650 - 1250 - 1350
PID temperature controllers

INSTALLATION AND INSTRUCTION MANUAL

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INTRODUCTION

Device data

In the space below, write the order code and other plate data shown on the label attached to the outside of the controller (see figure).

If you need technical assistance, this information must be given to Gefran Customer Service.

<table>
<thead>
<tr>
<th>Serial number</th>
<th>SN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished product code</td>
<td>CODE</td>
</tr>
<tr>
<td>Order code</td>
<td>TYPE</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>SUPPLY</td>
</tr>
<tr>
<td>Firmware version</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 650-1250-1350 controllers, the operator must be adequately instructed with regard to operating, emergency, diagnostics, and maintenance procedures.

If the 650-1250-1350 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).
INTRODUCTION

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.

Glossary

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

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

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

Cool Control used for cooling.

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

Heat Control used for heating.

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

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

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

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

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

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

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

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

Setpoint Set value (see SV).

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

Thermocouple Sensor that transmits an electrical signal of a few millivolts. Cannot be tested for galvanic continuity. It needs specially designed extension cables.
**Undershoot**
Situation in which PV does not reach SV because the control action stopped too soon.
The ON OFF controls have an undershoot greater than the PID controls.

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

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

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

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

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

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This manual may make reference to or reproduce trademarks and logos of third parties. Gefran S.p.A. acknowledges such parties’ ownership of these trademarks and logos.
1. GENERAL DESCRIPTION

1.1. Profile

The 650, 1250 and 1350 controllers are a family of devices designed to control temperature in industrial processes and to manage the positioning (without feedback) of motorized valves.

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

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

On models 1250 and 1350, a segmented bar graph shows percentages of power, delivered current or valve position.

Configuration/local operation is done with keys (4 on the 650 and 1250, 6 on the 1350), to which dual-function LEDs are associated: feedback for pressed key and guide for permitted operations.

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

The configuration can be cloned among controllers without having to switch on the power supply thanks to the Zapper, a battery-operated portable mini-configurator (to be ordered separately).

With GF_eXpress software and PC, you can program the extended configuration, create work recipes and update the firmware without having to switch on the controllers.

Thanks to the Smart Configurator function, you obtain the required parameter recipe by answering a few simple questions.

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

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

Sixteen AND, OR and Timer Function Blocks let you create customizable logic sequences for complete and flexible machine control.

The controller's HW resources are exploited completely, without any need for external devices such as timers and small PLCs.

Tuning is performed via advanced algorithms that ensure stable and accurate adjustments, even with critical or very fast heating systems, and that engage automatically when necessary.

Models with twelve ramp and hold steps, groupable in four programs, with enable inputs and event outputs, are available for applications with setpoint profiles.

The controller can be configured directly with the keys or graphically via GF_eXpress software.

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

1.2. Differences among models

<table>
<thead>
<tr>
<th></th>
<th>650</th>
<th>1250</th>
<th>1350</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 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</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</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>5 W</td>
<td>10 W</td>
<td>10 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. 650 Controller

Main features

- Operator interface with large LCD Display, customizable, with choice of colors
- 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
- 16 function block applications
- Timer, setpoint and algorithm programmer for controlling motorized valves
- Advanced tuning of control parameters
- Different password levels
- Universal input configurable for thermocouples, resistance thermometers, linear inputs
- Input from remote setpoint
- Relay, logic, isolated analog outputs
- Up to two TA inputs for interrupted load diagnostics
- RS485 serial communication in Modbus RTU
- Removable faceplate for immediate replacement
- Accuracy 0.2%, sampling time 60 ms

1.3.1. Display and keys

1. Temperature unit of measurement or number of program running.
3. Controller function states:
   - RUN = setpoint programmer active;
   - _/- = 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
5. Up/down keys: raise/lower the value of the parameter displayed on the SV or PV display.
6. F key: lets you navigate among controller menus and parameters. Confirms the parameter value and selects the next parameter.
7. Key pressed signals.
8. SV display: setpoint value, description of parameters, diagnostics and alarm messages. Configurable with parameter dS.SP (default = setpoint).
9. PV display: process variable, parameter values.
1.3.2. Drilling dimensions and templates

Figure 2 - 650 drilling dimensions and templates
1. GENERAL DESCRIPTION

1.4. 1250 Controller

Main features

- Operator interface with large LCD Display, customizable, with choice of colors
- 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
- 16 function block applications
- Timer, setpoint and algorithm programmer for controlling motorized valves
- Advanced tuning of control parameters
- Different password levels
- Universal input configurable for thermocouples, resistance thermometers, linear inputs
- Input from remote setpoint
- Relay, logic, isolated analog outputs
- Up to two TA inputs for interrupted load diagnostics
- RS485 serial communication in Modbus RTU
- Removable faceplate for immediate replacement
- Accuracy 0.2%, sampling time 60 ms

1.4.1. Display and keys

1. Temperature unit of measurement or number of program running.
3. Controller function states:
   - RUN = setpoint programmer active;
   - _/- = 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.
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 bArG.
10. SV display: parameter values. Configurable with parameter dS.SP (default = setpoint).
11. PV display: process variable.
1. GENERAL DESCRIPTION

1.4.2. Drilling dimensions and templates

Figure 4 - 1250 drilling dimensions and templates
1.5. 1350 Controller

Main features

- Operator interface with large LCD Display, customizable, with choice of colors
- 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
- 16 function block applications
- Timer, setpoint and algorithm programmer for controlling motorized valves
- Advanced tuning of control parameters
- Different password levels
- Universal input configurable for thermocouples, resistance thermometers, linear inputs
- Input from remote setpoint
- Relay, logic, isolated analog outputs
- Up to two TA inputs for interrupted load diagnostics
- RS485 serial communication in Modbus RTU
- Removable faceplate for immediate replacement
- Accuracy 0.2%, sampling time 60 ms

Dimensions 96 × 96 × 80 mm (1/4 DIN)

1.5.1. Display and keys

1. Temperature unit of measurement or number of program running.
3. Displays program number, step number, unit of measurement (% , A, kW, kWh).
4. Controller function states:
   - RUN = setpoint programmer active;
   - /- = 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.
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 bArG.
12. SV display: parameter values. Configurable with parameter dS.SP (default = setpoint).
13. PV display: process variable.
1. GENERAL DESCRIPTION

1.5.2. Drilling dimensions and templates

Figure 6 - 1350 drilling dimensions and templates
2. INSTALLATION

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

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

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

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

2.1. Mounting the controller

2.1.1. General installation rules

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

Attention! DO NOT install the controller in a potentially inflammable or explosive atmosphere.

It can be connected to elements that work in such atmospheres only by means of appropriate interfaces that conform to safety regulations in force in the country of installation.

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

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

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

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

2.1.2. Drilling dimensions

For correct installation, respect the dimensions of each hole and the distance between adjacent holes shown in the figures for each model (“Figure 2 – 650 drilling dimensions and templates” on page 14, “Figure 4 – 1250 drilling dimensions and templates” on page 16, “Figure 6 – 1350 drilling dimensions and templates” on page 18).

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. INSTALLATION

2.1.4. Vibrations

The controller can support vibrations from 10 to 55 Hz, 20 m/s², 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 / terminal section</th>
<th>Terminal size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>0.2...2.5 mm² (24...14 AWG)</td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>0.2...2.5 mm² (24...14 AWG)</td>
<td></td>
</tr>
<tr>
<td>Serial port</td>
<td>0.25...2.5 mm² (23...14 AWG)</td>
<td>5.8 mm max</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>0.8 mm² compensated</td>
<td></td>
</tr>
<tr>
<td>Potentiometer, linear, &quot;PT100&quot; resistance thermometer</td>
<td>0.8 mm²</td>
<td>5.8 mm max</td>
</tr>
<tr>
<td>Analog retransmission output</td>
<td>0.8 mm² compensated</td>
<td>5.8 mm max</td>
</tr>
<tr>
<td>Digital input/outputs</td>
<td>0.8 mm² compensated</td>
<td>5.8 mm max</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.

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.
2. INSTALLATION

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.

![Snubber connection diagram (AC)](image)

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

![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. 650 connection diagrams

#### 2.3.1. General diagram

- **OPTIONS**
  - **IN 1**: COM, CT1 (current transformer), CT2 (second current transformer for 2-phase/3-phase load)
  - **IN 2**: COM, IN 1, IN 2, IN 3
  - **RS485**: IN 1, IN 2, IN 3

- **LEGEND**
  - **PWR**: Power supply
  - **-**: Linear input in voltage / current
  - **-**: Input for current transformer
  - **+ SPR**: Remote Set-point
  - **- SPR**: Remote Set-point
  - **Isolated digital inputs**: Thermocouple input
  - **Input PT100 JPT100 2 / 3 wires**: Long-life solid state relay output
  - **RS485 serial line**: Logic output
  - **+**: DC analog output
  - **-**: Isolated analog output
2. INSTALLATION

2.3.2. Power supply

Power supply

<table>
<thead>
<tr>
<th>PWR</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>~</td>
<td>23</td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

Standard: 100...240 VAC/VDC ±10% 50/60Hz, max 5 VA
Optional: 20...27 VAC/VDC ±10% 50/60Hz, max 5 VA

2.3.3. Inputs

<table>
<thead>
<tr>
<th></th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
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<tr>
<td>4</td>
<td></td>
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<tr>
<td>3</td>
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<tr>
<td>2</td>
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<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Linear input (V, I)

Linear input voltage
- 60 mV (Ri > 70 kΩ)
- 1 V (Ri > 15 kΩ)

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

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.

Input PT100/JPT100 - 3-wires connection

<table>
<thead>
<tr>
<th></th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
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<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

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

2.3.4. Outputs

Characteristics of outputs are defined when the controller is ordered.

Output Out 1 – logic

Output 1 – 5 A relay

Output Out 1 – 5 A relay

Output Out 1 – 5 A relay

Output Out 2 - 5 A relay

Output Out 2 - 5 A relay

Output Out 2 - 5 A relay

Output Out 2 - 5 A relay

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

Input PT100/JPT100 - 2-wires connection

<table>
<thead>
<tr>
<th></th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
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</tbody>
</table>

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

Input PT100/JPT100 - 2-wires connection

<table>
<thead>
<tr>
<th></th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
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<tr>
<td>4</td>
<td></td>
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<tr>
<td>3</td>
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<tr>
<td>2</td>
<td></td>
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<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Linear input (V)

Linear input in direct voltage
- 5V, 10 V (Ri > 30 kΩ)

Output Out 1 – continuous

Output Out 1 – continuous

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

Input PT100/JPT100 - 2-wires connection

<table>
<thead>
<tr>
<th></th>
<th>6</th>
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<tbody>
<tr>
<td>5</td>
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<td>2</td>
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<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

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

Output Out 1 – logic

Output Out 1 – continuous

Output Out 1 – continuous

Input PT100/JPT100 - 2-wires connection

<table>
<thead>
<tr>
<th></th>
<th>3</th>
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<tbody>
<tr>
<td>2</td>
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<td>1</td>
<td></td>
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</tbody>
</table>

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

Input PT100/JPT100 - 2-wires connection

<table>
<thead>
<tr>
<th></th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>5</td>
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<td>4</td>
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<td>3</td>
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<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Linear input (V)

Linear input in direct voltage
- 5V, 10 V (Ri > 30 kΩ)
2.3.5. Options

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

**Option 1**
- **Current transformer**: 50 mA, 10 Ohm, 50/60 Hz
- **Second current transformer for 2-phase / 3-phase load**
- **Digital inputs**: NPN 24 V, 4.5 mA
- **PNP digital inputs**: +12/24 V max 3.6 mA

**Option 2**
- **Current transformer**: 50 mA, 10 Ohm, 50/60 Hz
- **Second current transformer for 2-phase / 3-phase load**
- **Serial line**: RS485 2-wires

**Option 3**
- **Isolated serial line**: RS485 2-wires
- **Digital inputs**: voltage-free contact
- **NPN digital inputs**: +12/24 V max 3.6 mA
2. INSTALLATION

Option 3

- Serial line RS485 2-wires
- +12/24 V max 3.6 mA
- PNP digital inputs

Option 4

- Analog output 0...10 V, I_{out} 20 mA
- 0...20 mA, 4...20 mA R_{in} < 500 Ω
- Digital inputs voltage-free contact

Option 5

- Remote Setpoint 0...10 V, R_{i} > 30 kΩ
- 0...20 mA, 4...20 mA R_{i} = 50 Ω
- Digital inputs NPN 24 V, 4.5 mA

Option 6

- Analog output 0...10 V, I_{out} 20 mA
- 0...20 mA, 4...20 mA R_{in} < 500 Ω
- Digital inputs voltage-free contact
2.4. **1250 - 1350 connection diagrams**

2.4.1. **General diagram**

![Diagram of 1250 - 1350 connection diagrams](image)

**LEGEND**
- **PWR** : Power supply
- **NO** : N.O. - Normally Open
- **SPR** : Remote Set-point
- **CT** : Current Transformer
- **IN** : Linear input in voltage/current
- **OUT** : Output
- RS485 serial line
- Isolated digital inputs
- Thermocouple input
- Input PT100 JPT100 2/3 wires
- Relay output
- Long-life solid state relay output
- Isolated analog output
- Logic output
2. INSTALLATION

2.4.2. Power supply

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.

2.4.3. Inputs

Output Out 1 – 5 A relay

Output Out 1 – logic

Logic 24 V (10 V to 20 mA)

Output Out 1 – continuous

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

Input PT100/JPT100 - 2-wires connection

2.4.4. Outputs

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

Output Out 2 – 5 A relay
2. INSTALLATION

2.4.5. Digital inputs

- **Output Out 2 - logic**
  - Logic 24 V (10 V to 20 mA)

- **Output Out 3 - 5 A relay**
  - 5 A relay 250 VAC / 30 VDC

- **Output Out 4 - 5 A relay**
  - 5 A Relay 250 VAC / 30 VDC

- **Output Out 4 - Triac**
  - Triac 75...264 VAC max 1A

- **Serial line**

- **CT Inputs**

- **Digital inputs**

- **Digital inputs voltage-free contact**

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

- **NPN 24 V, 4.5 mA**

- **RS485 2-wires**
  - B (Data +) 47 Serial line
  - A (Data -) 48 RS485 2-wires

- **Current transformer**
  - 50 mA ac, 10 Ω, 50/60 Hz

- **Second current transformer**
  - for 2-phase / 3-phase load
2. INSTALLATION

2.4.8. Remote setpoint input

Remote setpoint input

Remote setpoint
0...10 V, Ri > 30 kΩ
0...20 mA, 4...20 mA, Ri = 50 Ω

SPR +

SPR -

25
26
27
28

2.4.9. Analog output

Analog output

Analog output
0...10 V, max 20 mA
0...20 mA, 4...20 mA, Rout < 500 Ω

Out A1 +

Out A1 -

30
29
2.5. **RS485 serial connection diagram**

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

![RS485 connection diagram](image)

(*') for model
- 650-x-xxx-00031-x
- 650-x-xxx-00101-x
- 650-x-xxx-00201-x

Figure 13 - RS485 connection for 650 controller

![RS485 connection diagram](image)

Figure 14 - RS485 connection for 1250 and 1350 controllers
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 650, “1.4.1. Display and keys” on page 15 for the 1250, and “1.5.1. Display and keys” on page 17 for the 1350.

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 \( \nabla \) switches the controller function mode (manual/automatics).

3.1.2. Displays

The controllers have 2 or 3 displays, depending on the model. The Main menu shows:

- PV display: value of process variable.
- SV display: value of parameter (default = setpoint, if parameter dS.SP = SETP).
- F Display (models 1250 and 1350 only): value of control output (if parameter dS.F = OUT.PW).

On models 1250 and 1350, the percentage value of the control output is also shown graphically on a bargraph. On model 1350, an additional display shows the program number, step number, and unit of measurement (%a, kW, kWh).

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

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

3.1.2.1. Display characters

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

\[
\begin{array}{cccccc}
\text{!} & \text{"} & \text{#} & \text{$} & \text{%} & \text{&} \\
\text{\'} & \text{(|)} & \text{0} & \text{1} & \text{2} & \text{3} \\
\text{4} & \text{5} & \text{6} & \text{7} & \text{8} & \text{9} \\
\text{<} & \text{=} & \text{>} & \text{?} & \text{@} & \text{A} & \text{B} & \text{C} & \text{D} & \text{E} & \text{F} & \text{G} \\
\text{H} & \text{I} & \text{J} & \text{K} & \text{L} & \text{M} & \text{N} & \text{O} & \text{P} & \text{Q} \\
\text{R} & \text{S} & \text{T} & \text{U} & \text{V} & \text{W} & \text{X} & \text{Y} & \text{Z} & \text{[} \\
\text{\{]} & \text{\}]} & \text{\^} & \text{-} & \text{a} & \text{b} & \text{c} & \text{d} & \text{e} \\
\text{f} & \text{g} & \text{h} & \text{i} & \text{j} & \text{k} & \text{l} & \text{m} & \text{n} & \text{o} \\
\text{p} & \text{q} & \text{r} & \text{s} & \text{t} & \text{u} & \text{v} & \text{w} & \text{x} & \text{y} \\
\text{z} & \text{\[} & \text{\\}]} & \text{\^} & \text{-} & \text{a} & \text{b} & \text{c} & \text{d} & \text{e} \\
\end{array}
\]

Figure 15 - 14-segment font
3. COMMISSIONING

3.1.2.2. Scrolling messages

The SV (650) and F (1250 and 1350) 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 provided, selectable from the HMI menu with the LANG.n parameter. Each group contains up to 25 messages.

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)

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

3.3. First power-on

At first power-on, after the controller has run the self-diagnostics test, press the \[F\] key to access the Fast Configuration Menu. The parameters shown are a subset of all the controller parameters and let you rapidly configure the inputs and outputs.

The number and type of the parameters shown depends on the controller HW configuration and on the choices made with the parameters previously shown.

For example, minimum and maximum scale limits are shown only if you have chosen an mA or V type temperature sensor.

Fast Configuration also appears if the HMI menu is set to parameter QuiCk = On

3.3.1. Fast configuration

- **Selecting sensor type**
- **Selecting unit of measurement**
- **Minimum scale limit**
- **Maximum scale limit**
3. COMMISSIONING

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.

Selecting remote setpoint type
The menu item appears only if the optional input is available. The setpoint scale depends on the sensor selected.
3. COMMISSIONING

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

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 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 1250 and 1350 only).
3. COMMISSIONING

**Setting Setpoint**
Raises the value
Lowers the value

**Setting Alarm 1**
Raises the value
Lowers the value

**Selecting digital input 5 function**
The menu item appears only if the optional input is available (for models 1250 and 1350 only).

**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 43), 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.

```
0000 0000
Home page
Press > 2 seconds
00
PASS1
Enter password (default = 1) with the ▼ and ▲ keys
Press 3 times (if the model does not have remote setpoint input and current transformer options and is not the Programmer)

Submenu ALARM

ALAR
Select the Alarm number (default = 1) with the ▼ and ▲ keys
Description of parameter and list of options on page 77
Press twice

d.i.x
Set the alarm as direct or inverse (default = Direct) with the ▼ and ▲ keys
Description of parameter and list of options on page 77
Press twice

A.r.x
Set the alarm as absolute or deviation (default = Absolute) with the ▼ and ▲ keys
Description of parameter and list of options on page 77
Press 4 times

Hyste
Set hysteresis (default = -1) with the ▼ and ▲ keys
Description of parameter and list of options on page 79
Press twice

MSG.AL
Select the message assigned to the alarm (default = 0) with the ▼ and ▲ keys
Description of parameter and list of options on page 79
Press > 2 seconds

0000 0000
Home page
```

The ALARM submenu also lets you:
- select the input or value to be monitored for the alarm (parameter rEF.x, default = PV);
- select the method for applying hysteresis (parameter n.S.x, 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. COMMISSIONING

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.PHI, default = 100.0);
- set the minimum heating power limit (parameter H.PLO, 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.PHI, default = 100.0);
- set the minimum cooling power limit (parameter C.PLO, default = 0.0);
- set the Manual Reset value (parameter RESET, default = 0.0);
- set the Reset Power value (parameter P.RST, default = 0.0);
- set the Antireset value (parameter A.RST, default = 0.0);
- set the Feedforward Power value (parameter, 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);
3. COMMISSIONING

- 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 "7. Programming with PC" on page 159).

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 “4.27. Submenu PASC1 - Setting level 1 password” on page 136 and “4.28. Submenu PASC2 - Setting level 2 password” on page 136.
4. CONFIGURATION

4.2. Main menu

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.
4.3. 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>Level 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. Parameters

<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>

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

4.4. INFO Submenu - 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>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW_VER</td>
<td>47</td>
</tr>
<tr>
<td>CODE</td>
<td>47</td>
</tr>
<tr>
<td>ERROR</td>
<td>47</td>
</tr>
<tr>
<td>SAP_C</td>
<td>47</td>
</tr>
<tr>
<td>Ser.n</td>
<td>47</td>
</tr>
<tr>
<td>650.LV</td>
<td>47</td>
</tr>
<tr>
<td>CONTR</td>
<td>47</td>
</tr>
<tr>
<td>L.Func</td>
<td>47</td>
</tr>
<tr>
<td>IN.SPR</td>
<td>47</td>
</tr>
<tr>
<td>OUT.A1</td>
<td>47</td>
</tr>
<tr>
<td>CT1</td>
<td>48</td>
</tr>
<tr>
<td>1.IN.DG</td>
<td>48</td>
</tr>
<tr>
<td>RS485</td>
<td>48</td>
</tr>
<tr>
<td>Out1</td>
<td>48</td>
</tr>
<tr>
<td>Out2</td>
<td>48</td>
</tr>
<tr>
<td>Out3</td>
<td>48</td>
</tr>
<tr>
<td>Out4</td>
<td>48</td>
</tr>
<tr>
<td>OUT1.S</td>
<td>48</td>
</tr>
<tr>
<td>OUT2.S</td>
<td>48</td>
</tr>
<tr>
<td>OUT3.S</td>
<td>48</td>
</tr>
<tr>
<td>OUT4.S</td>
<td>48</td>
</tr>
<tr>
<td>T.DAYS</td>
<td>48</td>
</tr>
<tr>
<td>P.DAYS</td>
<td>48</td>
</tr>
<tr>
<td>T.INT</td>
<td>48</td>
</tr>
<tr>
<td>T.MIN</td>
<td>48</td>
</tr>
<tr>
<td>T.MAX</td>
<td>48</td>
</tr>
<tr>
<td>tiME</td>
<td>48</td>
</tr>
<tr>
<td>dAtE</td>
<td>48</td>
</tr>
</tbody>
</table>

* Appears only if function is available on controller.
** Appears only if output 1 is relay or logic.
*** Appears only if relative output is available and is relay or logic.
4. CONFIGURATION

4.4.1. SW.VER - Versione software

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</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>Password</th>
<th>Description</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. ERROR - Main input error

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR</td>
<td>MAIN 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:**
- nonE = No error
- Lou  = Process variable (PV) is below lower scale limit
- HIGH = Process variable (PV) is higher than upper scale limit
- Err  = PT100 in short circuit or input values below lower limit
  (for example, TC with incorrect connection)
- Sbr  = Sensor break or input values higher than upper limit

4.4.4. SAP.C - SAP code

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</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:** -

4.4.5. SE.r.n - Serial number of controller

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE.r.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. CONFIGURATION

4.4.6. xxxx - Model of controller

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrollling 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 (650LV, 650HV, 1250LV, 1250HV, 1350LV, 1350HV).

*Unit of measurement:* -

*Options:*
- 650.LV = 650 controller powered at 20...27 VAC/VDC
- 650.HV = 650 controller powered at 100...240 VAC/VDC
- 125.LV = 1250 controller powered at 20...27 VAC/VDC
- 125.HV = 1250 controller powered at 100...240 VAC/VDC
- 135.LV = 1350 controller powered at 20...27 VAC/VDC
- 135.HV = 1350 controller powered at 100...240 VAC/VDC

4.4.7. xxxx - Type of controller

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrollling 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

4.4.8. L.FUNC - Option Logic Functions available

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrollling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.FUNC</td>
<td>LOGIC FUNCTION AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

If present, this parameter indicates that the controller option is installed Logic Functions.

*Unit of measurement:* -

*Options:* -

4.4.9. IN.SPR - Remote setpoint input available

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrollling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN.SPR</td>
<td>REMOTE SETPOINT AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

If present, the parameter indicates that the remote setpoint input is installed on the controller.

*Unit of measurement:* -

*Options:* -

4.4.10. OUT.A1 - Analog output 1 available

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrollling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT.A1</td>
<td>ANALOG OUTPUT AVAILABLE</td>
<td>INFO</td>
<td>R</td>
</tr>
</tbody>
</table>

If present, the parameter indicates that the analog output in voltge or current is installed on the controller.

*Unit of measurement:* -

*Options:* -
4. CONFIGURATION

4.4.11. 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 TRASFORMER 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 = The device has 1 current transformer input
- CT1+2 = The device has 2 current transformer inputs

4.4.12. 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:**
- 1.IN.DG = 1 digital input installed on the controller
- 2.IN.DG = 2 digital input installed on the controller
- 3.IN.DG = 3 digital input installed on the controller
- 5.IN.DG = 4 digital input installed on the controller

4.4.13. 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:** -

4.4.14. 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
- CONTS = Continuous current output

4.4.15. 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>

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
4. CONFIGURATION

4.4.16. 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  
- TRIAC = Triac output (only for 650 model)

4.4.17. 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  
- TRIAC = Triac output (only for 1250 and 1350 models)

4.4.18. 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 (x 1000)

*Options:* -

4.4.19. 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, and if it is relay or logic, the parameter shows the number of switchings (in thousands).

*Unit of measurement:* Number (x 1000)

*Options:* -

4.4.20. 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, the parameter shows the number of switchings (in thousands).

*Unit of measurement:* Number (x 1000)

*Options:* -
### 4.4.21. **OUT4.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>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:* -

### 4.4.22. **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

### 4.4.23. **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

### 4.4.24. **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:* -

### 4.4.25. **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. CONFIGURATION

### 4.4.26. **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:* -

### 4.4.27. **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>INTERNAL TIME</td>
<td>INFO</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:* -

### 4.4.28. **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>INTERNAL DATE</td>
<td>INFO</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. PR.OPT Submenu - Configuring programs

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR.OPT</td>
<td>PROGRAMMER CONFIGURATION</td>
<td>Levelo</td>
<td>Lets you configure the 4 programs manageable by the programmer. The parameters are configured for each program to be used. The Programmer function must first be enabled with the menu MODE, parameter PROGR = On. For more information on configuring the programmer, see paragraph “5.13. et point programmer” at page 149.</td>
</tr>
</tbody>
</table>

Parameter page

- Selecting program 54
- Number of first step assigned to program 54
- Number of last step assigned to program 54
- Restart mode 54
- Type of control after program restart 54
- Option to start execution of program 55
- Action at end of program 55
- Limitation of step duration 55
4. CONFIGURATION

4.5.1. PR.OPT - Selecting program

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR.OPT</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...4

4.5.2. 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>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.

*Unit of measurement:* Number

*Options:* 1...12

4.5.3. 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>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.

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

*Unit of measurement:* Number

*Options:* 1...12

4.5.4. 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>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:* FI.STP = Program restarts from first step, with setpoint attributed or equal to PV based on the following parameter RST.SP

ST.STP = Program restarts from condition in which it stopped (last step in execution, setpoint

RSRCH = Program restarts with search for step (see programmer function...).

4.5.5. 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>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.
4.5.6. **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>DEF OF START EXEC PROGRAM</td>
<td>PR.OPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

Il parametro abilita o disabilita l'esecuzione automatica del reset della base tempi del programma dopo una commutazione STOP/START.

*Unit of measurement:* -

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

4.5.7. **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>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  
RESET = 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

4.5.8. **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>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 forzata al valore di FAULT.

*Unit of measurement:* -

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

4.6. **PR.STP Submenu - 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. Set point programmer” page 149.</td>
</tr>
</tbody>
</table>
4. CONFIGURATION

Submenu PR.STP - Configuration of program steps

- **Parameter**: PR.STP
  - **Page**: 57
  - **Description**: Programming step

- **Parameter**: SETP
  - **Page**: 57
  - **Description**: Programming step setpoint

- **Parameter**: RAMP.T
  - **Page**: 57
  - **Description**: Step time ramp

- **Parameter**: HOLD.T
  - **Page**: 57
  - **Description**: Hold time in step

- **Parameter**: HBB
  - **Page**: 57
  - **Description**: Enable Hold Back Band function

- **Parameter**: BAND
  - **Page**: 58
  - **Description**: Maximum deviation for HBB

- **Parameter**: HBB.R
  - **Page**: 58
  - **Description**: Enabling HBB during ramp

- **Parameter**: HBB.H
  - **Page**: 58
  - **Description**: Enabling HBB during hold

- **Parameter**: HBB2
  - **Page**: 48
  - **Description**: Enabling HBB with respect to I.SPR

- **Parameter**: S.SP.EN
  - **Page**: 58
  - **Description**: Enabling re-transmission of setpoint

- **Parameter**: SUB.SP
  - **Page**: 59
  - **Description**: Setpoint value of slaved controller

- **Parameter**: S.RM.EN
  - **Page**: 59
  - **Description**: Enabling ramp for slaved controller

- **Parameter**: ENBL.1
  - **Page**: 59
  - **Description**: Consent 1 to execute step

- **Parameter**: ENBL.2
  - **Page**: 59
  - **Description**: Consent 2 to execute step

- **Parameter**: ENBL.3
  - **Page**: 60
  - **Description**: Consent 3 to execute step

- **Parameter**: ENBL.4
  - **Page**: 60
  - **Description**: Consent 4 to execute step

- **Parameter**: EVN.R.1
  - **Page**: 60
  - **Description**: Event 1 during step ramp

- **Parameter**: EVN.R.2
  - **Page**: 60
  - **Description**: Event 2 during step ramp

- **Parameter**: EVN.R.3
  - **Page**: 60
  - **Description**: Event 3 during step ramp

- **Parameter**: EVN.R.4
  - **Page**: 61
  - **Description**: Event 4 during step ramp

- **Parameter**: EVN.H.1
  - **Page**: 61
  - **Description**: Event 1 during step hold

- **Parameter**: EVN.H.2
  - **Page**: 61
  - **Description**: Event 2 during step hold

- **Parameter**: EVN.H.3
  - **Page**: 61
  - **Description**: Event 3 during step hold

- **Parameter**: EVN.H.4
  - **Page**: 61
  - **Description**: Event 4 during step hold

- **Parameter**: GROP.R
  - **Page**: 62
  - **Description**: Group of parameters assigned to ramp

- **Parameter**: GROP.H
  - **Page**: 62
  - **Description**: Group of parameters assigned to hold

- **Parameter**: MSG.R
  - **Page**: 62
  - **Description**: Selecting message associated with the ramp

- **Parameter**: MSG.H
  - **Page**: 62
  - **Description**: Selecting message associated to hold
4.6.1. PR.STP - Programming step

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

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

**Unit of measurement:** Step number

**Options:** 1...12

4.6.2. 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>STEP SETPOINT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The parameter shows and sets the setpoint for the current programming step.
The selectable values are between the low setpoint (LO.SP) and the high setpoint (HI.SP), settable with submenu I.MAIN.

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

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

4.6.3. 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>STEP RAMP TIME</td>
<td></td>
<td></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

4.6.4. 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>STEP HOLD TIME</td>
<td></td>
<td></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

4.6.5. 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>HOLD BACK BAND FUNCTION</td>
<td></td>
<td></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
4. CONFIGURATION

4.6.6. 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>HOLD BACK BAND VALUE</td>
<td>PR.SPT</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

4.6.7. 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>ENABLE HOLD BACK BAND DURING STEP RAMP</td>
<td>PR.SPT</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

4.6.8. 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>ENABLE HOLD BACK BAND DURING STEP HOLD</td>
<td>PR.SPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

If the HBB function is enabled, the parameter enables and disables it during hold in the step.

*Unit of measurement:* -

*Options:* OFF = Disables HBB function during hold in step
           On  = Enables HBB function during hold in step

4.6.9. HBB2 - Enabling HBB with respect to I.SPR

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBB2</td>
<td>HOLD BACK BAND FUNCTION REFERRED TO I.SPR INPUT</td>
<td>PR.SPT</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, SP.REM parameter = On and submenu I.SPR, parameter F.SP = SETP
When the function is enabled with respect to the remote setpoint, if deviation PV-SPR exceeds value BAND, the program time base is stopped.

*Unit of measurement:* -

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

4.6.10. S.SP.EN - Enabling retransmission of setpoint

<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>SUBDUED SETPOINT RETRANSMITTED ENABLE</td>
<td>PR.SPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter enables and disables retransmission of the setpoint value to other slaved controllers.
The set point value is sent by configured analog output A1, OUT.AN submenu, parameter F.o.A1 = SLV.SP.

*Unit of measurement:* -

*Options:* OFF = Disables retransmission
           On  = Enables retransmission
4.6.11. 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>SUBDUE SETPOINT ASSOCIATED TO STEP</td>
<td>PR,SPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

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

*Unit of measurement:* %

*Options:* 0.0...100.0

4.6.12. 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>SUBDUE SETPOINT RAMP ENABLE</td>
<td>PR,SPT</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* -

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

On = Enables setpoint ramp for slaved controller

4.6.13. 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>STEP ENABLE FOR STEP START</td>
<td>PR,SPT</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

4.6.14. 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>STEP ENABLE FOR STEP START</td>
<td>PR,SPT</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. CONFIGURATION

4.6.15. 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>STEP ENABLE FOR STEP START</td>
<td>PR, SPT</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.

4.6.16. 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>STEP ENABLE FOR STEP START</td>
<td>PR, SPT</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.

4.6.17. 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>EVENT DURING STEP RAMP</td>
<td>PR, SPT</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

4.6.18. EVN.R.2 - Event 2 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.2</td>
<td>EVENT DURING STEP RAMP</td>
<td>PR, SPT</td>
<td>R W</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

4.6.19. 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>EVENT DURING STEP RAMP</td>
<td>PR, SPT</td>
<td>R W</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
4.6.20. **EVN.R.4 - 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.4</td>
<td>EVENT DURING STEP RAMP</td>
<td>PR.SPT</td>
<td>R W</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

4.6.21. **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>EVENT DURING STEP HOLD</td>
<td>PR.SPT</td>
<td>R W</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

4.6.22. **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>EVENT DURING STEP HOLD</td>
<td>PR.SPT</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

4.6.23. **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>EVENT DURING STEP HOLD</td>
<td>PR.SPT</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

4.6.24. **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>EVENT DURING STEP HOLD</td>
<td>PR.SPT</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. CONFIGURATION

#### 4.6.25. 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>CONTROL PARAMETER GROUP DURING STEP RAMP</td>
<td></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. PID.G.N is settable on the MODE submenu.

**Unit of measurement:** Number

**Options:** 0...PID.G.N = Number of group. If 0, parameters are those for controller settable on PID submenu.

#### 4.6.26. 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>CONTROL PARAMETER GROUP DURING STEP HOLD</td>
<td></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. PID.G.N is settable on the MODE submenu.

**Unit of measurement:** Number

**Options:** 0...PID.G.N = Number of group. If 0, parameters are those for controller settable on PID submenu.

#### 4.6.27. 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>SCROLLING MESSAGE DURING STEP RAMP</td>
<td></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 34. Setting it to “0” will not show any messages.

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

**Options:** 0...25

#### 4.6.28. 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>SCROLLING MESSAGE DURING STEP HOLD</td>
<td></td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter displays and sets the message number associated with the pitch during the maintenance, 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 34. Setting it to “0” will not show any messages.

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

**Options:** 0...25
4.7. I.MAIN Submenu - Configuration of main input

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.MAIN</td>
<td>MAIN INPUT CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the controller's main input.</td>
</tr>
</tbody>
</table>

![Diagram of I.MAIN Submenu]

- **tyPE**: Selecting sensor type
- **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

Parameter page

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### 4.7.1. 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>MAIN INPUT TYPE OF PROBE</td>
<td>I.MA IN</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the sensor type of the main 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 FAULT 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 °C</td>
<td>0...1000</td>
<td>0.0...999.9</td>
<td>&lt; 1.6°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>K °C</td>
<td>0...1300</td>
<td>0.0...999.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R °C</td>
<td>0...1750</td>
<td>0.0...999.9</td>
<td>with scale 0…1750 °C: &lt; 2°C (T &gt; 100 °C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S °C</td>
<td>0...1750</td>
<td>0.0...999.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T °C</td>
<td>-200…400</td>
<td>-199.9…400.0</td>
<td>&lt; 1.6°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C °C</td>
<td>0…2300</td>
<td>0.0...999.9</td>
<td>&lt; 1°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D °C</td>
<td>0...2300</td>
<td>0.0...999.9</td>
<td>&lt; 1.6°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pt20Rh °C</td>
<td>0...1880</td>
<td>0.0...999.9</td>
<td>&lt; 5.1°C (T&gt;1000°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pt40Rh °C</td>
<td>0...1880</td>
<td>0.0...999.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrared characteristic of the Tc K model see note</td>
<td>1 °C</td>
<td>10…70</td>
<td>10.0…70.0</td>
<td>maximum error 0.5°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 °C</td>
<td>60…120</td>
<td>60.0…120.0</td>
<td>maximum error 0.5°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 °C</td>
<td>115…165</td>
<td>115.0…165.0</td>
<td>maximum error 0.5°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 °C</td>
<td>140…260</td>
<td>140.0…260.0</td>
<td>maximum error 0.5°C</td>
<td></td>
</tr>
<tr>
<td>Resistance thermometer</td>
<td>PT100 °C</td>
<td>-200…850</td>
<td>-199.9…850.0</td>
<td>&lt; 1°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PT100 °C</td>
<td>-50…100</td>
<td>-50.0…100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>JPT100 °C</td>
<td>-200…600</td>
<td>-199.9…850.0</td>
<td>&lt; 1°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voltage/Current</td>
<td>0…60 mV</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0…20 mA</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4…20 mA</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0…10 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2…10 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0…5 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1…5 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0…1 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2…1 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
</tr>
<tr>
<td>Custom</td>
<td>RTD</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…60 mV</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…20 mA</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4…20 mA</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…10 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2…10 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…5 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1…5 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…1 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.2…1 V</td>
<td>-1999…9999</td>
<td>-1999…9999</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nota: 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).
4.7.2. 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>CUSTOM LINEARIZATION</td>
<td>I.MAIN</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.

For an explanation of 4-point linearization, see paragraph "5.4. 4-point input correction page 141."
4. CONFIGURATION

4.7.3. 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>UNIT OF MEASURE</td>
<td>I.MAIN</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the unit of measurement displayed for input 1. The unit appears on the Home 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

4.7.4. 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>DIGITAL FILTER</td>
<td>I.MAIN</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

4.7.5. 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>DIGITAL FILTER ON DISPLAY PV</td>
<td>I.MAIN</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

4.7.6. 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>DECIMAL POINT POSITION</td>
<td>I.MAIN</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
### 4.7.7. 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 LOW LIMIT</td>
<td>I.MAIN</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the lower limit of the measurement scale used for the main 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

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit = °C</td>
<td>Unit = °F</td>
<td>Unit = °C</td>
<td>Unit = °F</td>
<td></td>
</tr>
<tr>
<td>DEC.P = 0</td>
<td>DEC.P = 0</td>
<td>DEC.P = 0</td>
<td>DEC.P = 0</td>
<td></td>
</tr>
<tr>
<td>J.TC</td>
<td>0...1000</td>
<td>32...1832</td>
<td>4-20M</td>
<td>-1999...9999</td>
</tr>
<tr>
<td></td>
<td>0...1300</td>
<td>32...2372</td>
<td>10V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>K.TC</td>
<td>0...1750</td>
<td>32...3182</td>
<td>2-10V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>R.TC</td>
<td>0...1750</td>
<td>32...3182</td>
<td>5V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>S.TC</td>
<td>-200...400</td>
<td>-328...752</td>
<td>1-5V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>T.TC</td>
<td>0...2300</td>
<td>32...4172</td>
<td>1V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>C.TC</td>
<td>0...2300</td>
<td>32...4172</td>
<td>0.2-1V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>D.TC</td>
<td>0...2300</td>
<td>32...4172</td>
<td>C.RTD</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>PT2.TC</td>
<td>0...1880</td>
<td>32...4208</td>
<td>C.60MV</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>INFR1</td>
<td>10...70</td>
<td>50...158</td>
<td>C.20MA</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>INFR2</td>
<td>60...120</td>
<td>140...248</td>
<td>C.4-20</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>INFR3</td>
<td>115...165</td>
<td>239...329</td>
<td>C.10V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>INFR4</td>
<td>140...260</td>
<td>284...500</td>
<td>C.2-10</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>PT100</td>
<td>-200...850</td>
<td>-328...1562</td>
<td>C.5V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>PT.LIM</td>
<td>-50...100</td>
<td>-58...212</td>
<td>C.1-5V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>JTP10</td>
<td>-200...600</td>
<td>-328...1112</td>
<td>C.1V</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>60MV</td>
<td>-1999...9999</td>
<td>-1999...9999</td>
<td>C.0.2-1</td>
<td>-1999...9999</td>
</tr>
<tr>
<td>20MA</td>
<td>-1999...9999</td>
<td>-1999...9999</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.7.8. 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 HIGH LIMIT</td>
<td>I.MAIN</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the upper limit of the measurement scale used for the main 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. CONFIGURATION

#### 4.7.9. 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 OFFSET</td>
<td>I.MAIN</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

#### 4.7.10. 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>LOW LIMIT FOR SETPOINT</td>
<td>I.MAIN</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.

**Unit of measurement:** The one set with the Unit parameter

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

#### 4.7.11. 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>HIGH LIMIT FOR SETPOINT</td>
<td>I.MAIN</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.

**Unit of measurement:** The one set with the Unit parameter

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

#### 4.7.12. 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>LOW LIMIT FOR ABSOLUTE ALARMS</td>
<td>I.MAIN</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...9999

#### 4.7.13. 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>HIGH LIMIT FOR ABSOLUTE ALARMS</td>
<td>I.MAIN</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...9999
4.8. I.SPR Submenu - Configuration of remote setpoint input

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.SPR</td>
<td>REMOTE SETPOINT INPUT CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the remote setpoint input if it is installed on the controller. The remote setpoint can be assigned to the process variable PV (active in REM mode) or to the POWER value (active in MAN + REM mode).</td>
</tr>
</tbody>
</table>

Parameter page:

- **t.SPr**: Selecting type of remote setpoint input
- **F.SPr**: Selecting remote setpoint input function
- **Lin.S**: Selecting linearization type
- **FILT.S**: Digital filter
- **LO.SPR**: Minimum scale limit
- **HI.SPR**: Maximum scale limit
- **OF.SPR**: Scale offset correction
4. CONFIGURATION

4.8.1. t.SPr - Selecting type of remote setpoint input

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>t.SPr</td>
<td>DEFINITION OF REMOTE SETPOINT</td>
<td>I.SPR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the type of remote setpoint input.

**Unit of measurement: -**

**Options:**
- 20MA = Current input in 0...20 mA
- 4-20M = Current input in 4...20 mA
- 10V = Voltage input in 0...10 V
- 2-10V = Voltage input in 2...10 V
- 1V = Voltage input in 0...1 V
- C.20MA = Current input 0...20 mA with user calibration
- C.4-20 = Current input 4...20 mA with user calibration
- C.10V = Current input 0...10 V with user calibration
- C.2-10 = Current input 2...10 V with user calibration
- C.1V = Current input 0...1 V with user calibration

4.8.2. F.SPr - Selecting remote setpoint input function

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.SPr</td>
<td>FUNCTION OF REMOTE SETPOINT</td>
<td>I.SPR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the function assigned to the remote setpoint input.

**Unit of measurement: -**

**Options:**
- NONE = Display only
- SETP = Remote setpoint of Process Value (PV)
- POWER = Remote setpoint of Power
- RST.PW = Reset power

4.8.3. Lin.S - 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.S</td>
<td>CUSTOM LINEARIZATION</td>
<td>I.SPR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the type of linearization used.

**Unit of measurement: -**

**Options:**
- NONE = No linearization is applied
- 32.STP = 32-step linearization defined on LINRZ menu is applied
- 4.POIN = 4-point linearization defined on LINRZ menu is applied

4.8.4. FILT.S - Filtro digitale

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILT.S</td>
<td>DIGITAL FILTER</td>
<td>I.SPR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the value of the digital filter time constant.

**Unit of measurement: -**

**Options:**
- 0.00...20.00
4.8.5. **LO.SPR - Minimum scale limit**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO.SPR</td>
<td>INPUT LOW LIMIT</td>
<td>I.SPR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the minimum scale limit.

**Unit of measurement:** Scale points or %, according to the remote setpoint input function selected

**Options:**
- `-1999...9999` = In scale points referred to main input
- `-199.9...999.9` = In %, if the Power or RST.PW function was selected

4.8.6. **HI.SPR - 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.SPR</td>
<td>INPUT HIGH LIMIT</td>
<td>I.SPR</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the maximum scale limit.

**Unit of measurement:** Scale points or %, according to the remote setpoint input function selected

**Options:**
- `LO.SPR...9999` = In scale points referred to main input
- `LO.SPR...999.9` = In %, if the Power or RST.PW function was selected

4.8.7. **OF.SPR - 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.SPR</td>
<td>INPUT OFFSET</td>
<td>I.SPR</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 the input.

**Unit of measurement:** Scale points

**Options:** `-999...999`
4.9. I.CT1 Submenu - Configuration of current transformer CT1

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.CT1</td>
<td>CURRENT TRASFORMER 1 INPUT CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the input for current transformer CT1.</td>
</tr>
</tbody>
</table>

Parameter page

FILT.1

Digital filter

HI.CT1

Maximum scale limit

OF.CT1

Scale offset correction

73
4. CONFIGURATION

4.9.1. FILT.1 - Digital filter

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILT.1</td>
<td>DIGITAL FILTER</td>
<td>I.CT1</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.

Unit of measurement: Seconds
Options: 0.00...20.00

4.9.2. HI.CT1 - 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.CT1</td>
<td>INPUT HIGH LIMIT</td>
<td>I.CT1</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

Unit of measurement: A
Options: 0.0...100.0

4.9.3. OF.CT1 - 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.CT1</td>
<td>INPUT OFFSET</td>
<td>I.CT1</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.

Unit of measurement: A
Options: -99.9...99.9
4.10. I.CT2 Submenu - Configuration of current transformer CT2

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.CT2</td>
<td>CURRENT TRASFORMER 2 INPUT CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the input for current transformer CT2.</td>
</tr>
</tbody>
</table>

Parameter page

- Digital filter
- Maximum scale limit
- Scale offset correction
4. CONFIGURATION

4.10.1. FILT.2 - Digital filter

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILT.2</td>
<td>DIGITAL FILTER</td>
<td>I.CT2</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 CT2.

*Unit of measurement:* Seconds

*Options:* 0.00...20.00

4.10.2. HI.CT2 - 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.CT2</td>
<td>INPUT HIGH LIMIT</td>
<td>I.CT2</td>
<td>R W</td>
</tr>
</tbody>
</table>

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

*Unit of measurement:* A

*Options:* 0.0...100.0

4.10.3. OF.CT2 - 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.CT2</td>
<td>INPUT OFFSET</td>
<td>I.CT2</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 CT2.

*Unit of measurement:* A

*Options:* -99.9...99.9
### 4. CONFIGURATION

#### 4.11. ALARM Submenu - 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>

![Diagram of ALARM Submenu]

- **Parameter page**: 77
- **Parameter page**: 79

- **ALARM**: Selecting the alarm to be configured
- **REF.x**: Selecting the alarm reference
- **d.i.x**: Selecting direct or inverse alarm
- **A.r.x**: Selecting absolute or deviation alarm
- **n.S.x**: Method for applying hysteresis
- **PWON.E**: Disabling the alarm at power-on
- **LATCH**: Memorizing the alarm
- **HYSTE**: Hysteresis
- **DELAY**: Alarm trip delay

- **MSG.AL**: Message associated with tripping of alarm
- **BLK.AL**: Flashing of PV display
4.11.1. **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>ALARM</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.

4.11.2. **rEF.x - 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>rEF.x</td>
<td>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:* PV = Process variable
IN.SPR = Remote setpoint input
SP.ACT = Actual setpoint
CURR1 = Current of current transformer CT1
CURR2 = Current of current transformer CT2
OUT.KW = Power transferred to the load
ENERG = Energy transferred to load
TOT.EN = Totalizer Energy transferred to the load
T.INT = Internal temperature

4.11.3. **d.i.x - 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>d.i.x</td>
<td>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. Generic alarms AL1...AL4” on page 142.

*Unit of measurement:* -

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

4.11.4. **A.r.x - 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>A.r.x</td>
<td>ABSOLUTE/DEVIATION 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. Generic alarms AL1...AL4” on page 142.

*Unit of measurement:* -

*Options:* ABSLT = Absolute alarm
RELAT = Deviation alarm
4. CONFIGURATION

4.11.5. n.S.x - 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>n.S.x</td>
<td>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. Generic alarms AL1...AL4” on page 142.

**Unit of measurement:** -

**Options:**

- NORML = Normal alarm
- SYMMT = Symmetrical alarm (window)

4.11.6. 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>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)

4.11.7. 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>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
4.11.8. HYSTE - Hysteresis

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYST</td>
<td>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

4.11.9. 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>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. Generic alarms AL1...AL4” on page 142.

*Unit of measurement:* Minutes.seconds

*Options:* 0.00...99.59

4.11.10. 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>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 34.
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

4.11.11. 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>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. CONFIGURATION

#### 4.12. AL.HB Submenu – 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 CONFIG</td>
<td>Level 1</td>
<td>Lets you configure the Heater Break alarm, i.e., the alarm that trips when the heating element is outside normal operating parameters. The submenu is present if the CT1 or CT1+CT2 input option was previously selected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW.ON</td>
<td>Alarm due to insufficient current draw</td>
</tr>
<tr>
<td>HIG.ON</td>
<td>Alarm due to excessive current draw</td>
</tr>
<tr>
<td>HI.OFF</td>
<td>Alarm due to excessive current draw</td>
</tr>
<tr>
<td>TIME</td>
<td>HB alarm trip delay</td>
</tr>
<tr>
<td>THR.PE</td>
<td>Percentage of HB current compared to calibration</td>
</tr>
<tr>
<td>OUT</td>
<td>Control output associated with HB alarm</td>
</tr>
<tr>
<td>LoAd</td>
<td>Selecting type of connected load</td>
</tr>
<tr>
<td>MSG.HB</td>
<td>Message associated with tripping of HB alarm</td>
</tr>
<tr>
<td>BLK.HB</td>
<td>Flashing of PV display</td>
</tr>
</tbody>
</table>

Parameter page

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4. CONFIGURATION

### 4.12.1. 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

### 4.12.2. 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

### 4.12.3. 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 (eg a module SSR) is in short circuit.

*Unit of measurement:* A

*Options:* 0.0...999.9

### 4.12.4. 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
### 4.12.5. 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 “4.25. Submenu US.CAL – User calibrations” on page 131.

**Unit of measurement:** %

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

### 4.12.6. 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

### 4.12.7. 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 143.

**Unit of measurement:** -

**Options:**
- MONO = Monophase power supply, with current transformer CT1 only (if current transformer CT2 is 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

### 4.12.8. 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 34. 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
### 4.12.9. 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. CONFIGURATION

4.13. PID Submenu – 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>

- **Parameter**: Feeding forward power
- **Parameter**: Deadband
- **Parameter**: Fault action power
- **Parameter**: Setpoint gradient in increase
- **Parameter**: Setpoint gradient in decrease
- **Parameter**: Unit of measurement of gradient
- **Parameter**: Gradient of control output
- **Parameter**: Tripping delay
- **Parameter**: Power delivered when LBA alarm trips

**Acronym**
- S.TUNE: Enabling Self-Tuning
- SOFT.S: Enabling Soft-Start
- SOFT.T: Soft-Start Time
- A.TUNE: Enabling Auto-Tuning
- A.TUNE: Selecting type of Auto-Tuning
- Cntr: Selecting type of control
- DERV.S: Derivative sampling time
- H.PB: Proportional heating band or hysteresis in ON-OFF control
- H.IT: Integral heating time
- H.DT: Derivative heating time
- H.P.HI: Maximum limit of heating power

**Parameter**: Minimum limit of heating power
- **Parameter**: Selecting cooling fluid
- **Parameter**: Cooling setpoint with respect to heating setpoint
- **Parameter**: Proportional cooling band or hysteresis in ON-OFF control
- **Parameter**: Integral cooling time
- **Parameter**: Derivative cooling time
- **Parameter**: Maximum limit of cooling power
- **Parameter**: Minimum limit of cooling power
- **Parameter**: Manual reset
- **Parameter**: Reset power
- **Parameter**: Antireset
- **Parameter**: Feedforward power
- **Parameter**: Deadband
- **Parameter**: Fault action power
- **Parameter**: Setpoint gradient in increase
- **Parameter**: Setpoint gradient in decrease
- **Parameter**: Unit of measurement of gradient
- **Parameter**: Gradient of control output
- **Parameter**: Tripping delay
- **Parameter**: Power delivered when LBA alarm trips
### 4.13.1. 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>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 145.

**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-ons

### 4.13.2. 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>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 144. This parameter appears only if S.TUNE = OFF.

**Unit of measurement:** -

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

### 4.13.3. 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>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

### 4.13.4. 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>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 146.

**Unit of measurement:** -

**Options:**
- OFF = Auto-Tuning disabled
- On = Auto-Tuning enabled
4. CONFIGURATION

4.13.5. 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>AUTO TUNING SELECTION</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 input
- DEV1 = One-shot Auto-Tuning with activation when |SP-PV| > 1% of full scale of main input
- DEV2 = One-shot Auto-Tuning with activation when |SP-PV| > 2% of full scale of main input
- DEV4 = One-shot Auto-Tuning with activation when |SP-PV| > 4% of full scale of main input

4.13.6. 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>TYPE OF CONTROL</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

4.13.7. DERV.S - Derivative sampling time

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DERV.S</td>
<td>DERIVATIVE SAMPLE TIME</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. CONFIGURATION

4.13.8. 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>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 input.

*Unit of measurement:* %

*Options:* 0.0...999.9

4.13.9. 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>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

4.13.10. 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>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

4.13.11. H.P.HI - Maximum 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.HI</td>
<td>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

4.13.12. 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>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
### 4.13.13. 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>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)

### 4.13.14. 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>COOLING SETPOINT RELEVANT TO THE HEATING SETPOINT</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 input

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

### 4.13.15. 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>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 input.

**Unit of measurement:** %

**Options:** 0.0...999.9

### 4.13.16. 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>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

### 4.13.17. 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>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
4.13.18. 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>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

4.13.19. 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>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

4.13.20. RESET - Manual reset

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESET</td>
<td>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 input

Options: -999...999

4.13.21. P.RST - Potenza di reset

<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>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

4.13.22. A.RST - Antireset

<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>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 input

Options: 0...9999
4. CONFIGURATION

4.13.23. 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>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.

\[
U = \frac{\text{set point}}{\text{full scale – start scale}} \times \text{FEEDF} \times 100
\]

Unit of measurement: %

Options: -100.0...100.0

4.13.24. 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>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 input.

Options: 0...999

4.13.25. 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>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

4.13.26. 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>SETPOINT GRADIENT IN 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

4.13.27. GRAD.D - Setpoint gradient in decrease

<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>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. CONFIGURATION

4.13.28. 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>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

4.13.29. 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>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

4.13.30. 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>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.

*Unit of measurement:* Minutes

*Options:* 0.0...500.0

4.13.31. 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>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.

*Unit of measurement:* %

*Options:* -100.0...100.0
## 4. CONFIGURATION

### 4.14. PID.GR Submenu – 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>

**Parameter page**

- **PID.G.R**
  - 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
  - Threshold PV for the activation of the group of PID parameters

- **H.PB**
  - 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

- **H.IT**
  - Integral heating time
  - Derivative heating time
  - Maximum limit of heating power
  - Minimum limit of heating power

- **H.DT**
  - Derivative heating time
  - Maximum limit of heating power
  - Minimum limit of heating power

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

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

- **C.PB**
  - Proportional cooling band or hysteresis in ON-OFF control
  - Integral cooling time
  - Derivative cooling time
  - Maximum limit of cooling power
  - Minimum limit of cooling power

- **C.IT**
  - Integral cooling time
  - Derivative cooling time

- **C.DT**
  - Derivative cooling time
4.14.1. **PID.G.R - Selecting the parameter 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.R</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...PD.G.N = Numerical identification where PID.G.N is the total number of groups of parameters set on the MODE submenu

4.14.2. **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>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 input.

*Unit of measurement:* %

*Options:* 0.0...999.9

4.14.3. **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>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

4.14.4. **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>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

4.14.5. **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.P.HI</td>
<td>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. CONFIGURATION

4.14.6. 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>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. For details, see paragraph “4.13.12. H.P.LO – Minimum limit of heating power” on page 87.

**Unit of measurement:** %

**Options:** 0.0...100.0

4.14.7. 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>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 input.

**Unit of measurement:** %

**Options:** 0.0...999.9

4.14.8. 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>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

4.14.9. 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>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

4.14.10. 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>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
4.14.11. 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>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 “4.13.9. H.IT – Integral heating time” on page 87.

*Unit of measurement:* %

*Options:* 0.0...100.0

4.14.12. 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>PV BEYOND WHICH IS ACTIVE PARAMETER GROUP</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.

*Unit of measurement:* Scale points of main input

*Options:* LO.SCL...HI.SCL
4. CONFIGURATION

4.15. I.DIGT Submenu – Configuring digital inputs

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.DIGT</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 page

- Selecting the digital input: 97
- Defining the input state: 97
- Selecting the assigned function: 97
- Setting assigned consent number: 98
- Selecting the digital input message: 98
4.15.1. 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></td>
<td>I.DIGT 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...2 for model 650 with 2 digital inputs option
- 1...3 for model 650 with 3 digital inputs option
- 1...5 for models 1250 and 1350 with 5 digital inputs option

4.15.2. S.in.x - 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>S.in.x</td>
<td>DIGITAL INPUT STATUS</td>
<td></td>
<td>I.DIGT 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

4.15.3. F.in.x - 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.x</td>
<td>DIGITAL INPUT FUNCTION</td>
<td></td>
<td>I.DIGT 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-MA = Automatic-Manual control
- LO-RE = Local-Remote setpoint mode
- HOLD = Hold value of main input
- AL.ACK = Reset alarm latches
- S.TUNE = Activate Self-Tuning
- A.TUNE = Activate Auto-Tuning
- ON-OF = Software ON-OFF
- FKEY = Block F key
- WRI.EN = Enable writing of configuration parameters
  if the Multiset function is enabled:
- SEL.L = Select setpoint SETP1...SETP2 or SETP1...SETP4 low bit
- SEL.H = Select set point SETP1...SETP4 high bit Model “Programmer enabled
  SEL.L and SEL.H” have the meaning of selection Nr. program
  if the Timer function is enabled:
- T.STST = START/STOP timer
- T.RST = RESET timer
  if the Programmer function is enabled:
- P.STST = START/STOP programmer base times
- P.STRT = START programmer base times
- P.STOP = STOP programmer base times
- P.RST = RESET programmer base times
- P.SKP = SKIP to end of program (end cycle)
- ST.SKP = SKIP to end of step
  if the Logic Options function is enabled:
- FB.IN = Function Blocks Input
- KEY.U = replica UP button
- KEY.D = replica DOWN button
- KEY.F = replica F button
4. CONFIGURATION

4.15.4. 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>ENABLE NUMBER</td>
<td>I.DIGT</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.ENB.

Unit of measurement: Number

Options: 1...4

4.15.5. 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>NUMBER OF SCROLLING MESSAGE AT INPUT ACT</td>
<td>I.DIGT</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 34. If the parameter is set to “0” no message will be displayed when the digital input is activated. The same message number can be assigned to different inputs.

Unit of measurement: Message number

Options: 0...25
4. CONFIGURATION

4.16. OUTPU Submenu – 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 page

- Selecting the output
- Defining the output state
- Selecting the function assigned to relay, logic or Triac output
- Selecting the function assigned to continuous output
- Setting the event number
- Setting the Function Block output number
- Setting the digital input number
- Setting the number of switchings for signal
- State of output with broken input

Parameter page

- Selecting the output message
- Cycle time of output

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4.16.1. 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

4.16.2. S.ou.x - 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>S.ou.x</td>
<td>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 = 4mA and maximum = 20 mA, while inverse corresponds to minimum = 20 mA and maximum = 4 mA.

The outputs can be forced so that they are always on or off.

*Unit of measurement:* -

*Options:*  
- DIREC = Direct output  
- INVRS = Inverse output  
- OFF = Output forced off  
- ON = Output forced on
4.16.3. **F.ou.x - 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.ou.x</td>
<td>OUTPUT FUNCTION</td>
<td>OUTPU</td>
<td>R W</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
- **HEAT** = Heat control output
- **COOL** = Cool control output
- **ALRM1** = Output for Alarm 1
- **ALRM2** = Output for Alarm 2
- **ALRM3** = Output for Alarm 3
- **ALRM4** = Output for Alarm 4
- **OR.12** = Alarm 1 OR Alarm 2
- **OR.123** = Alarm 1 OR Alarm 2 OR Alarm 3
- **O.1234** = Alarm 1 OR Alarm 2 OR Alarm 3 OR Alarm 4
- **AND.12** = Alarm 1 AND Alarm 2
- **AND.123** = Alarm 1 AND Alarm 2 AND Alarm 3
- **AND.1234** = Alarm 1 AND Alarm 2 AND Alarm 3 AND Alarm 4
- **AL.HB** = Output for HB alarm
- **LBA** = Output for LBA alarm
- **BUT.SR** = Set/Reset from key

*if the Timer function is enabled:*

- **TIMER** = Timer state (end of count)

*if the Programmer function is enabled:*

- **P.HBB** = HBB alarm of programmer
- **P.RUN** = RUN state of programmer
- **P.HOLD** = STOP state of programmer
- **P.RDY** = READY state of programmer (after reset of time base)
- **P.END** = END state of programmer
- **EVENT** = EVENT state of programmer

*if model with Logic Operations:*

- **FB.OUT** = 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

4.16.4. **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.

**Unit of measurement:** -

**Options:**

- **NONE** = No assigned function
- **HEAT** = Heat control output
- **COOL** = Cool control output
- **PV** = Process variable
- **SSP** = Active setpoint
- **SP** = Local setpoint
- **SP-PV** = Deviation |SSp-PV|
- **SERIA** = Value set from serial line
### 4. CONFIGURATION

#### 4.16.5. 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>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.x = EVENT`.

*Unit of measurement:* Number

*Options:* 1...4

#### 4.16.6. FB.OU.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.OU.N</td>
<td>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.x = FB.OUT`.

*Unit of measurement:* Number

*Options:* 1...16

#### 4.16.7. 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>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.x = IN.DIG`.

*Unit of measurement:* Number

*Options:* 1...2 Model 650 with option 2 digital inputs
          1...3 Model 650 with option 3 digital inputs
          1...5 Models 1250 and 1350 with option 5 digital inputs

#### 4.16.8. 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>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

#### 4.16.9. 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>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 broken input (Err, Sbr, ...), if the output is direct or inverse.

*Unit of measurement:* -

*Options:* OFF = Output is off
          On = Output is on
4.16.10. 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>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 34.

If the parameter is set to “0” no message will be displayed when the output is activated.

The same message number can be assigned to different outputs.

*Unit of measurement:* Message number

*Options:* 0...25

4.16.11. 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>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 = HEAT or F.ou.x = COOL.

The slicing period is the cycle time, i.e., the sum of ON time and OFF time proportional to the value of Heat or Cool power.

**Example**

If Heat power is 25% and the 25% cycle time is 10.0 seconds, the output is active for 2.5 seconds and inactive for 7.5 seconds.

Burst Firing (BF) mode has a variable cycle time, optimized to transfer power as quickly as possible. The minimum interval for ON or OFF equals the electrical cycle (20 ms at 50 Hz).

The ON and OFF times are multiples of the minimum time.

**Example**

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

*Unit of measurement:* Seconds

*Options:* 0.0...20.0 for digital and Triac outputs. There is Burst Firing (BF) with 0.0.

1...200 for relay output
### 4. CONFIGURATION

#### 4.17. OUT.AN - Submenu – Configuring the analog retransmission output

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Password</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT.AN</td>
<td>ANALOG RETRASMISSION OUTPUT CONFIG</td>
<td>Level 2</td>
<td>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.</td>
</tr>
</tbody>
</table>

#### Parameter page

- **S.o.A1**: Defining the state of the analog output 105
- **t.o.A1**: Defining the type of analog output 105
- **F.o.A1**: Selecting the function assigned to the analog output 105
- **LO.A1**: Scale minimum 105
- **HI.A1**: Scale maximum 106
### 4.17.1. S.o.A1 - 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>S.o.A1</td>
<td>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.
The active direct output corresponds to minimum with the minimum output value in voltage or current.
The active inverse output corresponds to minimum with the maximum output value in voltage or current.
The outputs can be forced so that they are always on or off.

**Unit of measurement:** -

**Options:**
- **DIREC** = Direct output
- **INVRS** = Inverse output
- **OFF** = Forced output inactive (minimum voltage or current value)
- **ON** = Forced output active (maximum voltage or current value)

### 4.17.2. t.o.A1 - 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>t.o.A1</td>
<td>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.

**Unit of measurement:** -

**Options:**
- **20MA** = Output 0...20 mA
- **4-20M** = Output 4...20 mA
- **10V** = Output 0...10 V
- **2-10V** = Output 2...10 V
- **C.20MA** = Custom Output 0...20 mA
- **C.4-20** = Custom Output 4...20 mA
- **C.10V** = Custom Output 0...10 V
- **C.2-10** = Custom Output 2...10 V

### 4.17.3. F.o.A1 - 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>F.o.A1</td>
<td>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.

**Unit of measurement:** -

**Options:**
- **NONE** = No assigned function
- **HEAT** = Heat control power
- **COOL** = Cool control power
- **PV** = Process variable
- **SSP** = Active setpoint
- **SP** = Local setpoint
- **SP-PV** = Deviation [SP-PV]
- **SERIA** = Value set from serial line
  
  *if the Programmer function is enabled:*
- **SLV.SP** = Slaved setpoint

### 4.17.4. LO.A1 - Scale minimum

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO.A1</td>
<td>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.

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

**Options:** -1999...9999
4. CONFIGURATION

4.17.5. HI.A1 - Scale maximum

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI.A1</td>
<td>HIGH LIMIT ANALOG OUTPUT</td>
<td>OUT.AN</td>
<td>R W</td>
</tr>
</tbody>
</table>

Il parametro mostra e imposta il massimo di scala, che corrisponde al massimo dell’uscita in tensione o corrente.

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

*Options:* -1999...9999
### 4.18. VALVE Submenu – 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>

![Diagram of VALVE Submenu parameters]

- **F. uAL**: 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. CONFIGURATION

4.18.1. F.uAL - Defining valve function

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.uAL</td>
<td>VALVE CONTROL TYPE</td>
<td>VALVE</td>
<td>R W</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:**
- **HEAT** = Heat control power
- **COOL** = Cool control power

4.18.2. 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>VALVE</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets enabling of valve opening and closing with controller keys ▲ and ▼ in manual mode.

**Unit of measurement:** -

**Options:**
- **OFF** = Keys do not act directly on valve opening and closing
- **On** = Keys enabled for manual valve opening and closing

4.18.3. TRAVL - Valve actuator travel time

<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>VALVE</td>
<td>R W</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

4.18.4. 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>VALVE</td>
<td>R W</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 153.

**Unit of measurement:** % of TRAVL

**Options:** 0.0...25.0

4.18.5. 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 153.

**Unit of measurement:** % of TRAVL

**Options:** 0.0...100.0
4.18.6. 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:** % of TRAVL

**Options:** 0.0...100.0

4.18.7. 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:** % of TRAVL

**Options:** 0.0...100.0

4.18.8. 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 input

**Options:** 0.0...25.0
### 4. CONFIGURATION

#### 4.19. MODE Submenu – 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 page

- **PID.G.N**: Number of groups of control parameters
- **MA.AU**: Defining transition from Manual to Automatic
- **AU.MA**: Defining transition from Automatic to Manual
- **LO.rE**: Defining transition from remote SP to local SP or from remote manual to local manual
- **On.OF**: Enabling software on/off
- **MA.P.L**: Enabling manual power latch
- **MAn.P**: Enabling change of manual power value
- **dIG**: Defining type of digital inputs
- **ALRM.N**: Number of alarms enabled
- **TIMER**: Enabling Timer function
- **MUL.SP**: Enabling Multiset function
- **SP.REM**: Enabling the remote setpoint
- **SP.r.t**: Defining absolute or deviation remote setpoint
- **PROGR**: Enabling the setpoint programmer
- **t.Pro**: Setting the programmer base time
- **ENERG**: Enabling the energy counter function
- **T.SAMP**: Main input sample time
- **FREQZ**: Defining power line frequency

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4.19.1. **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>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

4.19.2. **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>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.

**Unit of measurement:** -

**Options:** STAND

4.19.3. **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>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

4.19.4. **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>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 F.SP r = SETP.

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. CONFIGURATION

4.19.5. 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>MODE</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

4.19.6. 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>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

4.19.7. 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>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

4.19.8. 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>MODE</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

4.19.9. 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>MODE</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. CONFIGURATION

4.19.10. 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>TIMER ENABLE</td>
<td></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 147.

*Unit of measurement:* -

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

4.19.11. 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>MULTISET ENABLE</td>
<td></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 149.

*Unit of measurement:* -

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

4.19.12. 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>REMOTE SP ENABLE</td>
<td></td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets enabling and the type of the remote set point.
It is enabled in sub-menu I.SPR, parameter F.SPr = SETP
The remote set point must also be set as a function of the remote input F.SPr = SETP.
Remote mode is enabled from the keys, digital inputs, serial line or as Function Block output by setting the LO-RE option.

*Unit of measurement:* -

*Options:*
- OFF = Remote setpoint disabled
- On = Remote setpoint enabled from analog input
- SEr = Remote setpoint enabled from serial

4.19.13. 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>REMOTE SP TYPE</td>
<td></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

4.19.14. 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></td>
<td>R W</td>
</tr>
</tbody>
</table>
4. CONFIGURATION

The parameter shows and sets enabling of the setpoint programmer for P or PV models.

**Unit of measurement:** -

**Options:**
- **OFF** = Setpoint programmer disabled
- **On** = Setpoint programmer enabled

### 4.19.15. 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>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** = Base time calculated in minutes:seconds

### 4.19.16. 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>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 154.

**Unit of measurement:** -

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

### 4.19.17. T.SAMP - Main 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>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the main input sample time.

**Unit of measurement:** Milliseconds

**Options:**
- **60**
- **120**

### 4.19.18. 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>MODE</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the power line frequency.

**Unit of measurement:** Hz

**Options:**
- **50**
- **60**
4.20. TIMER Submenu – Configuring timer parameters

<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 page

- Selecting Timer function mode
- Selecting the Start/Stop timer command
- Defining the Start/Stop timer command logic
- Selecting the Reset timer command
- Defining the Reset timer command logic
- Timer count band
- Selecting the function activated at end of count
- Timer value
- Message assigned to active Timer
### 4. CONFIGURATION

#### 4.20.1. F.tiM - 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>F.tiM</td>
<td>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 147.

**Unit of measurement:** -

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

#### 4.20.2. 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 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.

**Unit of measurement:** -

**Options:**
- **IN.DIG** = From digital input
- **ALRM1** = From alarm 1
- **ALRM2** = From alarm 2
- **ALRM3** = From alarm 3
- **ALRM4** = From alarm 4
- **AL.HB** = From HB alarm
- **SERIA** = From serial

#### 4.20.3. 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>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

#### 4.20.4. 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 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 HB alarm
- **SERIA** = From serial
### 4.20.5. 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>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

### 4.20.6. 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>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 input

*Options:* 0.0...25.0

### 4.20.7. 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>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

### 4.20.8. 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>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 tMEr

*Options:* 0...9999
4. CONFIGURATION

4.20.9. MSG.TM - Selecting the message assigned to the active 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>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 the active timer count, i.e., the scrolling message shown on the display.

For more information on scrolling messages, see paragraph “3.1.2.2. Scrolling messages” on page 34.

If the parameter is set to “0” no message will be displayed during the active timer count.

**Unit of measurement:** Message number

**Options:** 0...25
4. CONFIGURATION

4.21. ENERG Submenu - 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. The submenu appears if the energy counter function was enabled on the MODE submenu.</td>
</tr>
</tbody>
</table>

Parameter page

Selecting the output for energy calculation 120

Nominal line voltage 120

Nominal power of load 120

Nominal cost per kWh 120
4. CONFIGURATION

4.21.1. 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>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
- OU12 = Output 2
- OU13 = Output 3
- OU14 = Output 4

4.21.2. 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>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

4.21.3. 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>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

4.21.4. 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>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
4.22. SERIA Submenu – 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>

4.22. SERIA Submenu – Configuring serial communication

[Diagram]

Parameter page

- **CODE**: Identification code
- **KBAUD**: Selecting communication speed
- **Par**: Selecting parity

122
4. CONFIGURATION

4.22.1. 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

4.22.2. 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

4.22.3. 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
4.23. HMI Submenu – Configuring the display and keypad

<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 AND KEYBOARD</td>
<td>Level 2</td>
<td>Lets you configure the controller’s display and keys</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>but.1</td>
<td>Selecting function key 1 124</td>
</tr>
<tr>
<td>but.2</td>
<td>Selecting function key 2 124</td>
</tr>
<tr>
<td>but.3</td>
<td>Selecting function key 3 124</td>
</tr>
<tr>
<td>dS.SP</td>
<td>Selecting the SV display 125</td>
</tr>
<tr>
<td>dS.F</td>
<td>Selecting the F display 125</td>
</tr>
<tr>
<td>bArG</td>
<td>Selecting the bargraph display 125</td>
</tr>
<tr>
<td>MSG. LO</td>
<td>Selecting the message assigned to Low 126</td>
</tr>
<tr>
<td>MSG. HI</td>
<td>Selecting the message assigned to HIGH 126</td>
</tr>
<tr>
<td>MSG. ER</td>
<td>Selecting the message assigned to Err 126</td>
</tr>
<tr>
<td>MSG. SB</td>
<td>Selecting the message assigned to Sbr</td>
</tr>
<tr>
<td>LAnG</td>
<td>Selecting language for messages</td>
</tr>
<tr>
<td>SPEED</td>
<td>Message scrolling speed 127</td>
</tr>
<tr>
<td>BACKL</td>
<td>Backlighting level 127</td>
</tr>
<tr>
<td>QUICK</td>
<td>Quick configuration menu 128</td>
</tr>
</tbody>
</table>
4. CONFIGURATION

4.23.1. 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>KEY FUNCTION</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the function assigned to key 1 (📸) of the controller.

**Unit of measurement:** -

**Options:**
- NONE = No function assigned
- AU-MA = Automatic-Manual control
- LO-RE = Local-remote setpoint mode
- HOLD = Hold main input value
- AL.ACK = Reset alarm latches
- S.TUNE = Activate Self-Tuning
- A.TUNE = Activate Auto-Tuning
- OUT.S.R = Set/reset outputs set with BUT.SR function
- INT.RS = General reset
- CAL.HB = Calibrate HB alarm
  - if the Multiset function is enabled:
  - SP.SEL = Select setpoint SETP1...SETP2
  - if enabled Options Logics
- FB.IN = Input Function Blocks

4.23.2. 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>KEY FUNCTION</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the function assigned to key 2 (📸) of the 1350 controller.

**Unit of measurement:** -

**Options:**
- As per but.1

4.23.3. 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>KEY FUNCTION</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the function assigned to key 3 (📸) of the 1350 controller.

**Unit of measurement:** -

**Options:**
- As per but.1
4. CONFIGURATION

4.23.4. 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>SV DISPLAY FUNCTION</td>
<td>HMI</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 = Display off
- SETP = Local setpoint / manual power or active setpoint (read only), in case of Multiset function
- SSP = Active setpoint (read only)
- IN.SPR = Remote setpoint input
- OUT.PW = 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)
- CURR1 = Current input CT1
- CURR2 = Current input CT2

if the ENERG function is enabled:
- CURR = Load current
- OUT.KW = Power on load
- ENERG = Energy transferred to load

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

if controller model with programmer:
- P.TIME = Current ramp time or retention step execution

4.23.5. 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>F DISPLAY FUNCTION</td>
<td>HMI</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 1250 or 1350.

**Unit of measurement:** -

**Options:** Same as dS.SP

**note:** if dS.SP = SETP and dS.F = OUT.PW
or dS.SP = OUT.PW and dS.F = SETP in manual operation
gradient GRAD.0 = 0: OUT.PW become MAN.PW
gradient GRAD.0 <> 0: SETP become MAN.PW
MAN.PW be changed via up / down if MAN.P = CHANGE

4.23.6. bArG - Selecting the bargraph display

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bArG</td>
<td>BARGRAPH FUNCTION</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the display assigned to the bargraph.
The parameter appears only if the controller is 1250 or 1350.

**Unit of measurement:** -

**Options:** Same as dS.SP
4. CONFIGURATION

4.23.7. 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>NUM SCROLLING MSG WHEN MAIN INPUT IS LOW ERR</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the number of the message assigned to Low (process variable < 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 34.
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 “PROCESS VALUE UNDER LOW LIMIT”, for LANG2 corresponds to “VALORE DI PROCESSO INFERIORE AL MINIMO”).

Unit of measurement: Message number

Options: 0...25

4.23.8. 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>NUM SCROLLING MSG WHEN MAIN INPUT IS HI ERR</td>
<td>HMI</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter shows and sets the number of the message assigned to HIGH (process variable > 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 34.
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 “PROCESS VALUE OVER HIGH LIMIT”, for LANG2 corresponds to “VALORE DI PROCESSO SUPERIORE AL MASSIMO”).

Unit of measurement: Message number

Options: 0...25

4.23.9. 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>NUM SCROLLING MSG WHEN MAIN INPUT IS ERR ERR</td>
<td>HMI</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 34.
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 FAIL CONNECTION”, for LANG2 corresponds to “ERRATA CONNESSIONE SONDA”).

Unit of measurement: Message number

Options: 0...25
### 4.23.10. 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>NUM SCROLLING MSG WHEN MAIN IN IS SB ERR</td>
<td>HMI</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 34.

If the parameter is set to “0” no message will be displayed for Sbr.

*Unit of measurement:* Message number

*Options:* 0...25

### 4.23.11. 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

### 4.23.12. 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 650 and 1250) or the first 7 characters (on model 1350).

*Unit of measurement:* -

*Options:* 0...10 (default = 3)

*Note:* Messages with the description of the parameters always flow at a constant speed. NOT are subjected parameter setting SPEED

### 4.23.13. 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)
4.23.14. 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.

*Unit of measurement:* -

*Options:*
- **OFF** = Quick configuration menu is not displayed
- **On** = Quick configuration menu is displayed
4. CONFIGURATION

4.24. LINRZ Submenu – 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. The submenu is visible only if custom linearization was enabled in the configuration of the main input or of the setpoint input. You can set only one linearization, but it can be assigned to the main input, the setpoint input, or both.</td>
</tr>
</tbody>
</table>

![Diagram of Configuration Settings]

- **STP.xx**: Value of step xx
- **MV.STA**: Setting mV at start of scale
- **MV.FUL**: Setting mV at full scale
- **MV.50C**: Setting mV at temperature of 50°C
4. CONFIGURATION

4.24.1. 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>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 + \( n \cdot \Delta mV \) con \( \Delta mV = (mV \ full \ scale - mV \ start \ scale)/32.\)

*Unit of measurement:* Scale points

*Options:* -1999...9999

4.24.2. 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>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.

*Unit of measurement:* mV

*Options:* -19.99...99.99

4.24.3. 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>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.

*Unit of measurement:* mV

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

4.24.4. 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>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.

*Unit of measurement:* mV

*Options:* -1.999...9.999
### 4.25. US.CAL Submenu – User calibrations

<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>

![Diagram of parameter pages and calibrations]
4. CONFIGURATION

4.25.1. 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  
- **AL.HB** = HB calibration alarm. It is made up of 3 subsequent phases:  
  - Phase 1: OUTPUT SWITCH ON message, the output is enabled to 100% when the [F] key is pressed (set in the OUT parameter in sub-menu AL.HB) and then switch to phase 2.  
  - Phase 2: CALIBRATION RUNNING message, the percent of the current value is calculated when the [F] key is pressed (set in parameter THR-PE in sub menu AL.HB) and saved in parameter LOW.ON, and then switch to phase 3.  
  - Phase 3: END CALIBRATION message, press the [F] key to end calibration.  
- **RTC** = Real Time Clock setting  
  - the data in the RTC at each power-on are initialized to:  
    - HOUR = 0  
    - MIN = 0  
    - SEC = 0  
    - dAY = MONDA  
    - DATE = 1  
    - Mont = JANUA  
    - YEAR = 00  
- **ENERG** = Reset energy count (totalizer EN.KWH and time EN.TIM)  
- **P.DAYS** = Reset partial day count  
- **I.MAIN** = Calibration of custom main input (selected with parameter tyPE on I.MAIN menu)  
- **I.SPR** = Calibration of remote setpoint input (selected with parameter t.SPr on I.SPR menu)  
- **I.CT1** = CT1 input custom calibration  
- **I.CT2** = CT2 input custom calibration  
- **OUT.A1** = Calibration of custom retransmission output (selected with parameter t.o.A1 on OUT.AN menu)  
- **OUT.C** = Calibration of continuous output

4.25.2. 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.SPR, I.CT1, I.CT2, OUT.A1 or OUT.C.

**Unit of measurement**: -

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

4.25.3. 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 custom I.MAIN or I.SPR input in current or voltage. To calibrate:  
- apply the current or voltage value corresponding to minimum scale value to the selected input;  
- press the [F] key to acquire the calibration value.

**Unit of measurement**: -

**Options**: -

4.25.4. C.HIGH - Calibrating maximum current / voltage
### 4. CONFIGURATION

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.HIGH</td>
<td>US.CAL</td>
<td>R W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The parameter appears if you are calibrating a custom I.MAIN or I.SPR input in current or voltage.

To calibrate:
- apply the current or voltage value corresponding to maximum scale value to the selected input;
- press the \([F]\) key to acquire the calibration value.

*Unit of measurement:* -

*Options:* -

#### 4.25.5. 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>US.CAL</td>
<td>R W</td>
<td></td>
</tr>
</tbody>
</table>

The parameter appears if you are calibrating a custom I.MAIN RTD 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:* -

#### 4.25.6. 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>US.CAL</td>
<td>R W</td>
<td></td>
</tr>
</tbody>
</table>

The parameter appears if you are calibrating a custom I.MAIN RTD 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:* -

#### 4.25.7. 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>US.CAL</td>
<td>R W</td>
<td></td>
</tr>
</tbody>
</table>

The parameter shows and sets the hours on the Real Time Clock, if U.CAL = RTC.

*Unit of measurement:* Hours

*Options:* 0...23

#### 4.25.8. 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>US.CAL</td>
<td>R W</td>
<td></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

#### 4.25.9. SEC - Setting seconds
4. CONFIGURATION

<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

4.25.10. 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

4.25.11. 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

4.25.12. 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:* Month

*Options:* JANUA...DECEM

4.25.13. 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:* Year

*Options:* 0...99

4.25.14. C.LO - Setting analog output minimum
4. CONFIGURATION

<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 $\downarrow$ and $\uparrow$ 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

### 4.25.15. 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 $\downarrow$ and $\uparrow$ 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. CONFIGURAZIONE

4.26. PASC1 - Setting level 1 password 1

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</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>

The parameter lets you set the password for accessing level 1 configuration submenus.

*Unit of measurement:* Number

*Options:* 0...9999

4.27. PASC2 - Setting level 2 password 2

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASC2</td>
<td>SET PASS2</td>
<td>Livello 2</td>
<td>R W</td>
</tr>
</tbody>
</table>

The parameter lets you set the password for accessing level 2 configuration submenus.

*Unit of measurement:* Number

*Options:* 0...9999

4.28. FI.CFG - Entering the reset code

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Scrolling message</th>
<th>Submenu</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FI.CFG</td>
<td>ENTER DEFAULT CONFIGURATION PASS</td>
<td>Livello 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 key the controller runs the Power-on procedure, as described in paragraph “3.2. Sequence at power-on.”

*Unit of measurement:* Number

*Options:* 0...9999
5. EXAMPLES AND APPLICATION NOTES

5.1. Heat/cool control application

A 650 controller (model 650–D-R00-00000-1) controls a heating element via a solid-state relay connected to a logic output. A TC sensor measures the temperature. Each branch of the circuit is protected by a fuse. The cooling or alarm relay is protected by a snubber. The following diagram shows the various connections. One switch can control more than one controller.

With Quick Configuration you set:
- sensor type (TC);
- unit of measurement of temperature (°C);
- the logic output function (HEAT);
- the relay output function (ALRM1);
- the setpoint, i.e. the temperature to be maintained (SETP);
- the temperature value that trips the alarm (ALRM1).

5.1.1. Connection diagram

![Connection diagram](image-url)
5. Examples and applicative notes

5.1.2. Quick configuration procedure for model 650–D-R00-00000-1

- **Home**

- **Selecting sensor type**

  - Selecting unit of measurement
    - The unit of measurement can be °C or °F only if a TC or Rtd sensor is selected.

- **Select output 1 function**
  - The functions proposed are based on type of logic output.

- **Select output 2 function**
  - The functions proposed are based on type of logic output.

- **Setting Setpoint**
  - Raises the value
  - Lowers the value

- **Setting Alarm 1**
  - Default: direct maximum absolute
  - Raises the value
  - Lowers the value

- **Enable/disable quick configuration**

  - Raises the value
  - Lowers the value

  - Return to select sensory type

> 2 s
5.2. Heating control and current (CT) application

A 650 controller (model 650–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 650-D-R00-00100-1

Home

Selecting sensor type

Selecting unit of measurement
The unit of measurement can be °C or °F only if a TC or Rtd sensor is selected

Select output 1 function
The functions proposed are based on type of logic output.

Select output 2 function
The functions proposed are based on type of logic output.

Full-scale of the CT1 current transformer

Setting Setpoint

Setting Alarm 1
Default: direct maximum absolute

Enable/disable quick configuration

return to select sensory type
5.3. Remote setpoint input

The value of the analog remote setpoint input is shown in the parameter SETPR.

The function can be:
- display only (with settable alarms if required);
- process variable (PV) setpoint if the controller is in REMOTE mode;
- POWER setpoint if the controller is in MANUAL and REMOTE mode.

5.4. 4-point input correction

The 4-point input correction lets you correct the read of the main input and/or of the remote setpoint input by setting four values: A1, B1, A2 e B2.

To enable the function, set parameter Lin to 4.POIN (I.MAIN menu or I.SPR menu).

The limitations are:
- B1 must always be larger than A1;
- B1-A1 must be 25% larger than the full scale of the selected sensor.

The setting is limited to the preset scale LO.SCL... HI.SCL on the I.MAIN menu (or I.SPR). The offset function (parameter OF.SCL, I.MAIN menu) remains enabled.

By using this function for linear scales (60 mV, 1 V, 5 V, 10 V, 20 mA) you can invert the scale.

The four values are set on the LINRZ menu as follows:
- A1 = STP.00
- B1 = STP.01
- A2 = STP.02
- B2 = STP.03

Example

Select Pt100 input with Lin = 4.POIN to obtain an RTD sensor with 4-point input correction.

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

5.5. Current inputs

The values of current inputs CT1 and CT2 are shown in parameters CURR1 and CURR2.

These values are used in generic alarms AL1... AL4 and especially for the HB alarm.

The maximum scale value of the input is shown by parameter HI.CT1 on submenu I.CT1 for CT1, and by parameter HI.CT2 on submenu I.CT2 for CT2.
5.6. Alarms

5.6.1. Generic alarms AL1...AL4

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.

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 neutral with CT1 and CT2 (STAR), or a 3-phase delta load with CT1 and CT2 (DELTA).

5.6.3. HB alarm calibration

Calibration is possible:
- by user calibration U.CAL = AL.HB (turning the selected output on in OUT)
- as a function of the settable front key (but.1 for model 650, but.1 or but.2 or but.3 for models 1250 and 1350);

A 3-phase load can be controlled by means of a logic output connected in series to two SSR modules.

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.

If the parameter is set to LBA.TM = 0 the LBA function is disabled.
5. Examples and applicable notes

The value of the variable is enabled only outside the proportional band. With the alarm active, power is limited to the value LBA.PW. The alarm condition ceases if the temperature increases in heating (in case of decrease in cooling), by setting ALACK = On on the user configuration Menu, or by switching to Manual mode.

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 [Δ] keys pressed for 5 seconds to deactivate the controller.
The device goes to an “OFF” state and assumes the behavior of a controller switched off.
The voltage is not switched off: the process variable (PV) display stays on, but the SV display is off.
All of the outputs (control and alarms) are in an OFF state (logic level 0, relays de-excited) and all controller functions are inhibited except for the “POWER-UP” function and serial communication.

5.8.2. How to switch it on

Keep the [F] key pressed for 5 seconds: the controller goes from “OFF” to “ON” state.
If voltage is switched off during the “OFF” state, at the next Power-up the controller returns to “OFF” state (the controller latches the “ON/OFF”).
Functioning is normally enabled.
To disable it, set the parameter On.OF = disab. on the MODE configuration menu.
This function can be assigned to a digital input (F.in.x, parameter ON-OF), excluding deactivation from the keypad.

5.9. Soft-Start

If enabled (by setting SOFT.S = ON on the PID configuration menu), the Soft-Start function slices power based on the percentage of time lapsed since controller power-on compared to the time set in the parameter SOFT.T

Soft-Start is an alternative to Self-Tuning and is activated after every controller power-on.
The Soft-Start action is reset in Automatic-Manual switching.

5.10. Tuning

5.10.1. Tuning actions

Tuning actions are divided into 3 categories:
- **Proportional**: action in which the contribution on the output is proportional to the deviation in input.
- **Derivative**: action in which the contribution on the output is proportional to the speed of change of the deviation in input.
- **Integral**: action in which the contribution on the output is proportional to the integral in time of the deviation in input.
The deviation is the offset between the measured value of the controlled variable and the setpoint.
Tuning actions let you achieve optimum tuning of the controlled process in every phase.

5.10.1.1. Influence of Proportional, Derivative and Integral actions on response of controlled process

The response of the controlled process depends on the type of control action set. Specifically:
- Increasing the Derivative Action, corresponding to an increase in Derivative Time, reduces the deviation and prevents oscillations up to a critical value of Derivative Time, beyond which it increases the deviation and causes prolonged oscillations.
- Increasing the Integral Action, corresponding to a decrease in Integral Time, tends to cancel the deviation at full speed between the controlled variable and the setpoint.
- If the Integral Time value is too long (weak Integral action), there may be persistence of the deviation between the controlled variable and the setpoint.

For more information on tuning actions, contact Gefran Customer Care.

5.10.2. Manual tuning

Manual tuning is done as follows:
1. Set the setpoint to the working value.
2. Set the Proportional Band to 0.1% (with ON-OFF control).
3. Switch to automatic and watch the behavior of the variable.
There will be behavior similar to that shown in the following figure.
4. Calculate the PID parameters:
   - Proportional Band P.B. value
     \[ P.B. = \frac{\text{Peak}}{V_{\text{max}} - V_{\text{min}}} \times 100 \]
     where \( V_{\text{max}} - V_{\text{min}} \) is the scale interval.
   - Integral Time value \( I_t = 1.5 \times T \)
   - Derivative Time value \( dt = \frac{I_t}{4} \)

5. Switch the controller to manual.
6. Set the calculated parameters (re-enable PID control by setting a cycle time for relay output if necessary).
7. Switch to automatic.
8. To check optimization of the parameters, change the setpoint value if possible and check transitory behavior:
   if oscillation persists, increase the Proportional Band value; on the other hand, if the response is too slow, decrease the value.

### 5.10.3. Self-Tuning

Self-Tuning is a simplified and automatic tuning mode based on the process state.
The purpose of Self-Tuning is to calculate optimum control parameters at the start of the process.
The variable (for example, temperature) must be the one measurable at zero power (room temperature).

You can automatically start tuning at every power-on or start it by means of the appropriately configured (key).
The procedure runs automatically by optimizing the approach in relation to the real temperature value, in case of (relay, solid-state, Triac) control output, with automatic calculation of optimal cycle time \( CY.TIM \).

At the end of the procedure, the following new PID parameters are saved:
- proportional band,
- integral and derivative times, calculated for the current action (heat or cool).
In case of dual action (heat + cool) the parameters are calculated automatically separately for the two actions.

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

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

### Notes

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

**Example single action, PV less SP/4**

**Example dual heat/cool action, PV greater than SP/4**

**Example with SP-PV deviation less than 0.3\% f.s. dual heat/cool action**
5.10.4. Auto-Tuning

Enabling the Auto-Tuning function blocks the settings of the PID parameters. There are two types: continuous and one-shot.

Continuous Auto-Tuning constantly measures system oscillations, immediately searching for PID parameter values that reduce the current oscillation. It does not act if the oscillations drop to values below 1.0% of the Proportional Band. It is interrupted if the setpoint changes and automatically resumes with a constant setpoint.

The calculated parameters are not latched if the device switches off, if it goes into manual, or if the configuration code is disabled.

The controller resumes with the parameters programmed before enabling Auto-Tuning. The calculated parameters are latched when the function, enabled from digital input or key, is disabled.

One-shot" Auto-Tuning can be started manually or automatically. It is useful for calculating PID parameters when the system is around the setpoint.

"One-shot" Auto-Tuning produces a change in the control output up to a maximum of ±100% of current control power (limited with H.PB...H.P.LO for heat and with C.PB...C.P.LO for cool) and evaluates the effects in time overshoot.

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

Attention! At power-on or after a setpoint change, automatic start is inhibited for a time equal to five times the integral time (with minimum of 5 minutes). The same time has to pass after running “One-shot” Auto-Tuning.

5.10.5. Examples of tuning

The two diagrams below show the time change in the monitored value and the change in the controlled tuning output.

- PV = Process variable
- SP + cSPo = cooling setpoint
- cSPo = C.SP (HI.SCL - LO.SCL) / 100
- C.PB = Proportional cooling band
- SP = heating setpoint
- H.PB = Proportional heating band

Tuning output only with proportional action in case of proportional heating band separate from cooling band.

Tuning output only with proportional action in case of proportional heating band superimposed on cooling band.

5.10.6. Heat/Cool tuning with relative gain

For this tuning mode (enabled on the PID menu with parameter Cntr = PID.RG) you have to specify the cooling type (COOL parameter).

The PID cooling parameters are calculated starting from heating parameters in the specified ratios:

- Air relative gain H.PB / C.PB = 1
- Water relative gain H.PB / C.PB = 0.8
- Oil relative gain H.PB / C.PB = 0.4

Example

Starting with the following heat data:

- COOL = oil
- H.PB = 10.0
- H.IT = 4.00
- H.DT = 1.00

there will be the following cool data:

- C.PB = 12.5
- C.IT = 4.00
- C.DT = 1.00

For slicing cycle times for outputs, the following values should be set:

- Air CY.TIM Cycle T Cool = 10 seconds
- Water CY.TIM Cycle T Cool = 2 seconds
- Oil CY.TIM Cycle T Cool = 4 seconds

Attention! Cool parameters cannot be changed in this mode.
5.11. Timer

The timer is enabled on the MODE configuration menu by selecting TIMER = On.
In case of enabling, select the function F:tiM on the TIMER submenu by choosing among:
- ST.STP: Start/Stop timer
- STABL: stabilization timer
- SWITC: power-on timer

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 also assign a message to be displayed when the count is on.

When the set TIMER time is reached, you can:
- activate an OUT1…OUT4 output configured with F:ou.x = TIMER,
- go to software off with End = OFF,
- select setpoint 2 with End = SP1-2.

**Controlling timer from keyboard**
If the digital inputs are not enabled, the timer is controlled when TIM.EL is displayed by using the keys as follows:
- \( \Delta \) pressed with timer stopped = START
- \( \nabla \) pressed with timer running = 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.**
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 TIME. 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 TIME. 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 TIME.EL, which shows lapsed time.
5.12. Multiset, setpoint gradient

The Multiset function is enabled in configuration mode by selecting MUL.SP = On.

This function lets you set:

- 2 setpoints (SETP1 and SETP2) by using a digital input with function F.in.x = SP.SEL.L or a configurable faceplate key (BUT1 for model 650, BUT1 or BUT2 for models 1250 and 1350) setting the option but.x = SP.SEL. on the HMI submenu.
- 4 setpoints (SETP1, SETP2, SETP3 and SETP4) by using two digital inputs, one with function F.in.x = SP.SEL.L and the other with function F.in.x = SP.SEL.H.

The selection of SETP1 and SETP2 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.

A program can have a maximum of 12 steps and up to 4 programs can be saved in the controller.

Each program is defined by the number of its first and last step.

A program can be selected from the keypad, digital input 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).

5.13.2. Programmer functions

Depending on the model, the controller can combine the two functions of controller and single-loop programmer.

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.

A program can have a maximum of 12 steps and up to 4 programs can be saved in the controller.

Each program is defined by the number of its first and last step.
Changes possible in stop state
When the programmer is stopped, you can set or change:
• active setpoint;
• current step time;
• program number;
• step number;
• phase or segment (ramp or hold).

Consents
You can assign up to 4 consents to each step.
Therefore, the start of a step can depend on a defined state of consents. If the state does not agree with the programmed state, the time base stops.

If the state agrees with the programmed state, execution proceeds with restart of the time base. Each digital input can be assigned to one consent.

Events
You can assign up to 4 events to each step. At the start of the ramp and at the start of the hold of each step, the events are changed as programmed. Each digital output can be assigned to one event.

Other functions
• End program signal, with or without forcing of control outputs.
• Setting of a tolerance band relative to the setpoint. If the variable is outside the band, the time base is stopped (HBB alarm, Hold Back Band).
• Setpoint slaved with the same time base to manage a slaved controller via analog retransmission output A1.
• Total modularity of functions and parameters, with easy exclusion of ones not required

5.13.3. 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.

5.13.4. Program examples

5.13.4.1. ONE STEP program
Project conditions:
• ramp time = 0;
• hold;
• HBB enabling;
• switch-off

5.13.4.2. ONE STEP program
Project conditions:
• ramp time = 0;
• hold;
• HBB enabling;
• hold at end of program.

5.13.4.3. Program with assigned events
Project conditions:
• Evn.r.1 = On during STEP1;
• Evn.r.2 = OFF
• Evn.r.3 = OFF
• Evn.r.4 = nonE

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

STEP1 - setting events at start of hold:
• EVN.h.1 = nonE
• EVN.h.2 = On
• EVN.h.3 = nonE
• EVN.h.4 = 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:

Configuration of STEP 1

Configuration of STEP 2

Program diagram
5. Examples and applicative notes

5.13.4.4. Cyclical program with 3 setpoints and 3 steps

When the programmer state is not displayed, the key ( ) maintains the function selected with the parameter but1.

5.13.7. 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.

5.13.8. 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.

5.13.5. 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.

5.13.6. Controlling the program from the keypad

In the absence of enablings from digital inputs, the program is controlled when programmer state is displayed using the keys, with the following modes:

- ▲ pressed with program stopped = START;
- ▼ pressed with program running = STOP;
- ▼ + ▲ pressed for 2 seconds = RESET (condition maintained with key pressed);
5.14. 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.

![Diagram of valve connection](image)

Based on process dynamics, the controller determines the output value that drives the valve actuator so that valve opening maintains the required process variable value.

5.14.1. Valve control parameters

The controller controls the valves with the following parameters of the VALVE submenu:

- **TRAVL Actuator travel time**: the time the valve takes to go from completely open to completely closed (or vice versa). Settable with resolution of one second, this is a mechanical characteristic of the valve + actuator group.
  
  NOTE: if the actuator stroke is mechanically limited, reduce the TRAVL value proportionally.

- **TIM.LO Minimum impulse**: expressed as a percentage (with resolution of 0.1%) of actuator time, represents the minimum change in valve position corresponding to the minimum change in power supplied by the controller (power below which the actuator physically does not respond to the command). Raising TIM.LO lowers wear on the actuator to the detriment of precise positioning. Minimum impulse duration is settable in TIM.ON as a percentage of actuator time.

- **TIM.HI Impulse setpoint**: expressed as a percentage (with resolution of 0.1%) of actuator time, represents the deviation in position (requested position – real position) below which the maneuver request becomes impulsive. TIM.HI is only active with TIM.OF=0 Impulse approach allows fine tuning of the position valve, which is especially useful in case of high mechanical inertia. Setting TIM.HI = 0 excludes positioning modulation.

- **TIM.ON**: it is the shortest time accepted for the valve command pulse, expressed as percentage of the “actuator time”

- **TIM.OF**: it is the shortest time between two Valve ON pulse command, expressed as percentage of the “actuator time”:
  
  Setting TIM.OF=0 this function is excluded.
  
  Setting TIM.OF <>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.

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.

The actuators are normally protected against an OPEN command in fully open position or a CLOSE command in fully closed position.
5. Examples and applicative notes

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.
  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.

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 a single output of the controller.

The output must be relay, logic or triac.

The following information can be displayed on the user configuration menu:

- **Load current (parameter CURR).** This is shown immediately if the option CT1 or CT1 + CT2 is present, or is calculated by using load power (parameter P.LOAD) and line voltage (parameter V.LINE) values, using the formula CURR = P.LOAD / V.LINE. CURR is indicated in amperes and can have values from 0.0 to 99.9.
- **Power on load (parameter OUT.KW),** calculated in kW. Power is calculated based on nominal power P.LOAD (as a %) or on RMS current if the option CT1 or CT1 + CT2 is present. OUT.KW can have values from 0.00 to 99.99.
- **Elapsed time to equal the energy (parameter EN.TIM)** value between 0 and 999 hours
- **Energy to the load (parameter OU.KWH)** value between 0.00 and 99.99 kWh.
- **Totalizer energy transferred to load (parameter EN.KWH),** calculated in kWh. EN.KWH can have values from 0 to 9999. The counting of energy stops when it reaches the maximum 9999 kWh to a maximum of 999 hours time EN.TIM.
- **Cost of energy transferred to load (parameter EN.CST).** Cost is calculated based on the nominal cost of energy per kWh (parameter E.COST), using the formula EN.CST = EN.KWH × E.COST. EN.CST can have values from 0 to 9999.

With the controller in manual, setting the parameter KEY. MO = On allows direct control of the valve open and close commands via the [A] and [V] keys.
5.16. Logic Operations

5.16.1. Function blocks

By means of 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 FB1 to FB16. 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 16 Function Blocks. Each 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:

- \((a \text{ AND } b) \text{ OR } (c \text{ AND } d)\)
- \((a \text{ OR } c) \text{ AND } (b \text{ OR } d)\)
- \(a \text{ OR } b \text{ OR } c \text{ OR } d\)
- \(a \text{ AND } b \text{ AND } c \text{ AND } d\)

where the AND operator means that the linked operands must evaluate to “true” for the result to be “true,” whereas with the OR operator it is sufficient for only one linked operand to evaluate to “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 (2 or 3 for model 650, 5 for models 1250 and 1350),
- state of alarms,
- state of control output,
- state of controller,
- state of setpoint programmer,
- variables FB_OUT01…16 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:

<table>
<thead>
<tr>
<th>State Keys</th>
<th>Digital Input 1</th>
<th>Digital Input 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUT1</td>
<td>DIGITAL INPUT 3</td>
<td>DIGITAL INPUT 4</td>
</tr>
<tr>
<td>BUT2</td>
<td>DIGITAL INPUT 5</td>
<td></td>
</tr>
<tr>
<td>BUT3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State of digital outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTPUT 1</td>
</tr>
<tr>
<td>OUTPUT 2</td>
</tr>
<tr>
<td>OUTPUT 3</td>
</tr>
<tr>
<td>OUTPUT 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU-MA (select Automatic / Manual)</td>
</tr>
<tr>
<td>LO-RE (select Local / Remote)</td>
</tr>
<tr>
<td>HOLD (hold main input variable)</td>
</tr>
<tr>
<td>AL ACK (reset alarms latch)</td>
</tr>
<tr>
<td>A.TUNE (start Auto-Tuning)</td>
</tr>
<tr>
<td>S.TUNE (start Self-Tuning)</td>
</tr>
<tr>
<td>ON-OFF (software ON-OFF)</td>
</tr>
<tr>
<td>SKET (block F key)</td>
</tr>
<tr>
<td>WRLEN (enable write configuration parameter)</td>
</tr>
<tr>
<td>SPSE.L (select SP1/SP2 or SP1…SP4 low bit)</td>
</tr>
<tr>
<td>SPSE.H (select SP1…SP4 high bit)</td>
</tr>
<tr>
<td>T.STST (start/stop timer)</td>
</tr>
<tr>
<td>T.RST (reset timer)</td>
</tr>
<tr>
<td>P.STST (start/stop programmer)</td>
</tr>
<tr>
<td>P.STRT (start programmer)</td>
</tr>
<tr>
<td>P.STOP (stop programmer)</td>
</tr>
<tr>
<td>P.RST (reset programmer)</td>
</tr>
<tr>
<td>P.SKP (skip to step program)</td>
</tr>
<tr>
<td>ST.SKIP (skip to next step)</td>
</tr>
<tr>
<td>ST.ENB.1 (consent 1 to start step)</td>
</tr>
<tr>
<td>ST.ENB.2 (consent 2 to start step)</td>
</tr>
<tr>
<td>ST.ENB.3 (consent 3 to start step)</td>
</tr>
<tr>
<td>ST.ENB.4 (consent 4 to start step)</td>
</tr>
<tr>
<td>LED.GREEN.1 (only for 1350 model)</td>
</tr>
<tr>
<td>LED.GREEN.2 (only for 1350 model)</td>
</tr>
<tr>
<td>LED.GREEN.3 (only for 1350 model)</td>
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<tr>
<td>LED.GREEN.4 (only for 1350 model)</td>
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<tr>
<td>LED.GREEN.5 (only for 1350 model)</td>
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<tr>
<td>LED.GREEN.6 (only for 1350 model)</td>
</tr>
<tr>
<td>LED.GREEN.7 (only for 1350 model)</td>
</tr>
<tr>
<td>LED.GREEN.8 (only for 1350 model)</td>
</tr>
<tr>
<td>LED.RED.1 (only for 1350 model)</td>
</tr>
<tr>
<td>LED.RED.2 (only for 1350 model)</td>
</tr>
<tr>
<td>LED.RED.3 (only for 1350 model)</td>
</tr>
<tr>
<td>LED.RED.4 (only for 1350 model)</td>
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<tr>
<td>LED.RED.5 (only for 1350 model)</td>
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<tr>
<td>LED.RED.6 (only for 1350 model)</td>
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<td>LED.RED.7 (only for 1350 model)</td>
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<tr>
<td>LED.RED.8 (only for 1350 model)</td>
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<tr>
<td>LED.OUT.1</td>
</tr>
<tr>
<td>LED.OUT.2</td>
</tr>
<tr>
<td>LED.OUT.3</td>
</tr>
<tr>
<td>LED.OUT.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function state</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID heating</td>
</tr>
<tr>
<td>PID cooling</td>
</tr>
<tr>
<td>PID zero</td>
</tr>
<tr>
<td>ON/OFF heating</td>
</tr>
<tr>
<td>ON/OFF cooling</td>
</tr>
<tr>
<td>ON/OFF zero</td>
</tr>
<tr>
<td>OR state active alarms</td>
</tr>
<tr>
<td>AL1…AL4 (Alarm AL1…4 state)</td>
</tr>
<tr>
<td>LBA ALARM (LBA alarm state)</td>
</tr>
<tr>
<td>HB ALARM (HB alarm state)</td>
</tr>
</tbody>
</table>
### 5.16.3. Programming Function Block

#### 5.16.3.1. Configuration page

The Function Blocks configuration page of the GF_eXpress program lets you configure and debug the Function Blocks.

| 1. | Button to return to previous function block. |
| 2. | Number of function block and type of logic operations run. |
| 3. | Name of function block. You can insert an optional descriptive name of the function block. |
| 4. | Button to go to next function block. |
| 5. | Output value when result of function operations is true. |
| 6. | Graph of DELAY TIMER. |
| 7. | Name of output. You can insert an optional descriptive name of the output. |
| 8. | Type or variable of activated output. |
| 9. | Duration of ON delay. |
| 10. | Duration of OFF delay. |
| 11. | Unit of measurement of delays (seconds or minutes). |
| 12. | Type or variable of input evaluated for input d. |

Controller models with programmer also have:

- PROGRAMMER IN HBB ALARM
- PROGRAMMER IN RUN
- PROGRAMMER IN HOLD
- PROGRAMMER IN READY
- PROGRAMMER IN END
- STEP EVENT 1
- STEP EVENT 2
- STEP EVENT 3
- STEP EVENT 4

### 5. Examples and applicative notes

| LO ALARM | (Low sensor input state) |
| HI ALARM | (High sensor input state) |
| ERR ALARM | (Err sensor input state) |
| SBR | (Sbr sensor input state) |
| STATUS AUTOMATIC |
| STATUS MANUAL |
| STATUS LOCAL |
| STATUS REMOTE |

#### 5.16.3.2. Examples and applicative notes

- **LO ALARM** (Lou sensor input state)
- **HI ALARM** (HIGH sensor input state)
- **ERR ALARM** (Err sensor input state)
- **SBR** (Sbr sensor input state)
- **STATUS AUTOMATIC**
- **STATUS MANUAL**
- **STATUS LOCAL**
- **STATUS REMOTE**

Controller models with programmer also have:

- PROGRAMMER IN HBB ALARM
- PROGRAMMER IN RUN
- PROGRAMMER IN HOLD
- PROGRAMMER IN READY
- PROGRAMMER IN END
- STEP EVENT 1
- STEP EVENT 2
- STEP EVENT 3
- STEP EVENT 4

**Examples and applicative notes**

- LO ALARM (Low sensor input state)
- HI ALARM (HIGH sensor input state)
- ERR ALARM (Err sensor input state)
- SBR (Sbr sensor input state)
- STATUS AUTOMATIC
- STATUS MANUAL
- STATUS LOCAL
- STATUS REMOTE

Controller models with programmer also have:

- PROGRAMMER IN HBB ALARM
- PROGRAMMER IN RUN
- PROGRAMMER IN HOLD
- PROGRAMMER IN READY
- PROGRAMMER IN END
- STEP EVENT 1
- STEP EVENT 2
- STEP EVENT 3
- STEP EVENT 4
5.16.3.2. Enabling the function block and selecting the type of functional logic

The function block page is enabled automatically as soon as you select a type of functional logic. The page is not deleted if you select Disabled.

The configuration of inputs, output and delays stays saved in the software program.

When you select the type of functional logic assigned to the function block, its graph changes as well, as shown in the figures below.

Give a descriptive name to the function block so that it can be easily recognized for future use.

The name will be saved as part of the “configuration recipe” only on the PC. If you copy the configuration to other controllers, the controller to which the configuration is copied will not contain these descriptive names.

5.16.3.3. Configuring input variables

Configure the four input variables \( a, b, c \) and \( d \), one at a time. On the pull-down menu, select the variable to be assigned to the input.

The options are:
- ON, input always ON;
- OFF, input always OFF;
- one of the values in the groups of Digital input state, Digital output state, and Function state variables listed above in paragraph “5.16.2. Groups of variables.” on page 155.

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 = FB.IN for them.

If you want to transmit the output state of a function block (FUNCTION BLOCK OUTPUT 1...16) to an output OUT1...OUT4 of the controller, you have to configure the function Func = FB.OUT for these outputs and specify the output number of the function block in FB.OU.N

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. Examples and applicative notes

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.” 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

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.
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 1250 and 1350 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/product/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);
- set the user configuration menu sequence and parameters;
- set message strings (3 selectable languages);
- transfer any firmware updates.

The software is available on CD-rom (code F043958). The program can be updated automatically from www.gefran.com.

6.2.1.1. System requirements

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Minimum</th>
<th>Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Intel Pentium 1 GHz</td>
<td>Intel Core i5 2.5 GHz or higher</td>
</tr>
<tr>
<td>RAM</td>
<td>2 GB</td>
<td>4 GB or higher</td>
</tr>
<tr>
<td>Free space on Hard Disk</td>
<td>2 GB</td>
<td>4 GB or higher</td>
</tr>
<tr>
<td>Resolution</td>
<td>XGA (1024 x 768 pixel)</td>
<td>SXGA (1280 x 1024 pixel) or higher</td>
</tr>
<tr>
<td>Browser</td>
<td>Microsoft Internet Explorer 8.0</td>
<td>Microsoft Internet Explorer 9.0 or higher</td>
</tr>
<tr>
<td>Ethernet port</td>
<td>1 RJ45</td>
<td>1 RJ45</td>
</tr>
<tr>
<td>DVD reader</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>USB port</td>
<td>1 USB 2.0</td>
<td>1 USB 2.0</td>
</tr>
</tbody>
</table>
6. PROGRAMMING WITH PC
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 650, “1.4.1. Display and keys” on page 15 for the 1250, and “1.5.1. Display and keys” on page 17 for the 1350.

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.

- **Each time the key is pressed, you go back to the previous menu item or to the higher menu level, according to the context.**
  - Keep the key pressed for more than 2 seconds to return to the Home page.

- **Press the key to enter a submenu or to lower the displayed parameter value, according to the context.**
  - Keep the key pressed to progressively increase the speed of lowering the displayed parameter.

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

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

7.2. Power-on

The controller runs a self-diagnostics test immediately after power-on.

During the test all segments of the display flash and a checksum is run.

The hardware resources present are also acquired.

If the self-diagnostics test detects no errors, the controller enters normal functioning state (display shows Home page).

If any system errors are detected, the controller displays the related information.

If the error is caused by a damaged program, update the firmware.

If the error is caused by incorrect configuration, reconfigure the controller with PC and GF_eXpress software.

Errors are saved in a register and can be displayed with the Error function on the INFO menu.

7.3. Operation as controller

The device’s normal operating mode is controller-only.

The display shows the following information:

- **PV displays the process variable value;**
- **SV displays the setpoint value (if dS.Sp = setp);**
- **models 1250 and 1350 also display the control output value (if dS.F = OUT.PW);**
- **by pressing the 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 key pressed for more than 2 seconds to enter the Programming/Configuration menu.

Use the and keys to raise and lower the setpoint to the value required.

Press the key to save the SP value; otherwise, the set value is saved about 15 seconds after the last change.
7. OPERATOR GUIDE

7.4. Operation as programmer

7.4.1. Activating the programmer

To enable the Programmer function, set parameter PROGR = ON on the MODE menu.

On the user menu, the parameter P.STAT, which lets you display/control the programmer, is inserted by default. The user menu is available if QUICK = OFF

7.4.2. Display messages

The different controller models display programmer state information in different ways.

The following examples show how the identical information is displayed on the 650, 1250 and 1350 controllers. As opposed to the model 650, the models 1250 and 1350 also show the process variable PV value. As opposed to the other two models, the model 1350 also shows the setpoint value of the active step.

1. Indication of programmer state. When on, the programmer is on.
2. Number of program running (in example: number 2).
3. Number of program step running (in example: number 5).
4. RUN LED: when on, indicates that program is running; when flashing, indicates that program is in STOP, END or HOLD and that time base is stopped.
5. RAMP LED: when on, indicates that programmer is running ramp segment of step; if off, it is in hold segment of 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 time base, hh:mm or mm:ss (in example: time lapsed is 20 minutes 42 seconds).
8. Setpoint of current step, i.e., value to be reached (in example: 120).

7.5. Errors during operation

If errors occur during normal operation, the display shows:
- the identifying code of the error on the PV display;
- the value of the setpoint or of the control output on the SV display.

If provided during configuration of the controller, a specific scrolling message appears on the SV display (model 650) or on the F display (models 1250 and 1350).

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 50 parameters from those available for controller configuration (see chapter “4. Configuration” on page 43).

Among the parameters selected to build the menu of user configuration is PASS 1; it may be useful to submit a password to the parameters of the user menu. In the example (p. 164) is indicated to impose on setting password PASS 1 setting alarms.

The controller leaves the factory with a preconfigured user configuration menu (shown below for models 650-x-xxx-00000-x-xxx and 1250-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.

To access the User Configuration menu, simply press the [F] key. GF_express can be used to set the generic parameter in the user menu to automatically return to Home if positioned on the parameter and no key is pressed within 15 seconds.

---

### Table: Parameters of User Configuration Menu

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit of measurement</th>
<th>Valid values</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local setpoint</td>
<td>scale points</td>
<td>LO.SP...HI.SP</td>
<td></td>
</tr>
<tr>
<td>Alarm 1 limit</td>
<td>scale points</td>
<td>LO.AL...HI.AL, -999...999</td>
<td>If absolute alarm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>Alarm 2 limit</td>
<td>scale points</td>
<td>LO.AL...HI.AL, -999...999</td>
<td>If absolute alarm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>Alarm 3 limit</td>
<td>scale points</td>
<td>LO.AL...HI.AL, -999...999</td>
<td>If absolute alarm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>Alarm 4 limit</td>
<td>scale points</td>
<td>LO.AL...HI.AL, -999...999</td>
<td>If absolute alarm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>Reset alarms latch and LBA alarm</td>
<td></td>
<td>Off</td>
<td>Appears if at least one alarm with latch was set or if LBA alarm was enabled. The reset command is temporary and is not saved.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td></td>
</tr>
<tr>
<td>Reset scrolling message</td>
<td></td>
<td>Off</td>
<td>Appears if a scrolling message is present. The reset command is temporary and is not saved.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td></td>
</tr>
<tr>
<td>Control output value</td>
<td></td>
<td>-100.0...100.0 On / OFF</td>
<td>Value Read Only</td>
</tr>
<tr>
<td>Value manual power</td>
<td></td>
<td>0...100.0</td>
<td>The limit of setting depends on the type of control:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0...100.0% Heat control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-100.0...100.0% Heat/Cool control</td>
</tr>
</tbody>
</table>
7. OPERATOR GUIDE

Example Menu user parameter PASS 1
Display / setting of alarm thresholds are subject to setting
PASS 1

If the password is correct you are
in the menu, otherwise Home

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit of measurement</th>
<th>Valid values</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local setpoint</td>
<td>punti scala</td>
<td>LO.SP...HI.SP</td>
<td></td>
</tr>
<tr>
<td>Insert password 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm 1 limit</td>
<td>scale points</td>
<td>LO.AL...HI.AL</td>
<td>If absolute alarm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-999...999</td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>Alarm 2 limit</td>
<td>scale points</td>
<td>LO.AL...HI.AL</td>
<td>If absolute alarm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-999...999</td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>Alarm 3 limit</td>
<td>scale points</td>
<td>LO.AL...HI.AL</td>
<td>If absolute alarm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-999...999</td>
<td>If deviation alarm.</td>
</tr>
<tr>
<td>Alarm 4 limit</td>
<td>scale points</td>
<td>LO.AL...HI.AL</td>
<td>If absolute alarm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-999...999</td>
<td>If deviation alarm.</td>
</tr>
</tbody>
</table>

Home page
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 165).
8. MAINTENANCE

8.5. Disposal

The 650, 1250 and 1350 controllers must be disposed of in conformity to current laws and regulations. If not correctly disposed of, some of the components used in the devices may harm the environment.

8.6. 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>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 9. TECHNICAL DATA

### DISPLAY

<table>
<thead>
<tr>
<th>OPERATOR INTERFACE</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>LCD black background</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Screen area (L x H)</strong></td>
<td>35×30 mm</td>
<td>37×68 mm</td>
<td>83×68 mm</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>Backlit with LEDs, life &gt; 40,000 hours @ 25 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>* with brightness level BACKL=0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PV Display</strong></td>
<td>Number of digits: 4 to 7 segments, with decimal point</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Digit height: 17 mm</td>
<td>Digit height: 23 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Color: white or “custom”</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SV Display</strong></td>
<td>Number of digits: 5 to 14 segments, with decimal point</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Digit height: 7.5 mm</td>
<td>Digit height: 14 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Color: green or “custom”</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F Display</strong></td>
<td>Number of digits: 5 to 14 segments, with decimal point</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Digit height: 9 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Color: ambra or “custom”</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unit of measurement</strong></td>
<td>Selectable, °C, °F or custom</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Color: same as PV display</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Controller state signals</strong></td>
<td>Number: 6 (RUN, MAN, _/-, REM, SP1/2)</td>
<td>Color: ambra</td>
<td></td>
</tr>
<tr>
<td><strong>Output state signals</strong></td>
<td>Number: 4 (1, 2, 3, 4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bargraph indicator, configurable</strong></td>
<td>Type: graphic bargraph, 11 segments</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power indication: 0...100% or -100...100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current indication: 0...100% f.s.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valve position indication: 0...100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### KEYPAD

<table>
<thead>
<tr>
<th>OPERATOR INTERFACE</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Keys number</strong>: silicone</td>
<td>4 (Man/Auto, INC, DEC, F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong>: mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Programming is done with the GF_eXpress configuration program.
### Technical Data

#### Inputs

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>TC, RTD (PT100, JPT100), IR ES1B, DC linear sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>TC inputs: Calibration accuracy: &lt; +/- (0,25% of reading value in °C +0,1°C)</td>
</tr>
<tr>
<td></td>
<td>Linearization accuracy: 0,1% of reading value</td>
</tr>
<tr>
<td></td>
<td>Cold junction accuracy: &lt; +/- 1,5°C a 25°C room temperature</td>
</tr>
<tr>
<td></td>
<td>Cold junction compensation: &gt; 30:1 rejection to the change of the room temperature</td>
</tr>
<tr>
<td></td>
<td>RTD input: Calibration accuracy: &lt; +/- (0,15% of reading value in °C +1°C)</td>
</tr>
<tr>
<td></td>
<td>Temperature drift: &lt; +/- (0,005% of reading value in °C +0,015°C )/°C from 25°C room temperature</td>
</tr>
<tr>
<td></td>
<td>Linearization accuracy: 0,1% of reading value</td>
</tr>
<tr>
<td></td>
<td>Linear inputs: Calibration accuracy: &lt; 0,1% full scale</td>
</tr>
<tr>
<td></td>
<td>Temperature drift: &lt; +/- 0,005% full scale °C at 25°C room temperature</td>
</tr>
<tr>
<td></td>
<td>Sampling time 60 ms / 120 ms, selectable</td>
</tr>
<tr>
<td></td>
<td>Digital filter 0,0...20,0 s</td>
</tr>
<tr>
<td></td>
<td>Temperature unit of measurement Degrees C / F, selectable from keypad</td>
</tr>
<tr>
<td></td>
<td>Signal interval Type: linear</td>
</tr>
<tr>
<td></td>
<td>Scale: -1999...9999, settable decimal point</td>
</tr>
<tr>
<td></td>
<td>TC (thermocouple) input Thermocouple: J, K, R, S, T, C, D</td>
</tr>
<tr>
<td></td>
<td>Linearization: ITS90 or custom</td>
</tr>
<tr>
<td></td>
<td>RTD (resistance thermometer) input Resistance thermometer: PT100, JPT100</td>
</tr>
<tr>
<td></td>
<td>Input impedance (Ri): ≥ 30 kΩ</td>
</tr>
<tr>
<td></td>
<td>Linearization: DIN 43760 or custom</td>
</tr>
<tr>
<td></td>
<td>Max. line resistance: 20 Ω</td>
</tr>
<tr>
<td></td>
<td>DC linear input 0...60 mV input impedance (Ri): &gt; 70 kΩ</td>
</tr>
<tr>
<td></td>
<td>0...1 V input impedance (Ri): &gt; 15 kΩ</td>
</tr>
<tr>
<td></td>
<td>0...5 V / 0...10 V input impedance (Ri): &gt; 30 kΩ</td>
</tr>
<tr>
<td></td>
<td>0/4...20 mA input impedance (Ri): 50 Ω</td>
</tr>
<tr>
<td></td>
<td>Linearization: linear or custom</td>
</tr>
<tr>
<td></td>
<td>AUXILIARY INPUT</td>
</tr>
<tr>
<td>Remote setpoint</td>
<td>0...1 V, 0...10 V, 0/4...20 mA</td>
</tr>
<tr>
<td>Scale</td>
<td>0...1 V input impedance (Ri): &gt; 15 kΩ</td>
</tr>
<tr>
<td></td>
<td>0...10 V input impedance (Ri): &gt; 30 kΩ</td>
</tr>
<tr>
<td></td>
<td>0/4...20 mA input impedance (Ri): 50 Ω</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0,1% f.s. ±1 digit @25 °C</td>
</tr>
<tr>
<td>CT (ammeter) INPUT</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Isolated via external transformer</td>
</tr>
<tr>
<td>Number</td>
<td>2 max</td>
</tr>
<tr>
<td>Max. capacity</td>
<td>x / 50 mA AC</td>
</tr>
<tr>
<td>Line frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Input impedance (Ri): 10 Ω</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2% f.s. ±1 digit @25 °C</td>
</tr>
<tr>
<td>DIGITAL INPUTS</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>voltage-free contact, or</td>
</tr>
<tr>
<td></td>
<td>NPN 24 V - 4,5 mA, or</td>
</tr>
<tr>
<td></td>
<td>PNP 12/24 V - max 3,6 mA</td>
</tr>
<tr>
<td>(for detail see electrical connections)</td>
<td></td>
</tr>
<tr>
<td>Isolation</td>
<td>500 V</td>
</tr>
<tr>
<td>Number</td>
<td>3 max</td>
</tr>
<tr>
<td></td>
<td>5 max</td>
</tr>
</tbody>
</table>
### Outputs

<table>
<thead>
<tr>
<th>Relay (R)</th>
<th>Number: 4 max</th>
<th>Type of relay contact: NO</th>
<th>Max. current: 5 A, 250 VAC</th>
<th>Min. load: 5 V, 10 mA</th>
<th>Life cycle: &gt; 100,000 operations</th>
<th>Double isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic (D)</td>
<td>Number: 2 max</td>
<td>Type: for solid-state relays</td>
<td>Voltage: 24 V ±10% (min 10 V @20 mA)</td>
<td>Isolated from main input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triac (long life relè) (T)</td>
<td>Number: 1 max</td>
<td>Load: resistive</td>
<td>Voltage: 75...264 VAC</td>
<td>Current max: 1 A</td>
<td>Isolation 3 kV</td>
<td>Snubber circuit integrated</td>
</tr>
<tr>
<td>Continuous (C)</td>
<td>Number: 1 max</td>
<td>Current: 4...20 mA</td>
<td>$R_{\text{out}} &lt; 500 , \Omega$</td>
<td>Resolution: 12 bit</td>
<td>Isolated from main input</td>
<td></td>
</tr>
<tr>
<td>Analog retransmission (A1)</td>
<td>Number: 1 max</td>
<td>0...10 V, max 20 mA, $R_{\text{out}} &gt; 500 , \Omega$</td>
<td>0...20 mA, 4...20 mA, $R_{\text{out}} &lt; 500 , \Omega$</td>
<td>Resolution: 12 bit</td>
<td>Isolated from main input</td>
<td></td>
</tr>
</tbody>
</table>

### Alarms

| Number of alarm functions | 4 max, assignable to an output |
| Possible configurations | Maximum, minimum, symmetric, absolute/relative, exclusion at firing, memory, reset from keypad and/or contact, LBA, HB, HBB Hold Back Band if enabled with Programmer function |
## 9. TECHNICAL DATA

### CONTROL FUNCTIONS

<table>
<thead>
<tr>
<th>Control</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Single loop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>PID, ON/OFF, single action heat or cool, double action heat/cool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td>Continuous or ON/OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control output for motorized valves</td>
<td>Cycle time: constant or optimized (BF)</td>
<td>OPEN/CLOSE for floating motorized valve on Relay, Solid-state, Triac outputs</td>
<td></td>
</tr>
</tbody>
</table>

### SETPOINT PROGRAMMER

<table>
<thead>
<tr>
<th>Control</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of programs</td>
<td>Max 4</td>
<td>Start / Stop / Reset / Skip via digital inputs and/or outputs from logic operations</td>
<td>Output state: Run /Hold / Ready / End</td>
</tr>
<tr>
<td>Number of steps</td>
<td>Max 12, each with own setpoint, ramp time and hold time</td>
<td>Times settable in HH:MM or MM:SS</td>
<td>Max 4 consents, configurable for ramp and for hold</td>
</tr>
</tbody>
</table>

### MULTIPLE SETPOINTS

<table>
<thead>
<tr>
<th>Control</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of setpoints</td>
<td>Max 4, selectable from digital input</td>
<td>Each setpoint change is subject to set ramp, different for up and down ramp</td>
<td></td>
</tr>
</tbody>
</table>

### LOGIC OPERATIONS

<table>
<thead>
<tr>
<th>Control</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function blocks</td>
<td>Max 16, with 4 input variables per block.</td>
<td>The result can act on the state of the controller, of the programmer on alarms and outputs.</td>
<td>Each function contains an incorporated timer block timer.</td>
</tr>
</tbody>
</table>

### TIMER FUNCTION

<table>
<thead>
<tr>
<th>Control</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modes</td>
<td>START / STOP</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>FIRING (timed activation of control after power on)</td>
</tr>
</tbody>
</table>

### ENERGY COUNTER

<table>
<thead>
<tr>
<th>Control</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculation done on nominal line voltage and nominal load power or on rms current measured on load via CT</td>
<td></td>
<td></td>
<td></td>
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</tbody>
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### DIAGNOSTIC

<table>
<thead>
<tr>
<th>Control</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short circuit or open circuit (LBA alarm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interrupted or partially interrupted load (HB alarm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit of control output (SSR alarm)</td>
<td></td>
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<td></td>
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</table>

### RETENTIVE MEMORY

<table>
<thead>
<tr>
<th>Control</th>
<th>650</th>
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<th>1350</th>
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<tbody>
<tr>
<td>Type</td>
<td>EEPROM</td>
<td></td>
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<tr>
<td>Max. number of writes</td>
<td>1.000.000</td>
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### SERIAL INTERFACE

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<tr>
<th>Control</th>
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<th>1350</th>
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</thead>
<tbody>
<tr>
<td>Type: RS485</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baudrate: 1200, 2400, 4800, 9600, 19.200, 38.400, 57.600, 115.200 bit/s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol: MODBUS RTU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolated from main input</td>
<td></td>
<td></td>
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</table>

1) Programming is done with the GF_eXpress configuration program.
### GENERAL DATA

<table>
<thead>
<tr>
<th>POWER SUPPLY</th>
<th>650</th>
<th>1250</th>
<th>1350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>100...240 VAC/VDC ±10%, 50/60 Hz (on request 20...27 VAC/VDC ±10%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power dissipation</td>
<td>5 W max</td>
<td>10 W max</td>
<td>10 W max</td>
</tr>
<tr>
<td>Protections</td>
<td>Overvoltage 300 V / 35 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>Screw terminals and crimp connector, max. wire section 1 mm²</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONNECTIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial configuration</td>
<td>Connector: microUSB</td>
</tr>
<tr>
<td>port (for USB connection)</td>
<td></td>
</tr>
<tr>
<td>Inputs and outputs</td>
<td>Screw terminals and crimp connector, max. wire section 2.5 mm²</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>AMBIENT CONDITIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use</td>
<td>Indoor</td>
</tr>
<tr>
<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>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20 ... +70 °C (as per IEC 68-2-14)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>20...85% RH non-condensing (as per IEC 68-2-3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IP 65 on front panel</td>
<td>(as per IEC 68-2-3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASSEMBLY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning</td>
<td>On panel, removable faceplate</td>
</tr>
<tr>
<td>Installation regulations</td>
<td>Installation category: II; Pollution degree: 2</td>
</tr>
<tr>
<td>Isolation</td>
<td>double</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>48 × 48 mm (1/16 DIN), Depth: 80 mm</td>
<td>48 × 96 mm (1/8 DIN), Depth: 80 mm</td>
</tr>
<tr>
<td>96 × 96 mm (1/4 DIN), Depth: 80 mm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.16 kg</td>
<td>0.24 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CE STANDARDS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC (electromagnetic compatibility)</td>
<td>Conforms to directive 2014/30/EU with reference to standard EN 61326-1 emission in industrial environment class A for models 650 HV</td>
</tr>
<tr>
<td>Safety LVD</td>
<td>Conforms to directive 2014/35/EU with reference to standard EN61010-1</td>
</tr>
</tbody>
</table>
9. TECHNICAL DATA

Insulation Block Diagram 650

- Sensor Input, Auxiliary Input, CT Input
- Configuration port
- Modbus communication port
- Digital Input, Logic Output (SSR drive)
- DC Output 1, DC Output W
- Out 1 Relay
- Out 2, 3, 4 Relay
- Out 2 Relay
- Out 3 Relay (o Triac)

- Functional insulation
- Reinforced insulation
Insulation Block Diagram 1250-1350

Sensor Input, Auxiliary Input, CT Input

Configuration port

Modbus communication port

Digital Input, Logic Output (SSR drive)

DC Output 1, DC Output W

Out 1 Relay

Out 2 Relay

Out 3 Relay

Out 3 Relay (o Triac)

POWER supply

-3.3V

20V

96-240Vac

48-380Vacs

+6V

+24V

+40,5V

Functional insulation

Reinforced insulation
## 10. ORDER METHODS

### 10.1. 650 Controller

#### Power supply 100...240 VAC/VDC

<table>
<thead>
<tr>
<th>Code F</th>
<th>Model</th>
<th>Inputs</th>
<th>Outputs</th>
<th>Total Number of Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code F</td>
<td>Values Programmer Digital CT SPR Relay Triac Logic</td>
<td>Analog I Analog VII RS-485 Logic Functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>650D-R00-00000-1G</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>650-R-R00-00000-1G</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>650D-R00-00120-1G</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>650-R-R00-00120-1G</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>650D-R00-00030-1G</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>650-R-R00-00030-1G</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>650D-R00-00200-1G</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>650C-R00-00000-1G</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>650D-R00-00103-1G</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>650-R-R00-01030-1G</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>650D-R-R00-00101-1G</td>
<td>1</td>
<td>3</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>650D-R00-00011-1G</td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>650-R-R00-00011-1G</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>650D-RRR-00220-1LFG</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>650D-R00-00031-1LFG</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>650D-R00-00201-1LFG</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>*</td>
</tr>
<tr>
<td>650D-RRR-00000-1LFG</td>
<td></td>
<td></td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>650D-R00-00000-1LFG</td>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>650D-RRR-00000-1LFG</td>
<td></td>
<td></td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>650C-R00-00000-1LFG</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>650D-R00-00030-1LFG</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>650-R-R00-00030-1LFG</td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
| 650D-R00-01030-1LFG | 3 | 2 | 1 | 1 | *
| 650C-RRR-10030-1LFG | 3 | 1 | 3 | 1 | *
| 650V-R-RRR-00000-1LFG | | | 4 | 1 | 5 outputs |
| 650V-R-RRR-00030-1LFG | | | 3 | 4 | |
| 650P-D-RRR-00000-1LFG | | | 3 | 1 | |
| 650P-D-RRR-00030-1LFG | | | 3 | 1 | |
| 650D-RRR-01030-1LFG | 3 | 3 | 1 | 1 | *
| 650D-R00-00000-0G | | | 1 | 1 | 2 outputs |
| 650-R-R00-00000-0G | | | 2 | | |
| 650D-R00-00120-0G | 2 | 1 | 1 | 1 | |
| 650-R-R00-00120-0G | | | 2 | 2 | |
| 650D-R00-00000-0G | | | 2 | 2 | |
| 650-R-R00-00000-0G | | | 3 | 1 | |
| 650D-RR0-00000-0G | | | 4 | 1 | |
| 650-D-RRR-00220-0LFG | 2 | 2 | 3 | 1 | * |
| 650-D-RR0-00031-0LFG | 3 | 2 | 1 | * | |
| 650-D-RRR-00201-0LFG | 2 | 3 | 1 | * | |
| 650-D-RR0-00000-0LFG | | | 4 | 1 | 4 outputs |
| 650-D-RRR-00030-0LFG | | | 3 | 4 | |
| 650D-R00-00030-0LFG | | | 4 | 1 | |
| 650-R-R00-00030-0LFG | | | 3 | 1 | |
| 650-D-RRR-00000-0LFG | | | 4 | 1 | |
| 650C-RR0-00000-0LFG | 2 | 1 | | | |
| 650-R-R00-00000-0LFG | | | 3 | 1 | |
| 650D-R00-00000-0LFG | | | 3 | 1 | |
| 650-R-R00-00000-0LFG | | | 3 | 1 | |
| 650D-RR0-00000-0LFG | | | 3 | 1 | |
| 650-D-RRR-00000-0LFG | | | 4 | 1 | |
| 650-D-RRR-00030-0LFG | | | 3 | 4 | |
| 650R-V-R-RRR-00000-0LFG | | | 4 | 1 | |
| 650P-D-RRR-00000-0LFG | | | 3 | 1 | |
| 650P-D-RRR-00030-0LFG | | | 3 | 1 | |
| 650D-RRR-01030-0LFG | 3 | 3 | 1 | 1 | *

Please contact GEFRAN for information on available codes.
### 10. ORDER METHODS

#### 10.2. 1250 Controller

**Power supply 100...240 VAC/VDC**

<table>
<thead>
<tr>
<th>Code F</th>
<th>Model</th>
<th>Valves</th>
<th>Digital</th>
<th>CT</th>
<th>SPR</th>
<th>Relay</th>
<th>Misc</th>
<th>Logic</th>
<th>Analog I</th>
<th>Analog VI</th>
<th>RS485</th>
<th>Total Number of Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>F060836</td>
<td>1250-D-R00-00000-1-G</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 outputs</td>
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<tr>
<td>F060837</td>
<td>1250-D-R00-00000-1-G</td>
<td>5</td>
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<tr>
<td>F060838</td>
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<tr>
<td>F060839</td>
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<td>F060840</td>
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<td>F060841</td>
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<td>F060842</td>
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<td>5</td>
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<tr>
<td>F060843</td>
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<td>F060844</td>
<td>1250-D-R00-00100-1-G</td>
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<tr>
<td>F060845</td>
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<tr>
<td>F060846</td>
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<tr>
<td>F060847</td>
<td>1250-D-RR0-00000-1-G</td>
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<tr>
<td>F060848</td>
<td>1250-D-RR0-00050-1-G</td>
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<tr>
<td>F060849</td>
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<td>5</td>
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Please contact GEFRAN for information on available codes.

**Power supply 20...27 VAC/VDC**

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Please contact GEFRAN for information on available codes.
## 10.3. 1350 Controller

### Power supply 100...240 VAC/VDC

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Please contact GEFRAN for information on available codes.
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11. ACCESSORIES