850 - 1650 - 1850
Double PID temperature controller

INSTALLATION AND INSTRUCTION MANUAL

code: 80209C - 01-2020
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5.13.5.5. Program with HBB (hold back band) function

5.14. Managing motorized valves

5.14.1. Valve control parameters

5.14.2. Valve control modes

5.15. Energy counter

5.16. Logic Oforations

5.16.1. Function logic blocks

5.16.2. Groups of variables

5.16.3. Programming logic Function Blocks

5.16.3.1. Configuration page
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.

<table>
<thead>
<tr>
<th>Numero di matricola</th>
<th>SN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codice prodotto finito</td>
<td>CODE</td>
</tr>
<tr>
<td>Codice di ordinazione</td>
<td>TYPE</td>
</tr>
<tr>
<td>Tensione di alimentazione</td>
<td>SUPPLY</td>
</tr>
<tr>
<td>Versione firmware</td>
<td>VERS.</td>
</tr>
</tbody>
</table>

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 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.

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

---

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.

**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

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 NACAP 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 asynchronous 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, without 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 potentiometers, 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); 1/4 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

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

n/a = not available
1.3. **850 Controller**

**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

Dimensions 48 x 48 x 100 mm (1/16 DIN)
1.3.1. Display and keys

1 Unit of measurement or number of program running or number of loop displayed.
2 State of outputs OUT1, OU2, OUT3, OUT4.
3 Controller function states::
   - RUN = functioning (flashing = normal functioning, steady on = program running);
   - _/- = resetpoint 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.

Figure 1 - Description of 850 display and keys
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

**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 the 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 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

Dimensions 48 × 96 × 80 mm (1/8 DIN)
1.4.1. Display and keys

1. Unit of measurement or number of program running or number of loop displayed.
2. State of outputs OUT1, OUT2, OUT3, OUT4
3. Controller function states:
   - RUN = functioning (flashing = normal functioning, steady on = program running);
   - _/- = setpoint ramp active;
   - TUN = PID parameters tuning active;
   - MAN = manual/automatic (off = automatic control, on = manual control);
   - REM = remote setpoint enabled;
   - SP1/2 = setpoint active (off = setpoint 1, on = setpoint 2).
4. Work mode key (manual/automatic) in standard mode. A function can be assigned via parameter but1. The key is active only when the display shows the process variable (HOME).
5. Up/down keys: raise/lower the value of the parameter displayed on the SV or PV display.
6. F key: lets you navigate among controller menus and parameters. Confirms the parameter value and selects the next parameter.
7. Key pressed signals.
8. 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. SV display: parameter values. Configurable with parameter dS.SP (default = setpoint).
12. PV display: process variable.

Figure 3 - Description of 1650 display and keys
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**

**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

Dimensions 96 × 96 × 80 mm (1/4 DIN)
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.
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).
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

**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.

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.
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.
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:

<table>
<thead>
<tr>
<th>Connection</th>
<th>Cable section</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>1 mm²</td>
<td>1 m</td>
</tr>
<tr>
<td>Relay</td>
<td>1 mm²</td>
<td>3.5 m</td>
</tr>
<tr>
<td>Serial port</td>
<td>0.35 mm²</td>
<td>3.5 m</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>0.8 mm²</td>
<td>5 m</td>
</tr>
<tr>
<td>Potentiometer, linear, &quot;PT100&quot; resistance thermometer</td>
<td>1 mm²</td>
<td>3 m</td>
</tr>
<tr>
<td>Analog retransmission output</td>
<td>1 mm²</td>
<td>3.5 m</td>
</tr>
<tr>
<td>Digital input/outputs</td>
<td>1 mm²</td>
<td>3.5 m</td>
</tr>
<tr>
<td>Ethernet port</td>
<td>UTP 4x2xAWG24 cat 6</td>
<td>4 m</td>
</tr>
</tbody>
</table>

### 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 Nm.

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.

<table>
<thead>
<tr>
<th>Cable / terminal</th>
<th>Cable / terminal section</th>
<th>Terminal size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid cable</td>
<td>0.8...2,5 mm² (18...14 AWG)</td>
<td></td>
</tr>
<tr>
<td>Twisted</td>
<td>0.8...2,5 mm² (18...14 AWG)</td>
<td></td>
</tr>
<tr>
<td>Tag terminal</td>
<td>0.25...2,5 mm² (23...14 AWG)</td>
<td></td>
</tr>
<tr>
<td>Fork terminal</td>
<td>5.8 mm max</td>
<td></td>
</tr>
<tr>
<td>Ring terminal</td>
<td>5.8 mm max</td>
<td></td>
</tr>
</tbody>
</table>

**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)](image)

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

![Figure 12 - Snubber connection diagram (DC)](image)

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

- Power supply
- Linear input voltage / current
- Input for current transformer
- Isolated digital inputs
- Thermocouple input
- Input PT100 JPT100 2 / 3 wires
- Relay output
- Long-life solid state relay output
- Logic output
- Isolated logic output
- Isolated analog output

RS485 Bridge

OUT 4 (AL3 / HB)

CT1
CT2

OUT 1

5 V, 10 V
+ VTT

60 mV, 1 V, 20 mA

IN 3
IN 2
IN 1
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 - 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

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]

Output Out 2 - relay 5 A

Output Out 2 - logic

Output Out 2 - logic isolated

Output Out 3 - logic

Output Out 3 - logic isolated

Output Out 3 - Triac

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

2.3.5. Digital inputs

Digital inputs

Digital inputs
### Digital inputs

- **16**: PNP digital inputs
- **IN3**: +12/24 V max 3.6 mA

#### 2.3.6. Serial line

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

- **B (Data +)**: 18
- **A (Data -)**: 17
- **Serial line**: RS485 2-wires

#### 2.3.7. CT Inputs

**CT inputs** [option]

- **CT1**: 10
- **CT2**: 11
- **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]

- **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**: $R_i > 400 \, \text{KΩ}$
  - **0...5 V / 0...10 V**: $R_i > 400 \, \text{KΩ}$
- **Linear input in direct current**
  - **0/4...20 mA**: $R_i = 50 \, \text{KΩ}$

**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**: $R_{out} > 500 \, \text{Ω}$
- **0...20 mA / 4...20 mA**: $R_{out} < 500 \, \text{Ω}$
2.4. 1650 connection diagrams

2.4.1. General diagram

---

**Legend**
- PWR: Power supply
- VIN: Linear input in voltage / current
- VCT: Input for current transformer
- Isolated digital inputs
- Thermocouple input
- Input PT100 JPT100 2 / 3 wires
- NO: Relay output
- Logic output
- Isolated logic output
- Isolated analog output
- B (Data +)
- RS485 serial line
- A (Data -)
- Supply transmitter
- Supply potentiometer

---

**Diagram:**
- OUT 4
  - Current transformer
  - Second current transformer
  - for 2-phase / 3-phase load
- IN 5
- IN 4
- IN 3
- IN 2
- IN 1
  - COM
  - Option Modbus RTU (M) = M0 communication or ME
- VP1
  - 1 V, 20 mA
  - 5 V, 10 V
- VT2
  - 5 V, 10 V
  - 60 mV, 1 V, 20 mA
- CT1
  - 5 V, 10 V, 20mA
- CT2
  - Optional third input AUX2 (H = 3)
- OUT 2
- OUT 3
- OUT 1
- Main input (Main)
- with option OUT1 Master Modbus (B) = G

---

**Notes:**
- WITH Ethernet communication option (M) = E0 or ME
2.4.2. 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, l)**

- Linear input in direct voltage
  - 0...60 mV
  - 0...1 V
  - $R_i$

- Linear input in direct current
  - 0/4...20 mA, $R_i = 50\ \Omega$.

2.4.4. Outputs

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

**Outputs Out 1 - relay 5 A**

- Relay 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
  - $R_{out} < 500\ \Omega$

**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

### Digital inputs

#### Digital inputs

- IN5
- IN4
- IN3
- IN2
- IN1
- COM

#### Digital inputs

- IN5
- IN4
- IN3
- IN2
- IN1
- COM

#### Digital inputs

- NPN Digital inputs
  - IN5
  - IN4
  - IN3
  - IN2
  - IN1
  - COM
2.4.6. Serial line

Serial line

B (Data +) 47
A (Data -) 48

2.4.7. CT Inputs

Inputs CT1, CT2

36 CT1
35 ~
34 CT2
33 ~
32 ~

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 or 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 or 3]

Linear input in direct voltage
0...5 V / 0...10 V Ri > 400 KΩ
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
2.5. 1850 connection diagrams

2.5.1. General diagram

[Diagram showing connection diagrams for 1850, including various inputs and outputs with labels such as PWR, IN 1, OUT 1, etc.]

Legend:
- PWR: Power supply
- +: Linear input in voltage / current
- -: Input for current transformer
- Isolated digital inputs
- Thermocouple input
- Input PT100 / JPT100 2 / Swires
- Relay output
- Long-life solid state relay output
- Logic output
- Isolated logic output
- Isolated analog output
- B (Data +)
- A (Data -)
- VT
- VP
- RS485 serial line
- Supply transmitter
- Supply potentiometer
External power supply
24 VDC ±25%, max 3.5W

8 (PNP) digital Inputs/Outputs

8 Relays

External power supply
24 VDC ±25%, max 27W
2.5.2. Power supply

Power supply

| 12 | PWR |
| 11 | ~ |
| 10 | ~ |

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

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

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

2.5.3. Main input (MAIN)

Input TC

| 3 |
| 2 |
| 1 |

Available thermocouples:
J, K, R, S, T, C, D, B, E, L,
L-GOST; U, G, N,
Pt20Rh-Pt10Rh
ITS90 or custom linearization

Respect polarity
For extensions, use a compensated cable

2.5.4. Output

Output Out 1 - relay 5 A

Output Out 1 - logic

Output Out 1 - continuous

Output Out 2 – relè 5 A

Linear input (V)

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

Relay 250 VAC, 5 A

Logic 24 V ± 10%
(min 10 V a 20 mA)

4...20 mA  Rout < 500 Ω

Relay 250 VAC, 5 A

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

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

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.
**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**

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>IN5</th>
<th>IN4</th>
<th>IN3</th>
<th>IN2</th>
<th>IN1</th>
<th>COM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>41</td>
<td>42</td>
<td>43</td>
<td>44</td>
<td>45</td>
<td>46</td>
</tr>
<tr>
<td>Digital input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voltage-free contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Digital inputs**

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>IN5</th>
<th>IN4</th>
<th>IN3</th>
<th>IN2</th>
<th>IN1</th>
<th>COM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>41</td>
<td>42</td>
<td>43</td>
<td>44</td>
<td>45</td>
<td>46</td>
</tr>
<tr>
<td>NPN Digital input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 V, 4,5 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.5.6. Serial line

Serial line

RS485 2-wires

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.

2.5.7. CT Inputs

Inputs CT1, CT2

Current transformer
50 mA_ac, 10 , 50/60 Hz

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

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

Linear input in direct voltage
0...60 mV    \( R_i > 100 \, \text{MΩ} \)

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

Linear input in direct voltage
0...1 V    \( R_i > 400 \, KΩ \)

Linear input in direct current
0/4...20 mA, \( R_i = 50 \, \Omega \).

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
ITS80 or custom linearization

Respect polarity
For extensions, use a compensated cable

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

Linear input in direct voltage
0...5 V / 0...10 V    \( R_i > 400 \, KΩ \)
2.5.9. THIRD ANALOGUE INPUT (AUX2)

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

- 36    +  35    -  34
  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]

- 36    +  35    -  34    -  33
  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]

- 36    +  35    -  34    -  33

2.5.10. Analog outputs

Analog outputs A1

+  -
30 29
  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.

Analog outputs A2

+  -
32 31
  0...10 V, max 20 mA  Rout > 500 Ω
  0...20 mA / 4...20 mA  Rout < 500 Ω

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

8 Relay
(with option I/O = 01, 11)

External power supply
24 VDC ±25%, max 3,5W

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.

<table>
<thead>
<tr>
<th>Pinout</th>
<th>Rif. accessory</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - GND</td>
<td>CVP-03 Cod. F081138</td>
<td>0,3m</td>
</tr>
<tr>
<td>2 - TX/RX+</td>
<td>CVP-1 Cod. F081140</td>
<td>1m</td>
</tr>
</tbody>
</table>
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:

- 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).

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).

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. Display characters

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

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>I</td>
<td>J</td>
</tr>
<tr>
<td>K</td>
<td>L</td>
<td>M</td>
<td>N</td>
<td>O</td>
<td>P</td>
<td>Q</td>
<td>R</td>
<td>S</td>
<td>T</td>
</tr>
<tr>
<td>U</td>
<td>V</td>
<td>W</td>
<td>X</td>
<td>Y</td>
<td>Z</td>
<td>]</td>
<td>[</td>
<td>\</td>
<td>/</td>
</tr>
<tr>
<td>!</td>
<td>&quot;</td>
<td>#</td>
<td>$</td>
<td>%</td>
<td>&amp;</td>
<td>'</td>
<td>(</td>
<td>)</td>
<td>*</td>
</tr>
<tr>
<td>+</td>
<td>,</td>
<td>-</td>
<td>.</td>
<td>/</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>:</td>
<td>;</td>
<td>&lt;</td>
<td>=</td>
<td>&gt;</td>
</tr>
<tr>
<td>?</td>
<td>@</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
</tr>
<tr>
<td>I</td>
<td>J</td>
<td>K</td>
<td>L</td>
<td>M</td>
<td>N</td>
<td>O</td>
<td>P</td>
<td>Q</td>
<td>R</td>
</tr>
<tr>
<td>S</td>
<td>T</td>
<td>U</td>
<td>V</td>
<td>W</td>
<td>X</td>
<td>Y</td>
<td>Z</td>
<td>[</td>
<td>\</td>
</tr>
<tr>
<td>^</td>
<td>_</td>
<td>`</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>e</td>
<td>f</td>
<td>g</td>
</tr>
<tr>
<td>h</td>
<td>i</td>
<td>j</td>
<td>k</td>
<td>l</td>
<td>m</td>
<td>n</td>
<td>o</td>
<td>p</td>
<td>q</td>
</tr>
<tr>
<td>r</td>
<td>s</td>
<td>t</td>
<td>u</td>
<td>v</td>
<td>w</td>
<td>x</td>
<td>y</td>
<td>z</td>
<td></td>
</tr>
</tbody>
</table>
### 3.1.2.2. Scrolling messages

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

![Sequence diagram](image)

<table>
<thead>
<tr>
<th>Power On</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Configuration read by EEPROM.</td>
</tr>
<tr>
<td>11. Check of data consistency.</td>
</tr>
<tr>
<td>12. Recognition of available options.</td>
</tr>
</tbody>
</table>

- **DISPLAY ON**
  - All display segments are on.
  - 3 flashes at interval of about 1 second

- **CONTROL ON**
  - As per the set configuration.

- **HOME**
  - You have 2 home page.
  - The home page on the display in use is identified by its number, which alternates, at the top left, with the symbol ° C or ° F.

- **AUX IN + PID2**
  - True
  - False

- **MANUAL CONTROL**
  - True
  - False

- **HOME**
  - The displays show the process variable and the % value of power.

- **HOME**
  - The displays show the process variable, the setpoint or other defined parameter.

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

3.3.1. Fast configuration

- **Selecting sensor type**: Home
- **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 available.

Selecting output 4 function
The menu item appears only if the optional output is 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
- Raises the value
- Lowers the value

Setting Allarms 1
- Raises the value
- Lowers the value

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

Selection of probe type
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.

![Diagram of setting up the Alarm](image)
The ALARM submenu also lets you:
- select the input or value to be monitored for the alarm (parameter rEFE, default = PV);
- select the method for applying hysteresis (parameter no.Sy, default = NORML);
- enable or disable the power-on alarm (parameter PWON.E, default = OFF);
- latch/not latch the active alarm state (parameter LATCH, default = OFF);
- set the alarm trip delay (parameter DELAY, default = 0.00);
- activate or deactivate flashing of the PV display in case of alarm (parameter BLK.AL, default = OFF).

3.4.2. Setting up the Heater Break Alarm

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

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

The PID submenu also lets you:

- set the Soft-Start time (parameter SOFT.T, default = 0.0);
- select the type of Auto-Tuning used (parameter Aut.t, default = CONTI);
- set the derivative time (parameter DERVS, default = 1.0);
- 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 FAULT, default = 0.0);
- set the deadband (parameter DEAD.B, default = 0.0);
- 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 <?>).

4.1. Programming/Configuration Menu

4.1.1. First: know what you’re doing

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

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

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

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

4.1.2. Passwords

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

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

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

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

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

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)
- Home2 (0000 0000)

> 1 s time = 0 with only PID1
User configuration menu (max 100 parameters)

> 2 s Insert password 1
If password is correct, enter menu, if not, Home

> 6 s Insert password 2
If password is correct, enter menu, if not, Home

only for models with auxiliary input and PID2 enabled
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

**Inputs**

- Analog input IN.1
- Analog input IN.2
- Analog input IN.3
- Current input CT.1
- Current input CT.2
- Digital input INDIG.1
- Digital input INDIG.2
- Digital input INDIG.3
- Digital input INDIG.4
- Digital input INDIG.5
- 8 Digital inputs EXP

**Processing Software**

- Linearization LINRZ.1
- Linearization LINRZ.2
- Setpoint programmer PROGR.1
- Setpoint programmer PROGR.2
- Programmatore di setpoint
- PID control PID.1
- PID control PID.2
- Controller in cascade
- 16 Programs 192 Steps
- Multiset M.SP1.1...M.SP4.1
- Multiset M.SP1.2...M.SP4.2
- Alarm FAULT.1
- Alarm FAULT.2
- Alarm POWER.1
- Alarm POWER.2
- Alarm LBA.1
- Alarm LBA.2

**Outputs**

- Output OUT.1
- Output OUT.2
- Output OUT.3
- Output OUT.4
- Analog output OUT.A1
- Analog output OUT.A2
- 8 Digital outputs EXP
- 8 Relay outputs EXP
- Master Modbus serial

**Other Functions**

- Weekly Calendar
- Logic functions 1...32
- Mathematical functions 1...8
- Recipes 1...5 1...25 param.
- User menu 1...100 param.
- Master Modbus 1....20 communication functions
- Master Modbus serial
- Scrolling messages 1...3 languages with 1...25 posts or 1...75 posts

**Double Functions**

- Digital inputs function
- Outputs function
- Alarm HB
- Alarm 1...4
- Valve control

**Funzioni con definizione da GF_eXpress**
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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO</td>
<td>INSTRUMENT STATUS</td>
<td>Livello 1</td>
<td>Gives information on controller state and HW configuration</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out1</td>
<td>OUTPUT TYPE</td>
<td>INFO</td>
<td>R</td>
<td>The parameter specifies the type of output 1.</td>
</tr>
</tbody>
</table>

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.
7. Options: RELAY = Relay output, DIGIT = Logic output 24 V, CONTUS = Continuous output
8. Description of parameter values or information that can be read or written, as appropriate.
9. Any additional description of value of individual parameter.
### 4.4. Submenu INFO - Information display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO</td>
<td>INSTRUMENT STATUS</td>
<td>Level 1</td>
<td>Gives information on controller state and HW configuration.</td>
</tr>
</tbody>
</table>

#### Parameter List

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SW. VER Versione software</td>
<td>58</td>
<td>INSTRUMENT STATUS CT1+2</td>
<td>10</td>
<td>OUT4 S Numero commutazioni uscita 4</td>
<td>64</td>
</tr>
<tr>
<td>CODE Codice identificativo del regolatore</td>
<td>58</td>
<td>K. IN DG Ingresso digitale disponibile</td>
<td>61</td>
<td>INDG S Numero commutazioni ingresso digitale</td>
<td>64</td>
</tr>
<tr>
<td>ERR.1 Errore ingresso principale</td>
<td>58</td>
<td>RS485 Porta seriale RS485 disponibile</td>
<td>61</td>
<td>T. DAYS Totale giorni di funzionamento</td>
<td>13</td>
</tr>
<tr>
<td>ERR.2 Errore ingresso ausiliario</td>
<td>58</td>
<td>MAC. E Indirizzo Ethernet del regolatore</td>
<td>&lt;??</td>
<td>P. DAYS Parziale giorni di funzionamento</td>
<td>65</td>
</tr>
<tr>
<td>ERR.3 Errore ingresso ausiliario 2 (IN3)</td>
<td>&lt;??</td>
<td>IO. AUX I/O ausiliari disponibili</td>
<td>11</td>
<td>T. INT Temperatura interna del regolatore</td>
<td>65</td>
</tr>
<tr>
<td>M. ERR. x Errore blocco funzionale matematico x</td>
<td>59</td>
<td>IO. RELE Relè ausiliari disponibili</td>
<td>&lt;??</td>
<td>T. MIN Temperatura interna minima del regolatore</td>
<td>65</td>
</tr>
<tr>
<td>SAP. C Codice SAP</td>
<td>59</td>
<td>PS. MAI Alimentazione Sensor disponibile per ingresso principale</td>
<td>62</td>
<td>T. MAX Temperatura interna massima del regolatore</td>
<td>65</td>
</tr>
<tr>
<td>ERr. n Numero di serie del regolatore</td>
<td>59</td>
<td>PS. AUX Alimentazione Sensor disponibile per ingresso ausiliario</td>
<td>11</td>
<td>TIME Tempo interno</td>
<td>14</td>
</tr>
<tr>
<td>850. LV Modello del regolatore</td>
<td>60</td>
<td>Out1 Tipo dell’uscita 1</td>
<td>63</td>
<td>DATE Data interna</td>
<td>65</td>
</tr>
<tr>
<td>CONTR Tipo di regolatore</td>
<td>&lt;??</td>
<td>Out2 Tipo dell’uscita 2</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUNC. E Opzione Funzioni Logiche e Matematiche disponibile</td>
<td>60</td>
<td>Out3 Tipo dell’uscita 3</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CALEN Calendario disponibile</td>
<td>&lt;??</td>
<td>Out4 Tipo dell’uscita 4</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN. AUX Ingresso ausiliario disponibile</td>
<td>60</td>
<td>Out1 S Numero commutazioni uscita 1</td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. AUX2 Ingresso ausiliario 2 disponibile</td>
<td>&lt;??</td>
<td>Out2 S Numero commutazioni uscita 2</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUT. AN Uscita analogica disponibile</td>
<td>61</td>
<td>Out3 S Numero commutazioni uscita 3</td>
<td>64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW.VER</td>
<td>SOFTWARE VERSION</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* -

*Options:* -

4.4.2. CODE - Identifying code of controller

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CODE</td>
<td>INSTRUMENT ID CODE FOR SERIAL COMM</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR.1</td>
<td>INPUT ERROR</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR.2</td>
<td>INPUT ERROR</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR.3</td>
<td>INPUT ERROR</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.ERR.x*</td>
<td>MATH FUNCTION BLOCK x ERROR</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP.C</td>
<td>SAP ORDER CODE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

The parameter shows the product number (Fxxxxxx).

**Unit of measurement:** -

**Options:** -

### 4.4.8. SER.N - Serial number of controller

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SER.n</td>
<td>SERIAL NUMBER</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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. xxxx - Model of controller

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxx</td>
<td>MODEL</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

The parameter shows the model of the controller. xxxx 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. xxxx - Type of controller

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxx</td>
<td>MODEL OPTION</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

The parameter shows the type (xxxx) 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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNC.B</td>
<td>LOGIC AND MATH FUNCTIONS AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALEN</td>
<td>CALENDAR AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN.AUX</td>
<td>AUXILIARY INPUT AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAUX</td>
<td>AUXILIARY INPUT 2 AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT.AN</td>
<td>ANALOG OUTPUT AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTx</td>
<td>CURRENT TRANSFORMER AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>x.IN.DG</td>
<td>DIGITAL INPUT AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485</td>
<td>FIELDBUS AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC.E</td>
<td></td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.I/O</td>
<td>8.I/O EXPANSION AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.RELY</td>
<td>8 RELAY EXPANSION AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS.MAI</td>
<td>MAIN SENSOR POWER SUPPLY AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS.AUX</td>
<td>AUX SENSOR POWER SUPPLY AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out1</td>
<td>OUTPUT TYPE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out2</td>
<td>OUTPUT TYPE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out3</td>
<td>OUTPUT TYPE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out4</td>
<td>OUTPUT TYPE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT1.S</td>
<td>NUMBER X 1000 RELAY CYCLES</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT2.S</td>
<td>NUMBER X 1000 RELAY CYCLES</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT3.S</td>
<td>NUMBER X 1000 RELAY CYCLES</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT4.S</td>
<td>NUMBER X 1000 RELAY CYCLES</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDG.S</td>
<td>NUMBER OF DIGITAL INPUT CYCLES</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.DAYS</td>
<td>TOTAL DAYS OF OPERATION</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.DAYS</td>
<td>PARTIAL DAYS OF OPERATION</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.INT</td>
<td>INTERNAL TEMPERATURE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.MIN</td>
<td>MIN INTERNAL TEMPERATURE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.MAX</td>
<td>MAX INTERNAL TEMPERATURE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* °C

*Options:* -

4.4.38. TIME - Internal time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>INFO</td>
<td></td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>INFO</td>
<td></td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO.E</td>
<td>ETHERNET STATUS</td>
<td>Level 1</td>
<td>Supplies various information on the state of Ethernet communications.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet software version</td>
<td>73</td>
</tr>
<tr>
<td>Ethernet assignment mode status</td>
<td>73</td>
</tr>
<tr>
<td>Ethernet connection status</td>
<td>73</td>
</tr>
<tr>
<td>Ethernet link status</td>
<td>22</td>
</tr>
<tr>
<td>Ethernet speed status</td>
<td>73</td>
</tr>
<tr>
<td>Ethernet IP address</td>
<td>68</td>
</tr>
<tr>
<td>Ethernet Subnet mask</td>
<td>74</td>
</tr>
<tr>
<td>Ethernet Gateway address</td>
<td>74</td>
</tr>
<tr>
<td>Ethernet network status</td>
<td>74</td>
</tr>
</tbody>
</table>
### 4.5.1. VERS.E – Ethernet Software Version

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERS.E</td>
<td>ETHERNET SOFTWARE VERSION</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ty.S.E</td>
<td>ETHERNET ASSIGNMENT MODE STATUS</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Con.E</td>
<td>CONNECTION STATUS</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lin.E</td>
<td>ETHERNET LINK STATUS</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPD.E</td>
<td>ETHERNET SPEED STATUS</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.E</td>
<td>-</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub.E</td>
<td>-</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAt.E</td>
<td>-</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

This parameter shows the Gateway 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:* -

### 4.5.9. STA.E – Ethernet Network status

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>StA.E</td>
<td>ETHERNET STATUS</td>
<td>INFO.E</td>
<td>R</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASTE</td>
<td>MASTER ACTUAL DATA</td>
<td>Level 1</td>
<td>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.</td>
</tr>
</tbody>
</table>


STAT

- Stato della comunicazione Master Modbus
- Valore comunicazione Master 1
- Communication error Master 1
- Errore comunicazione Master 1
- Valore comunicazione Master 2
- Communication error Master 2
- Errore comunicazione Master 2
- Valore comunicazione Master 3
- Communication error Master 3
- Errore comunicazione Master 3
- Valore comunicazione Master 4
- Communication error Master 4
- Errore comunicazione Master 4
- Valore comunicazione Master 5
- Communication error Master 5
- Errore comunicazione Master 5
- Valore comunicazione Master 6
- Communication error Master 6
- Errore comunicazione Master 6
- Valore comunicazione Master 7

ERR.07

- Communication error Master 7

ERR.14

- Communication error Master 14

ERR.08

- Communication error Master 8

ERR.15

- Communication error Master 15

ERR.09

- Communication error Master 9

ERR.16

- Communication error Master 16

ERR.10

- Communication error Master 10

ERR.17

- Communication error Master 17

ERR.11

- Communication error Master 11

ERR.18

- Communication error Master 18

ERR.12

- Communication error Master 12

ERR.19

- Communication error Master 19

ERR.13

- Communication error Master 13

ERR.20

- Communication error Master 20

ERR.14

- Communication error Master 14
4.5.10. STAT – Master communication status

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stat</td>
<td>MASTER STATUS</td>
<td>MASTER</td>
<td>R</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAS.xx</td>
<td>(1) MASTER</td>
<td>MASTER</td>
<td>(2)</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR.xx</td>
<td>MASTER ERROR</td>
<td>MASTER</td>
<td>R</td>
</tr>
</tbody>
</table>

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
4.6. **RECIP Submenu - Configuring parameters recipes**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECIP</td>
<td>RECIPES CONFIGURATION</td>
<td>Level 1</td>
<td>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_RN &lt;&gt; 0.</td>
</tr>
</tbody>
</table>

(* 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.

4.6.1. **RECP.N - Selecting a recipe**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECP.N</td>
<td>RECIPE NUMBER</td>
<td>RECIP</td>
<td>R W</td>
</tr>
</tbody>
</table>

Parameter n lets you select the recipe to be displayed.

*Unit of measurement:* -

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

4.6.2. **ACRxx** - Parameter xx** of recipe

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACRxx</td>
<td>RECIP.1 ***</td>
<td>RECIP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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. (***) The description shown is the one for the parameter set with GF_eXpress at element xx of the recipe template.
4.7. Submenu PR.OPT - Configuring programs

<table>
<thead>
<tr>
<th>Acronimo</th>
<th>Messaggio a scorrimento</th>
<th>Password d'accesso</th>
<th>Descrizione</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR.OPT</td>
<td>PROGRAMMER CONFIGURATION</td>
<td>Livello 1</td>
<td>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 &lt;?&gt;.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR.OP.N</td>
<td></td>
</tr>
<tr>
<td>FI.STP</td>
<td></td>
</tr>
<tr>
<td>LA.STP</td>
<td></td>
</tr>
<tr>
<td>Strt</td>
<td>22</td>
</tr>
<tr>
<td>RST.SP</td>
<td></td>
</tr>
<tr>
<td>WAIT.S</td>
<td></td>
</tr>
<tr>
<td>End</td>
<td>74</td>
</tr>
<tr>
<td>LIMIT</td>
<td></td>
</tr>
<tr>
<td>MSG.EN</td>
<td>74</td>
</tr>
</tbody>
</table>

Parameter

Selecting program 73
Number of first step assigned to program 73
Number of last step assigned to program 73
Restart mode 22
Type of control after program restart 73
Option to start execution of program 23
Action at end of program 74
Message associated at the end of the program 74
Message associated at the end of the program 74
4.7.1. PR.OP.N - Selecting program

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR.OP.N</td>
<td>PROGRAM NUMBER</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FI.STP</td>
<td>PR.OPT.1 (o PR.OPT.2... PR.OPT.16) FIRST STEP OF PROGRAM</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA.STP</td>
<td>PR.OPT.1 (o PR.OPT.2... PR.OPT.16) LAST STEP OF PROGRAM</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.7.4. STRT - Restart mode

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRT</td>
<td>PR.OPT.1 (o PR.OPT.2... PR.OPT.16) RESTART TYPE AFTER POWER-ON</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter defines program restart mode after Power-on.

**Unit of measurement:** -
**Options:**
- **OFF** = 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
- **R SRC** = Program restarts with search for step (see programmer function...).

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RST.SP</td>
<td>PR.OPT.1 (or PR.OPT.2... PR.OPT.16) CONTROL TYPE AFTER RESET</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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.
### 4.7.6. WAIT.S - Option to start execution of program

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAIT.S</td>
<td>PR.OPT.1 (or PR.OPT.2… PR.OPT.16) DEF OF START EXEC PROGRAM</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.7.7. END - Action at end of program

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>End</td>
<td>PR.OPT.1 (or PR.OPT.2… PR.OPT.16) CONDITION AT END OF CYCLE</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.7.8. LIMIT - Limitation of step duration

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIMIT</td>
<td>PR.OPT.1 (or PR.OPT.2… PR.OPT.16) DEF OF STEP TIMING LIMITATION</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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.

### 4.7.9. MSG.EN - Message assigned to end of program

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.EN</td>
<td>PR.OPT.1 (o PR.OPT.2… PR.OPT.16) SCROLLING MESSAGE AT THE END</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

**Unit of measurement:** Message number

**Options:**
- 0…25 (con LAnG=LANG1 oppure LANG2 oppure LANG3)
- 0…75 (con LAnG=NONE)
### 4.8. Submenu PR.STP - Configuration of program steps

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR.STP</td>
<td>STEP DEFINITION</td>
<td>Level 1</td>
<td>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 &lt;?-&gt;.</td>
</tr>
</tbody>
</table>

#### Parameter Table

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PR. NUM</td>
<td>76</td>
<td>S. SP. EN</td>
<td>78</td>
<td>EVN. R. 4</td>
<td>30</td>
</tr>
<tr>
<td>PR. ST. N</td>
<td>76</td>
<td>SUN. SP</td>
<td>79</td>
<td>EVN. R. 1</td>
<td>81</td>
</tr>
<tr>
<td>ST. END</td>
<td>76</td>
<td>S. RM. EN</td>
<td>79</td>
<td>EVN. R. 2</td>
<td>31</td>
</tr>
<tr>
<td>SETP</td>
<td>76</td>
<td>ENBL. 1</td>
<td>79</td>
<td>EVN. R. 3</td>
<td>31</td>
</tr>
<tr>
<td>RAMP. T</td>
<td>77</td>
<td>ENBL. 2</td>
<td>79</td>
<td>EVN. R. 4</td>
<td>31</td>
</tr>
<tr>
<td>HOLD. T</td>
<td>77</td>
<td>ENBL. 3</td>
<td>29</td>
<td>GROP. R</td>
<td>82</td>
</tr>
<tr>
<td>HBB</td>
<td>77</td>
<td>ENBL. 4</td>
<td>29</td>
<td>GROP. H</td>
<td>83</td>
</tr>
<tr>
<td>BAND</td>
<td>77</td>
<td>EN. ST. N</td>
<td>80</td>
<td>MSG. R</td>
<td>83</td>
</tr>
<tr>
<td>HBB. R</td>
<td>78</td>
<td>EVN. R. 1</td>
<td>80</td>
<td>MSG. R</td>
<td>83</td>
</tr>
<tr>
<td>HBB. H</td>
<td>78</td>
<td>EVN. R. 2</td>
<td>81</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>EVN. R. 3</td>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Diagram

- **Program selection (only if “Simplified Programmer” mode is active S.PROG = ON nel men EN.FUN):** 76
- **Programming step:** 76
- **Last step of program (only if “Simplified Programmer” mode is active – S.PROG parameter = ON in EN.FUN menu):** 76
- **Programming step setpoint:** 76
- **Step time ramp:** 77
- **Hold time in step:** 77
- **Enable Hold Back Band function:** 77
- **Maximum deviation for HBB:** 77
- **Enabling HBB during ramp:** 78
- **Enabling HBB during hold:** 78
- **Enabling HBB with respect to the auxiliary input:** 78
- **Enabling ramp for slaved controller:** 79
- **Consent 1 to execute step:** 79
- **Consent 2 to execute step:** 79
- **Consent 3 to execute step:** 29
- **Consent 4 to execute step:** 29
- **Other programmer step as consent:** 80
- **Message assigned to ramp:** 83
- **Message assigned to hold:** 83
### 4.8.1. PR.NUM

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR.NUM</td>
<td>PROGRAMMER ACTUAL PROGRAM</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.8.2. PR.ST.N - Programming step

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR.ST.N</td>
<td>PROGRAMMER ACTUAL STEP</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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)

### 4.8.3. ST.END - End step of the program configuration

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST.END</td>
<td>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)</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.8.4. REFE – Step reference programmer

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>rEFE</td>
<td>REFERENCE PROGRAMMER</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.8.5. SETP - Programming step setpoint

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETP</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

**Options:** -1999...9999
4.8.6. RAMP.T - Step time ramp

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAMP.T</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.8.7. HOLD.T - Hold time in step

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOLD.T</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.8.8. HBB - Enable Hold Back Band function

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBB</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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)

4.8.9. BAND - Maximum deviation for HBB

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAND</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.8.10. HBB.R - Enabling HBB during ramp

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBB.R</td>
<td>PR.STP.1 (o PR.STP.2…PR.STP.192) ENABLE HOLD BACK BAND DURING STEP RAMP se modalità&quot;Programmatore semplificato&quot;disattiva; o PR.STP.1…PR.STP.16 ENABLE HOLD BACK BAND DURING STEP RAMP se modalità&quot;Programmatore semplificato&quot;attiva.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.8.11. HBB.H - Enabling HBB during hold

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBB.H</td>
<td>PR.STP.1 (o PR.STP.2…PR.STP.192) ENABLE HOLD BACK BAND DURING STEP HOLD se modalità&quot;Programmatore semplificato&quot;disattiva; o PR.STP.1…PR.STP.16 ENABLE HOLD BACK BAND DURING STEP HOLD se modalità&quot;Programmatore semplificato&quot;attiva.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBB2</td>
<td>PR.STP.1 (o PR.STP.2…PR.STP.192) HOLD BACK BAND FUNCTION REFERRED TO AUX INP se modalità&quot;Programmatore semplificato&quot;disattiva; o PR.STP.1…PR.STP.16 HOLD BACK BAND FUNCTION REFERRED TO AUX INP se modalità&quot;Programmatore semplificato&quot;attiva.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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, SPREM 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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.SP.EN</td>
<td>PR.STP.1 (o PR.STP.2…PR.STP.192) SUBDUE SETPOINT RETRANSMITTED ENABLE se modalità&quot;Programmatore semplificato&quot;disattiva; o PR.STP.1…PR.STP.16 SUBDUE SETPOINT RETRANSMITTED ENABLE se modalità&quot;Programmatore semplificato&quot;attiva.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.8.14. **SUB.SP - Setpoint value of slaved controller**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB.SP</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

If the S.SP.E 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

4.8.15. **S.RM.EN - Enabling ramp for slaved controller**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.RM.EN</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

If the S.SP.E 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

4.8.16. **ENBL.1 - Consent 1 to execute step**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENBL.1</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.8.17. **ENBL.2 - Consent 2 to execute step**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENBL.2</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

See ENBL.1 for details.
4.8.18. **ENBL.3 - Consent 3 to execute step**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENBL.3</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

See ENBL.1 for details.

4.8.19. **ENBL.4 - Consent 4 to execute step**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENBL.4</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

See ENBL.1 for details.

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.ST.N</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.8.21. **EVN.R.1 - Event 1 during step ramp**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVN.R.1</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.8.22. EVN.R.2 - Event 2 durante la rampa del passo

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVN.R.2</td>
<td>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.</td>
<td>PR.STP</td>
<td>RW</td>
</tr>
</tbody>
</table>

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

### 4.8.23. EVN.R.3 - Event 3 during step ramp

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVN.R.3</td>
<td>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.</td>
<td>PR.STP</td>
<td>RW</td>
</tr>
</tbody>
</table>

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

### 4.8.24. EVN.R.4 - Event 4 during step ramp

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVN.R.4</td>
<td>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.</td>
<td>PR.STP</td>
<td>RW</td>
</tr>
</tbody>
</table>

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

### 4.8.25. EVN.H.1 - Event 1 during step hold

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVN.H.1</td>
<td>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.</td>
<td>PR.STP</td>
<td>RW</td>
</tr>
</tbody>
</table>

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
### 4.8.26. EVN.H.2 - Event 2 during step hold

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVN.H.2</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.8.27. EVN.H.3 - Event 3 during step hold

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVN.H.3</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.8.28. EVN.H.4 - Event 4 during step hold

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVN.H.4</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.8.29. GROP.R - Group of parameters assigned to ramp

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROP.R</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

**Unit of measurement:** Number

- **Options:**
  - 0...4
### 4.8.30. GROP.H - Group of parameters assigned to hold

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROP.H</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

**Unit of measurement:** Number

**Options:** 0...4

### 4.8.31. MSG.R - Message associated with the ramp

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.R</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>. Setting it to “0” will not show any messages.

**Unit of measurement:** ID number of the message

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

### 4.8.32. MSG.H - Message associated with the maintenance

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.H</td>
<td>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.</td>
<td>PR.STP</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>. 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. Submenu INPUT - Configuring analog inputs

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT</td>
<td>INPUT CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the controller’s analog inputs (main and auxiliary).</td>
</tr>
</tbody>
</table>

Parameter

- **INP.N**
  - Selecting the analog input

- **tYPE**
  - Selecting sensor type

- **FUnC**
  - Selecting auxiliary input function

- **Lin**
  - Selecting linearization type

- **Unit**
  - Selecting the displayed unit of measurement

- **FILT**
  - Digital filter

- **FILT.D**
  - Digital filter on PV display

- **DEC.P**
  - Number of decimals displayed

- **LO.SCL**
  - Lower limit of scale

- **HI.SCL**
  - Upper limit of scale

- **OF.SCL**
  - Scale offset correction

- **LO.SP**
  - Lower limit for setpoint

- **HI.SP**
  - Upper limit for setpoint

- **LO.AL**
  - Lower limit for alarms

- **HI.AL**
  - Upper limit for alarms

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

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

- **MSG.ERR**
  - Selecting the message assigned to Err

- **MSG.SB**
  - Selecting the message assigned to Sbr
### 4.9.1. Functional schema

![Functional schema diagram]

### 4.9.2. INP.N - Selecting the analog input

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INP.N</td>
<td>INPUT NUMBER</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the identifying number of the analog input.

**Unit of measurement:** Number

**Options:** 1...3
### 4.9.3. TYPE - Selecting sensor type

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>INPUT.1 (or INPUT.2) or INPUT.3 TYPE OF PROBE</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>Sensor</th>
<th>Unit of measurement</th>
<th>Scale limits for DEC.P = 0</th>
<th>Scale limits for DEC.P = 1</th>
<th>Error @ 25°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouple</td>
<td>J</td>
<td>°C</td>
<td>-210...1200</td>
<td>-199.9...999.9</td>
<td>±0.05</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>°C</td>
<td>-270...1372</td>
<td>-199.9...999.9</td>
<td>±0.06</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>°C</td>
<td>-50...1768</td>
<td>-50.0...999.9</td>
<td>±0.02</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>°C</td>
<td>-50...1768</td>
<td>-50.0...999.9</td>
<td>±0.02</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>°C</td>
<td>-270...400</td>
<td>-199.9...400.0</td>
<td>±0.04</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>°C</td>
<td>0...2315</td>
<td>0.0...999.9</td>
<td>±0.011</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>°C</td>
<td>0...2315</td>
<td>0.0...999.9</td>
<td>±0.023</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>°C</td>
<td>40...1820</td>
<td>40.0...999.9</td>
<td>±0.03</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>°C</td>
<td>-270...1000</td>
<td>-199.9...999.9</td>
<td>±0.19 per T&lt;200°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±0.03 per T&gt;200°C</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>°C</td>
<td>-200...900</td>
<td>-199.9...900.0</td>
<td>±0.09</td>
</tr>
<tr>
<td></td>
<td>L-GOST</td>
<td>°C</td>
<td>-200...800</td>
<td>-199.9...800.0</td>
<td>±0.014</td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>°C</td>
<td>-200...600</td>
<td>-199.9...600.0</td>
<td>±0.135</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>°C</td>
<td>0...2315</td>
<td>0.0...999.9</td>
<td>±0.042</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>°C</td>
<td>-270...1300</td>
<td>-199.9...999.9</td>
<td>±0.047</td>
</tr>
<tr>
<td></td>
<td>Pt20Rh</td>
<td>°C</td>
<td>0...1888</td>
<td>0...999.9</td>
<td>±0.017</td>
</tr>
<tr>
<td></td>
<td>Pt40Rh</td>
<td>°C</td>
<td>0...1888</td>
<td>0...999.9</td>
<td>±0.017</td>
</tr>
<tr>
<td>Infrared characteristic of the Tc K model see note</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>°C</td>
<td>10...700</td>
<td>10.0...70.0</td>
<td>±0.06</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>°C</td>
<td>60...120</td>
<td>60.0...120.0</td>
<td>±0.06</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>°C</td>
<td>115...165</td>
<td>115.0...165.0</td>
<td>±0.06</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>°C</td>
<td>140...260</td>
<td>140.0...260.0</td>
<td>±0.06</td>
</tr>
<tr>
<td>Thermoresistance</td>
<td>PT100</td>
<td>°C</td>
<td>200...850</td>
<td>-199.9...850.0</td>
<td>±0.062</td>
</tr>
<tr>
<td></td>
<td>PT100 LIM</td>
<td>°C</td>
<td>-50...250</td>
<td>-50.0...250.0</td>
<td>±0.062</td>
</tr>
<tr>
<td></td>
<td>JPT100</td>
<td>°C</td>
<td>200...600</td>
<td>-199.9...850.0</td>
<td>±0.062</td>
</tr>
<tr>
<td>Voltage /Current</td>
<td>0...60 mA</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...20 mA</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>4...20 mA</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...10 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2...10 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...5 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1...5 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...1 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...2,4V HI</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...1,2V HI</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...1V HI</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>RTD</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...60 mA</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...20 mA</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>4...20 mA</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...10 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2...10 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...5 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1...5 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...1 V</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...2,4V HI</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...1,2V HI</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0...1V HI</td>
<td></td>
<td></td>
<td>-1999...9999</td>
<td>-</td>
</tr>
</tbody>
</table>

**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:**

<table>
<thead>
<tr>
<th>Type 1</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.TC</td>
<td>Thermocouple J</td>
</tr>
<tr>
<td>K.TC</td>
<td>Thermocouple K</td>
</tr>
<tr>
<td>R.TC</td>
<td>Thermocouple R</td>
</tr>
<tr>
<td>S.TC</td>
<td>Thermocouple S</td>
</tr>
<tr>
<td>T.TC</td>
<td>Thermocouple T</td>
</tr>
<tr>
<td>C.TC</td>
<td>Thermocouple C</td>
</tr>
<tr>
<td>D.TC</td>
<td>Thermocouple D</td>
</tr>
<tr>
<td>B.TC</td>
<td>Thermocouple B</td>
</tr>
<tr>
<td>E.TC</td>
<td>Thermocouple E</td>
</tr>
<tr>
<td>L.TC</td>
<td>Thermocouple L</td>
</tr>
<tr>
<td>L.GO.TC</td>
<td>Thermocouple L.GOST</td>
</tr>
<tr>
<td>U.TC</td>
<td>Thermocouple U</td>
</tr>
<tr>
<td>G.TC</td>
<td>Thermocouple G</td>
</tr>
<tr>
<td>N.TC</td>
<td>Thermocouple N</td>
</tr>
<tr>
<td>PT2.TC</td>
<td>Thermocouple Pt20Rh / Pt40Rh</td>
</tr>
</tbody>
</table>

**with model 850 (without option VT1), 1650 and 1850:**

<table>
<thead>
<tr>
<th>Type 1</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT100</td>
<td>Thermoresistance Pt100</td>
</tr>
<tr>
<td>PT.LIM</td>
<td>Thermoresistance Pt 100 limited</td>
</tr>
<tr>
<td>JPT10</td>
<td>Thermoresistance JPT100</td>
</tr>
<tr>
<td>60MV</td>
<td>Sensor 0...60 mV</td>
</tr>
<tr>
<td>20MA</td>
<td>Sensor 0...20 mA</td>
</tr>
<tr>
<td>4-20M</td>
<td>Sensor 4...20 mA</td>
</tr>
<tr>
<td>10V</td>
<td>Sensor 0...10 V</td>
</tr>
<tr>
<td>2-10V</td>
<td>Sensor 2...10 V</td>
</tr>
<tr>
<td>5V</td>
<td>Sensor 0...5 V</td>
</tr>
<tr>
<td>1-5V</td>
<td>Sensor 1...5 V</td>
</tr>
<tr>
<td>1V</td>
<td>Sensor 0...1 V</td>
</tr>
<tr>
<td>0.2-1V</td>
<td>Sensor 0.2...1 V</td>
</tr>
<tr>
<td>C.RTD</td>
<td>Sensor RTD with custom calibration</td>
</tr>
<tr>
<td>C.60MV</td>
<td>Sensor 0...60 mV with custom calibration</td>
</tr>
<tr>
<td>C.20MA</td>
<td>Sensor 0...20 mA with custom calibration</td>
</tr>
<tr>
<td>C.4-20</td>
<td>Sensor 4...20 mA with custom calibration</td>
</tr>
<tr>
<td>C.10V</td>
<td>Sensor 0...10 V with custom calibration</td>
</tr>
<tr>
<td>C.2-10</td>
<td>Sensor 2...10 V with custom calibration</td>
</tr>
<tr>
<td>C.5V</td>
<td>Sensor 0...5 V with custom calibration</td>
</tr>
<tr>
<td>C.1-5V</td>
<td>Sensor 1...5 V with custom calibration</td>
</tr>
<tr>
<td>C.1V</td>
<td>Sensor 0...1 V with custom calibration</td>
</tr>
<tr>
<td>C.0.2-1</td>
<td>Sensor 0,2...1 V with custom calibration</td>
</tr>
</tbody>
</table>

**with model 850 (with option VT1):**

<table>
<thead>
<tr>
<th>Type 1</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>60MV</td>
<td>Sensor 0...60 mV</td>
</tr>
<tr>
<td>20MA</td>
<td>Sensor 0...20 mA</td>
</tr>
<tr>
<td>4-20M</td>
<td>Sensor 4...20 mA</td>
</tr>
<tr>
<td>10V</td>
<td>Sensor 0...10 V</td>
</tr>
<tr>
<td>2-10V</td>
<td>Sensor 2...10 V</td>
</tr>
<tr>
<td>5V</td>
<td>Sensor 0...5 V</td>
</tr>
<tr>
<td>1-5V</td>
<td>Sensor 1...5 V</td>
</tr>
<tr>
<td>1V</td>
<td>Sensor 0...1 V</td>
</tr>
<tr>
<td>0.2-1V</td>
<td>Sensor 0.2...1 V</td>
</tr>
<tr>
<td>C.RTD</td>
<td>Sensor RTD with custom calibration</td>
</tr>
<tr>
<td>C.60MV</td>
<td>Sensor 0...60 mV with custom calibration</td>
</tr>
<tr>
<td>C.20MA</td>
<td>Sensor 0...20 mA with custom calibration</td>
</tr>
</tbody>
</table>

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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 JPT10
- 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
4.9.4. **SBR.E - Enabling SBR error**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBR.E</td>
<td>INPUT.1 (or INPUT.2) SBR ENABLE</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

Enables open thermocouple probe error detection, also permitting infrared sensor management with maximum 4Kohm output impedance.

This parameter only appears when a thermocouple type input is selected. When OFF, the parameter will be forced to ON (see options) at each Power On.

**Unit of measurement:** -

**Options:**
- **OFF** = Disable SBR alarm
- **On** = Enable SBR alarm
- **On.t** = Enable SBR alarm with timing
## FUNC - Selecting auxiliary input function

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNC</td>
<td>FUNCTION OF AUX INPUT</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

**Unit of measurement:**

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FUNC 2</strong></td>
<td>No function (only IN2 display)</td>
</tr>
<tr>
<td>NONE</td>
<td>Remote setpoint of Process Value (PV1) for PID.1 (*)</td>
</tr>
<tr>
<td>SETP</td>
<td>Remote setpoint of Power for PID.1 (*)</td>
</tr>
<tr>
<td>POWER</td>
<td>Reset power for PID.1</td>
</tr>
<tr>
<td>RST.PW</td>
<td>Reference of ratio controller for PID.1 (**)</td>
</tr>
</tbody>
</table>

if model has valve control:

- VALV.P = Valve position signal
- PV2 = Process Value (PV2) per PID.2

**FUNC 3**

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td>Nessuna funzione (solo visualizzazione IN3)</td>
</tr>
<tr>
<td>SETP</td>
<td>Remote setpoint of Process Value (PV1) for PID.1 (*)</td>
</tr>
<tr>
<td>POWER</td>
<td>Remote setpoint of Power for PID.1 (*)</td>
</tr>
<tr>
<td>RST.PW</td>
<td>Reset power for PID.1</td>
</tr>
<tr>
<td>RATIO</td>
<td>Riferimento per regolatore di rapporto per PID.1 (**)</td>
</tr>
</tbody>
</table>

if model has valve control:

- VALV.P = Segnale di posizione valvola
- SETP2 = Remote setpoint of Process Value (PV2) for PID.2
- POWER2 = 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.
4.9.5. LIN - Selecting linearization type

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lin</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) CUSTOM LINEARIZATION</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

**Unit of measurement:** -

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

4.9.6. UNIT - Selecting the displayed unit of measurement

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) UNIT OF MEASURE</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.9.7. FILT - Digital filter

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILT</td>
<td>INPUT.1 (or INPUT.2 DIGITAL FILTER</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.9.8. FILT.D - Digital filter on PV display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILT.D</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) DIGITAL FILTER ON DISPLAY PV</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.9.9. DEC.P - Number of decimals displayed

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEC.P</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) DECIMAL POINT POSITION</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.9.10. LO.SCL - Lower limit of scale

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO.SCL</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) INPUT LOW LIMIT</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Unit = °C DEC.P = 0</th>
<th>Unit = °F DEC.P = 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.TC</td>
<td>-210...1200</td>
<td>-346...2192</td>
</tr>
<tr>
<td>K.TC</td>
<td>-270...1372</td>
<td>-454...2502</td>
</tr>
<tr>
<td>R.TC</td>
<td>-50...1768</td>
<td>-88...314</td>
</tr>
<tr>
<td>S.TC</td>
<td>-50...1768</td>
<td>-88...314</td>
</tr>
<tr>
<td>T.TC</td>
<td>-270...400</td>
<td>-454...752</td>
</tr>
<tr>
<td>C.TC</td>
<td>0...2315</td>
<td>32...4199</td>
</tr>
<tr>
<td>D.TC</td>
<td>0...2315</td>
<td>32...4199</td>
</tr>
<tr>
<td>B</td>
<td>40...1820</td>
<td>104...3308</td>
</tr>
<tr>
<td>E</td>
<td>-270...1000</td>
<td>-454...1832</td>
</tr>
<tr>
<td>L</td>
<td>-200...900</td>
<td>-328...1652</td>
</tr>
<tr>
<td>L-GOST</td>
<td>-200...800</td>
<td>-328...1472</td>
</tr>
<tr>
<td>U</td>
<td>-200...600</td>
<td>-328...1112</td>
</tr>
<tr>
<td>G</td>
<td>0...2315</td>
<td>32...4199</td>
</tr>
<tr>
<td>N</td>
<td>-270...1300</td>
<td>-454...2372</td>
</tr>
<tr>
<td>PT2.TC</td>
<td>0...1888</td>
<td>32...3430</td>
</tr>
<tr>
<td>INFR1</td>
<td>10...70</td>
<td>50...158</td>
</tr>
<tr>
<td>INFR2</td>
<td>60...120</td>
<td>140...248</td>
</tr>
<tr>
<td>INFR3</td>
<td>115...165</td>
<td>239...329</td>
</tr>
<tr>
<td>INFR4</td>
<td>140...260</td>
<td>284...500</td>
</tr>
<tr>
<td>PT100</td>
<td>-200...850</td>
<td>-328...1562</td>
</tr>
<tr>
<td>PT.LIM</td>
<td>-50...250</td>
<td>-58...212</td>
</tr>
<tr>
<td>JPT10</td>
<td>-200...600</td>
<td>-328...1112</td>
</tr>
<tr>
<td></td>
<td>60MV</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>20MA</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>4-20M</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>10V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>2-10V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>5V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>1-5V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>1V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>0.2-1V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>2.4 VHI</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>1.2VHI</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C1VH</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C20MA</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.4-20</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.10V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.2-10</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.5V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.1-5V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.1V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.0.2-1</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.2.4 VH</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>C.1.2VH</td>
<td>-1999...9999</td>
</tr>
</tbody>
</table>

### 4.9.11. HI.SCL - Upper limit of scale

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI.SCL</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) INPUT HIGH LIMIT</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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).
### 4.9.12. OF.SCL - Scale offset correction

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF.SCL</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) INPUT OFFSET</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.9.13. LO.SP - Lower limit for setpoint

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO.SP</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) LOW LIMIT FOR SETPOINT</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.9.14. HI.SP - Upper limit for setpoint

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI.SP</td>
<td>INPUT.1 (or INPUT.2) HIGH LIMIT FOR SETPOINT</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.9.15. LO.AL - Lower limit for alarms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO.AL</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) LOW LIMIT FOR ABSOLUTE ALARMS</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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...999

### 4.9.16. HI.AL - Upper limit for alarms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI.AL</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) HIGH LIMIT FOR ABSOLUTE ALARMS</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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...999
4.9.17. **MSG.LO - Selecting the message assigned to Low**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.LO</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) NUM SCROLLING MSG WHEN INPUT IS LOW ERR</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>. 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)

4.9.18. **MSG.HI - Selecting the message assigned to HIGH**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.HI</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) NUM SCROLLING MSG WHEN INPUT IS HI ERR</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>. 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 or 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)

4.9.19. **MSG.ER - Selecting the message assigned to Err**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.ER</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) NUM SCROLLING MSG WHEN INPUT IS ERR ERR</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>. 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)
### 4.9.20. MSG.SB - Selecting the message assigned to Sbr

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.SB</td>
<td>INPUT.1 (or INPUT.2 or INPUT.3) NUM SCROLLING MSG WHEN INPUT IS SB ERR</td>
<td>INPUT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>. 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 LANG1 oppure LANG2 oppure LANG3)
- 0...75 (con LANG=NONE)
### 4.10. Submenu IN.CT - Configuration of current inputs

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN.CT</td>
<td>CT INPUT CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the inputs of the controller's current transformers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuring current transformers</td>
<td>98</td>
</tr>
<tr>
<td>Digital filter</td>
<td>98</td>
</tr>
<tr>
<td>Maximum scale limit</td>
<td>98</td>
</tr>
<tr>
<td>Limit scale correction</td>
<td>98</td>
</tr>
</tbody>
</table>

#### 4.10.1. Functional diagram

![Functional Diagram](image-url)
### 4.10.2. IN.CT.N – Configuring current transformers

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN.CT.N</td>
<td>CURRENT TRASFORMER NUMBER</td>
<td>IN.CT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* Number

*Options:* 1...2

### 4.10.3. FILT - Digital filter

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILT</td>
<td>IN.CT.1 (or IN.CT.2) DIGITAL FILTER</td>
<td>IN.CT</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the value of the digital filter time constant applied to the input for current transformer CT1 or CT2.

*Unit of measurement:* Seconds

*Options:* 0.00...20.00

### 4.10.4. HI.SCL - Maximum scale limit

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI.SCL</td>
<td>IN.CT.1 (or IN.CT.2) HIGH LIMIT</td>
<td>IN.CT</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the maximum scale limit of the input for current transformer CT1 or CT2.

*Unit of measurement:* A

*Options:* 0.0...100.0

### 4.10.5. OF.SCL - Scale offset correction

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF.SCL</td>
<td>IN.CT.1 (or IN.CT.2) OFFSET</td>
<td>IN.CT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.11. Submenu ALARM - Configuration of alarms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARM</td>
<td>ALARM CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the generic alarms.</td>
</tr>
</tbody>
</table>

Parameter Pag.

- Selecting the alarm to be configured 100
- Selecting the alarm reference 101
- Selecting direct or inverse alarm 51
- Selecting absolute or deviation alarm 102
- Method for applying hysteresis 102
- Disabling the alarm at power-on 102
- Memorizing the alarm 103
- Hysteresis 103
- Alarm trip delay 103
- Message associated with tripping of alarm 103
- Flashing of PV display 104
4.11.1. Functional diagram

4.11.2. ALARM -Selecting the alarm to be configured

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALRM.N</td>
<td>ALARM NUMBER</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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..
4.11.3. REFE - Selecting the alarm reference

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>REFE</td>
<td>ALARM.1 (o ALARM.2…ALARM.4) SELECTING REFERENCE SIGNAL</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 the 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
4.11.4. DI.IN - Selecting direct or inverse alarm

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>di.in</td>
<td>ALARM.1 (or ALARM.2…ALARM.4) DIRECT/INVERSE DEFINITION</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

**Unit of measurement:** -

**Options:**
- **DIREC** = Direct Alarm
- **INVRS** = Inverse Alarm

4.11.5. AB.RE - Selecting absolute or deviation alarm

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ab.rE</td>
<td>ALARM.1 (or ALARM.2…ALARM.4) ABSOLUTE/RELATIVE DEFINITION</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

**Unit of measurement:** -

**Options:**
- **ABSLT** = Absolute alarm
- **RELAT** = Deviation alarm

4.11.6. NO.SY - Method for applying hysteresis

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>no.SY</td>
<td>ALARM.1 (or ALARM.2…ALARM.4) NORMAL/SYMMETRIC DEFINITION</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

**Unit of measurement:** -

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWON.E</td>
<td>ALARM.1 (or ALARM.2…ALARM.4) DISABLE AT SWITCH ON</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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)
4.11.8. **LATCH - Memorizing the alarm**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LATCH</td>
<td>ALARM.1 (or ALARM.2…ALARM.4) MEMORY DEFINITION</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.11.9. **HYSTE - Hysteresis**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYSTE</td>
<td>ALARM.1 (or ALARM.2…ALARM.4) HYSTERESIS</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.11.10. **DELAY - Alarm trip delay**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DELAY</td>
<td>ALARM.1 (or ALARM.2…ALARM.4) DELAY OF ACTIVATION</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

*Unit of measurement:* Minutes.seconds

*Options:*  
- **0.00…99.59**

4.11.11. **MSG.AL - Message associated with tripping of alarm**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.AL</td>
<td>ALARM.1 (or ALARM.2…ALARM.4) SCROLLING MESSAGE AT ALARM ACT</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>. If the parameter is set to “0” no message will be displayed when the alarm trips.

The same message number can be assigned to different alarms.

*Unit of measurement:* Message number

*Options:*  
- **0...25** (with LAnG=LANG1 or LANG2 or LANG3)  
- **0…75** (with LAnG=NONE)
4.11.12. BLK.AL - Flashing of PV display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLK.AL</td>
<td>ALARM.1 (or ALARM.2...ALARM.4) BLINK DISPLAY PV DEF</td>
<td>ALARM</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

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
4.12.1. Functional diagram

Alarm due to insufficient current draw
LOW.ON page. 106

Alarm due to excessive current draw
HIG.ON page. 106

Alarm due to excessive current draw
HIG.OFF page. 107

Current input CURR.1

Current input CURR.2

Load type LOAD page. 108

Delay TIME page. 107

Alarm state AL.HB

Blinking display BLK.HB page. 108

Scrolling message MSG.HB page. 108

Output selection contro OUT page. 107

Output

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW.ON</td>
<td>LOW LOAD CURR THRESH ON TIME</td>
<td>AL.HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIG.ON</td>
<td>HIGH LOAD CURR THRESH ON TIME</td>
<td>AL.HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI.OFF</td>
<td>HIGH LOAD CURR THRESH OFF TIME</td>
<td>AL.HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 (e.g., a module SSR) is in short circuit.

*Unit of measurement:* A

*Options:* 0.0...999.9

4.12.5. TIME - HB alarm trip delay

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>WAITING TIME FOR ALHB TRIP</td>
<td>AL.HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>THR.PE</td>
<td>PERCENTAGE HB ALARM SP IN HB CALIB</td>
<td>AL.HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* %

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

4.12.7. OUT - Control output associated with HB alarm

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT</td>
<td>CONTROL OUTPUT HB AL</td>
<td>AL.HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.12.8. LOAD - Selecting type of connected load

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LoAd</td>
<td>TYPE OF LOAD CONFIGURATION</td>
<td>AL_HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.HB</td>
<td>SCROLLING MESSAGE AT HB ACT</td>
<td>AL_HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

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)

4.12.10. BLK.HB - Flashing of PV display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLK.HB</td>
<td>BLINK DISPLAY PV DEF HB AL</td>
<td>AL_HB</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.13. Submenu AL.PW - Configuring power alarm

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL.PW</td>
<td>POWER ALARM CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the power alarm, i.e., the alarm that trips when average power deviates from a configurable stability band.</td>
</tr>
</tbody>
</table>

Parameter Pag.

- **Select the Power alarm to configure** 110
- **Process variable stability band** 110
- **Power stability band** 110
- **Power alarm trip delay** 111
- **Message associated with tripping of power alarm** 111
- **Flashing of PV display when power alarm trips** 111
4.13.1. Functional diagram

![Functional Diagram]

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL.PW.N</td>
<td>POWER ALARM NUMBER</td>
<td>AL.PW</td>
<td>R W</td>
</tr>
</tbody>
</table>

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)

4.13.3. PV.BND – Process variable stability band

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV.BND</td>
<td>AL.PW.1 (or AL.PW.2) PV STABILITY BAND</td>
<td>AL.PW</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.13.4. PW.BND – Power stability band

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW.BND</td>
<td>AL.PW.1 (or AL.PW.2) PW STABILITY</td>
<td>AL.PW</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.13.5. TIME - Power alarm trip delay

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>AL.PW.1 (or AL.PW.2) WAITING TIME FOR ALPW TRIP</td>
<td>AL.PW</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.13.6. MSG.PW - Message associated with tripping of power alarm

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.PW</td>
<td>AL.PW.1 (or AL.PW.2) SCROLLING MESSAGE AT PW ACT</td>
<td>AL.PW</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <7>. 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)

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLK.PW</td>
<td>AL.PW.1 (or AL.PW.2) BLINK DISPLAY PV DEF PW AL</td>
<td>AL.PW</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.14. Submenu PID - Configuring control parameters

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID</td>
<td>PID CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the control parameters.</td>
</tr>
</tbody>
</table>


PID configuration 64 Maximum limit of heating power 117 Antireset 119
Enabling Self-Tuning 115 Minimum limit of heating power 117 Feedforward power 120
Enabling Soft-Start 115 Selecting cooling fluid 67 Deadband 120
Soft-Start Time 115 Cooling setpoint with respect to heating setpoint 118 Fault action power 120
Enabling Auto-Tuning 115 Proportional cooling band or hysteresis in ON-OFF control 118 Setpoint gradient in increase 120
Selecting type of Auto-Tuning 65 Integral cooling time 118 Setpoint gradient in decrease 70
Selecting type of control 116 Derivative cooling time 118 Unit of measurement of gradient 121
Derivative sampling time 116 Maximum limit of cooling power 119 Gradient of control output 121
Proportional heating band or hysteresis in ON-OFF control 117 Minimum limit of cooling power 119 Tripping delay 121
Integral heating time 117 Manual reset 119 Power delivered when LBA alarm trips 121
Derivative heating time 117 Reset power 119
4.14.1. Functional diagram

**SETPOINT LOCALE**

- Setpoint 1 multiset M.SET1x
- Setpoint 2 multiset M.SET2x
- Setpoint 3 multiset M.SET3x
- Setpoint 4 multiset M.SET4x

**SETPOINT REMOTO**

- Analog input IN.2
- Analog input IN.3
- Serial value SERIAL_SPR

**Local setpoint** SETPx

**Setpoint programmer** P.SETP

**Multiset selection** F.IN page. BUT.1...BUT.3 page. LFB_OUT_1...LFB_OUT_32 page.

**Enabling multiset** MUL.SP page.

**Enabling programmer** PROGR page.

**Enabling the remote setpoint** SP.REM page.

**Selection auxiliary input** FUNC page.

**Definition remote setpoint** SPR.T page.

**Gradient** GRAD.I page. 120
GRAD.D page. 70
UNIT page. 121

**Active setpoint** SSPx
next page
### 4.14.2. PID.N – PID Configuration

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID.N</td>
<td>PID NUMBER</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

**Unit of measurement:** Number

**Options:** 1...2

### 4.14.3. S.TUNE - Enabling Self-Tuning

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.TUNE</td>
<td>PID.1 (or PID.2) SELF TUNING ENABLE</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

**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

### 4.14.4. SOFT.S - Enabling Soft-Start

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFT.S</td>
<td>PID.1 (or PID.2) SOFT START ENABLE</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

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

### 4.14.5. SOFT.T - Soft-Start Time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFT.T</td>
<td>PID.1 (or PID.2) SOFT START TIME</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.14.6. A.TUNE - Enabling Auto-Tuning

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.TUNE</td>
<td>PID.1 (or PID.2) AUTO TUNING ENABLE</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

**Unit of measurement:** -

**Options:**
- OFF = Auto-Tuning disabled
- On = Auto-Tuning enabled
4.14.7. AUT.T - Selecting type of Auto-Tuning

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aut.t</td>
<td>PID.1 (or PID.2)</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.14.8. CNTR - Selecting type of control

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cntr</td>
<td>PID.1 (or PID.2)</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.14.9. DERVS - Derivative sampling time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DERVS</td>
<td>PID.1 (or PID.2)</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.PB</td>
<td>PID.1 (or PID.2) HEATING PROPORTIONAL BAND OR ON/OFF HYST</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* %

*Options:* 0.0...999.9

4.14.11. H.IT - Integral heating time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.IT</td>
<td>PID.1 (or PID.2) HEATING INTEGRAL TIME</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the integral heating time.

*Unit of measurement:* Minutes

*Options:* 0.00...99.99

4.14.12. H.DT - Derivative heating time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.DT</td>
<td>PID.1 (or PID.2) HEATING DERIVATIVE TIME</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the derivative heating time.

*Unit of measurement:* Minutes

*Options:* 0.00...99.99


<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.P.HI</td>
<td>PID.1 (or PID.2) HEATING POWER HIGH LIMIT</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* %

*Options:* 0.0...100.0


<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.P.LO</td>
<td>PID.1 (or PID.2) HEATING POWER LOW LIMIT</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.14.15. COOL - Selecting cooling fluid

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>COOL</td>
<td>PID.1 (or PID.2) COOLING MEDIA</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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)

### 4.14.16. C.SP - Cooling setpoint with respect to heating setpoint

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.SP</td>
<td>PID.1 (or PID.2) COOLING SETPOINT RELEVANT TO HEATING SETP</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.PB</td>
<td>PID.1 (or PID.2) COOLING PROPORTIONAL BAND OR ON/OFF HYST</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

**Unit of measurement:** %

**Options:** 0.0...999.9

### 4.14.18. C.IT - Integral cooling time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.IT</td>
<td>PID.1 (or PID.2) COOLING INTEGRAL TIME</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the integral cooling time.

**Unit of measurement:** Minutes

**Options:** 0.00...99.99

### 4.14.19. C.DT - Derivative cooling time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.DT</td>
<td>PID.1 (or PID.2) COOLING DERIVATIVE TIME</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the derivative cooling time.

**Unit of measurement:** Minutes

**Options:** 0.00...99.99
4.14.20. C.P.HI - Maximum limit of cooling power

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.P.HI</td>
<td>PID.1 (or PID.2) COOLING POWER HIGH LIMIT</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* %

*Options:* 0.0...100.0


<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.P.LO</td>
<td>PID.1 (or PID.2) COOLING POWER LOW LIMIT</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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


<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESET</td>
<td>PID.1 (or PID.2) MANUAL RESET</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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


<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.RST</td>
<td>PID.1 (or PID.2) RESET POWER</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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


<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.RST</td>
<td>PID.1 (or PID.2) ANTIRESET</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.14.25. FEEDF - Feedforward power

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEEDF</td>
<td>PID.1 (or PID.2) FEEDFORWARD</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.14.26. DEAD.B - Deadband

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEAD.B</td>
<td>PID.1 (or PID.2) DEAD BAND</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.14.27. FAULT - Fault action power

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAULT</td>
<td>PID.1 (or PID.2) FAULT ACTION POWER</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.14.28. GRAD.I - Setpoint gradient in increase

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAD.I</td>
<td>PID.1 (or PID.2) SETPOINT GRADIENT INCREMENT</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.14.29. GRAD.D - Gradiente di setpoint in decremento

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAD.D</td>
<td>PID.1 (or PID.2) SETPOINT GRADIENT IN DECREMENT</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.14.30. UNIT - Unit of measurement of gradient

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>PID.1 (or PID.2) GRADIENT UNIT OF MEASURE</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.14.31. GRAD.O - Gradient of control output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAD.O</td>
<td>PID.1 (or PID.2) CONTROL OUTPUT GRADIENT</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.14.32. LBA.TM - Tripping delay

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBA.TM</td>
<td>PID.1 (or PID.2) WAITING TIME FOR LBA ALARM TRIP</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBA.PW</td>
<td>PID.1 (or PID.2) POWER LIMITS BY LBA ALARM CONDITION</td>
<td>PID</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID.GR</td>
<td>PID GROUP PARAMETERS CONFIG</td>
<td>Level 1</td>
<td>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.</td>
</tr>
</tbody>
</table>

### Diagram

- **Parameter Pag.**
  - Selecting the parameter group to be configured
  - Selecting the parameter group to be configured
  - Proportional heating band or hysteresis in ON-OFF control
  - Integral heating time
  - Derivative heating time
  - Maximum limit of heating power
  - Minimum limit of heating power
  - Proportional cooling band or hysteresis in ON-OFF control
  - Integral cooling time
  - Derivative cooling time
  - Maximum limit of cooling power

- **Parameter Pag.**
  - Minimum limit of cooling power
  - Threshold PV for the activation of the group of PID parameters
### 4.15.1. PID.N - Selecting PID for parameters to be configured

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID.N</td>
<td>PID NUMBER</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* Number

*Options:* 1...2

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID.G.N</td>
<td>PID PARAMETERS GROUP NUMBER</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* Number

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.PB</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING PROPORTIONAL BAND OR ON/OFF HYST</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.15.4. H.IT - Integral heating time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.IT</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING INTEGRAL TIME</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the integral heating time.

*Unit of measurement:* Minutes

*Options:* 0.00...99.99

### 4.15.5. H.DT - Derivative heating time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.DT</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING DERIVATIVE TIME</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the derivative heating time.

*Unit of measurement:* Minutes

*Options:* 0.00...99.99
### 4.15.6. H.P.HI - Maximum heating power

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.PHI</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING POWER HIGH LIMIT</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* %

*Options:* 0.0...100.0

---

### 4.15.7. H.P.LO - Minimum limit of heating power

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.P.LO</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) HEATING POWER LOW LIMIT</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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


*Unit of measurement:* %

*Options:* 0.0...100.0

---

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.PB</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING PROPORTIONAL BAND OR ON/OFF HYST</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

---

### 4.15.9. C.IT - Integral cooling time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.IT</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING INTEGRAL TIME</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the integral cooling time.

*Unit of measurement:* Minutes

*Options:* 0.00...99.99

---

### 4.15.10. C.DT - Derivative cooling time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.DT</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING DERIVATIVE TIME</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the derivative cooling time.

*Unit of measurement:* Minutes

*Options:* 0.00...99.99
4.15.11. C.P.HI - Maximum limit of cooling power

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.P.HI</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING POWER HIGH LIMIT</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* %

*Options:* 0.0...100.0

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.P.LO</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) COOLING POWER LOW LIMIT</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

For details, see paragraph “4.13.21. C.P.LO - Minimum limit of cooling power” on page 119.

*Unit of measurement:* %

*Options:* 0.0...100.0

4.15.13. PV.THR - Threshold PV for the activation of the group of PID parameters

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV.THR</td>
<td>PID.GR.1 (or PID.GR.2…PID.GR.4) PV BEYOND WHICH THE GROUP IS ACTIVE</td>
<td>PID.GR</td>
<td>R W</td>
</tr>
</tbody>
</table>

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. Submenu IN.DIG - Configuring digital inputs

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN.DIG</td>
<td>DIGITAL INPUT CONFIG</td>
<td>Level 2</td>
<td>Lets you configure the controller’s digital inputs. The menu is present if there are digital inputs.</td>
</tr>
</tbody>
</table>

- **Parameter**: Selecting the digital input
  - Pag.: 128
- **Parameter**: Defining the input state
  - Pag.: 128
- **Parameter**: Selecting the assigned function
  - Pag.: 128
- **Parameter**: Setting assigned consent number
  - Pag.: 130
- **Parameter**: Pre-scaler setting for number of input switchings
  - Pag.: 130
- **Parameter**: Setting of number of input switchings for signal
  - Pag.: 130
- **Parameter**: Selecting the digital input message
  - Pag.: 131
4.17.1. Functional diagram

*) Verranno rilevate commutazioni con frequenza massima di 25 Hz con tempo di ON e di OFF pari ad almeno 20 msec.
### 4.17.2. I.DIG.N - Selecting the digital input

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.DIG.N</td>
<td>DIGITAL INPUT NUMBER</td>
<td>IN.DIG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.17.3. STAT - Defining the input state

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>StAt</td>
<td>IN.DIG.1 (o IN.DIG.2 … IN.DIG.5) DIGITAL INPUT STATUS</td>
<td>IN.DIG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.17.4. F.IN - Selecting the assigned function

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.in</td>
<td>IN.DIG.1 (o IN.DIG.2 … IN.DIG.5) DIGITAL INPUT FUNCTION</td>
<td>IN.DIG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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-OFF = 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 <?>):*

- 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.SKIP1 = 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 <?>):
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 <?>):
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 <?>):
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 Programmer 1 function is enabled in parameter PROGR on the EN.FUN menu:
(for details, see paragraph “5.13. Setpoint programmer” on page <?>):
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 2 function is enabled in parameter PROGR on the EN.FUN menu:
(for details, see paragraph “5.13. Setpoint programmer” on page <?>):
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.SK2 = 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 MultiSet function is enabled in MODE.2:
SE2.0 = Select setpoint M.SP1.2/M.SP2.2 or M.SP1.2…M.SP4.2 bit 0
SE2.1 = Select setpoint M.SP1.2…M.SP4.1 bit 1 and M.SP1.2…M.SP4.2 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 <?>):
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.SK2 = 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 <>):

- 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 and PROGR.2
- 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=VALVP and custom linear type, and with one output configured as V.OPEN and one configured as V.CLOS:

VALVP = Calibrazione ingresso ausiliario

### 4.17.5. ST.EN.N - Setting assigned consent number

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST.EN.N</td>
<td>IN.DIG.1 (o IN.DIG.2 … IN.DIG.5) ENABLE NUMBER</td>
<td>IN.DIG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.17.6. PRE.SW - Prescaler setting for number of input switchings

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE.SW</td>
<td>IN.DIG.1 (o IN.DIG.2 … IN.DIG.5) PRESCALER FOR SWITCHING CYCLES</td>
<td>IN.DIG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.17.7. SWTCH - Number of input switching setting for signaling

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWTCH</td>
<td>IN.DIG.1 (o IN.DIG.2 … IN.DIG.5) NUMBER OF SWITCHING CYCLES</td>
<td>IN.DIG</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the number of switchings of the digital input with CY.CNT function, which if exceeded generates the scrolling message DIGITAL INPUT SWITCH ALARM.
The function is disabled if the parameter equals "0".

*Unit of measurement:* Number

*Options:* 1...9999
4.17.8. MSG.IN - Selecting the digital input message

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.IN</td>
<td>IN.DIG.1 (o IN.DIG.2 ... IN.DIG.5) NUMBER OF SCROLLING MESSAGE AT INPUT ACT</td>
<td>IN.DIG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

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)
### 4.18. Submenu OUTPU - Configuring outputs

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTPU</td>
<td>OUTPUT CONFIG</td>
<td>Level 2</td>
<td>Lets you configure the controller outputs.</td>
</tr>
</tbody>
</table>

**Parameter**

- **OUT.N**
  - Selecting the output: 134

- **Stat**
  - Defining the output state: 134

- **F.out**
  - Selecting the function assigned to relay, logic or Triac output: 135

- **TYPE**
  - Defining the type of continuous output: 136

- **F.ou.C**
  - Selecting the function assigned to continuous output: 136

- **EVNT.N**
  - Setting the event number: 134

- **FB.O.N**
  - Setting the Function Block output number: 137

- **IN.DG.N**
  - Setting the digital input number: 137

- **SWITCH**
  - Setting the number of switchings for signal: 137

- **FAULT**
  - State of output with broken input: 138

- **MSG.OU**
  - Selecting the output message: 138

- **CY.TIM**
  - Cycle time of output: 139
4.18.1. Functional diagram

Scrolling message MSG.OU pag. 138

Definition state STAT pag. 134

Output

PWM MANAGEMENT with analogue levels for Output 1 only
if CONTA or CONT.C type

PWM MANAGEMENT parameter only for digital outputs with
F.OUT = HEAT1/COOL1
HEAT2/COOL2

Pulse Width Modulation (PWM) Management

- PWM MANAGEMENT with analogue levels for Output 1 only
  if CONTA or CONT.C type
- PWM MANAGEMENT parameter only for digital outputs with
  F.OUT = HEAT1/COOL1
  HEAT2/COOL2

- Off
- On

- CY.TIM

- PWM MANAGEMENT parameter only for digital outputs with
  F.OUT = HEAT1/COOL1
  HEAT2/COOL2

- Scrolling message MSG.OU pag. 138

- Function F.OUT pag. 135

- None HEAT1 COOL1 ALRM1
  ALRM2 ALRM3 ALRM4 OR.12
  OR.123 O.1234 AND.12 AN.123
  A.1234 LBA1 BUT.SR PONR1

- If model with CT1+CT2:
  AL.RB

- If the Timer function is enabled in MODE.1:
  TMR1

- If the Programmer 1 function is enabled in parameter PROGR on the EN.FUN menu:
  P.HEB1 P.RUN1 P.HLD1 P.RDY1
  P.END1 P.EVK1

- If the Logic option function is enabled:
  LFB.0

- If model with valve control:
  V.OPEN V.CLOS

- If model with digital inputs:
  IN.DIG

- If the PID2.E function is enabled in EN.FUN:
  HEAT2 COOL2 LBA2 PONR2

- If the Timer function is enabled in MODE.2:
  TMR2

- If the Programmer 2 function is enabled in parameter PROGR on the EN.FUN menu:
  P.HEB2 P.RUN2 P.HLD2 P.RDY2
  P.END2 P.EVK2

- If model with Master Modbus serial (except output 1) and at least one Master parameter configured as
  MASTER:
4.18.2. OUT.N - Selecting the output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT.N</td>
<td>OUTPUT NUMBER</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the identifying number of the output to be configured.

*Unit of measurement:* Number

*Options:* 1...4

4.18.3. STAT - Defining the output state

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>StAt</td>
<td>OUTPU.1 (o OUTPU.2… OUTPU.4) DIGITAL OUTPUT STATUS</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 = 4 mA 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)
4.18.4. F.OUT - Selecting the function assigned to relay, logic or Triac output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.out</td>
<td>OUTPU.1 (o OUTPU.2… OUTPU.4) OUTPUT FUNCTION</td>
<td>OUTPU</td>
<td>RW</td>
</tr>
</tbody>
</table>

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
- **OR.1234** = Alarm 1 OR Alarm 2 OR Alarm 3 OR Alarm 4
- **AND.12** = Alarm 1 AND Alarm 2
- **AND.123** = Alarm 1 AND Alarm 2 AND Alarm 3
- **AND.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 of PROGR.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)
### 4.18.5. TYPE - Defining the type of continuous output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>CONTINUE OUTPUT TYPE</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.18.6. F.OU.C - Selecting the function assigned to continuous output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.OU.C</td>
<td>REFERENCE SIGNAL CONTINUE OUTPUT</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 e parametro 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
### 4.18.7. EVNT.N - Setting the event number

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVNT.N</td>
<td>OUTPU.1 (o OUTPU.2… OUTPU.4) EVENT NUMBER</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.18.8. FB.O.N - Setting the Function Block output number

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB.O.N</td>
<td>OUTPU.1 (o OUTPU.2… OUTPU.4) FUNCTION BLOCK OUTPUT NUMBER</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.18.9. IN.DG.N - Setting the digital input number

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN.DG.N</td>
<td>OUTPU.1 (o OUTPU.2… OUTPU.4) DIGITAL INPUT NUMBER</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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**

### 4.18.10. MAST.N - Setting the Master communication parameter number

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAST.N</td>
<td>OUTPU.1 (o OUTPU.2… OUTPU.4) MASTER PARAMETER NUMBER</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.18.11. SWTCH - Setting the number of switchings for signal

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWTCH</td>
<td>OUTPU.1 (o OUTPU.2… OUTPU.4) NUMBER OF SWITCHING CYCLES</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the number of switchings (x1000) of the relay, exceeding which the signal is generated OUTX.SWITCH ALARM where X is the number of output 1 or 2 or 3 or 4 if the output is relay, logic or triac.
The function is disabled if the parameter equals “0”.

*Unit of measurement:* Number

*Options:* 0...9999
### 4.18.12. FAULT - State of output with broken input

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAULT</td>
<td>OUTPU.1 (o OUTPU.2 … OUTPU.4) FAULT OUTPUT STATE</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.18.13. MSG.OU - Selecting the output message

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.OU</td>
<td>OUTPU.1 (o OUTPU.2 … OUTPU.4) NUMBER OF SCROLLING MESSAGE AT OUTPUT ACT</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <? >.

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:**

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

### 4.18.14. LO.C – Low limit for continuous output / HI.C

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO.C</td>
<td>LOW LIMIT CONTINUE OUTPUT</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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:**

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

### 4.18.15. HI.C – Massimo di scala per uscita continua

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI.C</td>
<td>HIGH LIMIT CONTINUE OUTPUT</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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:**

**Options:**
- -1999...9999
4.18.16. CY.TIM - Cycle time of output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY.TIM</td>
<td>OUTPU.1 (o OUTPU.2 … OUTPU.4) CYCLE TIME</td>
<td>OUTPU</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 x 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
### 4.19. Submenu OUT.AN - Configuring the analog retransmission output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
</table>
| OUT.AN       | ANALOG RETRA
dmission 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** 141
- **Defining the state of the analog output** 141
- **Defining the type of analog output** 142
- **Selecting the function assigned to the analog output** 142
- **Scale minimum** 143
- **Scale maximum** 143
4.19.1. Functional diagram

4.19.2. OU.AN.N - Selecting the output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OU.AN.N</td>
<td>ANALOG OUTPUT NUMBER</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the identifying number of the output to be configured.

**Unit of measurement**: Number

**Options**: 1...2

4.19.3. STAT - Defining the state of the analog output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>StAt</td>
<td>OUT.AN.1 (o OUT.AN.2) ANALOG OUTPUT STATUS</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.19.4. TYPE - Defining the type of analog output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>OUT.AN.1 (o OUT.AN.2) ANALOG OUTPUT TYPE</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.19.5. FUNC - Selecting the function assigned to the analog output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FuNC</td>
<td>OUT.AN.1 (o OUT.AN.2) REFERENCE SIGNAL ANALOG OUTPUT</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
- IN2 = Auxiliary input

* if the model with auxiliary input:
- 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)
4.19.6.  MAST.N - Setting the Master communication parameter number

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAST.N</td>
<td>OUT.AN.1 (o OUT.AN.2) MASTER PARAMETER NUMBER</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* Number

*Options:* 1...20

4.19.7.  CY.TIM – Output cycle time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY.TIM</td>
<td>OUT.AN.1 (o OUT.AN.2) CYCLE TIME</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.19.8.  LO.SCL - Scale minimum

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO.SCL</td>
<td>OUT.AN.1 (o OUT.AN.2) LOW LIMIT ANALOG OUTPUT</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.19.9.  HI.SCL - Scale maximum

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI.SCL</td>
<td>OUT.AN.1 (o OUT.AN.2) HIGH LIMIT ANALOG OUTPUT</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.20. Submenu VALVE - Configuring valve parameters

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALVE</td>
<td>VALVE MANAGER</td>
<td>Level 2</td>
<td>Lets you configure control parameters for motorized valves. The submenu appears if the controller is set for valve control.</td>
</tr>
</tbody>
</table>

Parameter Pag.  

- **FuNC**: Defining valve function  
- **KEY.MO**: Enabling valve operation with keys  
- **TRAVL**: Valve actuator travel time  
- **TIM.LO**: Minimum power change for valve drive  
- **TIM.HI**: Impulse mode setpoint  
- **TIM.ON**: Minimum valve impulse time or ON time in impulse mode  
- **TIM.OF**: OFF time in impulse mode  
- **DEAD.B**: Deadzone symmetrical to setpoint
### 4.20.1. FUNC - Defining valve function

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FuNC</td>
<td>VALVE CONTROL FUNCTION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

### 4.20.2. KEY.MO - Enabling valve operation with keys

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY.MO</td>
<td>VALVE OPEN/CLOSE FROM IN/DEC BUTT ENABLE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The parameter shows and sets enabling of valve opening and closing with controller keys Δ 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

### 4.20.3. TRAVL - Valve actuator travel time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAVL</td>
<td>ACTUATOR TRAVEL TIME</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

### 4.20.4. TIM.LO - Minimum power change for valve drive

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIM.LO</td>
<td>MINIMUM PULSE TIME</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 <?>.

*Unit of measurement:* % di TRAVL

*Options:*
- 0.0...25.0
### 4.20.5. TIM.HI - Impulse mode setpoint

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIM.HI</td>
<td>IMPULSIVE MODE INTERVENTION THRESHOLD</td>
<td>VALVE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

*Unit of measurement:* % di TRAVL  
*Options:* 0.0...100.0

### 4.20.6. TIM.ON - Minimum valve impulse time or ON time in impulse mode

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIM.ON</td>
<td>ON TIME FOR IMPULSIVE MODE</td>
<td>VALVE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.20.7. TIM.OF - OFF time in impulse mode

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIM.OF</td>
<td>OFF TIME FOR IMPULSIVE MODE</td>
<td>VALVE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.20.8. DEAD.B - Deadzone symmetrical to setpoint

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEAD.B</td>
<td>DEAD ZONE</td>
<td>VALVE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.21. Submenu EN.FUN - Configuration of enablings

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.FUN</td>
<td>ENABLE FUNCTIONS</td>
<td>Level 2</td>
<td>Lets you configure other controller functions.</td>
</tr>
</tbody>
</table>

- **Enabling PID.2**
- **PID control application type**
- **Cascade control reference**
- **Enabling the setpoint programmer**
- **Number of parameters recipes**
- **Number of alarms enabled**
- **Enabling software on/off**
- **Defining type of digital inputs**
- **Sampling time of main and auxiliary input**
- **Defining power line frequency**
- **Enable mode programmer Simplified**
- **Enabling Menu configurator**
- **Enabling webserver**
- **Enabling Calendar**
4.21.1. PID2.E – Enabling PID.2

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID2.E</td>
<td>ENABLE OF PID 2</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.21.2. APP.T – PID control application type

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>APP.t</td>
<td>PID APPLICATION CONTROL TYPE</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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.

4.21.3. CAS.R – Cascade control reference

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS.r</td>
<td>CASCADE CONTROL REFERENCE</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.21.4. PROGR - Enabling the setpoint programmer

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGR</td>
<td>PROGRAMMER ENABLE</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.21.5. **RECP.N - Number of parameters recipes**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECP.N</td>
<td>NUM OF PARAMETER RECIPES</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

---

4.21.6. **ALRM.N - Number of alarms enabled**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALRM.N</td>
<td>NUM OF ENABLE ALARMS</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

---

4.21.7. **ON.OF - Enabling software on/off**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>On.OF</td>
<td>SOFTWARE ON/OFF ENABLE</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets enabling of on/off of the controller’s software. The software ON-OFF function is explained in detail in paragraph “5.8. Switching the software on/off” on page <?>.

*Unit of measurement:* -

*Options:* 
- ENABL = Controller software on/off enabled
- DISAB = Controller software on/off disabled

---

4.21.8. **DIG - Defining type of digital inputs**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>dIG</td>
<td>DIGITAL INPUT TYPE</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

---

4.21.9. **T.SAMP - Main and Auxiliary input sample time**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.SAMP</td>
<td>MAIN INPUT SAMPLE TIME</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the main and auxiliary input sample time.

*Unit of measurement:* Milliseconds

*Options:* 60 120
4.21.10. FREQZ - Defining power line frequency

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQZ</td>
<td>LINE FREQUENCY</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the power line frequency.

*Unit of measurement:* Hz

*Options:* 50, 60

4.21.11. S.PROG - Enabling Simplified Programming mode

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.PROG</td>
<td>SIMPLIFIED PROGRAMMER MODE</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

This parameter shows and sets enabling of Simplified Programming mode.

*Unit of measurement:* -

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

4.21.12. EN.EDI - Enabling Editor CONFIGURATOR MENU

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.EDI</td>
<td>ENABLE EDITOR CONFIGURATOR</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 Simplificato enabled

4.21.13. WEB.EN - Enabling webserver mode

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEB.E</td>
<td>WEBSERVER ENABLE</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

This parameter shows and sets enabling of webserver mode.

*Unit of measurement:* -

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

4.21.14. CAL.EN - Enabling calendar mode

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL.EN</td>
<td>CALENDAR ENABLE</td>
<td>EN.FUN</td>
<td>R W</td>
</tr>
</tbody>
</table>

This parameter shows and sets enabling of calendar mode.

*Unit of measurement:* -

*Options:* OFF = Calendar mode disabled, On = Calendar mode enabled
### 4.22. Submenu MODE - Configuring functioning mode

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODE</td>
<td>FUNCTION MODE MANAGER</td>
<td>Level 2</td>
<td>Lets you configure the controller's functioning mode.</td>
</tr>
</tbody>
</table>

#### Parameter Pag. Parameter Pag.

- **MODE.N**
  - Selecting function mode 152
  - Number of groups of control parameters 152

- **PID.G.N**
  - Defining transition from Manual to Automatic 152

- **MA.AU**
  - Defining transition from Automatic to Manual 152

- **AU.MA**
  - Defining transition from remote SP to local SP 153

- **LO.RE**
  - Enabling manual power latch 153

- **MA.Pl**
  - Enabling change of manual power value 153

- **Man.P**
  - Enabling Timer function 153

- **t.MEr**
  - Enabling Multiset function 154

- **MUL.SP**
  - Enabling the remote setpoint 154

- **SP.REM**
  - Defining absolute or deviation remote setpoint 154

- **t.Pro**
  - Setting the programmer base time 154

- **ENERG**
  - Enabling the energy counter function 154
4.22.1. **MODE.N - Selecting function mode**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODE.N</td>
<td>MODE NUMBER</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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)

4.22.2. **PID.G.N - Number of groups of control parameters**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID.G.N</td>
<td>MODE.1 (o MODE.2) NUM OF CONTROL PARAMETERS GROUP</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.22.3. **MA.AU - Defining transition from Manual to Automatic**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.AU</td>
<td>MODE.1 (o MODE.2) MANUAL TO AUTOMATIC TRANSITION TYPE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.22.4. **AU.MA - Defining transition from Automatic to Manual**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU.MA</td>
<td>MODE.1 (o MODE.2) AUTOMATIC TO MANUAL TRANSITION TYPE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.22.5. **LO.RE - Defining transition from remote SP to local SP**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO.rE</td>
<td>MODE.1 (o MODE.2) REMOTE TO LOCAL TRANSITION TYPE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.22.6. **MA.P.L - Enabling manual power latch**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.P.L</td>
<td>MODE.1 (o MODE.2) MANUAL POWER LATCH ENABLE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.22.7. **MAN.P - Enabling change of manual power value**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAn.P</td>
<td>MODE.1 (o MODE.2) MANUAL POWER MODIFY ENABLE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.22.8. **TMER - Enabling Timer function**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>tMEr</td>
<td>MODE.1 (o MODE.2) TIMER ENABLE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets enabling of the Timer function. The Timer function is explained in detail in paragraph “5.11. Timer” on page <?>.

*Unit of measurement:* -

*Options:* OFF = Timer disabled, ON.SEC = Timer enabled with time base Seconds, ON.MIN = enabled with time base Minutes
### 4.22.9. MUL.SP - Enabling Multiset function

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUL.SP</td>
<td>MODE.1 (o MODE.2) MULTISET ENABLE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

*Unit of measurement:* -

*Options:*  
- OFF = Multiset disabled  
- On = Multiset enabled

### 4.22.10. SP.REM - Enabling the remote setpoint

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP.REM</td>
<td>MODE.1 (o MODE.2) REMOTE SP ENABLE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.22.11. SPR.T - Defining absolute or deviation remote setpoint

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPr.t</td>
<td>MODE.1 (o MODE.2) REMOTE SP TYPE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.22.12. T.PRO - Setting the programmer base time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>t.Pro</td>
<td>MODE.1 (o MODE.2) PROGRAMMER BASE TIME DEFINITION</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.22.13. ENERG - Enabling the energy counter function

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERG</td>
<td>MODE.1 (o MODE.2) ENERGY COUNTER ENABLE</td>
<td>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

*Unit of measurement:* -

*Options:*  
- OFF = Energy counter disabled  
- On = Energy counter enabled
4.23. Submenu TIMER - Configurazione parametri timer

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIMER</td>
<td>TIMER MANAGER</td>
<td>Level 2</td>
<td>Lets you configure the timer parameters. The submenu appears only if the Timer function was enabled on the MODE submenu.</td>
</tr>
</tbody>
</table>

Parameter Pag.

- Selecting timer 157
- Selecting timer function 157
- Selecting the Start/Stop timer command 157
- Defining the Start/Stop timer command logic 157
- Selecting the Reset timer command 158
- Defining the Reset timer command logic 158
- Timer count band 158
- Selecting the function activated at end of count 158
- Timer value 159
- Selection of the message associated with the end of counting 159
### 4.23.1. Functional diagram

- **DIGITAL INPUT STATE**
- **ALARM 1 STATE**
- **ALARM 2 STATE**
- **ALARM 3 STATE**
- **ALARM 4 STATE**
- **HB ALARM STATE**
- **SERIAL STATE**

**Selecting Start/Stop**
- Start/Stop timer
- Stabilization Timer
- ON Timer

**Selecting reset command**
- Autoreset in stop
- Digital input state
- Alarm 1 state
- Alarm 2 state
- Alarm 3 state
- Alarm 4 state
- HB alarm state
- Serial state

**Defining logic Start/Stop**
- Start/Stop command

**Defining logic reset**
- Reset command

**Logic timer**
- Timer
- Band
- End

**Function selection**
- Func page 157

**Scrolling message**
- MSG
- TM

**Time elapsed**
- TIME
- RX

**Time remaining**
- TIME
- RX
4.23.2. TIME.N - Selecting timer

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME.N</td>
<td>TIMER NUMBER</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the identifying number of the timer to be configured.

**Unit of measurement:** Number

**Options:** 1...2

4.23.3. FUNC - Selecting Timer function mode

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FunC</td>
<td>TIMER.1 (o TIMER.2) TIMER FUNCTION</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the timer function mode. The Timer function is explained in detail in paragraph “5.11. Timer” on page <?>.

**Unit of measurement:** -

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>St.St</td>
<td>TIMER.1 (o TIMER.2) TIMER START STOP</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.S.t</td>
<td>TIMER.1 (o TIMER.2) LOGIC TYPE OF TIMER START/STOP</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.23.6. RESE - Selecting the Reset timer command

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>rESE</td>
<td>TIMER.1 (o TIMER.2) TIMER RESET</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.23.7. RES.T - Defining the timer reset command logic

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>rES.t</td>
<td>TIMER.1 (o TIMER.2) LOGIC TYPE OF TIMER RESET</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.23.8. BAND - Band for timer count

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAND</td>
<td>TIMER.1 (o TIMER.2) SYMM SP BAND WHERE TIMER IS ACTIVE</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.23.9. END - Selecting the function activated at end of count

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>End</td>
<td>TIMER.1 (o TIMER.2) FUNCTION WHERE TIMER IS OVER</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.23.10. TIMER - Timer value

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIMER</td>
<td>TIMER.1 (or TIMER.2) ACTUAL TIME</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the timer value.

*Unit of measurement:* Minutes or Seconds according to the selection set in the MODE submenu, parameter TIMER

*Options:* 0...9999

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSG.TM</td>
<td>TIMER.1 (or TIMER.2) MSG NUMBER (WHEN TIMER OVER)</td>
<td>TIMER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

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)
4.24. Submenu ENERG - Configuring energy counter parameters

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERG</td>
<td>ENERGY COUNTER MANAGER</td>
<td>Level 2</td>
<td>Lets you configure the energy counter parameters.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The submenu appears if the energy counter function was enabled on the MODE submenu.</td>
</tr>
</tbody>
</table>

- **ENRG.N**: Selecting energy counter
- **ENERG**: Selecting the output for energy calculation
- **V.LINE**: Nominal line voltage
- **P.LOAD**: Nominal power of load
- **E.COST**: Nominal cost per kWh
4.24.1. Functional diagram

With CT1/CT2 options

- Input signal from a current transformer CT1
- Input signal from a current transformer CT2

Without CT1 option

- Nominal power P_LOAD page 162

Selected Output ENERG page 162

Type of load LOAD page 96

Current load

Power % combinet on output

Power at 100%

Power on load OU.KWx

Nominal voltage V.LINE page 162

Nominal voltage V.LINE page 162

Nominal cost E.COST page 162

Nominal cost E.COSTx

Totalizer energy E.KWHx

Time totalizer energy E.TIM

Summation ∑
4.24.2. **ENRG.N - Selecting energy counter**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENRG.N</td>
<td>ENERGY COUNTER NUMBER</td>
<td>ENERG</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the identifying number of the energy counter to be configured.

*Unit of measurement:* Number

*Options:* 1...2

---

4.24.3. **ENERG - Selecting the output for energy calculation**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERG</td>
<td>ENERG.1 (o ENERG.2) ENERGY COUNTER ENABLE</td>
<td>ENERG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

---

4.24.4. **V.LINE - Nominal line voltage**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.LINE</td>
<td>ENERG.1 (o ENERG.2) NOMINAL VOLTAGE</td>
<td>ENERG</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the nominal line voltage to be used for the energy calculation.

*Unit of measurement:* V

*Options:* 0...999

---

4.24.5. **P.LOAD - Nominal power of load**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.LOAD</td>
<td>ENERG.1 (o ENERG.2) LOAD NOMINAL POWER</td>
<td>ENERG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

---

4.24.6. **E.COST - Nominal cost per kWh**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.COST</td>
<td>ENERG.1 (o ENERG.2) ENERGY COST / KWH</td>
<td>ENERG</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* Number

*Options:* 0.000...9.999
4.25. Submenu SERIA - Configuring serial communication

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERIA</td>
<td>SERIAL COMMUNICATION CONFIG</td>
<td>Level 2</td>
<td>Lets you configure serial communication.</td>
</tr>
</tbody>
</table>

4.25.1. CODE - Identification code

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CODE</td>
<td>INSTRUMENT ID CODE FOR SERIAL COMM</td>
<td>SERIA</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the identifying code of the controller in a Modbus serial network.

Unit of measurement: Number

Options: 1...247

4.25.2. KBAUD - Selecting communication speed

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>KBAUD</td>
<td>COMMUNICATION SPEED</td>
<td>SERIA</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.25.3. PAR - Selecting parity

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAr</td>
<td>PARITY</td>
<td>SERIA</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the parity used in serial communication.

**Unit of measurement:** -

**Options:**
- **NONE** = No parity
- **ODD** = Odd parity
- **EVEN** = Even parity

4.25.4. SCANR - Setting delay between two consecutive Modbus communications to slave nodes in serial connection

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCANR</td>
<td>SCAN RATE MODBUS MASTER</td>
<td>SERIA</td>
<td>R W</td>
</tr>
</tbody>
</table>

This parameter shows and sets the delay, in milliseconds, between two consecutive Modbus communications toward known slaves in serial connections.
The parameter only appears if the Modbus TCP option is available.

**Unit of measurement:** ms

**Options:** 0...9999
4.26. ETHER Submenu - Ethernet parameter configuration

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETHER</td>
<td>ETHERNET COMMUNICATION CONFIG</td>
<td>Level 2</td>
<td>Permits configuration of Ethernet communication.</td>
</tr>
</tbody>
</table>

Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pag.</th>
<th>Parameter</th>
<th>Pag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method for assignment of network parameters</td>
<td></td>
<td>Update time from Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Ethernet identification code</td>
<td></td>
<td>IP 1 address for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Address IP 1</td>
<td></td>
<td>IP 2 address for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Address IP 2</td>
<td></td>
<td>IP 3 address for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Address IP 3</td>
<td></td>
<td>IP 4 address for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Address IP 4</td>
<td></td>
<td>Definition of broadcast for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Subnet mask 1</td>
<td></td>
<td>Offset rispetto a GMT (Greenwich Mean Time)</td>
<td></td>
</tr>
<tr>
<td>Subnet mask 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subnet mask 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subnet mask 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address Gateway 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address Gateway 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address Gateway 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address Gateway 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pag.</th>
<th>Parameter</th>
<th>Pag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method for assignment of network parameters</td>
<td></td>
<td>Update time from Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Ethernet identification code</td>
<td></td>
<td>IP 1 address for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Address IP 1</td>
<td></td>
<td>IP 2 address for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Address IP 2</td>
<td></td>
<td>IP 3 address for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Address IP 3</td>
<td></td>
<td>IP 4 address for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Address IP 4</td>
<td></td>
<td>Definition of broadcast for Network Time Protocol server</td>
<td></td>
</tr>
<tr>
<td>Subnet mask 1</td>
<td></td>
<td>Offset rispetto a GMT (Greenwich Mean Time)</td>
<td></td>
</tr>
<tr>
<td>Subnet mask 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subnet mask 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subnet mask 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address Gateway 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address Gateway 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address Gateway 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address Gateway 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 4.26.1. **TYP.E – Network parameter assignment method**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYP.E</td>
<td>ASSIGNMENT MODE OF NETWORK PARAMETERS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:*

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIXED</td>
<td>Parameters entered manually are used</td>
</tr>
<tr>
<td>DHCP</td>
<td>Parameters received from the network’s DHCP server are used</td>
</tr>
</tbody>
</table>

### 4.26.2. **CODE.E – Ethernet identification code**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CODE.E</td>
<td>INSTRUMENT ID CODE ETHERNET</td>
<td>ETHER</td>
<td>R</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:*

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number</td>
</tr>
</tbody>
</table>

### 4.26.3. **IP.AD1 – Address IP 1**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.AD1</td>
<td>IP ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

This parameter shows the IP 1 address identifying the controller in an Ethernet network.

*Unit of measurement:*

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...255</td>
<td>Number</td>
</tr>
</tbody>
</table>

### 4.26.4. **IP.AD2 – Address IP 2**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.AD2</td>
<td>IP ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

This parameter shows the IP 2 address identifying the controller in an Ethernet network.

*Unit of measurement:*

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...255</td>
<td>Number</td>
</tr>
</tbody>
</table>

### 4.26.5. **IP.AD3 – Address IP 3**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.AD3</td>
<td>IP ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

This parameter shows the IP 3 address identifying the controller in an Ethernet network.

*Unit of measurement:*

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...255</td>
<td>Number</td>
</tr>
</tbody>
</table>
### 4.26.6. IP.AD4 – Address IP 4

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.AD4</td>
<td>IP ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.7. SUB.M1 – Subnet mask 1

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB.M1</td>
<td>SUBNET MASK</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.8. SUB.M2 – Subnet mask 2

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB.M2</td>
<td>SUBNET MASK</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.9. SUB.M3 – Subnet mask 3

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB.M3</td>
<td>SUBNET MASK</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.10. SUB.M4 – Subnet mask 4

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB.M4</td>
<td>SUBNET MASK</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.26.11. GT.AD1 – Gateway Address 1

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT.AD1</td>
<td>GATEWAY ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.12. GT.AD2 – Gateway Address 2

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT.AD2</td>
<td>GATEWAY ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

This 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

### 4.26.13. GT.AD3 – Gateway Address 3

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT.AD3</td>
<td>GATEWAY ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.14. GT.AD4 – Gateway Address 4

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB.M4</td>
<td>SUBNET MASK</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.15. TIM.NT – Network Time Protocol server update time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIM.NT</td>
<td>NETWORK TIME SERVER UPDATE TIME</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.26.16. IP.NT1 – IP address 1 for Network Time Protocol server

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.NT1</td>
<td>NETWORK TIME SERVER IP ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.17. IP.NT2 – IP address 2 for Network Time Protocol server

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.NT2</td>
<td>NETWORK TIME SERVER IP ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.18. IP.NT3 – IP address 3 for Network Time Protocol server

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.NT3</td>
<td>NETWORK TIME SERVER IP ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.19. IP.NT4 – IP address 4 for Network Time Protocol server

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP.NT4</td>
<td>NETWORK TIME SERVER IP ADDRESS</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.26.20. BRO.NT – Broadcast definition for Network Time Protocol server

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRO.NT</td>
<td>NETWORK TIME SERVER BROADCAST</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMT.OF</td>
<td>GREENWICH MEAN TIME OFFSET</td>
<td>ETHER</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.27. Submenu HMI - Display configuration

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>DISPLAY CONFIG</td>
<td>Level 2</td>
<td>Lets you configure the controller’s display.</td>
</tr>
</tbody>
</table>

4.27.1. HOM.S - Selecting Home page

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HoM.S</td>
<td>HOME SELECT</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.27.2. **BAR.E - Enable bargraph display on Home menus**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bAr.E</td>
<td>BARGRAPH ENABLE</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

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.

4.27.3. **LANG - Selecting language for messages**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAnG</td>
<td>MESSAGE LANGUAGE</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.27.4.  SPEED - Message scrolling speed

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED</td>
<td>SCROLLING MESSAGE SPEED</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

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)

4.27.5.  BACKL - Backlighting level

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACKL</td>
<td>BACKLIGHT LEVEL</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

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)

4.27.6.  QUICK - Quick configuration menu

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUICK</td>
<td>QUICK CONFIG ENABLE</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.28. Submenu HOME - Configuration of display and keyboard in Home1 and Home2

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOME</td>
<td>HOME DISPLAY AND KEYBOARD</td>
<td>Level 2</td>
<td>Lets you configure the controller’s display and keys in Home1 and Home2.</td>
</tr>
</tbody>
</table>

Parameter

- **HOME**
  - but.1
  - Selecting function key 1
    - but.2
      - Selecting function key 2
        - but.3
          - Selecting function key 3
          - ds.SP
            - Selecting the SV display
            - ds.F
              - Selecting the F display
              - bAr.1
                - Selecting bargraph 1 display
                - bAr.2
                  - Selecting bargraph 2 display
                  - bAr.3
                    - Selecting bargraph 3 display
                    - LED.1
                      - Enabling REMOTE flashing of the RUN LED
                      - LED.2
                        - Enabling MANUAL led
                        - LED.3
                          - Enabling TUNE led
                          - LED.4
                            - Enabling RAMP led

<table>
<thead>
<tr>
<th>Pag.</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>175</td>
<td>Home</td>
<td>?</td>
</tr>
<tr>
<td>175</td>
<td>but.1</td>
<td>?</td>
</tr>
<tr>
<td>175</td>
<td>but.2</td>
<td>?</td>
</tr>
<tr>
<td>175</td>
<td>but.3</td>
<td>?</td>
</tr>
<tr>
<td>176</td>
<td>ds.SP</td>
<td>?</td>
</tr>
<tr>
<td>177</td>
<td>ds.F</td>
<td>?</td>
</tr>
<tr>
<td>178</td>
<td>bAr.1</td>
<td>?</td>
</tr>
<tr>
<td>179</td>
<td>bAr.2</td>
<td>?</td>
</tr>
<tr>
<td>180</td>
<td>bAr.3</td>
<td>?</td>
</tr>
</tbody>
</table>
4.28.1. HOME - Selecting Home

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOME.N</td>
<td>HOME NUMBER</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the identifying number of Home to configure.

*Unit of measurement:* Number

*Options:* 1...2

4.28.2. BUT.1 - Selecting function key 1

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>but.1</td>
<td>HOME.1 (o HOME.2) KEY FUNCTION</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the function assigned to key 1 (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

4.28.3. BUT.2 - Selecting function key 2

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>but.2</td>
<td>HOME.1 (o HOME.2) KEY FUNCTION</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* -

*Options:* As per but.1

4.28.4. BUT.3 - Selecting function key 3

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>but.3</td>
<td>HOME.1 (o HOME.2) KEY FUNCTION</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* -

*Options:* As per but.1
4.28.5. **DS.SP - Selecting the SV display**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>dS.SP</td>
<td>HOME.1 (o HOME.2) SV DISPLAY FUNCTION</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
4.28.6. DS.F - Selecting the F display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>dS.F</td>
<td>HOME.1 (or HOME.2) F DISPLAY FUNCTION</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 auxiliary input 2**
  - **IN3** = Auxiliary input 2
4.28.7. BAR.1 - Selecting bargraph 1 display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bAr.1</td>
<td>HOME.1 (or HOME.2) BARGRAPH FUNCTION</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

4.28.8. BAR.2 - Selecting bargraph 2 display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bAr.2</td>
<td>HOME.1 (or HOME.2) BARGRAPH FUNCTION</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

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.C1, NO.FRA and NO.C1 (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 = Auxiliar 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 auxiliary 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

4.28.9. BAR.3 - Selecting bargraph 3 display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bAr.3</td>
<td>HOME.1 (o HOME.2) BARGRAPH FUNCTION</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the display assigned to the bargraph 3. The parameter appears only if the controller is 1650 or 1850.
The parameter appears only if parameter bAr.E is at
- ON.ALL, NO.FRA and ON.3LY (on 1650)
- ON.ALL, ON.AL1, NO.FRA, NO.FR1, ON.3LY and ON.3L1 (on 1850)

Unit of measurement: -

Options:
PV = Process variable
SETP = Local setpoint / manual power or active setpoint, in case of enabling Multiset function, setpoint gradient, remote setpoint, and programmer (if enabled) (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

4.28.10. LED.1 - Enable RUN led flashing

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED.1</td>
<td>ENABLE OF RUN LED BLINKING</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter enables and disabled RUN led flashing

**Unit of measurement:**  -

**Options:**
- OFF = Disables RUN led flashing
- On = Enables RUN led flashing
### 4.28.11. LED.2 – Enabling MANUAL led

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED.2</td>
<td>ENABLE OF MANUAL LED</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter enables and disables the MANUAL led

*Unit of measurement:* -

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

### 4.28.12. LED.3 – Enabling TUNE led

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED.3</td>
<td>ENABLE OF TUNE LED</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter enables and disables the TUNE led

*Unit of measurement:* -

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

### 4.28.13. LED.4 – Enabling RAMP led

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED.4</td>
<td>ENABLE OF RAMP LED</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter enables and disables the RAMP led

*Unit of measurement:* -

*Options:*
- OFF = Disables the RAMP led
- On = Enables the RAMP led

### 4.28.14. LED.5 – Enabling REMOTE led

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED.5</td>
<td>ENABLE OF REMOTE LED</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter enables and disables the REMOTE led

*Unit of measurement:* -

*Options:*
- OFF = Disables the REMOTE led
- On = Enables the REMOTE led

### 4.28.15. LED.6 – Enabling SP1/2 led

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED.6</td>
<td>ENABLE OF SP12 LED</td>
<td>HOME</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronimo</th>
<th>Messaggio a scorrimento</th>
<th>Password d’accesso</th>
<th>Descrizione</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNR.4.P</td>
<td>CUSTOM 4 POINT LINEARIZATION NUMBER</td>
<td>Level 2</td>
<td>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.</td>
</tr>
</tbody>
</table>

4.29.1. LNR.4.N - Selection of custom linearisation

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNR.4.N</td>
<td>CUSTOM 4 POINT LINEARIZATION NUMBER</td>
<td>LIN.4.P</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

Unit of measurement: Number

Options: 1...3

4.29.2. Md.4P - Four point linearisation method

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Md.4P</td>
<td>(LIN.4.P.1 (0 LIN.4-P.2 o LIN.4-P.3) CUSTOM 4 POINT LINEARIZATION MODE</td>
<td>LIN.4.P</td>
<td>RW</td>
</tr>
</tbody>
</table>

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. “Correction of four-point input” on page xxx) CALIB = point entry method via calibrator reading (redirects to paragraph 5.4. “Correction of four-point input” on page xxx)
4.29.3. **X1 - Abscissa of first linearisation point**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
</table>

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

4.29.4. **Y1 - Ordinate of the first 4-point linearisation point**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
</table>

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

4.29.5. **X2 - Abscissa of second linearisation point**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
</table>

This parameter permits setting of the abscissa of the second linearisation point in the four points.

*Unit of measurement:* Points on the scale

*Options:* -1999..9999

4.29.6. **Y2 - Ordinate of the second 4-point linearisation point**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
</table>

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
4.30. Submenu LINRZ - Configuring custom linearization

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINRZ</td>
<td>CUSTOM LINEARIZATION CONFIG</td>
<td>Level 2</td>
<td>Lets you configure the parameters for custom linearization in 32 steps or 4 points.</td>
</tr>
</tbody>
</table>

The submenu is visible only if custom linearization was enabled in the configuration of the main input or of the auxiliary input.

### 4.30.1. LNRZ.N - Selecting custom linearization

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNRZ.N</td>
<td>CUSTOM LINEARIZATION NUMBER</td>
<td>LINRZ</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the identifying number of the custom linearization to be configured.

*Unit of measurement:* Number

*Options:* 1...2

### 4.30.2. STP.xx - Value of step xx

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>STP.xx</td>
<td>LINRZ.1 (o LINRZ.2) CUSTOM LINEARIZATION STEP</td>
<td>LINRZ</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV.STA</td>
<td>LINRZ.1 (o LINRZ.2) MV START SCALE</td>
<td>LINRZ</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the value in millivolts at start of scale if the input is a thermocouple. The parameter appears only if 32-step linearization has been selected (see paragraph “4.8.5. LIN – Selecting linearization type” on page <<?>)

Unit of measurement: mV

Options: -19.99...99.99

4.30.4. MV.FUL - Setting mV at full scale

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV.FUL</td>
<td>LINRZ.1 (o LINRZ.2) MV FULL SCALE</td>
<td>LINRZ</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the value in millivolts at full scale if the input is a thermocouple. The parameter appears only if 32-step linearization has been selected (see paragraph “4.8.5. LIN – Selecting linearization type” on page <<?>)

Unit of measurement: mV

Options: MV.STA + 1...99.99

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV.50C</td>
<td>LINRZ.1 (o LINRZ.2) MV AT 50 °C</td>
<td>LINRZ</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the value in millivolts at 50°C if the input is a thermocouple. The parameter appears only if 32-step linearization has been selected (see paragraph “4.8.5. LIN – Selecting linearization type” on page 82)

Unit of measurement: mV

Options: -1.999...9.999
## Submenu US.CAL - Calibrazioni utente

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>US.CAL</td>
<td>USER CALIBRATION MANAGER</td>
<td>Level 2</td>
<td>Lets the user calibrate the controller with regard to Custom main input, HB alarm setpoints, energy reset, and partial day count.</td>
</tr>
</tbody>
</table>

### Parameter Pag. Parameter Pag.
- **Selecting the user calibration** Pag. **Setting month** Pag.
- **Resetting the factory calibration** Pag. **Setting year** Pag.
- **Calibrating minimum current / voltage** Pag. **Setting analog output minimum** Pag.
- **Calibrating maximum current / voltage** Pag. **Setting analog output maximum** Pag.
- **Calibrating minimum resistance value** Pag. **Setting hours** Pag.
- **Calibrating maximum resistance value** Pag. **Setting minutes** Pag.
- **Setting hours** Pag. **Setting seconds** Pag.
- **Setting minutes** Pag. **Setting day of week** Pag.
- **Setting seconds** Pag. **Setting day** Pag.
4.31.1. U.CAL - Selecting the user calibration

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.CAL</td>
<td>USER CALIBRATION TYPE</td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 auxiliary 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=VALVP function, and with one output set as V.OPEN and one output set as V.CLOS input configuration:

\[
\text{VALV.P} = \text{Auxiliary input calibration with valve position function.}
\]

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 can be aborted at any time by pressing the regulator key.

If model has custom auxiliary input 2:

\[
\text{I.AUX2} = \text{Calibration of custom auxiliary input 2 (selected with TYPE parameter in INPUT.3 menu).}
\]

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

### 4.31.2. FI.CAL - Resetting the factory calibration

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FI.CAL</td>
<td>FACTORY CALIBRATION</td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets resetting of the factory calibration.

This operation can be done only for inputs and outputs, if U.CAL corresponds to I.MAIN, I.AUX, I.CT1, I.CT2, OUT.A1, OUT.A2 or OUT.C.

**Unit of measurement:** -

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

### 4.31.3. C.LOW - Calibrating minimum current / voltage

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.LOW</td>
<td>US.CAL</td>
<td>R W</td>
<td></td>
</tr>
</tbody>
</table>

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 \text{F} key to acquire the calibration value.

**Unit of measurement:** -

**Options:** -

### 4.31.4. C.HIGH - Calibrating maximum current / voltage

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.HIGH</td>
<td>US.CAL</td>
<td>R W</td>
<td></td>
</tr>
</tbody>
</table>

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 \text{F} key to acquire the calibration value.

**Unit of measurement:** -

**Options:** -
### 4.31.5. RTD.LO - Calibrating minimum resistance value

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTD.LO</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

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:* -

### 4.31.6. RTD.HI - Calibrating maximum resistance value

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTD.HI</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

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:* -

### 4.31.7. HOUR - Setting hours

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOUR</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the hours on the Real Time Clock, if U.CAL = RTC.

*Unit of measurement:* Ore

*Options:* 0...23

### 4.31.8. MIN - Setting minutes

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the minutes on the Real Time Clock, if U.CAL = RTC.

*Unit of measurement:* Minutes

*Options:* 0...59

### 4.31.9. SEC - Setting seconds

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEC</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the seconds on the Real Time Clock, if U.CAL = RTC.

*Unit of measurement:* Seconds

*Options:* 0...59
### 4.31.10. DAY - Setting day of week

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>dAY</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.31.11. DATE - Setting day

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.31.12. MONT - Setting month

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mont</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the month on the Real Time Clock, if U.CAL = RTC.

**Unit of measurement:** Mese  
**Options:** JANUA...DECEM

### 4.31.13. YEAR - Setting year

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the year on the Real Time Clock, if U.CAL = RTC.

**Unit of measurement:** Anno  
**Options:** 0...99

### 4.31.14. C.LO - Setting analog output minimum

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.LO</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

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
### 4.31. C.HIG - Setting analog output maximum

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.HIG</td>
<td></td>
<td>US.CAL</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.32. PASC0 - Setting level password 0

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASC0</td>
<td>SET PASS0</td>
<td>Level 2</td>
<td>R W</td>
</tr>
</tbody>
</table>

This parameter may be used to set the password to access User Menu parameters. Default code: 10.

**Unit of measurement:** Number

**Options:** 0...9999

### 4.33. PASC1 - Setting level 1 password

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASC1</td>
<td>SET PASS1</td>
<td>Level 2</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

### 4.34. PASC2 - Setting level 2 password

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASC2</td>
<td>SET PASS2</td>
<td>Level 2</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter lets you set the password for accessing level 2 configuration submenus. Default code: 2.

**Unit of measurement:** Number

**Options:** 0...9999

### 4.35. FI.CFG - Entering the reset code

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FI.CFG</td>
<td>ENTER DEFAULT</td>
<td>Level 2</td>
<td>R W</td>
</tr>
</tbody>
</table>

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 <?>.

**Unit of measurement:** Number

**Options:** 0...9999
5. EXAMPLES AND APPLICATION NOTES

5.1. Heat/cool control application

A 850 controller (model 850-D-R00-00000-1) controls a heating element via a solid-state relay connected to a logic output. A TC sensor measures the temperature. Each branch of the circuit is protected by a fuse. The cooling or alarm relay is protected by a snubber. The following diagram shows the various connections. One switch can control more than one controller.

- With Quick Configuration you set:
  - sensor type (TC);
  - unit of measurement of temperature (°C);
  - the logic output function (HEAT);
  - the relay output function (ALRM1);
  - the full-scale value of the CT1 current transformer (HI.CT1);
  - the setpoint, i.e. the temperature to be maintained (SETP);
  - the temperature value that trips the alarm (ALRM1).

5.1.1. Connection diagram

![Connection Diagram](attachment:connection_diagram.png)
5.1.2. Quick configuration procedure for model 850–D-R00-00000-1

- **Home**
- **Selecting sensor type**
  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**
  
  > 2 s
  
  raises the value
  lowers the value

  > 2 s
  
  raises the value
  lowers the value

  > 2 s
  
  return to select sensory type
5.2. Heating control and current (CT) application

A 850 controller (model 850–D-R00-00100-1) controls a heating element via a solid-state relay connected to a logic output. A TC sensor measures the temperature. Each branch of the circuit is protected by a fuse. The alarm relay is protected by a snubber. A current transformer is connected to a dedicated input to indirectly measure electrical consumption. The following diagram shows the various connections. One switch can control more than one controller.

With Quick Configuration you set:

- sensor type (TC);
- unit of measurement of temperature (°C);
- the logic output function (HEAT);
- the relay output function (ALRM1);
- the full-scale value of the CT1 current transformer (HI.CT1);
- the setpoint, i.e. the temperature to be maintained (SETP);
- the temperature value that trips the alarm (ALRM1).

5.2.1. Connection diagram
5.2.2. Quick configuration procedure for model 850–D-R00-00000-1

- **Setting Alarm 1**
  - Default: direct maximum absolute

- **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**

*Return to select sensory type*
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

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).

"WARNING: The offset function (OF.SCL parameter) and linearisation itself remain enabled while setting parameters X1, X2, Y1, Y2. It is best to reset the OF.SCL parameter and disable 4-point linearisation when editing these 4 parameters, and then re-enable offset and 4-point linearisation when you have finished setting them (so that the PV appearing on the instrument during identification and setting of the 4 points is the effective one, not the one modified by linearisation)."

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 periodically 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

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.
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 correction.

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

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

5.5. 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.
5.6. Alarms

5.6.1. AL1...AL4 Generic alarms

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

**Absolute alarm**

AL1 inverse and absolute, AL2 direct and absolute. Two alarm setpoints, AL1 (lower setpoint) and AL2 (upper setpoint) are set, corresponding to two specific hysteresis values, Hyst1 (positive) and Hyst2 (negative). The alarm trips when the measured value remains less than AL1 or greater than AL2 for the set delays. The alarm condition ends when the measured value is greater than AL1 + Hyst 1, or less than AL2 - Hyst2. This prevents repeated alarms caused by slight changes in the measured value. Any alarm message at power-on, when the equipment is not at full speed, can be avoided by setting disable at power-on.

**Symmetrical absolute alarm**

A single alarm setpoint AL1 and a single hysteresis value Hyst1 are set. When a direct alarm is set, the alarm trips when the measured value is less than AL1 - Hyst1 or greater than AL1 + Hyst1 for the set delay. When an 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 an 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 assigned control output,
- is above set value HIG.ON in the ON time of the assigned control output,
- is above set value HI.OFF in the OFF time 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.

5.6.3. 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).

5.6.4. LBA alarm

This alarm signals an interrupt in the control loop as a possible consequence of a sensor in short circuit, an inverted sensor, or a load break.

It trips an alarm if the variable does not increase its value in heating (or does not decrease it in cooling) when maximum power is supplied for settable time LBA.TM.

LBA alarm in the presence of ON-OFF control (of heating, cooling and heating, and heating/cooling).

In the presence of PID control with ON-OFF heating or cooling, LBA.PW can only be set for the PID part.
5.6.5. 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.

5.7. Retransmission output

The retransmission output is used mainly to retransmit the OUT.PW control power.

5.8. Switching the software on/off

5.8.1. How to switch it off

Keep the [F] and [A] 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 (Fin.x, parameter ON-OF), excluding deactivation from the keypad.

5.9. Soft-Start

If enabled (by setting SOFT.S = ON on the PID configuration menu), the Soft-Start function slices power based on the percentage of time lapsed since controller power-on compared to the time set in the parameter SOFT.T

Soft-Start is an alternative to Self-Tuning and is activated after every controller power-on. The Soft-Start action is reset in Automatic-Manual switching.
5.10. Tuning

5.10.1. Tuning actions

Tuning actions are divided into 3 categories:

- **Proportional**: action in which the contribution on the output is proportional to the deviation in input.
- **Derivative**: action in which the contribution on the output is proportional to the speed of change of the deviation in input.
- **Integral**: action in which the contribution on the output is proportional to the integral in time of the deviation in input.

The deviation is the offset between the measured value of the controlled variable and the setpoint.

Tuning actions let you achieve optimum tuning of the controlled process in every phase.

5.10.1.1. Influence of Proportional, Derivative and Integral actions on response of controlled process

The response of the controlled process depends on the type of control action set. Specifically:

- Increasing the Proportional Band reduces oscillations but increases the deviation.
- Decreasing the Proportional Band reduces the deviation but causes oscillations of the controlled variable (excessively low Proportional Band values make the system unstable).
- Increasing the Derivative Action, corresponding to an increase in Derivative Time, reduces the deviation and prevents oscillations up to a critical value of Derivative Time, beyond which it increases the deviation and causes prolonged oscillations.
- Increasing the Integral Action, corresponding to a decrease in Integral Time, tends to cancel the deviation at full speed between the controlled variable and the setpoint.
- If the Integral Time value is too long (weak Integral action), there may be persistence of the deviation between the controlled variable and the setpoint.

For more information on tuning actions, contact Gefran Customer Care.

5.10.2. Manual tuning

Manual tuning is done as follows:

1. Set the setpoint to the working value.
2. Set the Proportional Band to 0.1% (with ON-OFF control).
3. Switch to automatic and watch the behavior of the variable.

There will be behavior similar to that shown in the following figure.

4. Calculate the PID parameters:
   - Proportional Band P.B. value
   \[
   \text{P.B.} = \frac{\text{Peak}}{V_{\text{max}} - V_{\text{min}}} \times 100
   \]
   where \( V_{\text{max}} - V_{\text{min}} \) is the scale interval.
   - Integral Time value \( t_{\text{I}} = 1.5 \times T \)
   - Derivative Time value \( dt = t_{\text{I}} / 4 \)

5. Switch the controller to manual.
6. Set the calculated parameters (re-enable PID control by setting a cycle time for relay output if necessary).
7. Switch to automatic.
8. To check optimization of the parameters, change the setpoint value if possible and check transitory behavior: if oscillation persists, increase the Proportional Band value; on the other hand, if the response is too slow, decrease the value.

5.10.3. Self-Tuning

Self-Tuning is a simplified and automatic tuning mode based on the process state.

The purpose of Self-Tuning is to calculate optimum control parameters at the start of the process.

The variable (for example, temperature) must be the one measurable at zero power (room temperature).

You can automatically start tuning at every power-on or start it by means of the appropriately configured key.

The procedure runs automatically by optimizing the approach in relation to the real temperature value, in case of (relay, solid-state, Triac) control output, with automatic calculation of optimal cycle time \( CY_{\text{TIM}} \).

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.
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 \( \text{ON} \), 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
For slicing cycle times for outputs, the following values should be set:

- **Air**  CY.TIM Cycle T Cool = 10 seconds
- **Water**  CY.TIM Cycle T Cool = 2 seconds
- **Oil**  CY.TIM Cycle T Cool = 4 seconds

⚠️ **Attention!** Cool parameters cannot be changed in this mode.

### 5.10.7. Cascade controls

Two controllers are arranged in cascade when the output signal from the first becomes the input signal to the second, which in turn sends a signal to the control unit. The primary controller compares the controlled variable to the setpoint, while the secondary controller compares the value of the controlled variable to the signal from the primary controller.

Cascade control provides faster control of the primary variable value. In addition, the primary variable is less subject to deviations. The secondary controller keeps the flow constant, changing it only when instructed by the primary controller.

The cascade controller is used especially in very slow processes. In these processes, the error is recovered over a long time, and when noise enters the process, you have to wait a long time before the error is revealed and before corrective action begins; therefore, the corrective action does not start immediately. After the action has started, you have to wait a long time for the result.

A cascade control is built by finding intermediate controlled variables that can perform rapid corrective actions in case of noise.

The primary and secondary controllers are arranged in cascade: each has its own process variable but only the secondary one has an output that commands the process.

The main advantages of cascade control are:

- noise in the secondary loop is corrected by the secondary controller before it can affect the primary variable;
- delays in the secondary part of the process are significantly reduced by the secondary loop, and this increases primary loop response speed;
- gain changes in the secondary part are compensated in its chain;
- the secondary loop lets the primary controller act precisely on the flow of material or energy.

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
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.

\[
\text{RATIO} = \frac{\text{IN1}}{\text{IN2} \text{ or } \text{IN3}}
\]

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:

\[
\text{IN1} = \text{SETP1} = \text{IN2} \text{ or IN3} \times \text{RAT.CO}
\]

5.10.8.1. Activating the ratio controller

Activate ratio controller work mode as follows:

- Enable the remote setpoint (parameter SREM 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.

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 PI).
- **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 hysteresis and to reduce valve time constants. Cascade control is normally not required in fast control loops (flow rates, pressures, etc.) and is more useful in temperature controls.

On series 850, 1650, 1850 controllers, the PID.1 control output is the setpoint for PID.2.

5.10.7.1. Tuning two PIDs configured for cascade control

If you need to tune two PIDs configured for cascade control (parameter APP=t=CAS.HE;CAS.CO;CAS.HC on EN.FUN menu), do as follows:

1. Set the primary PID to Manual (for example with the Automatic\Manual button on home page Home.1), and keep the secondary PID in Automatic.
2. Set the value of power delivered by the primary PID (secondary PID setpoint).
3. Start the Self-Tuning procedure for the secondary PID (see paragraph “5.10.3. Self-Tuning” on page 203).
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 203).

RATIO is the ratio required between IN1 (PV1) and IN2 (or IN3) (range from 0.01 to 99.99), i.e.

\[
\text{RATIO} = \frac{\text{IN1}}{\text{IN2} \text{ or IN3}}
\]

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:

\[
\text{IN1} = \text{SETP1} = \text{IN2} \text{ or IN3} \times \text{RAT.CO}
\]
5.11. Timer

The timer is enabled on the MODE configuration menu by selecting tMEr = ON.SEC or 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 \( \Delta \) and \( \nabla \), keys as follows:
• \( \Delta \) pressed with timer stopped = START
• \( \nabla \) pressed with timer on = STOP
• \( \Delta \) + \( \nabla \) 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

![Digital Input Timer Diagram](image)

Enabling from alarm

![Alarm Timer Diagram](image)
5.11.2. Stabilization timer

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

The band defining stabilization of the temperature is settable in BAND (from 0.0% to 25.0 % f.s.); the time is set in TIMER. With the band set to 0.0% the count starts the first time the setpoint is reached.

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

The following diagrams show how the stabilization timer works and the state of the end count output.

5.11.3. Start timer

The start timer is used to start the control a certain time after the controller is powered-on. The delay after start/power-on is settable in TIMER. The following diagrams show how the start timer works and the state of the end count output.

5.11.4. Variables available for the user configuration menu

The variables available for the timer are TIM.RE, which shows remaining time, and TIM.EL, which shows lapsed time.
5.12. Multiset, setpoint gradient

The Multiset function is enabled on the MODE configuration submenu by selecting MUL.SP = On.

This function allows to set:

- 2 setpoints (M.SP1 and M.SP2) by using a digital input with function Fin.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 = SPSEL on the HMI submenu.

- 4 setpoints (M.SP1, M.SP2, M.SP3 and M.SP4) by using two digital inputs, one with function Fin.x = SEL1.0 (for PID1) or SEL2.0 (for PID2) or SE12.0 (for PID1 and PID2) and the other with function Fin.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.

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).

A program can be run by one of the two programmers (PROGRAMMER 1 or PROGRAMMER 2) (see paragraph “5.13.3. Programmer functions” on page 212).
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  →  binary value = 5
state of digital input 2 = inactive
state of digital input 3 = active  →  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  →  binary value = 10
state of digital input 2 = inactive  →  select program 11 for PROGRAMMER 1
state of digital input 3 = active  →  select program 12 for PROGRAMMER 2

c) With state of digital inputs:

state of digital input 1 = active  →  binary value = 12
state of digital input 2 = inactive  →  select program 13 for PROGRAMMER 1
state of digital input 3 = active  →  select program 14 for PROGRAMMER 2

d) With state of digital inputs:

state of digital input 1 = active  →  binary value = 14
state of digital input 2 = inactive  →  select program 15 for PROGRAMMER 1
state of digital input 3 = active  →  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 <= RAMPT of step in execution: start from new time
    • if programmed time P.TIME_x > RAMPT 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 start of 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 the phase (ramp or hold)
  Going from ASYNCHRONOUS to SYNCHRONOUS and vice versa.
  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.
  You can assign up to 4 consents to each step: all parameters of single programs (PR.OPT submenu) and all parameters of single steps (PR.STP submenu) are available in display-only.
• 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.
• a special state of consents;

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:
5.13.5.4. Cyclical program with 3 setpoints and 3 steps

<table>
<thead>
<tr>
<th>SP07</th>
<th>SP05</th>
<th>SP06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 5</td>
<td>Step 6</td>
<td>Step 7</td>
</tr>
</tbody>
</table>

Time | Temperature
--- | ---
tr5 | tp5
tr6 | tp6
tr7 | tp7
tr8 |

5.13.5.5. Program with HBB (hold back band) function

<table>
<thead>
<tr>
<th>SP</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBB</td>
<td>Restart program</td>
</tr>
<tr>
<td>tw</td>
<td>tw1</td>
</tr>
<tr>
<td>tr</td>
<td>tr</td>
</tr>
<tr>
<td>tp1</td>
<td>tp1</td>
</tr>
<tr>
<td>tp2</td>
<td>tp2</td>
</tr>
</tbody>
</table>

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 Δ, ν keys, with the following modes:
- Δ pressed with program stopped = START;
- ν pressed with program running = STOP;
- Δ + ν pressed for 2 seconds = RESET (condition maintained with key pressed);

5.13.8. Programmer Reset mode

By setting RST.SP = ON provides that with active reset command the setpoint assumes the value of process variable PV and power is forced to zero.

Setting RST.SP = OFF maintains the active setpoint (prior to reset) and power control.

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

5.13.9. Restart with step search

If configured, in case of restart the programmer can try to restart nor from the first program step but from the point of the program that corresponds, or is closest to, the value of the active process variable PV.

This function mode is called “restart with step search.”

At start, if Strt = RSCH was set on the PR.OPT submenu, the program searches for the setpoint with value equal to variable PV.

The search is conducted by shifting the current time forward or back and skipping phases or steps.

The following diagram shows a typical 5-step program profile and explains how restart with step search works.
If the variable has values lower than the ones requested during a setpoint raise phase (point A, t1), restart is conducted by lowering the active time base until the setpoint profile (point A1) is intercepted.

If the variable has values lower than the ones requested during a setpoint lower phase (point B, t2), restart is conducted by raising the active time base until the setpoint profile (point B1) is intercepted.

If interception is impossible, as in the case of variable at value PV1, the program is restarted from the active setpoint and time.

If the HBB control is on, programmer base times remain in effect until the variable re-enters the set tolerance band, symmetrical to the setpoint value.

5.13.10. Managing a double programmer

The second input and the second PID let you activate a second programmer identical to the one described above. The two programmers can work in:
- Asynchronous mode (parameter PROGR = On2), or
- Synchronous mode (parameter PROGR = On.S).

5.13.10.1. Programmers in asynchronous mode

In this work mode the two programmers have independent time bases, therefore the Start-Stop, Skip step, Skip to end of program, and Reset commands are separate for each programmer.

With asynchronous programmers:
- Consents, i.e. step enable conditions (ENABLE), are the ones defined by the single programmer for the step it is executing, i.e., only the consents for the step that the first programmer (PROG1) is executing for the process managed by PROG1 and only the consents for the step that the second programmer (PROG2) is executing for the process managed by PROG2.
- You can subordinate execution of PROG2 steps to the execution of PROG1 steps. This is done by means of the PROG2 wait step, configurable with GF_eXpress. The result obtained depends on the states of PROG1 and PROG2 programs when the set condition occurs.

Example

You want to configure a wait so that PROG2 does not start executing STEP 3 until PROG1 has started executing STEP 2.

Set the Wait Step as follows with GF_eXpress:

The following cases are possible:
1. PROG.1 is already executing STEP 2 when PROG2 is about to start executing STEP 3: PROG2 continues to run STEP2 without any wait.
2. PROG.1 is already executing a step subsequent to STEP 2 when PROG2 is about to start executing STEP 3: PROG2 continues to run STEP2 without any wait.
3. PROG.1 is in one of the following states:
   - READY (programmer never started or has already ended the program and was configured to return to READY, parameter End=rESE);
   - END (programmer has already run the program and was configured to stay in this condition, parameter End=NONE or End=Off); and so PROG2 is suspended until PROG1 arrives at STEP 2. When PROG1 starts STEP 2, PROG2 starts executing STEP 3.

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

The settings for SUBDUE 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.

Consets, 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.

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 = \( \sum (\text{ramp time} + \text{hold time}) \), 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:

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

5.14.1. Valve control parameters

The controller controls the valves with the following parameters of the VALVE submenu:

- **TRAVL** Actuator travel time: the time the valve takes to go from completely open to completely closed (or vice versa). Settable with resolution of one second, this is a mechanical characteristic of the valve + actuator group. NOTE: if the actuator stroke is mechanically limited, reduce the TRAVL value proportionally.

- **TIM.LO** Minimum impulse: expressed as a percentage (with resolution of 0.1%) of actuator time, represents the minimum change in valve position corresponding to the minimum change in power supplied by the controller (power below which the actuator physically does not respond to the command). Raising TIM.LO lowers wear on the actuator to the detriment of precise positioning. Minimum impulse duration is settable in TIM.ON as a percentage of actuator time.

- **TIM.HI** Impulse setpoint: expressed as a percentage (with resolution of 0.1%) of actuator time, represents the deviation in position (requested position – real position) below which the maneuver request becomes impulsive. TIM.HI is only active with TIM.OF=0 Impulse approach allows fine tuning of the position valve, which is especially useful in case of high mechanical inertia. Setting TIM.HI = 0 excludes positioning modulation.

- **TIM.ON**: it is the shortest time accepted for the valve command pulse, expressed as percentage of the “actuator time”

- **TIM.OF**: it is the shortest time between two Valve ON pulse command, expressed as percentage of the “actuator time”:
  - Setting TIM.OF=0 this function is excluded.
  - Setting TIM.OFF≠0 the Valve movement becomes pulsing; ON pulse time= TIM.ON and OFF pulse time= TIM.OF
  If the value TIM.OF<TIM.ON the value is forced to TIM.ON.

- **DEAD.B** Deadband: this is a deviation band between the control setpoint and the process variable within which the controller does not supply any command to the valve (Open = OFF; Close = OFF). It is expressed as a percentage of full-scale and is symmetrical to the setpoint. Once the process is defined, the deadband is used to prevent stressing the actuator with repeated commands that would be irrelevant to the control.
  By setting DEAD.B = 0 the deadband is excluded.
5.14.2. Valve control modes

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

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

After reaching an assumed end position (fully open or fully closed determined by the virtual potentiometer), the controller supplies an additional command in the same direction, thereby ensuring that the real end position is reached.

With feedback valve, the actual position is acquired via the auxiliary analog input of the controller, which reparameterizes the value as a percentage (0.0 - 100.0%), compares it to the required position, then sends the appropriate command to the valve.

Calibration is required to store the minimum and maximum positions of the potentiometer.

The actuators are normally protected against an OPEN command in fully open position or a CLOSE command in fully closed position.

There are two setpoint approach modes:

- **Non-impulsive behavior**
  
  Set TIM_HI = 0 and TIM_OF = 0 for non-impulsive behavior: every request greater than TIM_LO is continually sent to the actuator via the V.OPEN / V.CLOS outputs.
  
  The shortest pulse time is settable in TIM.ON as percentage of the “actuator time”, it is recommended to set TIM.ON = TIM_LO.
  
  With power equal to 100.0% or to 0.0%, the corresponding output remains on.

- **Impulsive behavior**
  
  Set TIM_HI ≠ 0 and TIM_OF = 0 for impulsive behavior. every request greater than TIM_LO is sent to the actuator via the V.OPEN / V.CLOS outputs with impulses having a duration of TIM.ON.
  
  TIM_HI defines the deviation within which the movement becomes pulsing.
  
  With power equal to 100.0% or to 0.0%, the corresponding output remains on.

  With TIM_OF ≠ 0, every request greater than TIM_LO is sent to the actuator via the V.OPEN / V.CLOS outputs with impulses having a duration of TIM.ON and TIM_OF.
  
  In the case of floating valve, with power ≤ 10.0%, or ≥ 90.0%, the impulses are independent of TIM_LO.
  
  With power equal to 100.0% or to 0.0%, the corresponding output remains in modulation.

With the controllers in manual, setting parameter KEY_MO = On allows direct control of the valve open and close commands with the Δ 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)

NOTE: To enable the valve position control, set parameter FUnC=VALV.P for the auxiliary input

Auxiliary input
for models with Auxiliary Input option = 2

Valve connection diagram for models 850V (or 850PV)-X-RR-D...
default OUT2 (OPEN), OUT3 (CLOSE)

NOTE: To enable the valve position control, set parameter FUnC=VALV.P for the auxiliary input
Valve connection diagram
for models 1650V (or 1650PV)-X-RR...
for models 1850V (or 1850PV)-X-RR...
default OUT2 (OPEN), OUT3 (CLOSE)

Ph L+
Mp N-

Power neutral
Open command (phase)
OPEN
Close command (phase)
CLOSE

Position reverse potentiometer
MAX
SIGNAL
MIN

VALVE CONNECTION

Auxiliary input
for models with Auxiliary Input option = 2

NOTE:
To enable the valve position control,
set parameter FUNC=VALVP 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 amperes and can have values from 0.0 to 99.9.
• Power on load, parameter OU.KW_1 (or OU.KW_2), calculated in kW. Power is calculated:
  o if nominal power is not zero, based on nominal power P_LOAD_1 (identical for P_LO_AD_2), as % of same
  o if nominal power is zero, by using line voltage V.LINE_1 (or V.LINE_2) and current (here as well, considering PID power %)
OU.KW_1 (identical for OU.KW_2) can have values from 0.00 to 99.99.
• Time taken to count energy (parameter E.TIM_1 or E.TIM_2) value from 0 to 999 hours
• Energy on load (parameter O.KWH_1 or O.KWH_2) value from 0.00 to 99.99 kWh
• Energy counter transferred to load (parameter E.KWH_1 or E.KWH_2), calculated in kWh.

E.KWH_1 (identical for E.KWH_2) can have values from 0 to 9999.

The energy count does not depend on the output type, and is also done for continuous outputs (A for 850 and C for 1650/1850).

The energy count stops when it reaches the maximum of 9999 kWh or maximum time E.TIM_1 (or E.TIM_2) at 999 hours. The count is not linked to output type.

• Cost of energy transferred to load (parameter E.CST_1 or E.CST_2). Cost is calculated based on nominal cost of energy 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 Operations

5.16.1. Function logic blocks

By means of Logic Function Blocks, the Logic Operations function processes the values of input variables to obtain values for the output variables. This lets you control the processes very precisely, because you can make a number of actions subject to a series of essential requisites.

The Function Blocks are run every 100msec in sequence, from LFB1 to LFB32. Function block execution is suspended in Software OFF conditions. Typical maximum delay from activation of an input and corresponding output = 100msec.

The Function Blocks are programmed with GF_eXpress software. There is a maximum of 32 Logic Function Blocks. Each Logic Block manages up to 4 input variables and 1 variable output. Four types of logic operations on input variables a, b, c and d can be performed on the Function Blocks:

- (a AND b) OR (c AND d)
- (a OR c) AND (b OR d)
- a OR b OR c OR d
- a AND b AND c AND d

where the AND operator means that the linked operands must evaluate to “true” for the result to be “true,” whereas with the OR operator is it sufficient for only one linked operand to evaluate to “true” for the result to be “true”.

Parentheses change the order of evaluation of the expressions, i.e., expressions in parentheses are evaluated first, and the result is then used for expressions outside parentheses.

The input variables (a, b, c, d) to each Function Block can refer to:
- digital inputs (3 for model 850, 5 for models 1650 and 1850),
- auxiliary digital inputs (for model 1850),
- state of alarms,
- state of control output,
- state of controller,
- LFB_OUT_1...LFB_OUT_32,
- state of setpoint programmer,
- variables LFB_OUT_01...LFB_OUT_32 from other Function Blocks.

The result of the Logic Operations function can act on:
- state of controller,
- state of setpoint programmer,
- state of alarms,
- outputs, by directly setting the state.

5.16.2. Groups of variables

The controller provides a large number of variables that can be used in input for Logic Operations. The controller has the following groups of homogeneous variables:

State Keys
- BUT1
- BUT2
- BUT3
- UP
- DOWN

State of digital inputs
- DIGITAL INPUT 1
- DIGITAL INPUT 2
- DIGITAL INPUT 3
- DIGITAL INPUT 4
- DIGITAL INPUT 5

Status of auxiliary digital inputs
- AUX DIGITAL INPUT 1
- AUX DIGITAL INPUT 2
- AUX DIGITAL INPUT 3
- AUX DIGITAL INPUT 4
- AUX DIGITAL INPUT 5
- AUX DIGITAL INPUT 6
- AUX DIGITAL INPUT 7
- AUX DIGITAL INPUT 8

State of digital outputs
- OUTPUT 1
- OUTPUT 2
- OUTPUT 3
- OUTPUT 4

Status of auxiliary digital Outputs
- AUX OUTPUT 1
- AUX OUTPUT 2
- AUX OUTPUT 3
- AUX OUTPUT 4
- AUX OUTPUT 5
- AUX OUTPUT 6
- AUX OUTPUT 7
- AUX OUTPUT 8

Status of auxiliary relay Outputs
- AUX RELAY 1
- AUX RELAY 2
- AUX RELAY 3
- AUX RELAY 4
- AUX RELAY 5
- AUX RELAY 6
- AUX RELAY 7
- AUX RELAY 8

Menu navigation status
- HOME1 MENU
- HOME2 MENU

Function commands
- AU-MA1 (select Automatic / Manual for PID.1)
- LO-RE1 (select Local / Remote for PID.1)
- HOLD1 (variable hold of main input for PID.1)
- A.TUNE1 (activate Auto-Tuning for PID.1)
- S.TUNE1 (activate Self-Tuning 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)
- WREN (enable write configuration parameter)
- REC.0 (Select parameter recipe bit 0)
- REC.1 (Select parameter recipe bit 1)
- REC.2 (Select parameter recipe bit 2)
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.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)
PPR1.0  (start/stop programmer for PROGR.1 bit 0)
PPR1.1  (start/stop programmer for PROGR.1 bit 1)
PPR1.2  (start/stop programmer for PROGR.1 bit 2)
PPR1.3  (start/stop programmer for PROGR.1 bit 3)
PSTST1 (start/stop programmer for PROGR.1)
PSTR1  (start programmer for PROGR.1)
PSTOP1 (stop programmer for PROGR.1)
PRST1  (reset programmer for PROGR.1)
PSKP1  (skip to end program 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)
PPR2.0  (Select program for PROGR.2 bit 0)
PPR2.1  (Select program for PROGR.2 bit 1)
PPR2.2  (Select program for PROGR.2 bit 2)
PPR2.3  (Select program for PROGR.2 bit 3)
PSTST2 (start/stop programmer for PROGR.2)
PSTR2  (start programmer for PROGR.2)
PSTOP2 (stop programmer for PROGR.2)
PRST2  (reset programmer for PROGR.2)
PSKP2  (skip to end program 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 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 block 7)
CALC ALARM MATH8 (output in CALCULATION error state for math function block 8)
STATUS AUTOMATIC for PID.1
STATUS MANUAL for PID.1
STATUS LOCAL for PID.1
STATUS REMOTE for PID.1
STATUS AUTOMATIC for PID.2
STATUS MANUAL for PID.2
STATUS LOCAL for PID.2
STATUS REMOTE for PID.2
OUT1 SWITCH ALARM (OUT1.S count exceeded with output 1 SWITCH threshold)
OUT2 SWITCH ALARM (OUT2.S count exceeded with output 2 SWITCH threshold)
OUT3 SWITCH ALARM (OUT3.S count exceeded with output 3 SWITCH threshold)
OUT4 SWITCH ALARM (OUT4.S count exceeded with output 4 SWITCH threshold)
DIGITAL INPUT SWITCH ALARM (INDG.S count exceeded with SWITCH threshold)
MESSAGE 01 (show message at scroll 1)
MESSAGE 02 (show message at scroll 2)
MESSAGE 03 (show message at scroll 3)
MESSAGE 04 (show message at scroll 4)
MESSAGE 05 (show message at scroll 5)
MESSAGE 06 (show message at scroll 6)
MESSAGE 07 (show message at scroll 7)
MESSAGE 08 (show message at scroll 8)
MESSAGE 09 (show message at scroll 9)
MESSAGE 10 (show message at scroll 10)
MESSAGE 11 (show message at scroll 11)
MESSAGE 12 (show message at scroll 12)
MESSAGE 13 (show message at scroll 13)
MESSAGE 14 (show message at scroll 14)
MESSAGE 15 (show message at scroll 15)
MESSAGE 16 (show message at scroll 16)
MESSAGE 17 (show message at scroll 17)
MESSAGE 18 (show message at scroll 18)
MESSAGE 19 (show message at scroll 19)
MESSAGE 20 (show message at scroll 20)
MESSAGE 21 (show message at scroll 21)  L.C9 (logical coefficient 9)
MESSAGE 22 (show message at scroll 22)  L.C10 (logical coefficient 10)
MESSAGE 23 (show message at scroll 23)  L.C11 (logical coefficient 11)
MESSAGE 24 (show message at scroll 24)  L.C12 (logical coefficient 12)
MESSAGE 25 (show message at scroll 25)  L.C13 (logical coefficient 13)
MESSAGE 26 (show message at scroll 26)  L.C14 (logical coefficient 14)
MESSAGE 27 (show message at scroll 27)  L.C15 (logical coefficient 15)
MESSAGE 28 (show message at scroll 28)  L.C16 (logical coefficient 16)
MESSAGE 29 (show message at scroll 29)  L.C17 (logical coefficient 17)
MESSAGE 30 (show message at scroll 30)  L.C18 (logical coefficient 18)
MESSAGE 31 (show message at scroll 31)  L.C19 (logical coefficient 19)
MESSAGE 32 (show message at scroll 32)  L.C20 (logical coefficient 20)
HOME 1/2 MENU (set HOME1 or HOME2 if in HOME menu)  L.C21 (logical coefficient 21)
L.C22 (logical coefficient 22)
for regulator models with programmer there are also:
PROGRAMMER IN HBB ALARM for PROGR.1  L.C23 (logical coefficient 23)
PROGRAMMER IN RUN for PROGR.1  L.C24 (logical coefficient 24)
PROGRAMMER IN HOLD for PROGR.1  L.C25 (logical coefficient 25)
PROGRAMMER IN READY for PROGR.1  L.C26 (logical coefficient 26)
PROGRAMMER IN END for PROGR.1  L.C27 (logical coefficient 27)
STEP EVENT 1 for PROGR.1  L.C28 (logical coefficient 28)
STEP EVENT 2 for PROGR.1  L.C29 (logical coefficient 29)
STEP EVENT 3 for PROGR.1  L.C30 (logical coefficient 30)
STEP EVENT 4 for PROGR.1  L.C31 (logical coefficient 31)
STEP EVENT 5 for PROGR.1  L.C32 (logical coefficient 32)
PROGRAMMER IN HBB ALARM for PROGR.2  Status of digital outputs from Mathematical Function
PROGRAMMER IN RUN for PROGR.2  Blocks
PROGRAMMER IN HOLD for PROGR.2  MFB.1 DIGITAL OUTPUT
PROGRAMMER IN READY for PROGR.2  MFB.2 DIGITAL OUTPUT
PROGRAMMER IN END for PROGR.2  MFB.3 DIGITAL OUTPUT
STEP EVENT 1 for PROGR.2  MFB.4 DIGITAL OUTPUT
STEP EVENT 2 for PROGR.2  MFB.5 DIGITAL OUTPUT
STEP EVENT 3 for PROGR.2  MFB.6 DIGITAL OUTPUT
STEP EVENT 4 for PROGR.2  MFB.7 DIGITAL OUTPUT
STEP EVENT 5 for PROGR.2  MFB.8 DIGITAL OUTPUT
For models with Master serial you have:
MAS.01 (Master 1 value, for bit type data only)  Support coefficients (may be displayed and set in the
MAS.02 (Master 2 value, for bit type data only)  User menu)
MAS.03 (Master 3 value, for bit type data only)  L.C1 (logical coefficient 1)
MAS.04 (Master 4 value, for bit type data only)  L.C2 (logical coefficient 2)
MAS.05 (Master 5 value, for bit type data only)  L.C3 (logical coefficient 3)
MAS.06 (Master 6 value, for bit type data only)  L.C4 (logical coefficient 4)
MAS.07 (Master 7 value, for bit type data only)  L.C5 (logical coefficient 5)
MAS.08 (Master 8 value, for bit type data only)  L.C6 (logical coefficient 6)
MAS.09 (Master 9 value, for bit type data only)  L.C7 (logical coefficient 7)
MAS.10 (Master 10 value, for bit type data only) L.C8 (logical coefficient 8)
MAS.11 (Master 11 value, for bit type data only) L.C9 (logical coefficient 9)
MAS.12 (Master 12 value, for bit type data only) L.C10 (logical coefficient 10)
MAS.13 (Master 13 value, for bit type data only) L.C11 (logical coefficient 11)
MAS.14 (Master 14 value, for bit type data only) L.C12 (logical coefficient 12)
MAS.15 (Master 15 value, for bit type data only) L.C13 (logical coefficient 13)
MAS.16 (Master 16 value, for bit type data only) L.C14 (logical coefficient 14)
MAS.17 (Master 17 value, for bit type data only) L.C15 (logical coefficient 15)
MAS.18 (Master 18 value, for bit type data only) L.C16 (logical coefficient 16)
MAS.19 (Master 19 value, for bit type data only) L.C17 (logical coefficient 17)
MAS.20 (Master 20 value, for bit type data only) L.C18 (logical coefficient 18)
5.16.3. Programming logic Function Blocks

5.16.3.1. Configuration page

The GF_eXpress program's Logic Function Blocks configuration page lets you configure and debug the blocks.
1. Button to return to previous function block.
2. Number of function block and type of logic operations run.
3. Name of function block. You can insert an optional descriptive name of the function block.
4. Button to go to next function block.
5. Output value when result of function operations is true.
6. Graph of DELAY TIMER.
7. Name of output. You can insert an optional descriptive name of the output.
8. Type or variable of activated output.
9. Duration of ON delay.
10. Duration of OFF delay.
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 operation run. The input boxes also show the value that the input must assume in order to be considered “true”.
17. Selection of logic function applied to function block.
18. Button to print Logic Function Block in use.
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**
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 224.

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.

If digital inputs IN1, IN2, IN3, IN4, IN5 are among inputs \( a, b, c \) and \( d \), and you want them to be used only in Function Blocks, you have to configure the function Func = LFB.IN for them.

If you want to transmit the output state of a logic function block (LOGIC FUNCTION BLOCK OUTPUT 1...16) to an output OUT1...OUT4 of the controller, you have to configure the function F.out = LFB.O for these outputs and specify in FB.O.N the number of the function block output.

Complete the configuration by giving a descriptive name to each input so that it can be easily recognized for future use.
The name will be saved as part of the “configuration recipe” only on the PC and will not be transferred to the controller. Therefore, when the controllers are cloned, the controller to which the configuration was copied will not contain this descriptive name.

5.16.3.4. Configuring the output

Configure the output by selecting on the pull-down menu one of the values listed in the Function Commands group shown above in paragraph “5.16.2. Groups of variables” on page 224. This will be the output variable whose value will be changed by the result of the logic operation processed with the input variables data.

If the function given the output of the function block is the same assigned to a digital input, the state of this input has priority.

By clicking the output’s icon you can reverse, from normally open (NO) to normally closed (NC) and vice versa, the transmitted state if the result of the logic operation is “true.”

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 operation and the change in value of the output variable. These delays, which can differ from the “true” result and the “false” result of the logic operation, are set on the DELAY TIMER.

Delays can be counted in seconds or in minutes

Configure both delays:

- ON, which indicates how long after a “true” result of the logic operation the value of the output variable is changed.
- OFF, which indicates how long after a “false” result of the logic operation the value of the output variable is changed.

When the time is set to 0 (zero), the change in value of the output variable is instantaneous. If both delays for ON and OFF equal 0, the DELAY TIMER is ignored.

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 formatted). 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,
• 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 operation.

**Type 1 operations: 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 properly, 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 ( \( e^x \) ) 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”

**Type 2 operations: 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.
**Type 3 operations:** 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:** 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 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.
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.

**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”.
1. Button to return to previous Math Function Block.
2. Number of Math Function Block.
3. Name of Math Function Block. You can enter an optional descriptive name of the Math Function Block.
4. Button to go to next Math Function Block.
5. Button to print Math Function Block in use.
6. Name of output. You can enter an optional descriptive name of the output.
7. Output type or variable activated.
8. Setting limits control mode (Disabled => Limits calculated automatically, Enabled => Limits set by user)
9. Type of operation executed by Math Function Block in use.
10. Input type or variable evaluated for input b. Input b box is used for entering an optional descriptive name of input b.
11. Input type or variable evaluated for input a. Input a box is used for entering an optional descriptive name of input a.
12. Graphic representation of type of inputs (analog or digital) used by Math Function Block in use.
13. Selection of type of Math Function Block
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.

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.
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 \((c, d)\) you clicking the input’s symbol you can invert its reference state between normally open (NO) and normally closed (NC).

\[
\begin{array}{c|c}
\text{NO} & \text{NC} \\
\end{array}
\]

**ATTENTION:** Following a reboot of the controller after a Power ON, type 2 math function blocks always restart at their initial value. Specifically:
- 9999 for the block that memorizes the minimum,
- -1999 for the block that memorizes the maximum,
- 0 for Sample and Hold.

If you want to transmit the output state of a math function block (MATH FUNCTION BLOCK OUTPUT 1…8) to an analog output of the controller, simply assign the selected analog output to the MFB output.

If you select support coefficients as input variables, you have to set their value in the field provided.

Complete the configuration by giving a descriptive name to each input so that it can be easily recognized for future use.

The name will be memorized as part of the “configuration recipe” only on the PC and will not be transferred to the controller.

Therefore, when the controllers are cloned, the controller to which the configuration is copied will not contain the descriptive name.

5.17.3.4. Configuring the output

Configure the output by selecting (on the pull-down menu) one of the possible values listed in the Function Commands groups shown above in “5.17.2. Groups of variables” on page 201. This will be the output variable whose value will be changed by the result of the logic operation conducted with the input variables data.

End the configuration by giving a descriptive name to the output so that it can be easily recognized for future use.

The name will be memorized as part of the “configuration recipe” only on the PC and will not be transferred to the controller.

Therefore, when the controllers are cloned, the controller to which the configuration is copied will not contain the descriptive name.

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 formatted).

The window may be opened using the icon \(\text{Copy of Math Function Blocks} \) 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).

Example of copying recipes:

- Source recipe: Recipe 1
- Destination recipes: Recipe 2, Recipe 3, Recipe 4

5.18.5. 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
5.19. 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 forms 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 ACCESS=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 performed 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.

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**...

In the case of ACCESS=WRITE ONLY objects, the same value of a controller variable may be sent to multiple slave nodes 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 **40ms**
- With 2 objects, one of which has SPEED=HIGH while the other has SPEED=LOW: update 1 = update 2 = every **80ms**
- With 3 objects, one of which has SPEED=HIGH while two have SPEED=LOW: update 1 = **80ms**, update 2 = update 3 = every **160ms**

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=4.2ms) + (Response latency=5ms) + (RX message=4.2ms) = **13.4ms** (+ time of management of the RTS signal, if any)

Therefore:
- With 1 object: update every **20ms**
- With 2 objects, one of which has SPEED=HIGH while the other has SPEED=LOW: update 1 = update 2 = every **40ms**
- With 3 objects, one of which has SPEED=HIGH while two have SPEED=LOW: update 1 = **40ms**, update 2 = update 3 = every **80ms**

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.

**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.

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 operation 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:**
When assessing bit3 and bit6 in a word:

```
MASK=72 (0x48) e MAS.xx può 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].
5.19.3. 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.

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 operation).
- “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 operation 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 running on a 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).

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).
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).

Whichever method is used, if the assignment of new network parameters is successful the following screen will appear.

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.

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.
- 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. Operation as a device
Bridge with other devices

With the “ME = Ethernet Modbus TCP\RTU Bridge” option, the device can operate as a Modbus TCP\RTU bridge, permitting 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.

The 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
- BaudRate
- 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 permit 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.NT1 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.
5.21. Webserver function

The Modbus TCP option also forms 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.

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 achieve access and select the Cancel command, a message will appear in the browser. Warning: user and password are NOT encrypted!

The main page appears, as shown below

Quantities are displayed (editable variables appear in blue)
• PV1, PV2 (process value)
• 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: forms 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

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

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

There are two paragraphs on this page:
• MODELINFO WITH:
  - SW version
  - Serial code
  - Input error 1 and 2
  - Sap code
  - Serial number
  - Opt HW and SW
• DIAGNOSTICS with:
  - Working days; total days of operation
  - Internal temp, internal temperature
  - Min temp, minimum internal temperature
  - Max temp, maximum internal temperature

Go to the WIZARD page and click on the link to access the corresponding page

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

![Image](image1.png)

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

• **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

![Image](image2.png)

- **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 serial 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:

**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.

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 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):

![Instrument menu set-up](image)

This button opens a new window containing all the menus that may be displayed on the instrument

![Menu selection](image)

Select one of the n menus and another window will open formatting selection of individual menu parameters:

![Menu selection window](image)

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
In addition to the weekly calendar, two one-shot events may be set via the user menu, either on the instrument or in GF_eXpress:

**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.

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 performed in events 1 to 4
- **CALENDAR_DAYS_ENABLE_X**: enable day of the week

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
6. PROGRAMMING WITH PC

6.1. Controller-PC connection

The controller has a port to connect the device to a PC. The following photos show where the port is located on the different controller models. Models 1650 and 1850 differ only in the size of the case.

The connection requires a special accessory cable (code F060800), which acts as a USB-serial interface/converter and communicates as a Virtual COM Port with a USB port on the computer.

⚠️ Attention! To use this interface you have to install the VCP driver, downloadable from: www.gefran.com/en/products/261-gf_express#-downloads.

When the controller is connected to the PC you can configure it rapidly even when it is not powered. The instrument configuration memory is powered by the USB connection. Connecting the controller to the primary power supply while the USB cable is still connected DOES NOT activate normal Power-on. You must first disconnect the controller from the PC and then apply primary power.

6.2. Programming Tool

6.2.1. GF_eXpress

The GF_eXpress software lets you:
- read and write the configuration of controller (set of parameters);
- save recipes on the PC (recipe archive);
- display as graph / set all parameters needed for the Programmer function;
- display/set Logic operations (Function Blocks);
- display/set math operations (function blocks);
- set structure of parameters recipes;
- set sequence and parameters of user configuration menu;
- set message strings (3 selectable languages);
- transfer any firmware updates

The software is available on CD-rom (code F043958). The program can be updated automatically from www.gefran.com.

6.2.1. System requirements

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oforating system</td>
<td></td>
</tr>
<tr>
<td>Windows XP SP2 or Windows Vista or Windows 7 (32 bit)</td>
<td>Windows 7 (64 bit)</td>
</tr>
<tr>
<td>Processor</td>
<td></td>
</tr>
<tr>
<td>Intel Pentium 1 GHz</td>
<td>Intel Core i5 2.5 Ghz or higher</td>
</tr>
<tr>
<td>RAM</td>
<td></td>
</tr>
<tr>
<td>2 GB</td>
<td>4 GB or higher</td>
</tr>
<tr>
<td>Free space on Hard Disk</td>
<td></td>
</tr>
<tr>
<td>2 GB</td>
<td>4 GB or higher</td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
</tr>
<tr>
<td>XGA (1024 x 768 pixel)</td>
<td>SXGA (1280 x 1024 pixel) or higher</td>
</tr>
<tr>
<td>Browser</td>
<td></td>
</tr>
<tr>
<td>Microsoft Internet Explorer 8.0</td>
<td>Microsoft Internet Explorer 9.0 or higher</td>
</tr>
<tr>
<td>Ethernet port</td>
<td></td>
</tr>
<tr>
<td>1 RJ45</td>
<td>1 RJ45</td>
</tr>
<tr>
<td>DVD reader</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>USB port</td>
<td></td>
</tr>
<tr>
<td>1 USB 2.0</td>
<td>1 USB 2.0</td>
</tr>
</tbody>
</table>
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:

- 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.

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 [A] and [V] keys to raise and lower the setpoint to the value required.

Press the [F] key to save the SP value; otherwise, the set value is saved about 15 seconds after the last change.
7.4. Operation as programmer

7.4.1. Activating the programmer

To enable the Programmer function, set parameter PROGR = On1, On2, On.S. on the EN.FUNC menu. The following parameters are entered as default on the user menu:

- PROG.STATUS_1 which lets you request the display/check of PROGRAMMER 1
- PROG.STATUS_2, which lets you request the display/check of PROGRAMMER 2

7.4.2. Display indication

The different controller models display programmer status information in different ways. The following examples show how the same information is displayed on the 850, 1650, and 1850 controllers. Compared to the model 850, models 1650 and 1850 also show the process variable value (PV_1 PROG.STATUS_1 and PV_2 PROG.STATUS_2).

Compared to the other two models, the model 1850 also shows the setpoint value of the active step.

1. Indication of programmer status. When on, programmer is on.
2. Number of program running (number 2 in example).
3. Number of program step running (number 5 in example).
4. LED RUN: on indicates that program is running; flashing indicates that program is in STOP, END or HOLD, and that the time base is stopped.
5. LED RAMP: on indicates that program is running the ramp segment of the step; off means that it is in the hold segment of the step or at end of program (in example: running ramp of step 5).
6. Current time of segment (ramp or hold) of step. The time value depends on the set base times, hh:mm or mm:ss (in example: elapsed time is 20 minutes and 42 seconds).
7. Process variable PV_1 or PV_2 depending on whether you are in PROG.STATUS_1 or in PROG.STATUS_2 (in example: 118).
8. Setpoint of current step, i.e. the value to be reached (in example: 120).
7.5. Errors during operation

If errors occur during normal operation, the HOME.x pages will show:

- the name of the error on the PV display
- the value of the setpoint or control output on the SV display (only on models 1650 and 1850).
- a scrolling message with errors detected, on display SV (model 850) or on display F (models 1650 and 1850).

The most common error messages are:

**Lou**  Process variable is below minimum scale limit (parameter LO.SCL on I.MAIN).
**High**  Process variable is above maximum scale limit (parameter HI.SCL on I.MAIN).
**Err**   PT100 in short circuit or input values below minimum limits (for example, thermocouple with incorrect connection) or 4...20 mA transmitter broken or not powered.
**Sbr**   Sensor broken or input values above maximum limit.
7.6. Configuration (User menu)

Every operator has a freely accessible menu (no password required) on which he can configure some controller parameters.

The User Configuration menu can be built according to need with the GF_express software, grouping up to 100 parameters from those available for controller configuration (see chapter “4. Configuration” on page “4. CONFIGURATION” on page <?>). 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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit of misura</th>
<th>Valid values</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETP1</td>
<td>Local setpoint 1</td>
<td>scale points</td>
<td>LO.SP1...HI.SP1</td>
</tr>
<tr>
<td>ALRM1</td>
<td>Alarm 1 limit</td>
<td>scale points</td>
<td>LO.AL1...HI.AL1 -999...999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If absolute alarm.</td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>ALRM2</td>
<td>Alarm 2 limit</td>
<td>scale points</td>
<td>LO.AL1...HI.AL1 -999...999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If absolute alarm.</td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>ALRM3</td>
<td>Alarm 3 limit</td>
<td>scale points</td>
<td>LO.AL1...HI.AL1 -999...999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If absolute alarm.</td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>ALRM4</td>
<td>Alarm 4 limit</td>
<td>scale points</td>
<td>LO.AL1...HI.AL1 -999...999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If absolute alarm.</td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>AL.ACK</td>
<td>Reset alarms latch and LBA alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS.ACK</td>
<td>Reset scrolling message</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUT.P1</td>
<td>Control output value 1</td>
<td></td>
<td>-100.0...100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off / ON</td>
<td></td>
</tr>
<tr>
<td>Visualizzazione Home</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.STPN in the following figure), the number of the indexed submenu is always 1.
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 261).

8.5. Troubleshooting

The following table shows the most common controller faults and their remedies.

<table>
<thead>
<tr>
<th>Message or problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 9. TECHNICAL DATA

### 9.1. Controller 850

<table>
<thead>
<tr>
<th>OPERATOR INTERFACE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>LCD black background</td>
</tr>
<tr>
<td><strong>Screen area (L x H)</strong></td>
<td>35 × 30 mm</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>Backlit with LEDs, life &gt; 40.000 hours @ 25 °C (with brightness level backl = 8)</td>
</tr>
<tr>
<td><strong>PV display</strong></td>
<td>Number of digits: 4 to 7 segments, with decimal point; Digit height: 17 mm; Color: white</td>
</tr>
<tr>
<td><strong>SV display</strong></td>
<td>Number of digits: 5 to 14 segments, with decimal point; Digit height: 7.5 mm; Color: green</td>
</tr>
<tr>
<td><strong>Unit of measurement</strong></td>
<td>Selectable, °C, °F or custom ¹; Color: same as PV display</td>
</tr>
<tr>
<td><strong>Controller state signals</strong></td>
<td>Number: 6 (RUN, MAN, _/-, REM, SP1/2); Color: amber</td>
</tr>
<tr>
<td><strong>Output state signals</strong></td>
<td>Number: 4 (1, 2, 3, 4); Color: red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KEYPAD</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of keys</strong></td>
<td>4 silicon (Man/Auto, INC, DEC, F)</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>mechanical</td>
</tr>
</tbody>
</table>

¹ Programming is done with the GF_eXpress configuration program
### 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 AMS2750E, 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 polynomials; 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
- Types: 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 Type: linear
  - Scale: -1999...9999, settable decimal point
- Insulation Functional insulation between main and auxiliary inputs

#### TA (ammeter) INPUT

- Type Isolated via external transformer
- Number: 2 max
- Max. capacity: x / 50 mA AC
- Line frequency: 50/60 Hz
- Input impedance (Ri): 10 Ω
- Accuracy ±2% f.s. ±1 digit @25 °C

#### DIGITAL INPUTS

- Type voltage-free contact, or NPN 24 V - 4,5 mA, o
  - PNP 12/24 V - max 3,6 mA
  - for detail see electrical connections
- Isolation 250 V
- Number 3 max
## Outputs

**Relay (R)**
- Number: 3 max (4 max con 3 relè con contatto in comune)
- Tipo di contatto relè: NO
- Corrente max: 5A (2A per certificazione UL), 250VAC
- Carico minimo: 5 V, 10 mA
- 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, R\text{out} > 500 Ω
  - 0...20 mA, 4...20 mA, R\text{out} < 500 Ω
- Resolution: 12 bit
- Insulation compared to main input

**Analog retransmission (A1)**
- Number: 1 max
  - 0...10 V, max 20 mA, R\text{out} > 500 Ω
  - 0...20 mA, 4...20 mA, R\text{out} < 500 Ω
- Resolution: 12 bit
- Insulation compared to main input

## Alarms

**Number of alarm functions**
- 4 max, assignable to an output

**Possible configurations**
- Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, 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

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>Type</th>
<th>Single loop, double loop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>PID, ON/OFF, single action heat or cool, double action heat/cool</td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td>Continuous or ON/OFF Cycle time: constant or optimized (BF)</td>
<td></td>
</tr>
<tr>
<td>Control output for motorized valves</td>
<td>OPEN/CLOSE for floating motorized valve or with feedback with position control by potentiometer on Relay, Solid-state, Triac outputs.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SETPOINT PROGRAMMER</th>
<th>Number of programs</th>
<th>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</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of steps</td>
<td>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</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MULTIPLE SETPOINTS</th>
<th>Number of setpoints</th>
<th>Max 4, selectable from digital input Each setpoint change is subject to set ramp, different for up and down ramp</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>LOGIC OPERATIONS</th>
<th>Digital function blocks</th>
<th>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</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>OPERATIONS MATHEMATICAL</th>
<th>Analog function blocks</th>
<th>Max 8, with 2 input variables per block, with operators such as +, -, x, ÷, average, square root, ... The result may act on analog variables in input to PID loops (controlled variable, setpoint) or analog outputs</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>TIMER FUNCTION</th>
<th>Number timer</th>
<th>Standard: 1 If double loop: 2 independent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modes</td>
<td>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)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENERGY COUNTER</th>
<th>Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DIAGNOSTIC</th>
<th>Short circuit or open circuit (LBA alarm) Interrupted or partially interrupted load (HB alarm) Short circuit of control output (SSR alarm)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>RETENTIVE MEMORY</th>
<th>Type</th>
<th>FRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writes</td>
<td>Max. number: &gt; 10(^{10}) cycles Retention: &gt; 10 years</td>
<td></td>
</tr>
</tbody>
</table>

(*) 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) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power dissipation</td>
<td>10 W max</td>
<td></td>
</tr>
<tr>
<td>Protections</td>
<td>Overvoltage 300 V / 35 V</td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>Screw terminals and crimp connector, max. wire section 1 mm²</td>
<td></td>
</tr>
</tbody>
</table>

### 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 2.5mm²

- **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 2.5mm²

- **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 2.5mm²

- **Ethernet Modbus TCP and Webserver (optional)**
  - Baudrate: 10/100BaseTX, 10/100Mbit/s
  - Protocol: Modbus TCP slave, Webserver integrato
  - Isolation from other peripherals
  - Standard RJ45 connector

<table>
<thead>
<tr>
<th><strong>AMBIENT CONDITIONS</strong></th>
<th>Use</th>
<th>Internal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROTECTION LEVEL</strong></td>
<td>Altitude</td>
<td>2000 m max</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10 ... +55 °C (as per IEC 68-2-14)</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20 ... +70 °C (as per IEC 68-2-14)</td>
<td></td>
</tr>
<tr>
<td>Relative humidity</td>
<td>20...85% RH non-condensing (as per IEC 68-2-3)</td>
<td></td>
</tr>
<tr>
<td><strong>DIMENSIONS</strong></td>
<td>IP 65 on front panel (as per IEC 68-2-3)</td>
<td></td>
</tr>
<tr>
<td><strong>WEIGHT</strong></td>
<td>Positioning</td>
<td>On panel, removable faceplate</td>
</tr>
<tr>
<td><strong>CE STANDARDS</strong></td>
<td>Installation category: II</td>
<td></td>
</tr>
<tr>
<td>Installation regulations</td>
<td>Poluition degree: 2</td>
<td></td>
</tr>
<tr>
<td>Isolation: double</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 X 48 mm (1/16 DIN), Depth: 100 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PESO</strong></th>
<th>0,16 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NORME CE</strong></td>
<td>EMC conformity (electromagnetic compatibility)</td>
</tr>
<tr>
<td>Conforms to Directive 2014/30/EU norme EN 61326-1</td>
<td></td>
</tr>
<tr>
<td>Emissions in industrial environment classe A</td>
<td></td>
</tr>
<tr>
<td>LVD safety</td>
<td>Conforms to Directive 2014/35/EU norme EN 61010-1</td>
</tr>
</tbody>
</table>

### 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 AMS2750E, paragraph 3.3.1.

- **Europe**
  - CE, RoHS, REACH

- **USA, Canada**
  - UL, cUL

- **Russia**
  - EAC

---

1) Programming is done through the GF_eXpress configuration program
## OPERATOR INTERFACE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>LCD black background</td>
</tr>
<tr>
<td><strong>Screen area (L x H)</strong></td>
<td>37 x 68 mm</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>Backlit with LEDs, life &gt; 40,000 hours @ 25 °C</td>
</tr>
<tr>
<td></td>
<td>(with brightness level backl = 8)</td>
</tr>
<tr>
<td><strong>PV display</strong></td>
<td>Number of digits: 4 to 7 segments, with decimal point</td>
</tr>
<tr>
<td></td>
<td>Digit height: 17 mm</td>
</tr>
<tr>
<td></td>
<td>Color: white</td>
</tr>
<tr>
<td><strong>SV display</strong></td>
<td>Number of digits: 4 to 7 segments, with decimal point</td>
</tr>
<tr>
<td></td>
<td>Digit height: 14 mm</td>
</tr>
<tr>
<td></td>
<td>Color: green</td>
</tr>
<tr>
<td><strong>F display</strong></td>
<td>Number of digits: 5 to 14 segments, with decimal point</td>
</tr>
<tr>
<td></td>
<td>Digit height: 9 mm</td>
</tr>
<tr>
<td></td>
<td>Color: amber</td>
</tr>
<tr>
<td><strong>Unit of measurement</strong></td>
<td>Selectable, °C, °F or custom ¹</td>
</tr>
<tr>
<td></td>
<td>Color: same as PV display</td>
</tr>
<tr>
<td><strong>Controller state signals</strong></td>
<td>Number: 6 (RUN, MAN, _/-, REM, SP1/2)</td>
</tr>
<tr>
<td></td>
<td>Color: amber</td>
</tr>
<tr>
<td><strong>Output state signals</strong></td>
<td>Number: 4 (1, 2, 3, 4)</td>
</tr>
<tr>
<td></td>
<td>Color: red</td>
</tr>
<tr>
<td><strong>Bargraph indicator, configurable</strong></td>
<td>Type: graphic bargraph,11 segments</td>
</tr>
<tr>
<td></td>
<td>Power indication: 0 ... 100% o -100 ... 100%</td>
</tr>
<tr>
<td></td>
<td>Current indication: 0 ... 100% f.s.</td>
</tr>
<tr>
<td></td>
<td>Valve position indication: 0 ... 100%</td>
</tr>
<tr>
<td><strong>Bargraph indicator</strong></td>
<td>Type: double bar, 11 segments</td>
</tr>
<tr>
<td></td>
<td>Indication of process variable and setpoint: 0...100% f.s.</td>
</tr>
<tr>
<td><strong>KEYPAD</strong></td>
<td>Keys number: 4, silicone (Man/Auto, INC,DEC,F)</td>
</tr>
<tr>
<td></td>
<td>Type: mechanical</td>
</tr>
</tbody>
</table>
## INPUTS

<table>
<thead>
<tr>
<th><strong>Sensor type</strong></th>
<th><strong>MAIN AND AUXILIARY INPUT (Main, Aux1, Aux2)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensor type</strong></td>
<td><strong>Sensor type</strong></td>
</tr>
<tr>
<td>Thermocouples, RTD (PT100, JPT100), IR pyrometers with type K output, 4…20mA, 0…20mA, 10V, 5V, 1V, 60mV, potenziometer</td>
<td>• Thermocouples, RTD (PT100, JPT100), IR pyrometers with type K output, 4…20mA, 0…20mA, 10V, 5V, 1V, 60mV, potenziometer</td>
</tr>
<tr>
<td>Reading accuracy : ±0.1% of value read</td>
<td>• Reading accuracy : ±0.1% of value read</td>
</tr>
</tbody>
</table>

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 AMS2750E, 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 polynomials; 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

<table>
<thead>
<tr>
<th><strong>TA (ammeter) INPUT</strong></th>
<th><strong>Digital filter</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>Number</strong> 2 max</td>
</tr>
<tr>
<td>Max. capacity: x / 50 mA AC</td>
<td>Max. capacity: x / 50 mA AC</td>
</tr>
<tr>
<td>Line frequency: 50/60 Hz</td>
<td>Line frequency: 50/60 Hz</td>
</tr>
<tr>
<td>Input impedance (RI): 10 Ω</td>
<td>Input impedance (RI): 10 Ω</td>
</tr>
</tbody>
</table>

**Accuracy**
±2% f.s. ±1 digit @25 °C

### DIGITAL INPUTS

| **Number** 5 max |
| **Type** Voltage-free contact, or NPN 24 V - 4,5 mA, o PNP 12/24 V - max 3,6 mA |
| **Isolation** 250 V |

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### Outputs

<table>
<thead>
<tr>
<th>Relay (R)</th>
<th><strong>Number:</strong> 4 max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of relay contact:</strong> NO</td>
<td></td>
</tr>
<tr>
<td><strong>Max. current:</strong> 5A (2A at ambient temperature up to 45 °C for certification UL), 250VAC / 30 VDC, cosφ = 1</td>
<td></td>
</tr>
<tr>
<td><strong>Minimum load:</strong> 5 V, 10 mA</td>
<td></td>
</tr>
<tr>
<td><strong>Number of operations:</strong> &gt; 600,000 @ 2A load current</td>
<td></td>
</tr>
<tr>
<td><strong>Double isolation Installation of an external R-C suppressor (“snubber”) is recommended</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Logic (D)</th>
<th><strong>Number:</strong> 2 max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type:</strong> for solid-state relays</td>
<td></td>
</tr>
<tr>
<td><strong>Voltage:</strong> 24 V ±10% (min 10 V @20 mA)</td>
<td></td>
</tr>
<tr>
<td><strong>Isolated from main input</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Isolated logic (M)</th>
<th><strong>Number:</strong> 2 max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type:</strong> MOS optoisolated for PLC inputs and AC/DC load</td>
<td></td>
</tr>
<tr>
<td><strong>Voltage:</strong> 30 V AC/DC max</td>
<td></td>
</tr>
<tr>
<td><strong>Current:</strong> 100 mA max</td>
<td></td>
</tr>
<tr>
<td><strong>Resistance ON:</strong> 0,8 Ω max</td>
<td></td>
</tr>
<tr>
<td><strong>Isolation:</strong> 1500 V</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Triac (long life relay) (T)</th>
<th><strong>Number:</strong> 1 max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Load:</strong> resistive</td>
<td></td>
</tr>
<tr>
<td><strong>Voltage:</strong> 75...240 VAC</td>
<td></td>
</tr>
<tr>
<td><strong>Current max:</strong> 1 A</td>
<td></td>
</tr>
<tr>
<td><strong>Isolation:</strong> 3 kV</td>
<td></td>
</tr>
<tr>
<td><strong>Snubber circuit integrated zero crossing switching</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Continuous (C)</th>
<th><strong>Number:</strong> 1 max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current:</strong> 4...20mA</td>
<td></td>
</tr>
<tr>
<td><strong>R&lt;sub&gt;out&lt;/sub&gt;</strong> &lt; 500 Ω</td>
<td></td>
</tr>
<tr>
<td><strong>Resolution:</strong> 12 bit</td>
<td></td>
</tr>
<tr>
<td><strong>Isolated from main input</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog retransmission (A1) (A2)</th>
<th><strong>Number:</strong> 2 max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0...10 V, max 20 mA, R&lt;sub&gt;out&lt;/sub&gt;: &gt; 500 Ω</strong></td>
<td></td>
</tr>
<tr>
<td><strong>0...20 mA, 4...20 mA, R&lt;sub&gt;out&lt;/sub&gt;: &lt; 500 Ω</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Resolution:</strong> 12 bit</td>
<td></td>
</tr>
<tr>
<td><strong>Isolated from main input</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Alarms

<table>
<thead>
<tr>
<th><strong>Number of alarm functions</strong></th>
<th>4 max, assignable to an output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Possible configurations</strong></td>
<td>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</td>
</tr>
</tbody>
</table>

### Power Supply

<table>
<thead>
<tr>
<th>For sensor VT1, VT2</th>
<th><strong>Voltage:</strong> 24 VDC ±10%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current max:</strong> 30 mA</td>
<td></td>
</tr>
<tr>
<td><strong>VT1 option of Out3</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For potentiometer VP</th>
<th><strong>Voltage:</strong> 1 VDC ±1%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current max:</strong> 30 mA</td>
<td></td>
</tr>
</tbody>
</table>
### CONTROL FUNCTIONS

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>Type</th>
<th>Single loop, double loop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>PID, ON/OFF, single action heat or cool, double action heat/cool</td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td>Continuous or ON/OFF Cycle time: constant or optimized (BF)</td>
<td></td>
</tr>
<tr>
<td>Control output for motorized valves</td>
<td>OPEN/CLOSE for floating motorized valve or with feedback with position control by potentiometer on Relay, Solid-state, Triac outputs.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SETPOINT PROGRAMMER</th>
<th>Number of programs</th>
<th>Max 16 (if double loop 8 + 8) (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Double programmer if double loop)</td>
<td>Start / Stop / Reset / Skip via digital inputs and/or outputs from logic operations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output state: Run /Hold / Ready / End</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of steps</td>
<td>Max 192, each with own setpoint, ramp time and hold time (**)</td>
</tr>
<tr>
<td></td>
<td>Times settable in HH:MM or MM:SS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max 4 consents, configurable for ramp and for hold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max 4 events, configurable in ramp and in hold</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MULTIPLE SETPOINTS</th>
<th>Number of setpoints</th>
<th>Max 4, selectable from digital input</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Each setpoint change is subject to set ramp, different for up and down ramp</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOGIC OPERATIONS</th>
<th>Digital function blocks</th>
<th>Max 32, with 4 input variables per block.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Double programmer if double loop)</td>
<td>The result can act on the state of the controller, of the programmer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>on alarms and outputs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Each function contains a block type AND, OR, with TIMER</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPERATIONS MATHEMATICAL</th>
<th>Analog function blocks</th>
<th>Max 8, with 2 input variables per block, with operators such as + , - , x , : , average, square root, ...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The result may act on analog variables in input to PID loops (controlled variable, setpoint) or analog outputs .</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIMER FUNCTION</th>
<th>Modes</th>
<th>START / STOP (2 timer if double loop)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FIRING (timed activation of control after power on)</td>
<td></td>
</tr>
</tbody>
</table>

| ENERGY COUNTER | Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT |

<table>
<thead>
<tr>
<th>DIAGNOSTIC</th>
<th>Short circuit or open circuit (LBA alarm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interrupted or partially interrupted load (HB alarm)</td>
</tr>
<tr>
<td></td>
<td>Short circuit of control output (SSR alarm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RETENTIVE MEMORY</th>
<th>Type</th>
<th>FRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max. number of writes</td>
<td>Number max: &gt; 10^10 cycles</td>
</tr>
<tr>
<td></td>
<td>Retention: &gt; 10 anni</td>
<td></td>
</tr>
</tbody>
</table>

(*) 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

<table>
<thead>
<tr>
<th><strong>POWER SUPPLY</strong></th>
<th><strong>Operating voltage</strong></th>
<th>100...240 VAC/VDC ±10%, 50/60 Hz  (20...27 VAC/VDC ±10%, 50/60 Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Power dissipation</strong></td>
<td>10 W max</td>
</tr>
<tr>
<td></td>
<td><strong>Protections</strong></td>
<td>Overvoltage 300 V / 35 V</td>
</tr>
<tr>
<td></td>
<td><strong>Connection</strong></td>
<td>Screw terminals and crimp connector, max. wire section 1 mm²</td>
</tr>
<tr>
<td><strong>CONNECTIONS</strong></td>
<td><strong>Serial configuration port</strong></td>
<td>Connector: microUSB</td>
</tr>
<tr>
<td></td>
<td><strong>RS485 (option)</strong></td>
<td>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 2.5mm²</td>
</tr>
<tr>
<td></td>
<td><strong>Master Modbus</strong></td>
<td>Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s  Protocol: Modbus RTU Master Connector: RJ10</td>
</tr>
<tr>
<td></td>
<td><strong>RTU Bridge</strong></td>
<td>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 2.5mm²</td>
</tr>
<tr>
<td></td>
<td><strong>Ethernet Modbus TCP e Webserver (opzione)</strong></td>
<td>Baudrate : 10/100BaseTX, 10/100Mbit/s  Protocol : Modbus TCP slave, integrated Webserver Isolamento compared to other peripherals RJ45 Standard connector Screw terminals and crimp connector, max. wire section 2.5mm²</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>AMBIENT CONDITIONS</strong></th>
<th><strong>Use</strong></th>
<th>Indoor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Altitude</strong></td>
<td>2000 m max</td>
</tr>
<tr>
<td></td>
<td><strong>Operating temperature</strong></td>
<td>-10 ... +55 °C (as per IEC 68-2-14)</td>
</tr>
<tr>
<td></td>
<td><strong>Storage temperature</strong></td>
<td>-20 ... +70 °C (as per IEC 68-2-14)</td>
</tr>
<tr>
<td></td>
<td><strong>Relative humidity</strong></td>
<td>20...85% RH non-condensing (as per IEC 68-2-3)</td>
</tr>
</tbody>
</table>

| **PROTECTION LEVEL** | **IP 65 on front panel (as per IEC 68-2-3)** |

<table>
<thead>
<tr>
<th><strong>ASSEMBLY</strong></th>
<th><strong>Positioning</strong></th>
<th>On panel, removable faceplate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Installation regulations</strong></td>
<td>Installation category: II Pollution degree: 2 Isolation: double</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DIMENSIONS</strong></th>
<th><strong>48 X 96 mm (1/8 DIN)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Depth</strong></td>
</tr>
</tbody>
</table>

| **WEIGHT** | **0,24 kg** |

<table>
<thead>
<tr>
<th><strong>CE STANDARDS</strong></th>
<th><strong>EMC conformity</strong> (electromagnetic compatibility)</th>
<th>Conforms to Directive 2014/30/EU norme EN 61326-1 Emissions in industrial environment classe A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>LVD safety</strong></td>
<td>Conforms to Directive 2014/35/EU norme EN 61010-1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CERTIFICATIONS</strong></th>
<th><strong>Generals</strong></th>
<th>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 AMS2750E, paragraph 3.3.1.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Europe</strong></td>
<td>CE, RoHS, REACH</td>
</tr>
<tr>
<td></td>
<td><strong>USA, Canada</strong></td>
<td>UL, cUL</td>
</tr>
<tr>
<td></td>
<td><strong>Russia</strong></td>
<td>EAC</td>
</tr>
</tbody>
</table>

1) Programming is done with the GF_eXpress configuration program.
### 9.3. Controller 1850

#### OPERATOR INTERFACE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>LCD black background</td>
</tr>
<tr>
<td>Screen area (L x H)</td>
<td>83 x 68 mm</td>
</tr>
<tr>
<td>Lighting</td>
<td>Backlit with LEDs, life &gt; 40,000 hours @ 25°C (with brightness level backl = 0.8)</td>
</tr>
<tr>
<td>PV display</td>
<td>Number of digits: 4 to 7 segments, with decimal point</td>
</tr>
<tr>
<td></td>
<td>Digit height: 23 mm</td>
</tr>
<tr>
<td></td>
<td>Color: white</td>
</tr>
<tr>
<td>SV display</td>
<td>Number of digits: 4 to 7 segments, with decimal point</td>
</tr>
<tr>
<td></td>
<td>Digit height: 11 mm</td>
</tr>
<tr>
<td></td>
<td>Color: green</td>
</tr>
<tr>
<td>F display</td>
<td>Number of digits: 7 to 14 segments, with decimal point</td>
</tr>
<tr>
<td></td>
<td>Digit height: 9 mm</td>
</tr>
<tr>
<td></td>
<td>Color: amber</td>
</tr>
<tr>
<td>Unit of measurement</td>
<td>Selectable, °C, °F or custom ¹</td>
</tr>
<tr>
<td></td>
<td>Color: same as PV display</td>
</tr>
<tr>
<td>Controller state signals</td>
<td>Number: 6 (RUN, MAN, _/-, REM, SP1/2)</td>
</tr>
<tr>
<td></td>
<td>Color: amber</td>
</tr>
<tr>
<td>Output state signals</td>
<td>Number: 4 (1, 2, 3, 4)</td>
</tr>
<tr>
<td></td>
<td>Color: red</td>
</tr>
<tr>
<td>Bargraph indicator, configurable</td>
<td>Type: graphic bargraph, 11 segments</td>
</tr>
<tr>
<td></td>
<td>Power indication: 0...100% or -100...100%</td>
</tr>
<tr>
<td></td>
<td>Current indication: 0...100% f.s.</td>
</tr>
<tr>
<td></td>
<td>Valve position indication: 0...100%</td>
</tr>
<tr>
<td>Bargraph indicator</td>
<td>Type: double bar, 11 segments</td>
</tr>
<tr>
<td></td>
<td>Indication of process variable and setpoint: 0...100% f.s.</td>
</tr>
<tr>
<td>Inputs/outputs state signal (only with option)</td>
<td>Number: 8 inputs, 8 outputs</td>
</tr>
<tr>
<td></td>
<td>Color: green for inputs, red for outputs</td>
</tr>
<tr>
<td></td>
<td>Control via FB outputs</td>
</tr>
</tbody>
</table>

#### DISPLAY

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV display</td>
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</tr>
<tr>
<td></td>
<td>Digit height: 23 mm</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Digit height: 11 mm</td>
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<tr>
<td></td>
<td>Color: green</td>
</tr>
<tr>
<td>F display</td>
<td>Number of digits: 7 to 14 segments, with decimal point</td>
</tr>
<tr>
<td></td>
<td>Digit height: 9 mm</td>
</tr>
<tr>
<td></td>
<td>Color: amber</td>
</tr>
<tr>
<td>Unit of measurement</td>
<td>Selectable, °C, °F or custom ¹</td>
</tr>
<tr>
<td></td>
<td>Color: same as PV display</td>
</tr>
<tr>
<td>Controller state signals</td>
<td>Number: 6 (RUN, MAN, _/-, REM, SP1/2)</td>
</tr>
<tr>
<td></td>
<td>Color: amber</td>
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</tr>
<tr>
<td></td>
<td>Color: red</td>
</tr>
<tr>
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<td>Type: graphic bargraph, 11 segments</td>
</tr>
<tr>
<td></td>
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</tr>
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<td></td>
<td>Current indication: 0...100% f.s.</td>
</tr>
<tr>
<td></td>
<td>Valve position indication: 0...100%</td>
</tr>
<tr>
<td>Bargraph indicator</td>
<td>Type: double bar, 11 segments</td>
</tr>
<tr>
<td></td>
<td>Indication of process variable and setpoint: 0...100% f.s.</td>
</tr>
<tr>
<td>Inputs/outputs state signal (only with option)</td>
<td>Number: 8 inputs, 8 outputs</td>
</tr>
<tr>
<td></td>
<td>Color: green for inputs, red for outputs</td>
</tr>
<tr>
<td></td>
<td>Control via FB outputs</td>
</tr>
</tbody>
</table>

#### KEYPAD

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keys number</td>
<td>6, silicone (Man/Auto, L/R, *, INC, DEC, F)</td>
</tr>
<tr>
<td>Type</td>
<td>mechanical</td>
</tr>
</tbody>
</table>
**INPUTS**

### 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 AMS2750E, 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 polynomials; 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
- Types: 0…60mV, 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
- Type: Isolated via external transformer
- Number: 2 max
- Max. capacity: x / 50 mA AC
- Line frequency: 50/60 Hz
- Input impedance (Ri): 10 Ω

### Accuracy
- ±2% f.s. ±1 digit @25 °C

### DIGITAL INPUTS
- Type: voltage-free contact, or
- NPN 24 V - 4.5 mA, o
- PNP 12/24 V - max 3.6 mA
- For detail see electrical connections
- Isolation: 250 V
### 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  
|-------------------------------|--------------------------------------------------------|
| Voltage: 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 |

### 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%  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current max: 30 mA</td>
<td></td>
</tr>
</tbody>
</table>

### INPUTS / OUTPUTS

| Digital Inputs/Outputs | Number: 8, in two groups (5 + 3 with separate power supply)  
|------------------------|--------------------------------------------------------|
| Input: PNP 24 VDC, 5 mA  
| Output: PNP with 24 VDC external power supply, ±25%, max 100 mA, short circuit protection with PTC  
| Isolation: 250 V |

| Relay | Number: 8, in two groups (5 + 3 relays with common contact)  
|----------------|--------------------------------------------------------|
| Type of relay contact: NO  
| Max. current: 5A (at ambient temperature up to 45 °C for certification UL), 250VAC / 30VDC, cosφ = 1  
| Maximum 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

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Single/Double loop</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>PID, ON/OFF, single action heat or cool, double action heat/cool</td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td>Continuous or ON/OFF</td>
<td>Cycle time: constant or optimized (BF)</td>
</tr>
<tr>
<td>Control output for motorized valves</td>
<td>OPEN/CLOSE for floating motorized valve or with feedback with position control by potentiometer on Relay, Solid-state, Triac outputs.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SETPOINT PROGRAMMER (Double programmer if double loop)</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of programs</td>
<td>Max 16 (if double loop 8 + 8) (*)</td>
</tr>
<tr>
<td>Number of steps</td>
<td>Max 192, each with own setpoint, ramp time and hold time</td>
</tr>
<tr>
<td>Times settable</td>
<td>Times settable in HH:MM or MM:SS</td>
</tr>
<tr>
<td>Max 4 events</td>
<td>Max 4 events, configurable in ramp and hold</td>
</tr>
<tr>
<td>Digital function blocks</td>
<td>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</td>
</tr>
<tr>
<td>Analog function blocks</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPERATIONS MATHEMATICAL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modes</td>
<td>START / STOP (2 timer if double loop)</td>
</tr>
<tr>
<td>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)</td>
<td></td>
</tr>
<tr>
<td>FIRING (timed activation of control after power on)</td>
<td></td>
</tr>
<tr>
<td>ENERGY COUNTER</td>
<td>Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT</td>
</tr>
<tr>
<td>DIAGNOSTIC</td>
<td>Short circuit or open circuit (LBA alarm)</td>
</tr>
<tr>
<td>Interrupted or partially interrupted load (HB alarm)</td>
<td></td>
</tr>
<tr>
<td>Short circuit of control output (SSR alarm)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RETENTIVE MEMORY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>FRAM</td>
</tr>
<tr>
<td>Writes</td>
<td>Number max: &gt; 10¹⁰ cycles</td>
</tr>
<tr>
<td>Retention</td>
<td>&gt; 10 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CERTIFICAZIONI</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generals</td>
<td>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 AMS2750E, paragraph 3.3.1.</td>
</tr>
<tr>
<td>Europe</td>
<td>CE, RoHS, REACH</td>
</tr>
<tr>
<td>USA, Canada</td>
<td>UL, cUL</td>
</tr>
<tr>
<td>Russia</td>
<td>EAC</td>
</tr>
</tbody>
</table>

(*) 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
<table>
<thead>
<tr>
<th><strong>GENERAL DATA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POWER SUPPLY</strong></td>
</tr>
<tr>
<td>Operating voltage</td>
</tr>
<tr>
<td>(20...27 VAC/VDC ±10%, 50/60 Hz)</td>
</tr>
<tr>
<td>Power dissipation</td>
</tr>
<tr>
<td>Protections</td>
</tr>
<tr>
<td>Connection</td>
</tr>
<tr>
<td>Serial configuration port</td>
</tr>
<tr>
<td>RS485 (option)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Master Modbus</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>RTU Bridge</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Ethernet Modbus TCP and Webserver (option)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>AMBIENT CONDITIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use</strong></td>
</tr>
<tr>
<td><strong>Altitude</strong></td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
</tr>
<tr>
<td><strong>Storage temperature</strong></td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PROTECTION LEVEL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positioning</strong></td>
</tr>
<tr>
<td><strong>Installation regulations</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>DIMENSIONS</strong></td>
</tr>
<tr>
<td>96 X 96 mm (1/4 DIN)</td>
</tr>
<tr>
<td>Depth: 80 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>WEIGHT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.24 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CE STANDARDS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMC (electromagnetic compatibility)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>LVD safety</strong></td>
</tr>
</tbody>
</table>

1) Programming is done with the GF_eXpress configuration program.
## 9.4. Isolation block diagram 850

### Functional block diagram

- **SENSOR INPUT PV**
- **AUXILIARY INPUT**
- **CT1, CT2 INPUT**
- **DIGITAL INPUT DI1...DI3 or TRANSMITTER POWER SUPPLY**
- **CPU**
  - Main Processor ARM
  - FLASH memory
- **FRAM**
- **Internal Temperature**
- **RTC**
- **SRAM**
- **POWER IN** (90...260 VAC / 18...30 VAC/VDC)
- **LCD + CONTROLLER**
- **BACK LIGHT**
- **4 keys**
- **CONFIGURATION PORT**
- **COMMUNICATION INTERFACE**
  - MODBUS TCP
  - MODBUS
  - MODBUS (Master Modbus)
  - FIELDBUS communication interface
  - Ethernet communication interface
  - Fieldbus communication interface
- **OUT 1, 2, 3, 4**
  - LOGIC OUTPUT (SSR drive)
  - DC OUTPUT
- **TRIAC, RELAY, MOS**
  - Relay output 1
  - Relay outputs 2, 3, 4
  - Relay or Triac output 3
  - Power supply 100...240 VAC/VDC / 20...27 VAC/VDC

### Inputs and Outputs

- **Sensor input, CT Input, Configuration port**
- **Transmitter power supply (VT1)**
- **Auxiliary input (PV2), Transmitter power supply (VT2)**
- **Potentiometer power supply (VP)**
- **Fieldbus communication interface**
- **Ethernet communication interface**
- **Digital input, Logic output (SSR drive), DC output 1, Analog DC output 1, DC output A1**
- **MOS digital output**
- **Relay output 1**
- **Relay outputs 2, 3, 4**
- **Relay output 2**
- **Relay or Triac output 3**

### Power Supplies

- +24 V
- +5 V
- 3.3 V Auxiliary Input
- +3.3 V

### Isolation

- Functional isolation
- Reinforced isolation
9.5. Isolation block diagram 1650 - 1850

- **SENSOR INPUT PV**
- **AUXILIARY INPUT 1**
- **AUXILIARY INPUT 2**
- **CT1, CT2 INPUT**
- **DIGITAL INPUT DI1...DI5**
- **TRANSmitter POWER SUPPLY**
  - only for 1850
- **DIGITAL INPUT EDI1...EDI8**

- **CPU**
  - Main Processor ARM
  - FLASH memory
  - FRAM
  - Internal Temperature
  - RTC
  - SRAM

- **LCD + CONTROLLER**
  - BACK LIGHT
  - 1650 4 keys
  - 1850 6 keys

- **CONFIGURATION PORT**
- **COMMUNICATION INTERFACE**
  - OUT 1, 2, 3, 4
  - only for 1850
  - Modbus TCP
  - FIELDBUS

- **POWER IN**
  - (90...260 VAC / 18...30 VAC/VDC)

- **POWER SUPPLY**
  - External +24 V
  - +24 V
  - +24 V
  - +5 V
  - 3,3 V Auxiliary Input
  - +3,3 V
  - Auxiliary Input 2

- **PC INTERFACE**
- **FIELDBUS**
  - TRIAC, RELAY, MOS
  - DC OUTPUT
  - LOGIC OUTPUT (SSR drive)
  - OUT1 G (Master Modbus)

- **CONF IGURATION PORT**
- **COMMUNICATION INTERFACE**
  - OUT 1, 2, 3, 4
  - only for 1850
  - Modbus TCP
  - FIELDBUS

- **POWER IN**
  - (90...260 VAC / 18...30 VAC/VDC)

- **POWER SUPPLY**
  - External +24 V
  - +24 V
  - +24 V
  - +5 V
  - 3,3 V Auxiliary Input
  - +3,3 V
  - Auxiliary Input 2
<table>
<thead>
<tr>
<th>Function/Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor input, CT Input, Configuration port, OUT1 G (Master Modbus)</td>
</tr>
<tr>
<td>Auxiliary input (PV2), Transmitter power supply (VT2), Potentiometer power (VP)</td>
</tr>
<tr>
<td>Fieldbus Communication interface</td>
</tr>
<tr>
<td>Ethernet Communication interface</td>
</tr>
<tr>
<td>Fieldbus Communication interface</td>
</tr>
<tr>
<td>Digital input, Logic output (SSR drive), DC output 1, A1, A2 DC outputs, Transmitter power supply (VT1)</td>
</tr>
<tr>
<td>8 digital inputs, 8 digital outputs (only for 1850)</td>
</tr>
<tr>
<td>MOS digital output</td>
</tr>
<tr>
<td>Relay output</td>
</tr>
<tr>
<td>Relay output 2</td>
</tr>
<tr>
<td>Relay output 3</td>
</tr>
<tr>
<td>Uscita 34 relè o Triac</td>
</tr>
</tbody>
</table>

- Functional isolation
- Reinforced isolation
10. ORDER METHODS

10.1. Controller 850

Ordering code: 850 X X X X X X X X

<table>
<thead>
<tr>
<th>Model (A)</th>
<th>Controller</th>
<th>Programmer</th>
<th>Valve (*)</th>
<th>Programmer+valve (*)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Output 1 (B)</th>
<th>Relay</th>
<th>Logic</th>
<th>Analog</th>
<th>Master Modbus RTU communication</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Output 2 (C) - Output 3 (D)</th>
<th>Relay - Relay</th>
<th>Logic - Logic</th>
<th>Isolated logic - Isolated logic</th>
<th>Isolated logic - Long Life relay</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Output 4 (E)</th>
<th>Absent</th>
<th>Logic</th>
<th>Relay (1)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Power supply sensor VT1 for main input (F)</th>
<th>Absent</th>
<th>VT1 24 V (2)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Function (P)</th>
<th>00: Absent</th>
<th>FB: Logical + mathematical operations</th>
<th>CK: RTC + Logical operations + mathematical</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Supply (O)</th>
<th>0: 20...27 VAC / VDC</th>
<th>1: 100...240 VAC / VDC</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Communication (M)</th>
<th>00: Absent</th>
<th>M0: RS485 Modbus RTU</th>
<th>E0: Ethernet Modbus TCP (4)</th>
<th>ME: Ethernet Modbus TCP / RTU bridge (4)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Digital inputs (L)</th>
<th>0: Absent (5)</th>
<th>3: 3 DI</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CT Inputs</th>
<th>Auxiliary inputs (H-I)</th>
<th>00: Absent</th>
<th>20: CT1 + CT2</th>
<th>01: Input Aux: TC, RTD, 60mV</th>
<th>02: Input Aux: 1V/5V/10V/20mA + VP 1V</th>
<th>03: Input Aux: 1V/5V/10V/20mA + VT2 24 V</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Retransmission (G)</th>
<th>0: Absent</th>
<th>1: Analogue A1</th>
</tr>
</thead>
</table>

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

Ordering code: 1650 X 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 MM
- 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 (3)
- 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 + VT1 24 V

Input CT / 3° Analog input (H)
- 0 Absent
- 2 CT1 + CT2
- 3 3° Input Aux + VP 21 V (4)

Note
1) Only with option (C) = R e (D) = R
3) Only with option E-M = 0
4) Only with option (l) = 1,2,3

Check before each request a list of codes available on the following pages
**10.3. Controller 1850**

**Ordering code:**

<table>
<thead>
<tr>
<th>Model (A)</th>
<th>Controller</th>
<th>Programmer</th>
<th>Valve (1)</th>
<th>Programmer+valve (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>P</td>
<td>V</td>
<td>PV</td>
</tr>
</tbody>
</table>

**Output 1 (B)**

<table>
<thead>
<tr>
<th>Relay</th>
<th>Logic</th>
<th>Analog</th>
<th>Master Modbus RTU communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>D</td>
<td>C</td>
<td>G</td>
</tr>
</tbody>
</table>

**Output 2 (C) Output 3 (D)**

<table>
<thead>
<tr>
<th>Relay - Relay</th>
<th>Logic - Logic</th>
<th>Isolated logic - Isolated logic</th>
<th>Relay - VT1 24 V</th>
<th>Logic - VT1 24 V</th>
<th>Isolated logic - VT1 24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>R R</td>
<td>D D</td>
<td>M M</td>
<td>R V</td>
<td>D V</td>
<td>M V</td>
</tr>
</tbody>
</table>

**Output 4 (E)**

<table>
<thead>
<tr>
<th>Absent</th>
<th>Relay</th>
<th>Long Life relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>R</td>
<td>T</td>
</tr>
</tbody>
</table>

**Retransmission (G)**

<table>
<thead>
<tr>
<th>Absent</th>
<th>Analogue A1</th>
<th>Analogue A1 + A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Function (P)**

<table>
<thead>
<tr>
<th>00</th>
<th>Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB</td>
<td>Logical + mathematical operations</td>
</tr>
<tr>
<td>CK</td>
<td>RTC + Logical operations + mathematical</td>
</tr>
</tbody>
</table>

**Supply (O)**

| 0 | 20...27 VAC / VDC |
| 1 | 100...240 VAC / VDC |

**I/O opzionali (N)**

<table>
<thead>
<tr>
<th>00</th>
<th>Assenti</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>8 IN/OUT (5)</td>
</tr>
<tr>
<td>01</td>
<td>8 relè (5)</td>
</tr>
<tr>
<td>11</td>
<td>8 IN/OUT + 8 relè (5)</td>
</tr>
</tbody>
</table>

**Communication (M)**

<table>
<thead>
<tr>
<th>00</th>
<th>Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0</td>
<td>RS485 Modbus RTU (slave)</td>
</tr>
<tr>
<td>E0</td>
<td>Ethernet Modbus TCP</td>
</tr>
<tr>
<td>ME</td>
<td>Ethernet Modbus TCP / RS485 bridge</td>
</tr>
</tbody>
</table>

**Digital inputs (L)**

| 0 | Absent (3) |
| 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 (4) |

**Notes**

1) Only with option (C) = R and (D) = R
3) Only with option E-M = 0
4) Only with option (I) = 1,2,3
5) The option (N) require option (P) =FB or CK

Check before each request a list of codes available on the following pages
## 11. ACCESSORIES

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>F060800</td>
<td>Cable for programming with PC, USB-TTL 3 V with USB – microUSB connectors,  length 1.8 m</td>
<td>•  •  •</td>
</tr>
<tr>
<td>F043958</td>
<td>“GF_eXpress” software CD</td>
<td>•  •  •</td>
</tr>
<tr>
<td>F060909</td>
<td>Configuration kit for new instruments GF_eXK-3-0-0</td>
<td>•  •  •</td>
</tr>
<tr>
<td>51968</td>
<td>Rubber gasket 48×48 front-box</td>
<td>•</td>
</tr>
<tr>
<td>51969</td>
<td>Rubber gasket 48×96 front-box</td>
<td>•</td>
</tr>
<tr>
<td>51970</td>
<td>Rubber gasket 96×96 front-box</td>
<td>•</td>
</tr>
<tr>
<td>51292</td>
<td>Rubber gasket 48×48 box-panel</td>
<td>•</td>
</tr>
<tr>
<td>51068</td>
<td>Rubber gasket 48×96 box-panel</td>
<td>•</td>
</tr>
<tr>
<td>51069</td>
<td>Rubber gasket 99×96 box-panel</td>
<td>•</td>
</tr>
<tr>
<td>51250</td>
<td>Fastening box to panel</td>
<td>•</td>
</tr>
<tr>
<td>49030</td>
<td>Fastening box to panel</td>
<td>•  •</td>
</tr>
<tr>
<td>51294</td>
<td>Protection of contacts at box bottom</td>
<td>•</td>
</tr>
<tr>
<td>51328</td>
<td>Protection of contacts at box bottom</td>
<td>•  •</td>
</tr>
<tr>
<td>51454</td>
<td>18 contacts at box bottom</td>
<td>•</td>
</tr>
<tr>
<td>51453</td>
<td>24 contacts at box bottom</td>
<td>•</td>
</tr>
<tr>
<td>51738</td>
<td>36 contacts at box bottom</td>
<td>•  •</td>
</tr>
<tr>
<td>330200</td>
<td>Current transformer (CT) 50/0.05 A</td>
<td>•  •  •</td>
</tr>
<tr>
<td>330201</td>
<td>Current transformer (CT) 25/0.05 A</td>
<td>•  •  •</td>
</tr>
</tbody>
</table>