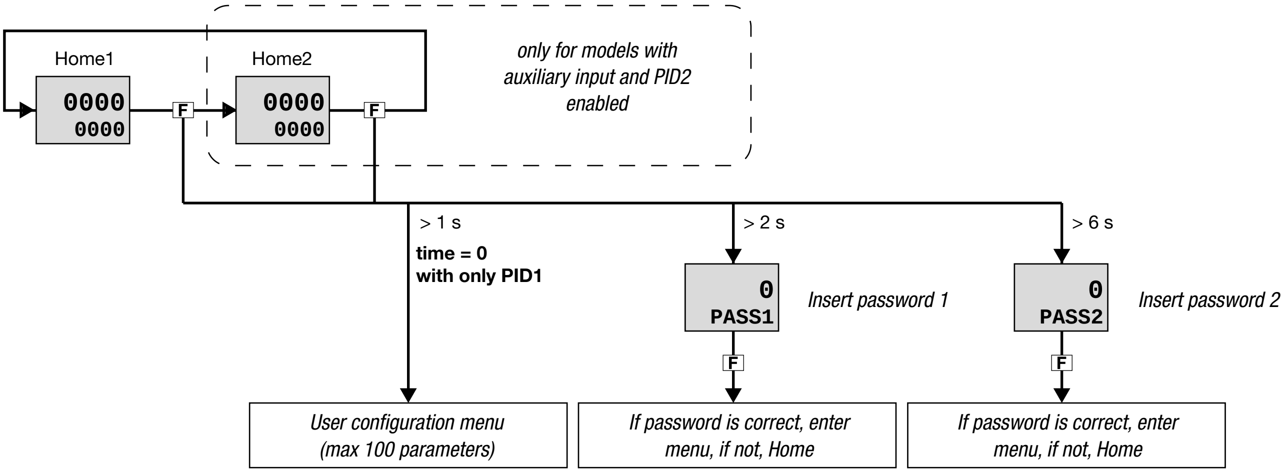
4.1.3. Password in the User Menu

Two passwords can be entered in the User menu, respectively:

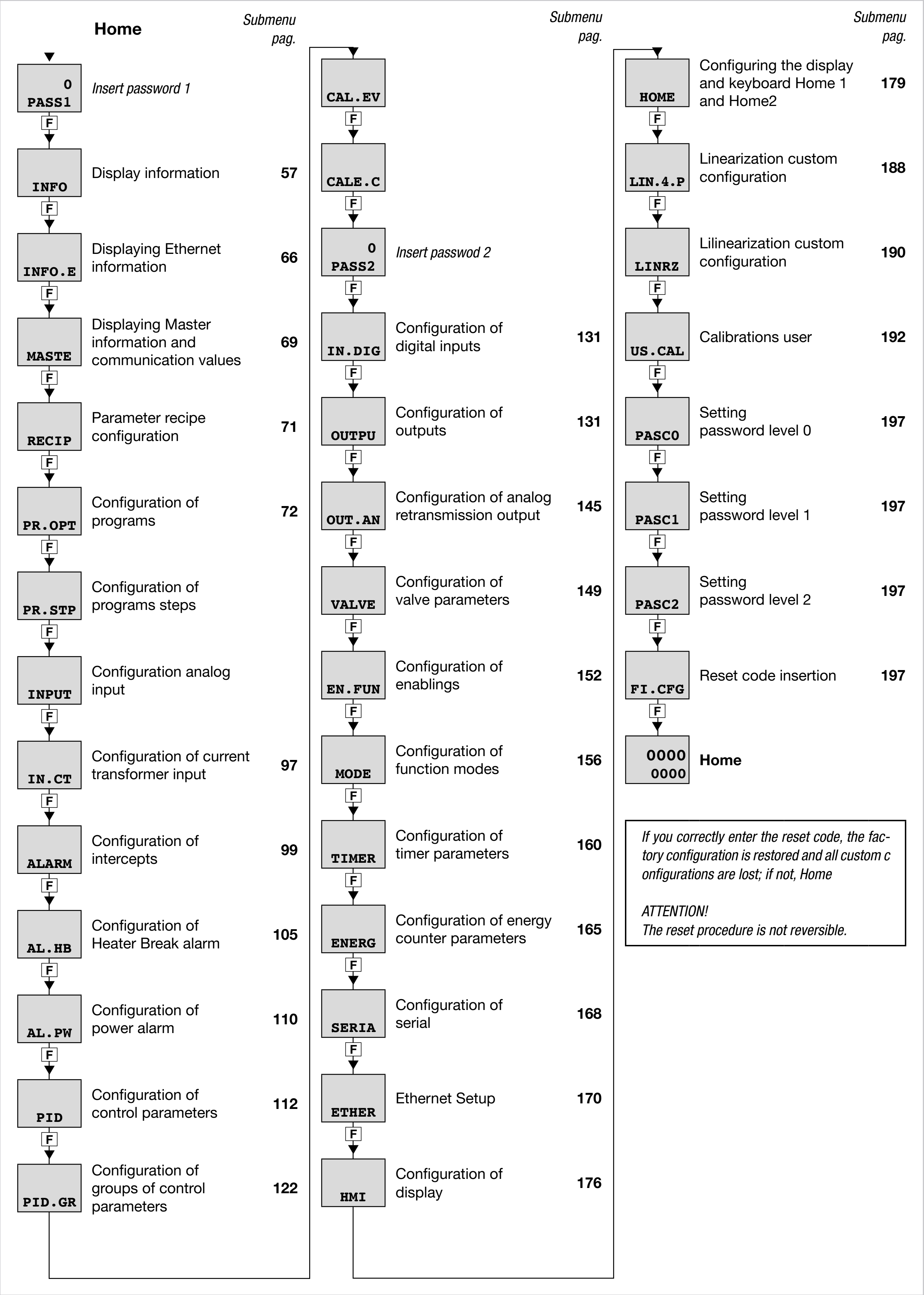
- Password 0 (default = 1 See paragraphs "4.28. PASC0 - Setting level 0 password 0" on page 169)
- Password 1 to inhibit navigation to parameters in positions subsequent to that assigned to the password.

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

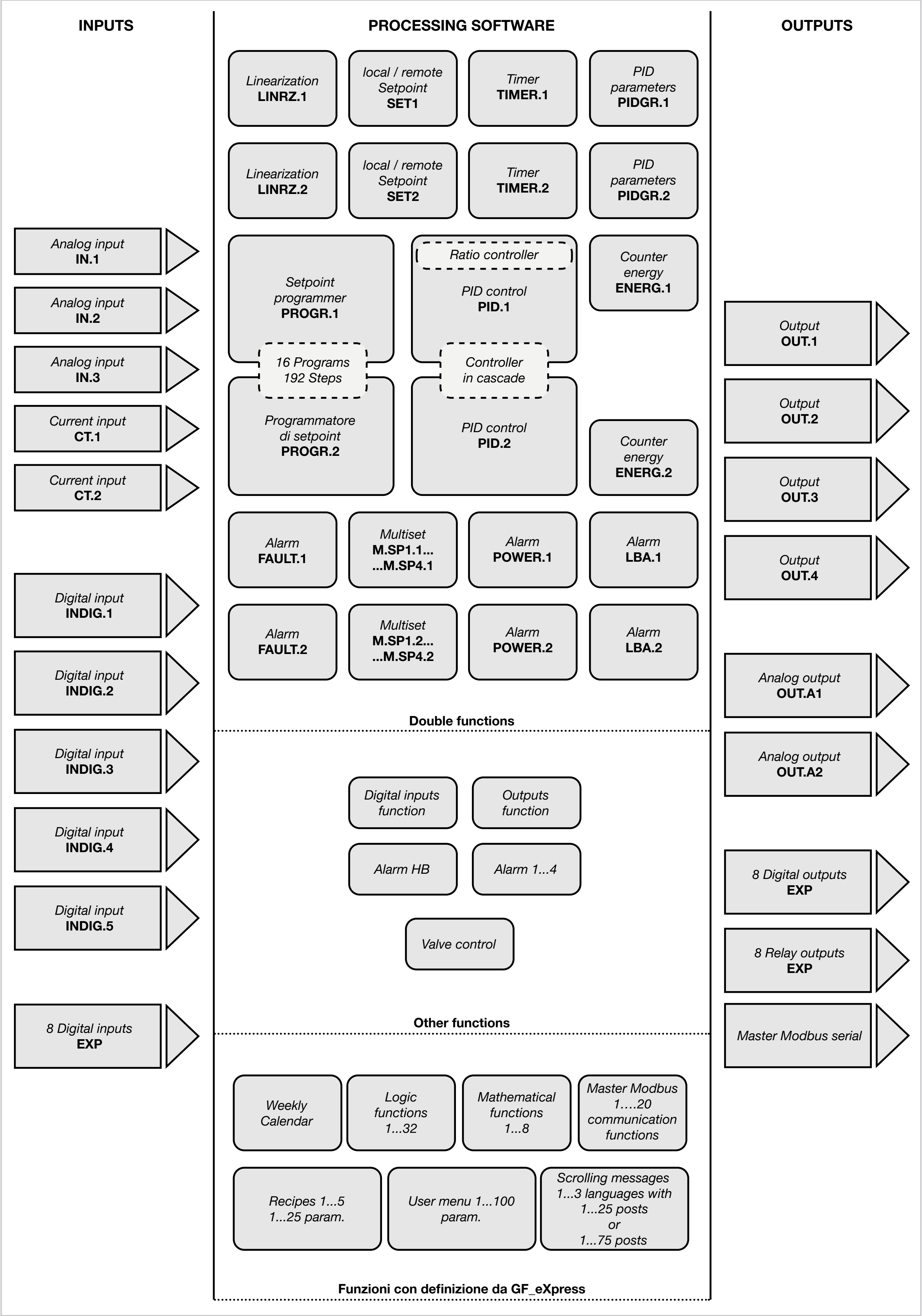


		Submenu pag.
0 PASS1	*Insert password 1*	
INFO	Display information	57
INFO.E	Displaying Ethernet information	66
MASTE	Displaying Master information and communication values	69
RECIP	Parameter recipe configuration	71
PR.OPT	Configuration of programs	72
PR.STP	Configuration of programs steps	
INPUT	Configuration analog input	
IN.CT	Configuration of current transformer input	97
ALARM	Configuration of intercepts	99
AL.HB	Configuration of Heater Break alarm	105
AL.PW	Configuration of power alarm	110
PID	Configuration of control parameters	112
PID.GR	Configuration of groups of control parameters	122
CAL.EV		
CALE.C		
0 PASS2	*Insert passwod 2*	
IN.DIG	Configuration of digital inputs	131
OUTPU	Configuration of outputs	131
OUT.AN	Configuration of analog retransmission output	145
VALVE	Configuration of valve parameters	149
EN.FUN	Configuration of enablings	152
MODE	Configuration of function modes	156
TIMER	Configuration of timer parameters	160
ENERG	Configuration of energy counter parameters	165
SERIA	Configuration of serial	168
ETHER	Ethernet Setup	170
HMI	Configuration of display	176
HOME	Configuring the display and keyboard Home 1 and Home2	179
LIN.4.P	Linearization custom configuration	188
LINRZ	Lilinearization custom configuration	190
US.CAL	Calibrations user	192
PASC0	Setting password level 0	197
PASC1	Setting password level 1	197
PASC2	Setting password level 2	197
FI.CFG	Reset code insertion	197
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.

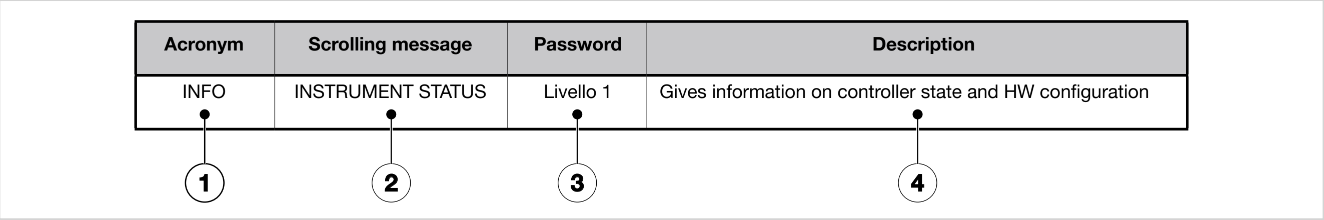
4.2.1. Functional schema



4.3. Legend for submenus and parameters

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

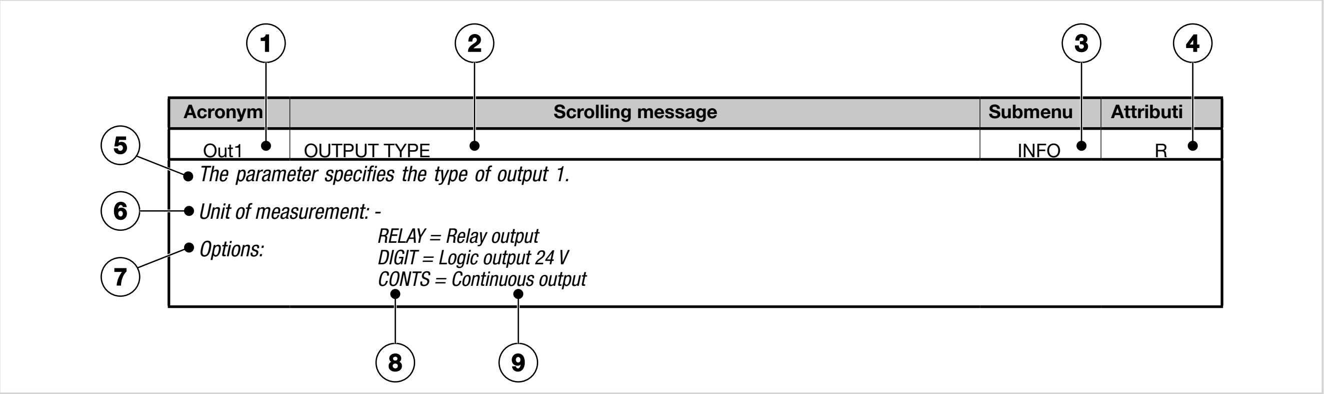
4.3.1. Submenu



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

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



Acronym	Scrolling message	Submenu	Attributi
Out1	OUTPUT TYPE	INFO	R

The parameter specifies the type of output 1.

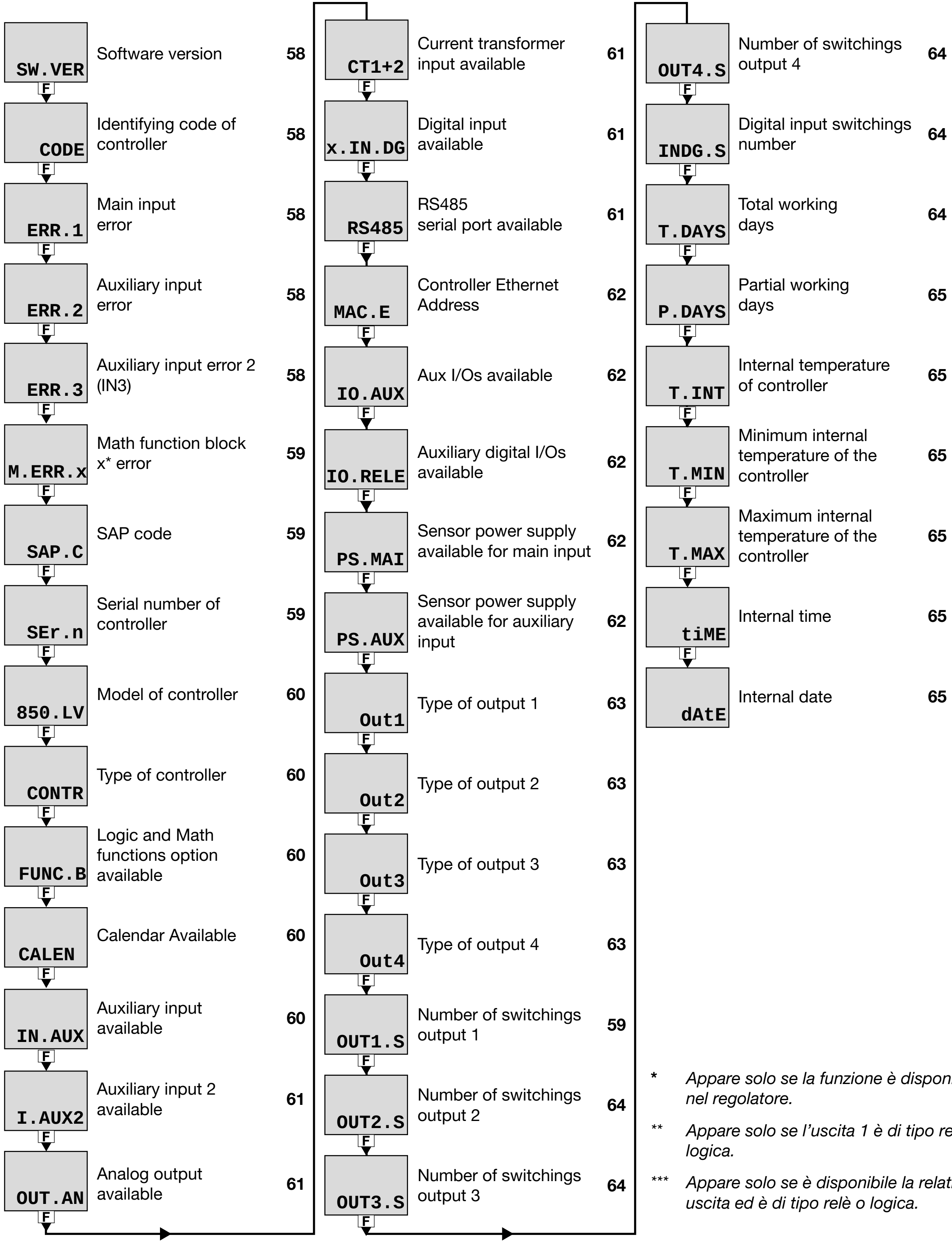
Unit of measurement: -

Options:
RELAY = Relay output
DIGIT = Logic output 24 V
CONTS = Continuous output

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.



	Parameter	Pag.
SW.VER	Software version	58
CODE	Identifying code of controller	58
ERR.1	Main input error	58
ERR.2	Auxiliary input error	58
ERR.3	Auxiliary input error 2 (IN3)	58
M.ERR.x	Math function block x* error	59
SAP.C	SAP code	59
SEr.n	Serial number of controller	59
850.LV	Model of controller	60
CONTR	Type of controller	60
FUNC.B	Logic and Math functions option available	60
CALEN	Calendar Available	60
IN.AUX	Auxiliary input available	60
I.AUX2	Auxiliary input 2 available	61
OUT.AN	Analog output available	61
CT1+2	Current transformer input available	61
x.IN.DG	Digital input available	61
RS485	RS485 serial port available	61
MAC.E	Controller Ethernet Address	62
IO.AUX	Aux I/Os available	62
IO.RELE	Auxiliary digital I/Os available	62
PS.MAI	Sensor power supply available for main input	62
PS.AUX	Sensor power supply available for auxiliary input	62
Out1	Type of output 1	63
Out2	Type of output 2	63
Out3	Type of output 3	63
Out4	Type of output 4	63
OUT1.S	Number of switchings output 1	59
OUT2.S	Number of switchings output 2	64
OUT3.S	Number of switchings output 3	64
OUT4.S	Number of switchings output 4	64
INDG.S	Digital input switchings number	64
T.DAYS	Total working days	64
P.DAYS	Partial working days	65
T.INT	Internal temperature of controller	65
T.MIN	Minimum internal temperature of the controller	65
T.MAX	Maximum internal temperature of the controller	65
tiME	Internal time	65
dAtE	Internal date	65

* *Appare solo se la funzione è disponibile nel regolatore.*

** *Appare solo se l'uscita 1 è di tipo relè o logica.*

*** *Appare solo se è disponibile la relativa uscita ed è di tipo relè o logica.*

4.4.1. SW.VER - Software version

Acronym	Scrolling message	Submenu	Attributes
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	Submenu	Attributes
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	Submenu	Attributes
ERR.1	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	Submenu	Attributes
ERR.2	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. Auxiliary input error 2 (IN3)

Acronym	Scrolling message	Submenu	Attributes
ERR.3	INPUT ERROR	INFO	R

The parameter displays the error (if present) detected on the optional auxiliary input 2 (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

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

Acronym	Scrolling message	Submenu	Attributes
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

4.4.7. SAP.C - SAP code

Acronym	Scrolling message	Submenu	Attributes
SAP.C	SAP ORDER CODE	INFO	R

The parameter shows the product number (Fxxxxxx).

Unit of measurement: -

Options: -

4.4.8. SER.N - Serial number of controller

Acronym	Scrolling message	Submenu	Attributes
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: -

4.4.9. xxxxx - Model of controller

Acronym	Scrolling message	Submenu	Attributes
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

4.4.10. 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

4.4.11. 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: **-**

4.4.12. CALEN – Calendar Available

Acronym	Scrolling message	Submenu	Attributes
CALEN	CALENDAR AVAILABLE	INFO	R

If present, this parameter indicates that the calendar option is installed in the controller.

Unit of measurement: -

Options: **-**

4.4.13. 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: **-**

4.4.14. I.AUX2 - Auxiliary input 2 available

Acronym	Scrolling message	Submenu	Attributes
I.AUX	AUXILIARY INPUT 2 AVAILABLE	INFO	R

If present, the parameter indicates that an auxiliary input 2 is installed on the controller.

Unit of measurement: -

Options: -

4.4.15. 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

4.4.16. 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

4.4.17. 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.

4.4.18. 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: -

4.4.19. MAC.E – Controller Ethernet Address

Acronym	Scrolling message	Submenu	Attributes
MAC.E	-	INFO	R

If present, this parameter indicates that the controller has an Ethernet communication module. The parameter shows the physical MAC address of the Ethernet in the scrolling message.
The information is shown in the format xx-xx-xx-xx-xx-xx.

Unit of measurement: -

Options: -

4.4.20. 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: -

4.4.21. 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: -

4.4.22. 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: **VT1** = Power supply for 24V transmitter.

4.4.23. 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.
VP1 = 1V potentiometer power supply.

4.4.24. 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).

4.4.25. 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

4.4.26. 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).

4.4.27. 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)

4.4.28. OUT1.S - Number of switchings output 1

Acronym	Scrolling message	Submenu	Attributes
OUT1.S	NUMBER X 1000 OF 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: -

4.4.29. OUT2.S - Number of switchings output 2

Acronym	Scrolling message	Submenu	Attributes
OUT2.S	NUMBER X 1000 OF 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***: -			

4.4.30. OUT3.S - Number of switchings output 3

Acronym	Scrolling message	Submenu	Attributes
OUT3.S	NUMBER X 1000 OF 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***: -			

4.4.31. OUT4.S - Number of switchings output 4

Acronym	Scrolling message	Submenu	Attributes
OUT4.S	NUMBER X 1000 OF 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***: -			

4.4.32. NDG.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***: -			

4.4.33. 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			

4.4.34. 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

4.4.35. 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: -

4.4.36. 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: -

4.4.37. 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: -

4.4.38. 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: -

4.4.39. DATE - Internal date

Acronym	Scrolling message	Submenu	Attributes
dAtE		INFO	R

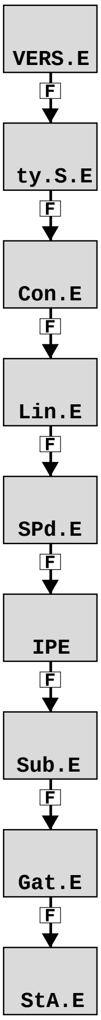
The parameter shows the complete internal date of the controller: month, day, year, day of week, with scrolling text.

Unit of measurement: MM / DD / YYYY

Options: -

4.5. INFO.E Submenu - Displaying Ethernet Information

Acronym	Scrolling message	Submenu	Attributes
INFO.E	ETHERNET STATUS	Level 1	Supplies various information on the state of Ethernet communications.



	Parameter	Pag.
VERS.E	Ethernet software version	**73**
ty.S.E	Ethernet assignment mode status	**73**
Con.E	Ethernet connection status	**73**
Lin.E	Ethernet link status	**67**
SPd.E	Ethernet speed status	**73**
IPE	Ethernet IP address	**68**
Sub.E	Ethernet Subnet mask	**74**
Gat.E	Ethernet Gateway address	**74**
StA.E	Ethernet network status	**74**

4.5.1. VERS.E – Ethernet Software Version

Acronym	Scrolling message	Submenu	Attributes
VERS.E	ETHERNET SOFTWARE VERSION	INFO.E	R

This parameter displays the software version (major.minor) on the controller’s Ethernet card.

Unit of measurement: -

Options: -

4.5.2. TY.S.E – Ethernet assignment mode status

Acronym	Scrolling message	Submenu	Attributes
ty.S.E	ETHERNET ASSIGNMENT MODE STATUS	INFO.E	R

This parameter shows the assignment mode of the Ethernet IP address, subnet mask and gateway parameters.

Unit of measurement: -

Options:
FIXED = Manually entered parameters are used
DHCP = Parameters received from the network DHCP server are used

4.5.3. CON.E – Ethernet Connection status

Acronym	Scrolling message	Submenu	Attributes
Con.E	CONNECTION STATUS	INFO.E	R

This parameter shows the status of the controller’s Ethernet connection.

Unit of measurement: -

Options:
NO.CON= No connection
CONNE = Active connection
DUP.IP = Duplicate IP address

4.5.4. LIN.E – Ethernet link status

Acronym	Scrolling message	Submenu	Attributes
Lin.E	ETHERNET LINK STATUS	INFO.E	R

This parameter shows the status of the controller’s Ethernet connection

Unit of measurement: -

Options:
UP = Rete attiva
DOWN = Rete non attiva

4.5.5. SPD.E – Ethernet speed status

Acronym	Scrolling message	Submenu	Attributes
SPd.E	ETHERNET SPEED STATUS	INFO.E	R

This parameter shows the status of the controller’s Ethernet connection

Unit of measurement: -

Options:
NONE = Speed not detected
10/H = 10Mbps Half Duplex
10/F = 10Mbps Full Duplex
100/H = 100Mbps Half Duplex
100/F = 100Mbps Full Duplex

4.5.6. IP.E – Ethernet IP Address

Acronym	Scrolling message	Submenu	Attributes
IP.E	-	INFO.E	R

This parameter shows the IP address identifying the controller on the Ethernet network.
This information is displayed in the form of a scrolling message with the format xxx.xxx.xxx.xxx

Unit of measurement: -

Options: -

4.5.7. SUB.E – Subnet mask Ethernet

Acronym	Scrolling message	Submenu	Attributes
Sub.E	-	INFO.E	R

This parameter shows the Subnet mask identifying the controller on the Ethernet network.
This information is displayed in the form of a scrolling message with the format xxx.xxx.xxx.xxx

Unit of measurement: -

Options: -

4.5.8. GAT.E – Ethernet Gateway address

Acronym	Scrolling message	Submenu	Attributes
GAt.E	-	INFO.E	R

This parameter shows the Gateway adress identifying the controller on the Ethernet network.
This information is displayed in the form of a scrolling message with the format xxx.xxx.xxx.xxx

Unit of measurement: -

Options: -

4.5.9. STA.E – Ethernet Network status

Acronym	Scrolling message	Submenu	Attributes
StA.E	ETHERNET STATUS	INFO.E	R

This parameter shows connection status identifying the controller on the Ethernet network.

Unit of measurement: -

Opzioni:
OK = Nessun errore
FAIL.N = NTP server not available

4.6. MASTER Submenu - Display of Master Modbus communication information and values

Acronym	Scrolling message	Password	Description
MASTE	MASTER ACTUAL DATA	Level 1	It provides information relating to the status of the Modbus Master communication and provides to configure and set the 20 remote parameters definable via GF_eXpress. The submenu appears if the model has a serial communication port. The Modbus Master has been updated at least one remote parameter.

	Parameter	Pag.
StAt	Stato della comunicazione Master Modbus	70
MAS.01	Valore comunicazione Master 1	70
ERR.01	Communication error Master 1	70
MAS.02	Valore comunicazione Master 2	70
ERR.02	Communication error Master 2	70
MAS.03	Valore comunicazione Master 3	70
ERR.03	Errore comunicazione Master 3	70
MAS.04	Valore comunicazione Master 4	70
ERR.04	Communication error Master 4	70
MAS.05	Valore comunicazione Master 5	70
ERR.05	Communication error Master 5	70
MAS.06	Valore comunicazione Master 6	70
ERR.06	Communication error	70
MAS.07	Valore comunicazione Master 7	70
ERR.07	Communication error Master 7	70
MAS.08	Valore comunicazione Master 8	70
ERR.08	Communication error Master 8	70
MAS.09	Valore comunicazione Master 9	70
ERR.09	Communication error Master 9	70
MAS.10	Valore comunicazione Master 10	70
ERR.10	Communication error Master 10	70
MAS.11	Valore comunicazione Master 11	70
ERR.11	Communication error Master 11	70
MAS.12	Valore comunicazione Master 12	70
ERR.12	Communication error Master 12	70
MAS.13	Valore comunicazione Master 13	70
ERR.13	Communication error Master 13	70
MAS.14	Valore comunicazione Master 14	70
ERR.14	Communication error Master 14	70
MAS.15	Valore comunicazione Master 15	70
ERR.15	Communication error Master 15	70
MAS.16	Valore comunicazione Master 16	70
ERR.16	Communication error Master 16	70
MAS.17	Valore comunicazione Master 17	70
ERR.17	Communication error Master 17	70
MAS.18	Valore comunicazione Master 18	70
ERR.18	Communication error Master 18	70
MAS.19	Valore comunicazione Master 19	70
ERR.19	Communication error Master 19	70
MAS.20	Valore comunicazione Master 20	70
ERR.20	Communication error Master 20	70

4.6.1. STAT – Master communication status

Acronym	Scrolling message	Submenu	Attributes
StAt	MASTER STATUS	MASTER	R

This parameter shows the status of the Master Modbus communication function.

Unit of measurement: -

Options:
RUN = Communication active
M.ERR = Communication error (at least one invalid response message)
TIM.OU = Communication timeout (at least one response message not received)
DISAB = Communication disabled

4.6.2. MAS.xx – Master communication value xx (*)

Acronym	Scrolling message	Submenu	Attributes
MAS.xx	(1)	MASTER	(2)

The parameter shows and sets (if R/W) the remote value.
The parameter is visible only if configured via GF_eXpress.

Unit of measurement: -

Options: (3)

(1) Descizione definita tramite GF_eXpress
(2) Tipo dato definito tramite GF_eXpress
(3) Intervallo di impostazione definito tramite GF_eXpress
(*) xx = da 01 a 20

4.6.3. ERR.xx – Master communication error xx (*)

Acronym	Scrolling message	Submenu	Attributes
ERR.xx	MASTER ERROR	MASTER	R

The parameter shows the status of the remote parameter in the event of malfunctioning.
The parameter is visible only if configured via GF_eXpress.

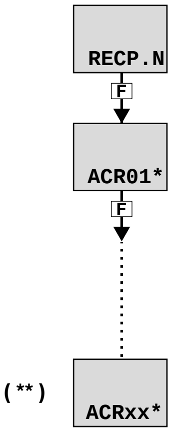
Unit of measurement: -

Options:
m.ERR = Error response message
tim.O = Timeout response message

(*) xx = da 01 a 20

4.7. 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.



Parameter	Pag.
Selecting a recipe	71
Parameter 1 recipe	71
Parameter xx recipe	71

(*) 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.

4.7.1. 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

4.7.2. 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.

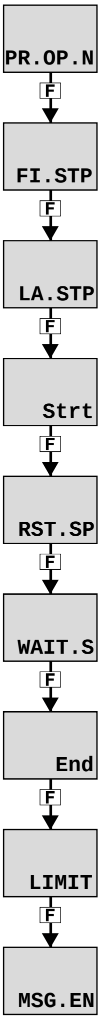
Unit of measurement: -

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.

4.8. Submenu PR.OPT - Configuring programs

Acronimo	Messaggio a scorrimento	Password d'accesso	Descrizione
PR.OPT	PROGRAMMER CONFIGURATION	Livello 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. If "Simplified Programmer" mode is active (S.PROG parameter set to EN.FUN)), the controller can manage 12 programs, each of which has up to 16 configurable steps. For more information on configuring the programmer, see paragraph "5.13. Setpoint programmer" on page 214.



	Parameter	**Pag.**
PR.OP.N	Selecting program	**73**
FI.STP	Number of first step assigned to program	**73**
LA.STP	Number of last step assigned to program	**73**
Strt	Restart mode	**73**
RST.SP	Type of control after program restart	**73**
WAIT.S	Option to start execution of program	**74**
End	Action at end of program	**74**
LIMIT	Message associated at the end of the program	**74**
MSG.EN	Messaggio associato alla fine del programma	**74**

4.8.1. 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**

4.8.2. 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.
This parameter is visible only if “Simplified Programmer” is deactivated (S.PROG parameter set to OFF)

Unit of measurement: Number

Options: **1...192**

4.8.3. 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.
This parameter is visible only if “Simplified Programmer” is deactivated (S.PROG parameter set to OFF)

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

Unit of measurement: Number

Options: **FI.STP...192**

4.8.4. 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...).

4.8.5. 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.

4.8.6. 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

4.8.7. 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

4.8.8. 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.

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

Acronym	Scrolling message	Submenu	Attributes
MSG.EN	PR.OPT.1 (o 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.

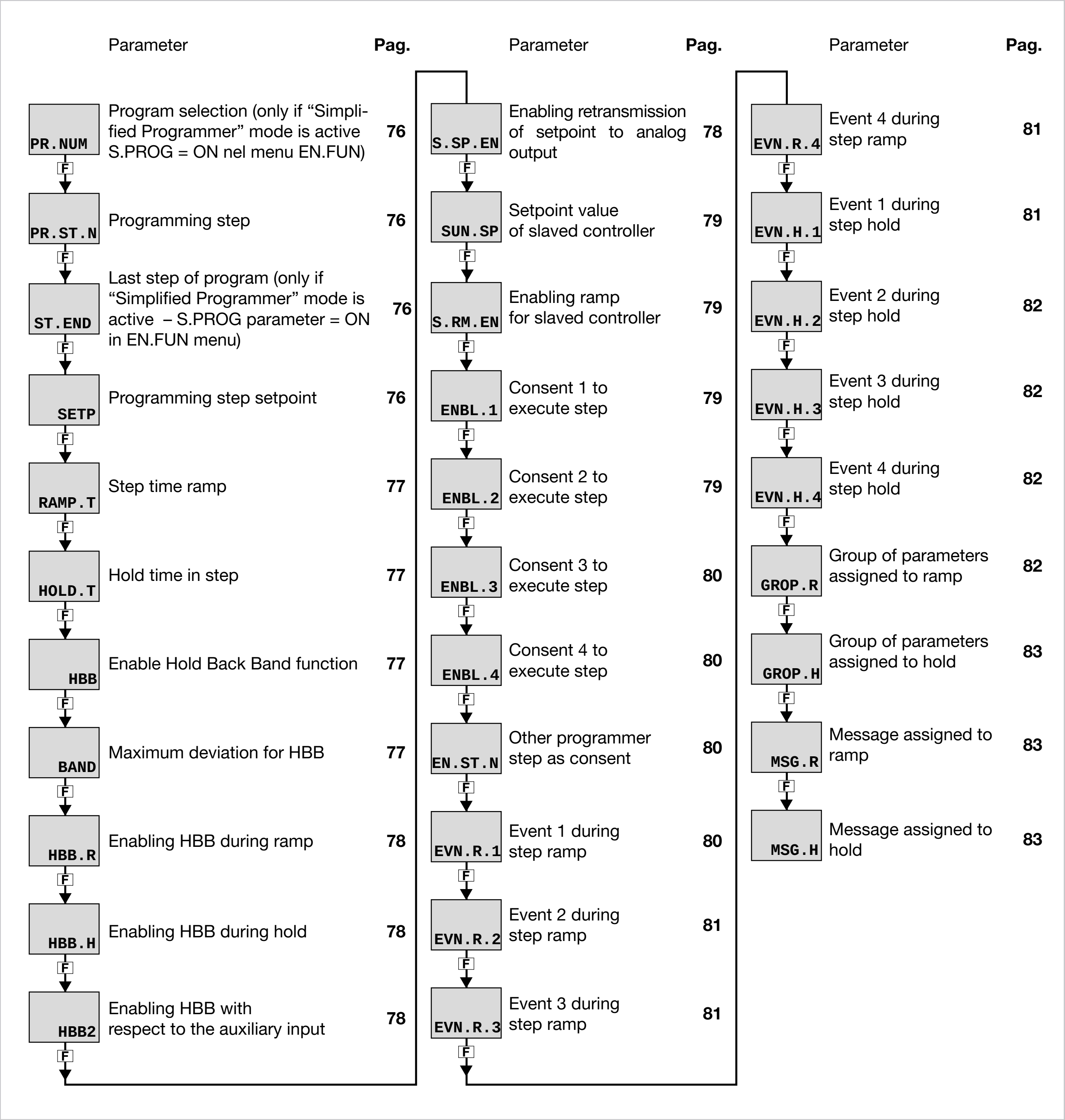
For more information on scrolling messages, see paragraph "3.1.2.2. Scrolling messages" on page 44.

Unit of measurement: Message number

Options:
0...25 (con LAnG=LANG1 oppure LANG2 oppure LANG3)
0…75 (con LAnG=NONE)

4.9. 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 214.



	Parameter	Pag.
PR.NUM	Program selection (only if “Simplified Programmer” mode is active S.PROG = ON nel menu EN.FUN)	76
PR.ST.N	Programming step	76
ST.END	Last step of program (only if “Simplified Programmer” mode is active – S.PROG parameter = ON in EN.FUN menu)	76
SETP	Programming step setpoint	76
RAMP.T	Step time ramp	77
HOLD.T	Hold time in step	77
HBB	Enable Hold Back Band function	77
BAND	Maximum deviation for HBB	77
HBB.R	Enabling HBB during ramp	78
HBB.H	Enabling HBB during hold	78
HBB2	Enabling HBB with respect to the auxiliary input	78
S.SP.EN	Enabling retransmission of setpoint to analog output	78
SUN.SP	Setpoint value of slaved controller	79
S.RM.EN	Enabling ramp for slaved controller	79
ENBL.1	Consent 1 to execute step	79
ENBL.2	Consent 2 to execute step	79
ENBL.3	Consent 3 to execute step	80
ENBL.4	Consent 4 to execute step	80
EN.ST.N	Other programmer step as consent	80
EVN.R.1	Event 1 during step ramp	80
EVN.R.2	Event 2 during step ramp	81
EVN.R.3	Event 3 during step ramp	81
EVN.R.4	Event 4 during step ramp	81
EVN.H.1	Event 1 during step hold	81
EVN.H.2	Event 2 during step hold	82
EVN.H.3	Event 3 during step hold	82
EVN.H.4	Event 4 during step hold	82
GROP.R	Group of parameters assigned to ramp	82
GROP.H	Group of parameters assigned to hold	83
MSG.R	Message assigned to ramp	83
MSG.H	Message assigned to hold	83

4.9.1. PR.NUM - Program selection

Acronym	Scrolling message	Submenu	Attributes
PR.NUM	PROGRAMMER ACTUAL PROGRAM	PR.STP	R W

This parameter shows and sets the program number that you intend to modify. Appears only if "Simplified Programmer" mode is selected - parameter S.PROG = ON).

Unit of measurement: Program number

Options: **1...12**

4.9.2. 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. Appears only if simplified programming mode is selected.

Unit of measurement: Number step

Options: **1...192 if S.PROG = OFF; 16 if S.PROG = ON ("Simplified Programmer" mode)**

4.9.3. ST.END - End step of the program configuration

Acronym	Scrolling message	Submenu	Attributes
ST.END	PR.STP.1 (o PR.STP.2…PR.STP.192) END STEP OF THE PROGRAM se modalità "Programmatore semplificato" disattiva; (o PR.STP.1…PR.STP.16) END STEP OF THE PROGRAM se modalità "Programmatore semplificato" attiva)	PR.STP	R W

This parameter shows and sets the current step as the last step in the program selected by the PR.NUM. parameter. Appears only if simplified programming mode is selected.

Unit of measurement: -

Options:
No = the current step is not the last in the program selected by the PR.NUM parameter
YES = the current step is the last in the program selected by the PR.NUM parameter

4.9.4. 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

4.9.5. SETP - Programming step setpoint

Acronym	Scrolling message	Submenu	Attributes
SETP	PR.STP.1 (o PR.STP.2…PR.STP.192) SETPOINT se modalità"Programmatore semplificato"disattiva; o PR.STP.1…PR.STP.16 SETPOINT se modalità"Programmatore semplificato"attiva.	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**

4.9.6. RAMP.T - Step time ramp

Acronym	Scrolling message	Submenu	Attributes
RAMP.T	PR.STP.1 (o PR.STP.2…PR.STP.192) RAMP TIME se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 RAMP TIME se modalità“Programmatore semplificato”attiva.	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**

4.9.7. HOLD.T - Hold time in step

Acronym	Scrolling message	Submenu	Attributes
HOLD.T	PR.STP.1 (o PR.STP.2…PR.STP.192) HOLD TIME se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 HOLD TIME se modalità“Programmatore semplificato”attiva.	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**

4.9.8. HBB - Enable Hold Back Band function

Acronym	Scrolling message	Submenu	Attributes
HBB	PR.STP.1 (o PR.STP.2…PR.STP.192) HOLD BACK BAND FUNCTION se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 HOLD BACK BAND FUNCTION se modalità“Programmatore semplificato”attiva.	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)

4.9.9. BAND - Maximum deviation for HBB

Acronym	Scrolling message	Submenu	Attributes
BAND	PR.STP.1 (o PR.STP.2…PR.STP.192) HOLD BACK BAND VALUE se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 HOLD BACK BAND VALUE se modalità“Programmatore semplificato”attiva.	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**

4.9.10. HBB.R - Enabling HBB during ramp

Acronym	Scrolling message	Submenu	Attributes
HBB.R	PR.STP.1 (o PR.STP.2…PR.STP.192) ENABLE HOLD BACK BAND DURING STEP RAMP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 ENABLE HOLD BACK BAND DURING STEP RAMP se modalità “Programmatore semplificato”attiva.	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

4.9.11. HBB.H - Enabling HBB during hold

Acronym	Scrolling message	Submenu	Attributes
HBB.H	PR.STP.1 (o PR.STP.2…PR.STP.192) ENABLE HOLD BACK BAND DURING STEP HOLD se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 ENABLE HOLD BACK BAND DURING STEP HOLD se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
HBB2	PR.STP.1 (o PR.STP.2…PR.STP.192) HOLD BACK BAND FUNCTION REFERRED TO AUX INP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 HOLD BACK BAND FUNCTION REFERRED TO AUX INP se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
S.SP.EN	PR.STP.1 (o PR.STP.2…PR.STP.192) SUBDUED SETPOINT RETRANSMITTED ENABLE se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 SUBDUED SETPOINT RETRANSMITTED ENABLE se modalità“Programmatore semplificato”attiva.	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

4.9.14. SUB.SP - Setpoint value of slaved controller

Acronym	Scrolling message	Submenu	Attributes
SUB.SP	PR.STP.1 (o PR.STP.2…PR.STP.192) SUBDUED SETPOINT ASSOCIATED TO STEP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 SUBDUED SETPOINT ASSOCIATED TO STEP se modalità“Programmatore semplificato”attiva.	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**

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

Acronym	Scrolling message	Submenu	Attributes
S.RM.EN	PR.STP.1 (o PR.STP.2…PR.STP.192) SUBDUED SETPOINT RAMP ENABLE se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 SUBDUED SETPOINT RAMP ENABLE se modalità“Programmatore semplificato”attiva.	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

4.9.16. ENBL.1 - Consent 1 to execute step

Acronym	Scrolling message	Submenu	Attributes
ENBL.1	PR.STP.1 (o PR.STP.2…PR.STP.192) STEP ENABLE FOR STEP START se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 STEP ENABLE FOR STEP START se modalità“Programmatore semplificato”attiva.	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

4.9.17. ENBL.2 - Consent 2 to execute step

Acronym	Scrolling message	Submenu	Attributes
ENBL.2	PR.STP.1 (o PR.STP.2…PR.STP.192) STEP ENABLE FOR STEP START se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 STEP ENABLE FOR STEP START se modalità“Programmatore semplificato”attiva.	PR.STP	R W

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

See ENBL.1 for details.

4.9.18. ENBL.3 - Consent 3 to execute step

Acronym	Scrolling message	Submenu	Attributes
ENBL.3	PR.STP.1 (o PR.STP.2…PR.STP.192) STEP ENABLE FOR STEP START se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 STEP ENABLE FOR STEP START se modalità“Programmatore semplificato”attiva.	PR.STP	R W

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

See ENBL.1 for details.

4.9.19. ENBL.4 - Consent 4 to execute step

Acronym	Scrolling message	Submenu	Attributes
ENBL.4	PR.STP.1 (o PR.STP.2…PR.STP.192) STEP ENABLE FOR STEP START se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 STEP ENABLE FOR STEP START se modalità“Programmatore semplificato”attiva.	PR.STP	R W

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

See ENBL.1 for details.

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

Acronym	Scrolling message	Submenu	Attributes
EN.ST.N	PR.STP.1 (o PR.STP.2…PR.STP.192) STEP FOR STEP START se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 STEP FOR STEP START se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
EVN.R.1	PR.STP.1 (o PR.STP.2…PR.STP.192) EVENT DURING STEP RAMP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 EVENT DURING STEP RAMP se modalità“Programmatore semplificato”attiva.	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

4.9.22. EVN.R.2 - Evento 2 durante la rampa del passo

Acronym	Scrolling message	Submenu	Attributes
EVN.R.2	PR.STP.1 (o PR.STP.2…PR.STP.192) EVENT DURING STEP RAMP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 EVENT DURING STEP RAMP se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
EVN.R.3	PR.STP.1 (o PR.STP.2…PR.STP.192) EVENT DURING STEP RAMP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 EVENT DURING STEP RAMP se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
EVN.R.4	PR.STP.1 (o PR.STP.2…PR.STP.192) EVENT DURING STEP RAMP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 EVENT DURING STEP RAMP se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
EVN.H.1	PR.STP.1 (o PR.STP.2…PR.STP.192) EVENT DURING STEP HOLD se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 EVENT DURING STEP HOLD se modalità“Programmatore semplificato”attiva.	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

4.9.26. 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.192) EVENT DURING STEP HOLD se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 EVENT DURING STEP HOLD se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
EVN.H.3	PR.STP.1 (o PR.STP.2…PR.STP.192) EVENT DURING STEP HOLD se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 EVENT DURING STEP HOLD se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
EVN.H.4	PR.STP.1 (o PR.STP.2…PR.STP.192) EVENT DURING STEP HOLD se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 EVENT DURING STEP HOLD se modalità“Programmatore semplificato”attiva.	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

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

Acronym	Scrolling message	Submenu	Attributes
GROP.R	PR.STP.1 (o PR.STP.2…PR.STP.192) CONTROL PARAMETER GROUP DURING STEP RAMP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 CONTROL PARAMETER GROUP DURING STEP RAMP se modalità“Programmatore semplificato”attiva.	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**

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

Acronym	Scrolling message	Submenu	Attributes
GROP.H	PR.STP.1 (o PR.STP.2…PR.STP.192) CONTROL PARAMETER GROUP DURING STEP HOLD se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 CONTROL PARAMETER GROUP DURING STEP HOLD se modalità“Programmatore semplificato”attiva.	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**

4.9.31. MSG.R - Message associated with the ramp

Acronym	Scrolling message	Submenu	Attributes
MSG.R	PR.STP.1 (o PR.STP.2…PR.STP.192) SCROLLING MESSAGE DURING STEP RAMP se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 SCROLLING MESSAGE DURING STEP RAMP se modalità“Programmatore semplificato”attiva.	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 44.
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)

4.9.32. MSG.H - Message associated with the maintenance

Acronym	Scrolling message	Submenu	Attributes
MSG.H	PR.STP.1 (o PR.STP.2…PR.STP.192) SCROLLING MESSAGE DURING STEP HOLD se modalità“Programmatore semplificato”disattiva; o PR.STP.1…PR.STP.16 SCROLLING MESSAGE DURING STEP HOLD se modalità“Programmatore semplificato”attiva.	PR.STP	R W

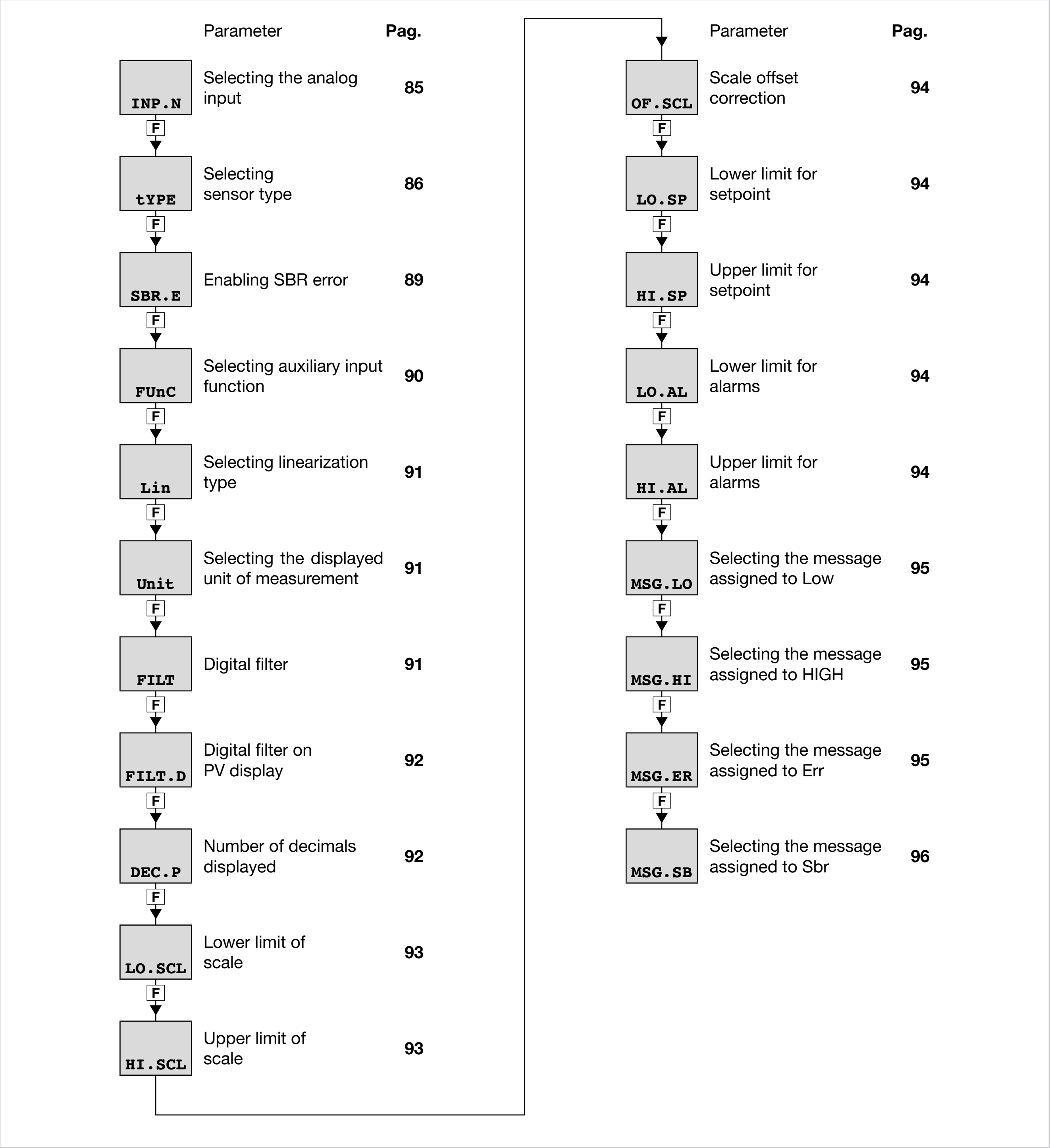
The parameter displays and sets the message number associated with the step during the ramp, which is the message that will appear on the display to scroll to the step you are configuring
More information on the scrolling message can be found in the section “3.1.2.2. Scrolling messages” on page 44.
Setting 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)

4.10. Submenu INPUT - Configuring analog inputs

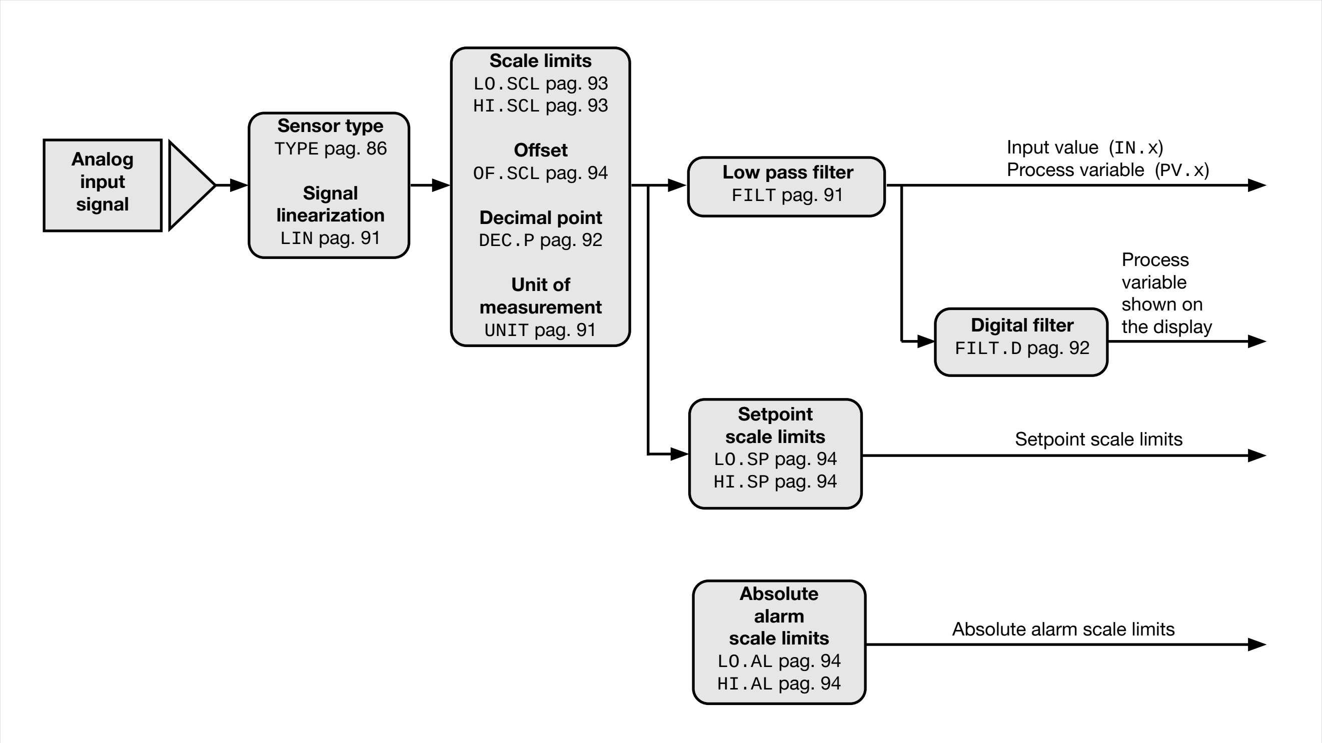
Acronym	Scrolling message	Password	Description
INPUT	INPUT CONFIG	Level 1	Lets you configure the controller's analog inputs (main and auxiliary).



	Parameter	Pag.
INP.N	Selecting the analog input	85
tYPE	Selecting sensor type	86
SBR.E	Enabling SBR error	89
FUnC	Selecting auxiliary input function	90
Lin	Selecting linearization type	91
Unit	Selecting the displayed unit of measurement	91
FILT	Digital filter	91
FILT.D	Digital filter on PV display	92
DEC.P	Number of decimals displayed	92
LO.SCL	Lower limit of scale	93
HI.SCL	Upper limit of scale	93

	Parameter	Pag.
OF.SCL	Scale offset correction	94
LO.SP	Lower limit for setpoint	94
HI.SP	Upper limit for setpoint	94
LO.AL	Lower limit for alarms	94
HI.AL	Upper limit for alarms	94
MSG.LO	Selecting the message assigned to Low	95
MSG.HI	Selecting the message assigned to HIGH	95
MSG.ER	Selecting the message assigned to Err	95
MSG.SB	Selecting the message assigned to Sbr	96

4.10.1. Functional schema



4.10.2. 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...3

4.10.3. TYPE - Selecting sensor type

Acronym	Scrolling message	Submenu	Attributes
TYPE	INPUT.1 (or INPUT.2) or INPUT.3 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	-210…1200	-199.9...999.9	±0,05
	K	°C	-270…1372	-199.9...999.9	±0,06
	R	°C	-50…1768	-50.0...999.9	±0,02
	S	°C	-50…1768	-50.0...999.9	±0,02
	T	°C	-270…400	-199.9...400.0	±0,04
	C	°C	0…2315	0.0...999.9	±0,011
	D	°C	0…2315	0.0...999.9	±0,023
	B	°C	40…1820	40.0…999.9	±0,03
	E	°C	-270…1000	-199.9...999.9	±0,19 per T<-200°C ±0,03 per T>-200°C
	L	°C	-200…900	-199.9...900.0	±0,09
	L-GOST	°C	-200…800	-199.9...800.0	±0,014
	U	°C	-200…600	-199.9...600.0	±0,135
	G	°C	0…2315	0.0…999.9	±0,042
	N	°C	-270…1300	-199.9...999.9	±0,047
	Pt20Rh Pt40Rh	°C	0…1888	0…999.9	±0,017
Infrared characteristic of the Tc K model *see note*	1	°C	10...70	10.0...70.0	±0,06
	2	°C	60...120	60.0...120.0	±0,06
	3	°C	115...165	115.0...165.0	±0,06
	4	°C	140...260	140.0...260.0	±0,06
Thermoresistance	PT100	°C	-200...850	-199.9...850.0	±0,062
	PT100 LIM	°C	-50...250	-50.0...250.0	±0,062
	JPT100	°C	-200...600	-199.9...600.0	±0,062
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...2,4V HI 0...1,2V HI 0...1V HI				
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...2,4V HI 0...1,2V HI 0...1V HI				

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

with model 850 (without option VT1), 1650 and 1850:
PT100 = Thermoresistance Pt100
PT.LIM = Thermoresistance Pt 100 limitated
JPT10 = Thermoresistance JPT100
60MV = Sensor 0...60 mV
20MA = Sensor 0...20 mA
4-20M = Sensor 4...20 mA
10V = Sensor 0...10 V
2-10V = Sensor 2...10 V
5V = Sensor 0...5 V
1-5V = Sensor 1...5 V
1V = Sensor 0...1 V
0.2-1V = Sensor 0,2...1 V
C.RTD = Sensor RTD with custom calibration
C.60MV = Sensor 0...60 mV with custom calibration
C.20MA = Sensor 0...20 mA with custom calibration
C.4-20 = Sensor 4...20 mA with custom calibration
C.10V = Sensor 0...10 V with custom calibration
C.2-10 = Sensor 2...10 V with custom calibration
C.5V = Sensor 0...5 V with custom calibration
C.1-5V = Sensor 1...5 V with custom calibration
C.1V = Sensor 0...1 V with custom calibration
C.0.2-1 = Sensor 0,2...1 V with custom calibration

with model 850 (with option VT1):
60MV = Sensor 0...60 mV
20MA = Sensor 0...20 mA
4-20M = Sensor 4...20 mA
10V = Sensor 0...10 V
2-10V = Sensor 2...10 V
5V = Sensor 0...5 V
1-5V = Sensor 1...5 V
1V = Sensor 0...1 V
0.2-1V = Sensor 0,2...1 V
C.RTD = Sensor RTD with custom calibration
C.60MV = Sensor 0...60 mV with custom calibration
C.20MA = Sensor 0...20 mA with custom calibration

with model 850 (with option VT1):
C.4-20 = Sensor 4...20 mA with custom calibration
C.10V = Sensor 0...10 V with custom calibration
C.2-10 = Sensor 2...10 V with custom calibration
C.5V = Sensor 0...5 V with custom calibration
C.1-5V = Sensor 1...5 V with custom calibration
C.1V = Sensor 0...1 V with custom calibration
C.0.2-1 = Sensor 0,2...1 V with custom calibration

TYPE 2
without options VP o VT2;

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

without options VP o VT2:
PT100 = Thermoresistance Pt100
PT.LIM = Thermoresistance Pt 100 limitata
JPT10 = Thermoresistance JPT100
60MV = Sensor 0...60 mV

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

with options VP o VT2:
C.RTD = Sensor RTD with custom calibration
C.60MV = Sensor 0...60 mV with custom calibration

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

TYPE 3

20MA = Sensor 0...20 mA
4-20M = Sensor 4...20 mA
10V = Sensor 0...10 V
2-10V = Sensor 2...10 V
5V = Sensor 0...5 V
1-5V = Sensor 1...5 V

2.4VHI = Sensor 0…2.4V high impedance
1.2VHI = Sensor 0…1.2V high impedance
1VHI = Sensor 0…1V high impedance

C.20MA = Sensor 0...20 mA with custom calibration
C.4-20 = Sensor 4...20 mA with custom calibration
C.10V = Sensor 0...10 V with custom calibration
C.2-10 = Sensor 2...10 V with custom calibration
C.5V = Sensor 0...5 V with custom calibration
C.1-5V = Sensor 1...5 V with custom calibration

C2.4VH = Sensor 0...2.4 V high impedance with custom calibration
C1.2VH = Sensor 0...1.2 V high impedance with custom calibration

4.10.4. SBR.E - Enabling SBR error

Acronym	Scrolling message	Submenu	Attributes
SBR.E	INPUT.1 (or 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

4.10.5. 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:

FUNC 2

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 = Reference of ratio controller for PID.1 (**)

if model has valve control:
VALV.P = Valve position signal

PV2 = Process Value (PV2) per PID.2

FUNC 3

NONE = Nessuna funzione (solo visualizzazione IN3)
SETP = Remote setpoint of Process Value (PV1) for PID.1 (*)
POWER = Remote setpoint of Power for PID.1 (*)
RST.PW = Reset power for PID.
RATIO = Riferimento per regolatore di rapporto per PID.1 (**)

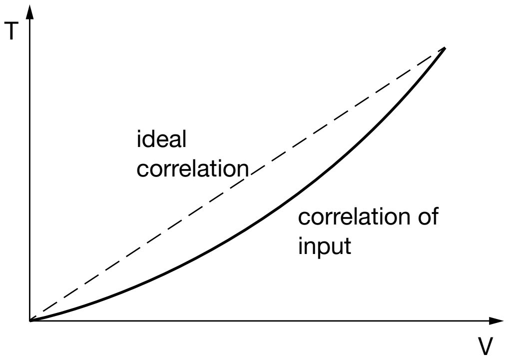
if model has valve control:
VALV.P = Segnale di posizione valvola
SETP2 = Remote setpoint of Process Value (PV2) for PID.2
POWE2 = Remote setpoint of Power for PID.2
RST.P2 = Reset power for PID.2

(*) 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 (o IN3) x RATIO, where RATIO (range from 0.01 to 99.99) is the value of the ratio required between PV1 and IN2 (o IN3). It is calculated in manual switching manual > automatic (with MA.AU = BUMPL) and can be modified on the User menu.

4.10.6. LIN - Selecting linearization type

Acronym	Scrolling message	Submenu	Attributes
Lin	INPUT.1 (or INPUT.2 or INPUT.3) 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.Z and LIN.4.P. submenu .

For an explanation of 4-point linearization, see paragraph “5.4. 4-point input correction” on page 202.

Unit of measurement: -

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

4.10.7. UNIT - Selecting the displayed unit of measurement

Acronym	Scrolling message	Submenu	Attributes
Unit	INPUT.1 (or INPUT.2 or INPUT.3) 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

4.10.8. 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**

4.10.9. FILT.D - Digital filter on PV display

Acronym	Scrolling message	Submenu	Attributes
FILT.D	INPUT.1 (or INPUT.2 or INPUT.3) 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**

4.10.10. DEC.P - Number of decimals displayed

Acronym	Scrolling message	Submenu	Attributes
DEC.P	INPUT.1 (or INPUT.2 or INPUT.3) 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

4.10.11. LO.SCL - Lower limit of scale

Acronym	Scrolling message	Submenu	Attributes
LO.SCL	INPUT.1 (or INPUT.2 or INPUT.3) 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

Type	Unit = °C DEC.P = 0	Unit = °F DEC.P = 0
J.TC	-210…1200	-346…2192
K.TC	-270…1372	-454…2502
R TC	-50…1768	-58…3214
S TC	-50…1768	-58…3214
T.TC	-270…400	-454…752
C.TC	0…2315	32…4199
D.TC	0…2315	32…4199
B	40…1820	104…3308
E	-270…1000	-454…1832
L	-200…900	-328…1652
L-GOST	-200…800	-328…1472
U	-200…600	-328…1112
G	0…2315	32…4199
N	-270…1300	-454…2372
PT2.TC	0…1888	32…3430
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...250	-58...212
JPT10	-200...600	-328...1112

	~~Unit = °C~~ DEC.P = 0	~~Unit = °F~~ DEC.P = 0
60MV	-1999...9999	-199.9...999.9
20MA	-1999...9999	-199.9...999.9
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
2.4 VHI	-1999...9999	-1999...9999
1.2VHI	-1999...9999	-1999...9999
C1VH	-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
C2.4 VH	-1999...9999	-1999...9999
C1.2VH	-1999...9999	-1999...9999

4.10.12. HI.SCL - Upper limit of scale

Acronym	Scrolling message	Submenu	Attributes
HI.SCL	INPUT.1 (or INPUT.2 or INPUT.3) 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).

4.10.13. OF.SCL - Scale offset correction

Acronym	Scrolling message	Submenu	Attributes
OF.SCL	INPUT.1 (or INPUT.2 or INPUT.3) 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**

4.10.14. LO.SP - Lower limit for setpoint

Acronym	Scrolling message	Submenu	Attributes
LO.SP	INPUT.1 (or INPUT.2 or INPUT.3) 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**

4.10.15. 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**

4.10.16. LO.AL - Lower limit for alarms

Acronym	Scrolling message	Submenu	Attributes
LO.AL	INPUT.1 (or INPUT.2 or INPUT.3) 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**

4.10.17. HI.AL - Upper limit for alarms

Acronym	Scrolling message	Submenu	Attributes
HI.AL	INPUT.1 (or INPUT.2 or INPUT.3) 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**

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

Acronym	Scrolling message	Submenu	Attributes
MSG.LO	INPUT.1 (or INPUT.2 or INPUT.3) 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 44.
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 or IN 3) UNDER LOW LIMIT", for LANG2 corresponds to "IN 1 (or IN 2 or IN3) INFERIORE AL MINIMO".

Unit of measurement: Message number

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

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

Acronym	Scrolling message	Submenu	Attributes
MSG.HI	INPUT.1 (or INPUT.2 or INPUT.3) 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 44.
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 o IN 3) OVER HIGH LIMIT ", for LANG2 corresponds to "IN 1 (or IN 2 or IN3) SUPERIORE AL MASSIMO".

Unit of measurement: Message number

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

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

Acronym	Scrolling message	Submenu	Attributes
MSG.ER	INPUT.1 (or INPUT.2 or INPUT.3) 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 44.
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 or SONDA 3) FAIL CONNECTION", for LANG2 corresponds to "ERRATA CONNESSIONE SONDA 1 (or SONDA 2 or SONDA 3)".

Unit of measurement: Message number

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

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

Acronym	Scrolling message	Submenu	Attributes
MSG.SB	INPUT.1 (or INPUT.2 or INPUT.3) 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 44.
If the parameter is set to “0” no message will be displayed for Sbr.

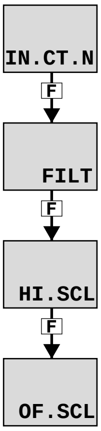
As default, MSG.SB is assigned the message “4” (for LANG1 corresponds to ““SENSOR BROKEN” 1 (or SENSOR 2 or SONDA 3) , for LANG2 corresponds to “SONDA 1 (or SONDA 2 or SONDA 3) APERTA”.

Unit of measurement: Number message

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

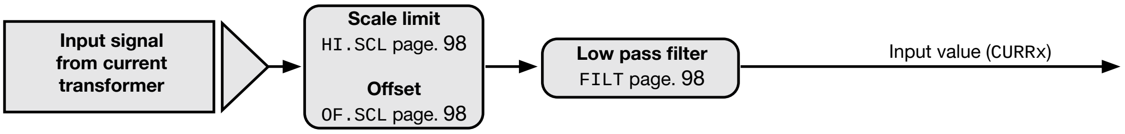
4.11. Submenu IN.CT - Configuration of current inputs

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



Parameter	Pag.
Configuring current transformers	98
Digital filter	98
Maximum scale limit	98
Limit scale correction	98

4.11.1. Functional diagram



4.11.2. 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

4.11.3. 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**

4.11.4. 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**

4.11.5. 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

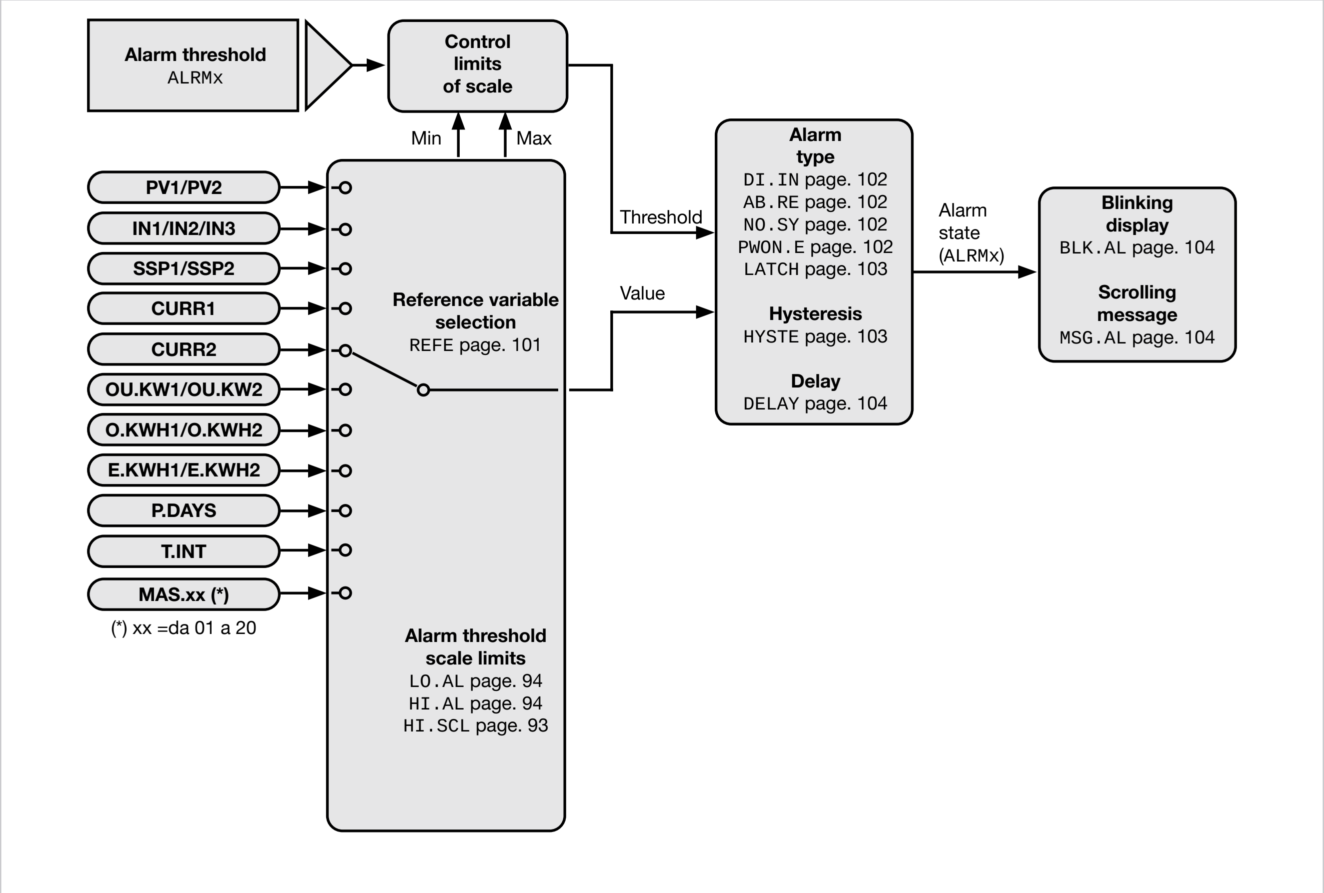
Options: **-99.9...99.9**

4.12. Submenu ALARM - Configuration of alarms

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

	Parameter	Pag.
ALRM.N	Selecting the alarm to be configured	**100**
rEFE	Selecting the alarm reference	**101**
di.in	Selecting direct or inverse alarm	**102**
Ab.rE	Selecting absolute or deviation alarm	**102**
no.SY	Method for applying hysteresis	**102**
PWON.E	Disabling the alarm at power-on	**102**
SP1C.E	Disabling alarm on Setpoint1 change	**103**
SP2C.E	Disabling alarm on Setpoint2 change	**103**
LATCH	Memorizing the alarm	**103**
HYSTE	Hysteresis	**103**
DELAY	Alarm trip delay	**104**
MSG.AL	Message associated with tripping of alarm	**104**
BLK.AL	Flashing of PV display	**104**

4.12.1. Functional diagram



4.12.2. 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..

4.12.3. REFE - Selecting the alarm reference

Acronym	Scrolling message	Submenu	Attributes
REFE	ALARM.1 (o 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

if model with auxiliary input 2:
IN3 = Auxiliary input 2

if model with Master Modbus serial and Master parameter configured::
MAS.01 = Master Value 1
MAS.02 = Master Value 2
MAS.03 = Master Value 3
MAS.04 = Master Value 4
MAS.05 = Master Value 5
MAS.06 = Master Value 6
MAS.07 = Master Value 7
MAS.08 = Master Value 8
MAS.09 = Master Value 9
MAS.10 = Master Value 10
MAS.11 = Master Value 11
MAS.12 = Master Value 12
MAS.13 = Master Value 13
MAS.14 = Master Value 14
MAS.15 = Master Value 15
MAS.16 = Master Value 16
MAS.17 = Master Value 17
MAS.18 = Master Value 18
MAS.19 = Master Value 19
MAS.20 = Master Value 20

4.12.4. 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 204.

Unit of measurement: -

Options:
DIREC = Direct Alarm
INVRS = Inverse Alarm

4.12.5. 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 204.

Unit of measurement: -

Options:
ABSLT = Absolute alarm
RELAT = Deviation alarm

4.12.6. 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 204.

Unit of measurement: -

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

4.12.7. 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)

4.12.8. SP1C.E - Disabling alarm on Setpoint1 change

Acronimo	Messaggio a scorrimento	Submenu	Attributi
SP1C.E	ALARM.1 (o ALARM.2…ALARM.4) DISABLE AT SETP1 CHANGE	ALARM	R/W

The parameter shows and sets the behaviour of the alarm when the SETP of PID1 is changed, for the alarm being configured. Setting the parameter from OFF to ON takes effect at the next setpoint change and masks the alarm.

Example
ALARM.1 set as Direct Alarm, Absolute, Normal on PV1 with PV1 = 43 and ALARM.1 = 26 (alarm is active)

If SP1C.E = OFF and the SETP of PID1 changes, the alarm remains active.
If SP1C.E = On and the SETP of PID1 changes, the alarm is inhibited; at this point, if PV1 falls below ALARM.1 and then rises again, with the same SETP, the alarm becomes active again, until the next SETP change

Unità di misura: -

Opzioni:
OFF = Alarm enabled on SETP1 change
On =Alarm disabled on SETP1 change

4.12.9. SP2C.E - Disabling alarm on Setpoint2 change

Acronimo	Messaggio a scorrimento	Submenu	Attributi
SP2C.E	ALARM.1 (o ALARM.2…ALARM.4) DISABLE AT SETP2 CHANGE	ALARM	R/W

The parameter shows and sets the behaviour of the alarm when the SETP of PID2 is changed, for the alarm being configured. Setting the parameter from OFF to ON takes effect at the next setpoint change and masks the alarm.
The parameter is only displayed if PID2 is active.

Example
ALARM.1 set as Direct Alarm, Absolute, Normal on PV2 with PV2 = 43 and ALARM.1 = 26 (alarm is active)

If SP2C.E = OFF and the SETP of PID2 changes, the alarm remains active.
If SP2C.E = On and the SETP of PID2 changes, the alarm is inhibited; at this point, if PV2 falls below ALARM.1 and then rises again, with the same SETP, the alarm will become active again, until the next SETP change

Unità di misura: -

Opzioni:
OFF = Alarm enabled on SETP2 change
On = Alarm disabled on SETP2 change

4.12.10. 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

4.12.11. 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

4.12.12. 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 204.

Unit of measurement: Minutes.seconds

Options: **0.00...99.59**

4.12.13. 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 44.
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)

4.12.14. 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

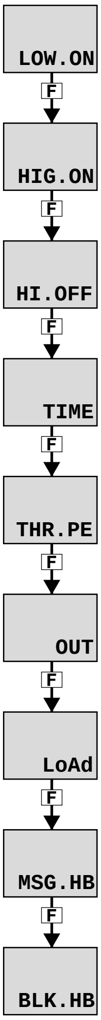
The parameter shows and sets the flashing of the PV display in case of alarm, for the alarm being configured.
If the parameter is “On,” the value shown on the PV display starts to flash in case of alarm.

Unit of measurement: -

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

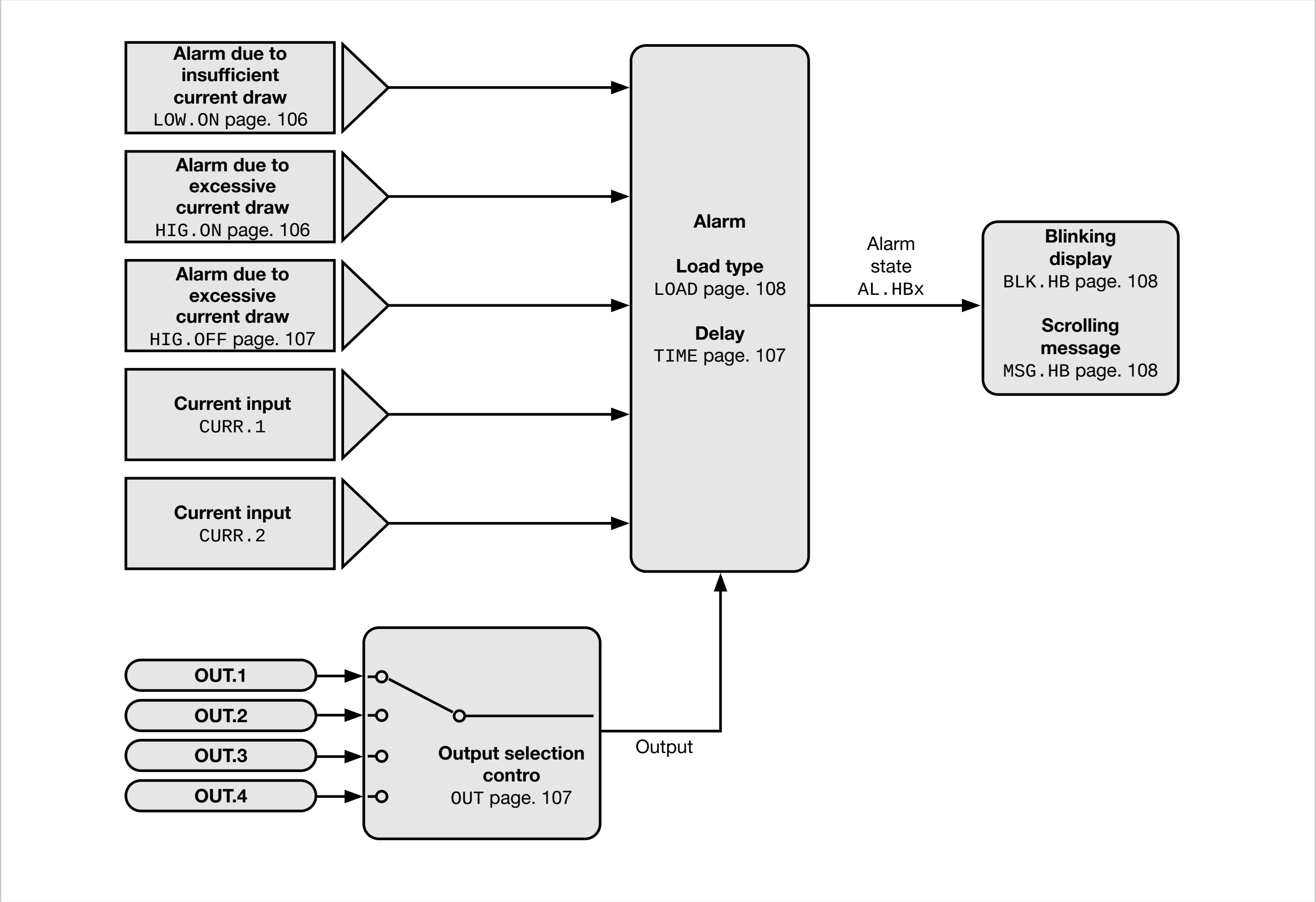
4.13. Submenu AL.HB - Configuring the Heater Break alarm

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.



	Parameter	Pag.
LOW.ON	Alarm due to insufficient current draw	**106**
HIG.ON	Alarm due to excessive current draw	**106**
HI.OFF	Alarm due to excessive current draw	**107**
TIME	HB alarm trip delay	**107**
THR.PE	Percentage of HB current compared to calibration	**107**
OUT	Control output associated with HB alarm	**107**
LoAd	Selecting type of connected load	**108**
MSG.HB	Message associated with tripping of HB alarm	**108**
BLK.HB	Flashing of PV display	**108**

4.13.1. Functional diagram



4.13.2. 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**

4.13.3. 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**

4.13.4. 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**

4.13.5. 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**

4.13.6. 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 “4.33. Submenu US.CAL - Calibrazioni utente” on page 192.

Unit of measurement: %

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

4.13.7. 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**

4.13.8. 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 205.

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

4.13.9. 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 44.
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)

4.13.10. 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.

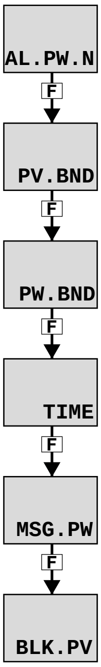
Unit of measurement: -

Options:

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

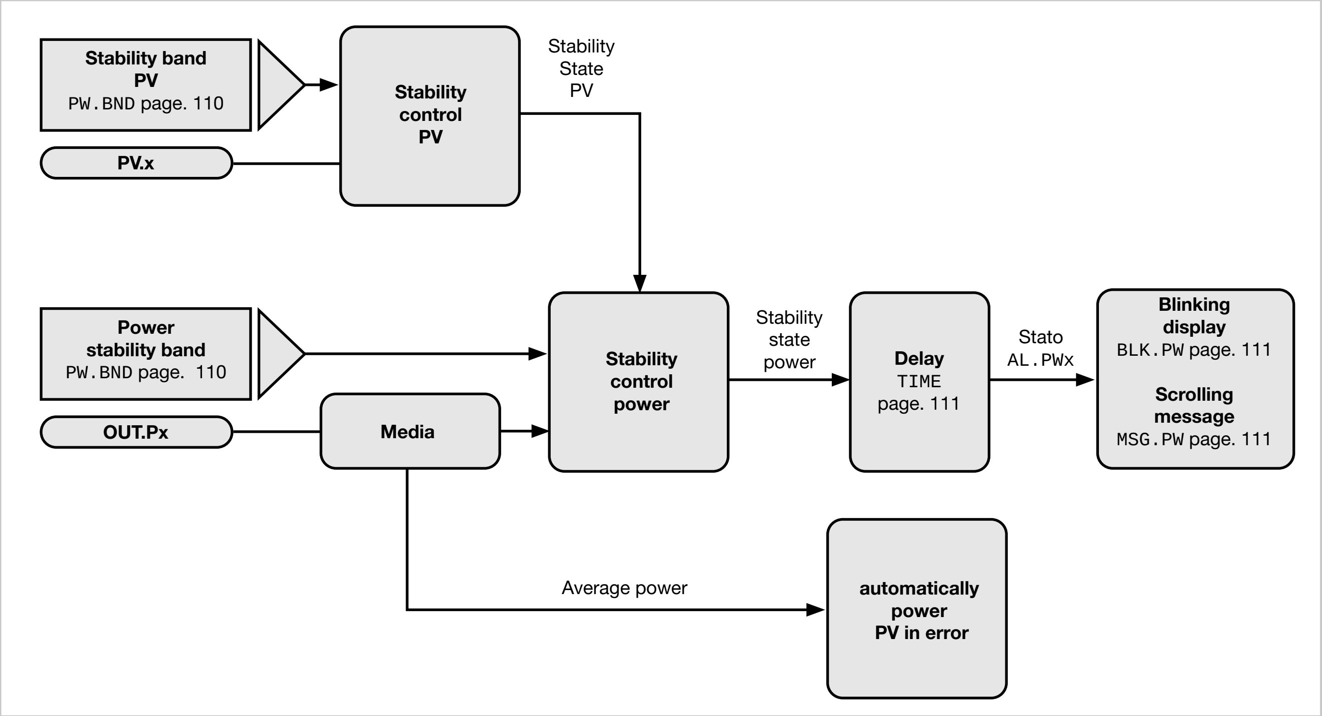
4.14. Submenu AL.PW - Configuring power alarm

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.



	Parameter	Pag.
AL.PW.N	Select the Power alarm to configure	110
PV.BND	Process variable stability band	110
PW.BND	Power stability band	110
TIME	Power alarm trip delay	111
MSG.PW	Message associated with tripping of power alarm	111
BLK.PV	Flashing of PV display when power alarm trips	111

4.14.1. Functional diagram



4.14.2. 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)

4.14.3. 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

4.14.4. 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

4.14.5. 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

4.14.6. 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 44.
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)

4.14.7. 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

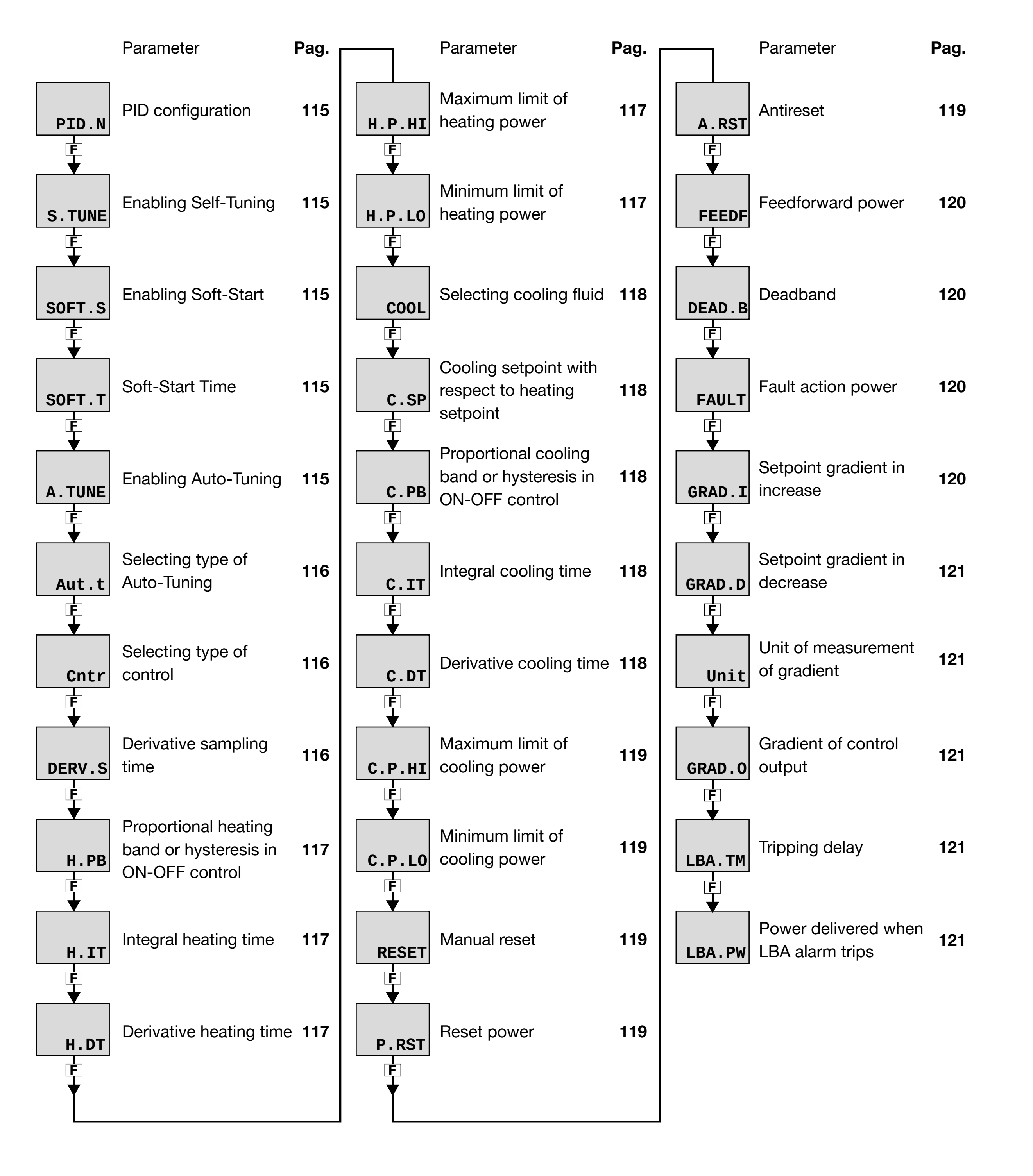
The parameter shows and sets the flashing of the PV display in case of power alarm.
If the parameter is “On,” in case of HB alarm the value on the PV display flashes with backlight at maximum brightness.

Unit of measurement: -

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

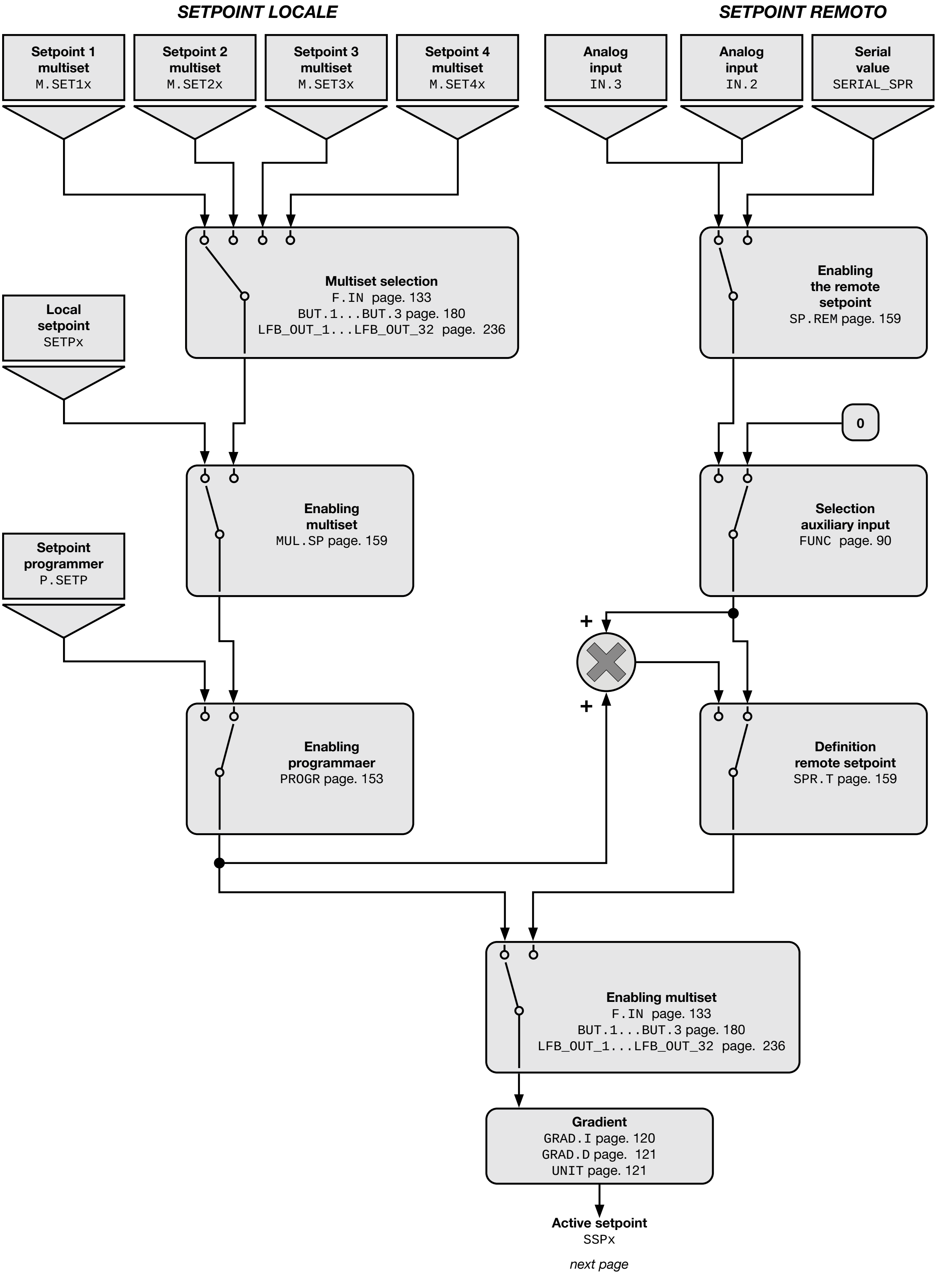
4.15. Submenu PID - Configuring control parameters

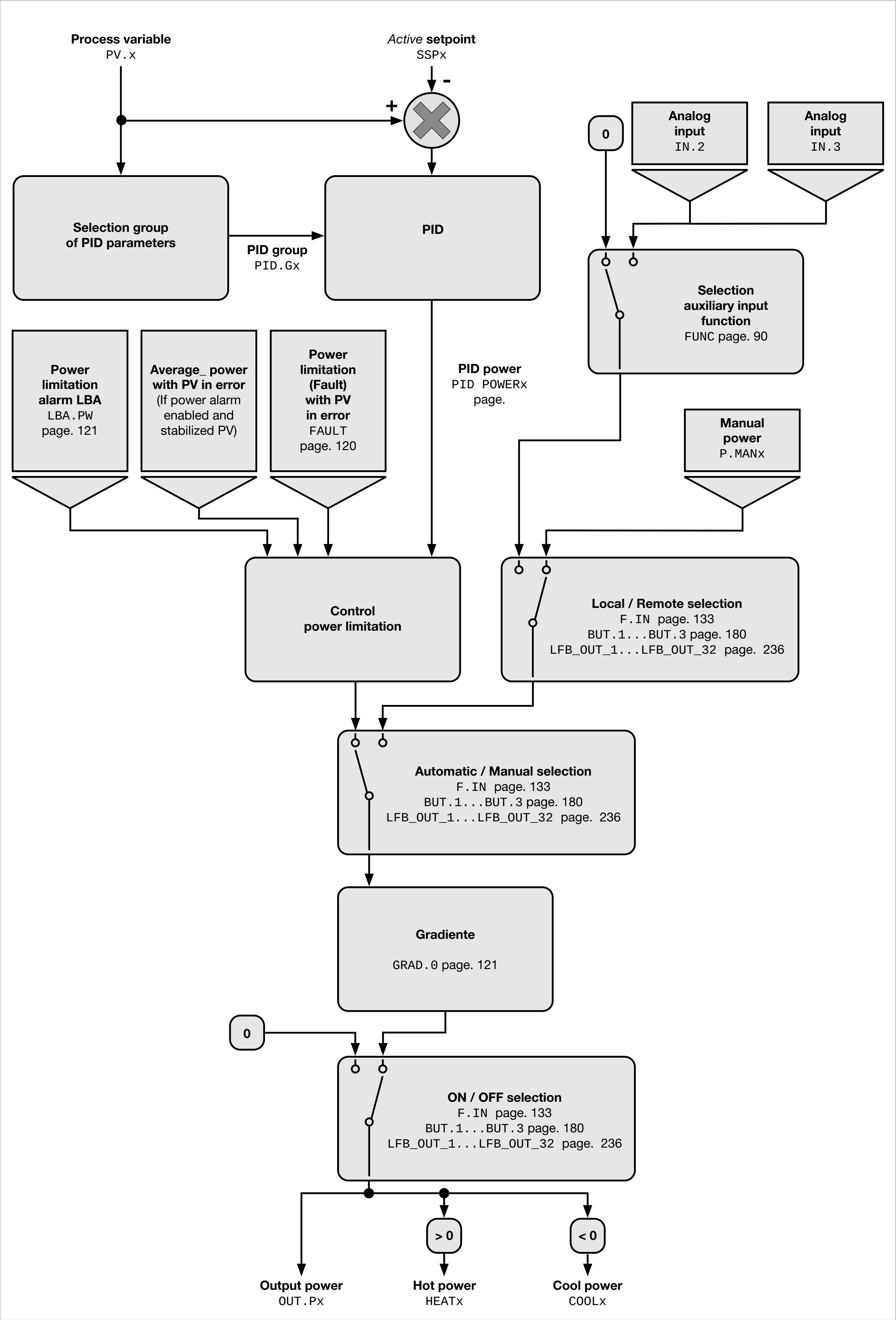
Acronym	Scrolling message	Password	Description
PID	PID CONFIG	Level 1	Lets you configure the control parameters.



	Parameter	Pag.
PID.N	PID configuration	115
S.TUNE	Enabling Self-Tuning	115
SOFT.S	Enabling Soft-Start	115
SOFT.T	Soft-Start Time	115
A.TUNE	Enabling Auto-Tuning	115
Aut.t	Selecting type of Auto-Tuning	116
Cntr	Selecting type of control	116
DERV.S	Derivative sampling time	116
H.PB	Proportional heating band or hysteresis in ON-OFF control	117
H.IT	Integral heating time	117
H.DT	Derivative heating time	117
H.P.HI	Maximum limit of heating power	117
H.P.LO	Minimum limit of heating power	117
COOL	Selecting cooling fluid	118
C.SP	Cooling setpoint with respect to heating setpoint	118
C.PB	Proportional cooling band or hysteresis in ON-OFF control	118
C.IT	Integral cooling time	118
C.DT	Derivative cooling time	118
C.P.HI	Maximum limit of cooling power	119
C.P.LO	Minimum limit of cooling power	119
RESET	Manual reset	119
P.RST	Reset power	119
A.RST	Antireset	119
FEEDF	Feedforward power	120
DEAD.B	Deadband	120
FAULT	Fault action power	120
GRAD.I	Setpoint gradient in increase	120
GRAD.D	Setpoint gradient in decrease	121
Unit	Unit of measurement of gradient	121
GRAD.O	Gradient of control output	121
LBA.TM	Tripping delay	121
LBA.PW	Power delivered when LBA alarm trips	121

4.15.1. Functional diagram




Process variable
PV.x
Active setpoint
SSPx
-
+
Analog input IN.2
Analog input IN.3
0
Selection group of PID parameters
PID group
PID.Gx
PID
Selection auxiliary input function
FUNC page. 90
Power limitation alarm LBA
LBA.PW
page. 121
Average_ power with PV in error
(If power alarm enabled and stabilized PV)
Power limitation (Fault) with PV in error
FAULT
page. 120
PID power
PID POWERx
page.
Manual power
P.MANx
Control power limitation
Local / Remote selection
F.IN page. 133
BUT.1...BUT.3 page. 180
LFB_OUT_1...LFB_OUT_32 page. 236
Automatic / Manual selection
F.IN page. 133
BUT.1...BUT.3 page. 180
LFB_OUT_1...LFB_OUT_32 page. 236
Gradiente
GRAD.0 page. 121
0
ON / OFF selection
F.IN page. 133
BUT.1...BUT.3 page. 180
LFB_OUT_1...LFB_OUT_32 page. 236
> 0
< 0
Output power
OUT.Px
Hot power
HEATx
Cool power
COOLx

4.15.2. 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

4.15.3. 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 208.

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

4.15.4. 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 207.
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

4.15.5. 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**

4.15.6. 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 209.

Unit of measurement: -

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

4.15.7. 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

4.15.8. 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

4.15.9. 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

4.15.10. 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**

4.15.11. 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**

4.15.12. 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**

4.15.13. 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**

4.15.14. 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**

4.15.15. 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)

4.15.16. 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**

4.15.17. 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**

4.15.18. 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**

4.15.19. 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**

4.15.20. 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** $\frac{\text{setpoint}}{\text{fondo scala - inizio scala}} \times \frac{\text{FEEDF}}{100}$

4.15.21. 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**

4.15.22. 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**

4.15.23. 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**

4.15.24. 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**

4.15.25. FEEDF - Feedforward power

Acronym	Scrolling message	Submenu	Attributes
FEEDF	PID.1 (o 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.

$$U = \frac{\text{setpoint}}{\text{end of scale - start of scale}} \times \frac{\text{FEEDF}}{100.0}$$

Unit of measurement: %

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

4.15.26. 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**

4.15.27. 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

4.15.28. 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**

4.15.29. GRAD.D - Setpoint Gradient in decreasing

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**

4.15.30. 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

4.15.31. 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**

4.15.32. 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**

4.15.33. 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

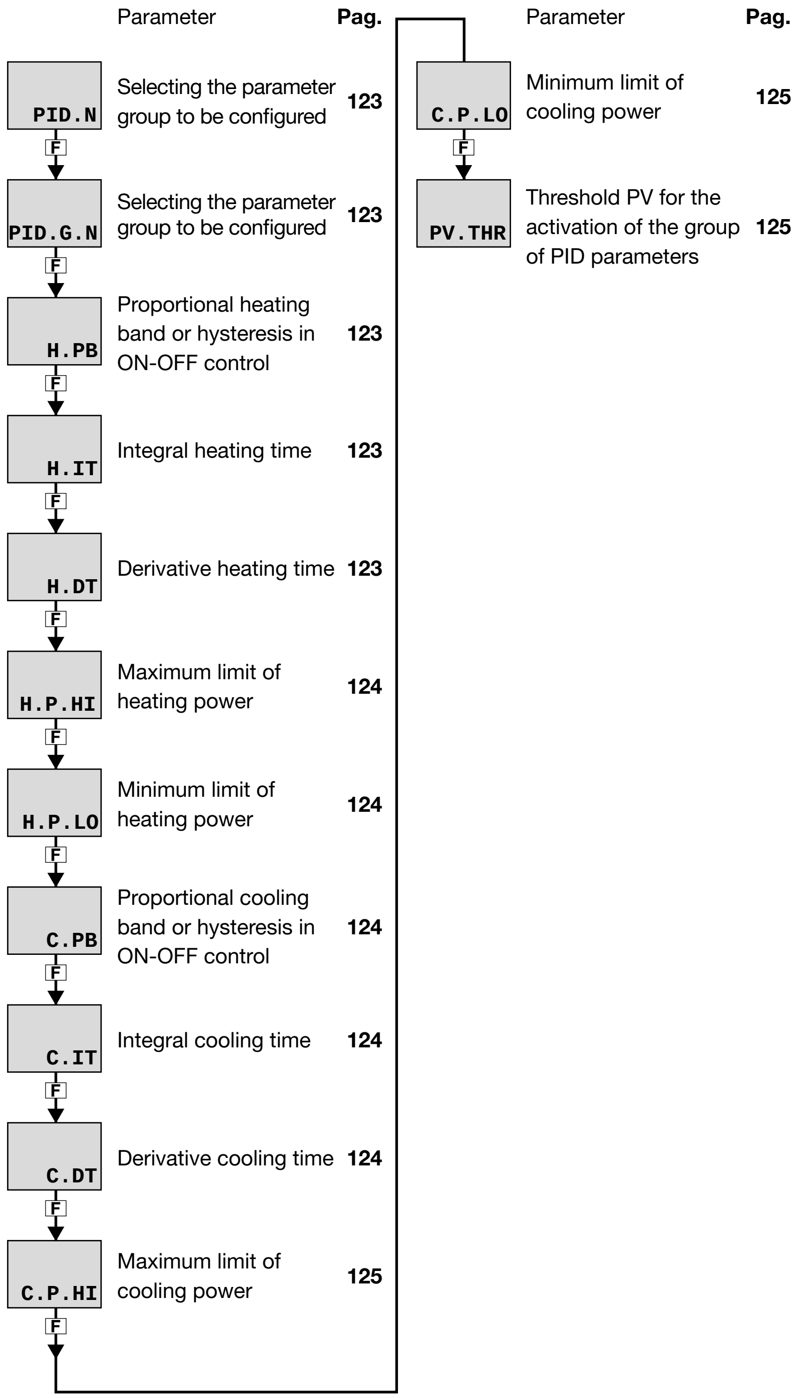
The parameter shows and sets the power value delivered when the LBA alarm trips.
This parameter will not appear in the presence of ON-OFF control (of heating, cooling and heating, and heating/cooling).
In the presence of PID control with ON-OFF heating or cooling, power . may be set for the PID part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

Unit of measurement: %

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

4.16. 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 reconfigure 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.



4.16.1. 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**

4.16.2. 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

4.16.3. 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**

4.16.4. 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**

4.16.5. 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**

4.16.6. 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**

4.16.7. 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 “4.15.14. H.P.LO - Minimum limit of heating power” on page 117.

Unit of measurement: %

Options: **0.0...100.0**

4.16.8. 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**

4.16.9. 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**

4.16.10. 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**

4.16.11. 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**

4.16.12. 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 "4.15.21. C.P.LO - Minimum limit of cooling power" on page 119.

Unit of measurement: %

Options: **0.0...100.0**

4.16.13. 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

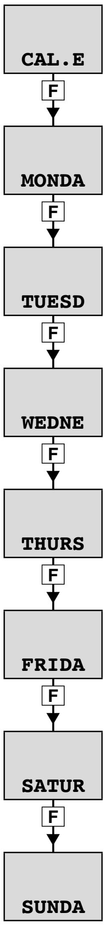
The parameter shows and sets the PV over which the group of PID parameters is active.
The parameter is shown only if the respective programmer is not enabled.

Unit of measurement: Scale points of main or auxiliary input

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

4.17. CAL.EV sub-menu - Enable Calendar events

Acronym	Scrolling message	Password	Description
CAL.EV	CALENDAR ENABLING	Level 1	Show Event Calendar settings



	Parameter	**Pag.**
CAL.E	Enable calendar	**126**
MONDA	Enable Monday	**126**
TUESD	Enable Tuesday	**127**
WEDNE	Enable Wednesday	**127**
THURS	Enable Thursday	**127**
FRIDA	Enable Friday	**127**
SATUR	Enable Saturday	**127**
SUNDA	Enable Sunday	**128**

4.17.1. CAL.E - Enable calendar

Acronym	Scrolling message	Submenu	Attributes
CAL.E	CALENDAR ENABLE	CAL.EV	R W

The parameter shows and sets when the calendar is enabled.

Unit of measurement: -

Options:
OFF = Calendar disabled
ONE.WE = Single week calendar enabled
WEKLY = Weekly calendar enabled

4.17.2. MONDA - Enable Monday

Acronym	Scrolling message	Submenu	Attributes
MONDA	DAYS ENABLE	CAL.EV	R W

The parameter shows and sets events enabled for Monday.

Unit of measurement: -

Options:
None = Monday calendar disabled
ON = Monday calendar enabled

4.17.3. TUESD - Enable Tuesday

Acronym	Scrolling message	Submenu	Attributes
TUESD	DAYS ENABLE	CAL.EV	R W

The parameter shows and sets when the calendar is enabled.

Unit of measurement: **-**

Options: **None** = Tuesday calendar disabled
ON = Tuesday calendar enabled

4.17.4. WEDNE - Enable Wednesday

Acronym	Scrolling message	Submenu	Attributes
WEDNE	DAYS ENABLE	CAL.EV	R W

The parameter shows and sets events enabled for Wednesday.

Unit of measurement: **-**

Options: **None** = Wednesday calendar disabled
ON = Wednesday calendar enabled

4.17.5. THURS - Enable Thursday

Acronym	Scrolling message	Submenu	Attributes
THURS	DAYS ENABLE	CAL.EV	R W

The parameter shows and sets the events enabled for Thursday.

Unit of measurement: **-**

Options: **None** = Thursday calendar disabled
ON = Thursday calendar enabled

4.17.6. FRIDA - Enable Friday

Acronym	Scrolling message	Submenu	Attributes
FRIDA	DAYS ENABLE	CAL.EV	R W

The parameter shows and sets the events enabled for Friday.

Unit of measurement: **-**

Options: **None** = Friday calendar disabled
ON = Friday calendar enabled

4.17.7. SATUR - Enable Saturday

Acronym	Scrolling message	Submenu	Attributes
SATUR	DAYS ENABLE	CAL.EV	R W

The parameter shows and sets the events enabled for Saturday.

Unit of measurement: **-**

Options: **None** = Saturday calendar disabled
ON = Saturday calendar enabled

4.17.8. SUNDA - Enable Sunday

Acronym	Scrolling message	Submenu	Attributes
SUNDA	DAYS ENABLE	CAL.EV	R W

The parameter shows and sets the events enabled for Sunday.

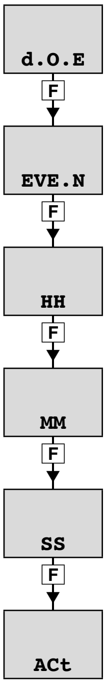
Unit of measurement: **-**

Options:

None = Sunday calendar disabled
ON = Sunday calendar enabled

4.18. CALE.C sub-menu - Enable Event Calendar

Acronym	Scrolling message	Password	Description
CALE.C	CALENDAR CONFIGURATION	Level 1	Show Event Calendar settings



Parameter	Pag.
Calendar day selection	129
Event selection on the selected day	129
Hour of the selected event	130
Minutes of the selected event	130
Seconds of the selected event	130
Action of the selected event	130

4.18.1. D.O.E - Event day selection

Acronym	Scrolling message	Submenu	Attributes
d.O.E	DAY OF EVENT	CALE.C	R W

The parameter shows and sets the day for the required Calendar event.

Unit of measurement: -

Options:
MONDA = day selected Monday
TUESD = day selected Tuesday
WEDNE = day selected Wednesday
THURS = day selected Thursday
FRIDA = selected day Friday
SATUR = day selected Saturday
SUNDA = day selected Sunday

4.18.2. EVE.N - Event number selection

Acronym	Scrolling message	Submenu	Attributes
EVE.N	EVENT NuMBER	CALE.C	R W

The parameter shows and sets the calendar event number to be selected.

Unit of measurement: number

Options: 1..4

4.18.3. HH - Hour of the event

Acronym	Scrolling message	Submenu	Attributes
HH	HOUR OF EVENT	CALE.C	R W

The parameter shows and sets the hour of the selected Calendar event.

Unit of measurement: number (hh)

Options: 0..23

4.18.4. MM - Minute of the event

Acronym	Scrolling message	Submenu	Attributes
MM	MINUTE OF EVENT	CALE.C	R W

The parameter shows and sets the minutes of the selected Calendar event.

Unit of measurement: number (mm)

Options: 0..59

4.18.5. SS - Seconds of the event

Acronym	Scrolling message	Submenu	Attributes
SS	SECOND OF EVENT	CALE.C	R W

The parameter shows and sets the seconds of the selected Calendar event.

Unit of measurement: number (ss)

Options: 0..59

4.18.6. ACt - Seconds of the event

Acronym	Scrolling message	Submenu	Attributes
ACt	ACTION OF EVENT	CALE.C	R W

The parameter shows and sets the seconds of the selected Calendar event.

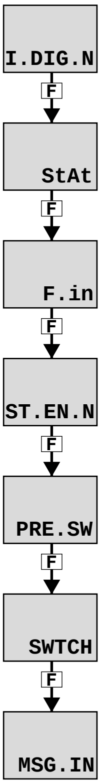
Unit of measurement: **-**

Options:

NONE = no event
ON.SW = SOFTWARE ON
OFF.SW = SOFTWARE OFF
O.S.S1 = SOFTWARE ON and Programmer 1 START
O.S.S2 = SOFTWARE ON and Programmer 2 START
ST.PR1 = Programmer 1 START
STP.P1 = Programmer 1 STOP
RESE1 = Programmer 1 RESET
ST.PR2 = Programmer 2 START
STP.P2 = Programmer 2 STOP
RESE2 = Programmer 2 RESET
ST.P12 = Programmer 1 and 2 START
STP.12 = Programmer 1 and 2 STOP
RES.1.2 = Programmer 1 and 2 RESET
TRIG1 = Trigger1 Function Block event
TRIG2 = Trigger2 Function Block event

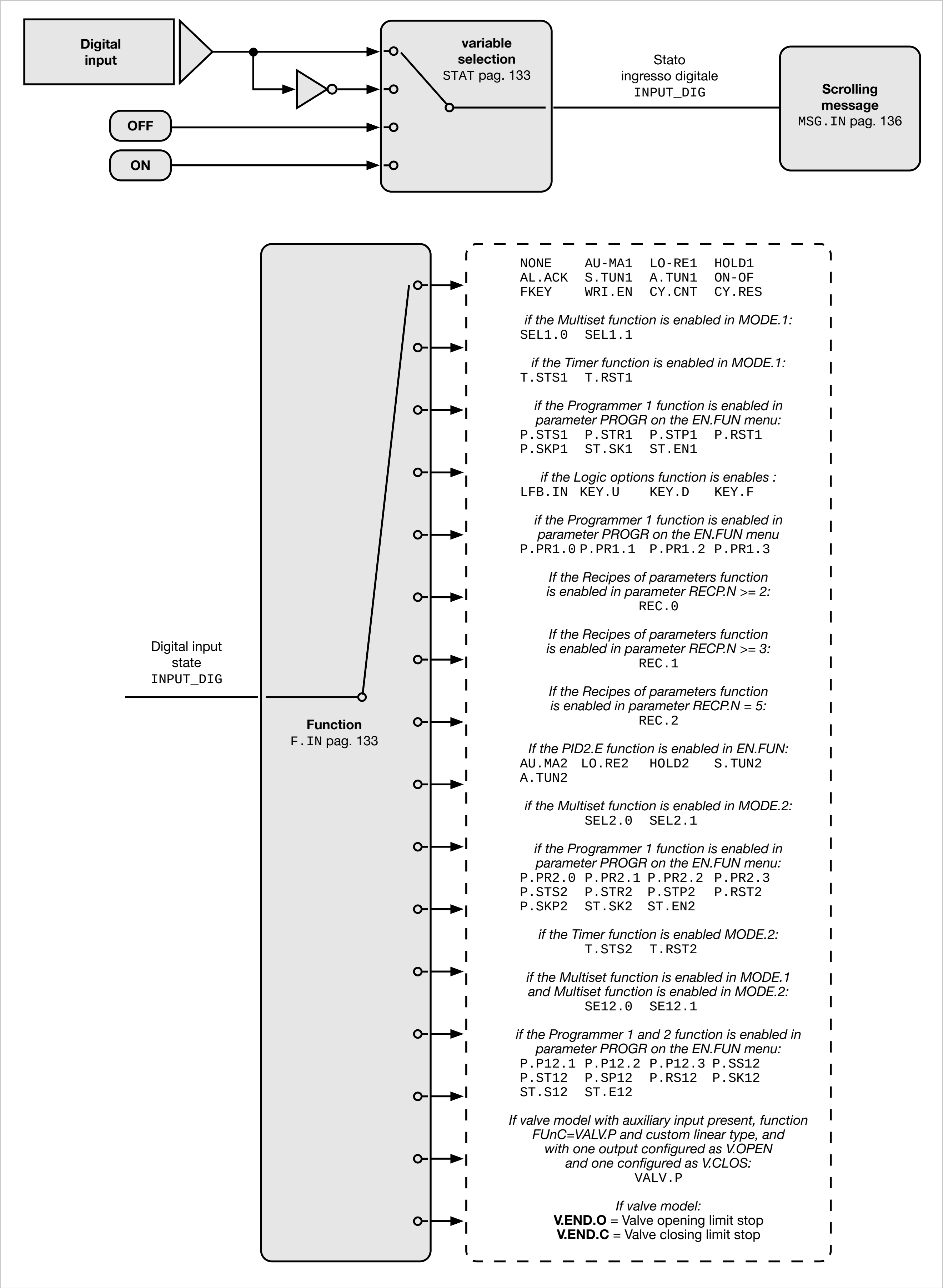
4.19. Submenu IN.DIG - Configuring digital inputs

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.



Parameter	Pag.
Selecting the digital input	133
Defining the input state	133
Selecting the assigned function	133
Setting assigned consent number	135
Pre-scaler setting for number of input switchings	135
Setting of number of input switchings for signal	135
Selecting the digital input message	136

4.19.1. Functional diagram



*) Verranno rilevate commutazioni con frequenza massima di 25 Hz con tempo di ON e di OFF pari ad almeno 20 msec.

4.19.2. 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

4.19.3. STAT - Defining the input state

Acronym	Scrolling message	Submenu	Attributes
StAt	IN.DIG.1 (o 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

4.19.4. F.IN - Selecting the assigned function

Acronym	Scrolling message	Submenu	Attributes
F.in	IN.DIG.1 (o 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 214*):*
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 214*):*
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

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 214*):*
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 244):
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 244):
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 244):
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 214*):*
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 214*):*
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 and PROGR.1 e PROGR.2 programmer time base
P.RS12 = RESET and PROGR.1 e 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

If valve model with auxiliary input present, function FUnC=VALV.P and custom linear type,
and with one output configured as V.OPEN and one configured as V.CLOS:
VALV.P = Auxiliary input configuration

if valve model:
V.END.O = Valve opening limit stopa
V.END.C = Valve closing limit stop

4.19.5. ST.EN.N - Setting assigned consent number

Acronym	Scrolling message	Submenu	Attributes
ST.EN.N	IN.DIG.1 (o 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**

4.19.6. PRE.SW - Prescaler setting for number of input switchings

Acronym	Scrolling message	Submenu	Attributes
PRE.SW	IN.DIG.1 (o 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**

4.19.7. SWTCH - Number of input switching setting for signaling

Acronym	Scrolling message	Submenu	Attributes
SWTCH	IN.DIG.1 (o 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".
CAUTION: the minimum counting unit is 1000 (display 1 = 1000 counts)

Unit of measurement: Number

Options: **1...9999**

4.19.8. MSG.IN - Selecting the digital input message

Acronym	Scrolling message	Submenu	Attributes
MSG.IN	IN.DIG.1 (o IN.DIG.2 … IN.DIG.5) NUMBER OF SCROLLING MESSAGE AT INPUT ACT	IN.DIG	R W

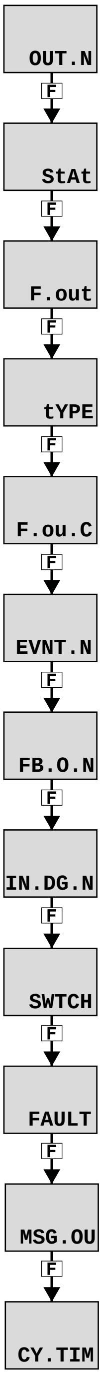
The parameter shows and sets the number of the message assigned to activation of the digital input, i.e., the scrolling message shown on the display.
For more information on scrolling messages, see paragraph "3.1.2.2. Scrolling messages" on page 44.
If the parameter is set to "0" no message will be displayed when the digital input is activated.
The same message number can be assigned to different inputs.

Unit of measurement: Number identificativo del messaggio

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

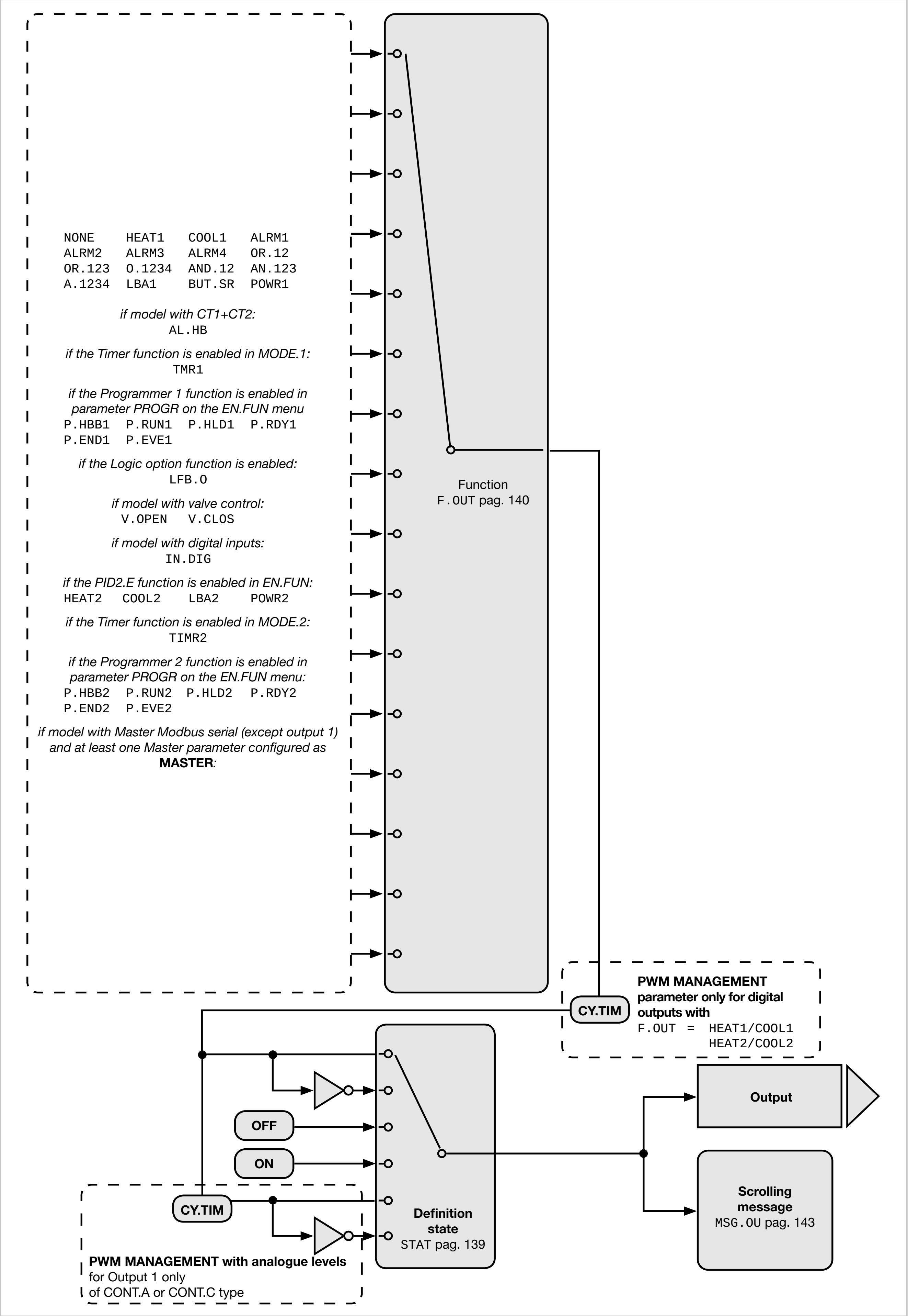
4.20. Submenu OUTPU - Configuring outputs

Acronym	Scrolling message	Password	Description
OUTPU	OUTPUT CONFIG	Level 2	Lets you configure the controller outputs.



	Parameter	Pag.
OUT.N	Selecting the output	139
StAt	Defining the output state	139
F.out	Selecting the function assigned to relay, logic or Triac output	140
tYPE	Defining the type of continuous output	141
F.ou.C	Selecting the function assigned to continuous output	141
EVNT.N	Setting the event number	142
FB.O.N	Setting the Function Block output number	142
IN.DG.N	Setting the digital input number	142
SWTCH	Setting the number of switchings for signal	142
FAULT	State of output with broken input	143
MSG.OU	Selecting the output message	143
CY.TIM	Cycle time of output	144

4.20.1. Functional diagram



4.20.2. 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**

4.20.3. STAT - Defining the output state

Acronym	Scrolling message	Submenu	Attributes
StAt	OUTPU.1 (o 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 VT1, 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
DI.PWM = Direct output with partialisation of ON/OFF and cycle time CY.TIM (for Output 1 of CONT.A or CONT.C type only)
IN.PWM = Direct output with partialisation of ON/OFF and cycle time CY.TIM (for Output 1 of CONT.A or CONT.C type only)

4.20.4. F.OUT - Selecting the function assigned to relay, logic or Triac output

Acronym	Scrolling message	Submenu	Attributes
F.out	OUTPU.1 (o 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

if model with CT1+CT2:
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 ofPROGR.1
P.EVE1 = EVENTO 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 = HBB programmer PROGR.2 alarm
P.RUN2 = RUN programmer PROGR.2 state
P.HLD2 = STOP programmer PROGR.2 state
P.RDY2 = READY programmer PROGR.2 state (after reset of time base)
P.END2 = END programmer PROGR.2 state
P.EVE2 = EVENTO programmer PROGR.2 state

if model with Master Modbus serial (except output 1) and at least one Master parameter configured as MASTER:
MASTER = Master value (for type provided to word only) (index no. to be specified in MAST.N)

4.20.5. 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

4.20.6. 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 in EN.FUNC and parameter FUNC=PV2 in INPUT.2:
HEAT2 = PID.2 heat control output
COOL2 = UPID.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 input

if the model with auxiliary input 2:
IN3 = Auxiliary input 2

4.20.7. EVNT.N - Setting the event number

Acronym	Scrolling message	Submenu	Attributes
EVNT.N	OUTPU.1 (o 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**

4.20.8. FB.O.N - Setting the Function Block output number

Acronym	Scrolling message	Submenu	Attributes
FB.O.N	OUTPU.1 (o 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**

4.20.9. IN.DG.N - Setting the digital input number

Acronym	Scrolling message	Submenu	Attributes
IN.DG.N	OUTPU.1 (o 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	Model 1650 and 1850 with option 5 digital inputs

4.20.10. MAST.N - Setting the Master communication parameter number

Acronym	Scrolling message	Submenu	Attributes
MAST.N	OUTPU.1 (o OUTPU.2… OUTPU.4) MASTER PARAMETER NUMBER	OUTPU	R W

This parameter shows and sets the Master parameter number associated with the output.
This parameter only appears if the F.OUT parameter = MASTER

Unit of measurement: Number

Options: **1...20**

4.20.11. SWTCH - Setting the number of switchings for signal

Acronym	Scrolling message	Submenu	Attributes
SWTCH	OUTPU.1 (o 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".
CAUTION: The minimum counting unit is 1000 ON-OFF switching operations. The alarm is therefore triggered for values strictly greater than the set SWTCH parameter (e.g. if SWTCH is set to 1, the alarm is not triggered at 1000 + 1 switches, but at 1000 + 1000 switches = 2000).

Unit of measurement: Number

Options: **0...9999**

4.20.12. FAULT - State of output with broken input

Acronym	Scrolling message	Submenu	Attributes
FAULT	OUTPU.1 (o 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

4.20.13. MSG.OU - Selecting the output message

Acronym	Scrolling message	Submenu	Attributes
MSG.OU	OUTPU.1 (o 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 44.
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)

4.20.14. LO.C – Low limit for continuous output / HI.C

Acronym	Scrolling message	Submenu	Attributes
LO.C	LOW LIMIT CONTINUE OUTPUT	OUTPU	R W

This parameter shows and sets the low limits of the scale, corresponding to the minimum output voltage or current.
Every time the F.ou.C parameter of power control output is set, the value of this parameter is forced to 0.

This parameter only applies if Output 1 is of the CONT.A or CONT.C type.

Unit of measurement: Points on the scale of quantities associated with continuous output

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

4.20.15. HI.C – Massimo di scala per uscita continua

Acronym	Scrolling message	Submenu	Attributes
HI.C	HIGH LIMIT CONTINUE OUTPUT	OUTPU	R W

This parameter shows and sets the high limits of the scale, corresponding to the maximum output voltage or current.
Every time the F.ou.C parameter of power control output is set, the value of this parameter is forced to 1000.

This parameter only applies if Output 1 is of the CONT.A or CONT.C type.

Unit of measurement: Points on the scale of quantities associated with continuous output

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

4.20.16. CY.TIM - Cycle time of output

Acronym	Scrolling message	Submenu	Attributes
CY.TIM	OUTPU.1 (o 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
Se la potenza di Heat è il 25% e la durata del ciclo è di 10.0 secondi, l'uscita è attiva per 2,5 secondi e disattiva per 7,5 secondi.

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.

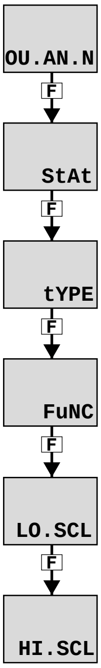
Example
If Heat power is 25% and the line frequency is 50 Hz, the cycle time is 80 ms. The output is active for 20 ms and inactive for 60 ms (= 3 × 20 ms, equal to the remaining 75% of the cycle time).

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

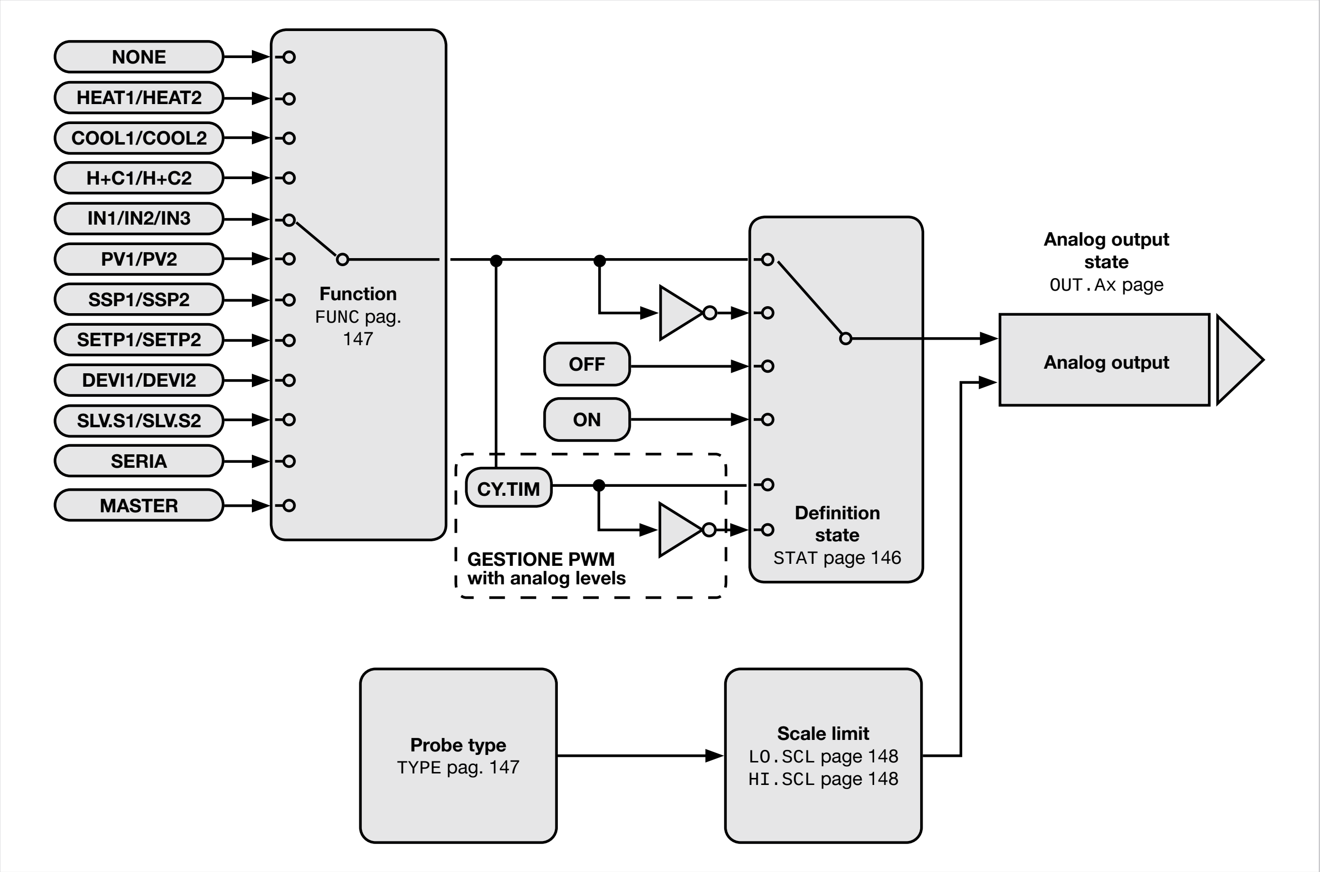
4.21. Submenu OUT.AN - Configuring the analog retransmission output

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.



Parameter	**Pag.**
Selecting the output	**146**
Defining the state of the analog output	**146**
Defining the type of analog output	**147**
Selecting the function assigned to the analog output	**147**
Scale minimum	**148**
Scale maximum	**148**

4.21.1. Functional diagram



4.21.2. 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**

4.21.3. 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)
DI.PWM = Direct output with partialisation of ON/OFF and cycle time CY.TIM
IN.PWM = Inverse output with partialisation of ON/OFF and cycle time CY.TIM

4.21.4. TYPE - Defining the type of analog output

Acronym	Scrolling message	Submenu	Attributes
tYPE	OUT.AN.1 (o 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

4.21.5. FUNC - Selecting the function assigned to the analog output

Acronym	Scrolling message	Submenu	Attributes
FuNC	OUT.AN.1 (o 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

if the model with auxiliary input 2:
IN3 = Auxiliary input 2

if model with Master Modbus serial (except output 1) and at least one Master parameter configured as GF_eXpress:
MASTER = Master value (for type provided to word only) (index no. to be specified in MAST.N)

4.21.6. MAST.N - Setting the Master communication parameter number

Acronym	Scrolling message	Submenu	Attributes
MAST.N	OUT.AN.1 (o OUT.AN.2) MASTER PARAMETER NUMBER	OUT.AN	R W

This parameter shows and sets the Master parameter number associated with the output.
This parameter only appears if the F.ou.C parameter = MASTER.

Unit of measurement: Number

Options: **1...20**

4.21.7. CY.TIM – Output cycle time

Acronym	Scrolling message	Submenu	Attributes
CY.TIM	OUT.AN.1 (o OUT.AN.2) CYCLE TIME	OUT.AN	R W

This parameter shows and sets the output partialisation period.
The parameter will appear if the StAt parameter = DI.PWM, IN.PWM.
Partialisation period is the cycle time, that is, the sum of ON time and OFF time proportional to the value to be retransmitted.

Example
If the value to be retransmitted is 25% and the duration of the cycle is 10.0 seconds, the output will be active for 2.5 seconds and deactivated for 7.5 seconds.

Unit of measurement: Seconds

Options: **1...200**

4.21.8. LO.SCL - Scale minimum

Acronym	Scrolling message	Submenu	Attributes
LO.SCL	OUT.AN.1 (o 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**

4.21.9. HI.SCL - Scale maximum

Acronym	Scrolling message	Submenu	Attributes
HI.SCL	OUT.AN.1 (o OUT.AN.2) HIGH LIMIT ANALOG OUTPUT	OUT.AN	R W

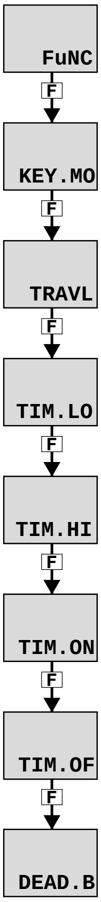
The parameter shows and sets the scale maximum, which corresponds to minimum output value in voltage or current.
Each time you set the power control output on parameter FuNC, the parameter value is forced to 1000.
The scale limit is ignored if the output is assigned to an MFB output (or calculated directly by an MFB).

Unit of measurement: Scale points of quantity assigned to analog output.

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

4.22. 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



	Parameter	Pag.
FuNC	Defining valve function	150
KEY.MO	Enabling valve operation with keys	150
TRAVL	Valve actuator travel time	150
TIM.LO	Minimum power change for valve drive	150
TIM.HI	Impulse mode setpoint	151
TIM.ON	Minimum valve impulse time or ON time in impulse mode	151
TIM.OF	OFF time in impulse mode	151
DEAD.B	Deadzone symmetrical to setpoint	151

4.22.1. 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

4.22.2. 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

4.22.3. 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**

4.22.4. 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 224.

Unit of measurement: % di TRAVL

Options: **0.0...25.0**

4.22.5. 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 224.

Unit of measurement: % di TRAVL

Options: **0.0...100.0**

4.22.6. 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**

4.22.7. 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: % di TRAVL

Options: **0.0...100.0**

4.22.8. DEAD.B - Deadzone symmetrical to setpoint

Acronym	Scrolling message	Submenu	Attributes
DEAD.B	DEAD ZONE	VALVE	R W

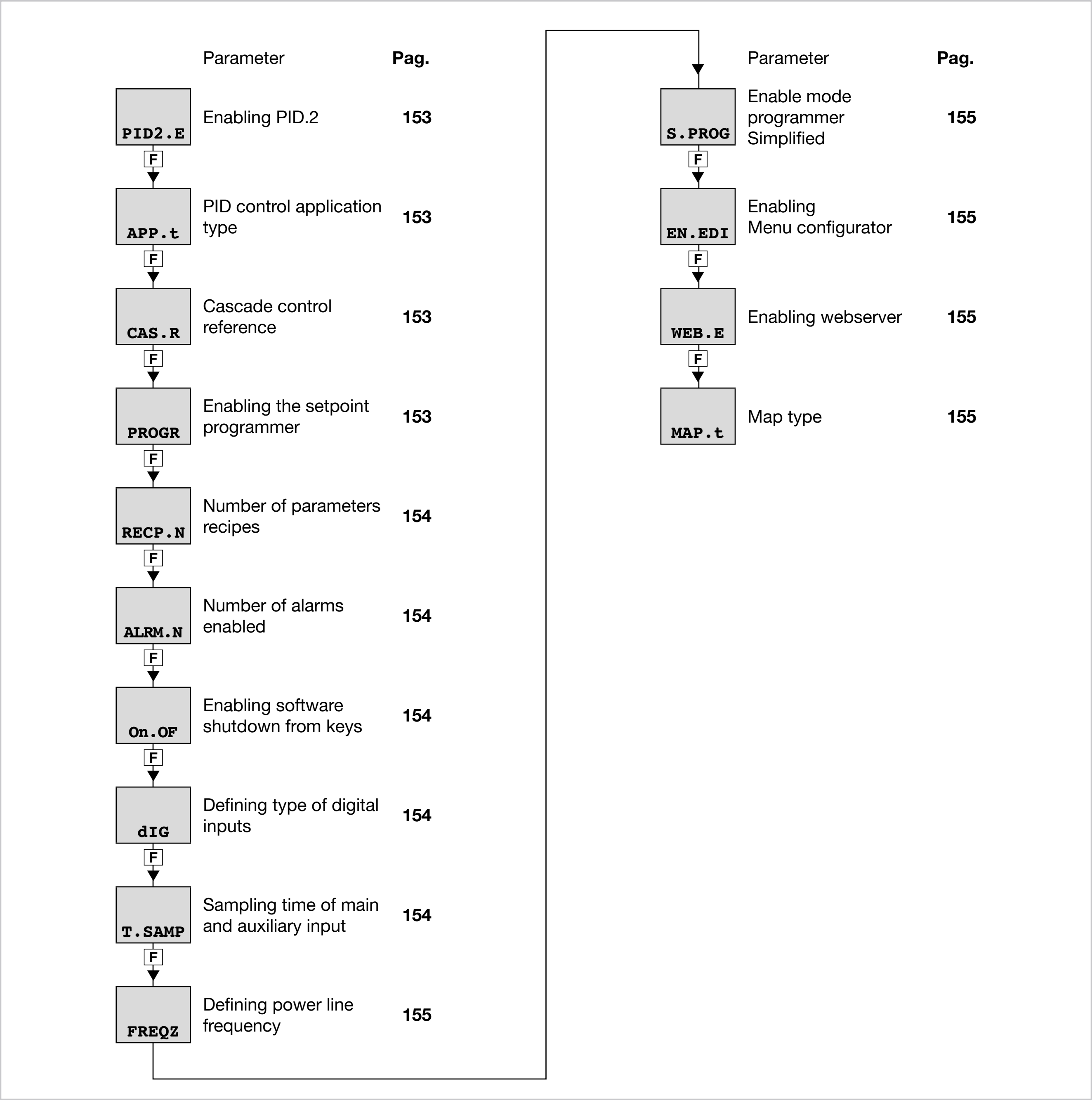
The parameter shows and sets a band symmetrical to the setpoint. If PV is in this band, valve activity and the related integral action is stopped.
It prevents frequent corrections of the valve position, with consequent electromechanical stress, following small changes in the value of the PV.

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

Options: **0.0...25.0**

4.23. Submenu EN.FUN - Configuration of enablings

Acronym	Scrolling message	Password	Description
EN.FUN	ENABLE FUNCTIONS	Level 2	Lets you configure other controller functions.



	Parameter	Pag.
PID2.E	Enabling PID.2	153
APP.t	PID control application type	153
CAS.R	Cascade control reference	153
PROGR	Enabling the setpoint programmer	153
RECP.N	Number of parameters recipes	154
ALRM.N	Number of alarms enabled	154
On.OF	Enabling software shutdown from keys	154
dIG	Defining type of digital inputs	154
T.SAMP	Sampling time of main and auxiliary input	154
FREQZ	Defining power line frequency	155

	Parameter	Pag.
S.PROG	Enable mode programmer Simplified	155
EN.EDI	Enabling Menu configurator	155
WEB.E	Enabling webserver	155
MAP.t	Map type	155

4.23.1. 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

4.23.2. 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.

4.23.3. 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

4.23.4. 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

4.23.5. 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**

4.23.6. 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**

4.23.7. ON.OF - Enabling software shutdown from keys

Acronym	Scrolling message	Submenu	Attributes
On.OF	SOFTWARE ON/OFF ENABLE	EN.FUN	R W

The parameter shows and determines whether controller software can be shut down using keys.
The software ON-OFF function is explained in detail in paragraph “5.8. Switching the software on/off” on page 207.
The function for starting up controller software with the F key always remains enabled.
In the case of the programmer, the software shutdown option at the end of the programme End=OFF is not affected by this parameter.
In the case of timers, the software shutdown option at the end of the count End=OFF is not affected by this parameter.
In the case of the calendar, the timed software shutdown option is not affected by this parameter.

Unit of measurement: -

Options:
ENABL = Controller software shutdown with keys is enabled
DISAB = Controller software shutdown with keys is disabled

4.23.8. 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

4.23.9. 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

4.23.10. 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

4.23.11. S.PROG - Enabling Simplified Programming mode

Acronym	Scrolling message	Submenu	Attributes
S.PROG	SIMPLIFIED PROGRAMMER MODE	EN.FUN	R W

This parameter shows and sets enabling of Simplified Programming mode.

Unit of measurement: -

Options:
OFF = Simplified Programming Mode disabled
On = Simplified Programming Mode enabled

4.23.12. EN.EDI - Enabling Editor configurator Menu

Acronym	Scrolling message	Submenu	Attributes
EN.EDI	ENABLE EDITOR CONFIGURATOR	EN.FUN	R W

This parameter shows and sets enabling in the set-up of the editor on the tools menu.

Unit of measurement: -

Options:
OFF = Menu Configurator disabled
On = Menu Configurator enabled

4.23.13. WEB.E - Enabling webserver mode

Acronym	Scrolling message	Submenu	Attributes
WEB.E	WEBSERVER ENABLE	EN.FUN	R W

This parameter shows and sets enabling of webserver mode.

Unit of measurement: -

Options:
OFF = Webserver mode disabled
On = Webserver mode enabled

4.23.14. MAP.T - Map type

Acronimo	Messaggio a scorrimento	Submenu	Attributi
MAP.t	MAP TYPE	EN.FUN	R

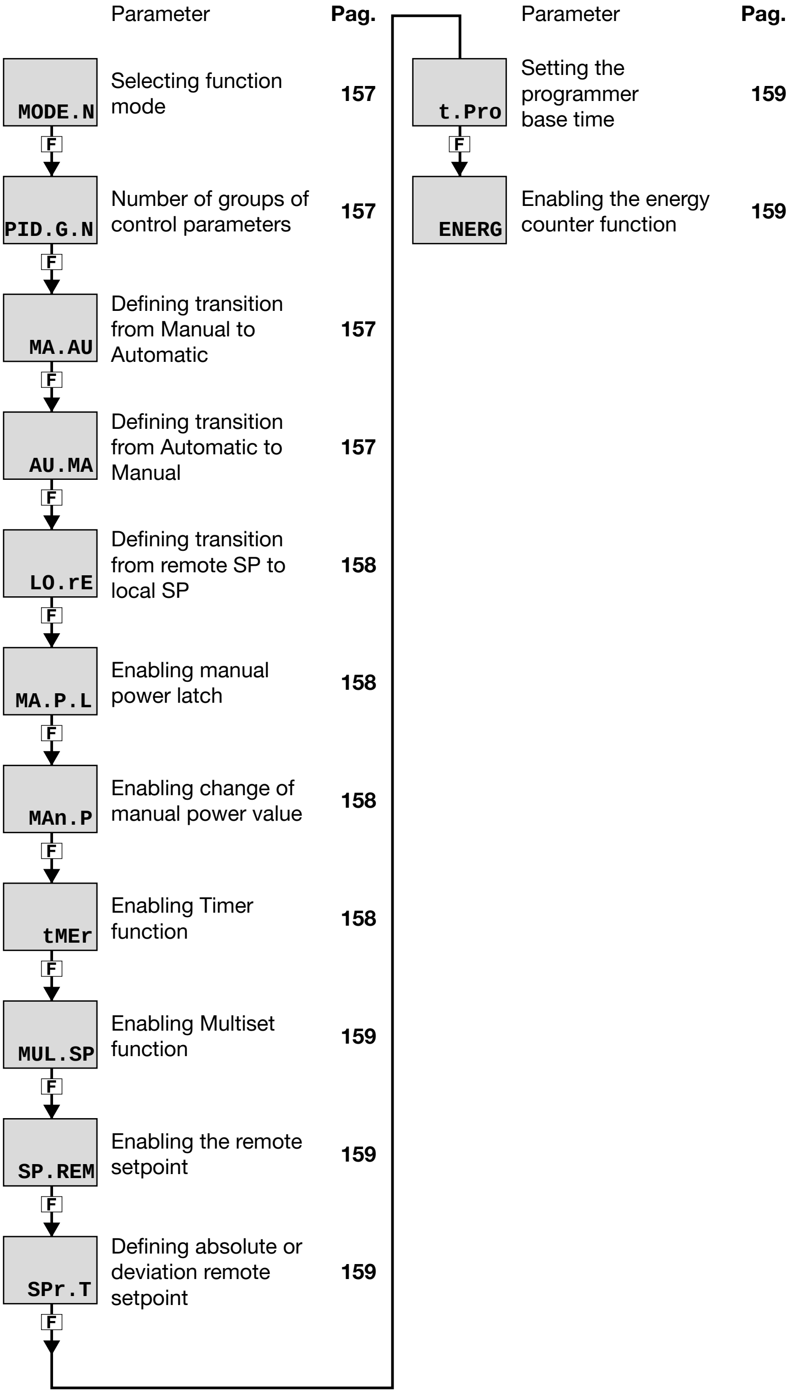
The parameter shows and sets the type of Modbus memory map to be used.
The parameter appears if the RS485 Modbus RTU or Ethernet Modbus TCP option is present.

Unità di misura: -

Opzioni:
STAND = Standard map
US+ST = User map + standard map

4.24. Submenu MODE - Configuring functioning mode

Acronym	Scrolling message	Password	Description
MODE	FUNCTION MODE MANAGER	Level 2	Lets you configure the controller’s functioning mode.



4.24.1. 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)

4.24.2. PID.G.N - Number of groups of control parameters

Acronym	Scrolling message	Submenu	Attributes
PID.G.N	MODE.1 (o 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**

4.24.3. MA.AU - Defining transition from Manual to Automatic

Acronym	Scrolling message	Submenu	Attributes
MA.AU	MODE.1 (o 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

4.24.4. AU.MA - Defining transition from Automatic to Manual

Acronym	Scrolling message	Submenu	Attributes
AU.MA	MODE.1 (o 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

4.24.5. LO.RE - Defining transition from remote SP to local SP

Acronym	Scrolling message	Submenu	Attributes
LO.rE	MODE.1 (o 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

4.24.6. MA.P.L - Enabling manual power latch

Acronym	Scrolling message	Submenu	Attributes
MA.P.L	MODE.1 (o 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

4.24.7. MAN.P - Enabling change of manual power value

Acronym	Scrolling message	Submenu	Attributes
MAn.P	MODE.1 (o 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

4.24.8. TMER - Enabling Timer function

Acronym	Scrolling message	Submenu	Attributes
tMEr	MODE.1 (o 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 212.

Unit of measurement: -

Options:
OFF = Timer disabled
ON.SEC = Timer enabled with time base Seconds
ON.MIN = enabled with time base Minutes

4.24.9. MUL.SP - Enabling Multiset function

Acronym	Scrolling message	Submenu	Attributes
MUL.SP	MODE.1 (o 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 214.

Unit of measurement: -

Options:
OFF = Multiset disabled
On = Multiset enabled

4.24.10. SP.REM - Enabling the remote setpoint

Acronym	Scrolling message	Submenu	Attributes
SP.REM	MODE.1 (o 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

4.24.11. SPR.T - Defining absolute or deviation remote setpoint

Acronym	Scrolling message	Submenu	Attributes
SPr.t	MODE.1 (o 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

4.24.12. T.PRO - Setting the programmer base time

Acronym	Scrolling message	Submenu	Attributes
t.Pro	MODE.1 (o 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 = e time calculated in minutes:seconds

4.24.13. ENERG - Enabling the energy counter function

Acronym	Scrolling message	Submenu	Attributes
ENERG	MODE.1 (o MODE.2) ENERGY COUNTER ENABLE	MODE	R W

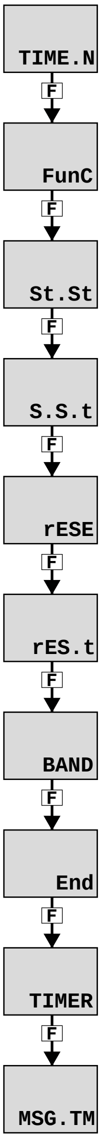
The parameter shows and sets enabling of the energy counter function.
The Energy Counter function is explained in detail in paragraph "5.15. Energy counter" on page 228.

Unit of measurement: -

Options:
OFF = Energy counter disabled
On = Energy counter enabled

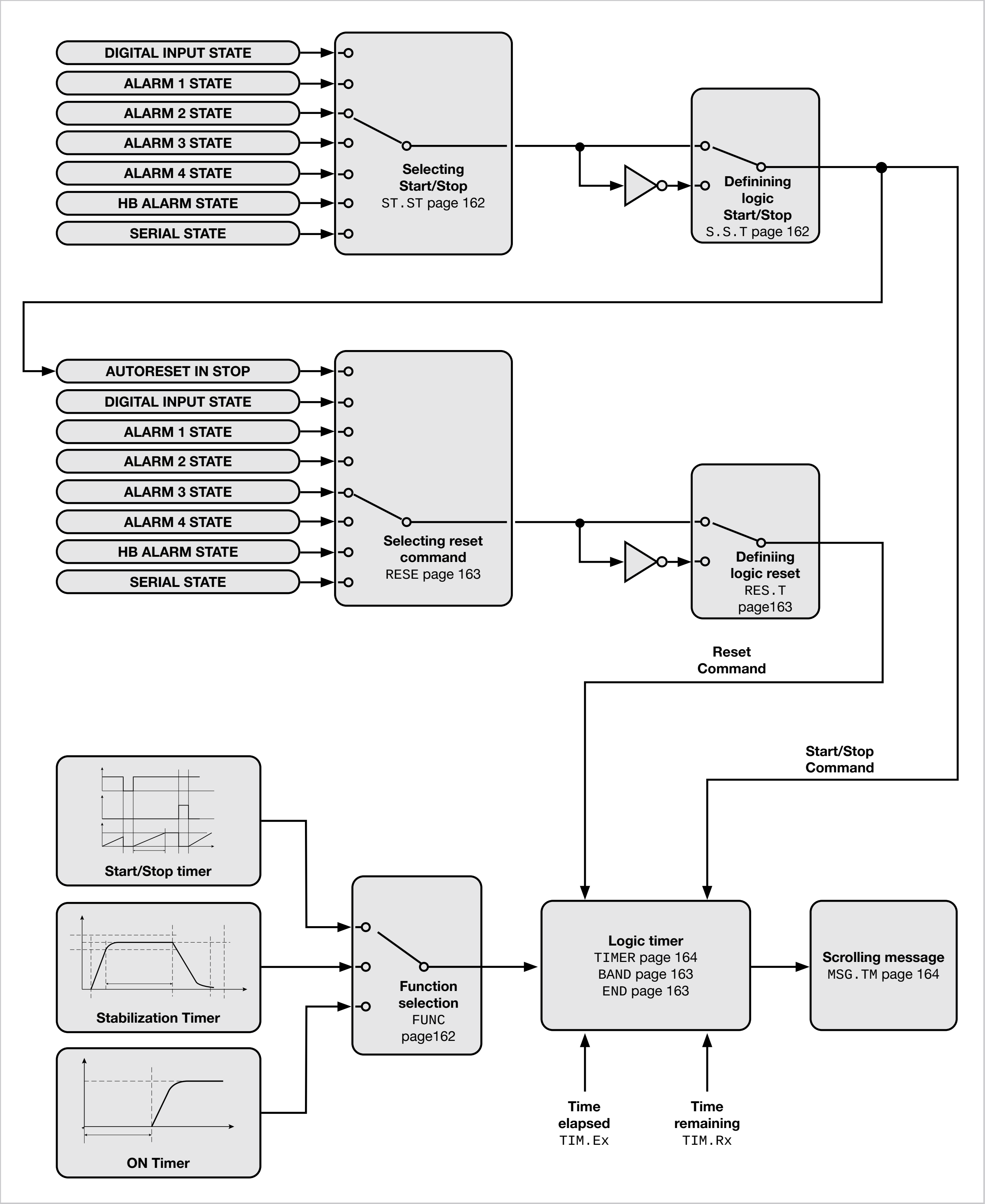
4.25. Submenu TIMER - Configurazione parametri timer

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.



Parameter	Pag.
Selecting timer	**162**
Selecting timer function	**162**
Selecting the Start/ Stop timer command	**162**
Defining the Start/Stop timer command logic	**162**
Selecting the Reset timer command	**163**
Defining the Reset timer command logic	**163**
Timer count band	**163**
Selecting the function activated at end of count	**163**
Timer value	**164**
Selection of the message associated with the end of counting	**164**

4.25.1. Functional diagram



4.25.2. 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**

4.25.3. FUNC - Selecting Timer function mode

Acronym	Scrolling message	Submenu	Attributes
FunC	TIMER.1 (o 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 212.

Unit of measurement: -

Options:
ST.STP = Start/Stop Timer
STABL = Stabilization Timer
SWITC = Power-on Timer

4.25.4. ST.ST - Selecting the Start/Stop timer command

Acronym	Scrolling message	Submenu	Attributes
St.St	TIMER.1 (o 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 alarm HB
SERIA = From serial

4.25.5. S.S.T - Defining the Start/Stop timer command logic

Acronym	Scrolling message	Submenu	Attributes
S.S.t	TIMER.1 (o 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

4.25.6. RESE - Selecting the Reset timer command

Acronym	Scrolling message	Submenu	Attributes
rESE	TIMER.1 (o 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 alarm HB
SERIA = From serial

4.25.7. RES.T - Defining the timer reset command logic

Acronym	Scrolling message	Submenu	Attributes
rES.t	TIMER.1 (o 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

4.25.8. BAND - Band for timer count

Acronym	Scrolling message	Submenu	Attributes
BAND	TIMER.1 (o 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**

4.25.9. END - Selecting the function activated at end of count

Acronym	Scrolling message	Submenu	Attributes
End	TIMER.1 (o 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

4.25.10. TIMER - Timer value

Acronym	Scrolling message	Submenu	Attributes
TIMER	TIMER.1 (o 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**

4.25.11. MSG.TM - Selecting message assigned to end of count

Acronym	Scrolling message	Submenu	Attributes
MSG.TM	TIMER.1 (o TIMER.2) MSG NUMBER WHEN TIMER OVER	TIMER	R W

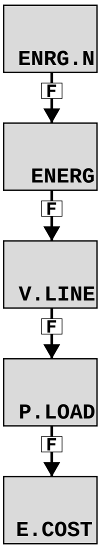
The parameter shows and sets the number of the message assigned to end of count condition of the timer, i.e. the scrolled message seen on the display.
For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 44.
If the parameter is set to “0” no message will be 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)

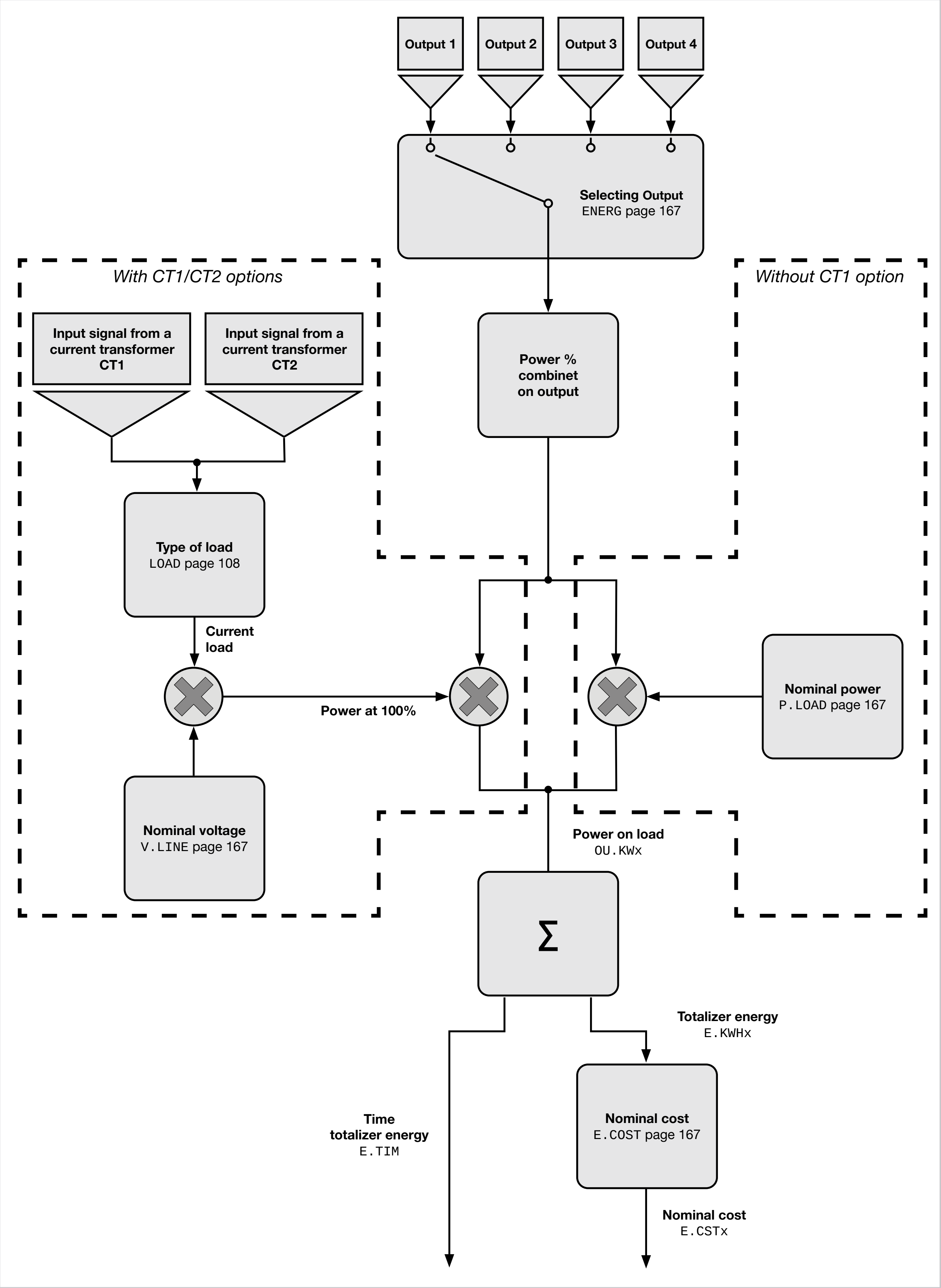
4.26. Submenu ENERG - Configuring energy counter parameters

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.



	Pararmeter	Pag.
ENRG.N	Selecting energy counter	**167**
ENERG	Selecting the output for energy calculation	**167**
V.LINE	Nominal line voltage	**167**
P.LOAD	Nominal power of load	**167**
E.COST	Nominal cost per kWh	**167**

4.26.1. Functional diagram



4.26.2. 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**

4.26.3. ENERG - Selecting the output for energy calculation

Acronym	Scrolling message	Submenu	Attributes
ENERG	ENERG.1 (o 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

4.26.4. V.LINE - Nominal line voltage

Acronym	Scrolling message	Submenu	Attributes
V.LINE	ENERG.1 (o 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**

4.26.5. P.LOAD - Nominal power of load

Acronym	Scrolling message	Submenu	Attributes
P.LOAD	ENERG.1 (o 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**

4.26.6. E.COST - Nominal cost per kWh

Acronym	Scrolling message	Submenu	Attributes
E.COST	ENERG.1 (o ENERG.2) ENERGY COST / KWH	ENERG	R W

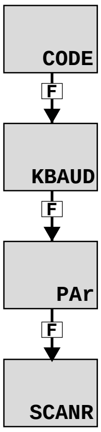
The parameter shows and sets the nominal cost of energy per kWh.

Unit of measurement: Number

Options: **0.000...9.999**

4.27. Submenu SERIA - Configuring serial communication

Acronym	Scrolling message	Password	Description
SERIA	SERIAL COMMUNICATION CONFIG	Level 2	Lets you configure serial communication. The submenu appears if the RS485 Modbus RTU option or the Ethernet Modbus TCP option is present.



Parameter	Pag.
Identification code	**168**
Selecting communication speed	**168**
Security parity	**169**
Slave scan delay	**169**

4.27.1. 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.
The parameter only appears if the RS485 Modbus TCP option is available.

Unit of measurement: Number

Options: **1...247**

4.27.2. 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

4.27.3. 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

4.27.4. SCANR - Setting delay between two consecutive Modbus master with Ethernet option

Acronym	Scrolling message	Submenu	Attributes
SCANR	SCAN RATE MODBUS MASTER	SERIA	R W

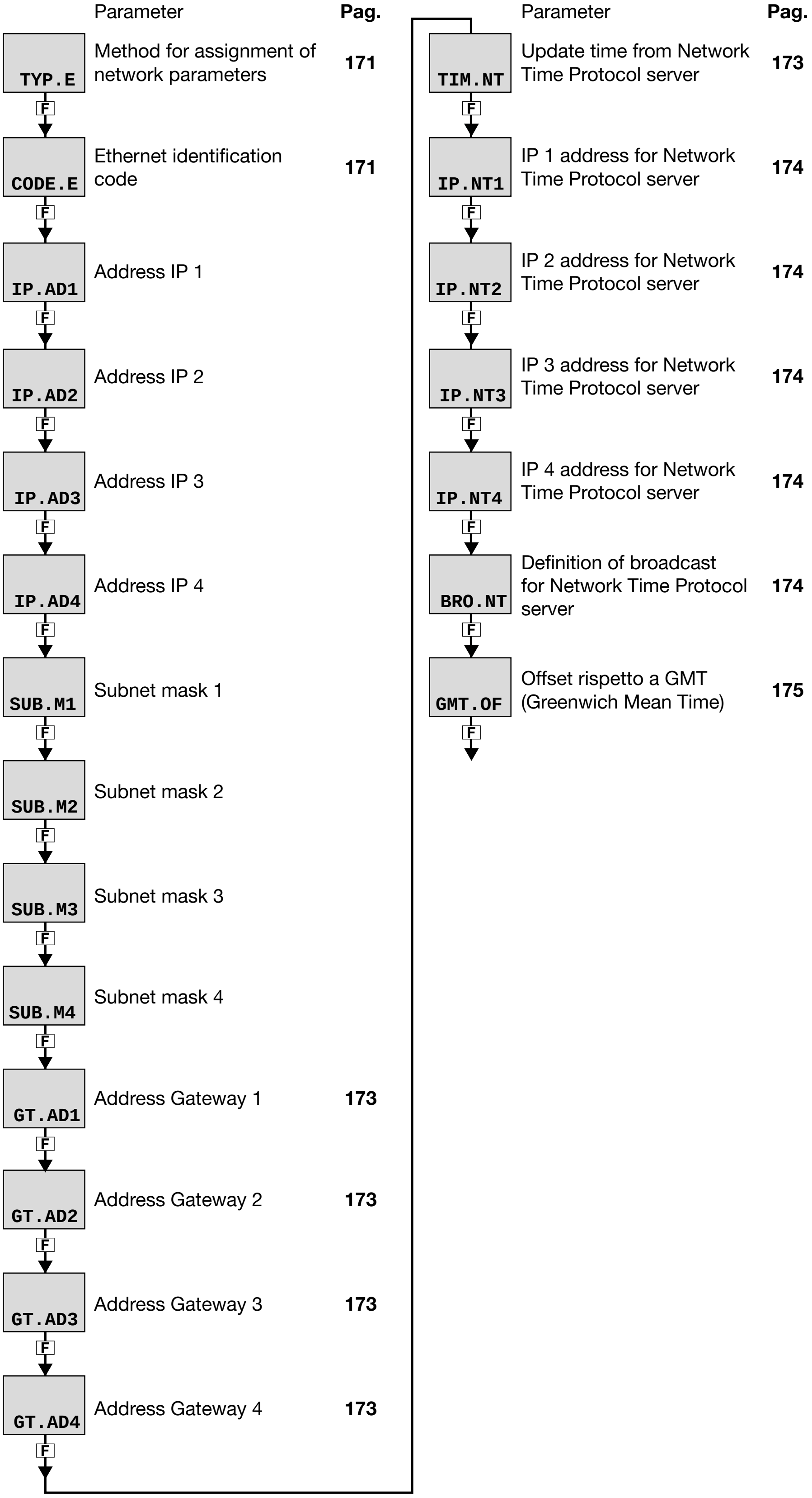
The parameter shows and sets the delay, in milliseconds, between two consecutive Modbus master communications to slave nodes connected via serial when other instrumentation is connected to the RS485 Modbus RTU via an Ethernet Modbus TCP card.
The parameter only appears if the Ethernet Modbus TCP e RS485 “bridge” option is available.

Unit of measurement: ms

Options: **0...9999**

4.28. ETHER Submenu - Ethernet parameter configuration

Acronym	Scrolling message	Password	Description
ETHER	ETHERNET COMMUNICATION CONFIG	Level 2	Permits configuration of Ethernet communication.



	Parameter	Pag.
TYP.E	Method for assignment of network parameters	171
CODE.E	Ethernet identification code	171
IP.AD1	Address IP 1	
IP.AD2	Address IP 2	
IP.AD3	Address IP 3	
IP.AD4	Address IP 4	
SUB.M1	Subnet mask 1	
SUB.M2	Subnet mask 2	
SUB.M3	Subnet mask 3	
SUB.M4	Subnet mask 4	
GT.AD1	Address Gateway 1	173
GT.AD2	Address Gateway 2	173
GT.AD3	Address Gateway 3	173
GT.AD4	Address Gateway 4	173
TIM.NT	Update time from Network Time Protocol server	173
IP.NT1	IP 1 address for Network Time Protocol server	174
IP.NT2	IP 2 address for Network Time Protocol server	174
IP.NT3	IP 3 address for Network Time Protocol server	174
IP.NT4	IP 4 address for Network Time Protocol server	174
BRO.NT	Definition of broadcast for Network Time Protocol server	174
GMT.OF	Offset rispetto a GMT (Greenwich Mean Time)	175

4.28.1. TYP.E – Network parameter assignment method

Acronym	Scrolling message	Submenu	Attributes
tyP.E	ASSIGNMENT MODE OF NETWORK PARAMETERS	ETHER	R W

This parameter shows the assignment mode of the Ethernet network's IP address, subnet mask and gateway parameters.

Unit of measurement:

Options: **FIXED** = Parameters entered manually are used
DHCP = Parameters received from the network's DHCP server are used

4.28.2. CODE.E – Ethernet identification code

Acronym	Scrolling message	Submenu	Attributes
CODE.E	INSTRUMENT ID CODE ETHERNET	ETHER	R

This parameter shows the identification code identifying the controller in an Ethernet Modbus network.

Unit of measurement: Number

Options: **1**

4.28.3. IP.AD1 – Address IP 1

Acronym	Scrolling message	Submenu	Attributes
IP.AD1	IP ADDRESS	ETHER	R W

This parameter shows the IP 1 address identifying the controller in an Ethernet network.
The parameter is the first field in the complete IP address (**xxx**.xxx.xxx.xxx).

Unit of measurement: Number
Options: **0...255**

4.28.4. IP.AD2 – Address IP 2

Acronym	Scrolling message	Submenu	Attributes
IP.AD2	IP ADDRESS	ETHER	R W

This parameter shows the IP 2 address identifying the controller in an Ethernet network.
The parameter is the first field in the complete IP address (xxx.**xxx**.xxx.xxx).

Unit of measurement: Number
Options: **0...255**

4.28.5. IP.AD3 – Address IP 3

Acronym	Scrolling message	Submenu	Attributes
IP.AD3	IP ADDRESS	ETHER	R W

This parameter shows the IP 3 address identifying the controller in an Ethernet network.
The parameter is the first field in the complete IP address (xxx.xxx.**xxx**.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.6. IP.AD4 – Address IP 4

Acronym	Scrolling message	Submenu	Attributes
IP.AD4	IP ADDRESS	ETHER	R W

This parameter shows the IP 4 address identifying the controller in an Ethernet network.
The parameter is the first field in the complete IP address (xxx.xxx.xxx.**xxx**).

Unit of measurement: Number

Options: **0...255**

4.28.7. SUB.M1 – Subnet mask 1

Acronym	Scrolling message	Submenu	Attributes
SUB.M1	SUBNET MASK	ETHER	R W

This parameter shows the Subnet mask 1 identifying the controller in an Ethernet network.
The parameter is the first field in the complete Subnet mask (**xxx**.xxx.xxx.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.8. SUB.M2 – Subnet mask 2

Acronym	Scrolling message	Submenu	Attributes
SUB.M2	SUBNET MASK	ETHER	R W

This parameter shows the Subnet mask 2 identifying the controller in an Ethernet network.
The parameter is the first field in the complete Subnet mask (xxx.**xxx**.xxx.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.9. SUB.M3 – Subnet mask 3

Acronym	Scrolling message	Submenu	Attributes
SUB.M3	SUBNET MASK	ETHER	R W

This parameter shows the Subnet mask 3 identifying the controller in an Ethernet network.
The parameter is the first field in the complete Subnet mask (xxx.xxx.**xxx**.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.10. SUB.M4 – Subnet mask 4

Acronym	Scrolling message	Submenu	Attributes
SUB.M4	SUBNET MASK	ETHER	R W

This parameter shows the Subnet mask 4 identifying the controller in an Ethernet network.
The parameter is the first field in the complete Subnet mask (xxx.xxx.xxx.**xxx**).

Unit of measurement: Number

Options: **0...255**

4.28.11. GT.AD1 – Gateway Address 1

Acronym	Scrolling message	Submenu	Attributes
GT.AD1	GATEWAY ADDRESS	ETHER	R W

This parameter shows the Gateway 1 address identifying the controller in an Ethernet network.
The parameter is the first field in the complete Gateway address (**xxx**.xxx.xxx.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.12. GT.AD2 – Gateway Address 2

Acronym	Scrolling message	Submenu	Attributes
GT.AD2	GATEWAY ADDRESS	ETHER	R W

IThis parameter shows the Gateway 2 address identifying the controller in an Ethernet network.
The parameter is the first field in the complete Gateway address(xxx.**xxx**.xxx.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.13. GT.AD3 – Gateway Address 3

Acronym	Scrolling message	Submenu	Attributes
GT.AD3	GATEWAY ADDRESS	ETHER	R W

This parameter shows the Gateway 3 address identifying the controller in an Ethernet network.
The parameter is the first field in the complete Gateway address (xxx.xxx.**xxx**.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.14. GT.AD4 – Gateway Address 4

Acronym	Scrolling message	Submenu	Attributes
SUB.M4	SUBNET MASK	ETHER	R W

This parameter shows the Gateway 4 address identifying the controller in an Ethernet network.
The parameter is the first field in the complete Gateway address (xxx.xxx.xxx.**xxx**).

Unit of measurement: Number

Options: **0...255**

4.28.15. TIM.NT – Network Time Protocol server update time

Acronym	Scrolling message	Submenu	Attributes
TIM.NT	NETWORK TIME SERVER UPDATE TIME	ETHER	R W

This parameter shows and updates the server update time for time synchronisation of the controller (Network Time Protocol).
If the parameter is 0, the automatic updating function will be disabled.

Unit of measurement: hours

Options: **0…9999**

4.28.16. IP.NT1 – IP address 1 for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
IP.NT1	NETWORK TIME SERVER IP ADDRESS	ETHER	R W

This parameter shows and updates the IP 1 address server update time for time synchronisation of the controller (Network Time Protocol)..
The parameter is the first field in the complete IP address (**xxx**.xxx.xxx.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.17. IP.NT2 – IP address 2 for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
IP.NT2	NETWORK TIME SERVER IP ADDRESS	ETHER	R W

This parameter shows and updates the IP 2 address server time for time synchronisation of the controller (Network Time Protocol).
The parameter is the first field in the complete IP address (xxx.**xxx**.xxx.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.18. IP.NT3 – IP address 3 for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
IP.NT3	NETWORK TIME SERVER IP ADDRESS	ETHER	R W

This parameter shows and updates the IP 3 address server time for time synchronisation of the controller (Network Time Protocol).
The parameter is the first field in the complete IP address (xxx.xxx.**xxx**.xxx).

Unit of measurement: Number

Options: **0...255**

4.28.19. IP.NT4 – IP address 4 for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
IP.NT4	NETWORK TIME SERVER IP ADDRESS	ETHER	R W

This parameter shows and updates the IP 4 address server time for time synchronisation of the controller (Network Time Protocol).
The parameter is the first field in the complete IP address (xxx.xxx.xxx.**xxx**).

Unit of measurement: Number

Options: **0...255**

4.28.20. BRO.NT – Broadcast definition for Network Time Protocol server

Acronym	Scrolling message	Submenu	Attributes
BRO.NT	NETWORK TIME SERVER BROADCAST	ETHER	R W

This parameter shows and updates the broadcast definition server for time synchronisation of the controller (Network Time Protocol).

Unit of measurement: -

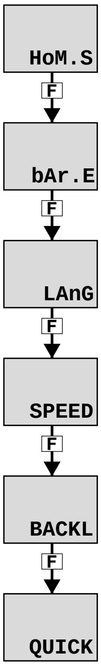
Options:
OFF = The server is on a local network
On = The server is on a public network

4.28.21. GMT.OF – Offset in relation to GMT (Greenwich Mean Time)

Acronym	Scrolling message	Submenu	Attributes
GMT.OF	GREENWICH MEAN TIME OFFSET	ETHER	R W
This parameter shows and updates the offset for time synchronisation of the GMT(Greenwich Mean Time). ***Unit of measurement***: hh.mm ***Options***: **-12.00…12.00**			

4.29. Submenu HMI - Display configurationy

Acronym	Scrolling message	Password	Description
HMI	DISPLAY CONFIG	Level 2	Lets you configure the controller’s display.



	Parameter	Pag.
HoM.S	Selecting Home page	176
bAr.E	Enable bargraph display on Home menus	177
LAnG	Selecting language for messages	177
SPEED	Message scrolling speed	178
BACKL	Backlighting level	178
QUICK	Quick configuration menu	178

4.29.1. 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

4.29.2. BAR.E - Enable bargraph display on Home menus

Acronym	Scrolling message	Submenu	Attributes
bAr.E	BARGRAPH ENABLE	HMI	R W

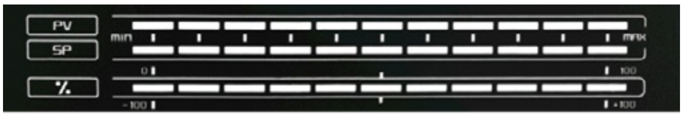
The parameter enables the display of bargraphs. The parameter appears only if the controller is 1650 or 1850.

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

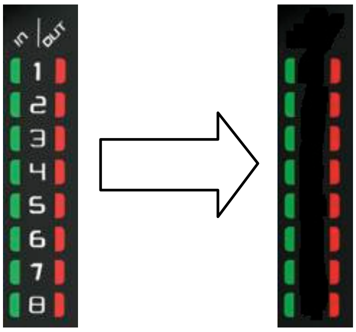
ON.3LY = Enables display of bargraph bAr.3 only

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.



4.29.3. 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

4.29.4. 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)

4.29.5. 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)

4.29.6. QUICK - Quick configuration menu

Acronym	Scrolling message	Submenu	Attributes
QUICK	QUICK CONFIG ENABLE	HMI	R W

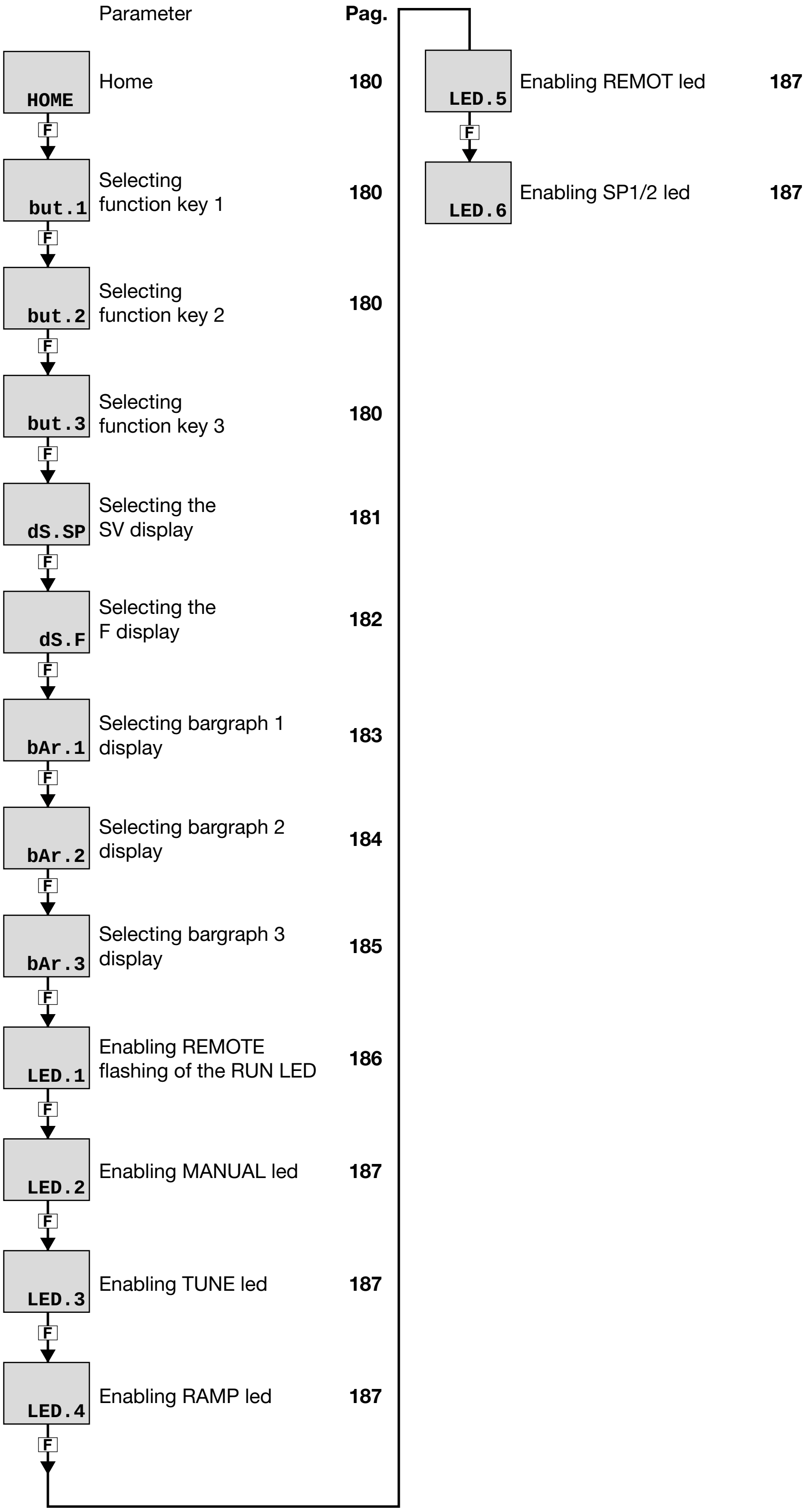
The parameter shows and sets enabling of the quick configuration menu.
The parameter appears only if the optional auxiliary input is NOT available.
At first power-on, the fast configuration menu is displayed on the controller model but is disabled for programmer or valve models.

Unit of measurement: -

Options:
OFF = Quick configuration menu is not displayed
On = Quick configuration menu is displayed

4.30. 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.



4.30.1. 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**

4.30.2. BUT.1 - Selecting function key 1

Acronym	Scrolling message	Submenu	Attributes
but.1	HOME.1 (o 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

if model is CT1+CT2:
CAL.HB = Alarm calibration HB

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

In the case of a valve model with auxiliary input, linear custom type FUnC=VALV.P function, and with one output set as V.OPEN and one output set as V.CLOS:
VALV.P = auxiliary input configuration

4.30.3. BUT.2 - Selecting function key 2

Acronym	Scrolling message	Submenu	Attributes
but.2	HOME.1 (o HOME.2) KEY FUNCTION	HOME	R W

The parameter shows and sets the function assigned to key 2 (L/R) of the 1850 controller.

Unit of measurement: -

Options: As per **but.1**

4.30.4. BUT.3 - Selecting function key 3

Acronym	Scrolling message	Submenu	Attributes
but.3	HOME.1 (o HOME.2) KEY FUNCTION	HOME	R W

The parameter shows and sets the function assigned to key 3 (✱) of the 1850 controller.

Unit of measurement: -

Options: As per **but.1**

4.30.5. DS.SP - Selecting the SV display

Acronym	Scrolling message	Submenu	Attributes
dS.SP	HOME.1 (o 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.R.TIM = Program total theoretical residual time (only for model 850)

IN1 = Main input

if model with auxiliar input 2
IN3 = Auxiliar input 2

if model with Modbus Master serial and Master parameter configured:
MAS.01 = Master value 1
MAS.02 = Master value 2
MAS.03 = Master value 3
MAS.04 = Master value 4
MAS.05 = Master value 5
MAS.06 = Master value 6
MAS.07 = Master value 7
MAS.08 = Master value 8
MAS.09 = Master value 9

MAS.10 = Master value 10
MAS.11 = Master value 11
MAS.12 = Master value 12
MAS.13 = Master value 13
MAS.14 = Master value 14
MAS.15 = Master value 15
MAS.16 = Master value 16
MAS.17 = Master value 17
MAS.18 = Master value 18
MAS.19 = Master value 19
MAS.20 = Master value 20

4.30.6. DS.F - Selecting the F display

Acronym	Scrolling message	Submenu	Attributes
dS.F	HOME.1 (o 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 = 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.R.TIM = Program total theoretical residual time (only for model 850)

IN1 = Main input

if model with auxiliar input 2
IN3 = Auxiliar input 2

if model with Modbus Master serial and Master parameter configured:
MAS.01 = Master value 1
MAS.02 = Master value 2
MAS.03 = Master value 3
MAS.04 = Master value 4
MAS.05 = Master value 5

MAS.06 = Master value 6
MAS.07 = Master value 7
MAS.08 = Master value 8
MAS.09 = Master value 9
MAS.10 = Master value 10
MAS.11 = Master value 11
MAS.12 = Master value 12
MAS.13 = Master value 13
MAS.14 = Master value 14
MAS.15 = Master value 15
MAS.16 = Master value 16
MAS.17 = Master value 17
MAS.18 = Master value 18
MAS.19 = Master value 19
MAS.20 = Master value 20

4.30.7. BAR.1 - Selecting bargraph 1 display

Acronym	Scrolling message	Submenu	Attributes
bAr.1	HOME.1 (o 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 (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

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 (only for model 850)

P.R.TIM = Program total theoretical residual time (only for model 850)

IN1 = Main input

if model with auxiliar input 2
IN3 = Auxiliar input 2

if model with Modbus Master serial and Master parameter configured:
MAS.01 = Master value 1
MAS.02 = Master value 2
MAS.03 = Master value 3
MAS.04 = Master value 4
MAS.05 = Master value 5
MAS.06 = Master value 6
MAS.07 = Master value 7
MAS.08 = Master value 8
MAS.09 = Master value 9
MAS.10 = Master value 10
MAS.11 = Master value 11
MAS.12 = Master value 12
MAS.13 = Master value 13
MAS.14 = Master value 14
MAS.15 = Master value 15
MAS.16 = Master value 16
MAS.17 = Master value 17
MAS.18 = Master value 18
MAS.19 = Master value 19
MAS.20 = Master value 20

4.30.8. BAR.2 - Selecting bargraph 2 display

Acronym	Scrolling message	Submenu	Attributes
bAr.2	HOME.1 (o 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)

f the 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 the model with CT1+CT2:
CURR1 = Current input CT1
CURR2 = Current input CT2

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

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

if model with auxiliar input 2
IN3 = Auxiliar input 2

if model with Modbus Master serial and Master parameter configured:
MAS.01 = Master value 1
MAS.02 = Master value 2
MAS.03 = Master value 3
MAS.04 = Master value 4
MAS.05 = Master value 5
MAS.06 = Master value 6
MAS.07 = Master value 7
MAS.08 = Master value 8
MAS.09 = Master value 9
MAS.10 = Master value 10
MAS.11 = Master value 11
MAS.12 = Master value 12
MAS.13 = Master value 13
MAS.14 = Master value 14
MAS.15 = Master value 15
MAS.16 = Master value 16
MAS.17 = Master value 17
MAS.18 = Master value 18
MAS.19 = Master value 19
MAS.20 = Master value 20

4.30.9. BAR.3 - Selecting bargraph 3 display

Acronym	Scrolling message	Submenu	Attributes
bAr.3	HOME.1 (o HOME.2) BARGRAPH FUNCTION	HOME	R W

e 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) (LED SP on)
SSP = Active setpoint (LED SP on)

if the 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 the model with CT1+CT2:
CURR1 = Current input CT1
CURR2 = Current input CT2

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

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

if model with auxiliar input 2
IN3 = Auxiliar input 2

if model with Modbus Master serial and Master parameter configured:
MAS.01 = Master value 1
MAS.02 = Master value 2
MAS.03 = Master value 3
MAS.04 = Master value 4
MAS.05 = Master value 5
MAS.06 = Master value 6
MAS.07 = Master value 7
MAS.08 = Master value 8
MAS.09 = Master value 9
MAS.10 = Master value 10
MAS.11 = Master value 11
MAS.12 = Master value 12
MAS.13 = Master value 13
MAS.14 = Master value 14
MAS.15 = Master value 15
MAS.16 = Master value 16
MAS.17 = Master value 17
MAS.18 = Master value 18
MAS.19 = Master value 19
MAS.20 = Master value 20

4.30.10. LED.1 - Enable RUN led flashing

Acronym	Scrolling message	Submenu	Attributes
LED.1	ENABLE 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

4.30.11. LED.2 – Enabling MANUAL led

Acronym	Scrolling message	Submenu	Attributes
LED.2	ENABLE OF MANUAL LED	HOME	R W

The parameter enables and disables the MANUAL led

Unit of measurement: -

Options:
OFF = Disables the MANUAL led
On = Enables the MANUAL led

4.30.12. LED.3 – Enabling TUNE led

Acronym	Scrolling message	Submenu	Attributes
LED.3	ENABLE OF TUNE LED	HOME	R W

The parameter enables and disables the TUNE led

Unit of measurement: -

Options:
OFF = Disables the TUNE led
On = Enables the TUNE led

4.30.13. LED.4 – Enabling RAMP led

Acronym	Scrolling message	Submenu	Attributes
LED.4	ENABLE OF RAMP LED	HOME	R W

The parameter enables and disables the RAMP led, only if Setpoint Gradient management is active.

Unit of measurement: -

Options:
OFF = Disables the RAMP ledw
On = Enables the RAMP led

4.30.14. LED.5 – Enabling REMOTE led

Acronym	Scrolling message	Submenu	Attributes
LED.5	ENABLE OF REMOTE LED	HOME	R W

The parameter enables and disables the REMOTE led

Unit of measurement: -

Options:
OFF = Disables the REMOT led
On = Enables the REMOT led

4.30.15. LED.6 – Enabling SP1/2 led

Acronym	Scrolling message	Submenu	Attributes
LED.6	ENABLE OF SP12 LED	HOME	R W

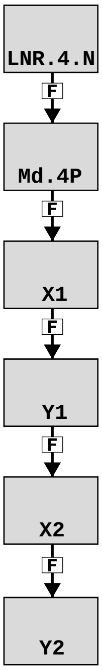
The parameter enables and disables the SP1/2 led

Unit of measurement: -

Options:
OFF = Disables the SP1/2 led
On = Enables the SP1/2 led

4.31. Submenu LNR.4.P - Permits configuration of custom linearisation 4 points

Acronimo	Messaggio a scorrimento	Password d’accesso	Descrizione
LNR.4.P	CUSTOM 4 POINT LINEARIZATION NUMBER	Level 2	Permits configuration of custom linearisation parameters to 4 points. The submenu is visible only if custom linearisation has been enabled in the configuration of the main input, the auxiliary input or the third input.



Parameter	Pag.
Selection of custom 4-point linearisation	188
Selection of custom 4-point linearisation mode	188
Abscissa of the first 4-point linearisation point	189
Ordinate of the first 4-point linearisation point	189
Abscissa of the second 4-point linearisation point	189
Ordinate of the second 4-point linearisation point	189

4.31.1. LNR.4.N - Selection of custom 4-point linearisation

Acronym	Scrolling message	Submenu	Attributes
LNR.4.N	CUSTOM 4 POINT LINEARIZATION NUMBER	LIN.4.P	R W

The parameter shows and sets the identify Number of custom linearisation to configure.

Unit of measurement: Number

Options: **1...3**

4.31.2. Md.4P - Selection of custom 4-point linearisation mode

Acronym	Scrolling message	Submenu	Attributes
Md.4P	LIN.4.P.1 (0 LIN.4-P.2 o LIN.4-P.3) CUSTOM 4 POINT LINEARIZATION MODE	LIN.4.P	RW

The parameter allows you to set the insertion mode of the linearization points.

Unit of measurement: -

Options: **RD.ADJ** = manual point entry mode (redirects to paragraph “5.4. 4-point input correction” on page 202
CALIB = point entry method via calibrator reading (redirects to paragraph “5.4. 4-point input correction” on page 202

4.31.3. X1 - Selection of custom 4-point linearisation mode

Acronym	Scrolling message	Submenu	Attributes
X1	LIN.4.P.1 (0 LIN.4.P.2 o LIN.4.P.3) CUSTOM 4 POINT LINEARIZATION STEP	LIN.4.P	RW

This parameter permits setting of the abscissa of the first linearisation point in the four points. If the RD.ADJ option is active (parameter Md.4P), an editable value will be displayed, while if the CALIB option is active, the value of the corresponding input is displayed, which may be edited with a calibrator or related instrument.

Unit of measurement: Points on the scale

Options: -1999..9999

4.31.4. Y1- Ordinate of the first 4-point linearisation point

Acronym	Scrolling message	Submenu	Attributes
Y1	LIN.4.P.1 (0 LIN.4.P.2 o LIN.4.P.3) CUSTOM 4 POINT LINEARIZATION STEP	LIN.4.P	RW

This parameter may be used to set the ordinate of the first 4-point linearisation point.

Unit of measurement: Points on the scale

Options: -1999..9999

4.31.5. X2 - Abscissa of second linearisation point

Acronym	Scrolling message	Submenu	Attributes
X2	LIN.4.P.1 (0 LIN.4.P.2 o LIN.4.P.3) CUSTOM 4 POINT LINEARIZATION STEP	LIN.4.P	RW

IThis parameter permits setting of the abscissa of the first of the four linearisation points. If the RD.ADJ option is active (parameter Md.4P), an editable value will be displayed, while if the CALIB option is active, the value of the corresponding input is displayed, which may be edited with a calibrator or related instrument.

Unit of measurement: Points on the scale

Options: -1999..9999

4.31.6. Y2- Ordinate of the second 4-point linearisation point

Acronym	Scrolling message	Submenu	Attributes
Y2	LIN.4.P.1 (0 LIN.4.P.2 o LIN.4.P.3) CUSTOM 4 POINT LINEARIZATION STEP	LIN.4.P	RW

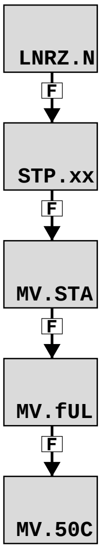
This parameter may be used to set the ordinate of the second 4-point linearisation point.

Unit of measurement: Points on the scale

Options: -1999..9999

4.32. 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.



Parameter	**Pag.**
Selecting custom linearization	**190**
VValue of step xx	**190**
Setting mV at start of scale	**191**
Setting mV at full scale	**191**
Setting mV at temperature of 50°C	**191**

4.32.1. 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**

4.32.2. STP.xx - Value of step xx

Acronym	Scrolling message	Submenu	Attributes
STP.xx	LINRZ.1 (o 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**

4.32.3. MV.STA - Setting mV at start of scale

Acronym	Scrolling message	Submenu	Attributes
MV.STA	LINRZ.1 (o 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 “4.10.6. LIN - Selecting linearization type” on page 91)

Unit of measurement: mV

Options: **-19.99...99.99**

4.32.4. MV.FUL - Setting mV at full scale

Acronym	Scrolling message	Submenu	Attributes
MV.FUL	LINRZ.1 (o 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 “4.10.6. LIN - Selecting linearization type” on page 91)

Unit of measurement: mV

Options: **MV.STA + 1...99.99**

4.32.5. MV.50c - Setting mV at temperature of 50 °C

Acronym	Scrolling message	Submenu	Attributes
MV.50C	LINRZ.1 (o LINRZ.2) MV AT 50 ‘C	LINRZ	R W

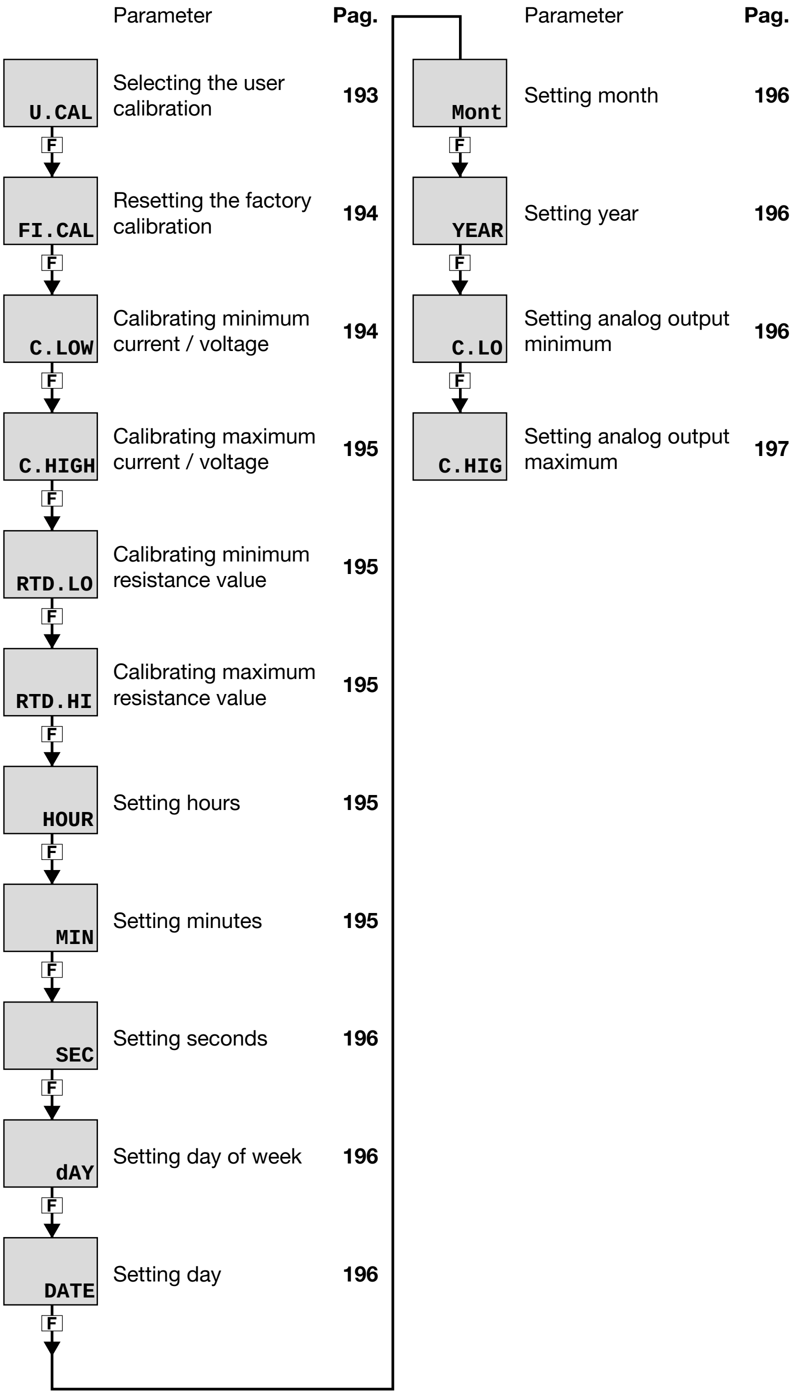
The parameter shows and sets the value in millivolts at 50°C if the input is a thermocouple.
The parameter appears only if 32-step linearization has been selected (see paragraph “4.10.6. LIN - Selecting linearization type” on page 91)

Unit of measurement: mV

Options: **-1.999...9.999**

4.33. Submenu US.CAL - Calibrazioni utente

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.



4.33.1. 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

if model with CT1+CT2:
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 button F is pressed (set in the OUT parameter in sub-menu AL.HB) and the transition to phase 2 takes place.
Phase 2: CALIBRATION RUNNING message, the percent current value (set in parameter THR.PE in sub-menu AL.HB) is calculated and saved in the LOW. ON parameter when button F is pressed (F), and the transition to phase 3 takes place.
Phase 3: END CALIBRATION message, calibration ends when button F is pressed.

.

RTC = Real Time Clock setting
if the model has no buffer battery, 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

if energy counting mode is enabled in MODE.1:
ENRG1 = Reset energy count 1 (totalizer EN.KWH1 and time EN.TIM1)

P.DAYS = Reset partial day count

if the main input is custom:
I.MAIN = Calibration of custom main input (selected with parameter TYPE on INPUT.1 menu)*

if the model with auxiliary input is custom:
I.AUX = Calibration of custom auxiliar input (selected with parameter TYPE on INPUT.2 menu)*

if model with CT1+CT2:
I.CT1 = CT1 input custom calibration
I.CT2 = CT2 input custom calibration

if the model with analogue output OUT.A1 is custom:
OUT.A1 = Calibration of custom retransmission output (selected with parameter t.o.A1 on OUT.AN menu)

if the model with analogue output OUT.A2 is custom:
OUT.A2 = Calibration of custom retransmission output (selected with parameter t.o.A2 on OUT.AN menu)

if the model with continuous output (OUT.A for 850 - OUT.C for 1650-1850) is custom:
OUT.C = Calibration of custom continuous output

if energy counting mode is enabled in MODE.2:
ENRG2 = Reset energy count 2 (E.KWH2 totalizer and E.TIM2 time)

CY.RES = Reset switching cycle count shown in INDG.S *in the case of a valve model with auxiliary input, linear custom type FUnC=VALV.P function, and with one output set as V.OPEN and one output set as V.CLOS input configuration:*

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 ⏻

if model has custom auxiliary input 2:

I.AUX2 = Calibration of custom auxiliary input 2 (selected with TYPE parameter in INPUT.3 menu).

* is the case of C.RTD, linearisation with 32 broken LIN=32STP must be enabled

4.33.2. 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.AUX2, I.CT1, I.CT2, OUT.A1,
OUT.A2 or OUT.C.

Unit of measurement: -

Options:
no = Keep user calibration
YES = Reset factory calibration

4.33.3. 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: -

4.33.4. C.HIGH - Calibrating maximum 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 maximum scale value to the selected input;
- press the F key to acquire the calibration value.

Unit of measurement: -

Options: -

4.33.5. 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: -

4.33.6. 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: -

4.33.7. 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: Ore

Options: **0...23**

4.33.8. 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**

4.33.9. 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**

4.33.10. 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**

4.33.11. 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**

4.33.12. 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: Mese

Options: **JANUA...DECEM**

4.33.13. 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: Anno

Options: **0...99**

4.33.14. 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**

4.33.15. 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**

4.34. PASC0 - Setting level password 0

Acronym	Scrolling message	Password	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**

4.35. PASC1 - Setting level 1 password

Acronym	Scrolling message	Password	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**

4.36. PASC2 - Setting level 2 password

Acronym	Scrolling message	Password	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**

4.37. FI.CFG - Entering the reset code

Acronym	Scrolling message	Password	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" on page 44.

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 temforature.

Each branch of the circuit is protected by a fuse.

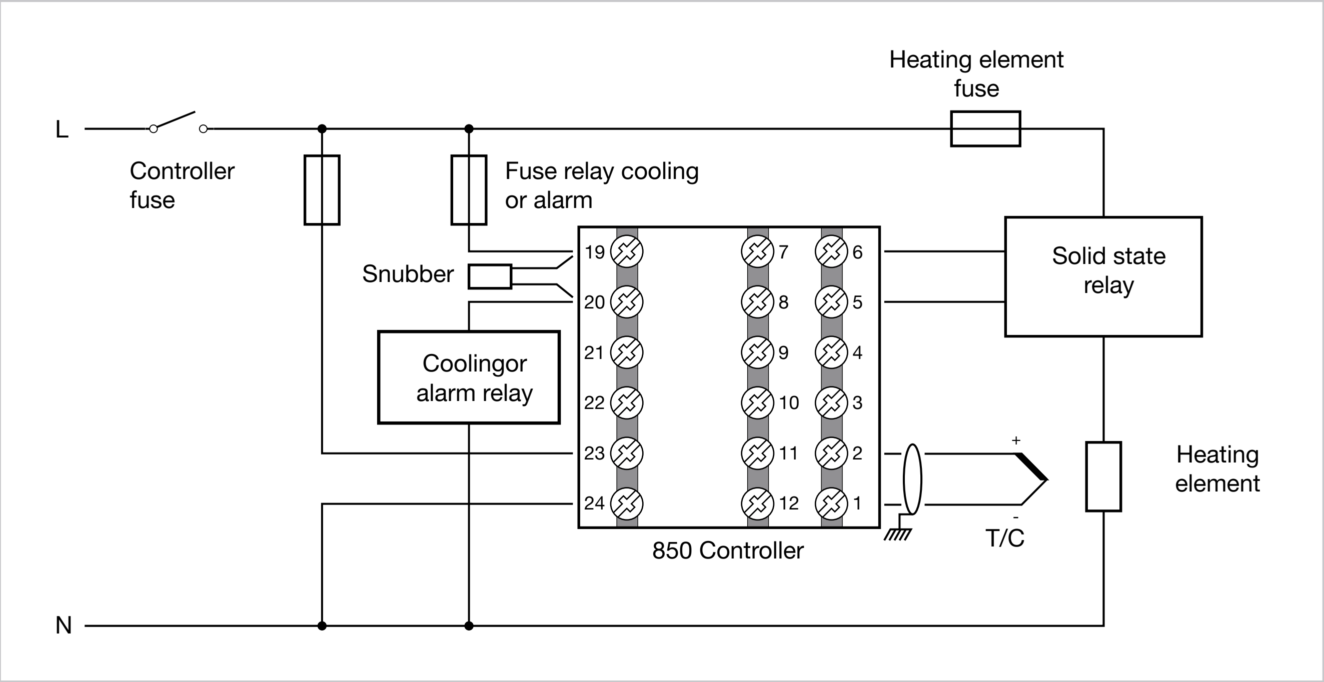
The cooling or alarm relay is protected by a snubber.

The following diagram shows the various connections.

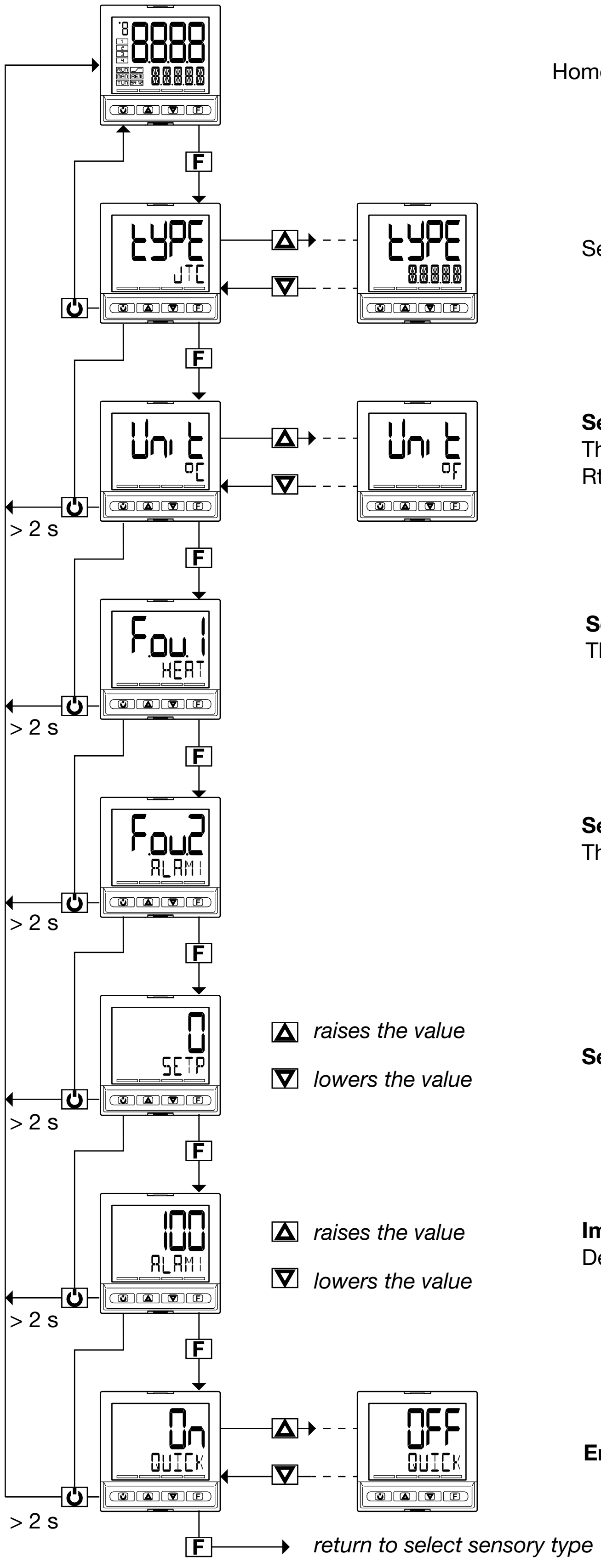
One switch can control more than one controller.

- With Quick Configuration you set:
- sensor type (TC);
- unit of measurement of temforature (°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 temforature to be maintained (SETP);
- the temforature 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

Selezione unità di misura
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

Impostazione Allarme 1
Default: assoluto di massima diretto

Enable/disable quick configuration

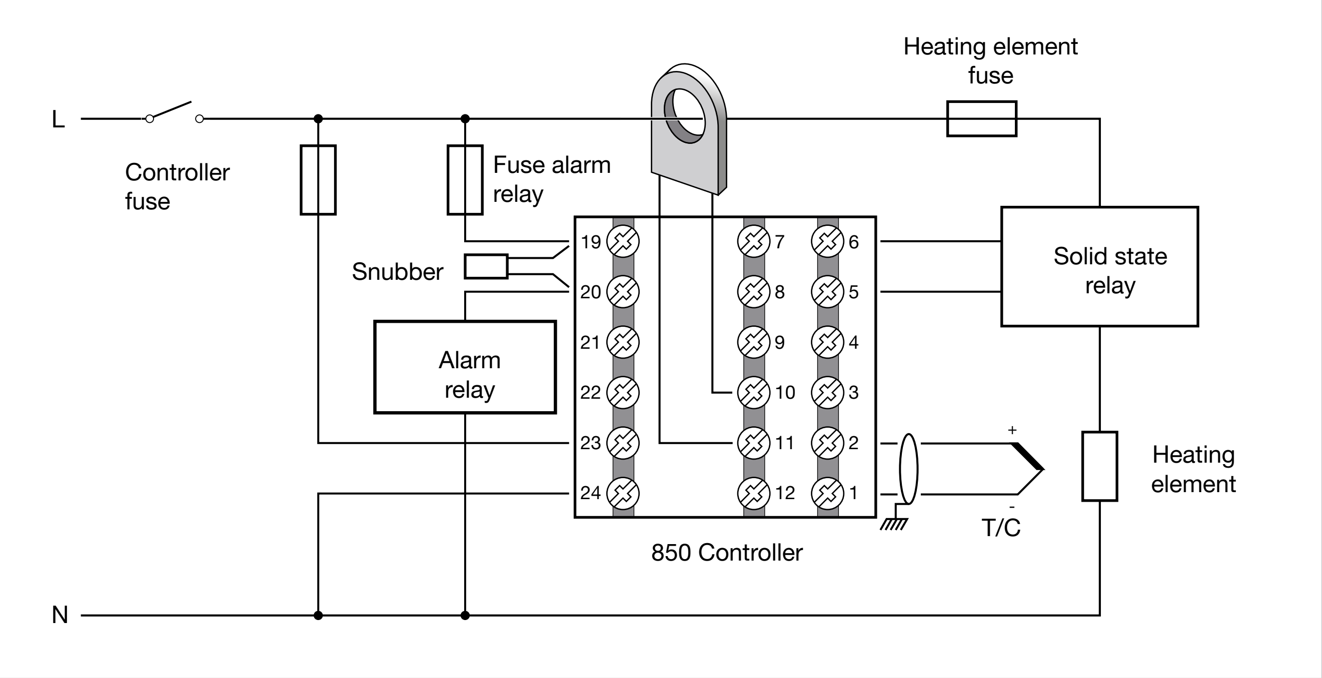
5.2. Heating control and current (CT) application

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 temforature.
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.

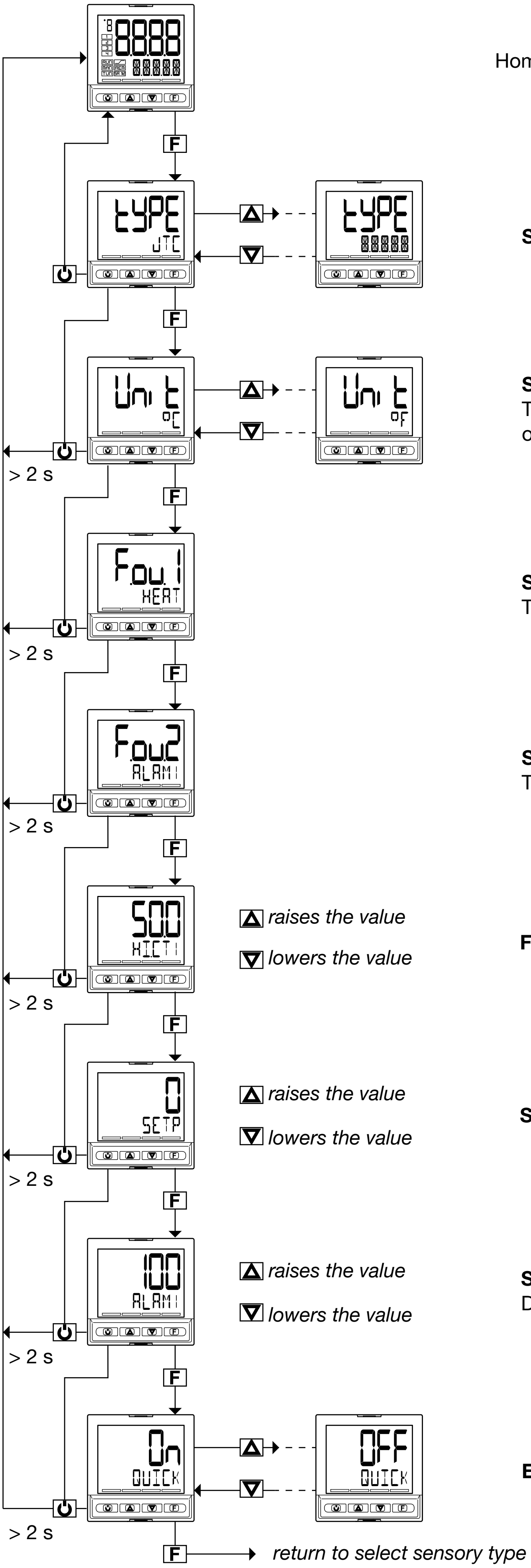
With Quick Configuration you set:

- sensor type (TC);
- unit of measurement of temforature (°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 temforature to be maintained (SETP);
- the temforature value that trips the alarm (ALRM1).

5.2.1. Connection diagram



5.2.2. 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.

Full-scale of the CT1 current transformer

Setting Setpoint

Setting Alarm 1
Default: direct maximum absolute

Enable/disable quick configuration

5.3. Ingresso ausiliario

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: X1, X2, Y1 e Y2.
To enable the function, set parameter Lin at 4.POIN (INPUT.1 menu for main input or INPUT.2 for auxiliary input or INPUT.3 for auxiliary input 2).

The limitations are:
- X2 must always be larger than X1;
- X2-X1 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 or INPUT.3 for auxiliary input 2).

When using this function on linear scales (60mV, 1V, 5V, 10 V, 20 mA), you may invert the scale.

The four values may be set in the LIN.4.P menu, as indicated by the Md.4P parameter:
- RD.ADJ: the user manually selects the parameters in order, X1, Y1, X2, and Y2, and edits the value appearing on the display
- CALIB: for values X1 and X2, no value is shown that can be increased or decreased, but the input is directly shown (which can be modified with a calibrator)

If you set the second option (**Md.4P="CALIB"**) and press F,

1) The calibrator reading will appear. Now press F
    1.1) the calibrator reading will be assigned to the first of the four parameters X1 (=value of the abscissa of the first linearisation point)
    1.2) display the second parameter X2 (=value of the ordinate of the first linearisation point)
2) When the second parameter Y2 (=value of the ordinate of the first linearisation point) appears on the screen, use the UP\DOWN buttons to determine the value to be assigned to this parameter. Once you have set the value, press F to assign a value to the second parameter Y2 (=value of the ordinate of the first linearisation point) and then go on to the next parameter
3) Enter the new parameter and display the calibrator reading. Now press F
    3.1) to assign the calibrator reading to the third of the four parameters X2 (=value of the abscissa of the second linearisation point)
    3.2) it will pass (go on to) display the fourth parameter Y2(=value of the ordinate of the second linearisation point)
4) when the fourth parameter Y2 (=value of the ordinate of the second linearisation point) appears, use the UP\DOWN buttons to determine the value to be assigned to this parameter. Once you have set the value, press F to assign a value to the fourth parameter Y2 (=value of the ordinate of the second linearisation point) and then exit the menu

In both modes, the effective input will appear on the instrument's display, net of the OFFSET parameter and of correction of the 4 points (in the LIN.4.P menu, you need not disable 4-point linearisation or reset the OF.SCLx parameter, if it has been entered).

Example of typical use
A customer's weights and measures division foriodically checks linearisation, which has been set to represent a straight line passing through two points (200, 210),(600, 700)
In this case, proceed as follows:

a) Set the calibrator to 200°C
b) Go into the new LIN.4.P menu and set parameter Md.4P to "CALIB"
c) Read the Inx parameter at 200°C and confirm the first parameter by pressing "F"
d) In the second parameter, set 210°C and press "F"
e) Set the calibrator to 600°C
f) Press "F" to confirm the reading of 600°C on the INx parameter shown
g) Set the fourth parameter to 700°C and press "F"
h) Exit the menu, and the PV will appear with 4-point correction set

Note1: you do NOT need to remember to disable linearisation during the procedure
Note2: you do NOT need to remember to reset the offset

WARNING: if the FILT.D parameter is not 0, when you return to the home page, you may find a PV value different from the one set (as the INx parameter is displayed during the procedure, and not PVx). In the LINRZ menu, on the other hand, the PV for compatibility with the old linearisation method appears.

5.4.1. Entering linearisation parameters with the LINRZ menu

The four values may be entered directly in the LINRZ menu, as follows:

- X1 = STP.00
- X2 = STP.01
- Y1 = STP.02
- Y2 = STP.03

In this case, however, you must obligatorily reset the OF.SCLx parameter if it is included in the INPUT menu, and disable 4-point linearisation so that the LINRZ menu displays the input value without the contribution of offset and linearisation.

Example

Selection of Pt100 input with Lin = 4.POIN to obtain an RTD sensor with 4-point input correctio.

Pt100 input with:

- Lin = 4.POIN (Pt100 natural scale -200...850),
- DEC.P = 0
- LO.SCL = 0
- HI.SCL = 400

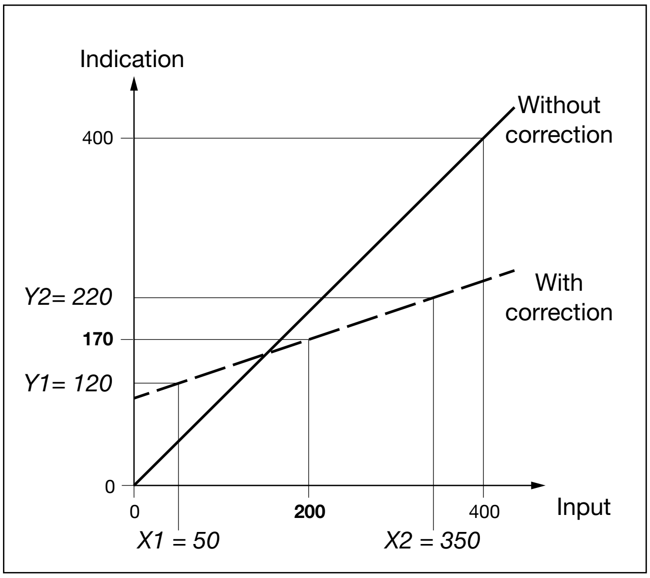


Figure 20 - Diagram of 4-point input correction, for the example (Pt100 input)

The reference points on the real curve (input) are:

- X1 = STP.00 = 50,
- X2 = STP.01 = 350,

X2-X1 = 300, which is 85 more (10% of 850).

The corresponding points on the corrected curve (indication) are:

- Y1 = STP.02 = 120,
- Y2 = STP.03 = 220.

With the corrected curve, an input value of 200 is displayed as 170.

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

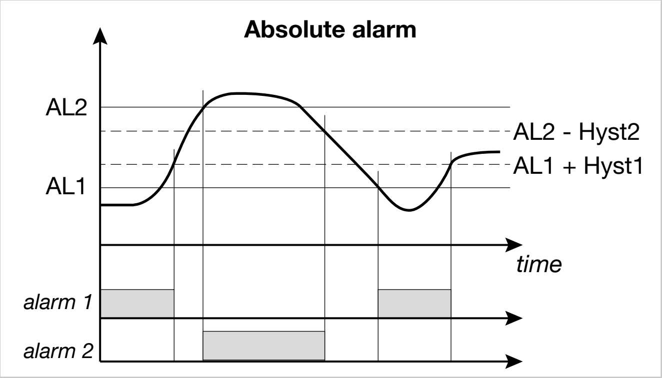
5.6. Alarms

5.6.1. AL1...AL4 Generic alarms

Generic alarms AL1…AL4 can be mainly 4 types,
as described below:

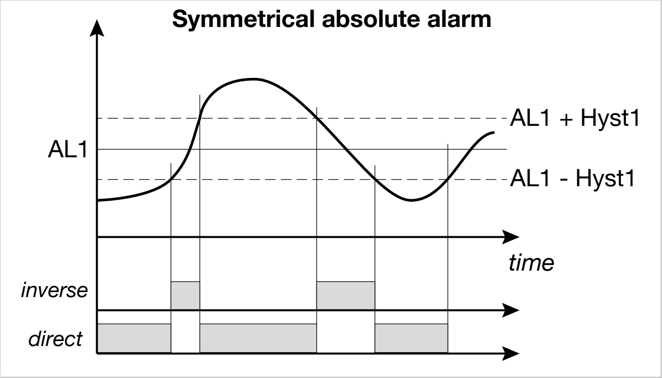
Absolute alarm

AL1 inverse and absolute, AL2 direct and absolute.
Two alarm setpoints, AL1 (lower setpoint) and AL2 (upfor 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.



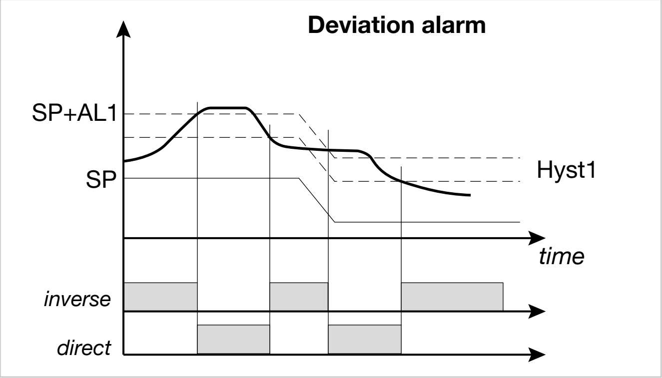
Symmetrical absolute alarm

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.



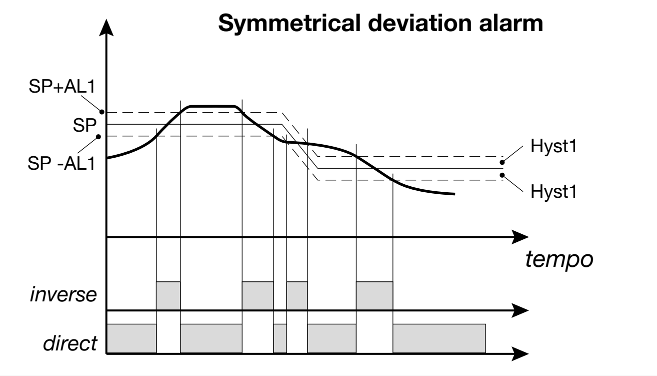
Deviation alarm

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).

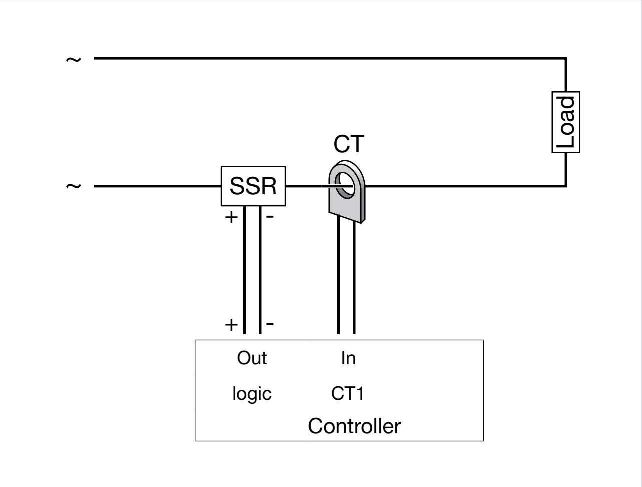


Figure 21 - HB alarm with monophase load

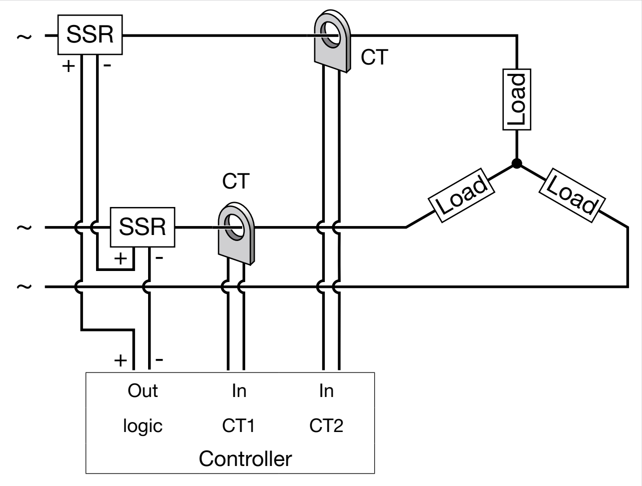


Figure 22 - AHB alarm with 3-phase star load without Neutral

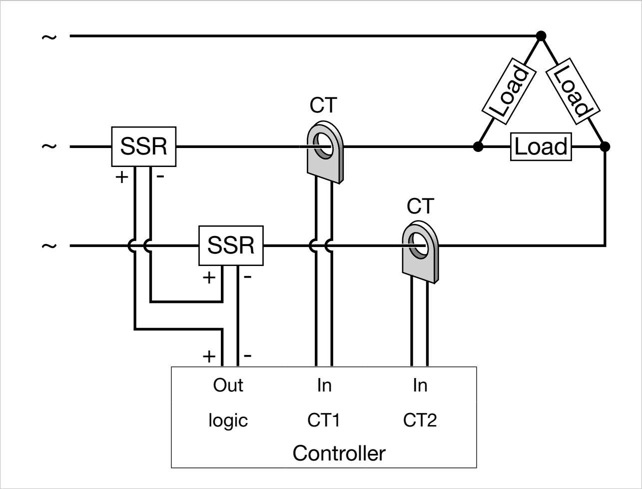


Figure 23 - HB alarm with 3-phase delta load

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 or 1650, but.1 or but.2 or but.3 for model 850): to acquire the current value, the automatic or manual power must be > 10%; press the key to confirm the current forcent 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.
Setting the parameter LBA.TM = 0 disables the LBA function. The value of the variable is enabled only outside the proportional band.
When the alarm is active, power is limited to the value LBA. PW and the PV display flashes.
The alarm condition is reset if the temperature increases in heating mode (if it decreases in cooling mode), by setting AL.ACK = On in the user configuration menu, or by switching to Manual mode.

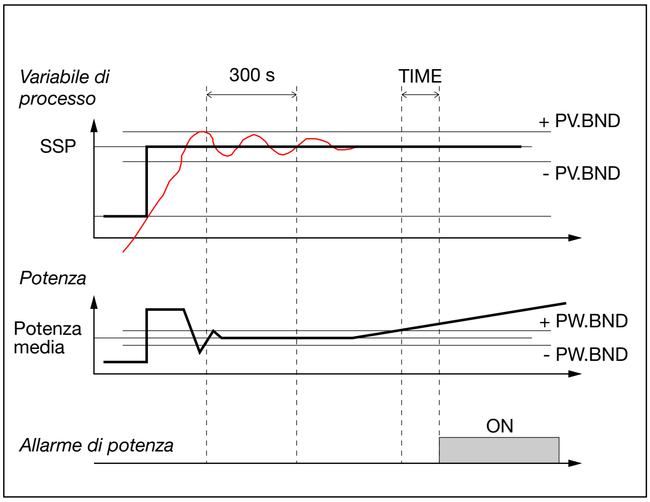
The LBA alarm is disabled in the presence of ON-OFF control (of heating, cooling, and heating/cooling).
In the presence of PID control with ON-OFF heating or cooling, LBA.PW can only be set for
the PID part.

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 forcentage 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 **Δ** 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 forcentage 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 forsistence 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

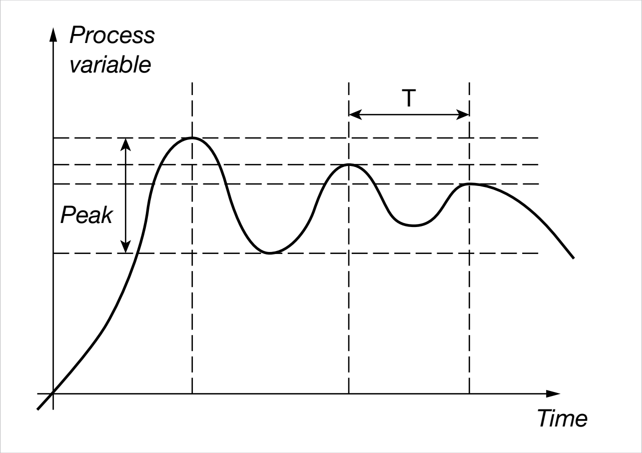
Manual tuning is done as follows:

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 forsists, 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, temforature) must be the one measurable at zero power (room temforature).

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 temforature 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:

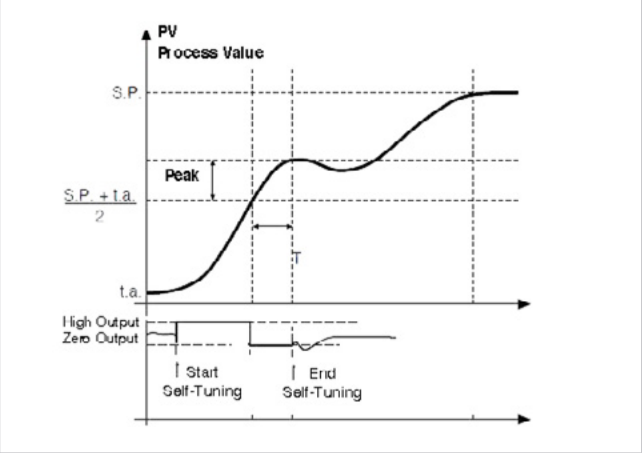
- proportional band,
- integral and derivative times, calculated for the current action (heat or cool). In case of dual action (heat + cool) the parameters are calculated automatically separately for the two actions.

Active tuning condition is signaled on the display by an LED.

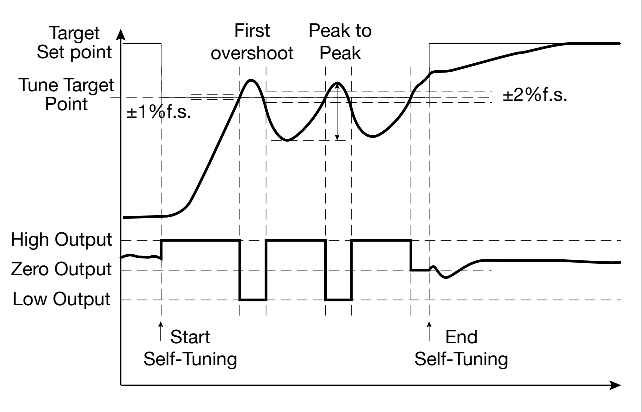
⚠ **Attention!** Self-Tuning is not applicable with an ON/OFF control.

Notes

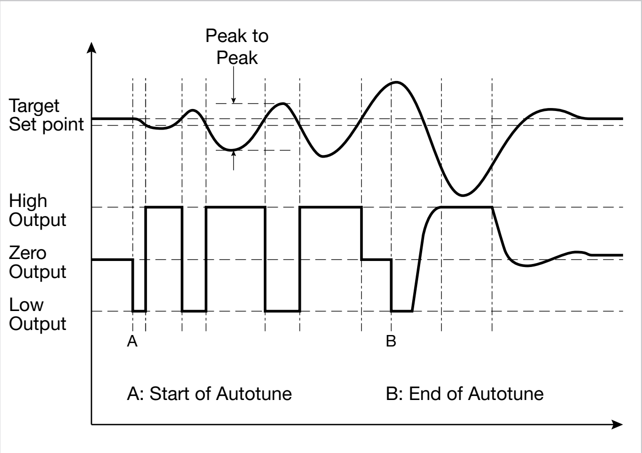
- For the programmer model, if Self-Tuning starts when the controller is powered-on, the program is in STOP.
- If SP-PV deviation is less than 0.3% f.s., Self-Tuning switches to “one shot” Auto-Tuning; otherwise it calculates a point at 75% of deviation around which to start “one shot” Auto-Tuning, considering 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.

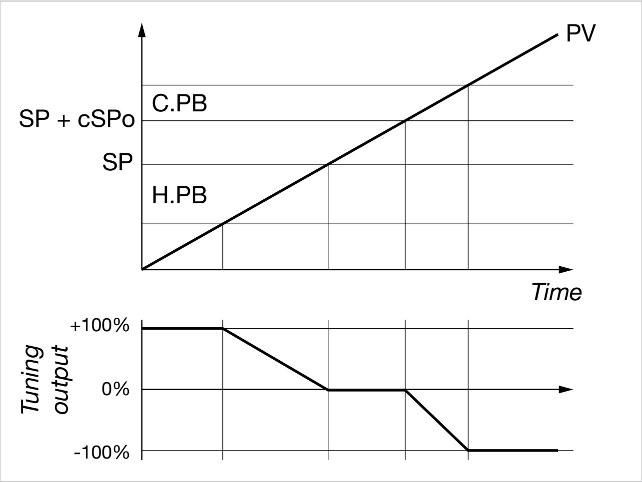
The calculated parameters are latched. It starts manually via digital input or via Tuning key after an undershoot/overshoot. It starts automatically (with error band of 0.5%) when the PV-SP error goes beyond the set band (programmable at 0.5%,1%, 2%, 4% of full-scale).

⚠ **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.

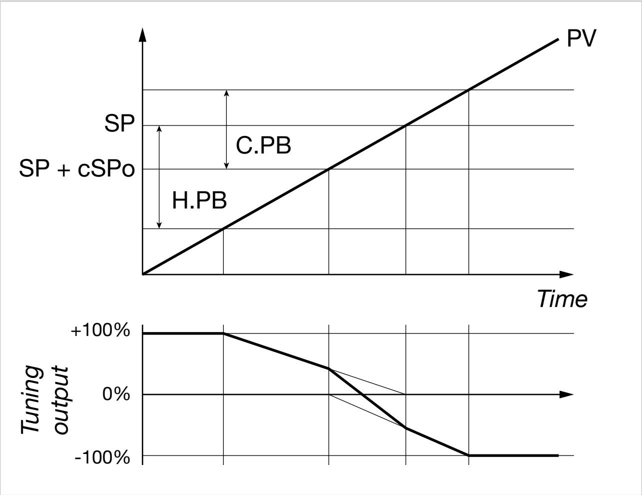
5.10.5. Examples of tuning

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 suforimposed 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

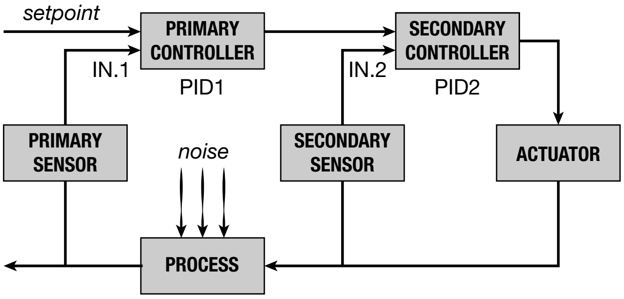
there will be the following cool data:
- C.PB = 12.5
- C.IT = 4.00
- C.DT = 1.00

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 forform 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 temforature 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 208)
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 208”5.10.3. Self-Tuning” on page 208).

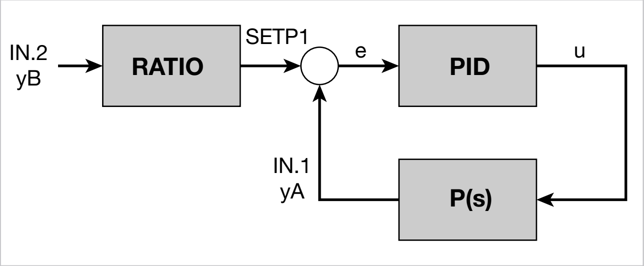
5.10.8. Ratio control

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 (or IN3) (range from 0.01 to 99.99), i.e.

RATIO = IN1 / IN2 (or IN3)

This ratio is automatically calculated in the transition from manual -> automatic and can be changed on the User menu.

The PID control controls IN1 so that it is always:

IN1 = SETP1 = IN2 (or IN3) 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 function (FUNC in INPUT.2) or the auxiliary input 2 function (FUNC in INPUT.3) as the reference for the ratio controller for PID.1.

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**.

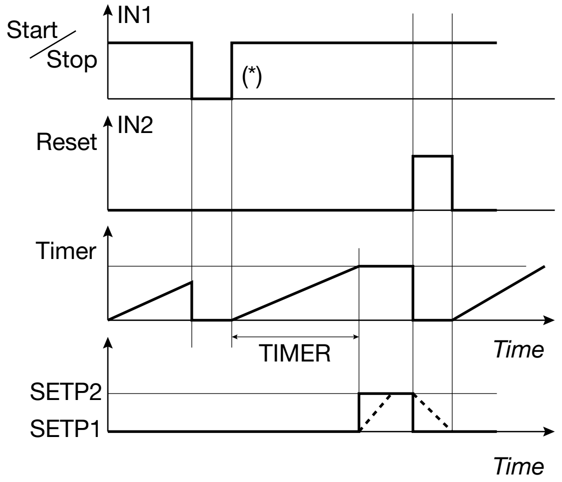
The following diagrams show timer behavior when enabling from digital input and from alarm are used.

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).

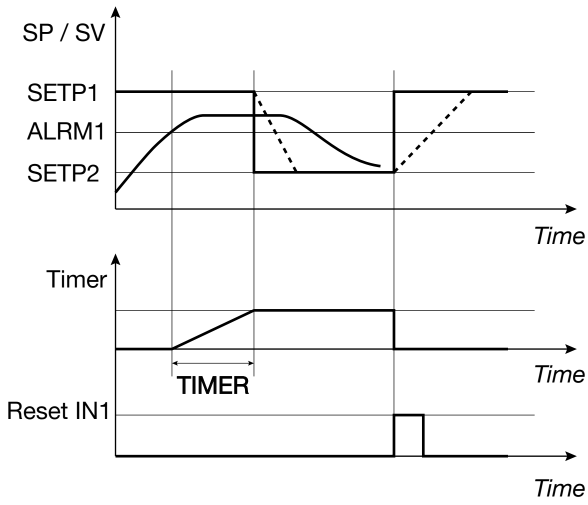
MSP1/MSP2 are managed only if the Multiset function is enabled, as indicated in the End parameter

Enabling from digital input



(*) if the auto reset function is enabled

Enabling from alarm



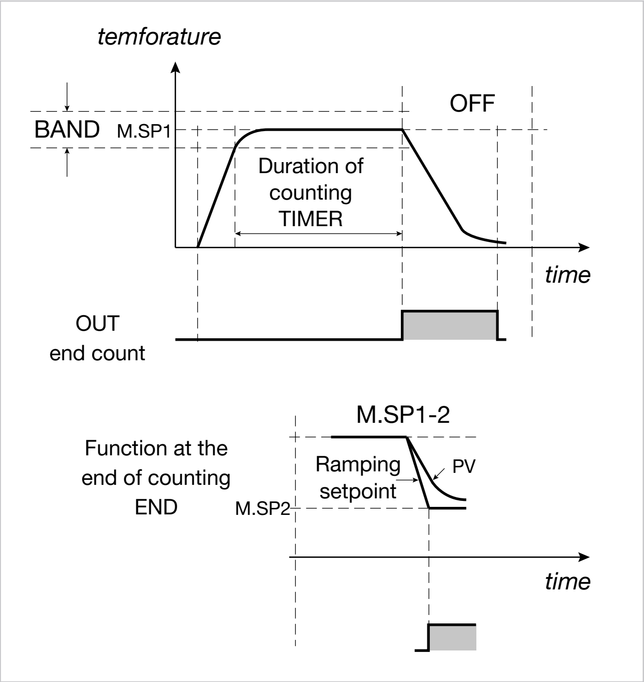
5.11.2. Stabilization timer

The stabilization timer is used to control a process at a certain temforature for a certain time.

The band defining stabilization of the temforature 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.

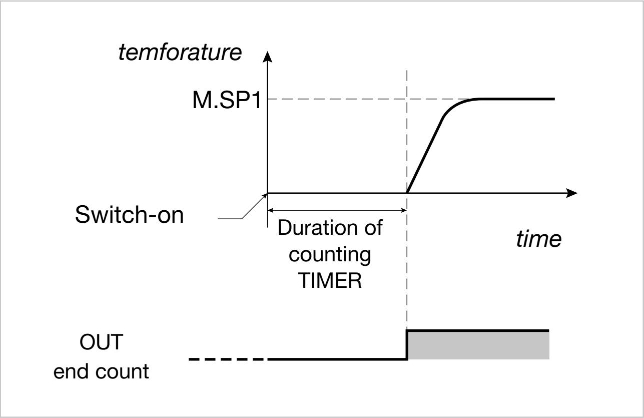
When the function at end of count is End = SP1-2, the end count state activates when the setpoint reaches value SETP2 based on the value of the up gradient GRAD.I (if SETP2 > SETP1) or down gradient GRAD.D (if SETP2 < SETP1). Switching is immediate if the gradient is set to 0 (zero).

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).

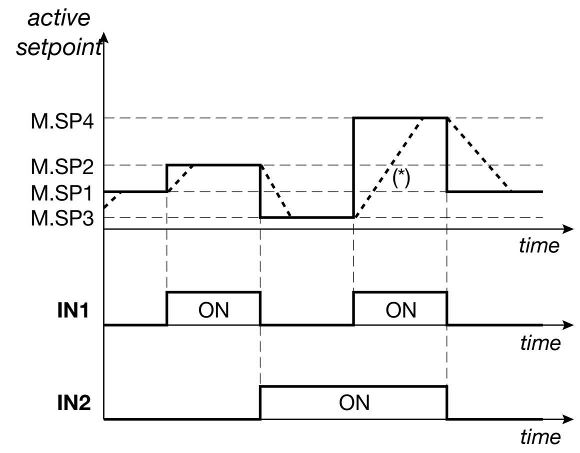
The selection of M.SP1 and M.SP2 is shown on the display via LED.

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

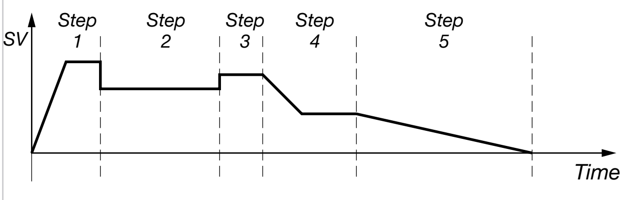
A program is a set of steps, each having a number of parameters, that let you control the value of a process or of a device based on lapsed time, on specific conditions, and on reference values saved in the controller or supplied to it from the outside.

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.

Standard Programmer Mode
A program can have a maximum of 192 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.

Simplified Programmer Mode
In this mode a program consists of a fixed number of steps (maximum 16) and the instrument can store up to 12 programs of 16 steps each in memory.

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 215).

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 forformed:

  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.

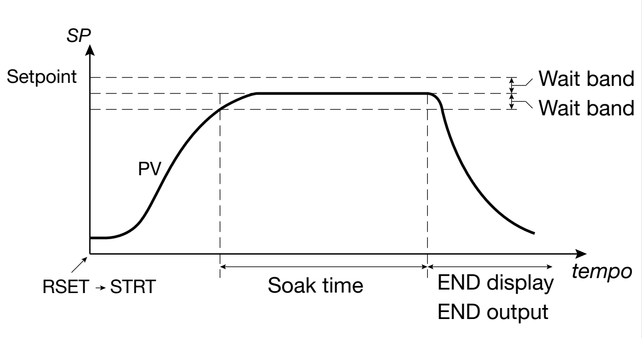
When the programmer reaches the END state, the third bargraph, used for example on models 1650-1850 to display delivered power, lights up completely.

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

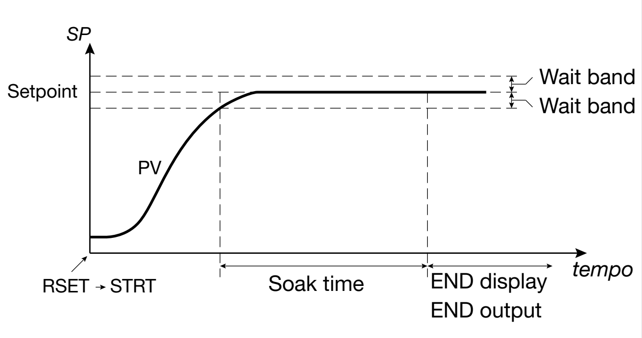
5.13.5.1. ONE STEP program

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

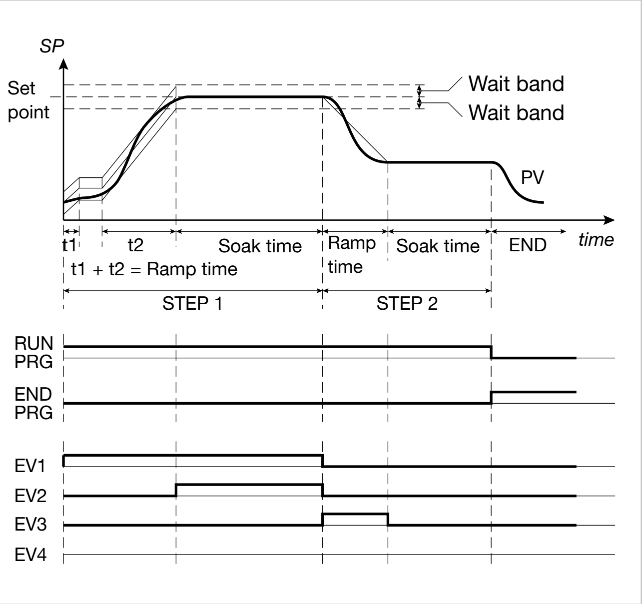
Project conditions:
- Evnt.1 On during STEP1;
- Evnt.2 On during hold of STEP1;
- Evnt.3 On during ramp of STEP2;
- Evnt.4 not used.

STEP1 - setting events at start of step:
- EVN.r.1 = On
- EVN.r.2 = OFF
- EVN.r.3 = OFF
- EVN.r.4 = nonE

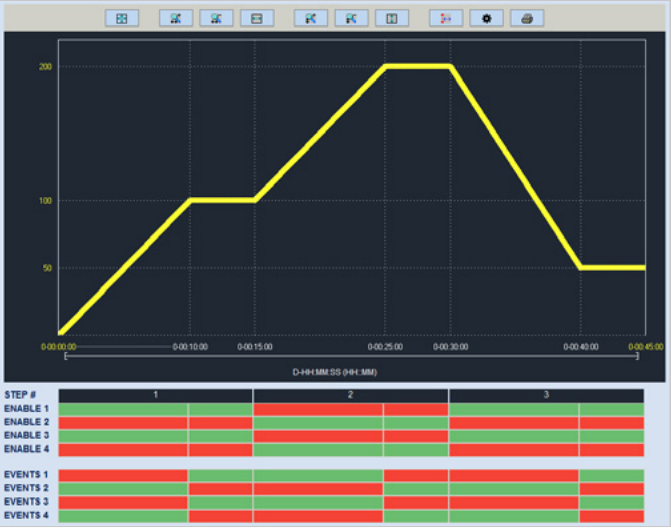
STEP1 - setting events at start of hold:
- EVN.h.1 = nonE
- EVN.h.2 = On
- EVN.h.3 = nonE

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

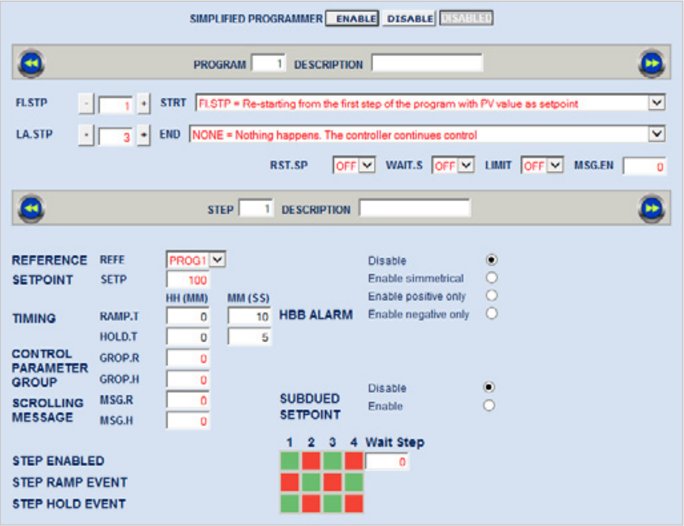


Using GF_eXpress software for the configuration, the displayed pages would be:



STEP #	1		2		3	
ENABLE 1	🟩	🟩	🟥	🟥	🟩	🟩
ENABLE 2	🟥	🟥	🟩	🟩	🟥	🟥
ENABLE 3	🟩	🟩	🟥	🟥	🟩	🟩
ENABLE 4	🟥	🟥	🟩	🟩	🟥	🟥
EVENTS 1	🟥	🟩	🟩	🟥	🟥	🟩
EVENTS 2	🟩	🟥	🟥	🟩	🟩	🟥
EVENTS 3	🟥	🟩	🟩	🟥	🟥	🟩
EVENTS 4	🟩	🟥	🟥	🟩	🟩	🟥

Program diagram



PROGRAM 1 DESCRIPTION

FI.STP 1 STRT FI.STP = Re-starting from the first step of the program with PV value as setpoint

LA.STP 3 END NONE = Nothing happens. The controller continues control

RST.SP OFF WAIT.S OFF LIMIT OFF MSG.EN 0

STEP 1 DESCRIPTION

REFERENCE SETPOINT REFE PROG1

SETP 100

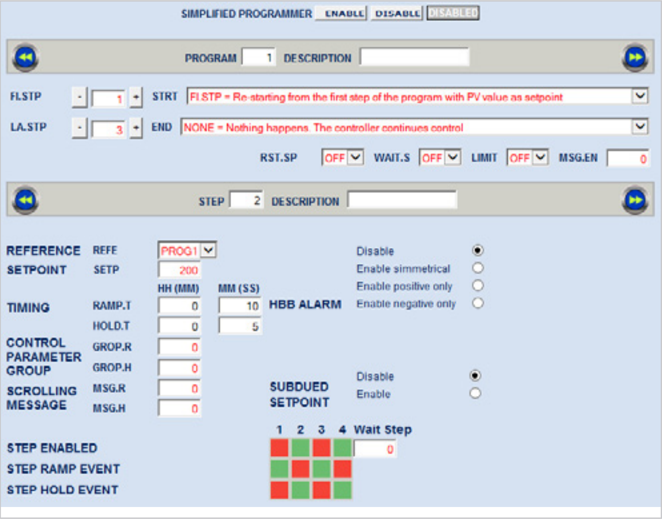
		HH (MM)	MM (SS)
TIMING	RAMP.T	0	10
	HOLD.T	0	5
CONTROL PARAMETER GROUP	GROP.R	0	
	GROP.H	0	
SCROLLING MESSAGE	MSG.R	0	
	MSG.H	0	

HBB ALARM
- Disable ●
- Enable simmetrical ○
- Enable positive only ○
- Enable negative only ○

SUBDUED SETPOINT
- Disable ●
- Enable ○

	1	2	3	4	Wait Step
STEP ENABLED	🟩	🟥	🟩	🟥	0
STEP RAMP EVENT	🟥	🟩	🟥	🟩	
STEP HOLD EVENT	🟩	🟥	🟩	🟥	

Configuration of STEP1



PROGRAM 1 DESCRIPTION

FI.STP 1 STRT FI.STP = Re-starting from the first step of the program with PV value as setpoint

LA.STP 3 END NONE = Nothing happens. The controller continues control

RST.SP OFF WAIT.S OFF LIMIT OFF MSG.EN 0

STEP 2 DESCRIPTION

REFERENCE REFE PROG1

SETPOINT SETP 200

		HH (MM)	MM (SS)
TIMING	RAMP.T	0	10
	HOLD.T	0	5
CONTROL PARAMETER GROUP	GROP.R	0	
	GROP.H	0	
SCROLLING MESSAGE	MSG.R	0	
	MSG.H	0	

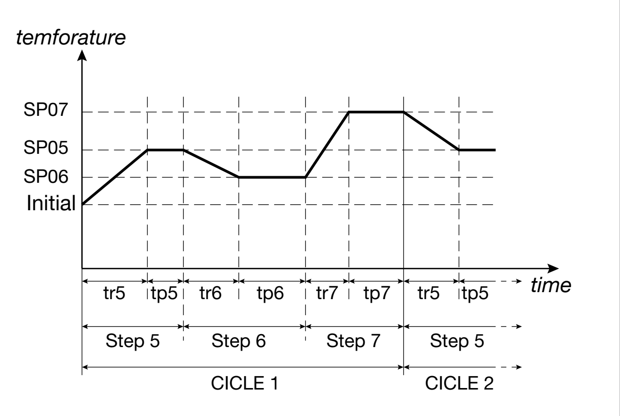
HBB ALARM
Disable ●
Enable simmetrical ○
Enable positive only ○
Enable negative only ○

SUBDUED SETPOINT
Disable ●
Enable ○

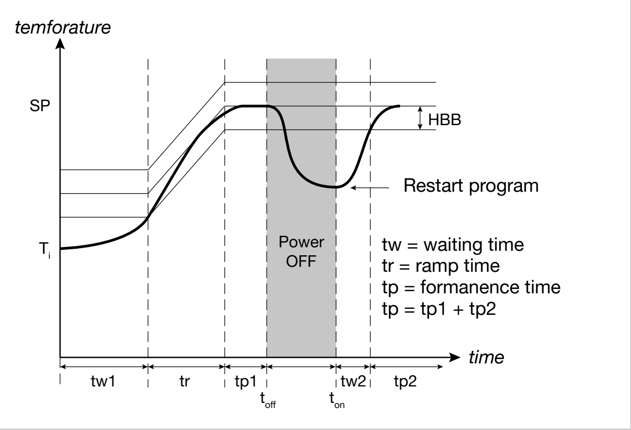
	1	2	3	4	Wait Step
STEP ENABLED	🟥	🟩	🟥	🟩	0
STEP RAMP EVENT	🟩	🟥	🟩	🟥	
STEP HOLD EVENT	🟥	🟩	🟥	🟩	

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



tw = waiting time
tr = ramp time
tp = formanence time
tp = tp1 + tp2

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.

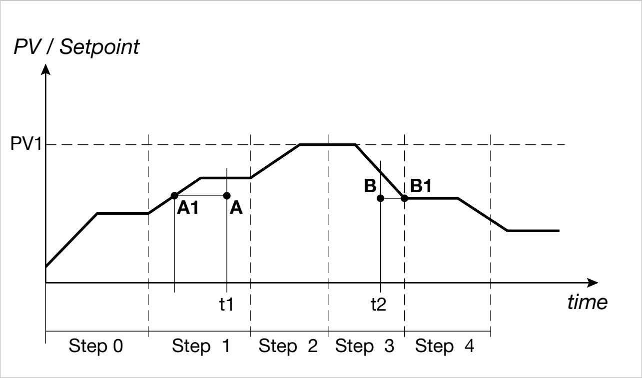
This function is valid in case of reset from digital inputs or enabled keys, as well as in case of reset following a program change (possible only in STOP) or STOP/START switching at end of program.

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.

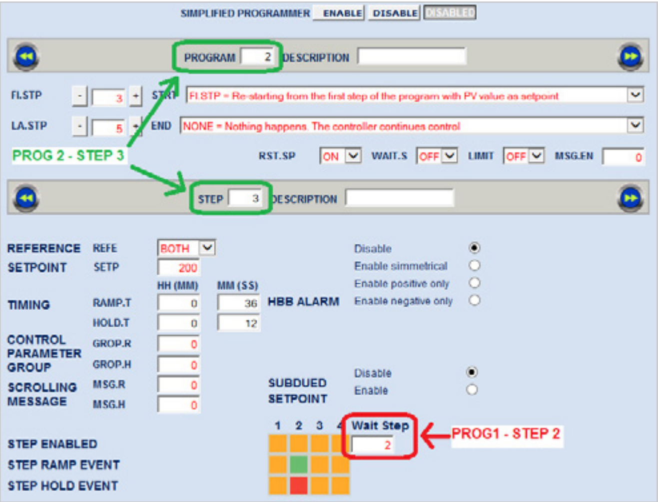
With asynchronous programmers:

- 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:



PROGRAM 2 DESCRIPTION
FI.STP 3 START FI.STP = Re-starting from the first step of the program with PV value as setpoint
LA.STP 5 END NONE = Nothing happens. The controller continues control
RST.SP ON WAIT.S OFF LIMIT OFF MSG.EN 0
STEP 3 DESCRIPTION
REFE BOTH
SETP 200
RAMP.T HH (MM) 0 MM (SS) 36
HOLD.T HH (MM) 0 MM (SS) 12
HBB ALARM: ● Disable ○ Enable simmetrical ○ Enable positive only ○ Enable negative only
GROP.R 0
GROP.H 0
MSG.R 0
MSG.H 0
SUBDUED SETPOINT: ● Disable ○ Enable
Wait Step 2

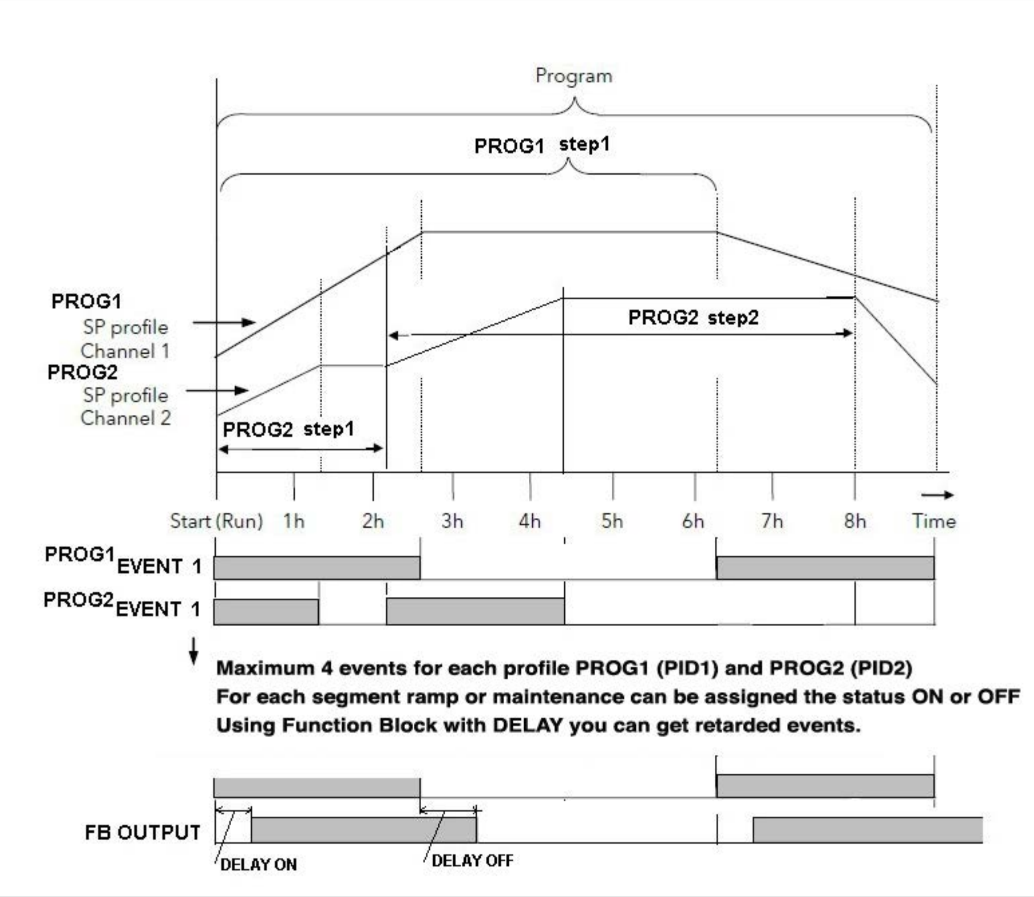
The following cases are possible:

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

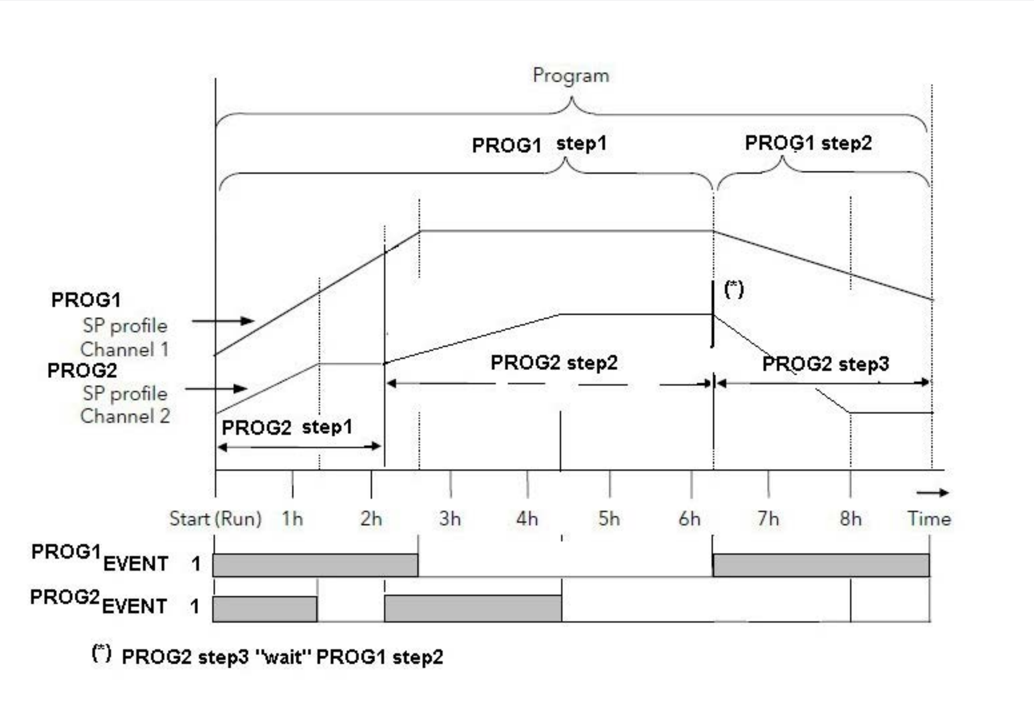
The start step and start hold events are the ones for the step in execution by its programmer.

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.:

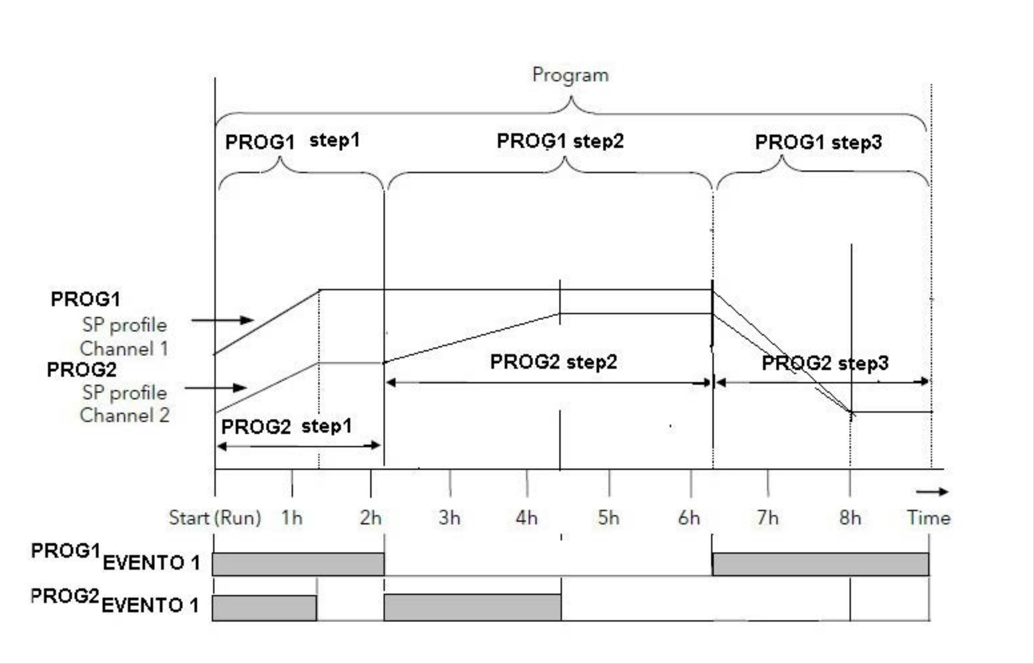
- consents for the step that the first programmer (PROG1) is executing;
- consents for the step that the second programmer (PROG2) is executing.

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).

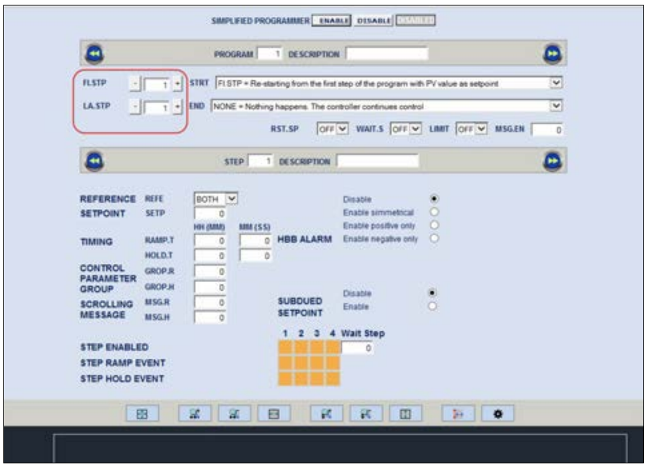
5.13.12. SIMPLIFIED PROGRAMMER MODE

In Simplified Programmer Mode you can only use the PR.STP menu to configure programs. To enable this mode, adjust the S.PROG parameter in the EN.FUN menu (after enabling programmer mode using the PROG parameter in the EN.FUN menu).
There may be a maximum of 12 programs each, with a maximum of 16 steps, numbered from 1 to 16.
The FI.STP and LA.STP parameters in the PR.OPT menu disappear, as the first step in the selected program will always be number 1. In the PR.STP menu you may indicate which of the 16 steps will be the last step in the program using the ST.END parameter.
The scrolling string reminds you which of the 12 programs you are editing.

☞ **WARNING**: when switching the S.PROG parameter in the EN.FUN menu from ON to OFF, you must obligatorily reset the FI.STP and LA.STP parameters in all programs, as they are not compatible with non-simplified mode

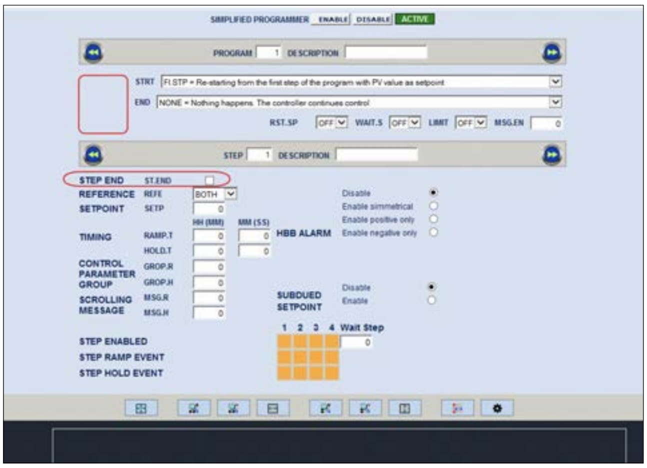
In both simplified and non-simplified mode, the GF_eXpress tool may be used for easy program set-up.

In non-simplified mode, the FI.STP and LA.STP parameters appear and may be freely set:



SIMPLIFIED PROGRAMMER ENABLE DISABLE DISABLED
PROGRAM 1 DESCRIPTION
FI.STP 1
LA.STP 1
STRT FI.STP = Re-starting from the first step of the program with PV value as setpoint
END NONE = Nothing happens. The controller continues control
RST.SP OFF WAIT.S OFF LIMIT OFF MSG.EN 0
STEP 1 DESCRIPTION
REFERENCE REFE BOTH
SETPOINT SETP 0
TIMING RAMP.T 0 0
HOLD.T 0 0
CONTROL PARAMETER GROUP GROP.R 0
GROP.H 0
SCROLLING MESSAGE MSG.R 0
MSG.H 0
HBB ALARM ● Disable ○ Enable simmetrical ○ Enable positive only ○ Enable negative only
SUBDUED SETPOINT ● Disable ○ Enable
Wait Step 0

In simplified mode, the FI.STP and LA.STP parameters disappear and the ST.END parameter appears for selecting the last step in the programi:



SIMPLIFIED PROGRAMMER ENABLE DISABLE ACTIVE
PROGRAM 1 DESCRIPTION
STRT FI.STP = Re-starting from the first step of the program with PV value as setpoint
END NONE = Nothing happens. The controller continues control
RST.SP OFF WAIT.S OFF LIMIT OFF MSG.EN 0
STEP 1 DESCRIPTION
STEP END ST.END ☐
REFERENCE REFE BOTH
SETPOINT SETP 0
TIMING RAMP.T 0 0
HOLD.T 0 0
CONTROL PARAMETER GROUP GROP.R 0
GROP.H 0
SCROLLING MESSAGE MSG.R 0
MSG.H 0
HBB ALARM ● Disable ○ Enable simmetrical ○ Enable positive only ○ Enable negative only
SUBDUED SETPOINT ● Disable ○ Enable
Wait Step 0

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.

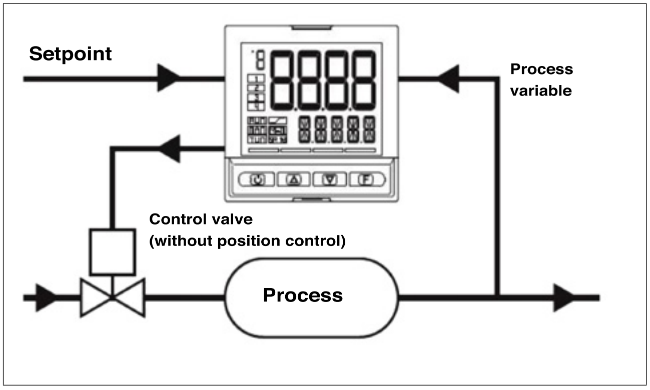


Figure 24 - Connection diagram for floating valve

If available, the auxiliary input of the controller can be configured for the valve position function.

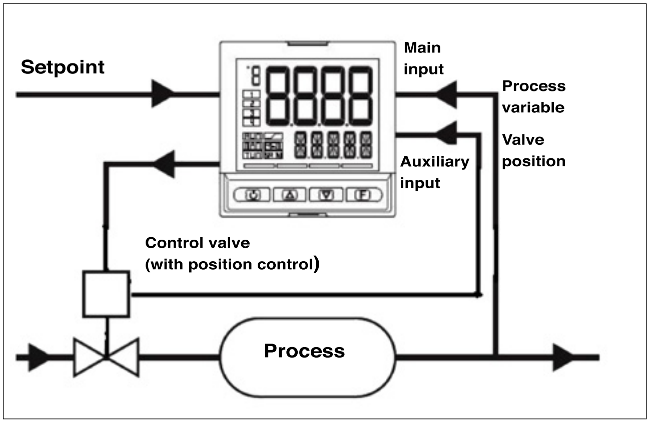


Figure 25 - Connection diagram for feedback valve

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.
It is possible to limit the valve stroke by means of two limit stop contacts connected to two digital inputs of the instrument set with function F.In=V.END.O (opening limit stop) and F.In=V.END.C (closing limit stop). Limit stop functions are also available as logical states to be set via Logical Function Blocks.

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 forcentage (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 forcentage of actuator time.

- **TIM.HI Impulse setpoint**: expressed as a forcentage (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 forcentage of the "actuator time"

- **TIM.OF**: it is the shortest time between two Valve ON pulse command, expressed as forcentage 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 forcentage 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

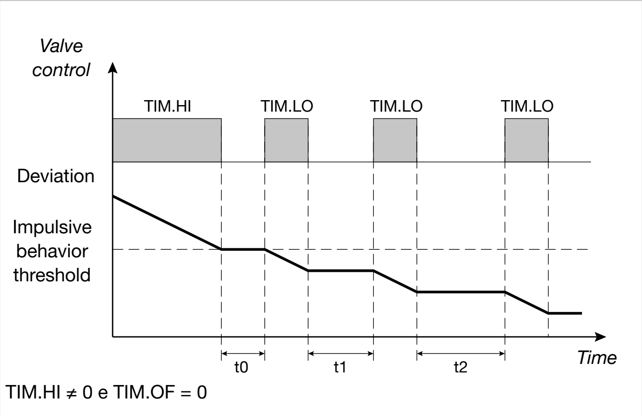
In valve control, every request for a maneuver greater than minimum impulse is sent to the actuator via the relays with function V.OPEN / V.CLOS.

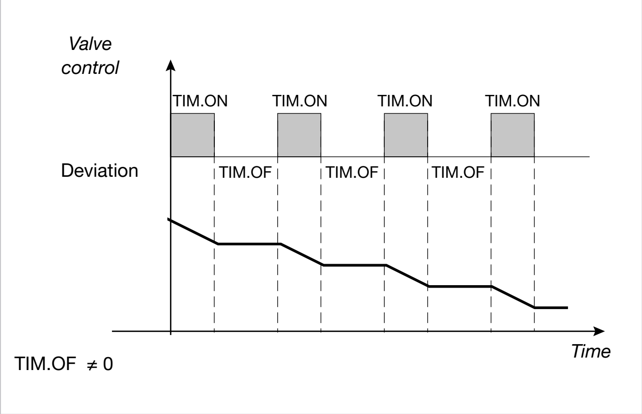
In the case of floating valve each action updates the assumed position of the virtual potentiometer calculated on the basis of declared actuator travel time. This mode always provides an assumed valve position, which is compared with the controller's position request.
After reaching an assumed end position (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 forcentage (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 forcentage 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.



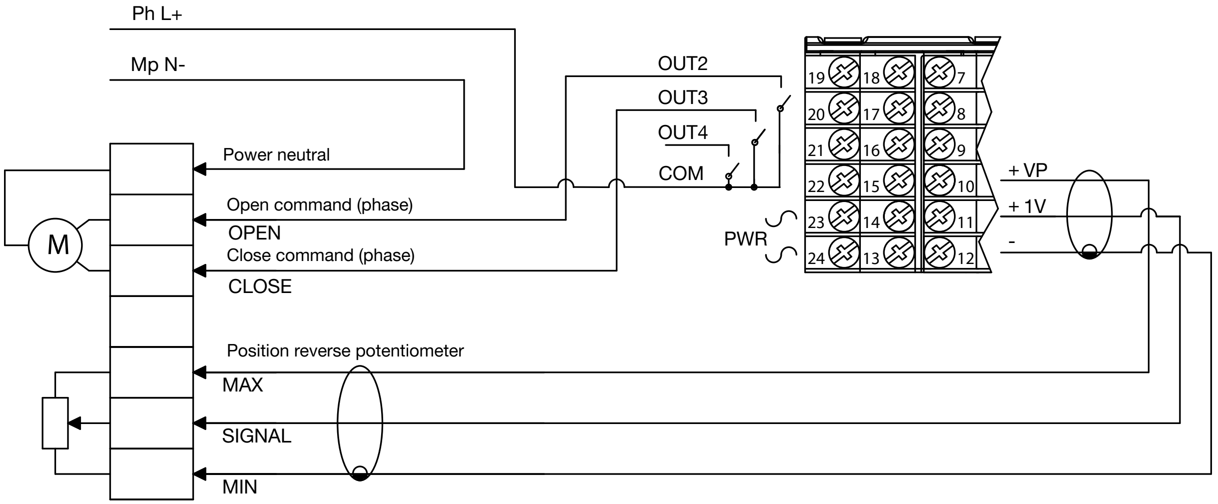


Impulsive behavior

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)



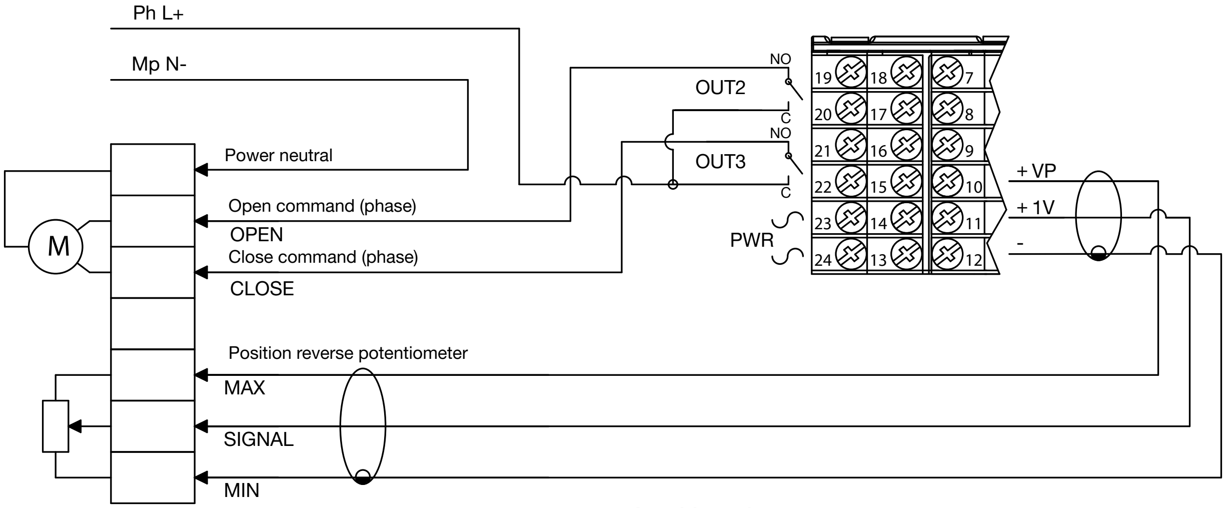
VALVE CONNECTION

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)



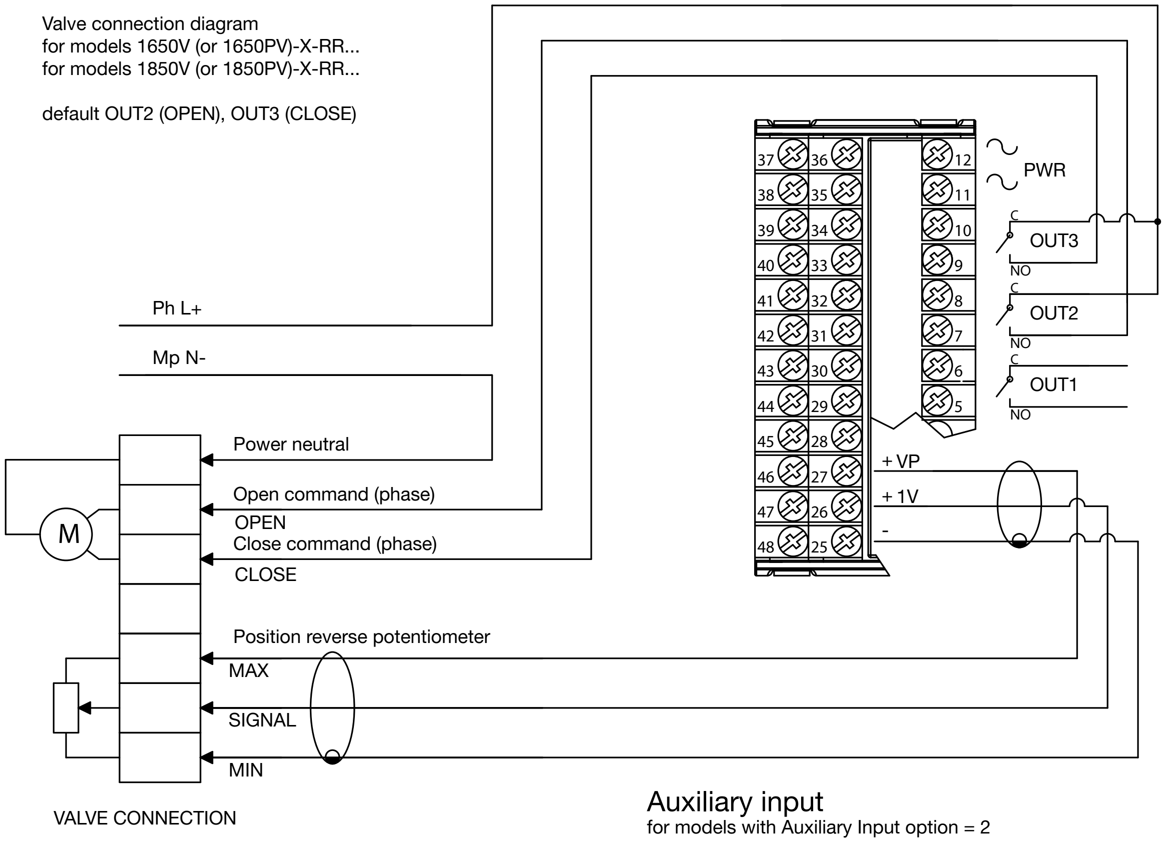
VALVE CONNECTION

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)



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

The figure shows the valve feedback connection at the AUX1 input.
Alternatively, you may connect the valve feedback to the AUX2 input,
if present.

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 amfores 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 for 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 Oforations

5.16.1. Function logic blocks

By means of Logic Function Blocks, the Logic Oforations 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 oforations on input variables **a, b, c** and **d** can be forformed 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 oforator means that the linked oforands must evaluate to “true” for the result to be “true,” whereas with the OR oforator is it sufficient for only one linked oforand 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 Oforations 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 Oforations.
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 for PID.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)

FORCED END OF ALL D.ON TIMERS
(forcing at the end of counting for all D.ON timers)
FORCED END OF ALL D.OF TIMERS
(forcing at the end of counting for all D.OF timers)
FORCED END OF ALL D.ON\D.OF TIMERS
(forcing at the end of counting for all D.ON timers and D.OF)

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 OR)
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 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 blocko 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)

for regulator models with programmer there are also:
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

For models with Master serial you have:
MAS.01 (Master 1 value, for bit type data only)
MAS.02 (Master 2 value, for bit type data only)
MAS.03 (Master 3 value, for bit type data only)
MAS.04 (Master 4 value, for bit type data only)
MAS.05 (Master 5 value, for bit type data only)
MAS.06 (Master 6 value, for bit type data only)
MAS.07 (Master 7 value, for bit type data only)
MAS.08 (Master 8 value, for bit type data only)
MAS.09 (Master 9 value, for bit type data only)
MAS.10 (Master 10 value, for bit type data only)
MAS.10 (Master 10 value, for bit type data only)
MAS.11 (Master 11 value, for bit type data only)
MAS.12 (Master 12 value, for bit type data only)
MAS.13 (Master 13 value, for bit type data only)
MAS.14 (Master 14 value, for bit type data only)
MAS.15 (Master 15 value, for bit type data only)
MAS.16 (Master 16 value, for bit type data only)
MAS.17 (Master 17 value, for bit type data only)
MAS.18 (Master 18 value, for bit type data only)
MAS.19 (Master 19 value, for bit type data only)
MAS.20 (Master 20 value, for bit type data only)

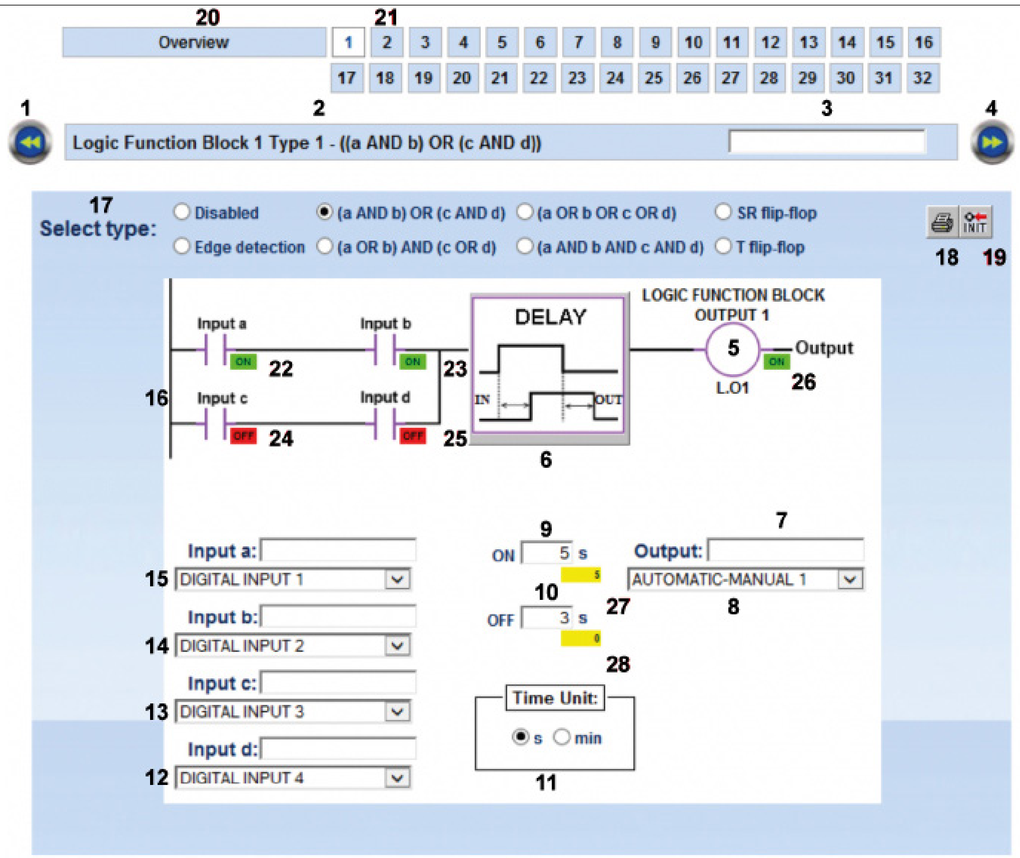
Support coefficients (may be displayed and set in the User menu)
L.C1 (logical coefficient 1)
L.C2 (logical coefficient 2)
L.C3 (logical coefficient 3)
L.C4 (logical coefficient 4)
L.C5 (logical coefficient 5)
L.C6 (logical coefficient 6)
L.C7 (logical coefficient 7)
L.C8 (logical coefficient 8)
L.C9 (logical coefficient 9)
L.C10 (logical coefficient 10)
L.C11 (logical coefficient 11)
L.C12 (logical coefficient 12)
L.C13 (logical coefficient 13)
L.C14 (logical coefficient 14)
L.C15 (logical coefficient 15)
L.C16 (logical coefficient 16)
L.C17 (logical coefficient 17)
L.C18 (logical coefficient 18)
L.C19 (logical coefficient 19)
L.C20 (logical coefficient 20)
L.C21 (logical coefficient 21)
L.C22 (logical coefficient 22)
L.C23 (logical coefficient 23)
L.C24 (logical coefficient 24)
L.C25 (logical coefficient 25)
L.C26 (logical coefficient 26)
L.C27 (logical coefficient 27)
L.C28 (logical coefficient 28)
L.C29 (logical coefficient 29)
L.C30 (logical coefficient 30)
L.C31 (logical coefficient 31)
L.C32 (logical coefficient 32)

Status of digital outputs from Mathematical Function Blocks
MFB.1 DIGITAL OUTPUT
MFB.2 DIGITAL OUTPUT
MFB.3 DIGITAL OUTPUT
MFB.4 DIGITAL OUTPUT
MFB.5 DIGITAL OUTPUT
MFB.6 DIGITAL OUTPUT
MFB.7 DIGITAL OUTPUT
MFB.8 DIGITAL OUTPUT

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.



Logic Function Block 1 Type 1 - ((a AND b) OR (c AND d))

Select type:
○ Disabled
● (a AND b) OR (c AND d)
○ (a OR b OR c OR d)
○ SR flip-flop
○ Edge detection
○ (a OR b) AND (c OR d)
○ (a AND b AND c AND d)
○ T flip-flop

Input a:
DIGITAL INPUT 1

Input b:
DIGITAL INPUT 2

Input c:
DIGITAL INPUT 3

Input d:
DIGITAL INPUT 4

ON 5 s

OFF 3 s

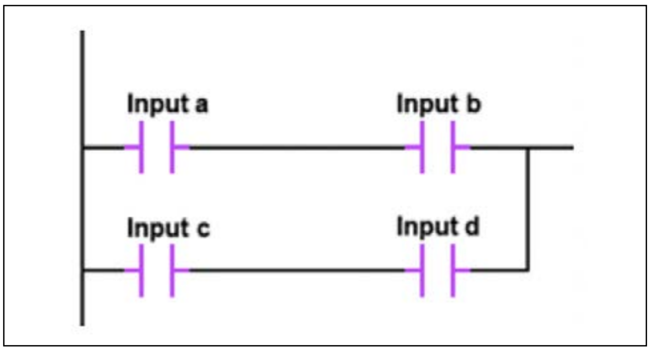
Output:
AUTOMATIC-MANUAL 1

Time Unit:
● s ○ min

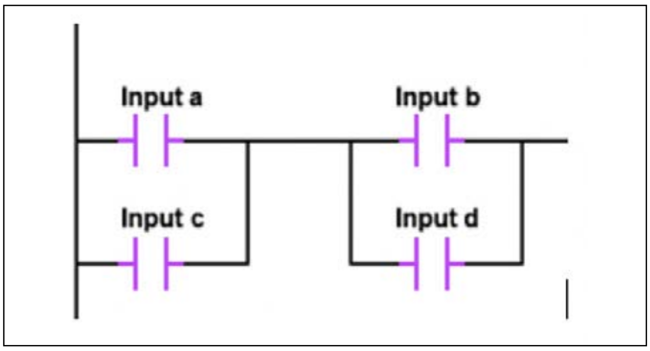
1. Button to return to previous function block.
2. Number of function block and type of logic oforations run.
3. Name of function block. You can insert an optional descriptive name of the function block.
4. Button to go to next function block.
5. Output value when result of function oforations is true.
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. Unità di misura dei tempi di ritardo (secondi o minuti).
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**. The Input d box is used to insert an optional descriptive name of 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 oforation 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.
19. Button for initialising Logical Functional Blocks (as upon controller power-on).
20. Button for showing an overview of the function blocks enabled.
21. Button for showing the function block shown in the box.
22. Display current status of input a (only if controller is connected).
23. Display current status of input b (only if controller is connected).
24. Display current status of input c (only if controller is connected).
25. Display current status of input d (only if controller is connected).
26. Display current status of output (only if controller is connected).
27. Display current status of ON (only if controller is connected).
28. Display current status of OFF(only if controller is connected).

5.16.3.2. Enabling logic function block and selecting the type of logic function

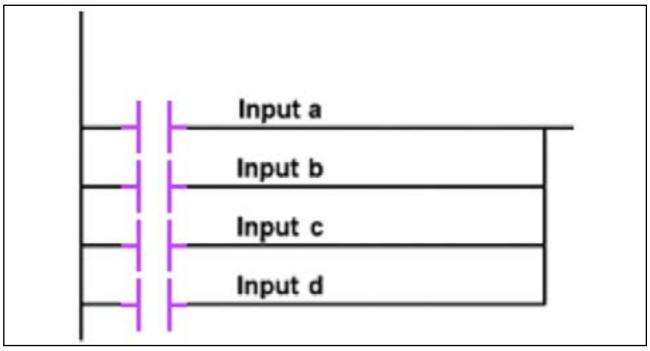
The logic function block page is enabled automatically as soon as you select a type of logic function.
If Disabled is selected, the page is not deleted. The configuration of inputs, outputs and delay times remains stored in the software program.
When you select the type of logic function assigned to the logic function block, its symbol changes as well, as shown in the figures below.



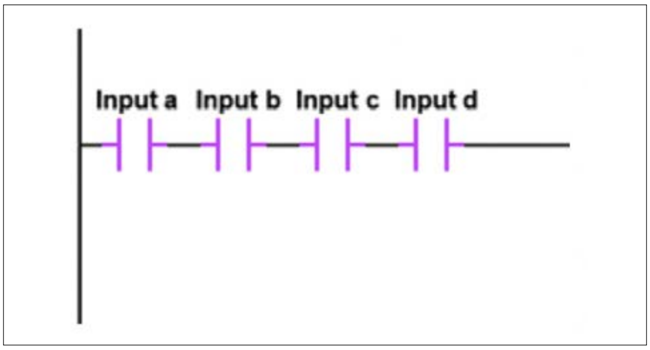
TYPE 1 - (**a** AND **b**) OR (**c** AND **d**)



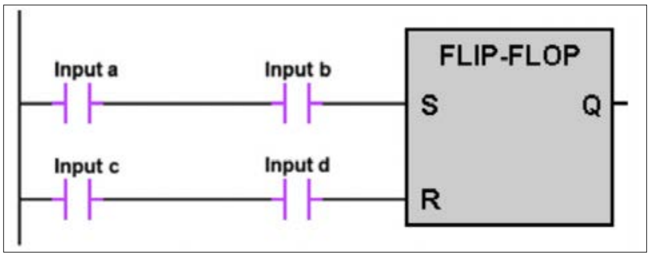
TYPE 2 - (**a** OR **c**) AND (**b** OR **d**)



TYPE 3 - **a** OR **b** OR **c** OR **d**



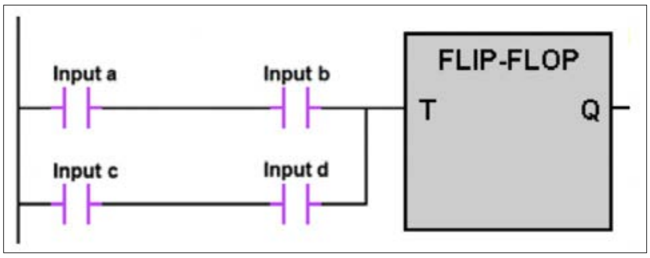
TYPE 4 - **a** AND **b** AND **c** AND **d**



TYPE 5 - SR flip-flop

The Logical Function Block output will be as shown in the table of truth of SR flip-flop appearing below.

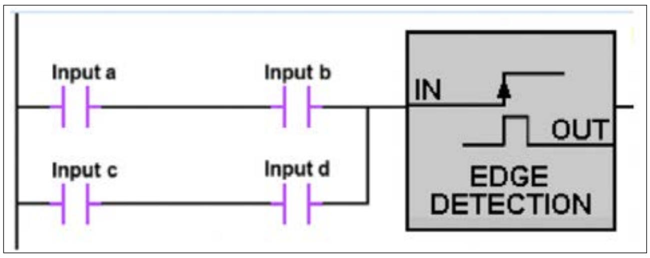
Input		Output	Action
S	R	Q_{n+1}	
0	0	Q_n	No Change
0	1	0	Reset Output
1	0	1	
1	1	Undefined	Undefined



TYPE 6 - T flip-flop

The Logical Function Block output will be as shown in the table of truth of T flip-flop appearing below

Input	Output
T	Q_{n+1}
0	Q_n
1	NOT(Qn)



TYPE 7 – Edge detection

An impulse with a duration of one cycle of execution of logical functions (100 ms) will be generated on the Logical Function Block output every time a source of an increase in input IN is intercepted

You can name the logic function block so that it can be easily recognized for future use

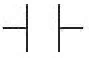
The name will be saved as part of the “configuration recipe” only on the PC. If you copy the configuration to other controllers, the controller to which the configuration is copied will not contain these descriptive names.

5.16.3.3. Configuring input variables

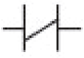
Configure the four input variables **a, b**, **c** and **d**, one at a time. On the pull-down menu, select the variable to be assigned to the input.
The options are:

- 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 229.

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.



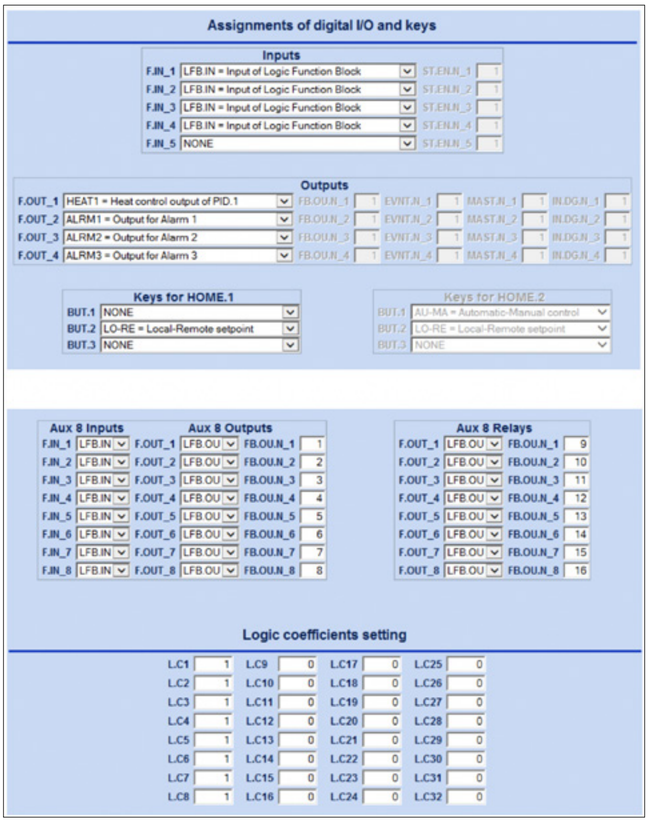
NO



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.



Assignments of digital I/O and keys

Inputs

F.IN_1 LFB.IN = Input of Logic Function Block ST.EN.N_1 1
F.IN_2 LFB.IN = Input of Logic Function Block ST.EN.N_2 1
F.IN_3 LFB.IN = Input of Logic Function Block ST.EN.N_3 1
F.IN_4 LFB.IN = Input of Logic Function Block ST.EN.N_4 1
F.IN_5 NONE ST.EN.N_5 1

Outputs

F.OUT_1 HEAT1 = Heat control output of PID.1 FB.OU.N_1 1 EVNT.N_1 1 MAST.N_1 1 IN.DG.N_1 1
F.OUT_2 ALRM1 = Output for Alarm 1 FB.OU.N_2 1 EVNT.N_2 1 MAST.N_2 1 IN.DG.N_2 1
F.OUT_3 ALRM2 = Output for Alarm 2 FB.OU.N_3 1 EVNT.N_3 1 MAST.N_3 1 IN.DG.N_3 1
F.OUT_4 ALRM3 = Output for Alarm 3 FB.OU.N_4 1 EVNT.N_4 1 MAST.N_4 1 IN.DG.N_4 1

Keys for HOME.1

BUT.1 NONE
BUT.2 LO-RE = Local-Remote setpoint
BUT.3 NONE

Keys for HOME.2

BUT.1 AU-MA = Automatic-Manual control
BUT.2 LO-RE = Local-Remote setpoint
BUT.3 NONE

Aux 8 Inputs / Aux 8 Outputs

F.IN_1 LFB.IN F.OUT_1 LFB.OU FB.OU.N_1 1
F.IN_2 LFB.IN F.OUT_2 LFB.OU FB.OU.N_2 2
F.IN_3 LFB.IN F.OUT_3 LFB.OU FB.OU.N_3 3
F.IN_4 LFB.IN F.OUT_4 LFB.OU FB.OU.N_4 4
F.IN_5 LFB.IN F.OUT_5 LFB.OU FB.OU.N_5 5
F.IN_6 LFB.IN F.OUT_6 LFB.OU FB.OU.N_6 6
F.IN_7 LFB.IN F.OUT_7 LFB.OU FB.OU.N_7 7
F.IN_8 LFB.IN F.OUT_8 LFB.OU FB.OU.N_8 8

Aux 8 Relays

F.OUT_1 LFB.OU FB.OU.N_1 9
F.OUT_2 LFB.OU FB.OU.N_2 10
F.OUT_3 LFB.OU FB.OU.N_3 11
F.OUT_4 LFB.OU FB.OU.N_4 12
F.OUT_5 LFB.OU FB.OU.N_5 13
F.OUT_6 LFB.OU FB.OU.N_6 14
F.OUT_7 LFB.OU FB.OU.N_7 15
F.OUT_8 LFB.OU FB.OU.N_8 16

Logic coefficients setting

L.C1 1 L.C9 0 L.C17 0 L.C25 0
L.C2 1 L.C10 0 L.C18 0 L.C26 0
L.C3 1 L.C11 0 L.C19 0 L.C27 0
L.C4 1 L.C12 0 L.C20 0 L.C28 0
L.C5 1 L.C13 0 L.C21 0 L.C29 0
L.C6 1 L.C14 0 L.C22 0 L.C30 0
L.C7 1 L.C15 0 L.C23 0 L.C31 0
L.C8 1 L.C16 0 L.C24 0 L.C32 0

Complete the configuration by giving a descriptive name to each input so that it can be easily recognized for future use.

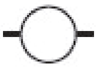
The name will be saved as part of the “configuration recipe” only on the PC and will not be transferred to the controller. Therefore, when the controllers are cloned, the controller to which the configuration was copied will not contain this descriptive name.

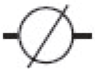
5.16.3.4. Configuring the output

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 229.
This will be the output variable whose value will be changed by the result of the logic oforation 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 oforation 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

For logical function types 1, 2, 3 and 4 only ,you can insert a delay between the result of the logic oforation 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 oforation, 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 oforation the value of the output variable is changed.
- OFF, which indicates how long after a “false” result of the logic oforation the value of the output variable is changed

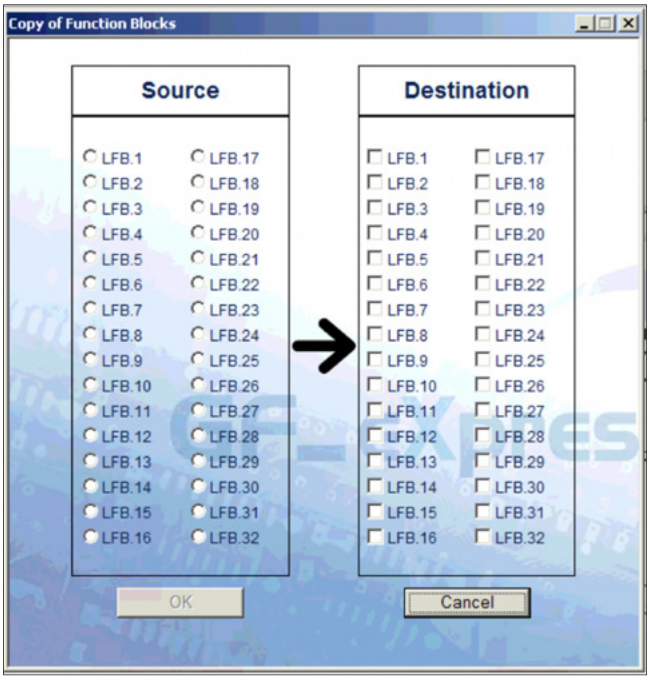
When the time is set to 0 (zero), the change in value of the output variable is instantaneous.
If both delays for ON and OFF equal 0, the DELAY TIMER is ignored.

The counter values that have passed and remain in the ON and OFF delay times are reported in the variables:
- E.ON.01…E.ON.32 (time passed of ON)
- R.ON.01…R.ON.32 (time left of ON)
- E.OF.01…E.OF.32 (time passed of OFF)
- R.OF.01…R.OF.32 (time passed of OFF)

The delay times for ON (D.ON.01…D.ON.32) and OFF (D.OF.01…D.OF.32) and the counter values that have passed and remain may be entered in the user menu.

5.16.3.6. Copy of a Logical Function Block

A copy of a Logical Function Block may be made using the dedicated window, selecting the source Function Block (a single block only) and the destination Function Block(s) (multiple blocks formitted).
The window is opened using the icon or the “Copy of Logic Function Blocks” command in the Service menu



5.17. Math oforations

5.17.1. Math function blocks

The math oforations 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.
There is a maximum of 8 function blocks, each of which can handle up to 2 analogue variables and 2 digital variables in input and 1 analogue variable and 1 digital variable as 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.

The input variables (c, d) refer to variables LFB_OUT_01… LFB_OUT_32 from logic function blocks.

2 types of oforations 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).
- Type 3: UP/DOWN COUNTER with prescaler x1, x10, x100, x1000 of the logical input (d) + reset logical input (c) with threshold (UP) or preset (DOWN) analogue (a) and digital output at end of count + analogue counter output (b);
- Type 4: COMPARISON of (a, b) with digital output

The result of the Math Oforations function can act on:

- process variables,
- local setpoint,
- value of analog outputs.
- Reference for alarms AL1…AL4

5.17.2. Groups of variables

The controller offers many variables that can be used in input for math oforations.
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

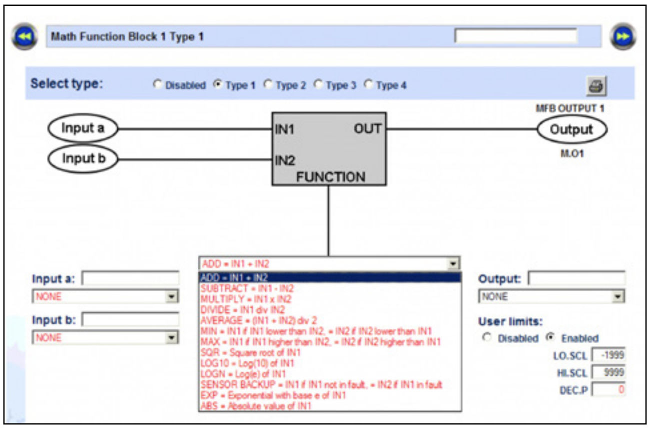
Support coefficients (displayable and settable on User menu)

M.C1	mathematical coefficient 1 (with setting of the decimal point position in M.DECP1)
M.C2	mathematical coefficient 2 (with setting of the decimal point position in M.DECP2)
M.C3	mathematical coefficient 3 (with setting of the decimal point position in M.DECP3)
M.C4	mathematical coefficient 4 (with setting of the decimal point position in M.DECP4)
M.C5	mathematical coefficient 5 (with setting of the decimal point position in M.DECP5)
M.C6	mathematical coefficient 6 (with setting of the decimal point position in M.DECP6)
M.C7	mathematical coefficient 7 (with setting of the decimal point position in M.DECP7)
M.C8	mathematical coefficient 8 (with setting of the decimal point position in M.DECP1)

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 oforation.



Math Function Block 1 Type 1

Select type: ○ Disabled ● Type 1 ○ Type 2 ○ Type 3 ○ Type 4

Input a: NONE

Input b: NONE

ADD = IN1 + IN2

Output: NONE

User limits: ○ Disabled ● Enabled

LO.SCL -1999

HI.SCL 9999

DEC.P 0

Type 1 oforations: MATH FUNCTION (a, b)

ADD: reports as the output of the Math Function Block the value of the sum of the parameter connected with “Input a” and the parameter connected with “Input b”

SUBTRACT: reports as the output of the Math Function Block the value of the difference between the parameter connected with “Input a” and the parameter connected with “Input b”

MULTIPLY: reports as the output of the Math Function Block the value of multiplication of the parameter connected with “Input a” and the parameter connected with “Input b”

DIVIDE: reports as the output of the Math Function Block the value of division of the parameter connected with “Input a” by the parameter connected with “Input b”

AVERAGE: reports as the output of the Math Function Block the value of the average of the parameter connected with “Input a” and the parameter connected with “Input b”

MIN: reports as the output of the Math Function Block the value of the parameter connected with “Input a” if this parameter is less than the parameter connected with “Input b”, or the value of the parameter connected with “Input b” if the parameter is less than the parameter connected with “Input a”

MAX: reports as the output of the Math Function Block the value of the parameter connected with “Input a” if this parameter is greater than the parameter connected with “Input b”, or the value of the parameter connected with “Input b” if this parameter is greater than the parameter connected with “Input a”

SQR: reports as the output of the Math Function Block the value of the square root of the parameter connected with “Input a”

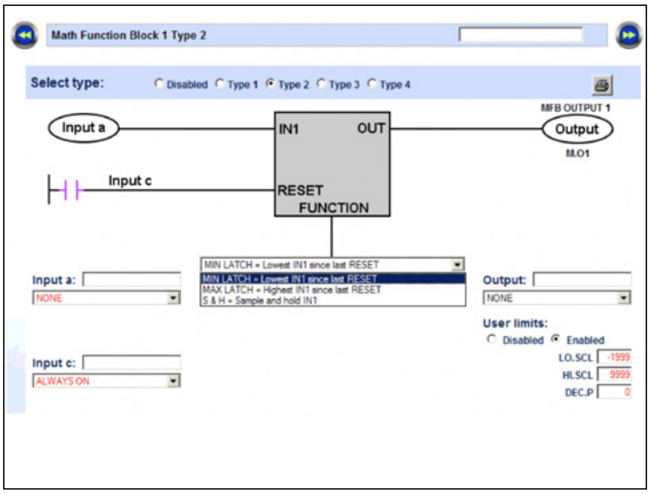
LOG10: reports as the output of the Math Function Block the value of the logarithm to base 10 of the parameter connected with “Input a”

LOGN: reports as the output of the Math Function Block the value of the logarithm to base N of the parameter connected with “Input a”

SENSOR BACKUP: reports as the output of the Math Function Block the value of the parameter connected with “Input a”, if the first input is functioning proforly, or the value of the parameter connected with the first input, if the first input is functioning incorrectly (SBR, High, Low,…)

EXP: reports as the output of the Math Function Block the value of the exponential (ex) of the parameter connected with “Input a”

ABS: reports as the output of the Math Function Block the absolute value of the parameter connected with “Input a”



Math Function Block 1 Type 2

Select type: ○ Disabled ○ Type 1 ● Type 2 ○ Type 3 ○ Type 4

Input a: NONE

Input c: ALWAYS ON

MIN LATCH = Lowest IN1 since last RESET

Output: NONE

User limits: ○ Disabled ● Enabled

LO.SCL -1999

HI.SCL 9999

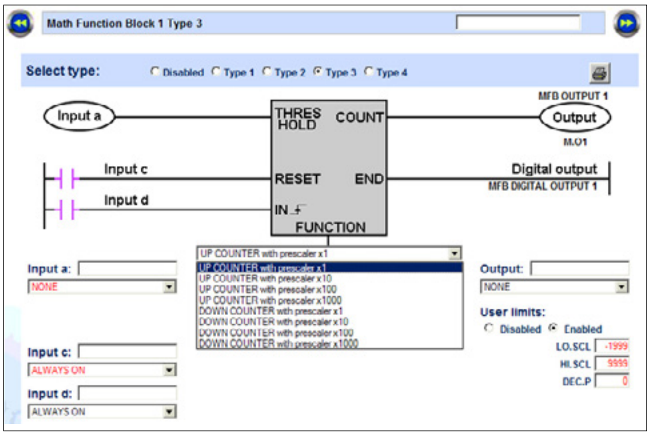
DEC.P 0

Type 2 oforations : MATH FUNCTION (a) + LOGICAL RESET COMMAND (c)

MIN LATCH: reports as the output of the Math Function Block the minimum value of the parameter connected with “Input a” starting from the last impulse that reached the block reset input via the digital parameter connected with “Input c”. The reset remains active for as long as it stays at the high value.

MAX LATCH: reports as the output of the Math Function Block the maximum value of the parameter connected with “Input a” starting from the last impulse that reached the block reset input via the digital parameter connected with “Input c”. The reset remains active for as long as it stays at the high value.

S&H: reports as the output of the Math Function Block the value of the parameter connected with “Input a” for as long as the digital parameter connected with “Input c” keeps RESET input low. As soon as the digital parameter connected with “Input c” raises the RESET input, the Math Function Block output will remain steady at the value that the parameter connected to “Input a” had at the time of transition of the RESET input from LOW => HIGH.



Math Function Block 1 Type 3

Select type: ○ Disabled ○ Type 1 ○ Type 2 ● Type 3 ○ Type 4

Input a: NONE

Input c: ALWAYS ON

Input d: ALWAYS ON

UP COUNTER with prescaler x1

Output: NONE

User limits: ○ Disabled ● Enabled

LO.SCL -1999

HI.SCL 9999

DEC.P 0

Type 3 oforations: UP/DOWN COUNTER with prescaler x1, x10, x100, x1000 of the logical input (d) + reset logical input (c) with threshold (UP) or preset (DOWN) analogue (a) and digital output at end of count + analogue counter output (b)

UP COUNTER with prescaler x 1: increases the value of the analogue output of the Math Function every time the parameter connected with digital input “Input d” switches from low logical value to high logical value (rising edge).

The value of the analogue output of the Math Function Block will remain at zero for as long as the value of the parameter connected with digital input “Input c” keeps RESET input high.

The digital output of the Math Function Block will take on the logical value HIGH when the value appearing on the analogue output of the Math Function Block reaches the value of the parameter connected with analogue input “Input a”. Until then, the digital output of the Math Function Block will remain on LOW logical value.

UP COUNTER with prescaler x 10: : increases the value of the analogue output of the Math Function every time the parameter connected with digital input “Input d” switches from low logical value to high logical value (rising edge) ten times.

The value of the analogue output of the Math Function Block will remain at zero for as long as the value of the parameter connected with digital input “Input c” keeps RESET input high.

The digital output of the Math Function Block will take on the logical value HIGH when the value appearing on the analogue output of the Math Function Block reaches the value of the parameter connected with analogue input “Input a”. Until then, the digital output of the Math Function Block will remain on LOW logical value.

UP COUNTER with prescaler x 100: iincreases the value of the analogue output of the Math Function every time the parameter connected with digital input “Input d” switches from low logical value to high logical value (rising edge) one hundred times.

The value of the analogue output of the Math Function Block will remain at zero for as long as the value of the parameter connected with digital input “Input c” keeps RESET input high.

The digital output of the Math Function Block will take on the logical value HIGH when the value appearing on the analogue output of the Math Function Block reaches the value of the parameter connected with analogue input “Input a”. Until then, the digital output of the Math Function Block will remain on LOW logical value.

UP COUNTER with prescaler x 1000: increases the value of the analogue output of the Math Function every time the parameter connected with digital input “Input d” switches from low logical value to high logical value (rising edge) one thousand times.

The value of the analogue output of the Math Function Block will remain at zero for as long as the value of the parameter connected with digital input “Input c” keeps RESET input high.

The digital output of the Math Function Block will take on the logical value HIGH when the value appearing on the analogue output of the Math Function Block reaches the value of the parameter connected with analogue input “Input a”. Until then, the digital output of the Math Function Block will remain on LOW logical value.

DOWN COUNTER with prescaler x 1: decreases the value of the analogue output of the Math Function, starting with the value of the parameter connected with analogue “Input a”, every time the parameter connected with digital input “Input d” switches from low logical value to high logical value (rising edge)

The value of the analogue output of the Math Function Block will remain at zero for as long as the value of the parameter connected with digital input “Input c” keeps RESET input high.

The digital output of the Math Function Block will take on the logical value HIGH when the value appearing on the analogue output of the Math Function Block is zero. Until then, the digital output of the Math Function Block will remain on LOW logical value.

DOWN COUNTER with prescaler x 10: decreases the value of the analogue output of the Math Function, starting with the value of the parameter connected with analogue “Input a”, every time the parameter connected with digital input “Input d” switches from low logical value to high logical value (rising edge) ten times

The value of the analogue output of the Math Function Block will remain at zero for as long as the value of the parameter connected with digital input “Input c” keeps RESET input high.

The digital output of the Math Function Block will take on the logical value HIGH when the value appearing on the analogue output of the Math Function Block is zero. Until then, the digital output of the Math Function Block will remain on LOW logical value.

DOWN COUNTER with prescaler x 100: decreases the value of the analogue output of the Math Function by one, starting with the value of the parameter connected with analogue “Input a”, every time the parameter connected with the digital input of the Math Function Block remains at LOW logical value.

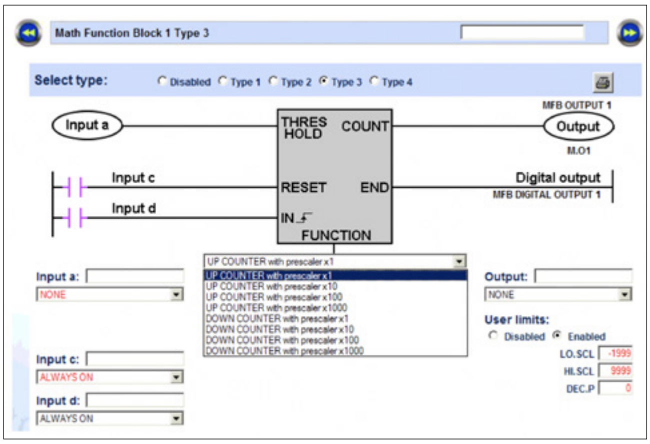
The value of the analogue output of the Math Function Block will remain at zero for as long as the value of the parameter connected with digital input “Input c” keeps RESET input high.

The digital output of the Math Function Block will take on the logical value HIGH when the value appearing on the analogue output of the Math Function Block is zero. Until then, the digital output of the Math Function Block will remain on LOW logical value.

DOWN COUNTER with prescaler x 1000: : decreases the value of the analogue output of the Math Function, starting with the value of the parameter connected with analogue “Input a”, every time the parameter connected with digital input “Input d” switches from low logical value to high logical value (rising edge) one thousand times.

The value of the analogue output of the Math Function Block will remain at zero for as long as the value of the parameter connected with digital input “Input c” keeps RESET input high.

The digital output of the Math Function Block will take on the logical value HIGH when the value appearing on the analogue output of the Math Function Block is zero. Until then, the digital output of the Math Function Block will remain on LOW logical value. digital input “Input d” switches from low logical value to high logical value (rising edge) one hundred times.



Math Function Block 1 Type 3

Select type: ○ Disabled ○ Type 1 ○ Type 2 ● Type 3 ○ Type 4

UP COUNTER with prescaler x1

Input a: NONE

Input c: ALWAYS ON

Input d: ALWAYS ON

Output: NONE

User limits: ○ Disabled ● Enabled

LO.SCL -1999

HI.SCL 9999

DEC.P 0

Type 4 oforations : COMPARISON of (a, b) with digital output

GREATER keeps :

The digital output of the Math Function Block LOW if the value of the parameter connected with “Input a” is less than or equal to the value of the parameter connected with “Input b”.

The digital output of the Math Function Block HIGH if the value of the parameter connected with “Input a” is greater than the value of the parameter connected with “Input b”.

LESS keeps :

The digital output of the Math Function Block LOW if the value of the parameter connected with “Input a” is greater than or equal to the value of the parameter connected with “Input b”.

The digital output of the Math Function Block HIGH if the value of the parameter connected with “Input a” is less than the value of the parameter connected with “Input b”.

GREATER OR EQUAL keeps :

The digital output of the Math Function Block LOW if the value of the parameter connected with “Input a” is less than the value of the parameter connected with “Input b”.

The digital output of the Math Function Block HIGH if the value of the parameter connected with “Input a” is greater than or equal to the value of the parameter connected with “Input b”.

LESS OR EQUAL keeps :

The digital output of the Math Function Block LOW if the value of the parameter connected with “Input a” is greater than the value of the parameter connected with “Input b”.

The digital output of the Math Function Block HIGH if the value of the parameter connected with “Input a” is less than or equal to the value of the parameter connected with “Input b”.

EQUAL keeps :

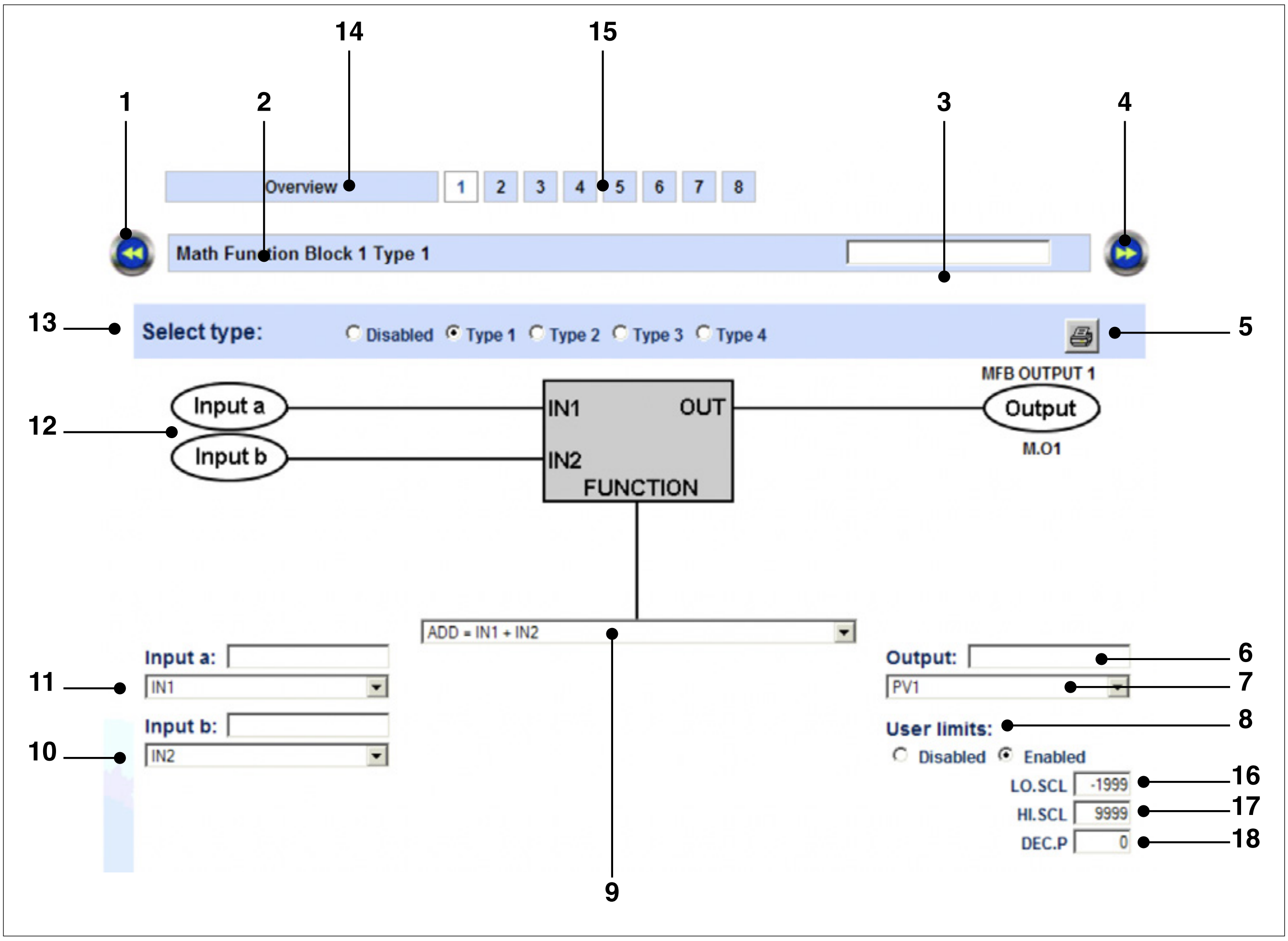
The digital output of the Math Function Block LOW if the value of the parameter connected with “Input a” is different from the value of the parameter connected with “Input b”.

The digital output of the Math Function Block HIGH if the value of the parameter connected with “Input a” is the same as the value of the parameter connected with “Input b”.

NOT EQUAL keeps :

The digital output of the Math Function Block LOW if the value of the parameter connected with “Input a” is equal to the value of the parameter connected with “Input b”.

The digital output of the Math Function Block HIGH if the value of the parameter connected with “Input a” is different from the value of the parameter connected with “Input b”.



Select type: ○ Disabled ● Type 1 ○ Type 2 ○ Type 3 ○ Type 4

ADD = IN1 + IN2

Input a: IN1

Input b: IN2

Output: PV1

User limits: ○ Disabled ● Enabled

LO.SCL -1999

HI.SCL 9999

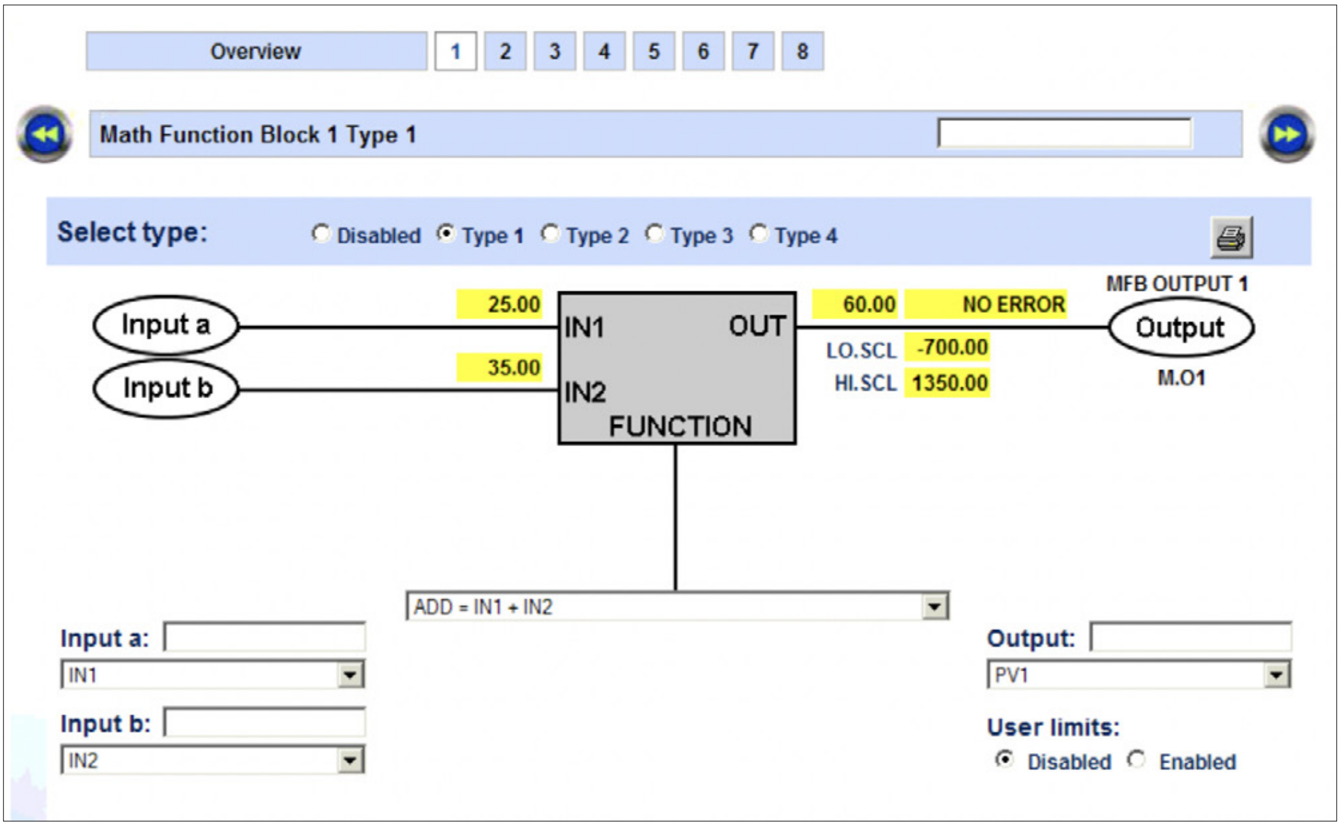
DEC.P 0

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 oforation 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
14. Button for showing an overview of the Math Function Block enabled.
15. Button for showing the Math Function Block shown in the box.

By enabling manual mode for setting maximums and minimums, you see the following:

16. Minimum value that Math Function Block output can assume.
17. Maximum value that Math Function Block output can assume.
18. 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.



Math Function Block 1 Type 1

Select type: ○ Disabled ● Type 1 ○ Type 2 ○ Type 3 ○ Type 4

Input a 25.00

Input b 35.00

OUT 60.00 NO ERROR

LO.SCL -700.00

HI.SCL 1350.00

MFB OUTPUT 1 Output M.O1

ADD = IN1 + IN2

Input a: IN1

Input b: IN2

Output: PV1

User limits: ● Disabled ○ Enabled

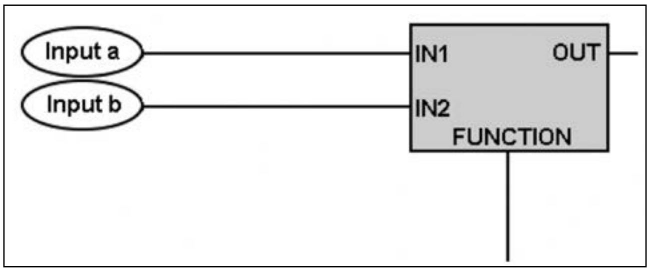
Following a reboot of the controller after a Power ON, type 2 math function blocks always restart at their initial value. Specifically:

- 9999 for the block that memorizes the minimum,
- -1999 for the block that memorizes the maximum,
- 0 for Sample and Hold.

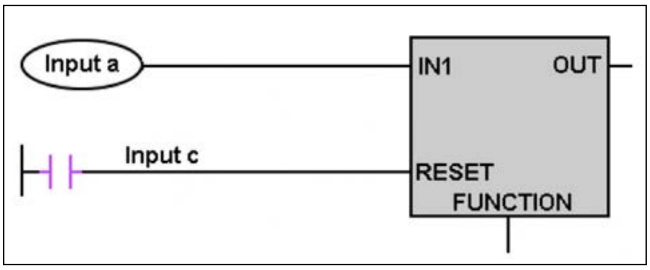
5.17.3.2. Enabling a function block and selecting the type of math function

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.

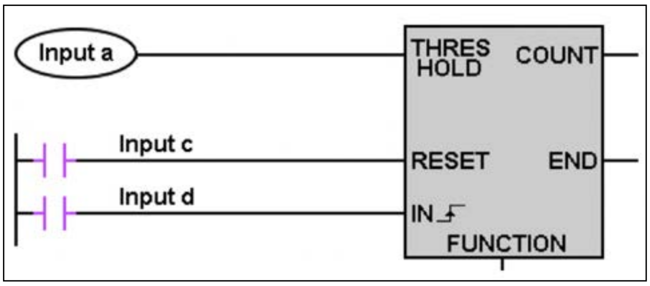
When you select the type of math function assigned to the function block, its symbol changes as well as shown in the figures below.



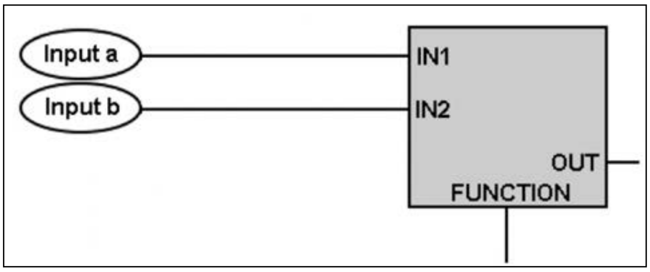
TYPE 1



TYPE 2



TYPE 3



TYPE 4

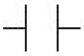
You can name the function block so that it can be easily recognized for future use.

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.

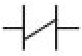
5.17.3.3. Configuring input variables

Configure the input variables (**a, b**) to TYPE 1 and TYPE 4 or (**a**, **c**) to TYPE 2 or (**a, c, d**) to TYPE 3, by selecting (on the pull-down menu) which variable will be assigned to the input.

In case of the logical inputs (c, d) y clicking the input's symbol you can invert its reference state between normally open (NO) and normally closed (NC).



NO



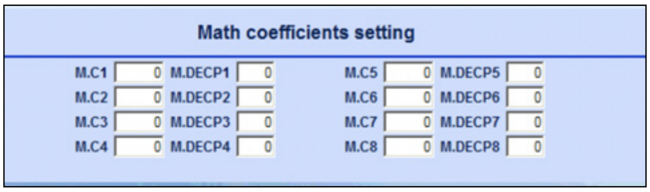
NC

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.



Math coefficients setting

M.C1	0	M.DECP1	0	M.C5	0	M.DECP5	0
M.C2	0	M.DECP2	0	M.C6	0	M.DECP6	0
M.C3	0	M.DECP3	0	M.C7	0	M.DECP7	0
M.C4	0	M.DECP4	0	M.C8	0	M.DECP8	0

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 oforation 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.

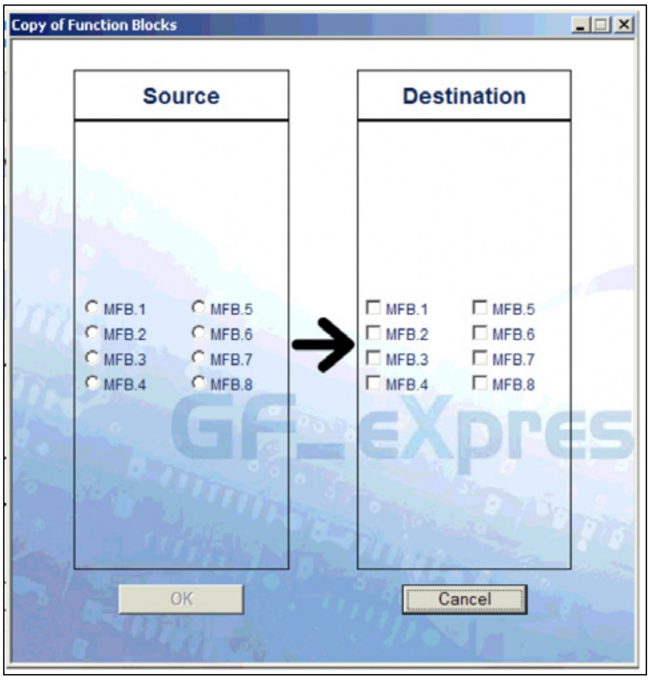
Therefore, when the controllers are cloned, the controller to which the configuration is copied will not contain the descriptive name.

In types 3 and 4, the status of the digital output shown may then be processed as input for the Logical Function Blocks.

5.17.3.5. Copy of Math Function Blocks

A copy of a Math Function Block may be made using the dedicated window, selecting the source Function Block (a single block only) and the destination Function Block(s) (multiple blocks formitted).

The window may be opened using the icon or the "Copy of Math Function Blocks" command on the Service menu



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

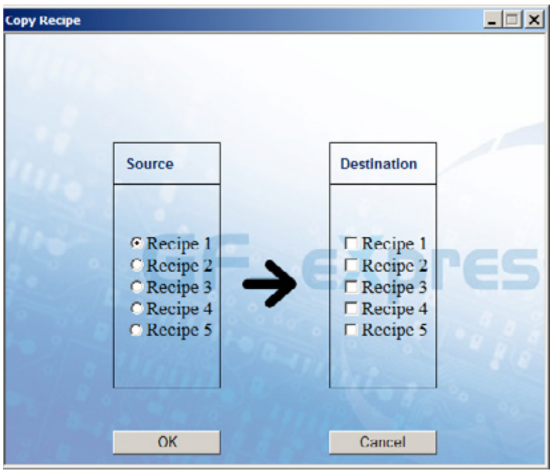
5.18.3. Saving parameters in active recipe

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).
nare la ricetta sorgente (unica) e la\e ricetta\e destinataria\e.



Source:
● Recipe 1
○ Recipe 2
○ Recipe 3
○ Recipe 4
○ Recipe 5

Destination:
☐ Recipe 1
☐ Recipe 2
☐ Recipe 3
☐ Recipe 4
☐ Recipe 5

5.19. Master Modbus Communication

5.19.1. Master communication blocks

With option “G = Master Modbus RTU Communication”, the device offers the Master Modbus RTU communication mode.
The Master Modbus RTU mode provides the user with up to 20 Modbus objects from devices connected to the controller as slave nodes or formits writing of the value of an internal controller value onto remote devices.

The features of these objects are defined in the Master communication blocks and can be intuitively set in the dedicated set-up page, “Master Communication” on GF_eXpress.

ACCESS=READ ONLY or AC-CESS=READ/WRITE objects may be used as:

- references for alarms (REFE)
- references for digital outputs (F.out) if the data is bit type
- references for analogue outputs (F.ou.C, Func) if the data is word type
- input for Math Functions if the data is of word type
- input for Logic Functions if the data is bit type

and may be:
- displayed in Home.x as numerical data (dS.SP, dS.F) or as a bar graph form (bAr.1, bAr.2, bAr.3)
- displayed and/or set in the “MASTE” submenu or the User Menu

ACCESS=WRITE ONLY objects may be used to write the value of a controller value on a remote device (e.g. power calculated by PID).

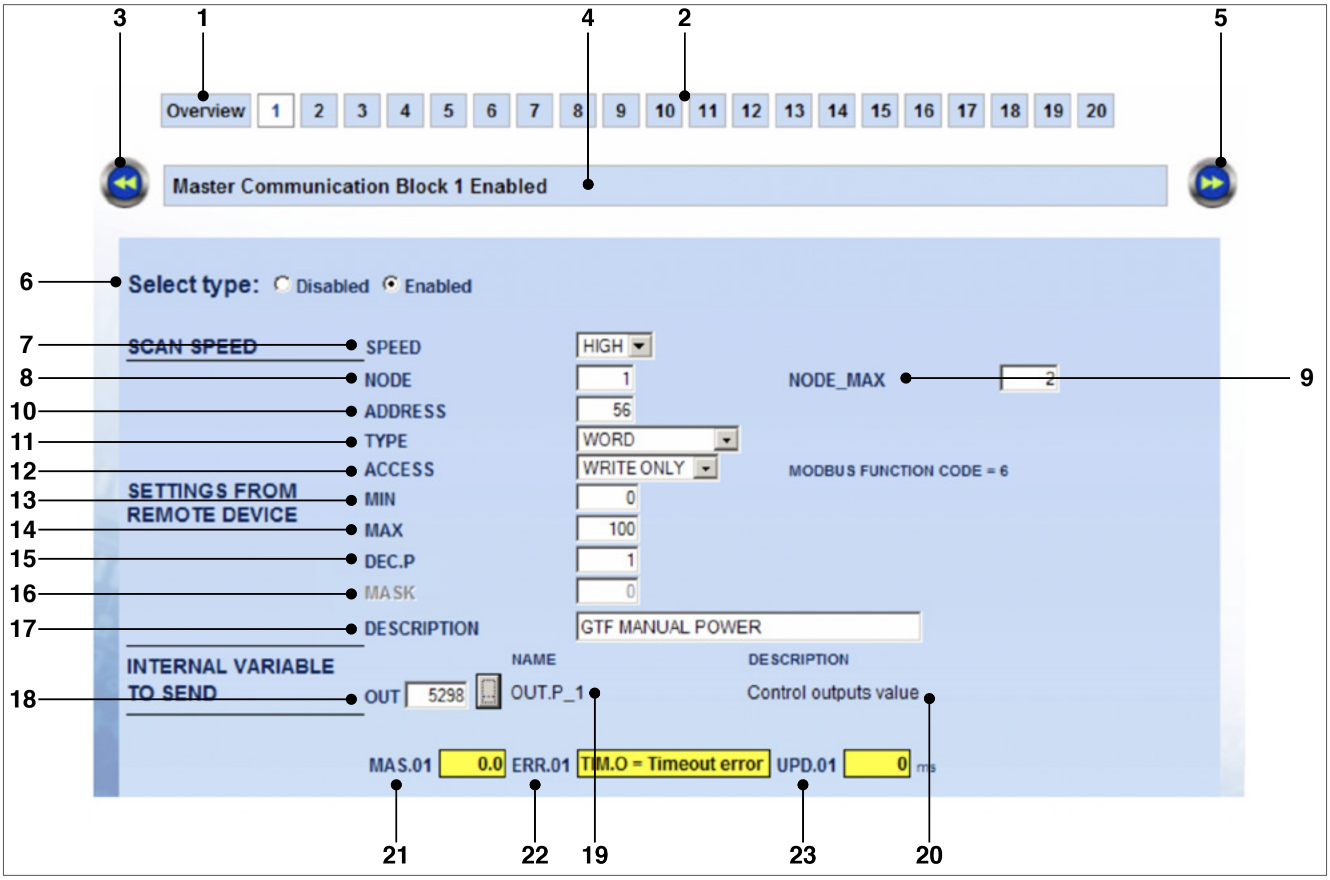
Objects may be grouped into two types of task (SPEED=LOW or SPEED=HIGH) on the basis of the reading and/or writing speed forformance desired.
Tasks are forformed alternately, and scanning times depend on the number of objects with the same value for the SPEED parameter.

⚠ **Attention**! Modbus data exchange may be managed to slave devices guaranteeing response times below the MASTER_TIM parameter (range 60…1000ms, default = 60ms). If no response is received, scanning of the master will continue, but the error will be recorded in the parameter ERR.x= tim.O with x from 1 to 20 in the MASTE submenu.

5.19.2. Programming Master communication blocks

5.19.2.1. Set-up page

The set-up page for Master Communication Blocks in the GF_ eXpress program formits set-up and debugging.



Master Communication Block 1 Enabled

Select type: ○ Disabled ● Enabled

~~SCAN SPEED~~

SPEED HIGH

NODE 1

NODE_MAX 2

ADDRESS 56

TYPE WORD

ACCESS WRITE ONLY

MODBUS FUNCTION CODE = 6

SETTINGS FROM REMOTE DEVICE

MIN 0

MAX 100

DEC.P 1

MASK 0

DESCRIPTION GTF MANUAL POWER

INTERNAL VARIABLE TO SEND

	NAME	DESCRIPTION
OUT 5298	OUT.P_1	Control outputs value

MAS.01 0.0 ERR.01 TIM.O = Timeout error UPD.01 0 ms

1. Button for showing an overview of the communication blocks enabled.
2. Button for showing the communication block shown in the box.
3. Button for going back to the previous function block.
4. Communication block number.
5. Button for going on to the next communication block.
6. Selection enabling/disabling the communication block.
7. Selection for configuring the type of task (SPEED=LOW, HIGH).
8. Selection of the Modbus slave node.
9. Selection of the maximum Modbus slave node (ACCESS=WRITE_ONLY in the case of multi-node writing NODE to consecutive NODE_MAX).
10. Selection of the variable's address in the Modbus slave.
11. Selection of the type of variable in the Modbus slave (TYPE=WORD, BIT, BIT(S) OF WORD).
12. Selection of the type of variable access in the Modbus slave (ACCESS=READ/WRITE, READ ONLY, WRITE ONLY).
13. Selection of the minimum value of the variable in the Modbus slave (for TYPE=WORD only).
14. Selection of the maximum value of the variable in the Modbus slave (for TYPE=WORD only).
15. Selection of the position of the decimal point in the variable in the Modbus slave (for TYPE=WORD only).
16. Selection of the mask for selection of the bits in the variable in the Modbus slave (for TYPE=BIT(S) OF WORD only).
17. Setting the description of the variable in the Modbus slave.
18. Selection of the internal variable to be retransmitted in the Modbus slave (for ACCESS=WRITE ONLY only).
19. Display acronym of the internal variable to be retransmitted in the Modbus slave.
20. Display description of the internal variable to be retransmitted in the Modbus slave.
21. Display current data read by the Modbus slave or written in the Modbus slave (only if the controller is connected).
22. Display current error of data (only if controller is connected).
23. Display current data update time (only if controller is connected).

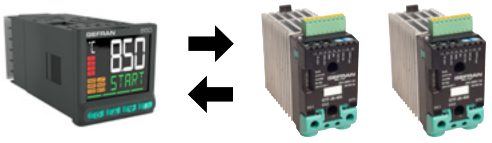
5.19.2.2. Enabling communication block

The communication block page is automatically enabled when you select “Enabled” block type.
If you select “Disable”, the parameter configuration will be stored in memory by the software program, ready to be reused at a later time with no need for a new configuration.

5.19.2.3. Selecting scanning speed

Communication blocks are executed by alternating two tasks, referred to as SPEED=LOW and SPEED=HIGH. Each communication block may be associated with one of the two tasks to obtain the desired parameter scanning speed. Master communication is managed every 20ms; effective scanning times depend on this time, the slave device’s latency time and the communication speed set.

Example:



with the following set-up:
MCB.01 SPEED=HIGH
MCB.02 SPEED=LOW
MCB.03 SPEED=LOW
MCB.04 SPEED=LOW
The communication sequence will be:
…**MCB.01**…MCB.02…**MCB.01**…MCB.03…**MCB.01**…MCB.04…

In the case of ACCESS=WRITE ONLY objects, the same value of a controller variable may be sent to multiple slave noes with a node number between consecutive NODE and NODE_MAX values.
In this case, scanning time is lengthened proportionately.

Example:

with the following set-up:
MCB.01 SPEED=HIGH NODE=1 NODE_MAX=3
MCB.02 SPEED=LOW
MCB.03 SPEED=LOW
MCB.04 SPEED=LOW
The communication sequence will be:
…**MCB.01** NODE=1…MCB.02…**MCB.01** NODE=2…MCB.03…**MCB.01** NODE=3…MCB.04…

Scanning time also depends on the baud rate used (MASTER_KBAU=19200, 38400, 57600, 115200) and the latency time of the slave’s response.

Example:
850/1650/1850 connection with Gefran 19200 baud devices:
- Power controllers: GTF
- Controllers and programmers: 400/401, 450, 600/1200/1300, 800/1600/1800, 2500, 650/1250/1350, 850/1650/1850
- Indicators and alarm units: 4/40 T/B, 40TB, 2400, 650L/1250L

With a latency time for Modbus communication in the slave of 0 to 20ms, the total duration of a message will be a maximum of:

(TX message=4.2ms) + (Response latency=20ms) + (RX message=4.2ms) =
28.4ms (+ time of management of the RTS signal, if any)
Therefore:
- With 1 object: update every **40**ms
- With 2 objects, one of which has SPEED=HIGH while the other has SPEED=LOW: update 1 = update 2 = every **80**ms
- With 3 objects, one of which has SPEED=HIGH while two have SPEED=LOW: update 1 = **80**ms, update 2 = update 3 = every **160**ms

Example:
850/1650/1850 connection with Gefran 19200 baud devices:
- Power controllers: GFX4/GFXTERMO4/GFX4-IR/GFW

With a latency time for Modbus communication in the slave of 0 to 5ms, the total duration of a message will be a maximum of:

(TX message=**4.2**ms) + (Response latency=**5**ms) + (RX message=**4.2**ms) =
13.4ms (+ time of management of the RTS signal, if any)

Therefore:
- With 1 object: update every **20**ms
- With 2 objects, one of which has SPEED=HIGH while the other has SPEED=LOW: update 1 = update 2 = every **40**ms
- With 3 objects, one of which has SPEED=HIGH while two have SPEED=LOW: update 1 = **40**ms, update 2 = update 3 = every **80**ms

Only if the instrument is connected will the effective update time for each communication block in the variable UPD.x with x from 1 to 20 be reported in the set-up page.

5.19.2.4. Selecting remote device parameters

The communication block parameters determining the objects in the remote device are:

- **NODE**: remote device node
- **NODE_MAX**: maximum remote device node (for ACCESS=WRITE_ONLY only in the case of multi-node writing from NODE to consecutive NODE_MAX)
- **ADDRESS**: Modbus address of the object in the remote device to be read and/or written with the variable
- **TYPE**: type of object in the remote device
- **ACCESS**: type of object access in the remote device
- **MIN**: minimum value of the object in the remote device
- **MAX**: maximum value of the object in the remote device
- **DEC.P**: position of the decimal point value of the object in the remote device
- **MASK**: bit mask of the object in the remote device
- **DESCRIPTION**: description value of the object in the remote device. The description will appear on the instrument as a scrolling message when the data appears in the "MASTE" menu or the User menu.

TYPE parameter

The TYPE=WORD parameter is used to assess word data. This data is shown in the MAS.xx parameter in the MASTE menu or in the User Menu.
This data may be used in Math Function Blocks or retransmitted on an analogue output.
In the case of ACCESS=WRITE_ONLY write access or ACCESS=READ/WRITE access, the MIN...MAX limits apply and the value written in the MAS.xx parameter and in the slave are subject to these limits.
In the case of access in read-only mode, ACCESS=READ_ONLY, the MIN...MAX limits still apply, and the value written in the parameter MAS.xx , starting with the value read on the slave, is subject to these limits.
The limits on the data appearing on the controller display are between -1999…9999.

The TYPE=BIT parameter is used to assess bit data. This data appears in the MAS.xx parameter in the MASTE menu or in the User Menu.
This data may be used in Logical Function Blocks or retransmitted on an analogue output.
The limits on the data are 0…1.

The TYPE=BIT(S) OF WORD parameter is used to assess word data in AND with the MASK mask.
The result of the oforation appears in the MAS.xx parameter MAS.xx nel menu MASTE oppure inserito nello User Menu.
This data may be used in Math Function Blocks or retransmitted on an analogue output.
In the case of ACCESS=WRITE_ONLY write access or ACCESS=READ/WRITE access, the MIN...MAX limits apply and the value written in the MAS.xx parameter and in the slave are subject to these limits. In the case of access in read-only mode, ACCESS=READ_ONLY, the MIN...MAX limits still apply, and the value written in the parameter MAS.xx , starting with the value read on the slave, is subject to these limits.
The limits on the data appearing on the controller display are between -1999…9999.
Example:
To assess bit3 in a word:
MASK=8 (0x08) and MAS.xx may take on the values = 8 (bit3=1) or = 0 (bit3=0).

Volendo valutare il bit3 e il bit6 di una word:
MASK=72 (0x48) e MAS.xx potrà assumere i valori = 72 (bit3=1 e bit6=1) oppure 64 (bit6=1) oppure 8 (bit3=1) oppure 0 (bit3=0 e bit6=0)

MIN and MAX parameters

The MIN and MAX limits are significant when the TYPE=WORD parameter or the TYPE=BIT(S) OF WORD parameter and the parameter:

- ACCESS=WRITE_ONLY or ACCESS=READ_WRITE: to limit the value written on the slave.
- ACCESS=READ_ONLY: to set the limits on the scale if the value is used as input for a Math Function Block or retransmitted to an analogue output (if the MIN and MAX limits are not taken into account, the dynamic of the output is rescaled over a maximum range of [0…65535] points).

Example:
When reading a word with an effective range of [0…1000] points, if it is to be retransmitted to an analogue output of 0-10V where 0 points=0V and 1000 points=10V, set MIN=0 and MAX=1000.

⚠ **Warning!** In order to be correctly displayed and set in the controller, data read and written in the slave must be within the range [-1999…9999].
In the case of TYPE=BIT(S) OF WORD, you may therefore read and write from bit0 to bit12 [0…8191].

5.19.2.5. Selecting an internal variable to be retransmitted

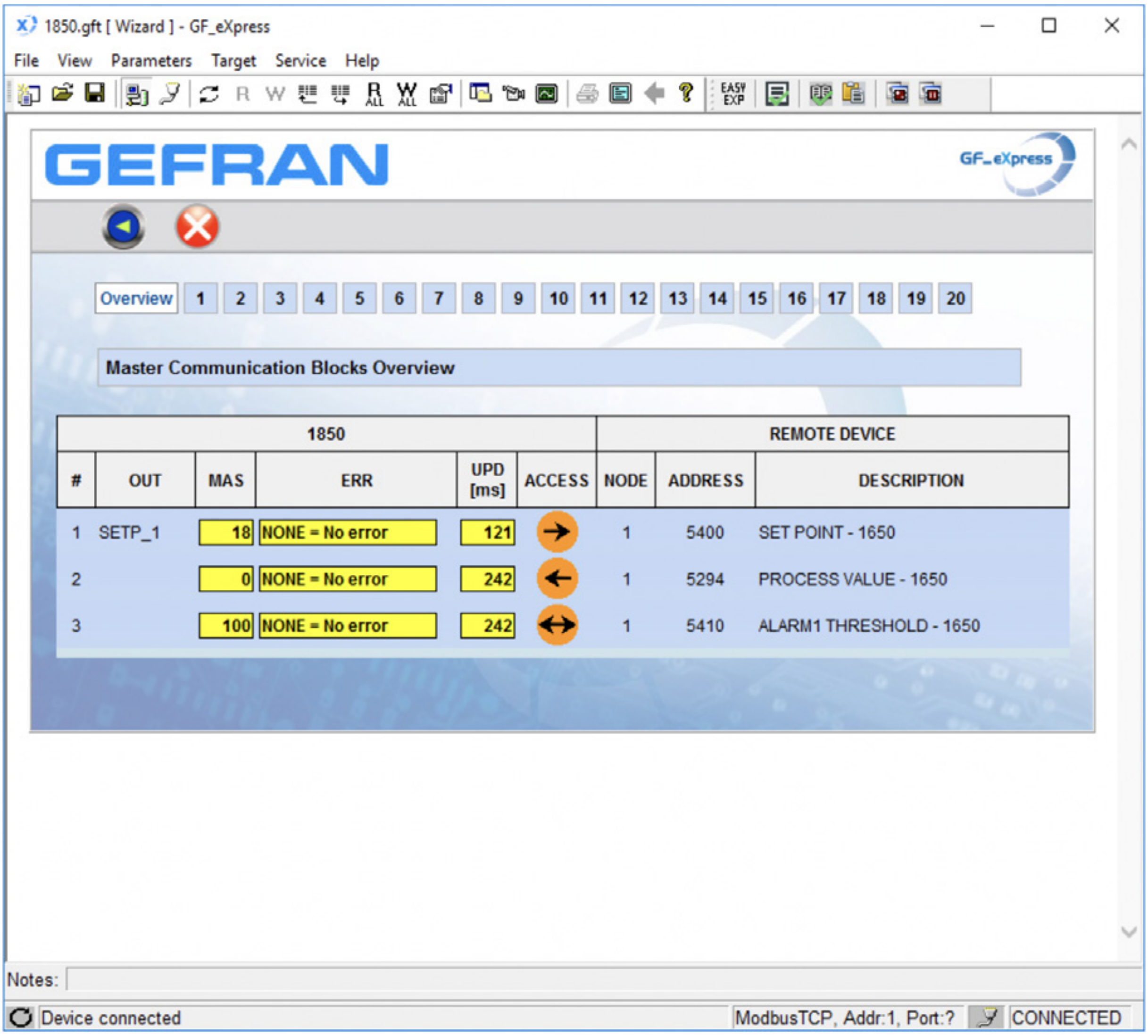
In the case of a communication block with WRITE_ONLY access, the instrument will send the remote device the value of an internal variable selected through the OUT parameter.

5.19.3. Setting the Master Modbus serial port

GF_eXpress may be used to set the communication speed (MASTER_KBAU=19200, 38400, 57600, 115200 baud), parity type (MASTER_PAR=NO_PARITY, ODD, EVEN) and timeout (MASTER_TIM=60…1000ms) of the Master Modbus serial.

5.19.4. Modbus object summary page

The "Overview" page in the Master Communication section of GF_eXpress may be used to obtain an overview of the Modbus parameters the device is exchanging with the connected nodes.



Master Communication Blocks Overview

1850						REMOTE DEVICE		
#	OUT	MAS	ERR	UPD [ms]	ACCESS	NODE	ADDRESS	DESCRIPTION
1	SETP_1	18	NONE = No error	121	→	1	5400	SET POINT - 1650
2		0	NONE = No error	242	←	1	5294	PROCESS VALUE - 1650
3		100	NONE = No error	242	↔	1	5410	ALARM1 THRESHOLD - 1650

Device connected

ModbusTCP, Addr:1, Port:?

CONNECTED

Information on Master device variables appears in the section on the left:

• "OUT" column:	name of the parameter sent (ONLY in the case of a writing oforation).
• "MAS" column:	value of the parameter written and\ or read.
• "ERR" column:	status of communication with the slave device..
• "UPD" column:	real parameter update time

.

• "ACCESS" column: type of oforation configured:

Write Only: →

Read Only: →

Read and Write: ↔

The parameters set for communication with the Slave node(s) appear on the right:

• "NODE" column:	number of the Slave node with which to conduct Modbus communication
• "ADDRESS" column:	Modbus address of the parameter to be exchanged (in read and\or write mode)
• "DESCRIPTION" column:	description of the object to be exchanged (in read and\or write mode)

5.20. Slave Communication in Modbus TCP

The “E0 = Ethernet Modbus TCP” option may be used to access the device using the Modbus TCP protocol.
Access may take place via any client (including the GF_eXpress set-up), implementing the following Modbus commands :

- 01 : Read Coils
- 02 : Read Discrete Inputs
- 03 : Read Holding Registers
- 04 : Read Input Registers
- 05 : Write Single Coil
- 06 : Write Single Register
- 15 : Write Multiple Coils
- 16 : Write Multiple registers

In order to connect with the device using the Modbus TCP protocol via a client, you must assign network parameters, and specifically:

- IP address (default 192.168.1.50)
- Subnet Mask (default 255.255.255.0)
- Gateway (default 192.168.1.1)

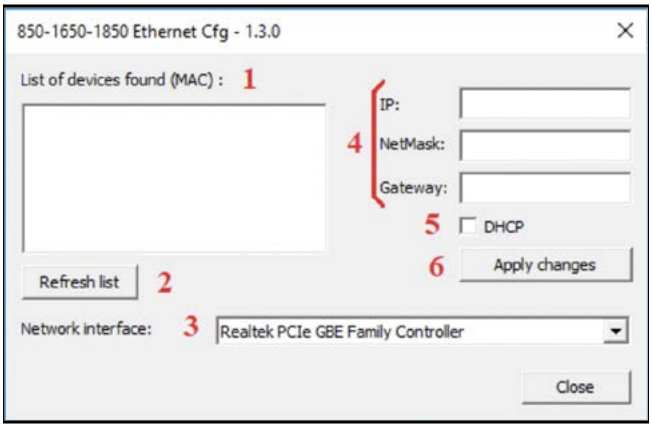
Attribution of these parameters may take place in two ways:

- acting on the parameters in the instrument’s ETHER submenu (enter reference to paragraph **"4.24. ETHER submenu - “Configuration of Ethernet parameters”**)

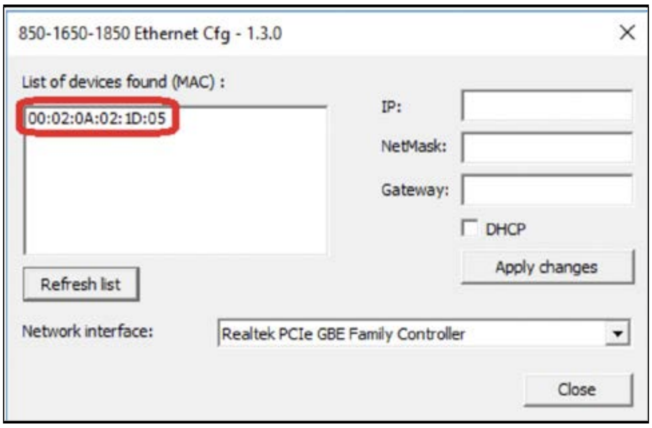
- using the “SetIP_850” Set-up Tool run on the PC
As this is a case of a Slave device connected via the Modbus TCP protocol acting as a bridge, it will also be necessary to indicate the node number (NodeID) of the device you want to connect to. The NodeID of the controller with the optional card is 1.

5.20.1. Setting network parameters using the tool on a PC

As stated above, network parameters may be assigned using the set-up tool
“SetIP_850” running on a PC.
When you run this tool, the following dialogue box appears

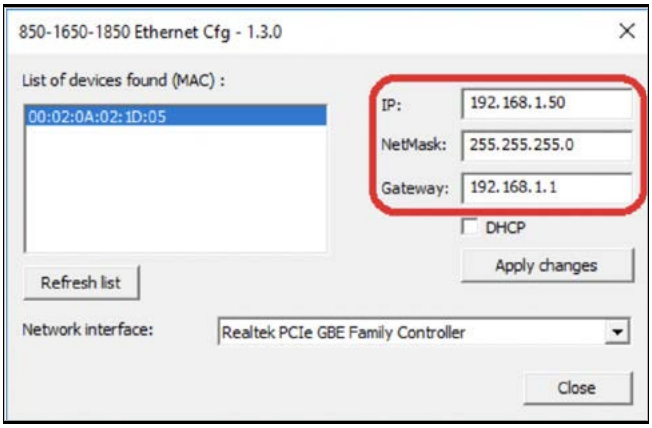


1. list of devices in the Forformance family (850-1650-1850) with the network option,
2. button for searching for devices in the Forformance family (850-1650-1850) with the network option,
3. selector for the network interface card on the PC to which the search for devices in the Forformance family (850-1650-1850) with the network option will be conveyed,
4. network parameters of the device selected in the list appearing on the left (see point 1)
5. enabling\disabling assignment of device network parameters via DHCP server
6. button for sending the set network parameters (see point 4) to the device selected in the list appearing on the left (see point 1).
Once you have selected the network interface card of the PC to which you wish to convey the search for devices in the Forformance family (850-1650-1850) with the network option (see point 3), press the button identified in point 2 and the scan will begin). When the search has been completed, a list of the devices found will appear in the area on the left (see point 1 and illustration below).



00:02:0A:02:1D:05

Once you have obtained a list of devices in the Forformance family (850-1650-1850) with the network option, if you select one of the items in the list, the corresponding network parameters will appear in the top right (see illustration below).

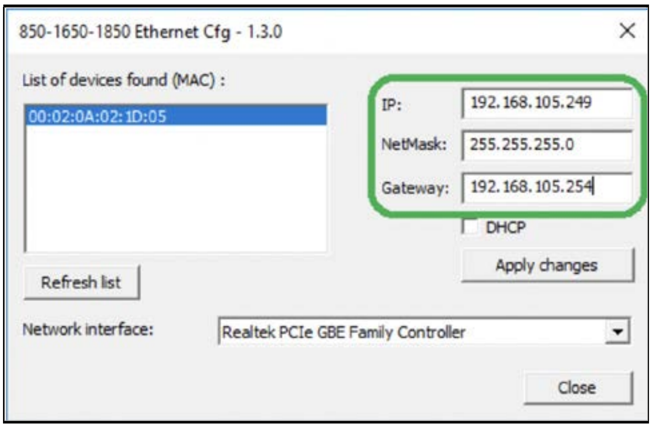


00:02:0A:02:1D:05

IP: 192.168.1.50
NetMask: 255.255.255.0
Gateway: 192.168.1.1

There are only two ways of assigning values different from the default values, and they are mutually exclusive :

- Fixed network parameters: set the new network parameter values to be assigned to the device and press “Apply changes” (see illustration below)


850-1650-1850 Ethernet Cfg - 1.3.0

List of devices found (MAC) :

00:02:0A:02:1D:05

IP: 192.168.105.249

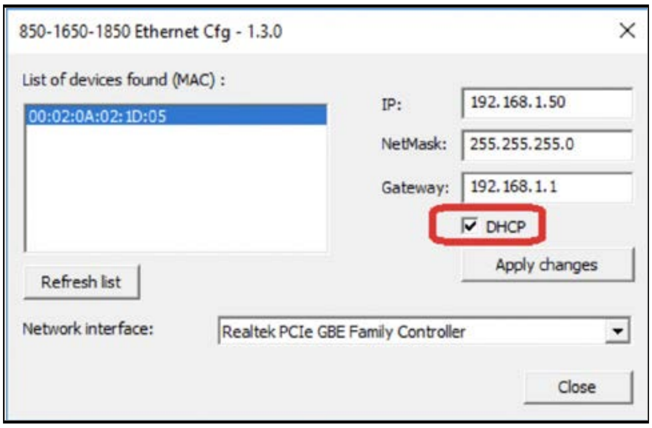
NetMask: 255.255.255.0

Gateway: 192.168.105.254

☐ DHCP

Network interface: Realtek PCIe GBE Family Controller

- Network parameters automatically assigned by DHCP server: enable the corresponding item and press “Apply changes” (see illustration below)


850-1650-1850 Ethernet Cfg - 1.3.0

List of devices found (MAC) :

00:02:0A:02:1D:05

IP: 192.168.1.50

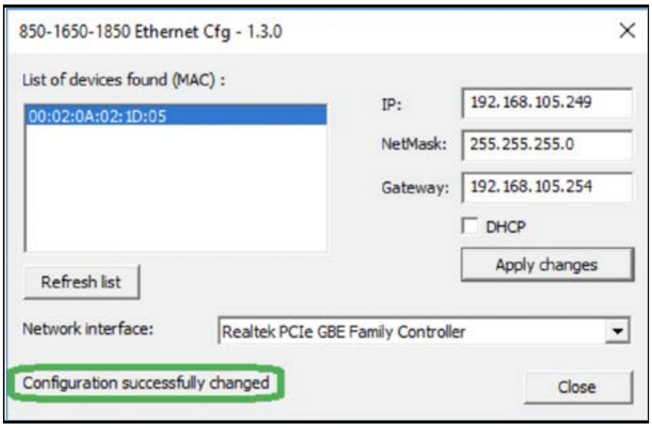
NetMask: 255.255.255.0

Gateway: 192.168.1.1

☑ DHCP

Network interface: Realtek PCIe GBE Family Controller

Whichever method is used, if the assignment of new network parameters is successful the following screen will appear.


850-1650-1850 Ethernet Cfg - 1.3.0

List of devices found (MAC) :

00:02:0A:02:1D:05

IP: 192.168.105.249

NetMask: 255.255.255.0

Gateway: 192.168.105.254

☐ DHCP

Network interface: Realtek PCIe GBE Family Controller

Configuration successfully changed

If it is not, nothing will appear in the box in the lower left.

⚠ **Warning**! Once the network parameters have been changed by one of the two methods described above, the device must be turned off and on again to implement the change.

If no devices in the Forformance family (850-1650-1850) with the network option are found upon completing the initial search (begun using the “Refresh list” button), the area at the top left will remain empty.

5.20.2. Modbus TCP communication diagnostics

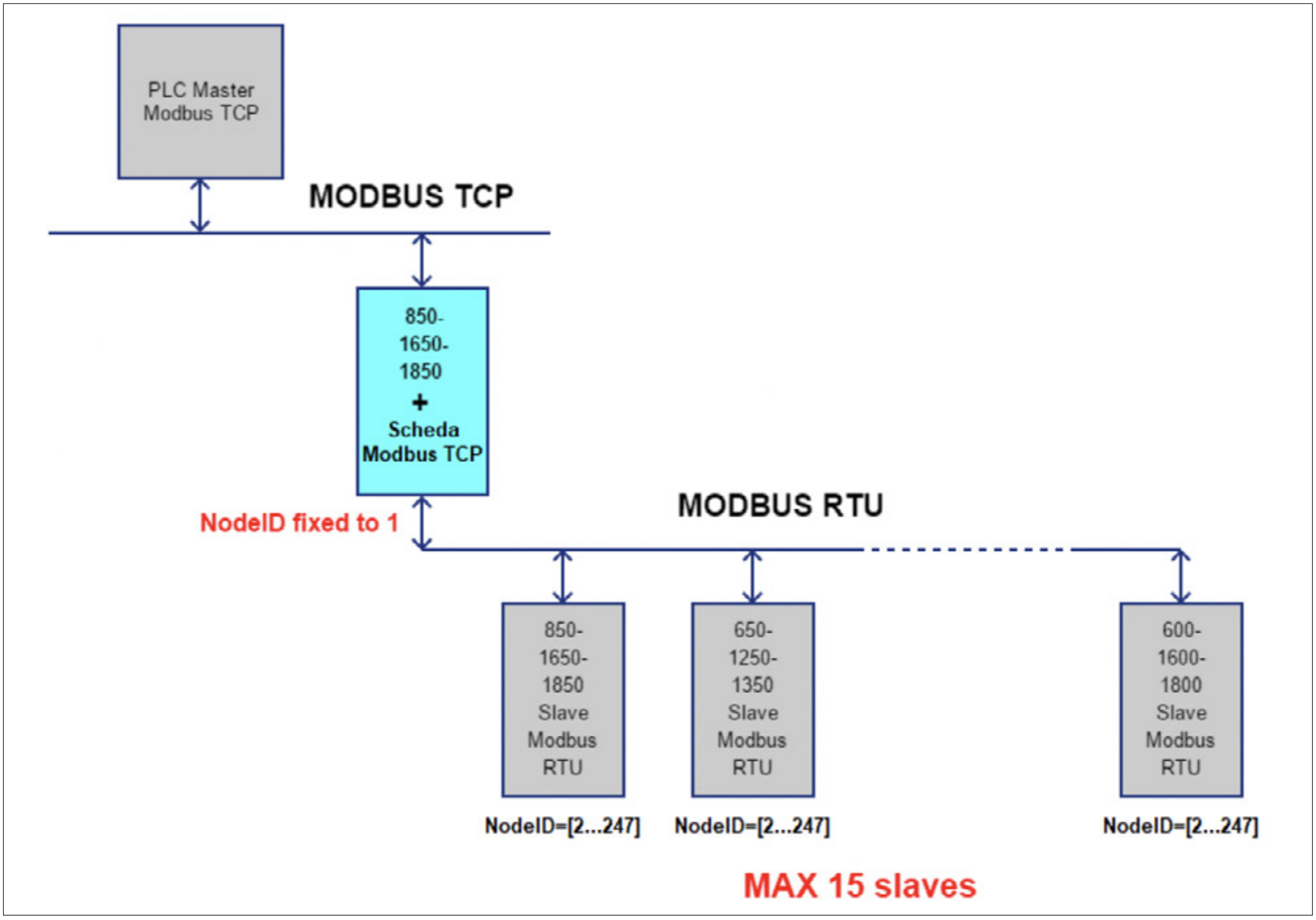
If the Modbus TCP communication option is installed but there are errors exchanging data with the device where the network interface card is assembled :

- the MAC.E parameter in the INFO submenu (add reference to paragraph **“4.4.6. MAC.E – Controller Ethernet address”**) will display the value 0x:00:00:00:00:00:00.
- The INFO.E submenu (add reference to paragraph **“4.5. INFO.E Submenu - Displaying Ethernet information”**) and the ETHER submenu (add reference to paragraph **“4.24. ETHER Submenu - Ethernet parameter set-up”**) will not appear

If there are no errors, you will be able to obtain network connection status by accessing the parameters in the INFO.E submenu (add reference to paragraph **“4.5. INFO.E Submenu - Displaying Ethernet information”**).

5.20.3. Oforation as a device Bridge with other devices

With the “ME = Ethernet Modbus TCP\RTU Bridge” option, the device can oforate as a Modbus TCP\RTU bridge, formitting connection of other devices using the serial number appearing on the terminals on the bottom of the box (see enter reference to paragraphs **“2.3. 850 wiring diagrams”** , **“2.4. 1650 wiring diagrams”** and **“2.5. 1850 wiring diagrams”**), obtaining the following architecture:



As shown in the figure above, the maximum number of nodes that may be connected is 15.

IThe value of the node number on the various devices connected may vary within the range of [2…247], in that the value 1 is reserved for the device with the Modbus TCP card mounted on it. The value of the serial parameters

- BadRate
- Parity
- Stopbit

(see **“Add reference to paragraph 4.23. SERIA Submenu - Serial configuration”**), must be the same for all Slaves.

The SCANR parameter in the SERIA submenu may be used to introduce a delay between two consecutive Modbus requests in order to formit exchange of data with other devices with higher response times.

This delay will affect all communications, data scan time via Modbus.

5.20.4. Synchronising the internal clock via NTP server

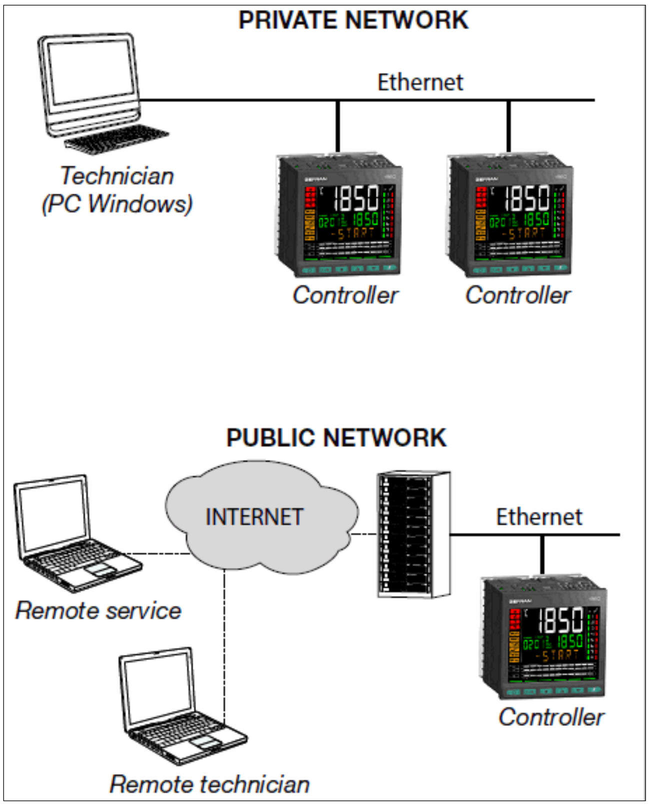
The **“E0 = Ethernet Modbus TCP”** and **“ME = Ethernet Modbus TCP\RTU Bridge”** options may be used to permit use of the device’s internal clock synchronisation service (RTC) with an NTP (Network Time Protocol) server in the same sub-network as the controller or in an external network. The service is activated by setting the value of the parameter TIM.NT to a value other than zero (see paragraph **“4.24.15. TIM.NT – Update time from Network Time Protocol server”**). Once started, the controller will periodically ask the server identified by the network address specified in the IP.NTX parameters (see paragraph **“4.24.16. IP.NT1 – Indirizzo IP 1 for server Network Time Protocol”** and subsequent points) for the new date and time value to be used and copy it into its internal clock.

This service ensures that events programmed with the Calendar (see paragraph **“5.23. Calendario”**) on different devices, each of which is connected with the same NTP server, all refer to the same basic time.

5.20.5. Private networks and public networks

The connection networks may be private or public.
A private network is a closed network with no connections to the outside world, which is intrinsically more secure.
The public network (Internet), in contrast, allows you to access devices connected to the network from anywhere in the world but, because of this, it is less secure.

Finally, there is the option of connecting a private network to a public network through a device called a firewall, which keeps it isolated except for duly authorised traffic.
In this type of configuration, a private network is often identified with the acronym LAN (Local Area Network), while the public network is referred to with the acronym WAN (Wide Area Network).
Other ways to identify them are intranet and extranet.
Note that the private network may consist of a single devic.



5.20.6. Firewall

A firewall is a physical device or a software application that isolates a device or a section in a network from the rest of the connection network.
Several firewalls may need to be crossed to reach a device. For example, there might be a firewall
between the corporate LAN and the Internet, and another firewall that isolates the device from the corporate network.
To access a multi-purpose controller behind a firewall you need to configure the access channels or firewall traffic rules and implement connections via VPN (Virtual Private Network) or directly through a modem.
Consult the corporate IT system administrator to properly configure firewalls or find out about the parameters required to implement a VPN or connect via modem.
In order to connect to an external multi-purpose controller and ensure the proper operations of all the services, the following ports need to be open (provide this list to the IT administrator):

Port	Service
502	Modbus TCP
8080	Webserver

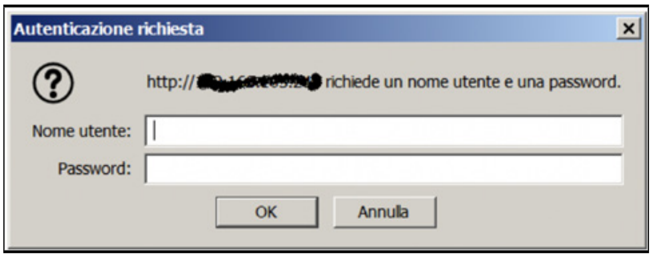
5.20.7. Router

In cases of particularly complex or extensive Ethernet networks, or networks subject to intense broadcast traffic, the connection to the 850, 1650 and 1850 controllers must be isolated. This is achieved by structuring the network into subnets (corporate/machine), or by limiting TCP/IP traffic to the traffic strictly necessary for hubs or services.
This rule should normally also be observed when connecting 850, 1650 and 1850 controllers in small networks, or with remote access systems.
The recommended solution is to connect the 850, 1650 and 1850 controllers via a router.
A router is a layer 3 device that allows you to route the communication packets between different networks, that is, to determine which specific port to release the package in arrival from on the basis of the target IP address.
Use of a router ensures that Ethernet traffic to or from the 850, 1650 and 1850 controllers is filtered and remains isolated from the rest of the corporate network or from the external network
.

5.21. Webserver function

The Modbus TCP option also formits use of the webserver function, which provides a series of web pages with a selection of device parameters, accessible using any internet browser.

To access these pages, simply open any internet browser and set the device's IP address. After a few seconds, the login window shown below will appear.



http://[redacted] richiede un nome utente e una password.

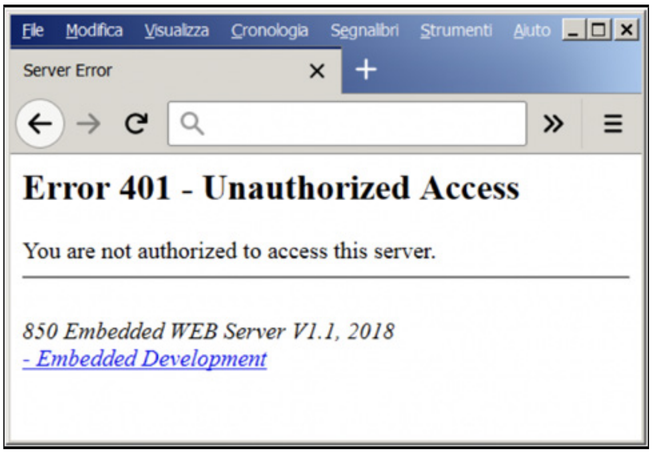
Nome utente:

Password:

2 users are available:

- admin with webadmin password
- webuserD with webuserD password. This user is read-only, and so any writing options will be rejected.

if you cannot obtain access and select the Cancel command, the screen shown below will appear in the browser:



Error 401 - Unauthorized Access

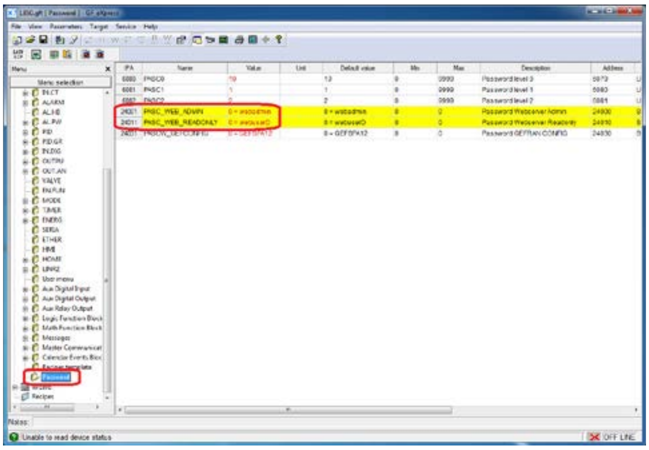
You are not authorized to access this server.

850 Embedded WEB Server V1.1, 2018

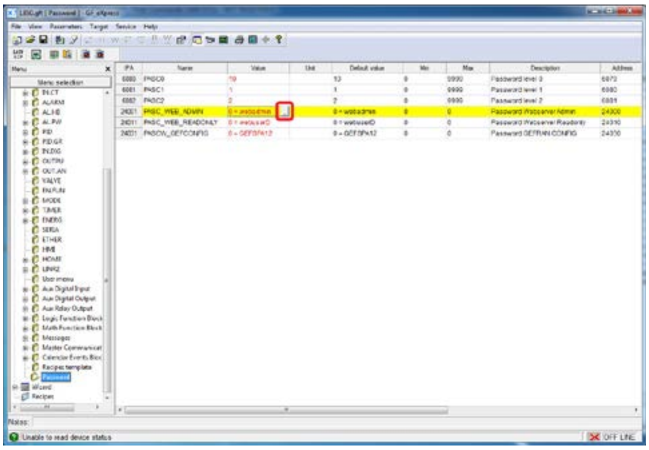
- Embedded Development

Caution! User and Password are NOT encrypted.

You can change the default access passwords associated with the two users by editing them via GF_eXpress

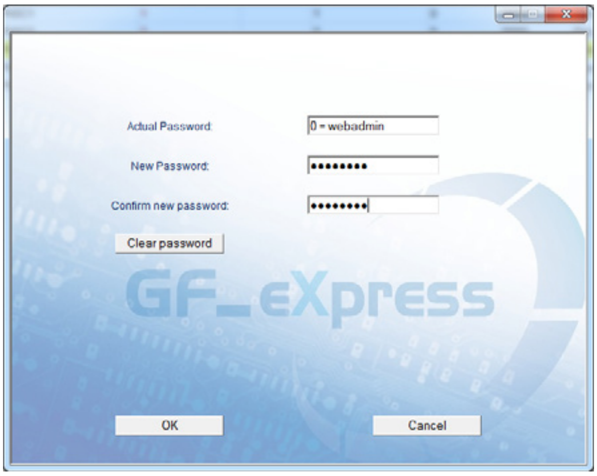


To give the password parameter a different value from the default value, select the appropriate button in the grid



When you press this button, a dialogue box will appear with:

- a "Current Password" field displaying the current password plain text
- a "New Password" field in which you can set the new password in encrypted form.
- a "Confirm new password" field where you will be asked to confirm the new password in encrypted form
- a "Clear" button for resetting the default password
- OK\Cancel buttons to confirm and/or cancel the setting



Actual Password: 0 = webadmin

New Password: ••••••••

Confirm new password: ••••••••

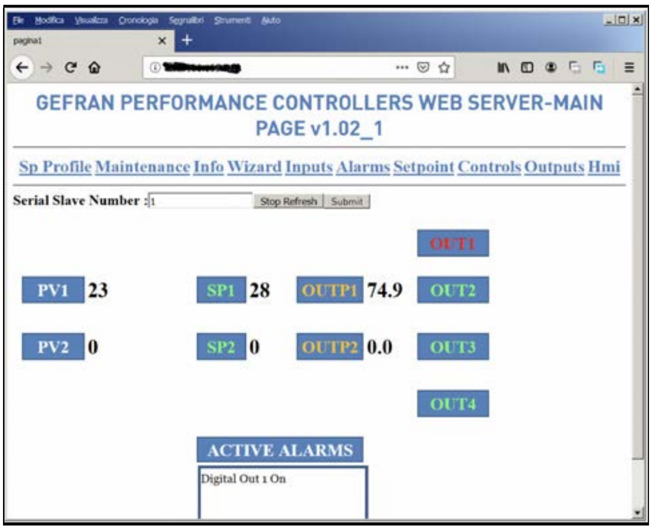
The value assigned to the access passwords associated with the two webserver users are in no way visible on the instrument, but only via GF_eXpress.

Caution! Passwords are case-sensitive and must be at least four characters long.
The admissible characters are:

- 'A'... 'Z' e 'a'...'z'
- '0'...'9'
- '! ' , '$' , '%' , '&' , '>' , '<' , ';' , ':' , ',' , '.' , '#' , '@' , '_' , '-'

Use of a character other than those listed above, or a sequence of permitted characters shorter than the minimum length, will make the password unacceptable and cause an error message to appear in the password setting dialogue box when you press "OK".

The main page appears, as shown below



[redacted]

GEFRAN PERFORMANCE CONTROLLERS WEB SERVER-MAIN PAGE v1.02_1

Serial Slave Number : 1

PV1 23 SP1 28 OUTP1 74.9

PV2 0 SP2 0 OUTP2 0.0

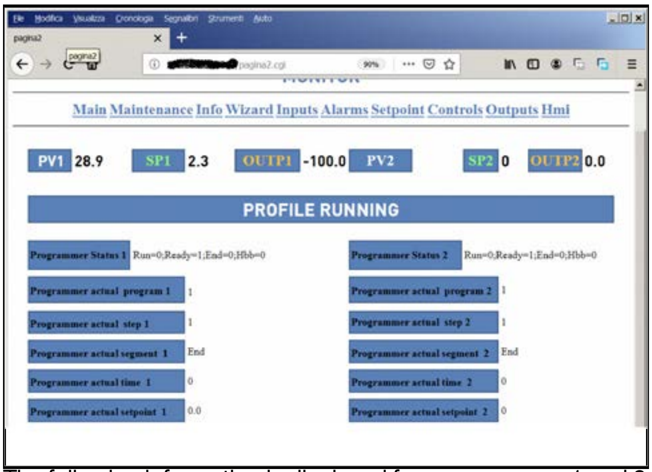
ACTIVE ALARMS

Digital Out 1 On

Quantities are displayed **(editable variables appear in blue)**

- PV1,PV2 (process vale)
- SP1,SP2 (active setpoints)
- OUTP1, OUTP2 (output powers)
- Status of Relay/Logical outputs OUT1,2,3,4 . Text in red means it is active
- Active Alarms (Window containing mnemonic alarm messages)
- The page has a mechanism for refreshing every 2.5 seconds
- **Serial Slave Number** : formits selection of the serial code (node number) of a device in the 850 family connected via serial 485 and view its pages. Follow these steps to change the node number:
  - Click on the Stop Refresh button and wait for the button caption to say "Refresh stopped"
  - Enter a node number between 1 and 247
  - Press "Submit" to change the setting

If a device connected to the serial sub-network does not respond, the pages will show the variables PV1,PV2,SP1,SP2,OUTP1,OUTP2 with the value Err!
Click on the Sp_Profile link to go to the SP Profile Monitor page, where the status of the two available programs is displayed



[redacted]pagina2.cgi

PV1 28.9 SP1 2.3 OUTP1 -100.0 PV2 SP2 0 OUTP2 0.0

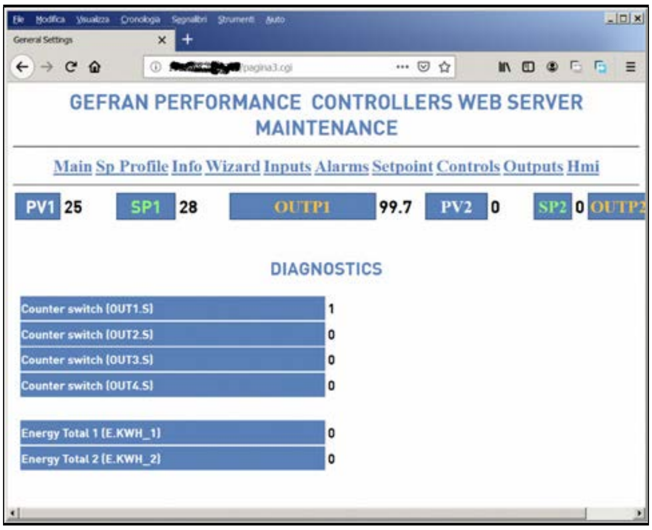
PROFILE RUNNING

Programmer Status 1	Run=0;Ready=1;End=0;Hbb=0	Programmer Status 2	Run=0;Ready=1;End=0;Hbb=0
Programmer actual program 1	1	Programmer actual program 2	1
Programmer actual step 1	1	Programmer actual step 2	1
Programmer actual segment 1	End	Programmer actual segment 2	End
Programmer actual time 1	0	Programmer actual time 2	0
Programmer actual setpoint 1	0.0	Programmer actual setpoint 2	0

The following information is displayed for programmers 1 and 2

- Programmer Status (Run,Ready,End,Hbb)
- Programmer actual program (Number of the program currently running)
- Programmer actual step (Number of the step currently running)
- Programmer actual segment (Ramp, Hold, end)
- Programmer actual time (time of the ramp/step currently running)
- Programmer actual set point (setpoint of the step currently running)

Click on the Maintenance link to go to the page



[redacted]pagina3.cgi

GEFRAN PERFORMANCE CONTROLLERS WEB SERVER MAINTENANCE

PV1 25 SP1 28 OUTP1 99.7 PV2 0 SP2 0 OUTP2

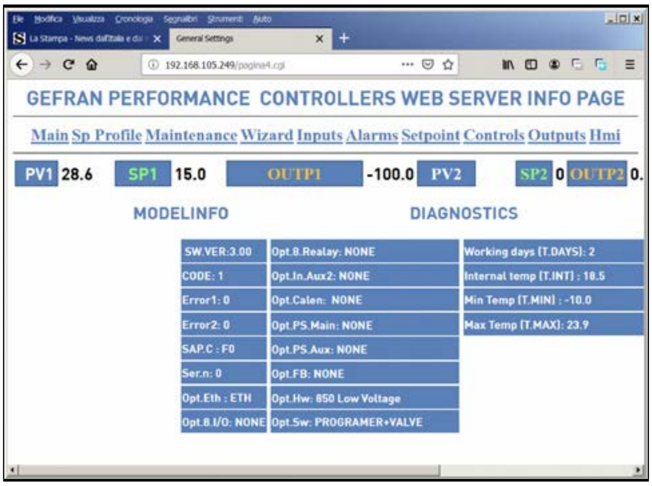
DIAGNOSTICS

Counter switch (OUT1.S)	1
Counter switch (OUT2.S)	0
Counter switch (OUT3.S)	0
Counter switch (OUT4.S)	0
Energy Total 1 (E.KWH_1)	0
Energy Total 2 (E.KWH_2)	0

The page includes:

1. Counter switch (1,2,3,4) , thousands of switches
2. Total energy 1,2 used by pid 1,2

Go to the Info page to view the information listed below



192.168.105.249/pagina4.cgi

GEFRAN PERFORMANCE CONTROLLERS WEB SERVER INFO PAGE

PV1 28.6 SP1 15.0 OUTP1 -100.0 PV2 SP2 0 OUTP2 0.

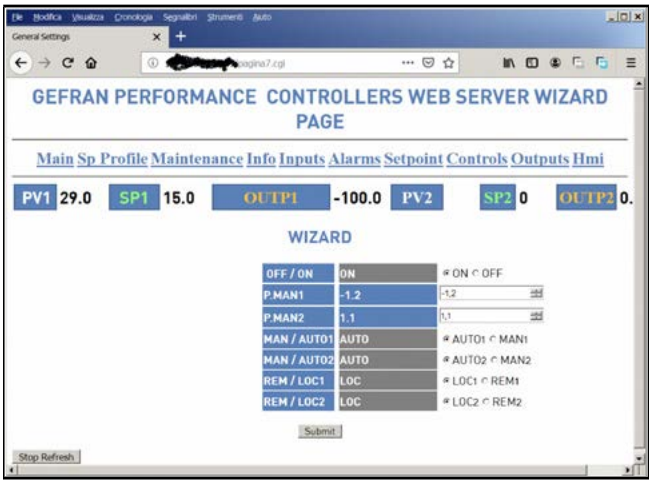
MODELINFO		DIAGNOSTICS
SW.VER:3.00	Opt.8.Realay: NONE	Working days (T.DAYS): 2
CODE: 1	Opt.In.Aux2: NONE	Internal temp (T.INT) : 18.5
Error1: 0	Opt.Calen: NONE	Min Temp (T.MIN) : -10.0
Error2: 0	Opt.PS.Main: NONE	Max Temp (T.MAX): 23.9
SAP.C : F0	Opt.PS.Aux: NONE	
Ser.n: 0	Opt.FB: NONE	
Opt.Eth : ETH	Opt.Hw: 850 Low Voltage	
Opt.8.I/O: NONE	Opt.Sw: PROGRAMER+VALVE	

There are two paragraphs on this page:

- MODELINFO WITH:
  - SW version
  - Serial code
  - Input error1 and 2
  - Sap code
  - Serial Number
  - Opt Hw and SW

- DIAGNOSTICS with:
  - Working days ; total days of oforation
  - Internal temp , internal temforature
  - Min temp, minimum internal temforature
  - Max temp, maximum internal temforature

Go to the WIZARD page and click on the link to access the corresponding page



[redacted]/pagina7.cgi

GEFRAN PERFORMANCE CONTROLLERS WEB SERVER WIZARD PAGE

Main Sp Profile Maintenance Info Inputs Alarms Setpoint Controls Outputs Hmi

PV1 29.0 SP1 15.0 OUTP1 -100.0 PV2 SP2 0 OUTP2 0.

WIZARD

OFF / ON	ON	● ON ○ OFF
P.MAN1	-1.2	-1,2
P.MAN2	1.1	1,1
MAN / AUTO1	AUTO	● AUTO1 ○ MAN1
MAN / AUTO2	AUTO	● AUTO2 ○ MAN2
REM / LOC1	LOC	● LOC1 ○ REM1
REM / LOC2	LOC	● LOC2 ○ REM2

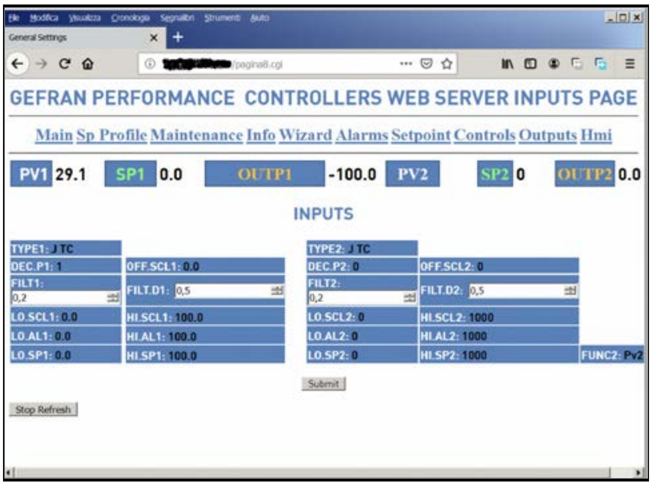
The information appearing on the page is as follows:

- **OFF/ON** instrument power down command
- **P.MAN1,2** Power 1,2 delivered manually by the corresponding PID
- **MAN/AUTO** 1 and 2, manual/automatic PID command
- **REM/LOC** 1 and 2, remote/local PID command
- The page is refreshed every 2.5 seconds. Proceed as follows to set the parameters:

1. Click on Stop Refresh
2. Set the desired values
3. Select Submit

- The WIZARD page then starts refreshing again

The page input attached below



[redacted]/pagina8.cgi

GEFRAN PERFORMANCE CONTROLLERS WEB SERVER INPUTS PAGE

Main Sp Profile Maintenance Info Wizard Alarms Setpoint Controls Outputs Hmi

PV1 29.1 SP1 0.0 OUTP1 -100.0 PV2 SP2 0 OUTP2 0.0

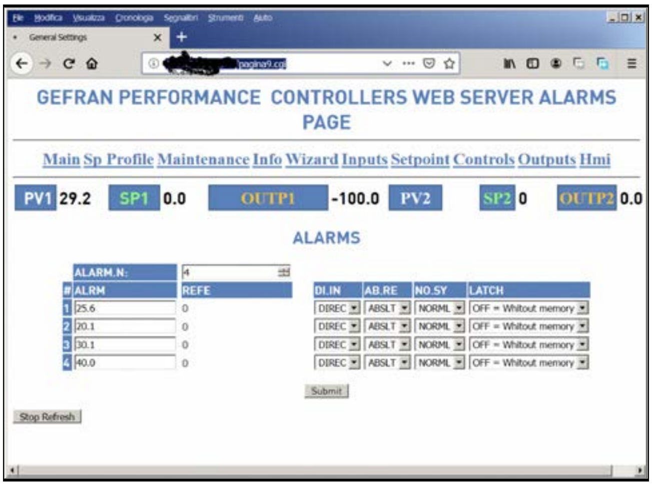
INPUTS

TYPE1: J TC		TYPE2: J TC		
DEC.P1: 1	OFF.SCL1: 0.0	DEC.P2: 0	OFF.SCL2: 0	
FILT1: 0,2	FILT.D1: 0,5	FILT2: 0,2	FILT.D2: 0,5	
LO.SCL1: 0.0	HI.SCL1: 100.0	LO.SCL2: 0	HI.SCL2: 1000	
LO.AL1: 0.0	HI.AL1: 100.0	LO.AL2: 0	HI.AL2: 1000	
LO.SP1: 0.0	HI.SP1: 100.0	LO.SP2: 0	HI.SP2: 1000	FUNC2: Pv2

Shows information on main inputs 1 and 2:

- Type 1 and 2 formit selection of the type of sensor of the main inputs
- Dec.P1 and 2 identify the decimal point used for processing the main inputs
- FILT 1 and 2 , input time filter
- LO.SCL 1 and 2, low end of scale
- LO.AL1 and 2, low end of scale for absolute alarms
- LO.SP1 and 2, low end of scale for setpoints
- OFF.SCL 1 and 2 , offset input
- FILT.D 1 and 2, display filter for process variables
- HI.SCL 1 and 2, high end of scale
- HI.AL1 and 2, high end of scale for absolute alarms
- HI.SP1 and 2, high end of scale for setpoints
- FUNC function of input 2

Shows information on main inputs 1 and 2:



[redacted]/pagina9.cgi

GEFRAN PERFORMANCE CONTROLLERS WEB SERVER ALARMS PAGE

Main Sp Profile Maintenance Info Wizard Inputs Setpoint Controls Outputs Hmi

PV1 29.2 SP1 0.0 OUTP1 -100.0 PV2 SP2 0 OUTP2 0.0

ALARMS

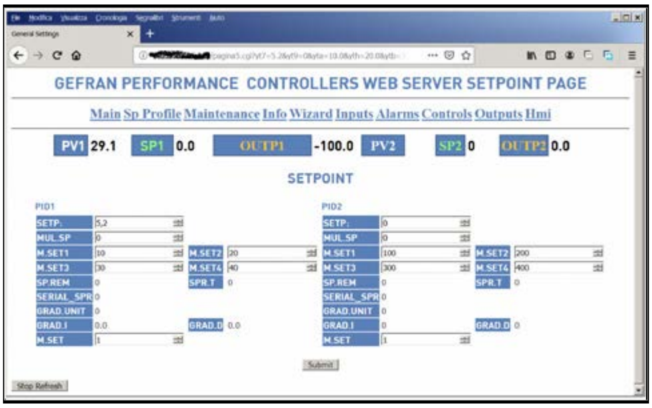
ALARM.N: 4

#	ALRM	REFE	DI.IN	AB.RE	NO.SY	LATCH
1	25.6	0	DIREC	ABSLT	NORML	OFF = Whitout memory
2	20.1	0	DIREC	ABSLT	NORML	OFF = Whitout memory
3	30.1	0	DIREC	ABSLT	NORML	OFF = Whitout memory
4	40.0	0	DIREC	ABSLT	NORML	OFF = Whitout memory

The ALARMS page contains the following information:

- **ALARM.N** number of alarms enabled
- **ALRM 1,2,3,4** alarm set point value
- **REFE 1,2,3,4** alarm setpoint reference
- **DI.IN 1,2,3,4** definition for direct / inverse alarm
- **AB.RE 1,2,3,4** definition for relative / absolute alarm
- **NO.SY 1,2,3,4** definition for normal / symmetrical alarm
- **LATCH 1,2,3,4** definition for alarm on/off memory. The page is refreshed every 2.5 seconds. Follow the steps listed on the previous page to edit these fields

The SETPOINT page contains the information listed below



GEFRAN PERFORMANCE CONTROLLERS WEB SERVER SETPOINT PAGE

Main Sp Profile Maintenance Info Wizard Inputs Alarms Controls Outputs Hmi

PV1 29.1 SP1 0.0 OUTP1 -100.0 PV2 SP2 0 OUTP2 0.0

SETPOINT

PID1				PID2			
SETP.	5,2			SETP.	0		
MUL.SP	0			MUL.SP	0		
M.SET1	10	M.SET2	20	M.SET1	100	M.SET2	200
M.SET3	30	M.SET4	40	M.SET3	300	M.SET4	400
SP.REM	0	SPR.T	0	SP.REM	0	SPR.T	0
SERIAL_SPR	0			SERIAL_SPR	0		
GRAD.UNIT	0			GRAD.UNIT	0		
GRAD.I	0.0	GRAD.D	0.0	GRAD.I	0	GRAD.D	0
M.SET	1			M.SET	1		

- **SETP 1,2** : Set point
- **MUL.SP 1,2**: Multiset enabling
- **M.SET1** : Multiset point 1,2
- **M.SET2** : Multiset point 1,2
- **M.SET3** : Multiset point 1,2
- **M.SET4** : Multiset point 1,2

- **SP.REM** : Remote setpoint enabling 1,2
- **SERIAL_SPR** : remote setpoint from seriale 1,2
- **GRAD.UNIT** : unit of measurement of gradient 1,2
- **GRAD.I** : Gradient increasing 1,2
- **GRAD.D** : Gradient decreasing 1,2
- **M.SET** : multiset selection 1,2
- The page is refreshed every 2.5 seconds. Follow the steps listed on the previous page to edit these fields

The CONTROLS page contains the information listed below

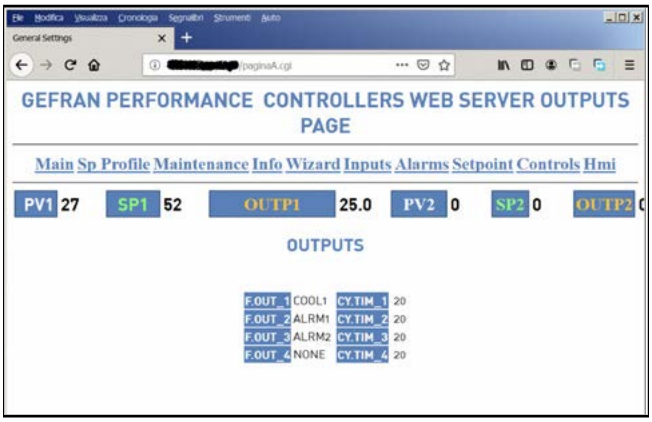
GEFRAN PERFORMANCE CONTROLLERS WEB SERVER CONTROLS PAGE

PV1 27 SP1 52 OUTP1 25.0 PV2 0 SP2 0 OUTP2 0.0

CONTROLS

CONTROLS1				CONTROLS2			
CNTR	H.PID	S.TUNE	OFF	CNTR	H.PID	S.TUNE	OFF
H.PB	1	A.TUNE	OFF	H.PB	1	A.TUNE	OFF
H.IT	4	AUT.T	O.SHOT	H.IT	4	AUT.T	CONTI
H.DT	1	SOFT.S	0	H.DT	1	SOFT.S	0
COOL	0	SOFT.T	420.0	COOL	0	SOFT.T	0.0
C.PB	1	SELFTUN	Stop	C.PB	1	SELFTUN	Stop
C.IT	4	AUTOTUN	Stop	C.IT	4	AUTOTUN	Stop
C.DT	1	SoftStart	Stop	C.DT	1	SoftStart	Stop
				PID2.E	On	APP.T	2.PID

Parameters:
- **CNTR** : type of pid 1,2 controller
- **H.PB** : proportional heating band 1,2
- **H.IT** : integral heating time 1,2
- **H.DT** : derivative heating time 1,2
- **C.PB** : proportional cooling band 1,2
- **C.IT** : integral cooling time 1,2
- **C.DT** : derivative cooling time 1,2
- **COOL** : type of cooling fluid 1,2
- **S.TUNE** : self-tuning enabled 1,2
- **A.TUNE** : autotuning enabled 1,2
- **ATU.T** : type of autotuning 1,2
- **SOFT.S** : soft start enabled 1,2
- **SOFT.T** : soft start time 1,2
- **SELFTUN** : self-tuning status 1,2
- **AUTOTUN** : autotuning status 1,2
- **SoftStart** : softstart status 1,2
- **PID.E** : pid 2 enabled
- **APP.T** : PID control type
- The page is refreshed every 2.5 seconds. Follow the steps listed on the previous page to edit these fields



GEFRAN PERFORMANCE CONTROLLERS WEB SERVER OUTPUTS PAGE

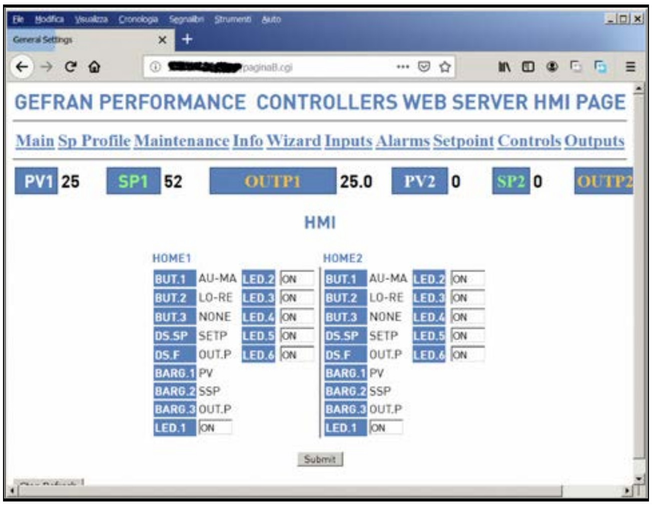
PV1 27 SP1 52 OUTP1 25.0 PV2 0 SP2 0 OUTP2

OUTPUTS

F.OUT_1	COOL1	CY.TIM_1	20
F.OUT_2	ALRM1	CY.TIM_2	20
F.OUT_3	ALRM2	CY.TIM_3	20
F.OUT_4	NONE	CY.TIM_4	20

The OUTPUTS page may be used to display the following information on outputs:
F.OUT : reference to output 1,2,3,4
CY.TIM: cycle time for outputs 1,2,3,4 (relay, triac, logical)

The HMI page



GEFRAN PERFORMANCE CONTROLLERS WEB SERVER HMI PAGE

PV1 25 SP1 52 OUTP1 25.0 PV2 0 SP2 0 OUTP2

HMI

HOME1				HOME2			
BUT.1	AU-MA	LED.2	ON	BUT.1	AU-MA	LED.2	ON
BUT.2	LO-RE	LED.3	ON	BUT.2	LO-RE	LED.3	ON
BUT.3	NONE	LED.4	ON	BUT.3	NONE	LED.4	ON
DS.SP	SETP	LED.5	ON	DS.SP	SETP	LED.5	ON
DS.F	OUT.P	LED.6	ON	DS.F	OUT.P	LED.6	ON
BARG.1	PV			BARG.1	PV		
BARG.2	SSP			BARG.2	SSP		
BARG.3	OUT.P			BARG.3	OUT.P		
LED.1	ON			LED.1	ON		

contains the following fields:
- **BUT.1** : M/A function key for home 1 and 2
- **BUT.2** : Key2 function key for home 1 and 2
- **BUT.3** : Key3 function key for home 1 and 2
- **DS.SP** : SV display function for home 1 and 2
- **DS.F** : F display function for home 1 and 2
- **BARG.1** : Bargraph 1 for home 1 and 2
- **BARG.2** : Bargraph 2 for home 1 and 2
- **BARG.3** : Bargraph 3 for home 1 and 2
- **LED.1,2,3,4,5,6** : Led function for home 1 and 2
- The page is refreshed every 2.5 seconds. Follow the steps listed on the previous page to edit these fields.

5.22. Instrument menu set-up

The instrument set-up menu may be customised, selecting the menus and parameters in each menu that must be visible or invisible while browsing. For selecting the menus and menu parameters to be displayed in the instrument's editor, there is a new button on the WIZARD di GF_ eXpress page (which may be activated using the "EN.EDI" parameter in the EN.FUN menu):

This button opens a new window containing all the menus that may be displayed on the instrument

Select one of the n menus and another window will open formitting selection of individual menu parameters:

ENABLE ROOT MENU "INPUT" ☑

INPUT NUMBER ☑

Parameter		Description
TYPE	☑	Type of probe
SBR.E	☑	SBR enable
FUNC	☑	Function of input
LIN	☑	Custom linearization
UNIT	☑	Unit of measure
FILT	☑	Digital filter
FILT.D	☑	Digital filter on display PV
DEC.P	☑	Decimal point position
LO.SCL	☑	Input low limit
HI.SCL	☑	Input high limit
OF.SCL	☑	Input offset
LO.SP	☑	Low limit for setpoint
HI.SP	☑	High limit for setpoint
LO.AL	☑	Low limit for absolute alarms
HI.AL	☑	High limit for absolute alarms
MSG.LO	☑	Number of scrolling message when input is in LOW error
MSG.HI	☑	Number of scrolling message when input is in HIGH error
MSG.ER	☑	Number of scrolling message when input is in ERR error
MSG.SB	☑	Number of scrolling message when input is in SBR error

You may select / deselect all parameters at the same time with the "SELECT ALL" and "UNSELECT ALL" buttons.
The "ROOT" and "NUMBER" checkboxes (the second only in the case of a menu with multiple instances, such as INPUT1, INPUT2, etc.) above these buttons cannot be selected by the user, but indicate the two editor views which are obligatory if there is at least one menu parameter selected. The corresponding variables may be viewed in the EXForT menu under the "Enable Menu" group.

5.23. Calendar

The option “CK = RTC+Logical + Mathematical Options” may be used to configure the device to trigger a series of actions over time.
The calendar may be set in the EN.FUN menu using the CAL.EN parameter
As follows:

- Weekly: continuous calendar (“WEEKLY” option)
- Single week (“ONE.OF option”): the calendar triggers events for up to seven days, then switches OFF, **while keeping all information on events and enabling of days set to ON stored in memory.**

The actions that may be scheduled are:

- SW ON (starting up the software, or terminating software off condition – see paragraph 5.8)
- SW OFF (turning off the software - see paragraph 5.8)
- START PROGRAMMER 1
- STOP PROGRAMMER 1
- RESET PROGRAMMER 1 (the programmer goes into “READY” condition)
- START PROGRAMMER 2
- STOP PROGRAMMER 2
- RESET PROGRAMMER 2 (the programmer goes into “READY” condition)
- SW ON and START PROGRAMMER 1 (if software is of, software on will be forced, followed by start programmer)
- SW ON and START PROGRAMMER 2 (if software is of, software on will be forced, followed by start programmer)
- P.ST12: START programmer time base PROGR.1 and PROGR.2
- P.SP12: STOP programmer time base PROGR.1 and PROGR.2
- P.RS12: RESET programmer time base PROGR.1 and PROGR.2
- TRIGGERED TIME EVENT 1 (as in FB input)
- TRIGGERED TIME EVENT 2 (as in FB input)

The TRIGGERED TIME EVENT 1 action and the TRIGGERED TIME EVENT 2 action are set as input for the LFBs to define any internal status currently managed by the LFBs. The LFBs may be used to force statuses (see Function Commands)

Up to 4 events are available for each day of the week; a single day may be enabled or not, as required.

⚠ **Warning**: in a ONE WEEK calendar, at midnight, the previous day is considered completed in terms of the associated events, which will therefore no longer take place, even if the day is still enabled. In the event of a power supply failure and return, events associated with the days during which the power supply was off will remain active.

The calendar can only be configured using the GF_eXpress tool:

Select everything you need to set scheduled events in the WEEKLY CALENDAR:

- Enable single week or weekly calendar
- Enable day of the week
- 4 events
- Hour, minute and second when the event will be triggered

MONDAY

ACTIVE

EVENT1	EVENT2	EVENT3	EVENT4
ACTION1	ACTION2	ACTION3	ACTION4
OFF.SW	NONE	NONE	ON.SW
HOUR 9 MINUTE 10 SECOND 0	HOUR 0 MINUTE 0 SECOND 0	HOUR 0 MINUTE 0 SECOND 0	HOUR 9 MINUTE 11 SECOND 0

TUESDAY

DISABLED

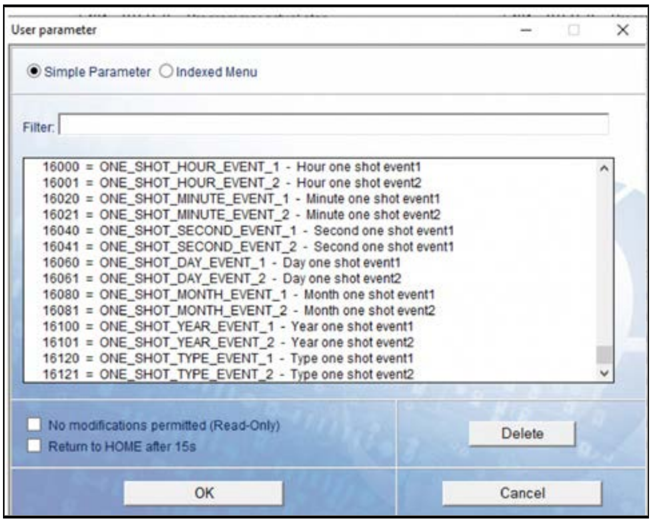
EVENT1	EVENT2	EVENT3	EVENT4
ACTION1	ACTION2	ACTION3	ACTION4
NONE	NONE	NONE	NONE
HOUR 0 MINUTE 0 SECOND 0	HOUR 0 MINUTE 0 SECOND 0	HOUR 0 MINUTE 0 SECOND 0	HOUR 0 MINUTE 0 SECOND 0

WEDNESDAY

ACTIVE

EVENT1	EVENT2	EVENT3	EVENT4
ACTION1	ACTION2	ACTION3	ACTION4
OFF.SW	NONE	NONE	ON.SW
HOUR 9 MINUTE 15 SECOND 0	HOUR 0 MINUTE 0 SECOND 0	HOUR 0 MINUTE 0 SECOND 0	HOUR 9 MINUTE 16 SECOND 0

In addition to the weekly calendar, two one-shot events may be set via the usermenu, either on the instrument or in GF_eXpress:



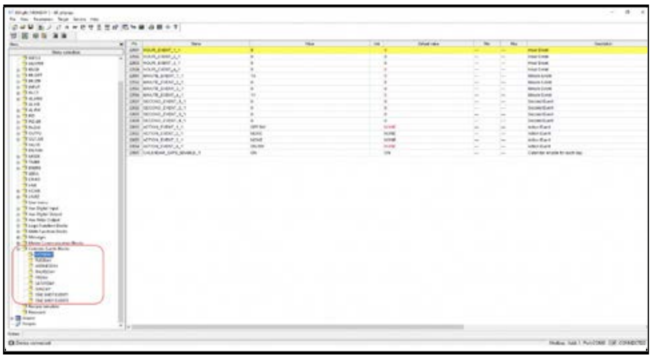
● Simple Parameter ○ Indexed Menu

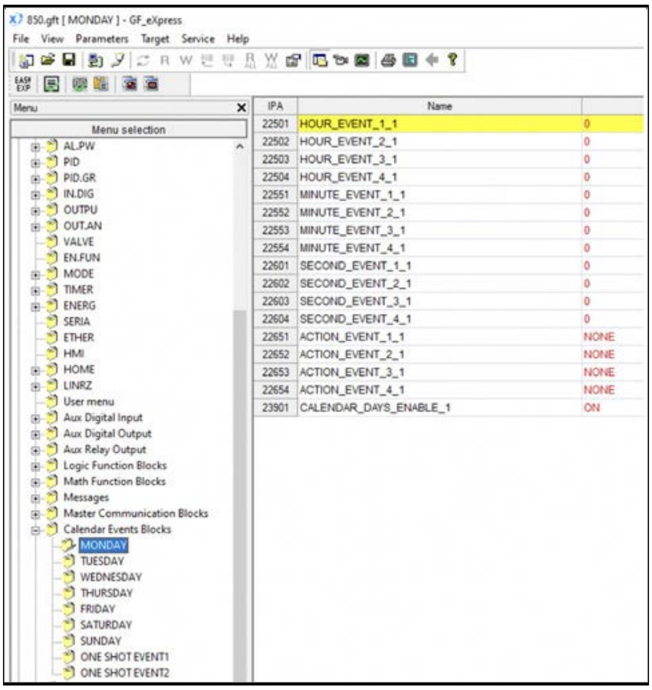
```
16000 = ONE_SHOT_HOUR_EVENT_1 - Hour one shot event1
16001 = ONE_SHOT_HOUR_EVENT_2 - Hour one shot event2
16020 = ONE_SHOT_MINUTE_EVENT_1 - Minute one shot event1
16021 = ONE_SHOT_MINUTE_EVENT_2 - Minute one shot event2
16040 = ONE_SHOT_SECOND_EVENT_1 - Second one shot event1
16041 = ONE_SHOT_SECOND_EVENT_2 - Second one shot event1
16060 = ONE_SHOT_DAY_EVENT_1 - Day one shot event1
16061 = ONE_SHOT_DAY_EVENT_2 - Day one shot event2
16080 = ONE_SHOT_MONTH_EVENT_1 - Month one shot event1
16081 = ONE_SHOT_MONTH_EVENT_2 - Month one shot event2
16100 = ONE_SHOT_YEAR_EVENT_1 - Year one shot event1
16101 = ONE_SHOT_YEAR_EVENT_2 - Year one shot event2
16120 = ONE_SHOT_TYPE_EVENT_1 - Type one shot event1
16121 = ONE_SHOT_TYPE_EVENT_2 - Type one shot event2
```

☐ No modifications permitted (Read-Only)
☐ Return to HOME after 15s

Warning: remember to enter all the parameters listed above, as a single event requires complete date and time information to be triggered (it is not a weekly trigger)

On the main menu, the Calendar may be set in the "Calendar Events Blocks" submenu, where the days of the week and the two one-shot events appear.

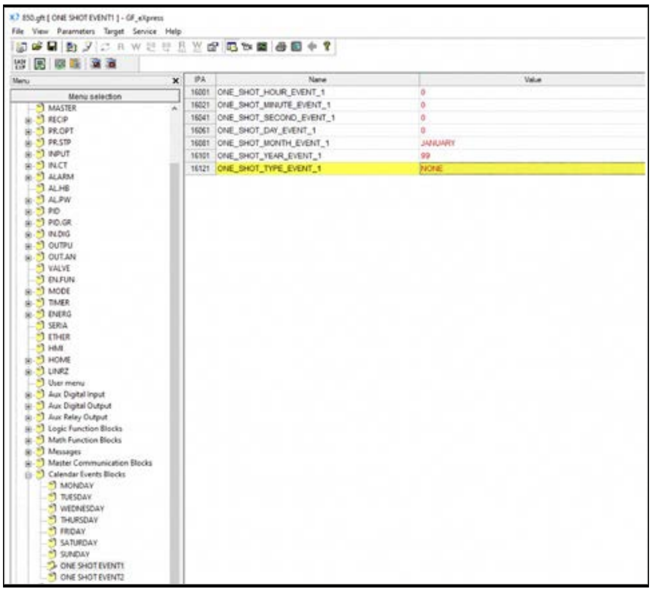




IPA	Name	
22501	HOUR_EVENT_1_1	0
22502	HOUR_EVENT_2_1	0
22503	HOUR_EVENT_3_1	0
22504	HOUR_EVENT_4_1	0
22551	MINUTE_EVENT_1_1	0
22552	MINUTE_EVENT_2_1	0
22553	MINUTE_EVENT_3_1	0
22554	MINUTE_EVENT_4_1	0
22601	SECOND_EVENT_1_1	0
22602	SECOND_EVENT_2_1	0
22603	SECOND_EVENT_3_1	0
22604	SECOND_EVENT_4_1	0
22651	ACTION_EVENT_1_1	NONE
22652	ACTION_EVENT_2_1	NONE
22653	ACTION_EVENT_3_1	NONE
22654	ACTION_EVENT_4_1	NONE
23901	CALENDAR_DAYS_ENABLE_1	ON

For each day of the week, you may set:

- HOUR_EVENT_X: time of events 1 to 4
- MINUTE_EVENT_X: minute of events 1 to 4
- SECOND_EVENT_X: second of events 1 to 4
- ACTION_EVENT_X: action to be forformed in events 1 to 4
- CALENDAR_DAYS_ENABLE_X: enable day of the week



IPA	Name	Value
16001	ONE_SHOT_HOUR_EVENT_1	0
16021	ONE_SHOT_MINUTE_EVENT_1	0
16041	ONE_SHOT_SECOND_EVENT_1	0
16061	ONE_SHOT_DAY_EVENT_1	0
16081	ONE_SHOT_MONTH_EVENT_1	JANUARY
16101	ONE_SHOT_YEAR_EVENT_1	99
16121	ONE_SHOT_TYPE_EVENT_1	NONE

For one-shot events, you may set:

- ONE_SHOT_HOUR_EVENT: time of the single event
- ONE_SHOT_MINUTE_EVENT: minute of the single event
- ONE_SHOT_SECOND_EVENT: second of the single event
- ONE_SHOT_DAY_EVENT: day of the month of the single event
- ONE_SHOT_MONTH_EVENT: month of the single event
- ONE_SHOT_YEAR_EVENT: year of the single event
- ONE_SHOT_TYPE_EVENT: type of action of the single event

The actions that may be scheduled in the weekly calendar are:

- ON SW (start software or exit the software off condition - see section 5.8)
- SW OFF (shut down the software - see paragraph 5.8)
- START PROGRAMMER 1
- STOP PROGRAMMER 1
- RESET PROGRAMMER 1 (the programmer goes into “READY” condition)
- START PROGRAMMER 2
- STOP PROGRAMMER 2
- RESET PROGRAMMER 2 (the programmer goes into “READY” condition)
- SW ON and START PROGRAMMER 1 (if software is off, software on will be forced, followed by start programmer)
- SW ON and START PROGRAMMER 2 (if software is off, software on will be forced, followed by start programmer)
- P.ST12: START programmer time base PROGR.1 and PROGR.2
- P.SP12: STOP programmer time base PROGR.1 and PROGR.2
- P.RS12: RESET programmer time base PROGR.1 and PROGR.2
- TRIGGERED TIME EVENT 1 (as in FB input)
- TRIGGERED TIME EVENT 2 (as in FB input)

The possible time-manageable actions for ONE_SHOT events (ONE_SHOT_TYPE_EVENT parameter) are:

- SW ON (start up the software, or exit the software off condition – see paragraph 5.8)
- SW OFF (shut down the software - see paragraph 5.8)
- START PROGRAMMER 1
- RESET PROGRAMMER 1 (the programmer goes into “READY” condition)
- START PROGRAMMER 2
- RESET PROGRAMMER 2 (the programmer goes into “READY” condition)
- P.ST12: START programmer time base PROGR.1 and PROGR.2
- P.RS12: RESET programmer time base PROGR.1 and PROGR.2
- TRIGGERED TIME EVENT 1 (as in FB input)
- TRIGGERED TIME EVENT 2 (as in FB input)

5.23.1. Calendar management via keyboard

The calendar can also be managed via the instrument keyboard, using the CAL.EV and CALE.C sub-menus.

In CAL.EV it is possible to enable the single week or weekly calendar and the individual days of the week to be set.

Calendar event settings are in CALE.C.

Entering the CALE.C menu, you will be asked to select the day of the week to be set, followed by the event number that can be set (from 1 to 4). Selecting the event will then prompt the event time in HH, MM and SS (parameters in sequence) and the action to be taken for the selected event.

5.24. Customisable Modbus memory map

The Modbus memory map of the instrument appears in the document 80288_MEMORY_MAP_850-1650-1850, but it can be modified via GF_eXpress:

- Custom map

permits definition of a word memory area of 32 contiguous elements in order to make use of the Modbus multi-word read and write commands and thus speed up data exchange with a Modbus Master SCADA

- User map

allows you to replace the instrument’s standard word and bit map with a user-definable one with the following properties:

- WORD map (16bit access) of 20 read/write elements that can be scaled up if necessary
- WORD map (16bit access) of 2 elements with read-only bit structure
- WORD map (16bit access) of 2 elements with read/write bit structure
- BIT map (bit access) of 20 read/write elements

Addresses outside the user map remain those of the standard map.

This management is activated via the MAP.t parameter in the EN.FUNC menu when the RS485 Modbus RTU or the Ethernet Modbus TCP option is present.

The complete standard map remains valid through the service serial port (microUSB connector) always present in the device.

Example 1:

The address 45400 is not present in the standard map in WORD and can be added to the user map by redirecting a parameter from the standard internal map. In this case, the entire standard map plus the user map remains active. Since GF_eXpress is based on the standard map, it can be used on the service serial port (microUSB connector), which is always present in the device, on the optional RS485 Modbus RTU serial port, and on the optional Ethernet Modbus TCP port.

Example 2:

The address 5400 is present in the standard map at WORD (5400 = SETP_1), but can be added to the user map by redirecting another parameter in the standard internal map. In this case, the user map has priority over the standard internal map. Since it is based on the standard map, GF_eXpress can only be used on the service serial (microUSB connector), which is always present in the device.

⚠ **CAUTION!** In the presence of the Ethernet Modbus TCP option:

- Activating the user map MAP.t=USER automatically deactivates the Webserver function (WEB.E=OFF).

- The following addresses cannot be used in the WORD user map: 6001 to 6013, 6640 to 6651, 22200 to 22213, 22300 to 22307, 22332 to 22339, 22424 to 22435, 22441 to 22444.

CAUTION!

PIn order to:

1.configure the user map on a target

2.transfer a recipe using the user map to a target

3.read a recipe using the user map from a target

it is necessary to be connected to the service\debug serial line described in Chapter “6. PROGRAMMING WITH PC” in the manual.

Once the recipe has been configured/written/read, either the RS-485 serial port or the Ethernet port may be used to access the User Map parameters.

CAUTION!

When preparing the User Map using the GF_eXpress tool, make sure:

1.that there are no unused addresses (65535 = none) between one set address and another (in the case of multiple writes or multiple reads, addresses not on the user map will not be ignored but those on the standard map will be used);

2.to correctly use the Modbus commands relating to the WORD and BIT sections (if a BIT address is queried with WORD commands, the address on the standard map will be used, if not present in the WORD user map);

3.that the multiple Modbus commands used have a correspondence in terms of the number of parameters handled with the User map set (again, in the case of multiple address reads/writes, the addresses in the standard map will be written/read if not defined in the User map);

CAUTION!

If the division factor DIVISION BY 10 or DIVISION BY 100 is used, the value read by the internal instrument variable will be divided by 10 before being sent via Modbus; on the contrary, when writing, the parameter written will be multiplied by the same value.

PLEASE NOTE: Make sure that the write value given that is multiplied by a factor of 10 or 100 does not exceed the limits allowed for the variable itself; otherwise a Modbus error will be receive.

- Support variables

allows free use of 4 non-volatile 16bit memory cells of the controller by accessing them via:

- the WORD map (16bit access) for the 4 word variables
- the BIT map (bit access) for the first 8 bits of the first word variable

These variables are not shown on the instrument display.

5.24.1. Custom map

The parameters defining the 32 internal variables, to be read or written contiguously, are available in GF_eXpress→Expert→Custom Map→Address:

- `CustAddr01…32`

while in GF_eXpress→Expert→Custom Map→Data the corresponding data is shown (by way of example):

- `CustData01…32`

In GF_eXpress the data is always reported with read-only access to ensure that the same data cannot take on two values in the .GFE recipe, while with a Modbus Master SCADA, access depends on the type of internal variable selected.

Example:

With `CustAddr01` = 5294, `CustAddr02` = 5296 e

`CustAddr03` = 5298

it is possible to use the multi-word read command to access the data 5294 = PV_1 - Process Variable, 5296 = SSP_1 - Active Setpoint and 5298 = OUT.P_1 - Control outputs value in a single Modbus message starting from the first `CustData01` address.

5.24.2. Rescalable user map in WORD (16bit access)

The parameters defining the WORD-type user map (20 elements) are available in GF_eXpress→Expert→-User Map→Word (16 bits access):

- `ADDRESS_USER_WORD_1…_20`: are the addresses of the user map in WORD, while
- `INTERNAL_USER_WORD_1…_20`: are the corresponding addresses of the standard internal map to WORD, and
- `RESCALE_USER_WORD_1…_20`: are the settings of any rescaling, i.e.

`= NONE = No rescaling`

`= DIVISION BY 10 = division of the data by 10`

`= DIVISION BY 100 = divisione per 100 del dato`

Example 1:

With `ADDRESS_USER_WORD_1` = 57, `INTERNAL_USER_WORD_1` = 5400 and `RESCALE_USER_WORD_1` = NONE

you want to map the internal address 5400 of the standard map in WORD to address 57 of the user map (5400 = SETP_1 - Local Setpoint) without any rescaling.

With SETP_1=100 at address 57 the data is =100.

Example 2:

With `ADDRESS_USER_WORD_2` = 58, `INTERNAL_USER_WORD_2` = 5302 e `RESCALE_USER_WORD_2` = DIVISION BY 10

you want to map the internal address 5302 of the standard map in WORD (5302 = CURR1 - Current input CT1) to address 58 of the user map in WORD with the data divided by 10.

With CURR1=10.3A (i.e. Modbus data without formatting =103) at address 58 the data is =10A.

The type of access (read-only or read/write) depends on the selected data type of the internal map. The value of user address = 65535 means not configured.

5.24.3. WORD user map (16bit access) with read-only bit structure

Parameters defining the WORD-type user map with bit meaning read-only (2 elements) are available in GF_eXpress→Expert→User Map→Word (16 bits access) with bit structure R/O:

- `ADDRESS_USER_ WORDBIT_R_1…_2`: are the addresses of the user map in WORD, while
- `INTERNAL_USER_WORDBIT_R_1_BIT00…_2_BIT15`: these are the corresponding addresses of the standard read-only internal BIT map, one for each of the 16 bits to be configured

Example:

With `ADDRESS_USER_WORDBIT_R_1` = 34, `INTERNAL_USER_WORDBIT_R_1_BIT00` = 60 and

`INTERNAL_USER_WORDBIT_R_1_BIT01` = 61

the read-only variable made up of bit 0 that reports the internal address 60 of the standard BIT map (60 = bit_AL_1 - Alarm 1 status) and bit 1 that reports the internal address 61 of the standard BIT map (61 = bit_AL_2 - Alarm 2 status) is to be mapped in WORD user map address 34.

The value of user address = 65535 means not configured.

5.24.4. WORD user map (16bit access) with read/write bit structure

Parameters defining the WORD-type user map with bit meaning in read/write (2 elements) are available in GF_eXpress→Expert→User Map→Word (16 bits access) with bit structure R/W:

`ADDRESS_USER_WORDBIT_RW_1…_2` are the addresses of the user map in WORD, while

- `INTERNAL_USER_WORDBIT_RW_1_BIT00…_2_BIT15` are the corresponding addresses in the standard internal BIT map with read/write access, one for each of the 16 bits to be configured

Example:

With `ADDRESS_USER_WORDBIT_RW_1` = 13, `INTERNAL_USER_WORDBIT_RW_1_BIT04` = 2,

`INTERNAL_USER_WORDBIT_RW_1_BIT11` = 0 and `INTERNAL_USER_WORDBIT_RW_1_BIT14` = 3

you want to map at address 13 of the user map in WORD the read/write variable composed of bit 4, which shows the internal address 2 of the standard BIT map (2 = bit_ON_OFF - software On/Off), bit 11, which shows the internal address 0 of the standard BIT map (0 = bit_AUTO_MAN_1 - Auto/Manual), and bit 14, which shows the internal address 3 of the standard BIT map (3 = bit_SELFT_STOP_START_1 - Selftuning Stop/Start).

The value of user address = 65535 means not configured.

5.24.5. User map with BIT access

The parameters defining the BIT-type user map (20 elements) are available in GF_eXpress→Expert→User Map→Bit access:

- `ADDRESS_USER_BIT_1…_20`: are the addresses of the user map in BIT, while
- `INTERNAL_USER_BIT_1…_20`: are the corresponding addresses of the standard internal BIT map

Example:

With `ADDRESS_USER_BIT_1` = 33 and `INTERNAL_USER_BIT_1` = 10

you want to map to address 33 of the BIT user map the internal address 10 of the BIT standard map (10 = bit_HOLD_1 - Main input hold).

The type of access (read-only or read/write) depends on the selected data type of the internal map. The value of user address = 65535 means not configured.

5.24.6. Support variables

The parameters defining the support variables are available in GF_eXpress→Expert→Parameters→Global:

- `USER_VARIABLE_1…_4`: these are the 4 variables with 16bit access

and in GF_eXpress→Expert→Bit access→Global:

- `Bit_USER_VARIABLE_1_bit0…_bit7`: are the 8 variables with bit access corresponding to the first 8 bits of the first word variable `USER_VARIABLE_1`

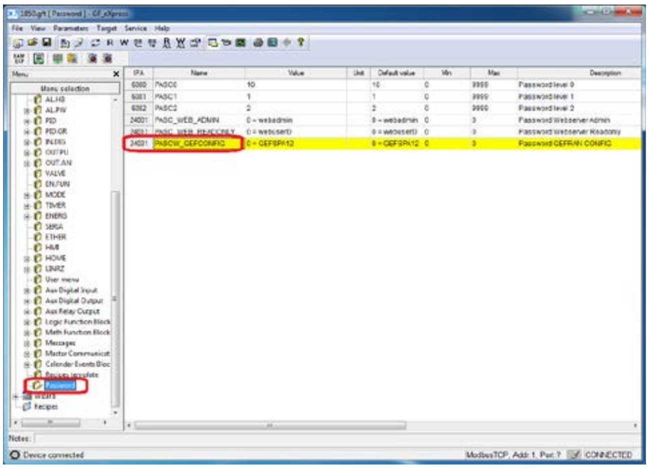
Example:

By setting `USER_VARIABLE_1` = 15 this value is saved in the non-volatile memory of the instrument and can be read/reset via bit commands:

```
Bit_USER_VARIABLE_1_bit0 = 1
Bit_USER_VARIABLE_1_bit1 = 1
Bit_USER_VARIABLE_1_bit2 = 1
Bit_USER_VARIABLE_1_bit3 = 1
Bit_USER_VARIABLE_1_bit4 = 0
Bit_USER_VARIABLE_1_bit5 = 0
Bit_USER_VARIABLE_1_bit6 = 0
Bit_USER_VARIABLE_1_bit7 = 0
```

5.25. Protection of controller configuration via GF_eXpress by password

Starting with firmware version 3.00, it is possible to protect access via the GF_eXpress configurator to certain controller parameters by means of a password that can be set freely by the user.
This password can only be configured **only** via GF_eXpress (parameter “PASCW_GEFCONFIG” in the “Password” menu).



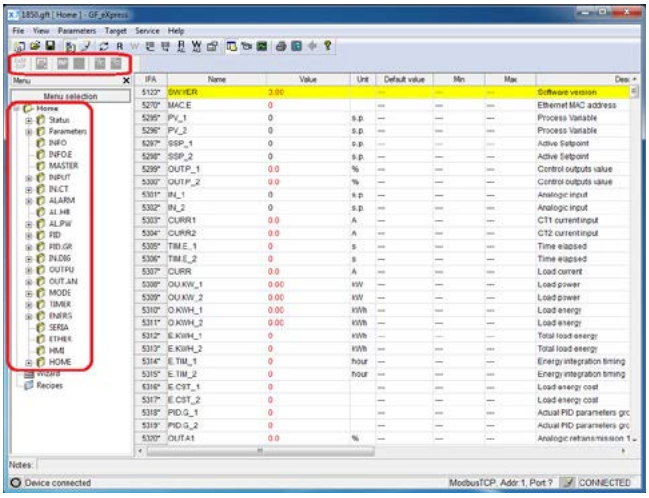
IPA	Name	Value	Unit	Default value	Min	Max	Description
6080	PASC0	10		10	0	9999	Password level 0
6081	PASC1	1		1	0	9999	Password level 1
6082	PASC2	2		2	0	9999	Password level 2
24001	PASC_WEB_ADMIN	0 = webadmin		0 = webadmin	0	3	Password Webserver Admin
24011	PASC_WEB_READONLY	0 = webuser0		0 = webuser0	0	3	Password Webserver Readonly
24001	PASCW_GEFCONFIG	0 = GEFSPA12		0 = GEFSPA12	0	3	Password GEFRAN CONFIG

ModbusTCP, Addr 1, Port ? CONNECTED

The default value of this parameter, equal to “GEFSPA12”, renders the protection inactive, thus guaranteeing full operation of the GF_eXpress configurator.

Caution! The value assigned to the password that protects configuration of parameters on the controller is in no way visible on the instrument, but only via GF_eXpress.
The user must store the specific password set on the individual controller independently.
If the user forgets the password set on the target, it will not be possible to recover it, so the user must perform a factory reset of the controller to be able to access all configuration parameters again via GF_eXpress.

If the user sets a password on the controller that differs from the default password, it will be necessary to know this password in order to have full read and write access to all parameters and wizards via the GF_eXpress configurator.
If the user who connects to the device via the GF_eXpress configurator does not know the password set on the controller (to a value other than the default), the user’s access will be limited to a subset of parameters and he or she will be able to view/edit them only via the grid (all wizards will be disabled).



IPA	Name	Value	Unit	Default value	Min	Max	Desc
5123*	SW.VER	3.00		—	—	—	Software version
5270*	MAC.E	0		—	—	—	Ethernet MAC address
5295*	PV_1	0	s.p.	—	—	—	Process Variable
5296*	PV_2	0	s.p.	—	—	—	Process Variable
5297*	SSP_1	0	s.p.	—	—	—	Active Setpoint
5298*	SSP_2	0	s.p.	—	—	—	Active Setpoint
5299*	OUT.P_1	0.0	%	—	—	—	Control outputs value
5300*	OUT.P_2	0.0	%	—	—	—	Control outputs value
5301*	IN_1	0	s.p.	—	—	—	Analogic input
5302*	IN_2	0	s.p.	—	—	—	Analogic input
5303*	CURR1	0.0	A	—	—	—	CT1 current input
5304*	CURR2	0.0	A	—	—	—	CT2 current input
5305*	TIM.E_1	0	s	—	—	—	Time elapsed
5306*	TIM.E_2	0	s	—	—	—	Time elapsed
5307*	CURR	0.0	A	—	—	—	Load current
5308*	OU.KW_1	0.00	kW	—	—	—	Load power
5309*	OU.KW_2	0.00	kW	—	—	—	Load power
5310*	O.KWH_1	0.00	kWh	—	—	—	Load energy
5311*	O.KWH_2	0.00	kWh	—	—	—	Load energy
5312*	E.KWH_1	0	kWh	—	—	—	Total load energy
5313*	E.KWH_2	0	kWh	—	—	—	Total load energy
5314*	E.TIM_1	0	hour	—	—	—	Energy integration timing
5315*	E.TIM_2	0	hour	—	—	—	Energy integration timing
5316*	E.CST_1	0		—	—	—	Load energy cost
5317*	E.CST_2	0		—	—	—	Load energy cost
5318*	PID.G_1	0		—	—	—	Actual PID parameters grc
5319*	PID.G_2	0		—	—	—	Actual PID parameters grc
5320*	OUT.A1	0.0	%	—	—	—	Analogic retransmission 1

ModbusTCP, Addr 1, Port ? CONNECTED

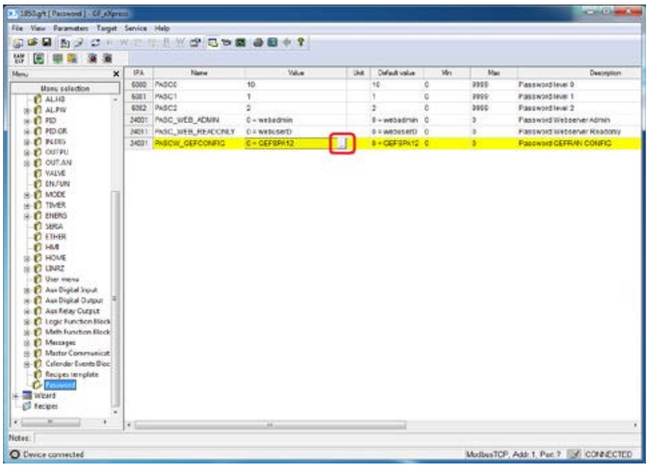
Functions whose configuration via GF_eXpress can be protected by a password are:

- Linearisation of inputs
- Auxiliary Digital Inputs and Outputs
- Internal recipes
- Programmers in Synchronous and Asynchronous Mode
- Logical Blocks
- Mathematical blocks
- Configurable Messages
- Master Communication
- User menu
- Events calendar
- Configuration of parameters displayed in the on-board configuration menu

Access to the controller’s parameters via a generic Modbus client (either RTU or TCP) will not be affected in any way by setting a password other than the default.

5.25.1. Password Setting

To give the password parameter a different value from the default value, select the appropriate button in the grid



IPA	Name	Value	Unit	Default value	Min	Max	Description
6080	PASC0	10		10	0	9999	Password level 0
6081	PASC1	1		1	0	9999	Password level 1
6082	PASC2	2		2	0	9999	Password level 2
24001	PASC_WEB_ADMIN	0 = webadmin		0 = webadmin	0	3	Password Webserver Admin
24011	PASC_WEB_READONLY	0 = webuserD		0 = webuserD	0	3	Password Webserver Readonly
24031	PASCW_GEFCONFIG	0 = GEFSPA12		0 = GEFSPA12	0	3	Password GEFRAN CONFIG

When you press this button, a dialogue box will appear with:

- the **"Current Password"** field displaying the current value of the password as plain text
- the **"New Password"** field in which you can set the new password value in encrypted form.
- a **"Confirm new password"** field where you will be asked to confirm the new password in encrypted form
- a **"Clear"** button for resetting the password to the default value
- OK\Cancel buttons to confirm and/or cancel the setting

Actual Password: 0 = GEFSPA12

New Password: ••••••

Confirm new password: ••••••

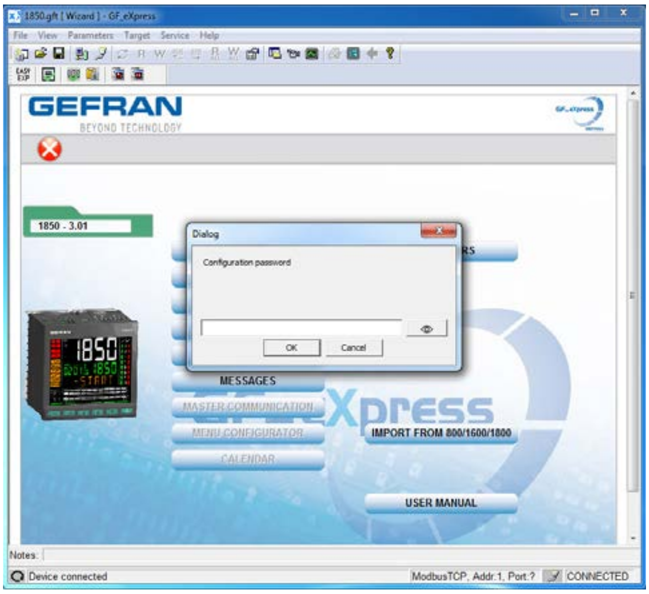
Caution! Passwords are case-sensitive and must be at least four characters long.
The admissible characters are:

- 'A'... 'Z' e 'a'...'z'
- '0'...'9'
- '! ' , '$' , '%' , '&' , '>' , '<' , ';' , ':' , ',' , '.' , '#' , '@' , '_' , '-'

Use of a character other than those listed above, or a sequence of permitted characters shorter than the minimum length, will make the password unacceptable and cause an error message to appear in the password setting dialogue box when you press "OK".

5.25.2. Access to a device with password-protected configuration via GF_eXpress

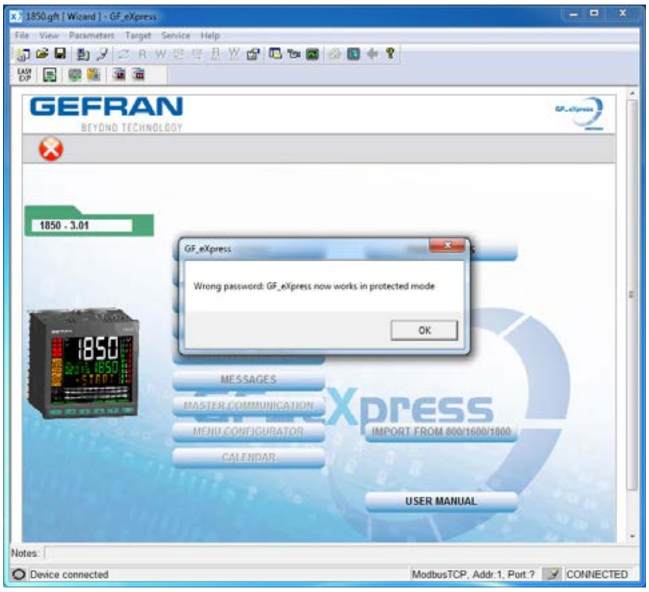
The first time you use the GF_eXpress configurator to access a device on which a password other than the default was previously set (see paragraph "5.25.1. Password Setup"), you will be prompted to enter the password,



whether you are opening a configuration file (.gfe file) or creating a new configuration file.
Once the correct value has been set, the GF_eXpress configurator will be fully operational.
If

- the password entered is different from the one set on the controller
- the user does not enter a password

The following warning window will appear



Wrong password: GF_eXpress now works in protected mode

Informing the user that from now on the configurator will work in reduced mode.
To exit this mode it will be necessary to close the current session of the GF_eXpress configurator and start a new one.

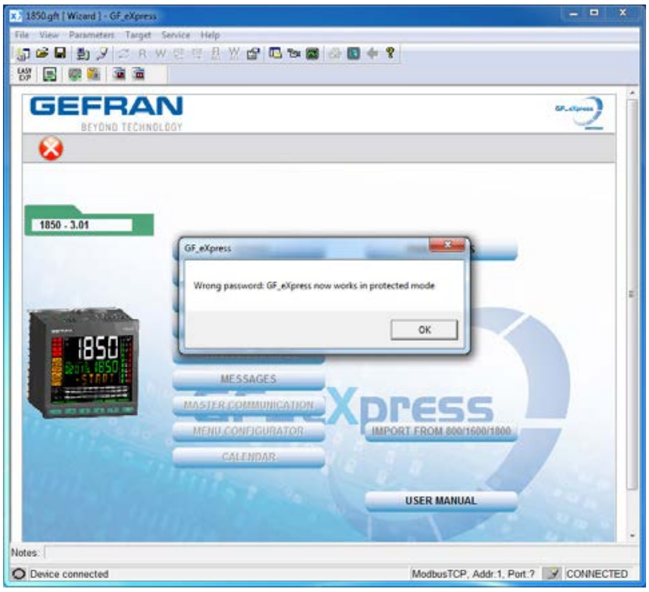
Caution! All configuration parameters that are not accessible in GF_eXpress in protected mode will be forced to their default value in the configuration file (.gfe file).

5.25.3. Opening a password-protected configuration file with GF_eXpress

If the user tries to open a password-protected configuration file in GF_eXpress and there is no way to establish communication with any target, it will be necessary to know the value of the password saved in the configuration file in order to obtain full access to the parameters.
If

- the password entered is different from the password saved in the configuration file
- the user does not enter a password

The following warning window will appear



Wrong password: GF_eXpress now works in protected mode

Device connected

ModbusTCP, Addr.1, Port.? CONNECTED

informing the user that from now on the configurator will work in reduced mode.
This condition will persist even if the user connects to a controller at a later date.
To exit this mode it will be necessary to close the current session of the GF_eXpress configurator and start a new one.

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 Oforations (Function Blocks);
- display/set math Oforations (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
Oforating 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:

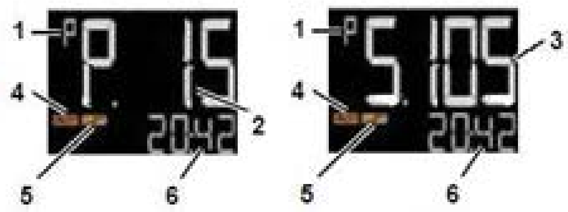
- PROG.STATUS_1 which lets you request the display/check of PROGRAMMER 1
- PROG.STATUS_2, which lets you request the display/check of PROGRAMMER 2

7.4.2. Display indication

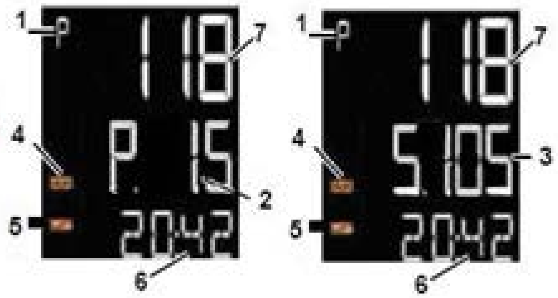
The different controller models display programmer status information in different ways.
The following examples show how the same information is displayed on the 850, 1650, and 1850 controllers.
Compared to the model 850, models 1650 and 1850 also show the process variable value (PV_1 PROG.STATUS_1 and 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).

850



1650



1850

1850

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 “4. CONFIGURATION” on page 52).

The parameters that may be selected to build the user set-up menu include PASS0 and PASS1; 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 misura	Valid values	Notes
SETP1	Local setpoint 1	scale points	LO.SP1...HI.SP1	
F ↓ **ALRM1**	Alarm 1 limit	scale points	LO.AL1...HI.AL1 -999...999	If absolute alarm. If deviation alarm.
F ↓ **ALRM2**	Alarm 2 limit	scale points	LO.AL1...HI.AL1 -999...999	If absolute alarm. If deviation alarm.
F ↓ **ALRM3**	Alarm 3 limit	scale points	LO.AL1...HI.AL1 -999...999	If absolute alarm. If deviation alarm.
F ↓ **ALRM4**	Alarm 4 limit	scale points	LO.AL1...HI.AL1 -999...999	If absolute alarm. If deviation alarm.
F ↓ **AL.ACK**	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.
F ↓ **MS.ACK**	Reset scrolling message		Off On	Appears if a scrolling message is present. The reset command is temporary and is not saved.
F ↓ **OUT.P1**	Control output value 1		-100.0...100.0 On / OFF	Value Read Only
F ↓ Visualizzazione Home				

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).

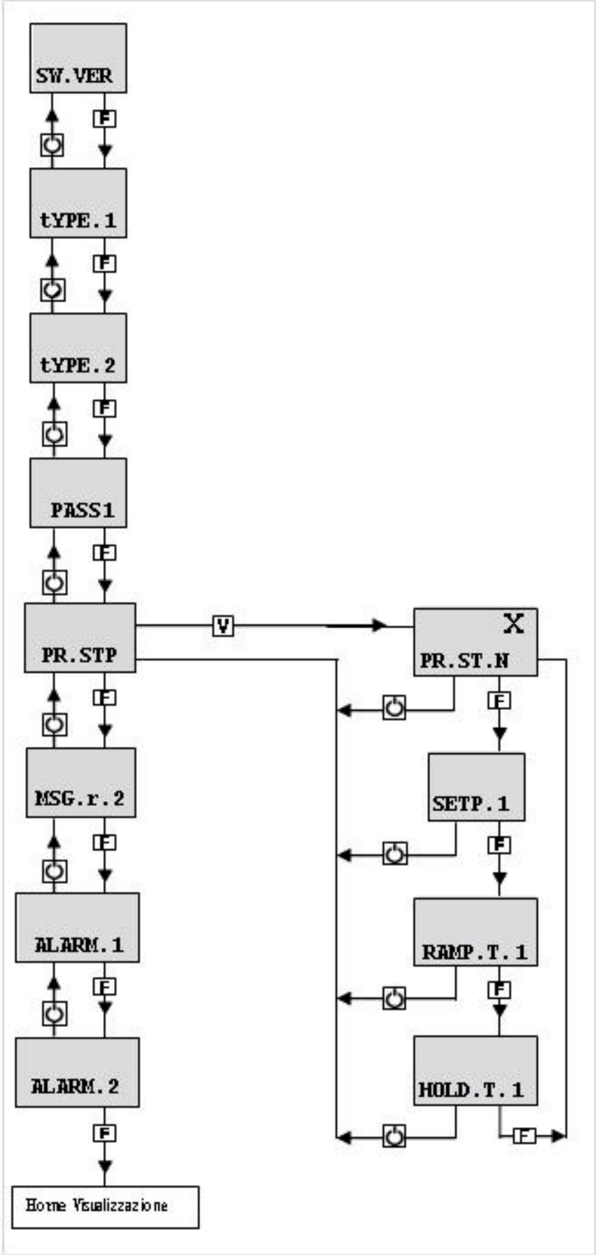
If:

- 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

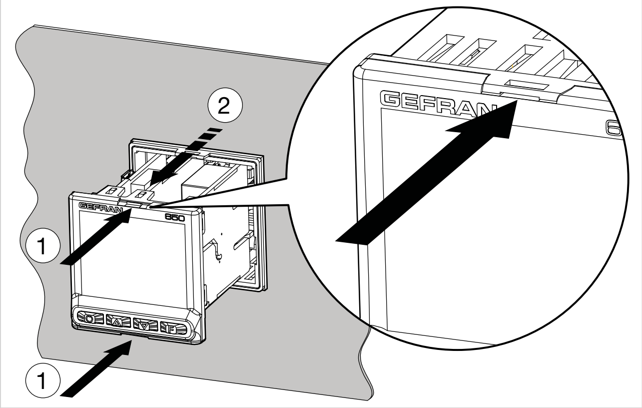
Attention!
The controller must be repaired only by technicians trained and authorized by Gefran. Any attempt by unauthorized personnel to repair or change the hardware characteristics of the controller will void the warranty.

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”8.1. Replacing the controller” on page 273).

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

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1) Programming is done with the GF_eXpress configuration program

INPUTS		
MAIN AND AUXILIARY INPUT	Sensor type	• Thermocouples, RTD (PT100, JPT100), IR Pyrometers with type K output, 4…20mA, 0…20mA, 10V, 5V, 1V, 60mV, potentiometer •Reading accuracy: ±0.1% of value read This Gefran controller, when subjected to the necessary calibration operations in the field, is suitable for use in Nadcap applications for any class of oven, from 1 to 6, according to specification AMS2750F, paragraph 3.3.1.
	Thermocouple Input	• Types: J, K, R, S, T, C, D, B, E, L, L-GOST, U, G, N,Pt20Rh-Pt40Rh Custom linearisation available • Linearisation accuracy: according to standard ITS90 polynomes; refer to user manual for details • Cold joint accuracy: < ± 1°C at 25°C ambient temperature • Cold joint compensation: greater than 40:1, rejection at changes in room temperature exceeding 25°C • Diagnostics: Indication of faulty probe and out of scale
	RTD input (Pt100 and JPt100)	• Types: Pt100, JPt100. Custom linearisation available • Calibration precision: < ±0.1% of the value read in °C ± 0.4°C • Linearisation accuracy: <±0.062°C • Thermal shift: < (±0.002% of read value/°C, starting from 25°C room temperature) ± 0.1°C • Diagnostics: Indication of faulty probe and out of scale
	Linear DC input	• Tipes : 0...60 mV, 0…20mA, 4…20mA, 0…1V, 0…5V, 0…10V • Input impedance : 0…60mV, 0…1V : > 100 MΩ 0…5V, 0…10V : > 400 kΩ 0…20mA, 4…20mA : 50 Ω • Linearisation: linear or custom • Calibration accuracy: < 0.1% full scale • Thermal shift: <±0.003% full scale/°C, starting from 25°C room temperature
	Sampling time	60 ms or 120 ms, selectionable
	Digital filter	0,0...20,0 s configurable
	Rejection to network disturbance (48-62Hz)	Rejection to differential mode: >80 dB Rejection to common mode: >150 dB
	Temperature unit of measure	Grade C / F, selectable on the keypad
	Reading interval	Tipe: linear Scale: -1999...9999,settable decimal point
	Insulation	Functional insulation between main and auxiliary inputs
TA (ammeter) INPUT	Isolation	Isolated via external transformer
	Accuracy	±2% f.s. ±1 digit @25 °C
	Type	Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
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 if 3 relè has a common wire) Type of relè contact :NO Maximum current : 5A (2A for UL applications), 250Vac Minimum load : 5V, 10mA Number of operations: > 600,000 @ 2A load current Double insulation Installation of an external R-C suppressor (“snubber”) is recommended
	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, Rload: > 500 Ω 0...20 mA, 4...20 mA, Rload: < 500 Ω Resolution: 12 bit Insulation compared to main input
	Analog retransmission (A1)	Number: 1 max 0...10 V, max 20 mA, Rload: > 500 Ω 0...20 mA, 4...20 mA, Rload: < 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 power-on, 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 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	Max. number: > 10^{10} cycles Retention: > 10 years

(*) if in standard mode; if in “Simplified programmer” mode, Max 12 programs

(**) freely selectable in any program, if in standard mode; if in “Simplified programmer” mode, MAX 16 steps per program, in a set order: Program 1 Step 1-16, Program 2 Step 17 – 32, and so on

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 slave Insulation respect to main input Screw terminals and crimp connector, max. wire section 2,5mm^2
	Master Modbus	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Master Screw terminals and crimp connector, max. wire section 2,5mm^2
	RTU Bridge	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Master Screw terminals and crimp connector, max. wire section 2,5mm^2
	Ethernet Modbus TCP and Webserver (optional)	Baudrate : 10/100BaseTX, 10/100Mbit/s Protocol : Modbus TCP slave, Webserver integrato Isolation from other peripherals Standard RJ45 conector
	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
NORME CE	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
CERTIFICATIONS	Generals	This Gefran controller, when subjected to the necessary calibration operations in the field, is suitable for use in Nadcap applications for any class of oven, from 1 to 6, according to specification AMS2750F, paragraph 3.3.1.
	Europe	CE, RoHS, REACH
	USA, Canada	UL, cUL
	Russia	EAC

1) Programming is done through 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 AND AUXILIARY INPUT (Main, Aux1, Aux2)	Sensor type	• Thermocouples, RTD (PT100, JPT100), IR pyrometers with type K output, 4…20mA, 0…20mA, 10V, 5V, 1V, 60mV, potenziometer • Reading accuracy : ±0,1% of value read This Gefran controller, when subjected to the necessary calibration operations in the field, is suitable for use in Nadcap applications for any class of oven, from 1 to 6, according to specification AMS2750F, paragraph 3.3.1.
	Thermocouple (only Main and Aux1)	• Types : J, K, R, S, T, C, D, B, E, L, L-GOST, U, G, N,Pt20Rh-Pt40Rh Custom linearisation available • Linearisation accuracy: according to standard ITS90 polynomes; refer to user manual for details • Cool junction accuracy: < ± 1°C a 25°C room temperature • Cool junction compensation : greater than 40:1 rejection at changes in room temperature exceeding 25°C Diagnostics: Indication of faulty probe and out of scale
	RTD input (Pt100 and JPt100) (only Main and Aux1)	• Types: Pt100, JPt100. Custom linearisation available • Calibration accuracy: < ±0,1% of the value read in °C ± 0,4°C • Linearisation accuracy: <±0,062°C • Thermal shift: < (±0.002% of read value/°C, starting from 25°C room temperature) ± 0.1°C • Diagnostics: Indication of faulty probe and out of scale
	Linear DC input	• Types : 0...60 mV, 0…20mA, 4…20mA, 0…1V, 0…5V, 0…10V, 0…2.4V high impedance, 0…1.2V high impedance •Input impedance : 0…60mV, 0…1V, 0…1.2V, 0…2.4V : > 100 MΩ 0…5V, 0…10V : > 400 kΩ 0…20mA, 4…20mA : 50 Ω • Linearisation: linear or custom • Calibration accuracy: < 0.1% full scale • Thermal shift: <±0.003% full scale/°C, starting from 25°C room temperature
	Sampling time	60 ms or 120 ms, selectable
	Digital filter	0,0...20,0 s configurable
	Rejection at network disturbance (48-62Hz)	Rejection at differential mode: >80 dB Rejection at common mode: >150 dB
	Temperature unit of measure	Grado C / F, selectable on the keypad
	Reading interval	Tipe: linear Scale: -1999...9999, settable decimal point
	Insulation	Functional insulation between main and auxiliary inputs
TA (ammeter) INPUT	Isolation	Isolated via external transformer
	Accuracy	±2% f.s. ±1 digit @25 °C
	Type	Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
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)	Nuumber: 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 Number of operations: > 600,000 @ 2A load current Double isolation Installation of an external R-C suppressor (“snubber”) is recommended
	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 VT1, VT2	Voltage: 24 VDC ±10% Current max: 30 mA VT1 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 192, 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

(*) if in standard mode; if in “Simplified programmer” mode, Max 12 programs

(**) freely selectable in any program, if in standard mode; if in “Simplified programmer” mode, MAX 16 steps per program, in a set order: Program 1 Step 1-16, Program 2 Step 17 – 32, and so on

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
	Master Modbus	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Master Connector: RJ10
	RTU Bridge	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Master Screw terminals and crimp connector, max. wire section 2.5mm^2
	Ethernet Modbus TCP e Webserver (opzione)	Baudrate : 10/100BaseTX, 10/100Mbit/s Protocol : Modbus TCP slave, integrated Webserver Isolamento compared to other peripherals RJ45 Standard connector
	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
CERTIFICATIONS	Generals	This Gefran controller, when subjected to the necessary calibration operations in the field, is suitable for use in Nadcap applications for any class of oven, from 1 to 6, according to specification AMS2750F, paragraph 3.3.1.
	Europe	CE, RoHS, REACH
	USA, Canada	UL, cUL
	Russia	EAC

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		
INGRESSI PRINCIPALE ED AUSILIARIO (Main, Aux1, Aux2)	Sensor type	• Thermocouples, RTD (PT100, JPT100), IR pyrometers with type K output, 4…20mA, 0…20mA, 10V, 5V, 1V, 60mV, potentiometer • Reading accuracy: ±0.1% of value read This Gefran controller, when subjected to the necessary calibration operations in the field, is suitable for use in Nadcap applications for any class of oven, from 1 to 6, according to specification AMS2750F, paragraph 3.3.1.
	Thermocouple (only Main and Aux1)	• Types: J, K, R, S, T, C, D, B, E, L, L-GOST, U, G, N,Pt20Rh-Pt40Rh Custom linearisation available • Linearisation accuracy: according to standard ITS90 polynomes; refer to user manual for details • Cold joint accuracy: < ± 1°C at 25°C ambient temperature • Cold joint compensation: greater than 40:1, rejection at changes in room temperature exceeding 25°C • Diagnostics: Indication of faulty probe and out of scale
	RTD input (Pt100 and JPt100)	• Types: Pt100, JPt100. Custom linearisation available • Calibration accuracy: < ±0,1% of the value read in °C ± 0,4°C • Linearisation accuracy: <±0,062°C • Thermal shift: < (±0.002% of read value/°C, starting from 25°C room temperature) ± 0.1°C • Diagnostics: Indication of faulty probe and out of scale
	Linear DC input	• Tipi : 0...60 mV, 0…20mA, 4…20mA, 0…1V, 0…5V, 0…10V, 0…2.4V high impedance, 0…1.2V high impedance • Input impedance : 0…60mV, 0…1V, 0…1.2V, 0…2.4V : > 100 MΩ 0…5V, 0…10V : > 400 kΩ 0…20mA, 4…20mA : 50 Ω • Linearisation: linear or custom • Calibration accuracy: < 0,1% out of scale • Thermal shift: <±0.003% full scale/°C, starting from 25°C room temperature
	Sampling time	60 ms or 120 ms, selectable
	Digital filter	0,0...20,0 s configurable
	Rejection to network disturbance (48-62Hz)	Rejection to differential mode: >80 dB Rejection to common mode: >150 dB
	Temperature unit of measure	Grade C / F, selectable on the keypad
	Reading interval	Type: linear Scale: -1999...9999, settable decimal point
	Insulation	Functional insulation between main and auxiliary inputs
	Type	Isolato tramite trasformatore esterno
		Number: 2 max Maximum load: x / 50 mA AC Network frequency: 50/60 Hz Input impedance (Ri): 10 Ω
TA (ammeter) input	Isolation	Isolated via external transformer
	Accuracy	±2% f.s. ±1 digit @25 °C
	Type	Number: 2 max Max. capacity: x / 50 mA AC Line frequency: 50/60 Hz Input impedance (Ri): 10 Ω
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 Number of operations: > 600,000 @ 2A load current Double isolation Installation of an external R-C suppressor (“snubber”) is recommended
	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 VT1, VT2	Voltage: 24 VDC ±10% Current max: 30 mA VT1 option of Out3
	For potentiometer VP	Voltage: 1 VDC ±1% Current max: 30 mA
INPUTS / OUTPUTS OPZIONALI		
	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, cos▯ =1 Max. current for each common: 5 A Number of operations: > 600,000 @ 2A load current Double isolation Installation of an external R-C suppressor (“snubber”) is recommended

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 192, 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

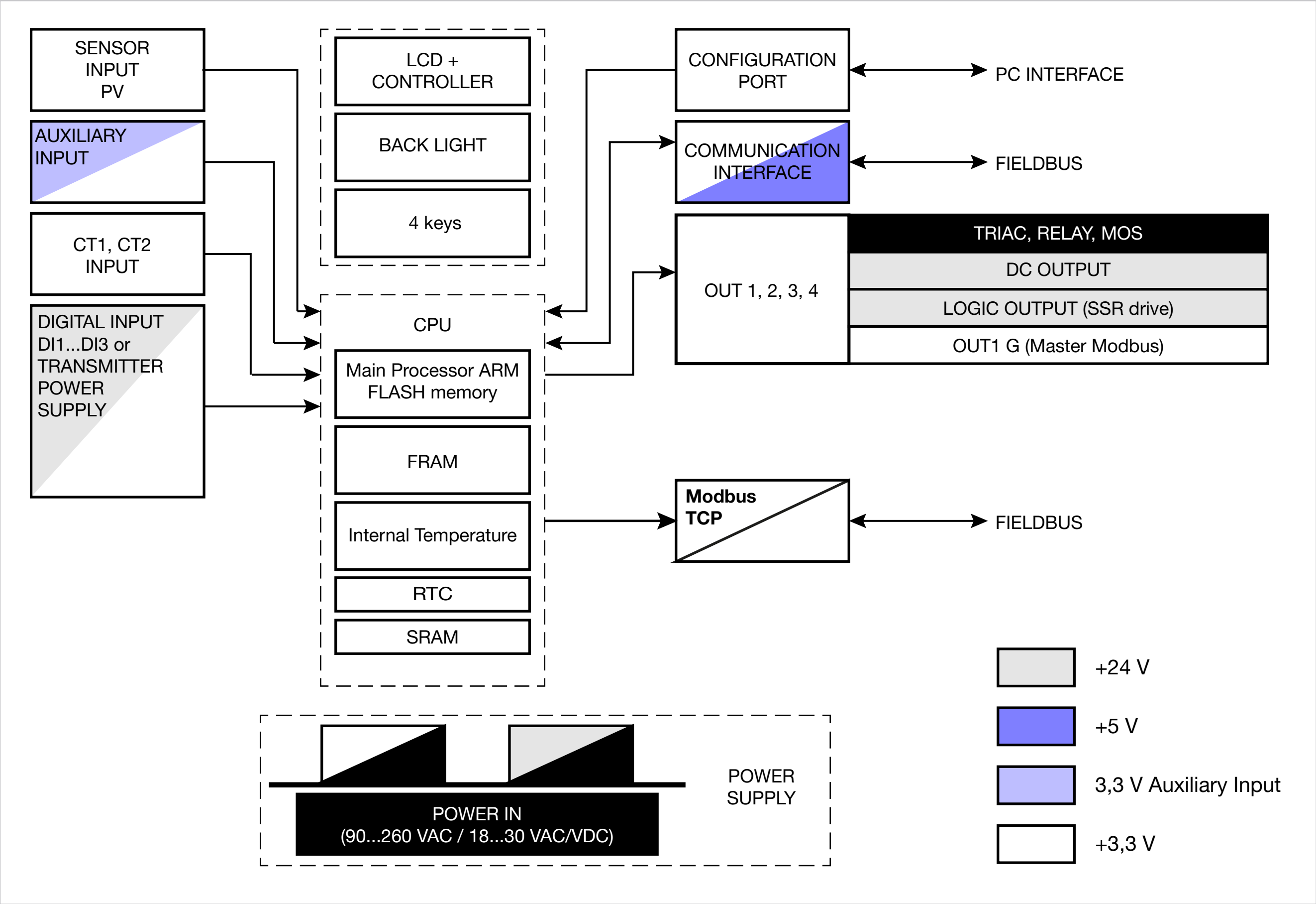
(*) if in standard mode; if in "Simplified programmer" mode, Max 12 programs

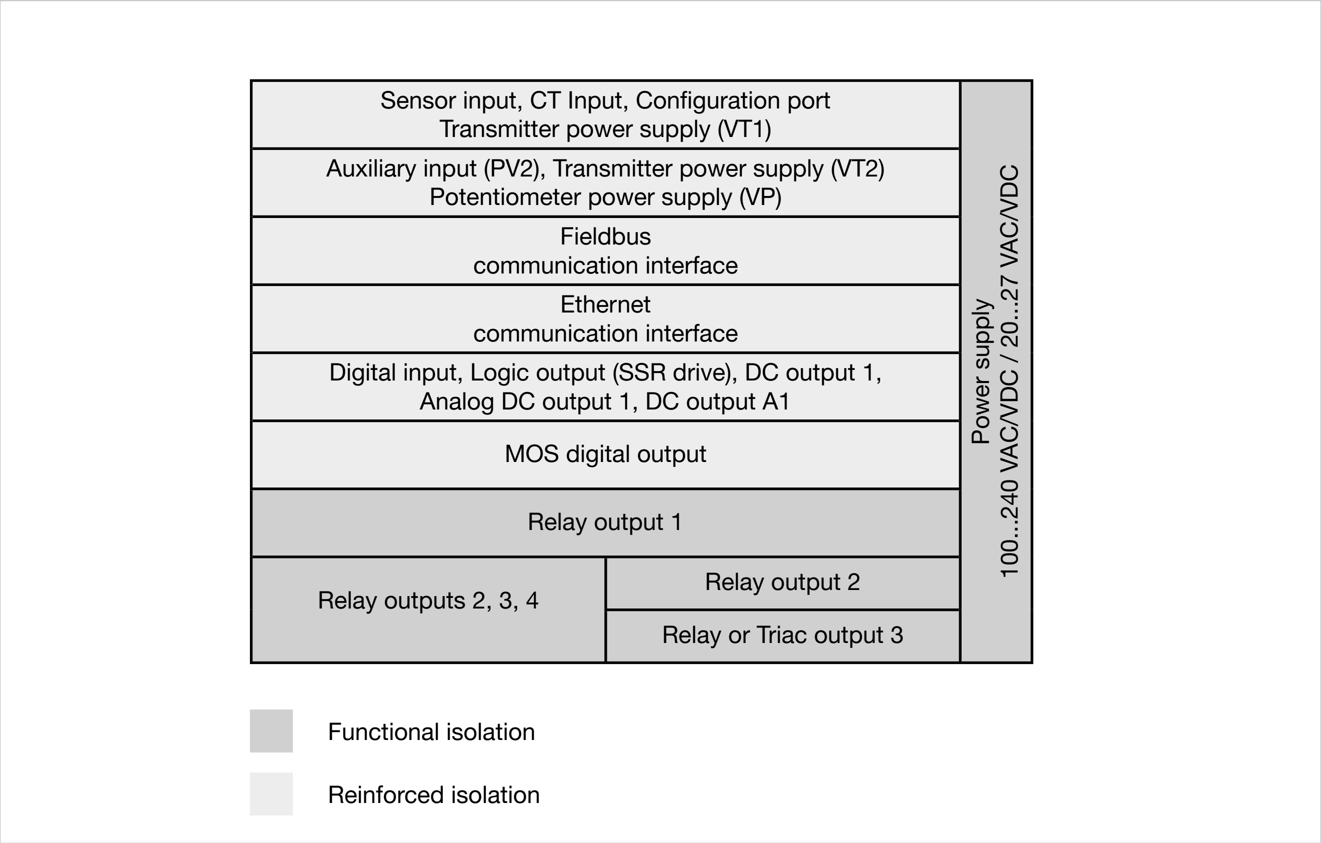
freely selectable in any program, if in standard mode; if in "Simplified programmer" mode, MAX 16 steps per program, in a set order: Program 1 Step 1-16, Program 2 Step 17 – 32, and so on

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
	Master Modbus	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Master Connettore RJ10
	RTU Bridge	Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s Protocol: Modbus RTU Master Screw terminals and crimp connector, max. wire section 2.5 mm^2
	Ethernet Modbus TCP and Webserver (option)	Baudrate : 10/100BaseTX, 10/100Mbit/s Protocol : Modbus TCP slave, integrated Webserver Isolation from other peripherals Standard RJ45 connector
	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
CERTIFICAZIONI	Generals	This Gefran controller, when subjected to the necessary calibration operations in the field, is suitable for use in Nadcap applications for any class of oven, from 1 to 6, according to specification AMS2750F, paragraph 3.3.1.
	Europe	CE, RoHS, REACH
	USA, Canada	UL, cUL
	Russia	EAC

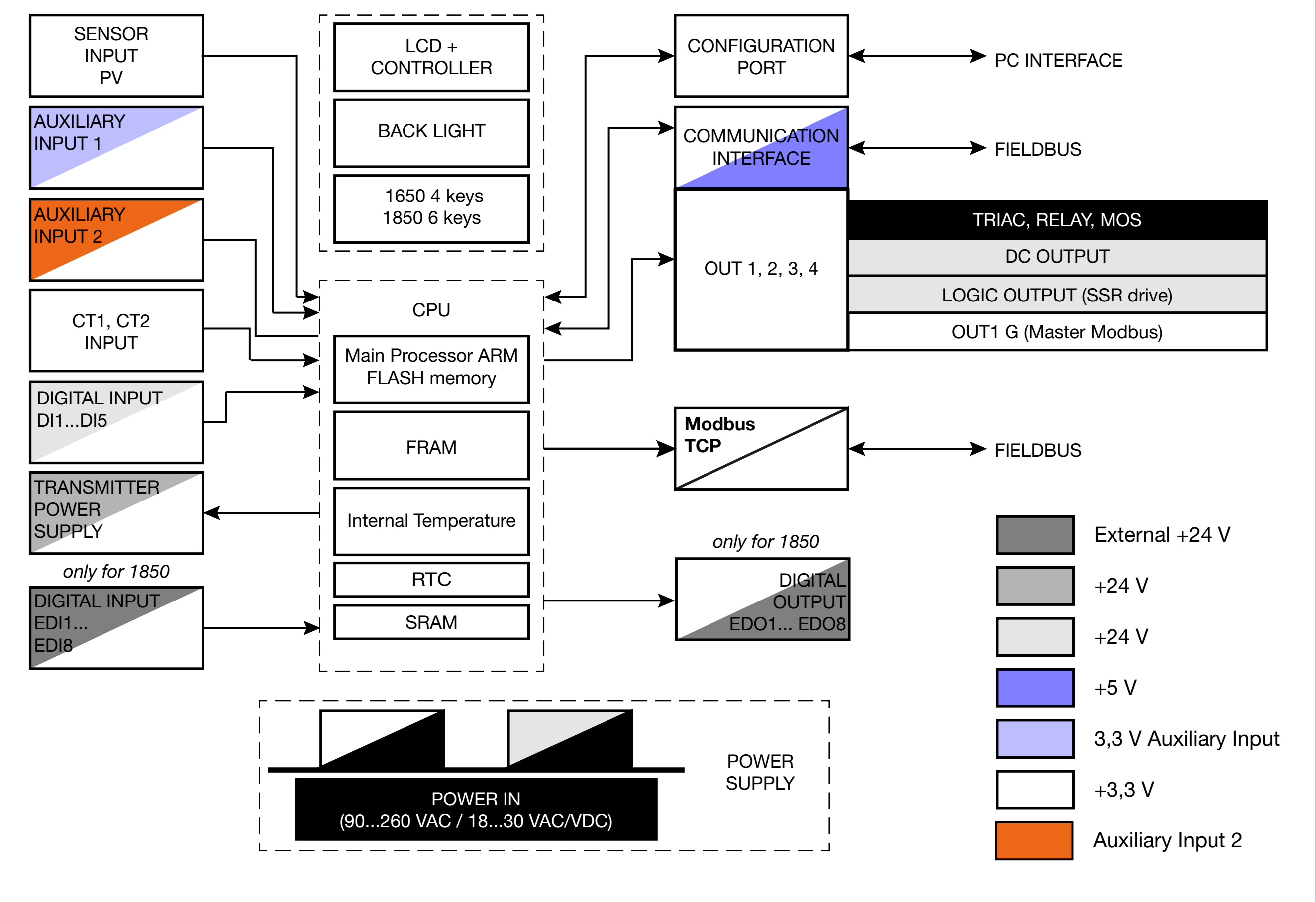
1) Programming is done with the GF_eXpress configuration program.

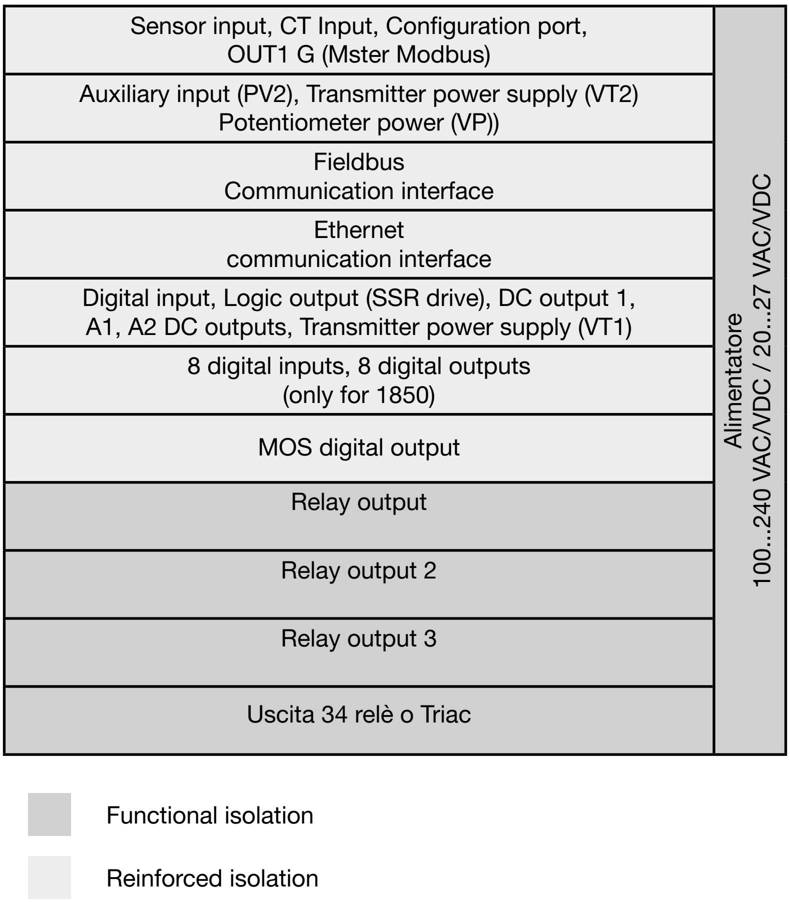
9.4. Isolation block diagram 850





9.5. Isolation block diagram 1650 - 1850




Sensor input, CT Input, Configuration port, OUT1 G (Mster Modbus)
Auxiliary input (PV2), Transmitter power supply (VT2) Potentiometer power (VP))
Fieldbus Communication interface
Ethernet communication interface
Digital input, Logic output (SSR drive), DC output 1, A1, A2 DC outputs, Transmitter power supply (VT1)
8 digital inputs, 8 digital outputs (only for 1850)
MOS digital output
Relay output
Relay output 2
Relay output 3
Uscita 34 relè o Triac
Alimentatore 100...240 VAC/VDC / 20...27 VAC/VDC
Functional isolation
Reinforced isolation

10. ORDER METHODS

10.1. Controller 850

		A		B		C	D	E		F		G		H	I		L		M			N		O		P	
Ordering code:	850	X	-	X	-	X	X	X	-	X	-	X	-	X	X	-	X	-	X	X	-	00	-	X	-	X	X

Model (A)	
Controller	
Programmer	P
Valve (*)	V
Programmer+valve (*)	PV

Output 1 (B)	
Relay	R
Logic	D
Analog	A
Master Modbus RTU communication	G

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

Function (P)	
00	Absent
FB	Logical + mathematical operations
CK	RTC + Logical operations + mathematical

Supply (O)	
0	20...27 VAC / VDC
1	100...240 VAC / VDC

Communication (M)	
00	Absent
M0	RS485 Modbus RTU
E0	Ethernet Modbus TCP (4)
ME	Ethernet Modbus TCP / RTU bridge (4)

Digital inputs (L)	
0	Absent (3)
3	3 DI

CT Inputs Auxiliary inputs (H-I)	
00	Absent
20	CT1 + CT2
01	Input Aux: TC,RTD,60mV
02	Input Aux : 1V/5V/10V/20mA + VP 1V
03	Input Aux : 1V/5V/10V/20mA + VT2 24 V

Retransmission (G)	
0	Absent
1	Analogue A1

Notes

1) Only with: (C) = R and (D) = R
2) Alternative PT100
3) Only with option H-I = 0
4) Only with option (E)=0/R; (G)=0; (L)=3

Check before each request a list of codes available on the following pages

10.2. Controller 1650

	A		B		C	D	E		F		G		H	I		L		M		N		O		P
Ordering code: 1650	X	-	X	-	X	X	X	-	0	-	X	-	X	X	-	X	-	X X	-	0 0	-	X	-	X X

Model (A)	
Controller	
Programmer	P
Valve (1)	V
Programmer+valve (1)	PV

Output 1 (B)	
Relay	R
Logic	D
Analog	C
Master Modbus RTU communication	G

Output 2 (C) Output 3 (D)	
Relay - Relay	R R
Logic - Logic	D D
Isolated logic - Isolated logic	M M
Relay - VT1 24 V	R V
Logic - VT1 24 V	D V
Isolated logic - VT1 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

Function (P)	
00	Absent
FB	Logical + mathematical operations
CK	RTC + Logical operations + mathematical

Supply (O)	
0	20...27 VAC / VDC
1	100...240 VAC / VDC

Communication (M)	
00	Absent
M0	RS485 Modbus RTU (slave)
E0	Ethernet Modbus TCP
ME	Ethernet Modbus TCP / RTU bridge

Digital inputs (L)	
0	Absent (2)
5	5 DI

Auxiliary input (I)	
0	Absent
1	Input Aux : TC, RTD, 60mV
2	Input Aux: 1V/5V/10V/20mA + VP 1 V
3	Input Aux : 1V/5V/10V/20mA + VT2 24 V

Input CT / 3° Analog input (H)	
0	Absent
2	CT1 + CT2
3	3° Input Aux + VP 2 1 V (3)

Note
1) Only with option (C) = R e (D) = R
2) Only with option E-M = 0
3) Only with option (I) = 1,2,3

Check before each request a list of codes available on the following pages

10.3. Controller 1850

A B C D E F G H I L M N O P

Ordering code: 1850 X - X - X X X - 0 - X - X X - X - X X - X X - X - X X

Model (A)	
Controller	
Programmer	P
Valve (1)	V
Programmer+valve (1)	PV

Output 1 (B)	
Relay	R
Logic	D
Analog	C
Master Modbus RTU communication	G

Output 2 (C) Output 3 (D)	
Relay - Relay	R R
Logic - Logic	D D
Isolated logic - Isolated logic	M M
Relay - VT1 24 V	R V
Logic - VT1 24 V	D V
Isolated logic - VT1 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
CK	RTC + Logical operations + mathematical

Supply (O)	
0	20...27 VAC / VDC
1	100...240 VAC / VDC

I/O opzionali (N)	
00	Assenti
10	8 IN/OUT (4)
01	8 relè (4)
11	8 IN/OUT + 8 relè (4)

Communication (M)	
00	Absent
M0	RS485 Modbus RTU (slave)
E0	Ethernet Modbus TCP
ME	Ethernet Modbus TCP / RS485 bridge

Digital inputs (L)	
0	Absent (2)
5	5 DI

Auxiliary input (I)	
0	Absent
1	Input Aux : TC, RTD, 60mV
2	Input Aux: 1V/5V/10V/20mA + VP 1 V
3	Input Aux : 1V/5V/10V/20mA + VT2 24 V

Input CT / 3° Analog input (H)	
0	Absent
2	CT1 + CT2
3	3° Input Aux + VP 2 1 V (3)

Notes

1) Only with option (C) = R and (D) = R
2) Only with option E-M = 0
3) Only with option (I) = 1,2,3
4) The option (N) require option (P) =FB or CK

Check before each request a list of codes available on the following pages

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	•	•	•

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