GEFRAN

2850T - 3850T
Multi-purpose controller

USE AND INSTALLATION MANUAL

$C\!E$

code: 80703G

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PREFACE

Device data

Write the order code and other plate data found on the label applied to the controller exterior here (see illustration). Should you need technical assistance, they must be communicated to Gefran Customer Service.

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

Warnings and safety

Always make sure you have the latest manual version, that can be freely downloaded from the Gefran website (www.gefran.com).

The devices illustrated in the manual must be installed by qualified technicians, following the laws and regulations in effect and according to the instructions contained in this manual.

Installation and/or maintenance technicians must read this manual and strictly follow the instructions herein and found in the annexes since Gefran cannot be held liable for personal, property and/or product damages should the following conditions not be met.

This manual must be available to people who interact with the devices described herein.
Before interacting with 2850T and 3850T multi-purpose controllers, the operator must be adequately instructed on the device operating, emergency, diagnostics and mainte-nance procedures.

If 2850T and 3850T multi-purpose controllers are used in applications with risk of personal, machine or material dam-ages, they must be combined with auxiliary alarm devices. We recommend ensuring the ability to check alarm opera-tions even during normal operations.

Do not touch live device terminals.

Before contacting Gefran Customer Service, in the event of alleged instrument malfunctions, we recommend consulting the Troubleshooting Guide in the "Maintenance"

Typical concepts used in the manual

Pay attention when the following symbols are found in the manual.

They indicate particularly important information that effect correct product operations or safety, or provide mandatory instructions.

They indicate a risk condition for the installation technician or user due to hazardous voltages.

They call the reader's attention to a specific point.

They signal a suggestion that could be helpful for better device use.

They indicate a reference to other technical documents that may be downloaded from www.gefran.com.

Glossary

4...20 mA	Electrical current used as a signal that is transmitted by certain sensors or that is specifically used to control a device such as, for example, a motor-driven valve.
Alarm	Output that is triggered when a certain condition is met such as, for example, a certain temperature.
Auto Tune	Function that lets you easily calculate and set P, I and D parameters thanks to controller self-learning.
Batch	Production batch ID.
Batch Report	A series of analog and digital variables are generally associated with the batch. The report starts with the program RUN command and ends when the program END status is reached.
Blocks Function	Default controls for specifications function used in Sequential Logics.
Cool	Control used for cooling.
Data log encryption	Technology that guaranteed logged data integrity (DataLog and Batch). The saved file is read and write protected by a CRC control. Encrypted files can be decrypted by the DataLog Utility for PC.
Datalogger	Continuous recording function for a series of analog and digital variables.
GETLogic	Gefran Embedded Technology: function that lets you set Sequential Logics directly from the terminal.
GETView	Gefran Embedded Technology: function that lets you set custom graphics pages directly from the terminal.
HBB	Alarm Hold Back Band: alarm associated with the SP profile, that checks that the reference variable (PV) remains within a tolerance band set according to the generated SP. If PV goes outside the set band, the profile generator will be shut down and HBB WAIT will appear on the monitor. The profile generator automatically returns to RUN when PV returns within the tolerance band. If you want to move forward with

	profile steps in HBB condition, SKIP is permitted, provided you first go to HOLD STATUS.
HB	Heater Break Alarm: requires use of current transformer inputs, associated with a control output, of which it takes into consideration the ON and OFF phases. The alarm signals changes in load absorption, discriminating between current values for current inputs.
Heat/Cool	Control that is used both for heating and cooling (requires two control outputs).
Heat	Control used for heating.
Hysteresis	When the value of the controlled variable, at a precise moment, depends not only from another reference variable, but also by the values which the controlled variable had previously, we are in the presence of hysteresis. The hysteresis can therefore be seen as an inertia which affects the control system, causing variable delays between variation of the reference variable and variation of the controlled variable.
Sequential Logic	Sequence of function blocks that describe the sequential management of the machine cycle.
ON-OFF	Control procedure based on output on and off. In heating control, the output remains active until PV is a certain amount less than SV (offset), and then turns off until PV is higher than SV by the same amount (or different, depending on the controller configuration). In the case of cooling, the output it is on until PV > SV - offset and off until PV < SV + offset. This type of control is not intelligent, does not take account of the disturbances and is not very accurate, but ensures a limited number of output switching.
Overshoot	Situation where PV exceeds SP because the control action was too late. The ON-OFF controls have a greater overshoot than the PID controls.
PID	Acronym for Proportional-Integration-Differentiation indicates a negative feedback

system, meaning a device whose input acquires a value from a process, compares it with a reference value and uses the difference (error) for determine the value of the controller output variable, which is the variable that controls the process itself. The output is controlled according to the actual error value (proportional action), a set of previous error values (integral action) and the error value rate of change (derivative action).

Setpoint Profile See SP.

Program Function set (Sp Profile, Sequential Logic, Recording) that describe a production cycle.

Pt100 Commonly used temperature probe.
At 0° C /F, its resistance is 100 ohms, while at room temperature is about 106 ohms. You can test the Pt100 for electrical continuity and you can use normal extension cords.

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

Solid State Relay Also known as SSR (Solid-state relay) is a relay designed specially for frequent switching. There are no moving parts or mechanical contacts, but, however, fail or short circuit. These types of relays are often used in temperature control systems such as PID.

Segment Basic element for the configuration of a SP profile. It describes the operations of an individual segment in detail. The set of segments describes the execution of a SP profile.

Sensor A device that translates physical phenomena (i.e. resistance variation as a function of temperature) in electrical signals that can be acquired and processed by the controller.

Setpoint Set value (see SV).

SSP SP/FSSPActive set point, in the case of a set point gradient, shows its real value.

SP Acronym for Setpoint Profile meaning the set of segments that describe the trend over time of a value, typically a setpoint and the status of a series of digital events (In/Out).

SV Acronym for Set Value which is the value that the process variable (temperature, valve opening, etc.) must achieve and maintain.

TA Current transformer

Thermocouple Sensor that transmits an electrical signal of a few millivolts, that cannot be tested for electrical continuity.
It needs specially designed extension cords.

Undershoot Situation where PV does not reach SV because the control action was too early. The ON-OFF controls have an undershoot greater than the PID controls.

Engineering unit Unit of measure suited to directly express the measured physical variable value.

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

Disclaimer

Although all information contained within this document has been carefully checked, Gefran S.p.A. cannot be held liable for the possible presence of errors, or damage to persons or property due to improper use of this manual.

Gefran S.p.A. also reserves the right to make changes to the content and form of this document as well as the characteristics of the illustrated devices at any time without prior notice.

The technical and performance data indicated in this manual are to be considered as a guide for the user to determine the suitability for a certain use, and are not guarantees. They may be the result of Gefran S.p.A. test conditions and the user must compare them to his/her real application requirements.

Gefran S.p.A. cannot be held in any way liable for any damage to persons or property resulting from controller tampering, incorrect and improper use or otherwise non compliant with controller features and instructions in this manual.

Copyright

1. GENERAL DESCRIPTION

1.1. Profile

2850T   3850T
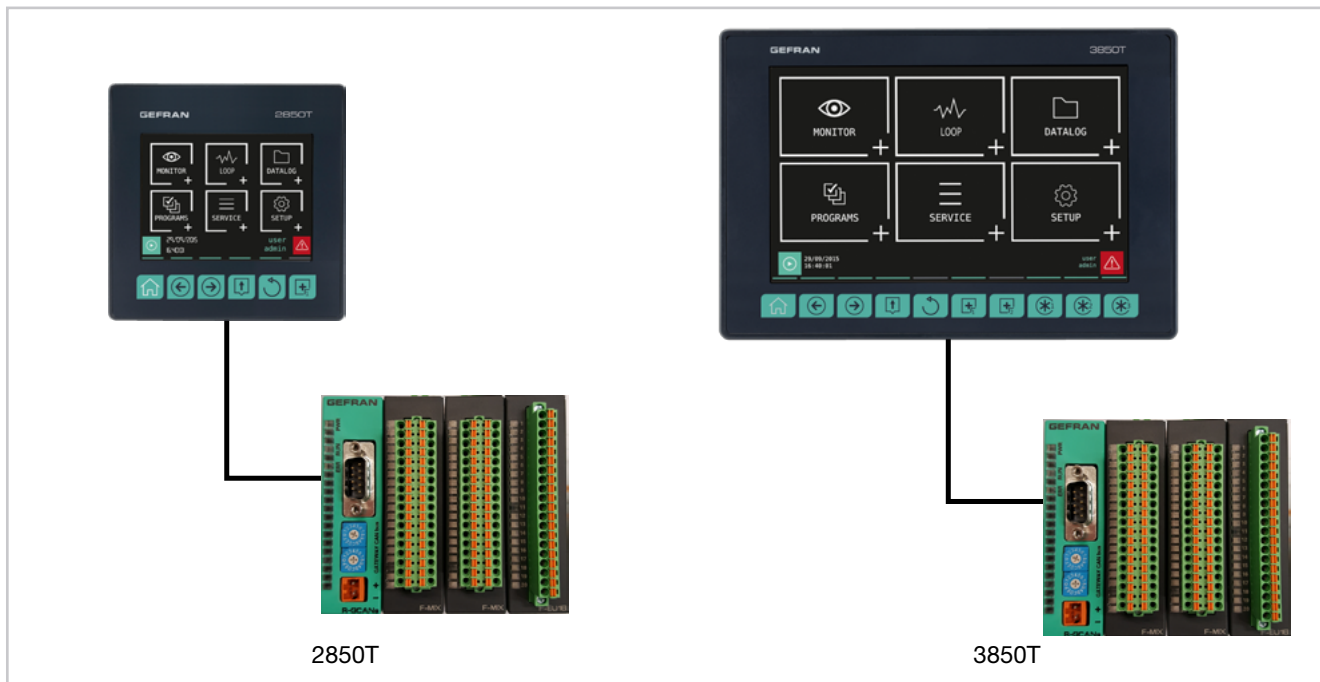
The 2850T and 3850T multi-purpose controllers designed to control the temperature in production processes (heat treatment, kiln and autoclave management, etc.) used in different industrial sectors such as automotive, food, metal-works, etc.

The controllers consist of three elements: the operator interface with touch screen display and keys, the I/O module group for connection to plants and machinery and the connection cable between the interface and the module group.

The two controllers share the same main features and the same functions. The differences are listed in paragraph "1.2. Model differences" on page 10.

The **color touch screen display** (3.5" for the 2850T model and 7" for the 3850T model) allows the operator to easily and quickly interact with the controller, managing actions and parameters.
Access to the main controller functions and navigation between pages is made easier thanks to its **function keys** (6 for model 2850T and 10 for model 3850T), some of which are customisable.
Customized pages may be configured directly on the display, even without a PC or external software. This option allows you create optimised graphic interfaces to control the machinery used. A graphic symbol library is provided for this purpose (buttons, bargraph, data display, etc.) that can be set and linked to the controller variables. You may also import images, such as representations of the machinery or of the system's operating diagram, to be used as a background, to make control even more intuitive for operators.
Controllers can control different **PID** (up to 8 for model 2850T and up to 16 for model 3850T) fully configurable.
Each PID can be used as a control for a single loop, a valve or a ratio control, it can be connected to the profile pro-

grammer or be used as a cascade controller.
Tuning is performed through advanced algorithms that ensure stable and accurate temperature control, avoiding exceeding set limits or having unstable process control even in critical heat or fast motion processes.

The **setpoint profile programmer** allows you to set the programs to manage heat treatment cycles. The profile is the set of segments that describe the setpoint curve. You can create up to 200 (model 2850T) or 250 (model 3850T) programs, stored internally, each of which can contain up to 50 segments.
Each program lets you set up to four setpoint profiles. A descriptive message, 16 input events (IN), 16 outbound events (OUT), the setpoint value and the HBB alarm threshold can be set for each program.
You can launch up to four programs simultaneously with the 2850T model and 8 programs simultaneously with the 3850T model, each of which can handle up to 4 synchronous profiles.
The profile programmer can be set in synchronous mode (all profiles are run with a common time base) or asynchronous (each profile can be run with an independent time base). The asynchronous mode is obtained by running different programs simultaneously.

The available logical operators (AND, OR, Timer, Counter etc.) allow you to create custom **logic operating** sequences integrated with , thus obtaining complete and flexible machine control.
The available **settable mathematical functions** (addition, multiplication, division, minimum or maximum value, algorithms, etc.) can be used associated with process values as analog channels and virtual channels, to manage advanced controls, such as ratio controls or custom mathematical formulas.

1. GENERAL DESCRIPTION

The **Data Logger function,** combined with the Real Time Clock (RTC clock with rechargeable buffer battery) stores process data, IN/OUT signals and the status of the alarms in an open file (.CSV format) or encrypted file. The minimum data sampling frequency is 100 milliseconds. Saved files can then be exported from the controller via USB or Ethernet network.

The **batch report** option lets you to associate this data with a specific batch produced, to be able to use them in production and quality reports.

A specific application for PC (**Report Utility**) is available for easy management of all data logger data and the production batch reports which allows you to manually copy and delete files via an Ethernet network between the controller and a PC or automatically at dates that can be set manually by the operator. The data stored on the PC can then be displayed in graphical format or a spreadsheet (Excel type) or exported as CSV or PDF files.

For the quick and safe installation of the machinery or plant, use the **recipes** stored in the controller. The recipes, easily retrievable by the operator, can be of two types: **OEM manufacturer recipes**, which contain the machine setup parameters and **production recipes**, which contain single production settings (profile program, logical steps, math functions).

The recipes can be easily transferred between different controllers via USB key or Ethernet network.

Controllers offer **complete diagnostics** (probe break down or incorrect connection, total or partial load break down, control loop faults), which helps the operator in case of controlled machine or process faults.

All **controller alarms** are stored internally and can be viewed as Active alarms and Historical alarms. The relevant message is displayed for each historical alarm with the date and time of the various states (active alarm, ACK, and alarm cleared). The ACK parameter, settable for each alarm, ensures that the active alarm was acknowledged by the operator.

An **internal energy counter**, with configurable offset alarm, provides energy consumption and cost totals.

For **accurate time stamps,** the controller supports the Simple Network Time Protocol (SNTP) service, which continuously updates the controller's date and time from the SNTP server connected via Ethernet network.

The **weekly clock** function lets you automatically start or stop a programmer or a process, without the need of operator intervention.

The clock is based on a settable weekly calendar (day of week and time).

The display **language selection** lets the operator interact with the device in the preferred language, facilitating work.

Secure access to all controller parameters is guaranteed by **3 preconfigured password levels** (Operator, Maintenance technician and OEM manufacturer). In this way, each user can only access the assigned functions and parameters.

You can connect the controller to the factory HMI/SCADA network by using standard **Modbus TCP (Ethernet) connectivity**.

Complete controller configuration is facilitated by use of the PC programming tool GF_express, which proposes intuitive Wizard pages, permitting easy construction of customized graphic pages and advanced logic.

1.2. Model differences

	2850T	3850T
Touch Screen display dimensions	3,5"	7"
Number of keys	6	10
Number of customisable keys	0	3
Max number of LOOP	8	16
Max number of programs	200	250
Logical and mathematical operations	400	400
Data Logger analog values	25	50
Data Logger digital events	50	50
Interface dimensions	100 × 100 mm	198 × 134.4 mm

1.3. Hardware architecture
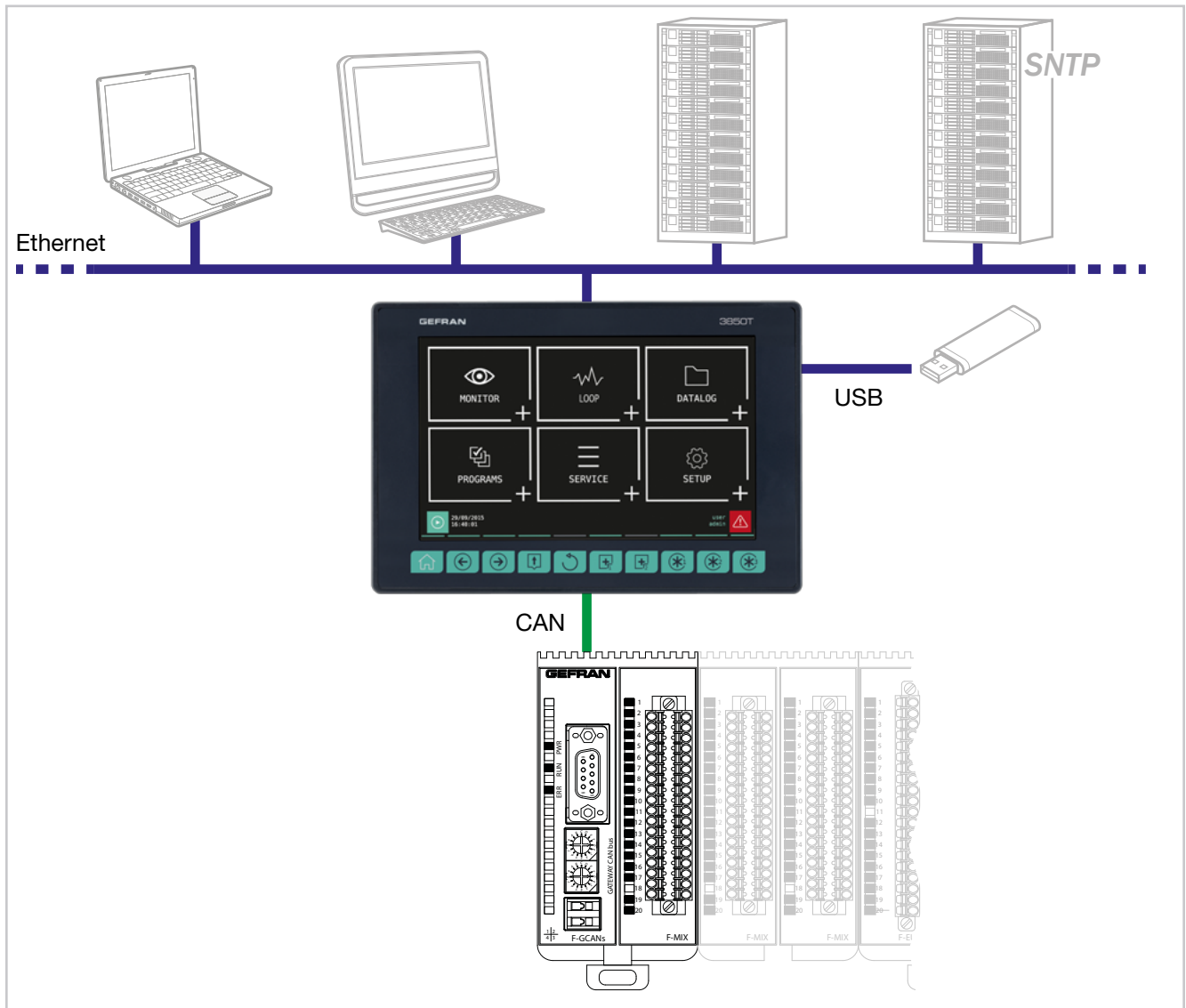
1. GENERAL DESCRIPTION

1.4.   2850T controller

Main features
- Operator interface with color touch screen display, 3.5 "
- Up to 8 PID control loops
- Cascade, ratio and valve PID controls
- Profile programmer with ramps and retention; synchronous and asynchronous
- Up to 200 50-segment programmes
- 3 password protected user levels
- Energy meter (kWh)
- Configurable logic operations
- Configurable math functions
- Data Log with Real Time Clock
- Batch Report management
- Transcript of unencrypted files (CSV) or encrypted for DataLog and production batches
- Setting up custom pages
- Management of active and historic alarms
- Current and cleared alarm management
- USB for data export and parameter cloning
- Control parameter advanced tuning
- Configurable analogue and digital I/O signals
- HMI/SCADA/PLC data exchange via Ethernet Modbus TCP
- Message language selection
- Compliance with CFR-21 regulation through Audit Trail (SW option in the order code)

1.4.1.   Display and keys
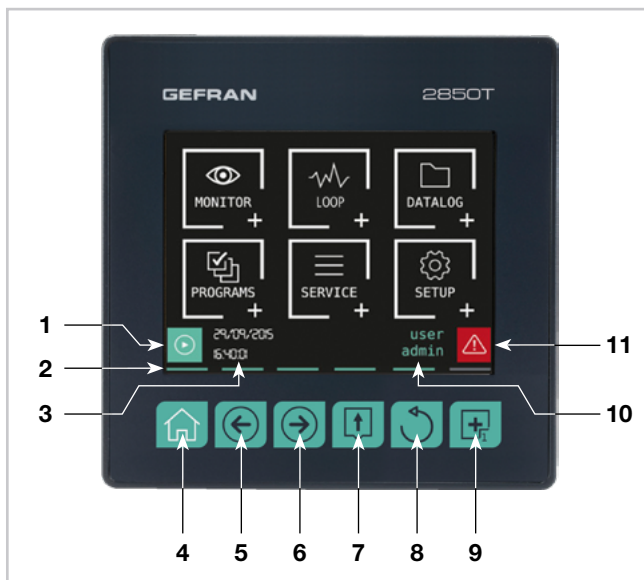
Figure 1 - 2850T display and key description

1. Shortcut icon (the landing page depends on the option chosen):
   - Controller with PROGRAMMER option: go to the Program Monitor page that displays main program information and lets you manage its execution.
   - Controller with RECORDER option: go to the Trend page that displays the set variable trends in graphic format.
2. Lighted pressed key conformation.
3. Date and time indication.
4. Home page key: return to the main menu.
5. Left Page key: changes the page in the submenus with multiple pages.
6. Right Page key: changes page in the submenus with multiple pages.
7. Group Page key: go to the higher menu level.
8. Back key: return to the previous page.
9. Custom Page 1 key: goes to the first custom page containing at least one graphic component.
10. Authenticated user indication. The login page opens by touching the indication.
11. Alarm Icon: blinks to indicate an alarm; tapping the icon opens the page that lists current alarms.

1.4.2.   Dimensions and drilling templates
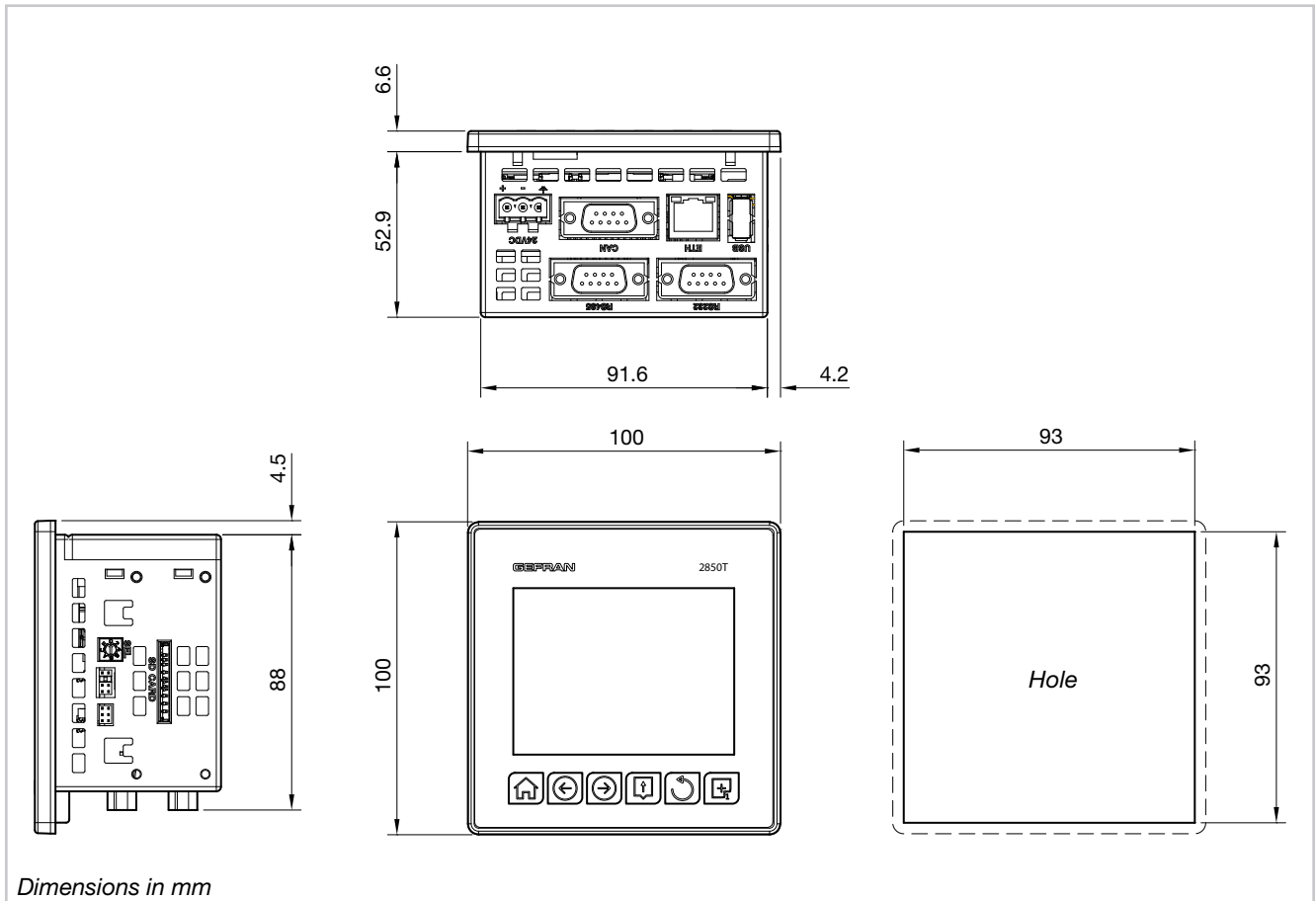
Figure 2 - 2850T interface dimensions and drilling templates

1. GENERAL DESCRIPTION

1.5.   3850T controller

Main features

- Operator interface with color touch screen display, 7"
- Up to 16 PID control loops
- Cascade, ratio and valve PID controls
- Profile programmer with ramps and retention; synchronous and asynchronous
- Up to 250 50-segment programmes
- 3 password protected user levels
- Energy meter (kWh)
- Configurable logic operations
- Configurable math functions
- Data Log with Real Time Clock
- Batch Report management
- Transcript of unencrypted files (CSV) or encrypted for DataLog and production batches
- Setting up custom pages
- Active and historical alarm management
- USB for data export and parameter cloning
- Control parameter advanced tuning
- Configurable analogue and digital I/O signals
- HMI/SCADA/PLC data exchange via Ethernet Modbus TCP
- Message language selection
- Compliance with CFR-21 regulation through Audit Trail (SW option in the order code)

1.5.1.   Display and keys
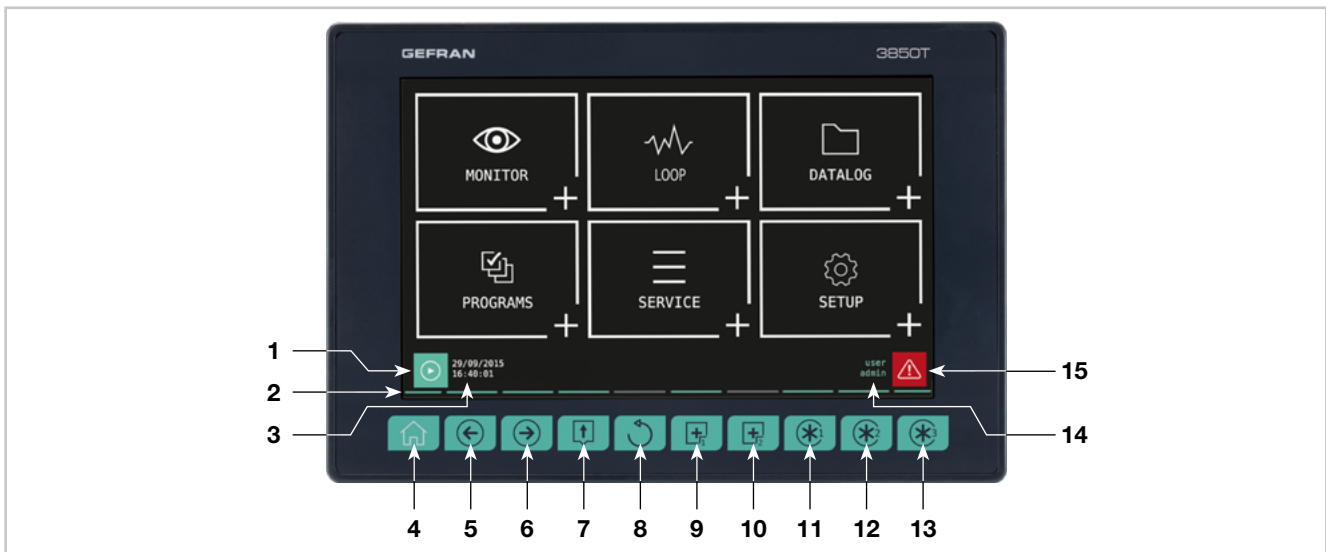
Figure 3 - 3850T display and key description

1. Shortcut icon (the landing page depends on the option chosen):
   - Controller with PROGRAMMER option: go to the Program Monitor page that displays main program information and lets you manage its execution. If the program that is opened is intended for recording only, the simplified interface will open, as in the case of the RECORDER.
   - Controller with RECORDER option: go to the Trend page for starting and stopping recording.
2. Lighted pressed key conformation.
3. Date and time indication.
4. Home page key: return to the main menu.
5. Left Page key: changes the page in the submenus with multiple pages.
6. Right Page key: changes page in the submenus with

multiple pages.
7. Group Page key: go to the higher menu level.
8. Back key: return to the previous page.
9. Custom Page 1 key: goes to the first custom page containing at least one graphic component.
10. Custom Page 2 button: go to second custom page.
11. Customizable Key Function 1: raise the digital variable FUNCT_1.
12. Customizable Key Function 2: raise the digital variable FUNCT_2.
13. Customizable Key Function 3: raise the digital variable FUNCT_3.
14. Authenticated user indication. The login page opens by touching the indication.
15. Alarm Icon: blinks to indicate an alarm; tapping the icon opens the page that lists current alarms.

1.5.2. Dimensions and drilling templates
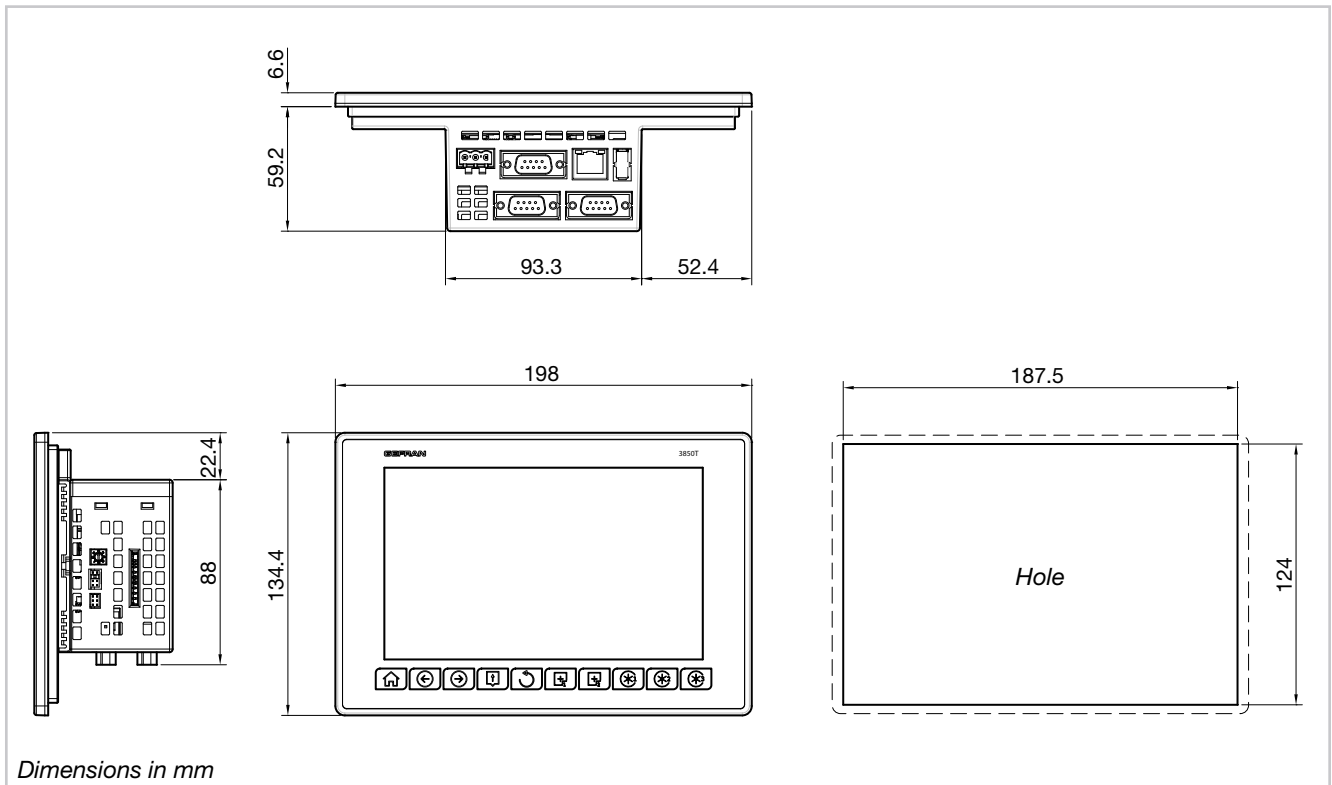
Figure 4 - 3850T interface dimensions and drilling templates

1.6. I/O modules
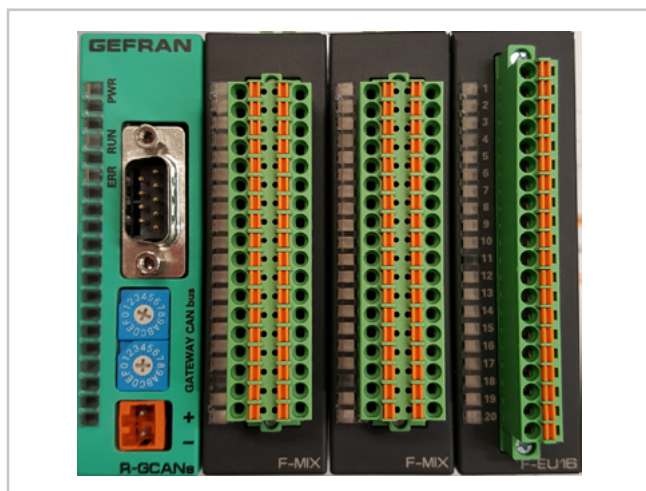
Main features

- Available in the F-MIX versions (analog and digital inputs and outputs) and F-EU16 (digital inputs and outputs)
- F-MIX version: 4 analog inputs, 2 analog outputs, 8 digital inputs, 8 digital outputs
- F-EU16 version: 8 digital inputs, 8 digital outputs
- Standard composition from 1 to 4 F-MIX modules (according to the controller model) and 1 F-GCANs communication module
- Possibility to expand the standard composition with 1 or 2 F-EU16 modules
- Containers for 2, 4, 6 or 8 modules, according to the chosen composition
- Container assembly on DIN 35 mm rail

1.6.1. Compositions

Composition		Mod. 1	Analog		Digital		Tot. I/O	2850T code	3850T code
			IN	OUT	IN	OUT			
Standard	F-GCANs, F-MIX	2	4	2	8	8	22	2850T-xx-04-xx-xx-xx-xx-xx-00-x-x	3850T-xx-04-xx-xx-xx-xx-xx-00-x-x
	F-GCANs, F-MIX, F-MIX	4	8	4	16	16	44	2850T-xx-08-xx-xx-xx-xx-xx-00-x-x	3850T-xx-08-xx-xx-xx-xx-xx-00-x-x
	F-GCANs, F-MIX, F-MIX, F-MIX	4	12	6	24	24	66	n/a	3850T-xx-12-xx-xx-xx-xx-xx-00-x-x
	F-GCANs, F-MIX, F-MIX, F-MIX, F-MIX	8	16	8	32	32	88	n/a	3850T-xx-16-xx-xx-xx-xx-xx-00-x-x
with additional digital expansions	F-GCANs, F-MIX, F-EU16	4	4	2	16	16	38	2850T-xx-04-xx-xx-xx-xx-xx-08-x-x	3850T-xx-04-xx-xx-xx-xx-xx-08-x-x
	F-GCANs, F-MIX, F-MIX, F-EU16	4	8	4	24	24	60	2850T-xx-08-xx-xx-xx-xx-xx-08-x-x	3850T-xx-08-xx-xx-xx-xx-xx-08-x-x
	F-GCANs, F-MIX, F-MIX, F-MIX, F-EU16	8	12	6	32	32	82	n/a	3850T-xx-12-xx-xx-xx-xx-xx-08-x-x
	F-GCANs, F-MIX, F-MIX, F-MIX, F-MIX, F-EU16	8	16	8	40	40	104	n/a	3850T-xx-16-xx-xx-xx-xx-xx-08-x-x
	F-GCANs, F-MIX, F-EU16, F-EU16	4	4	2	24	24	54	2850T-xx-04-xx-xx-xx-xx-xx-16-x-x	3850T-xx-04-xx-xx-xx-xx-xx-16-x-x
	F-GCANs, F-MIX, F-MIX, F-EU16, F-EU16	8	8	4	32	32	76	2850T-xx-08-xx-xx-xx-xx-xx-16-x-x	3850T-xx-08-xx-xx-xx-xx-xx-16-x-x
	F-GCANs, F-MIX, F-MIX, F-MIX, F-EU16, F-EU16	8	12	6	40	40	98	n/a	3850T-xx-12-xx-xx-xx-xx-xx-16-x-x
	F-GCANs, F-MIX, F-MIX, F-MIX, F-MIX, F-EU16, F-EU16	8	16	8	48	48	120	n/a	3850T-xx-16-xx-xx-xx-xx-xx-16-x-x

Notes

1) Container dimensions in modules
n/a = composition not available

1.6.2. Dimensions

I/O 2 SLOT

119,8

52

109,5

I/O 4 SLOT

119,8

104

109,5

I/O 8 SLOT

119,8

208

109,5
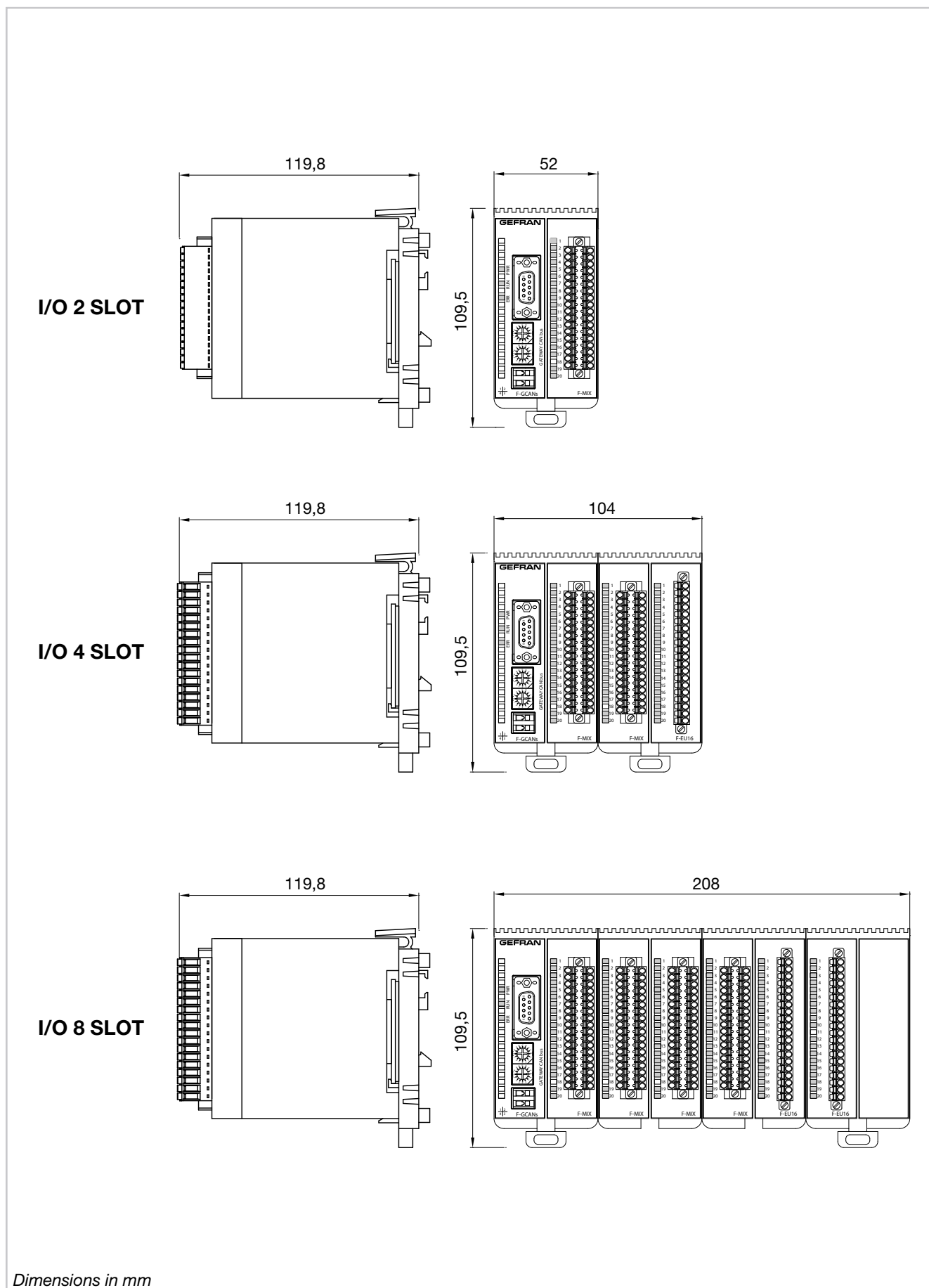
Dimensions in mm

Figure 5 - I/O module container dimensions

2. INSTALLATION

Warning! The installation of the devices described in the manual must be carried out by qualified personnel, following the laws and regulations and in accordance with the instructions contained in this manual.

Before proceeding with the installation, check that the controller is intact and has not been damaged during transport. Also make sure that the package contains all the accessories listed in the supplied documentation, especially the sealing gasket and fixing brackets.

Verify that the order code corresponds to the configuration required for the application in which the controller is intended (the supply voltage, number and type of inputs and outputs). See chapter 10 - Order codes - to verify the configuration corresponding to each order code.

Warning! If even one of the above-mentioned requirements (qualified technician, device intact, configuration not matching that required) is not met, suspend installation and contact your Gefran dealer or Gefran Customer Service.

2.1. Controller assembly

2.1.1. General installation rules

The controller is designed for permanent indoor installations. It must be mounted in electrical cabinets, or in machine or production process plant control panels, which are able to protect the connectors on the back of the controllers.

Warning! The controller must NOT be installed in dangerous environments (flammable or explosive). It can be connected to elements that operate in such environments only by means of suitable types of interfaces in conformity with the applicable safety standards.

Warning! If the controller is used in applications with risk of damage to persons or property, it is essential to combine it with specific alarm devices. We recommend including the ability to check alarm operation even during the normal operation of the controller and the system or equipment being monitored.

Sudden changes in temperature, freezing or condensation or corrosive gases should not occur where the controller is installed.

The controller can operate in environments with pollution degree 2 (presence of non-conductive dust, only temporarily conductive due to potential condensation). Prevent the device from being reached by metallic processing particles or scraps as well as any condensation products.

The controller is sensitive to strong electromagnetic fields. Avoid placing it near radio devices or other equipment that can generate electromagnetic fields, such as high-power remote controllers, contactors, relays, thyristor power groups (in particular, phase shift), motors, solenoids, transformers, high-frequency welders, etc.

2.1.2. Drilling Dimensions

For proper interface installation, respect the size of the single hole and the spacing between the adjacent holes shown in the illustrations of the different models ("Figure 2 - 2850T interface dimensions and drilling templates" on page 13 and "Figure 4 - 3850T interface dimensions and drilling templates" on page 15).

Warning! The support on which the interface must be mounted must have the following characteristics:
- be rigid and sturdy enough to support the device and not bend during use;
- have a thickness between 1 and 4 mm, in order to allow the device to be secured with the supplied brackets.

2.1.3. Protection against dust and water infiltration

The front of the interface provides IP65 protection. Therefore, the device can be installed in dusty environments or subject to water sprays provided that:
- the compartment containing the interface is also dust and water-tight;
- the support on which the interface is installed is perfectly smooth and without undulations in the front;
- the hole on the support scrupulously complies with the indicated drilling dimensions;
- the interface well-secured to the support, to enable the gasket inserted between the device and panel to ensure water-tightness.

Warning! If not adequately protected, the interface protection degree is IP20 (rear housing and connectors).

2. INSTALLATION

2.1.4. Vibration

The interface can withstand vibrations from 10 to 150 Hz, 20 m/s² (2 g), in all directions (X, Y and Z).
If the device is mounted on a support that exceeds these limits, a vibration suspension and damping system should be provided.

2.1.5. Minimum clearances for ventilation

The temperature of the compartment that contains the interface should not exceed, in any case, the 55° C (131 °F). Never block the air vents.
The illustrations "Figure 2 - 2850T interface dimensions and drilling templates" on page 13 and "Figure 4 - 3850T interface dimensions and drilling templates" on page 15 indicate the minimum distances to be observed to ensure device ventilation.

> 👉 **Tip.** The lower the temperature in which the device operates, the higher the life expectancy of its electronic components.

2.1.6. Positioning

The interface must be positioned so that the display is not directly illuminated by the sun or by particularly intense light sources. If necessary, shield direct beams, for example, with an anti-reflective screen.
The interface angle should be between 30° and 120°, as indicated in the figure.
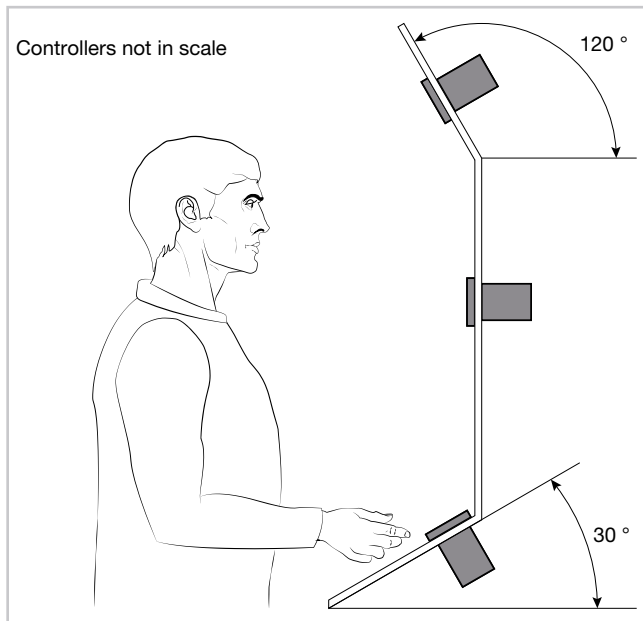
Figure 6 - Controller positioning

2.1.7. Panel Mount

1. Insert the tapered rubber gasket between the interface and the panel. The gasket, supplied, it is essential to ensure the degree of said frontal protection.
2. Insert the device into the hole previously drilled on the panel.
3. Insert the supplied brackets on the back of the device. For the 3850T model, first insert the square metal brackets and secure with screws.

4. Tighten the screws to lock the device to the panel. The tightening torque must be between 0.3 and 0.4 N m.

The following illustrations show how to secure the two interface models.
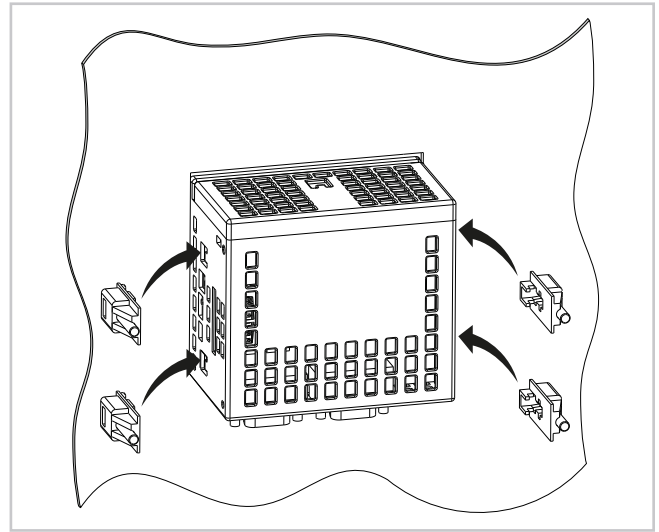
Figure 7 - 2850T installation
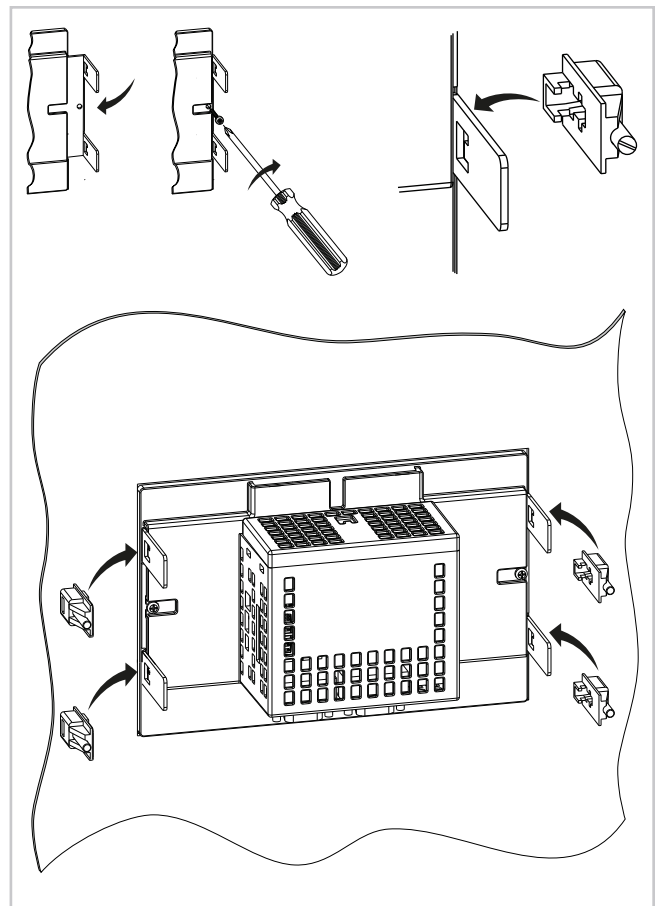
Figure 8 - 3850T installation

2.2. Installing I/O modules and Gefran communication

2.2.1. General installation rules

The I/O module groups are designed for permanent indoor installations. They must be installed in control panels that are able to protect the connectors on the modules.

⚠ **Warning!** The modules must NOT be installed in dangerous environments (flammable or explosive). They can be connected to elements that operate in such environments only by means of suitable types of interfaces in conformity with the applicable safety standards.

Sudden changes in temperature, freezing or condensation or corrosive gases should not occur where modules are installed.

Modules can operate in environments with pollution degree 2 (presence of non-conductive dust, only temporarily conductive due to potential condensation). Prevent modules from being reached by metallic processing particles or scraps as well as any condensation products.

2.2.2. Vibration

The modules can withstand vibrations from 10 to 150 Hz, 20 m/s^2 (2 g), in all directions (X, Y and Z).
If the modules are mounted on a support that exceeds these limits, a vibration suspension and damping system should be provided.

2.2.3. Minimum clearances for ventilation

The temperature of the compartment that contains the modules should not exceed, in any case, the 55° C (131 °F). Never block the air vents.

☞ **Tip.** The lower the temperature in which the modules operate, the higher the life expectancy of their electronic components.

⚠ **Warning!** Forced module cooling (i.e. with a fan) can cause measurement errors.

2.2.4. Positioning

The modules can only be mounted horizontally.
When positioning the modules, make sure that there is sufficient air circulation around them. Figure 9 shows the minimum distances from adjacent walls that must be respected for ventilation.
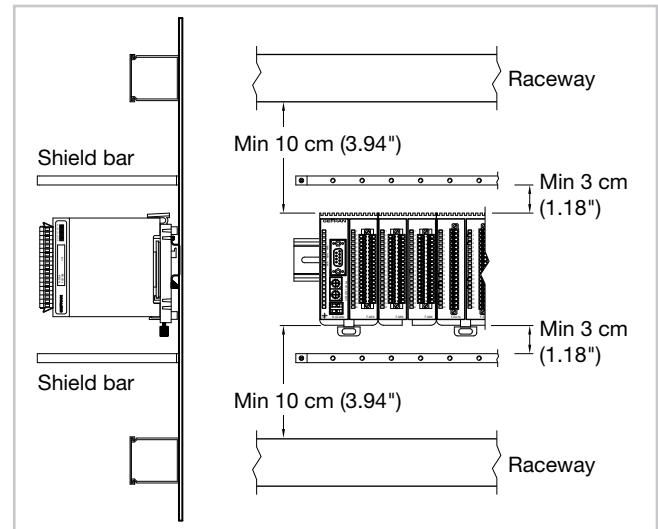
Figure 9 - Horizontal positioning

2.2.5. Module installation

The modules must be mounted on metallic and grounded DIN 35 mm (1,38") rail inside switchboards.
To secure the modules:
1. insert the top of the module hook on the DIN rail;
2. rotate the module to the vertical position, pressing until you hear the "clack" which indicates that the lower slide hook is attached to the DIN rail.

⚠ **Warning!** There is a spring contact at the back of each module to ground it through the DIN rail. There will be no electric continuity with the ground if the rail is not conductive or is not connected.
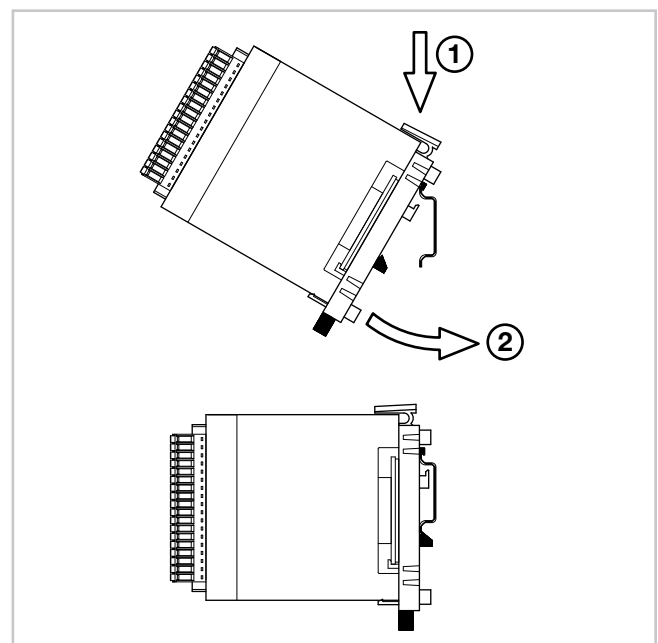
Figure 10 - DIN rail mounting

2.2.6. Removing Modules

To remove the modules:
1. pull down lower slide lock to release the module;
2. rotate the module outwards;
3. remove the top part of the module hook from the DIN rail.
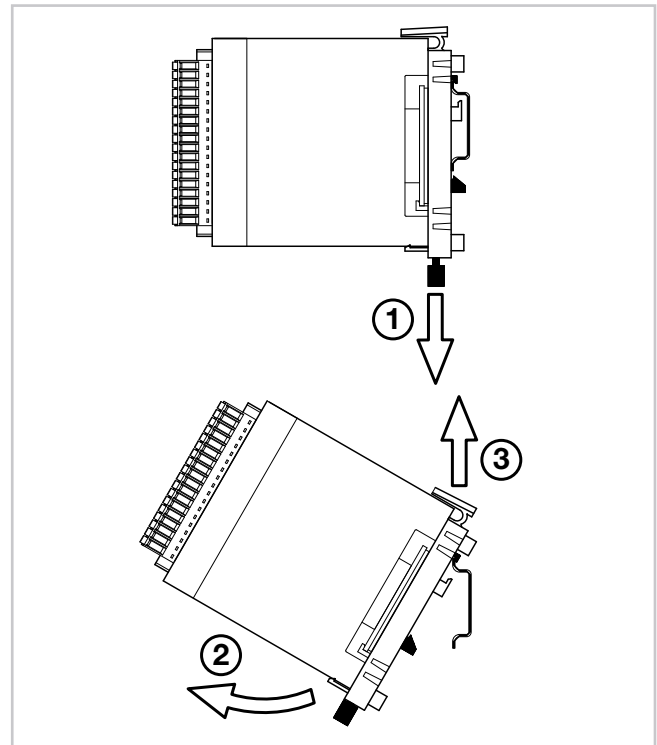
Figure 11 - Removal from DIN rail

2.3. Connections

⚠️ **Warning!** Please remember that failing to follow the instructions below could lead to electrical safety and electromagnetic compatibility problems, as well as void the warranty.

2.3.1. General rules for connections

1. The externally connected circuits must have double insulation.
2. In the case of shielded cables, the shield must be grounded at one point only, possibly close to the I/O module group.
3. Input cables must be physically separated from output ones and the power connections.
4. Do not connect the unused I/O contacts.

2.3.2. Electromagnetic Compatibility (EMC)

The most stringent generic standards were used for electromagnetic compliance, using the following experimental configuration:

Connection	Cable section	Length
Voltage	1 mm² (17 AWG)	1 m (39.37")
Serial port	0,35 mm²	3.5 m (137.79")
Thermocouple	0,8 mm² (18 AWG)	5 m (196.85") compensated
Potentiometer, linear, "PT100" thermistor	1 mm² (17 AWG)	3 m (9.84")
Digital inputs/outputs	1 mm² (17 AWG)	3.5 m (137.79")

2.3.3. Cables

Always make connections using cables suited to the voltage and current limits specified in the Technical Specifications.

For connections, use copper wires with insulation for 60/75° C (140/167 °F). For non power connections, do not use twisted and shielded cables.

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

2.3.4. Voltage

⚠️ **Warning!** Before powering the interface and I/O module group, make sure that the supply voltage corresponds to that on the device plates.

The 24 VDC supply must come from a Class II source or limited energy low voltage. The power supply must use a separate line from that used for the electromechanical power devices and low-voltage power cables must follow a separate path from the plant or machine power cables.

⚠️ **Warning!** Make sure that the grounding connection is efficient. A missing or ineffective ground connection can cause unstable device operations due to excessive environmental disturbances. In particular, check that:
• the voltage between ground and earth is < 1 V;
• the ohmic resistance is < 6 Ω.

Ensure that the 24 VDC power supply is fitted with a switch, or that there is a bipolar switch on the line that connects it to the mains voltage, in order to easily cut-off power to the controller in case of need. Insert connection wires in the ferrite bead supplied within the product (suggested 18 AWG wires).

2.3.5. Input and output connections

The I/O module input and output lines should be separated from the power line.

To avoid disturbances, the I/O module input and output cables must be kept away from the power cables (high voltage or large current).

Input, output and power cables must not be laid in parallel. Shielded cable or separate cable ducts are recommended.

⚠ **Warning!** If the controller is connected to NON isolated electrical devices (i.e. thermocouples), the ground connection must be made with a specific conductor to prevent it from being directly through the machine structure.

The connectors are polarised and accept wires of between 0.2 and 1,5 mm^2 (from 24 to 15 AWG).

Insert the wire in the connector hole corresponding to the terminal that is to be connected. After inserting the conductors, push the connector into the module.

To disconnect a wire, place a screwdriver into the slot next to the conductor, to release the retaining spring.

The following figure shows how to insert or remove a wire to/from the connector.
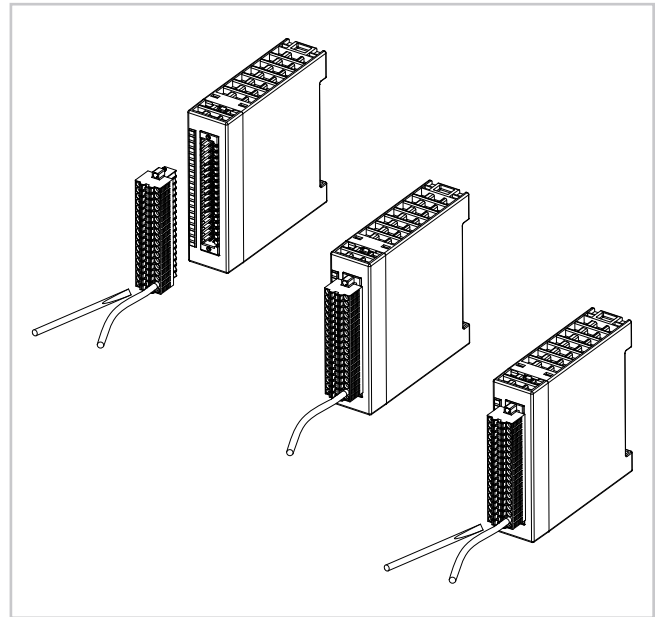
Figure 12 - I/O Connectors

2.4. Interface connection diagram

1. Power supply 24 VDC ±25% Also connect the connector to the ground wire.
2. CAN Port DB9 M.
3. Green LED indicates active Ethernet connection.
4. RJ45 Ethernet port 10/100 Mbit/s.
5. Yellow LED indicates data transfer in progress.
6. USB port type A.
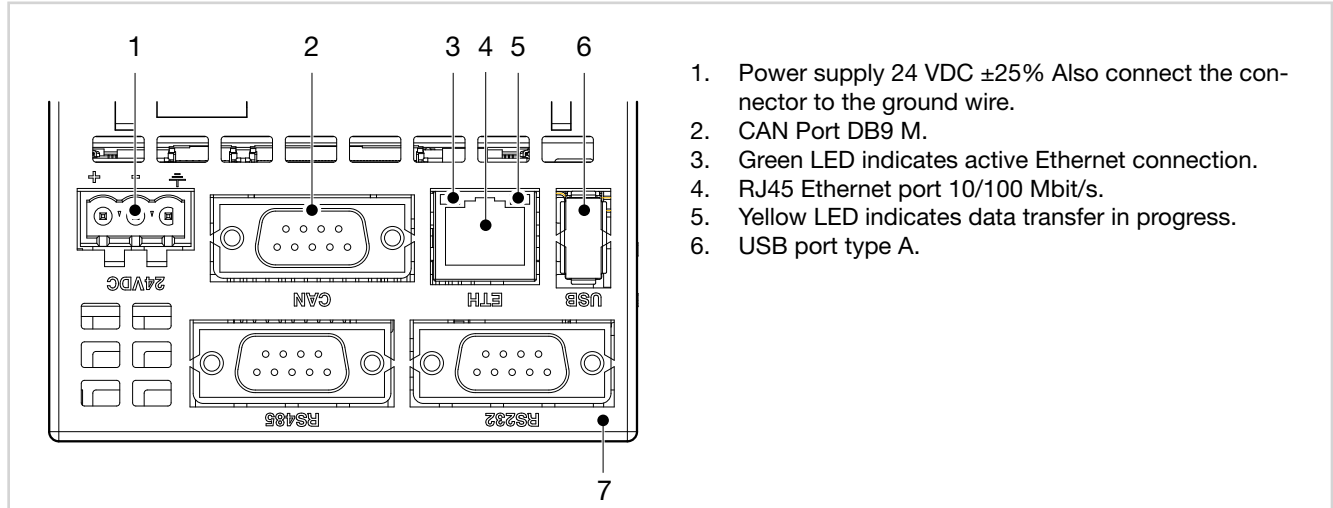
2.5. Ethernet Connections

Personal computers, servers and multi-purpose controllers can communicate through the Ethernet connection. This means that you can:

- control one or more multi-purpose controllers through one or more personal computers;
- store data produced or used by one or more multi-purpose controllers on one or more servers and have them readily available;
- keep one or more multi-purpose controllers time synced via an NTP (Network Time Protocol).

NTP servers allow computer systems to be synchronised, meaning all connected devices will have the same time, referring to a precise external clock and not only the internal clock, less precise.

Synchronisation enables a value offset of less than one millisecond for systems belonging to the same network and in any case less than a few hundred milliseconds for remote networks.

2. INSTALLATION

2.5.1. Private networks and public networks
The connection networks may be private or public.
A private network is a closed network with no connections to the outside world and is intrinsically more secure.
The public network (Internet), in contrast, allows you to access the devices connected to the network from anywhere in the world but, because of this, it is less secure.

Finally, there is the option of connecting a private network to a public network through a device called a firewall, which keeps them isolated except for duly authorised traffic.
In this type of configuration, a private network is often identified with the acronym LAN (Local Area Network) and the public with the acronym WAN (Wide Area Network). Other ways to identify them are intranet and extranet.
Note that the private network can also be constituted by a single device.

Figure 13 3 shows the different types of networks.
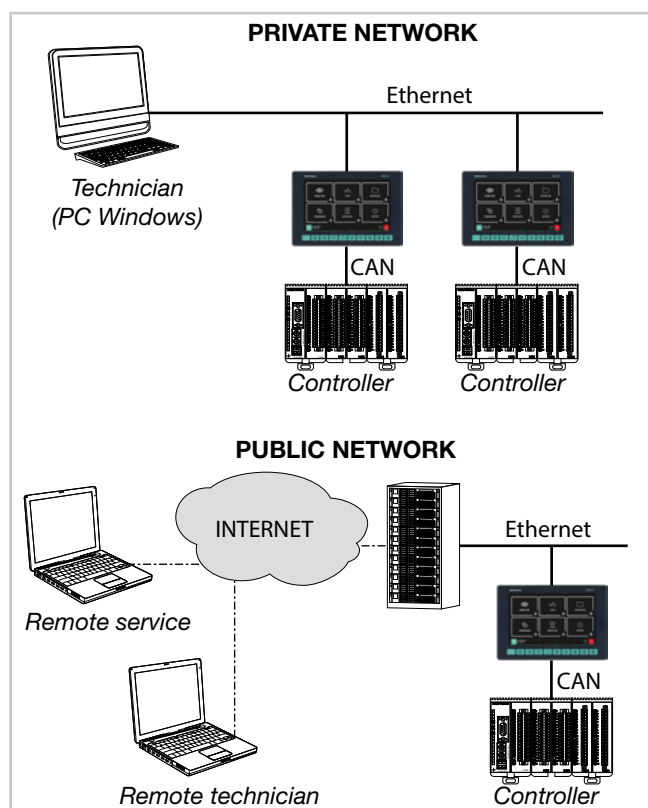
Figure 13 - Types of networks

2.5.2. Firewall
The firewall is a physical device or a software application that isolates a device or a network section from the rest of the connection network.
Several firewalls may need to be crossed to reach a device. For example, there might be a firewall between the corporate LAN and the Internet and another firewall that isolates the device from the corporate network.
To access a multi-purpose controller behind a firewall you need to configure the access channels or firewall traffic rules and implement connections via VPN (Virtual Private Network) or directly through a modem.
Consult the corporate IT system administrator to properly configure firewalls or know the parameters to implement a VPN or connect via modem.

In order to connect to an external multi-purpose controller and ensure the proper operations of all the services, the following ports need to be open (communicate the list to the IT administrator):

Port	Service
20, 21	FTP
502	Modbus TCP
5500, 5800, 5900	VNC

2.5.3. Router
In cases of particularly complex or extended Ethernet networks or that are subject to intense broadcast type traffic, the connection to the 2850T and 3850T controllers must be isolated. This is achieved by structuring the network into subnets (corporate/machine), or by limiting the TCP/IP traffic actually necessary for hubs or services.
This rule, in general, should be also be observed when connecting 2850T and 3850T controllers in small sized networks or with remote access systems.

The recommended solution is to connect the 2850T and 3850T controllers via a router.
The router is a layer 3 device that allows you to route the communication packets between different networks, meaning to determine specific port outputs package that arrived based on the target IP address.
The use of router ensures that the Ethernet traffic to or from the 2850T and 3850T controllers is filtered and remains isolated from the rest of the corporate network or from the external network.

2.5.4. VNC (Virtual Network Computing)
You can check the multi-purpose controller remotely using a VNC connection with a personal computer. The RFB protocol used is public domain.
With the VNC connection, the multi-purpose controller assumes the host function and the personal computer the client, where the connected multi-purpose controller interface is exactly reproduced.
Every action (clicking with the mouse, settings, etc.) performed on the reproduction of the interface display that appears on the personal computer is faithfully replicated on the controller and vice versa. The pages on the display and computer monitor are synchronised in real time.

2.5.5. VNC Server
The VNC server is part of multi-purpose controller operations. The VNC server is disabled by default. To enable it:
1. Log in as administrator. For more information on the login procedure, refer to the section "4.1. Login password" on page 37.
2. Open the Home Page by pressing the [⌂] button and select **Service**.
3. Select **Setup**
4. Select Configuration on the page that opens. Note the device IP address that is used to configure access through clients. If the network addresses have not yet been set, see paragraph "4.15.2.2. Network Configuration" on page 79.
5. Select **Network**.
6. Select **NTP VCN Configuration**.

7. On the page that opens, enable VNC by ticking the appropriate box and enter the password that will be used to login. The password can be up to 34 characters long.

The viewer can handle multiple concurrent connections, but an excessive number of connections can cause image refresh to slow.

2.5.6. VNC Viewer
There are several programs that turn a personal computer into a VNC client.

In addition to personal computers there are VNC viewers for other devices such as tablets and smartphones.

2.6. F-GCANs communication module connection diagram

Yellow LED: +24 VDC power supply on
Green LED: module operating status *
Red LED: module alarm **
CAN bus connector
Unused
Unused
Power supply 24 VDC ±25% 2 A max

GEFRAN
PWR
RUN
ERR
GATEWAY CAN bus
F-GCANs
CAN bus connection
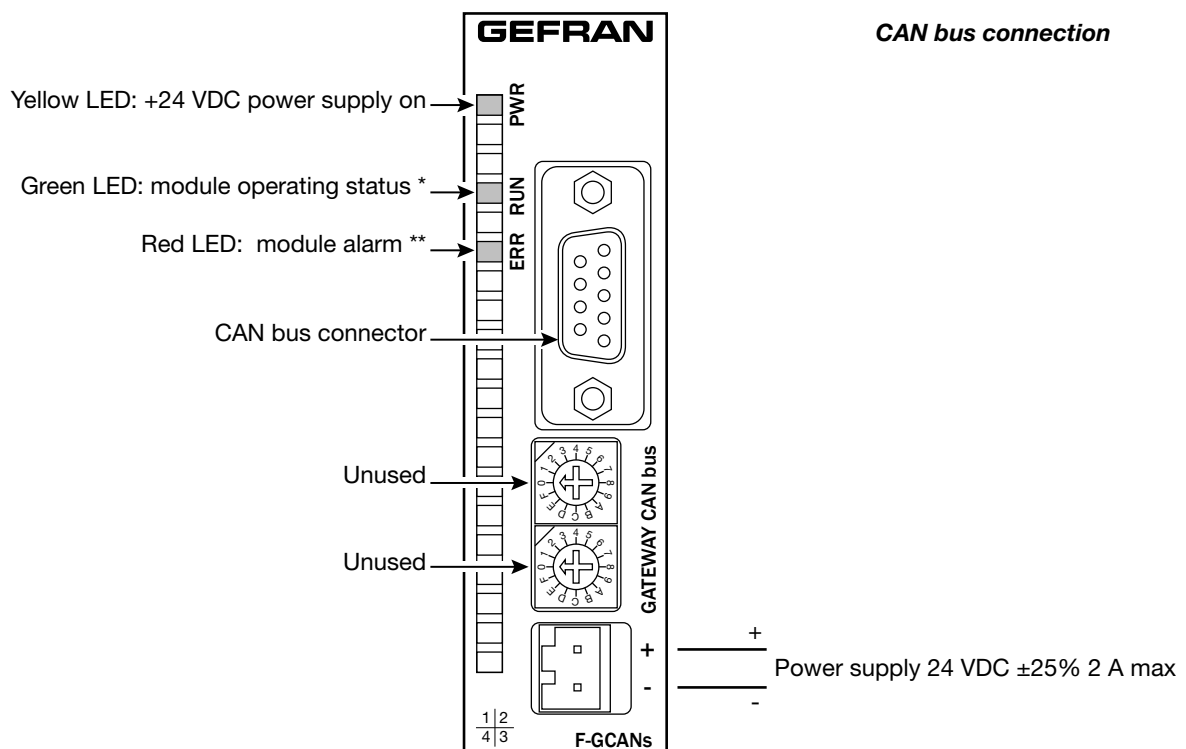
*) on = module on
    flashing = module not on
**) on = generic error
    flashing = communication error

2.7. F-MIX module connection diagrams

2.7.1. General layout

Yellow LED: +24 VDC external power supply on — 1
Green LED: digital input DI1 status ON — 2
Green LED: digital input DI2 status ON — 3
Green LED: digital input DI3 status ON — 4
Green LED: digital input DI4 status ON — 5
Green LED: digital input DI5 status ON — 6
Green LED: digital input DI6 status ON — 7
Green LED: digital input DI7 status ON — 8
Green LED: digital input DI8 status ON — 9
Green LED: digital output DO1 status ON — 10
Green LED: digital output DO2 status ON — 11
Green LED: digital output DO3 status ON — 12
Green LED: digital output DO4 status ON — 13
Green LED: digital output DO5 status ON — 14
Green LED: digital output DO6 status ON — 15
Green LED: digital output DO7 status ON — 16
Green LED: digital output DO8 status ON — 17
— 18
Green LED: module operating status * — 19
Red LED: module alarm — 20

F-MIX

Digital outputs - Analog inputs - Analog outputs

Digital inputs

A

+VI24 — 1		2 — GNDI
DO1 — 3		4 — DO2
DO3 — 5		6 — DO4
DO5 — 7		8 — DO6
DO7 — 9		10 — DO8
GNDI — 11		12 — GNDI
AO1 — 13		14 — AO2
CT1 — 15		16 — CT2
VP1 — 17		18 — VP2
-AI1 — 19		20 — -AI2
+AI1 — 21		22 — +AI2
AI1mA — 23		24 — AI2mA
VS1 — 25		26 — VS2
GNDI — 27		28 — GNDI
VP3 — 29		30 — VP4
-AI3 — 31		32 — -AI4
+AI3 — 33		34 — +AI4
AI3mA — 35		36 — AI4mA

B

DI1 — 1		2 — DI2
DI3 — 3		4 — DI4
DI5 — 5		6 — DI6
DI7 — 7		8 — DI8

DI   = Digital input
DO   = Digital output
AI   = Analog input
AO   = Analog output
+VI24 = 24 V voltage
GNDI = 0 V voltage
CT   = input from a current transformer
VP   = Potentiometer power
VS   = Extensometer input

(*) Fast flashing = module on
     slow flashing = module awaiting configuration (not operating)

2.7.2. Voltage

Voltage
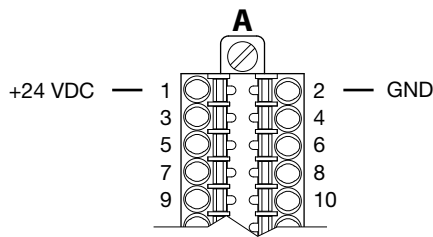
2.7.3. Digital inputs

Digital inputs DI1 ... DI8
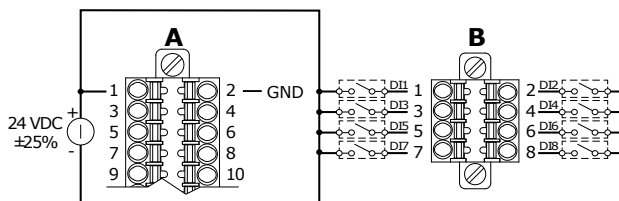
2.7.4. Analog inputs

Potentiometer inputs
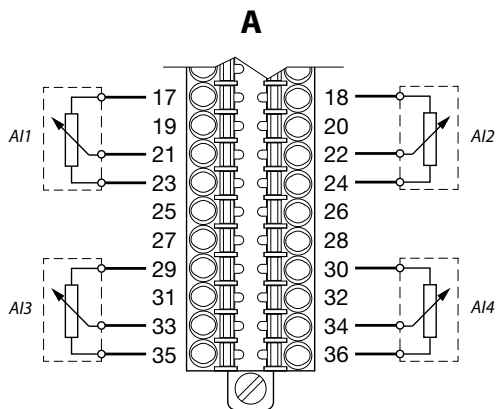
Thermocouple inputs
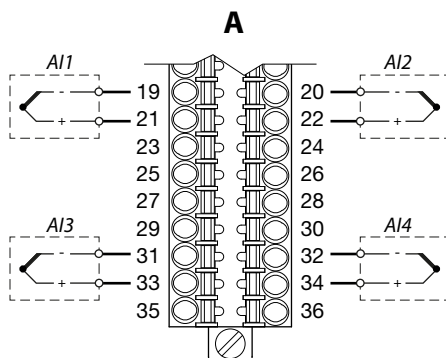
Inputs RTD PT100/PT1000 - 4-wire connection
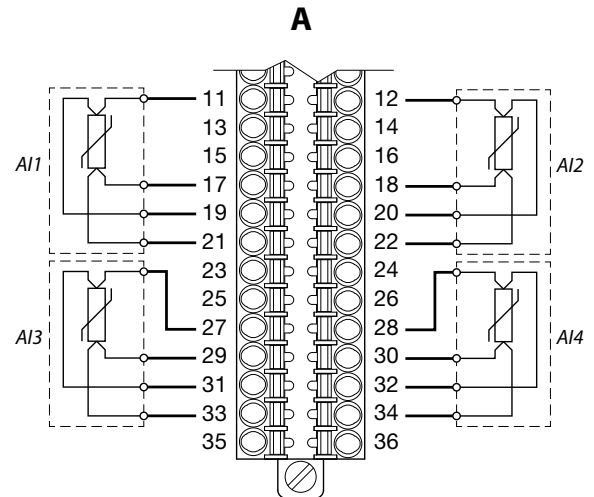
Inputs RTD PT100/PT1000 - 3-wire connection
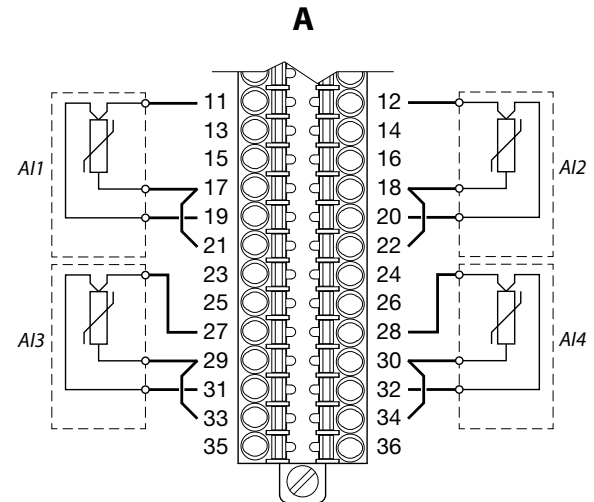
Inputs RTD PT100/PT1000 - 2-wire connection
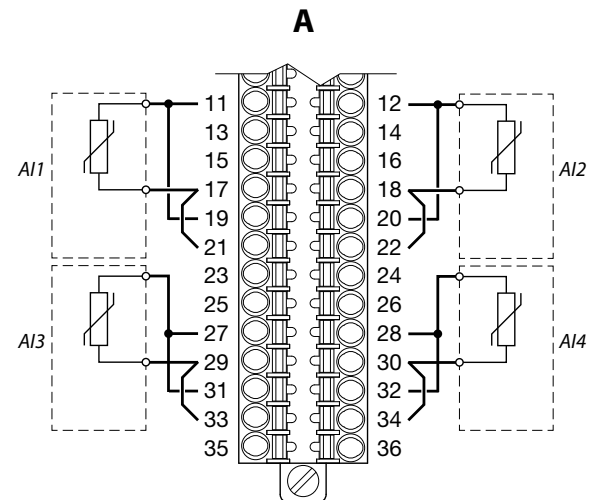
2. INSTALLATION

Single-ended voltage inputs
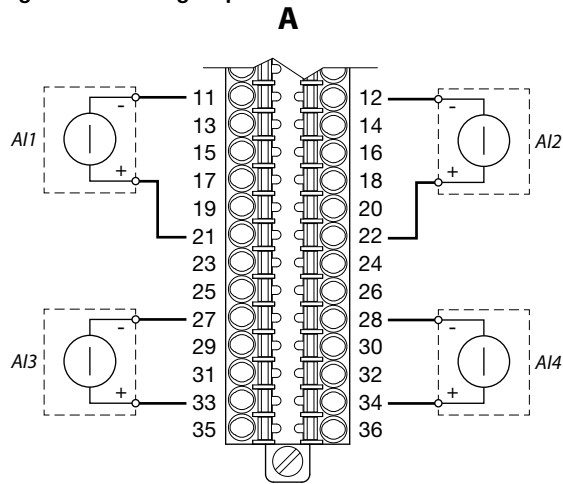
Current inputs
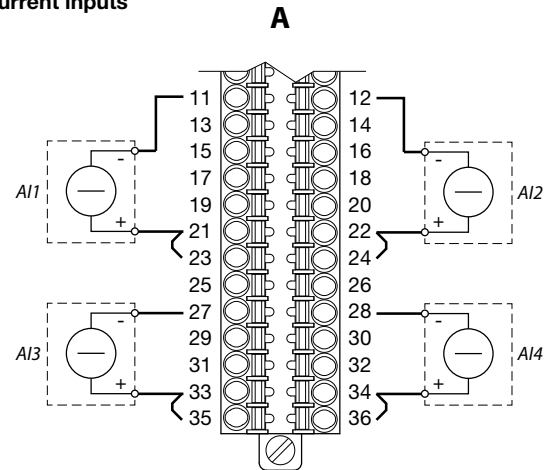
Differential voltage inputs

Amplified current transducer inputs - 4-wire connection
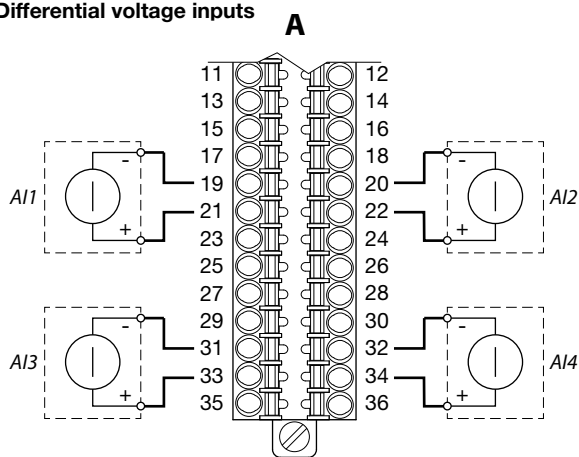
High impedance voltage input
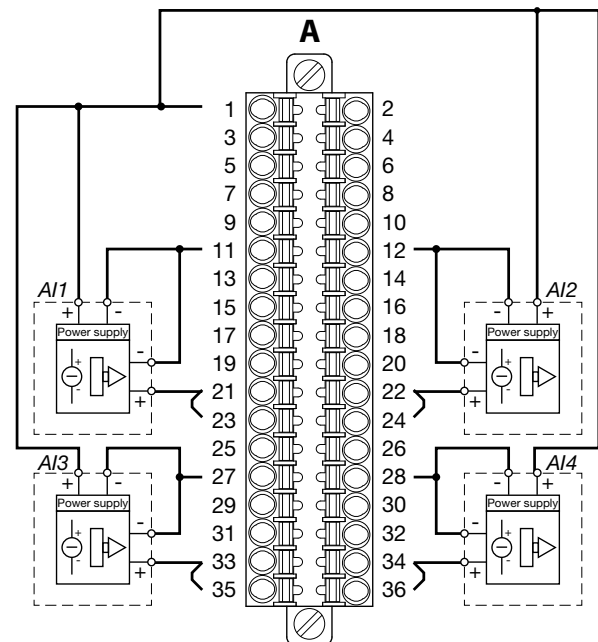
Amplified current transducer inputs - 2-wire connection

Current transformer inputs

A
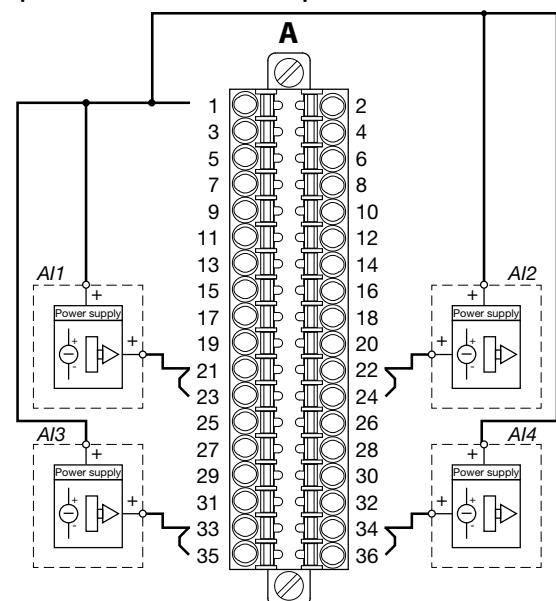
9 10
11 12
CT1 13 14 CT2
max 15 16 max
50 mA RMS 17 18 50 mA RMS
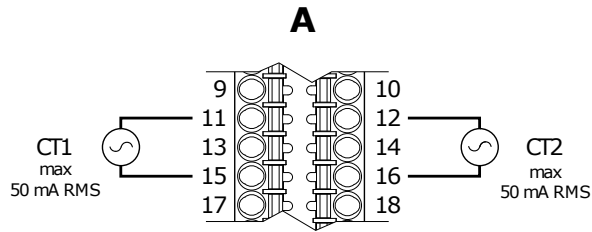
2.7.5. Digital outputs

Analog outputs AO1 ... AO8

A

11 12
AO1 — LOAD — 13 14 LOAD — AO2
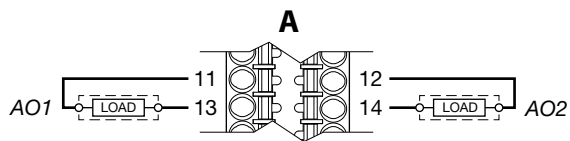
2.7.6. Analog outputs

Digital outputs DO1 ... DO8

A

1 2
DO1 — LOAD — 3 4 — LOAD — DO2
24 VDC + DO3 — LOAD — 5 6 — LOAD — DO4
±25% DO5 — LOAD — 7 8 — LOAD — DO6
- DO7 — LOAD — 9 10 — LOAD — DO8
11 12
GND

2.8. F-EU16 digital I/O module connection diagram

Yellow LED: power supply for DO1-DO4 on — 1
Green LED: output DO1 status ON — 2
Green LED: output DO2 status ON — 3
Green LED: output DO3 status ON — 4
Green LED: output DO4 status ON — 5
Yellow LED: power supply for DO5-DO8 on — 6
Green LED: output DO5 status ON — 7
Green LED: output DO6 status ON — 8
Green LED: output DO7 status ON — 9
Green LED: output DO8 status ON — 10
11
Green LED: input DI1 status ON — 12
Green LED: input DI2 status ON — 13
Green LED: input DI3 status ON — 14
Green LED: input DI4 status ON — 15
Green LED: input DI5 status ON — 16
Green LED: input DI6 status ON — 17
Green LED: input DI7 status ON — 18
Green LED: input DI8 status ON — 19
Red LED: module alarm — 20

F-EU16

+24 VDC per DO1-DO4
LOAD — DO1
LOAD — DO2
LOAD — DO3
LOAD — DO4
+24 VDC per DO5-DO8
LOAD — DO5
LOAD — DO6
LOAD — DO7
LOAD — DO8
GND

24 VDC
±25%

DI1
DI2
DI3
DI4
DI5
DI6
DI7
DI8
GND

24 VDC
±25%

2.9.   Touch Screen calibration procedure

Step 1 – Power off the unit and locate the "SEL" rotary switch on the right side of the unit case

Step 2 – set the switch to the "E" position
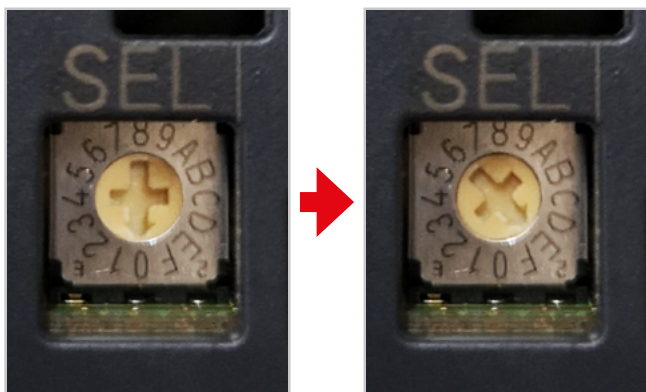
Step 3 – Power on the unit ; the touch-screen calibration page should appear
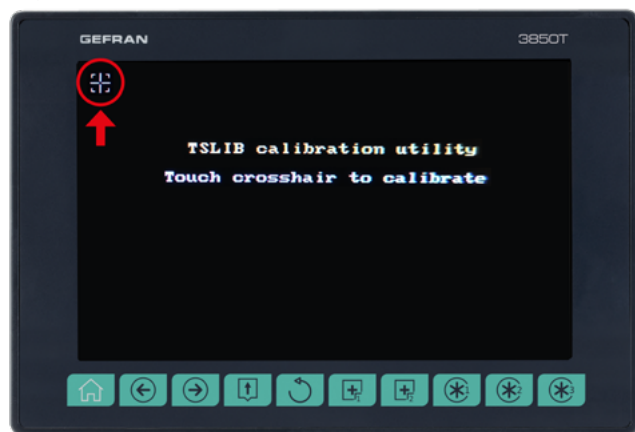
Touch the cross-hair to calibrate the upper left corner position.

It is recommended to use a pen tip rather than fingers to improve accuracy.

Step 4 – Proceed to calibrate all corners and screen centre in the same way:
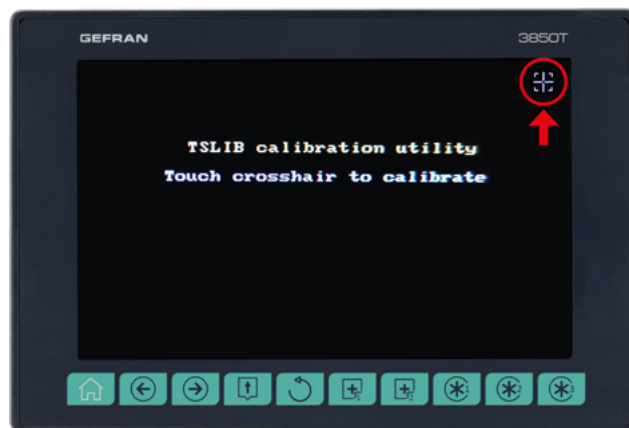
Upper right corner

Lower right corner
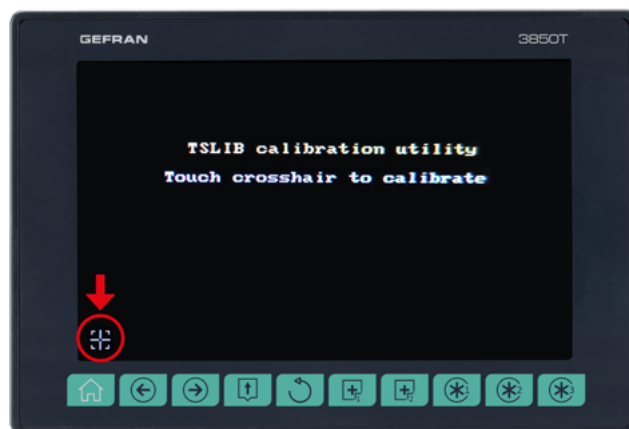
Lower left corner

Centre

Step 5 – After the "center" calibration please wait until the unit returns automatically to main page

Step 6 – Reset "SEL" switch to "0" position (it is not necessary to power-off the unit)
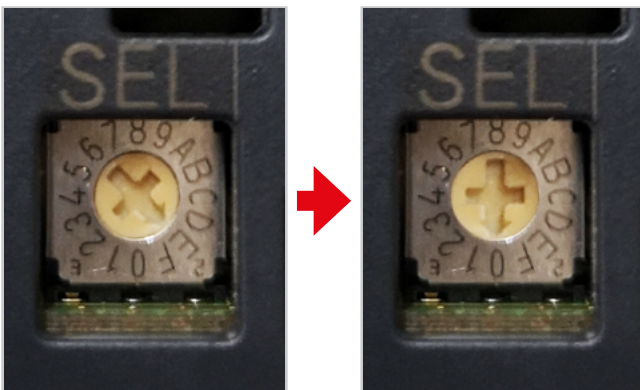
The calibration procedure is over

3.   COMMISSIONING

3.1.   Display information and key use

The general description of the display and the keys of the individual models is contained in the paragraphs "1.4.1. Display and keys" on page 12 for the 2850T interface and "1.5.1. Display and keys" on page 14 for the 3850T interface.

3.1.1.   Navigation

To navigate the menus and sub-menus, use the touch screen display and 6 or 10 keys below the display.
To select or set parameters and for all configuration tasks, only use the touch screen display.

3.1.2.   Virtual keyboards

The alphanumeric keyboard or the numeric keypad appears on the display when you need to enter text or numeric values appear on the display, respectively.
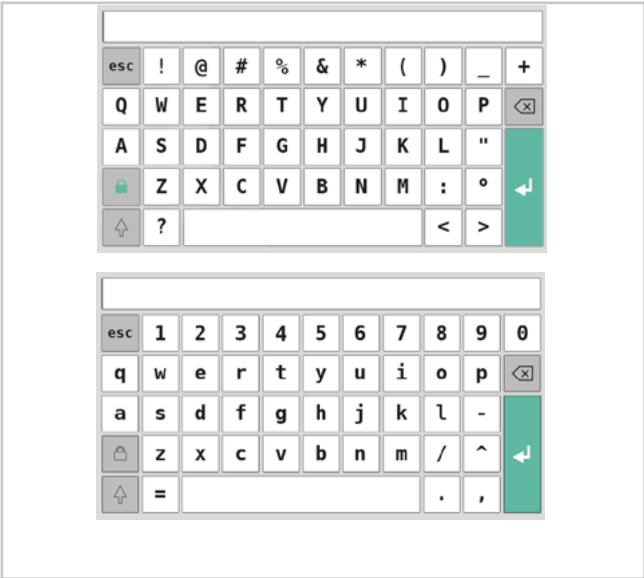
Figure 14 - Alphanumeric keyboard
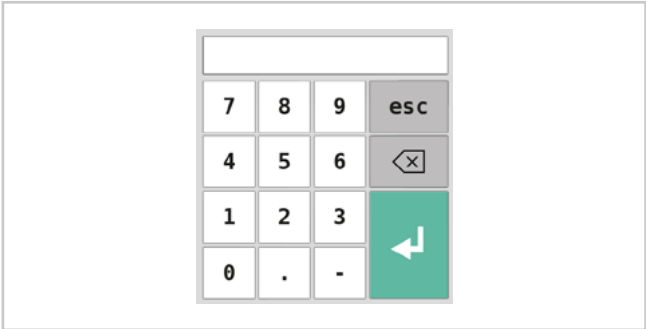
Figure 15 - Numeric keypad

The keyboards have a window at the top where the entered text appears.
Use the following keys to save, delete, cancel or change the keyboard:

Stores the entered text or value, as it appears in the window, and closes the virtual keyboard.

Deletes the last character entered. The virtual keyboard remains open.

Closes the virtual keyboard, discarding any entered text or value that appears in the window.

Changes the display of the alphanumeric keyboard keys.

3. COMMISSIONING

3.2. Behavior when turned on

When turned on, the multi-purpose controller loads the operating system and the default program. "Loading ..." appears on the screen.

When finished loading, the display turns off and "starting ..." appears after a few seconds to indicate that the default program is launched.

When the start-up phase is completed after the word "starting..." from the factory default condition, a quick setup menu page is displayed as shown in the figure.

On the proposed page you can quickly set the language, current date and hour, unit of temperature measurement, and an option inhibiting panel display.
The selected settings will be applied if you press OK and discarded if you press Cancel.

Any communication errors between I/O modules and the terminal are indicated by the Alarm icon in the pages. Touch the icon to view the list of alarms and review specific alarms.

3.3.   First start-up

The diagram illustrates controller operations at first start-up.
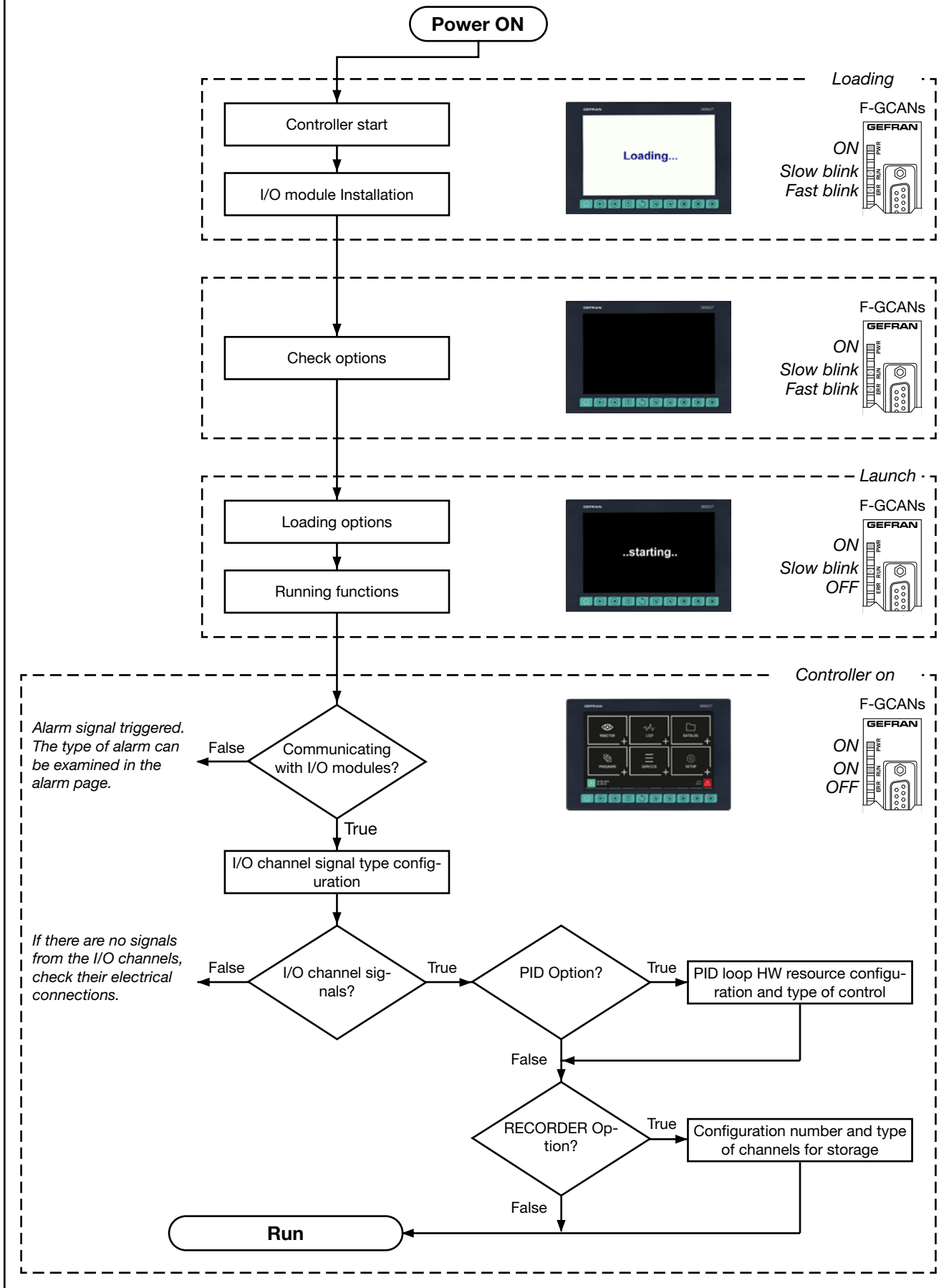
4.   MENU AND CONFIGURATION

A high level of knowledge of problems and techniques associated with the controlled process is required to properly set the parameters needed to configure the controller so that it meets the application requirements.

If you are unsure of your skills, or you are not fully aware of the consequences that could result from incorrect parameter settings, we do not recommend you proceed with the configuration.

⚠ **Warning!** Before commissioning the controller the user must ensure the parameters are set correctly to avoid damage to persons or property.

If in doubt, or if you would like some clarification, please visit www.gefran.com or contact the Gefran Customer Care service.

4.1.   Login password

Access to the menus is protected by 3 password levels: Operator, Maintenance and Administrator, listed from the one with lowest privileges to that with full access to all controller functions and parameters in default configuration. The level determines which menus, with their functions and parameters, you can navigate.

The first level (by default), Operator, provides access to sub-menus and more operational parameters, namely the ones that most affect the daily monitored machine or plant operations.

The second level (by default), Maintenance (SERVICE), provides access to the sub-menus and the parameters dedicated to the configuration of device hardware resources.

The third level (by default), Administrator (ADMIN), is reserved to the manufacturer who has included the multi-purpose controller in its machinery or plant.

The default password values are:
*   OPERATOR level: free access (no user or password)
*   SERVICE level: User = service, Password = 5678
*   ADMIN level: User = admin, Password = 1234

After a period of inactivity time (without touching the touch sensitive screen and without pressing a physical button), which can be set in the options, the system automatically logs out the logged in user and returns to the main menu page.

The name of the person currently logged in may be read in the lower right hand corner of the display.

Passwords can be created and modified. See the paragraph in this regard "4.16.6. USER CFG sub-menu" on page 102.
Note: user administration with the SW CFR21 option is different and more complex. For further info see the specific chapter ("7. Examples and application notes" on page 121)

4.2.   Display, configuration and management

Specific menus are used to view information on the multi-purpose controller and operations it performs, to configure the device and its functions and, ultimately, to manage the machine or process controlled by the controller. Each controller parameter, function or process can be managed by one or more menus.

Available trees and menu items vary depending on the controller model. The individual display or configuration pages, however, are the same for all models.

The menu structure shown in detail is that of the controller complete with all the options.
For other versions, refer to the graphical representations of the different menus (paragraphs "4.8. Controller menu with GETLogic and GETview options" on page 43, "4.9. Tool menu with GETLogic, GETview and recorder options" on page 44 and "4.10. Controller menu with GETLogic, GETview and recorder options" on page 45), from which you can trace back to the individual information and configuration pages available.

4.3. Monitor Program

The Monitor Program page is the page that shows the most important information of the loaded program. It is also the page which, by default (editable), appears at the end of the multi-purpose controller start-up procedure. Through this page, you can also manage the program (start, stop, etc).

The Monitor Program page is always accessible:
- using the **Home Page ➔ Monitor ➔ Monitor Prog** menu or more simply
- by touching the 🔘 key permanently displayed in the lower left corner of the display.
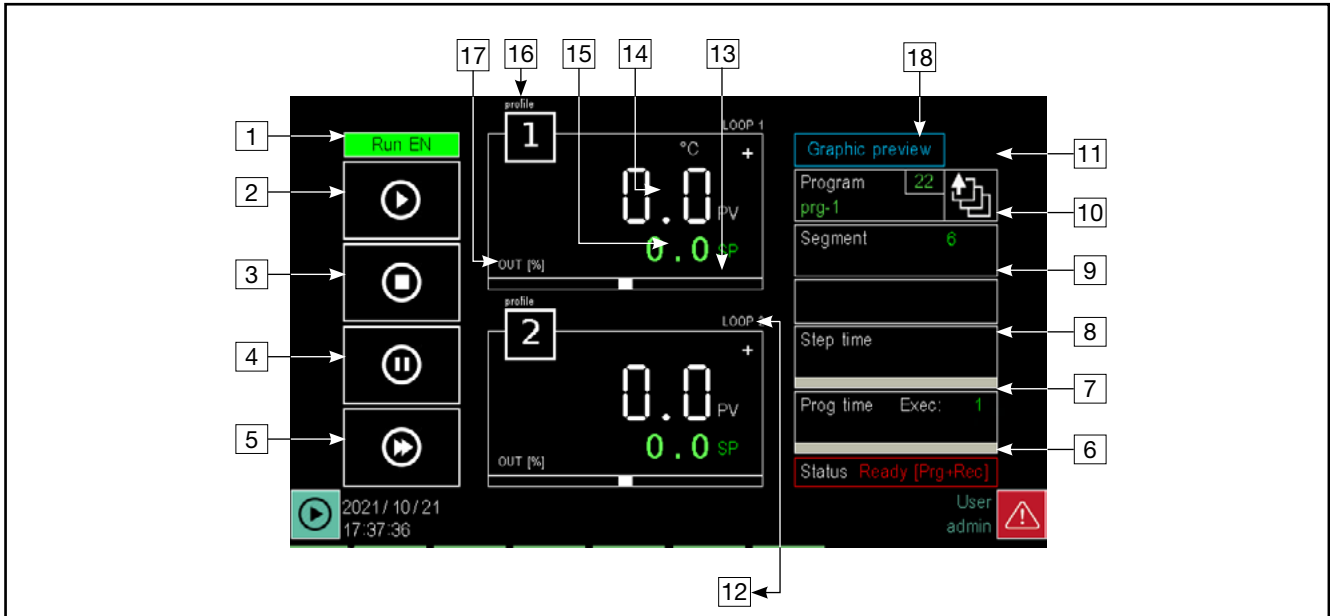
1. Viewing the signal to run the program.
2. START button: starts the program. A pop-up window opens when you touch the button displaying the production batch number and you can enter a name. To enter this information, touch the appropriate fields and use the virtual keyboard that appears. The data is not mandatory, but entered in the report produced at the end of processing, if the batch name is not specified, it will be given the same name as the previous one. Touch the Start button in the pop-up to start the program or the Cancel button to cancel the operation and close the pop-up.
3. RESET button: stops the program and returns to the Ready state (first step of the program), skipping any steps yet to be run. This opens a pop-up confirmation window. Touch the Stop button in the pop-up to stop the program or the Cancel button to cancel the operation and close the pop-up
4. PAUSE button: freezes the program, which assumes the Hold condition. To resume the program from the same point where it was stopped, touch the START button again (If necessary, you may go on to the next step in the HBB status using the HOLD and SKIP commands).
5. SKIP button: allows you to skip to the next step and is only active when the program is in the Hold condition.
6. Program status and any associated recording (separate indication is given for the actual program and variable sampling recording if enabled):
   • **Ready [Prg]/[Prg+Rec]:** program ready to be started
   • **Run [Prg]/[Prg+Rec]:** program running
   • **Hold [Prg]/[Prg+Rec]:** program paused
   • **End [Prg]/[Prg+Rec]:** program concluded.
7. Program run time. The progress bar indicates its progress in relation to the total theoretical time calculated.

8. Time remaining to run the step.The progress bar indicates its progress in relation to the theoretical time calculated.
9. Program messages:
   • wait condition: the program is suspended pending the signal to run the step (see variable WAIT_n);
   • suspend: the program was suspended;
   • hbb ch n: the program was suspended because the PV is out of the HBB control range (see variable HBB_n).
10. Number of the segment in progress.
11. Name of the program viewed. Touch the field to open a list of stored programs from which you can select the program to use.
12. Indication of the name of the controlled Loop.
13. Deviation bar graph: indicates, in percentage, the difference between PV and SP. If PV is less than SP the bar is lit in blue to the left of the median point, if PV is greater than SP is lit in red to the right of the median point.
14. Process Value (PV): the value that the process variable has at that time. The variable unit of measurement is also shown.
15. Setpoint (SP): is the process set value, which is the value that the machinery or system must reach and/or maintain.
16. Approximate profile number.
17. Indicator of the deviation bar, which may indicate the difference between PV and SP or the Loop output power. The selection is made on the Loop Monitor page
18. Program identification number. This is an active area; touch it to open the program selection window.

4.4.   Management of program running

Each program is characterized by its "status" and can be changed using the appropriate commands visible on the Program Monitor page. The commands may also be managed directly from the digital inputs configured for each program and from different sources (GETlogic, GETview…) through the system variables: START_n, PAUSE_n, END_n, RESET_n, SKIP_n . n corresponds to the position in memory of the program being worked with, and can take on a value from 1 to 8. These commands guarantee control of the programs completely independently of of one another, from customizable command sources.

Program status is also available in the STATUS_n variable, and may be 0 = READY, 1 = RUN, 2 = HOLD, or 3 = END.

When a program is loaded into memory by selecting among the available programs or creating a new one, is will have READY status. It does not currently act on any output and is ready to be run. When it is run by pressing Start, its status will become RUN. In RUN status, profiles and outputs are controlled, and the logical functions programmed for the program are run.
If necessary, the program may be put on HOLD using the PAUSE command, after which the outputs will be kept constant; press START again to resume RUN status. The cycle can end regularly and come to END status, in which the behavior of the outputs will depend on the settings selected. You can also go to END status with the END command. Under regular conditions, END status maintains control of resources dedicated to the program and does not permit them to be controlled by other programs or sources. To free up the resources used by the program completely, use the RESET command, which puts the program directly in READY status. The "**Program Configuration"** chapter

includes information on program status customisation, particularly the behavour of the END and READY statuses (induced by a RESET).

The interaction between commands and program statuses is summed up in the table below.
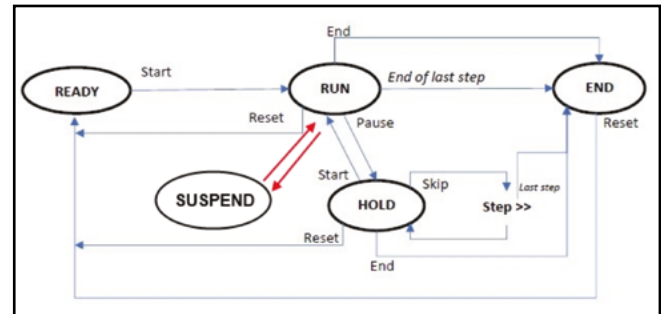
In addition to the PAUSE command, there is another, SUSPEND, which has the following characteristics:
- allows the program to be temporarily suspended when this signal is high.
- the program will restart automatically when suspend is lowered
- the STATUS of the program continues to be 1 (run)
- it is not possible to skip from the suspended state
- To enable suspending with these characteristics, the system variable SUSPED_n must be raised (e.g. with the logic functions or from the custom pages), where n is the position of the program you wish to suspend.

4.5.   Monitor Recorder

If the programmer option does not appear, the instrument has a number of record pages. These pages may be used to manage record recipes (start up, stop, etc).

The Monitor Program page is always accessible:
- using the **Home Page ➔ Monitor ➔ Monitor Prog** menu or more simply
- by touching the ⏵ button which appears at all times in the lower left hand corner of the display

There are three different views, showing one, two or four records at the same time, respectively. For each record, you may:

- start/restart recording with the START button
- stop and close the recording with the STOP button
- pause the recording with the PAUSE button
- assign a name to the record, which will then appear in the "batch name" field
- view sequential record time

By pausing a recording, the corresponding progress time is stopped, the counting restarts if recording restarts by pressing the START button.

For each recording, the current state in which it is located is shown. the possible states are the following:
- Ready [Rec]: recording is stopped and can be started with START -> a pop-up is displayed at start to enter the name of the job
- Hold [Rec]: recording is paused, can be restarted with START
- Run [Rec]: recording is in progress, can be stopped permanently or paused

4. CONFIGURATION

View 1 recorder
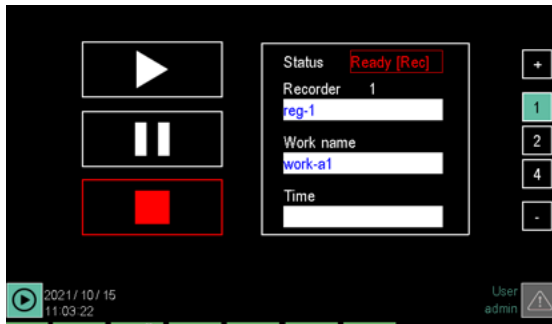
View 2 recorders

View 4 recorders

The procedure for control recipe settings is very similar to that of the programmer, with the same pages and the same settings. The reader is therefore referred to the explanation appearing at "4.14.3.5. Program report configuration" on page 76.

4.6.   Main menu (controller with all options)
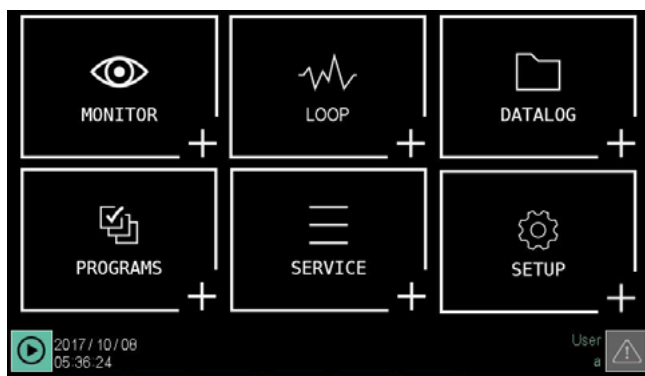
Home Page

This is what the Home Page and the main menu look like for the controller version complete with all options. For the menu layout for other controller versions, see paragraphs "4.8. Controller menu with GETLogic and GETview options" on page 43, "4.9. Tool menu with GETLogic, GETview and recorder options" on page 44 and "4.10. Controller menu with GETLogic, GET-view and recorder options" on page 45.
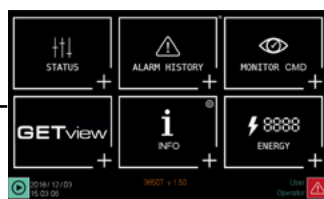
MONITOR menu (page 46)
With this menu you can view input and output status, alarm history, go to Monitor Program page, open custom pages and read information on the controller configuration.
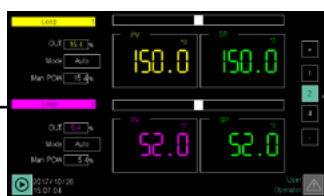
Menu LOOP (page 49)
With this menu you can view the most important information on 1, 2 or 4 LOOP.
On the page you can also set the manual power for each LOOP displayed.

DATALOG menu (page 50)
Current trends of the selected parameters and the historical trends of the set values can be viewed in a list or graph and current trend data can be exported to a USB key in this menu.
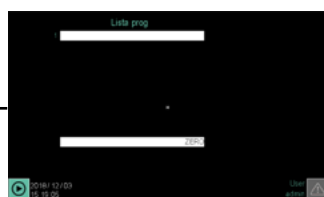
PROGRAMS menu (page 55)
Programs used by the multi-purpose controller are managed with this menu. You can read programs from a storage device, you can create new programs by setting the relative parameters or you can edit the parameters of existing programs.
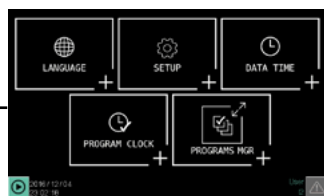
SERVICE menu (page 78)
With this menu you can set the interface language, the Ethernet network parameters, the display brightness, controller date and time, the weekly programmer clock, view information about the bus and the application and more.

SETUP menu (page 33)
With this menu you can set communication and I/O modules, alarms, system variables, PID, user variables and manage users.

4.7.   Controller menu with programmer, GETLogic, GETview and recorder
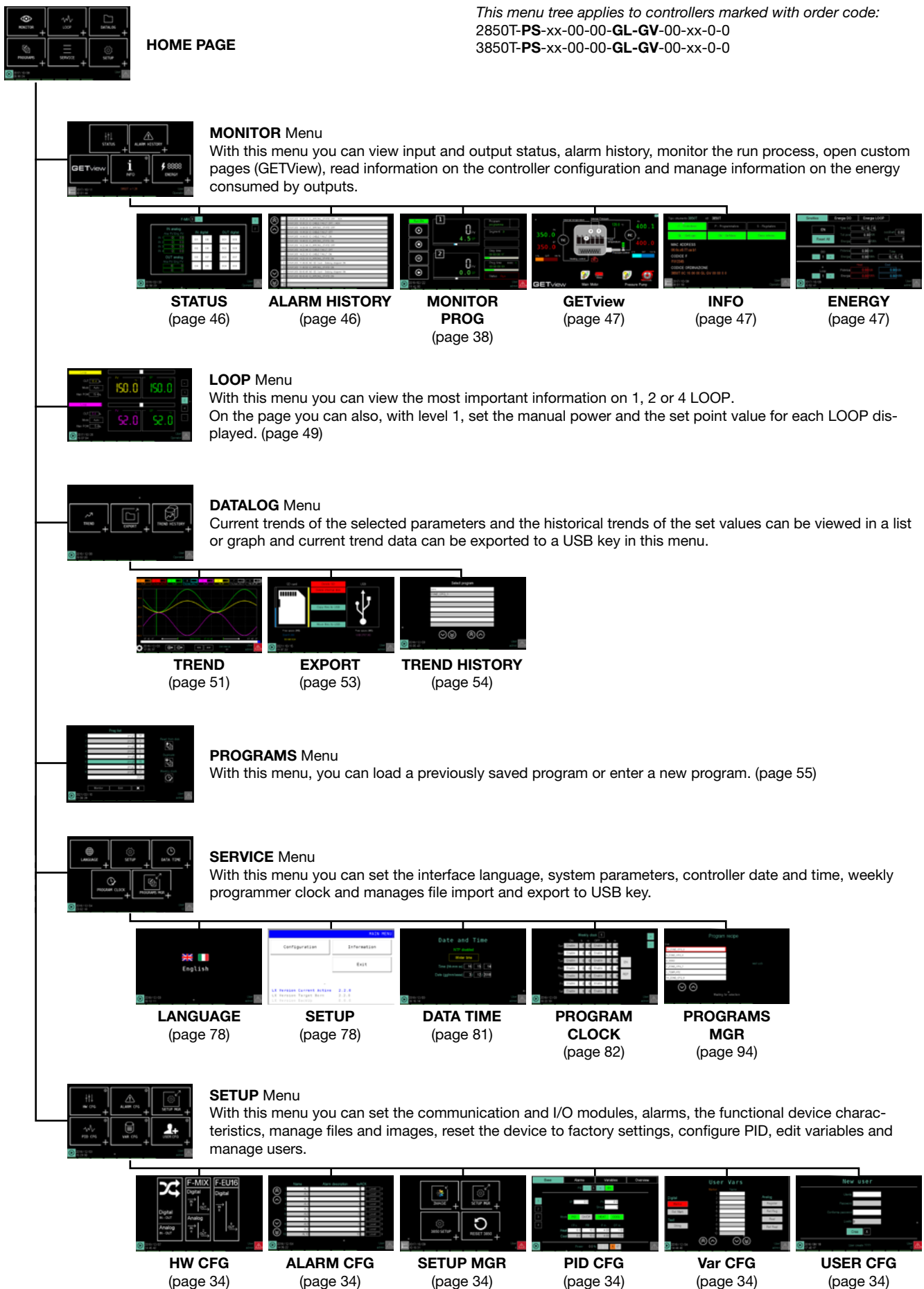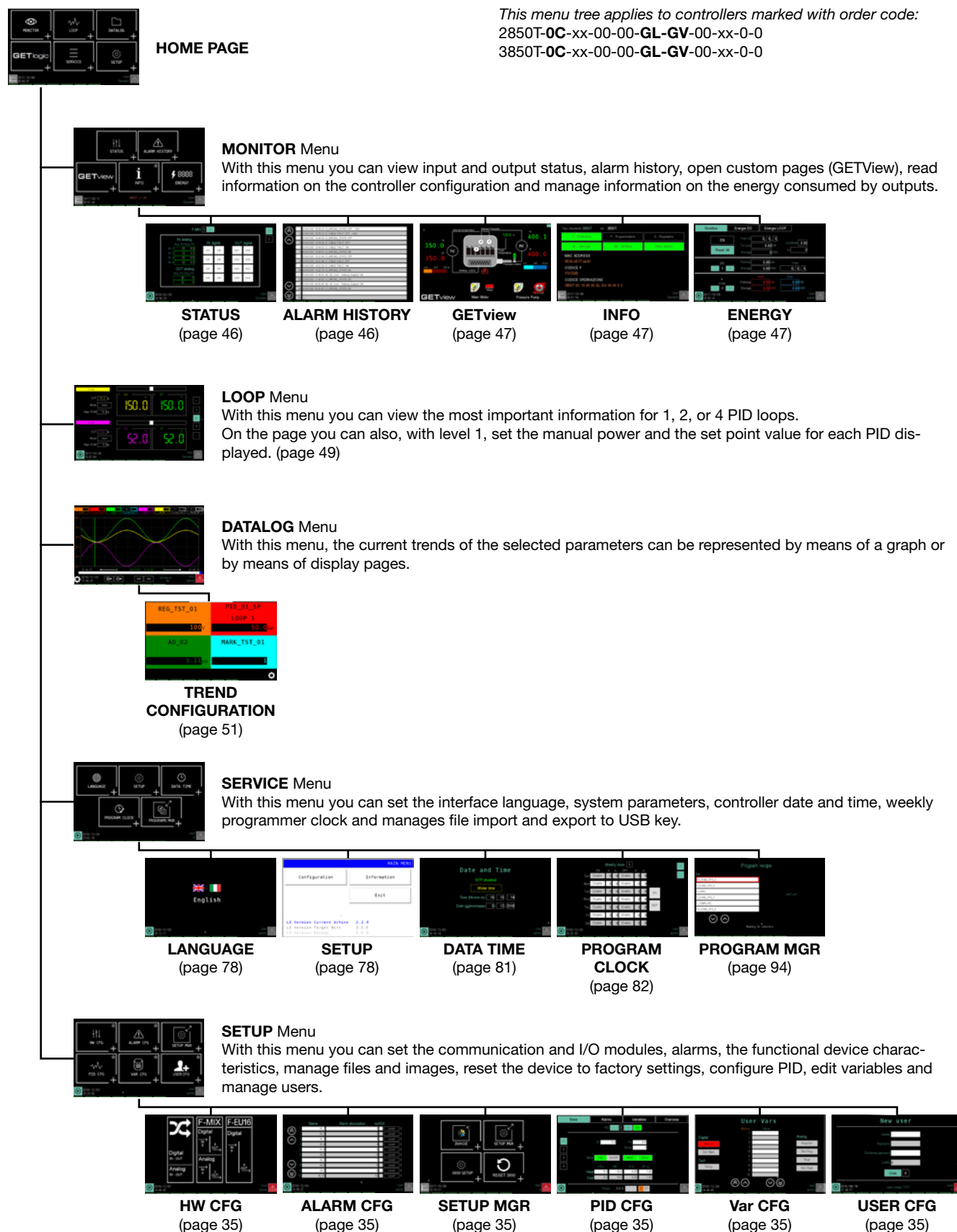
HOME PAGE

MONITOR Menu
With this menu you can view input and output status, alarm history, monitor the run process, open custom pages (GETView), read information on the controller configuration and manage information on the energy consumed by outputs.
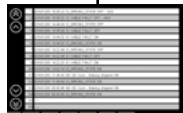
STATUS (page 46)	**ALARM HISTORY** (page 46)	**MONITOR PROG** (page 38)	**GETview** (page 47)	**INFO** (page 47)	**ENERGY** (page 47)

LOOP Menu
With this menu you can view the most important information on 1, 2 or 4 LOOP.
On the page you can also, with level 1, set the manual power and the set point value for each LOOP displayed. (page 49)

DATALOG Menu
Current trends of the selected parameters and the historical trends of the set values can be viewed in a list or graph and current trend data can be exported to a USB key in this menu.
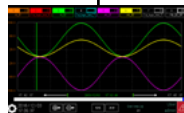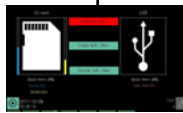
TREND (page 51)	**EXPORT** (page 53)	**TREND HISTORY** (page 54)

PROGRAMS Menu
With this menu, you can load a previously saved program or enter a new program. (page 55)

SERVICE Menu
With this menu you can set the interface language, system parameters, controller date and time, weekly programmer clock and manages file import and export to USB key.

LANGUAGE (page 78)	**SETUP** (page 78)	**DATA TIME** (page 81)	**PROGRAM CLOCK** (page 82)	**PROGRAMS MGR** (page 94)

SETUP Menu
With this menu you can set the communication and I/O modules, alarms, the functional device characteristics, manage files and images, reset the device to factory settings, configure PID, edit variables and manage users.

HW CFG (page 34)	**ALARM CFG** (page 34)	**SETUP MGR** (page 34)	**PID CFG** (page 34)	**Var CFG** (page 34)	**USER CFG** (page 34)

4.8.   Controller menu with GETLogic and GETview options

HOME PAGE

This menu tree applies to controllers marked with order code:
2850T-**0C**-xx-00-00-**GL-GV**-00-xx-0-0
3850T-**0C**-xx-00-00-**GL-GV**-00-xx-0-0

MONITOR Menu
With this menu you can view input and output status, alarm history, open custom pages (GETView), read information on the controller configuration and manage information on the energy consumed by outputs.

STATUS	**ALARM HISTORY**	**GETview**	**INFO**	**ENERGY**
(page 46)	(page 46)	(page 47)	(page 47)	(page 47)

LOOP Menu
With this menu you can view the most important information for 1, 2, or 4 PID loops.
On the page you can also, with level 1, set the manual power and the set point value for each PID displayed. (page 49)

DATALOG Menu
With this menu, the current trends of the selected parameters can be represented by means of a graph or by means of display pages.

TREND CONFIGURATION
(page 51)

SERVICE Menu
With this menu you can set the interface language, system parameters, controller date and time, weekly programmer clock and manages file import and export to USB key.

LANGUAGE	**SETUP**	**DATA TIME**	**PROGRAM CLOCK**	**PROGRAM MGR**
(page 78)	(page 78)	(page 81)	(page 82)	(page 94)

SETUP Menu
With this menu you can set the communication and I/O modules, alarms, the functional device characteristics, manage files and images, reset the device to factory settings, configure PID, edit variables and manage users.

HW CFG	**ALARM CFG**	**SETUP MGR**	**PID CFG**	**Var CFG**	**USER CFG**
(page 35)	(page 35)	(page 35)	(page 35)	(page 35)	(page 35)

4.9. Tool menu with GETLogic, GETview and recorder options

HOME PAGE

This menu tree applies to controllers marked with order code:
2850T-**0S**-xx-00-00-**GL-GV**-00-xx-0-0
3850T-**0S**-xx-00-00-**GL-GV**-00-xx-0-0

MONITOR Menu

With this menu you can view input and output status, alarm history, open custom pages (GETView), read information on the controller configuration and manage information on the energy consumed by outputs.

STATUS	**ALARM HISTORY**	**GETview**	**INFO**	**ENERGY**
(page 46)	(page 46)	(page 47)	(page 47)	(page 47)

DATALOG Menu

Current trends of the selected parameters and the historical trends of the set values can be viewed in a list or graph and current trend data can be exported to a USB key in this menu.

TREND	**EXPORT**	**TREND HISTORY**
(page 51)	(page 53)	(page 54)

SERVICE Menu

With this menu you can set the interface language, the system parameters, controller date and time and weekly programmer clock.

LANGUAGE	**SETUP**	**DATA TIME**	**PROGRAM CLOCK**
(page 78)	(page 78)	(page 81)	(page 82)

SETUP Menu

With this menu you can set the communication and I/O modules, alarms, the functional device characteristics, manage files and images, reset the device to factory settings, edit variables and manage users.

HW CFG	**ALARM CFG**	**SETUP MGR**	**Var CFG**	**USER CFG**
(page 36)	(page 36)	(page 36)	(page 36)	(page 36)

4.10. Controller menu with GETLogic, GETview and recorder options

HOME PAGE

This menu tree applies to controllers marked with order code:
2850T-**CS**-xx-00-00-**GL-GV**-00-xx-0-0
3850T-**CS**-xx-00-00-**GL-GV**-00-xx-0-0

MONITOR Menu
With this menu you can view input and output status, alarm history, open custom pages (GETView), read information on the controller configuration and manage information on the energy consumed by outputs.

STATUS	ALARM HISTORY	GETview	INFO	ENERGY
(page 46)	(page 46)	(page 47)	(page 47)	(page 47)

LOOP Menu
With this menu you can view the most important information on 1, 2 or 4 PID.
On the page you can also, with level 1, set the manual power and the set point value for each PID displayed. (page 49)

DATALOG Menu
Current trends of the selected parameters and the historical trends of the set values can be viewed in a list or graph and current trend data can be exported to a USB key in this menu.

TREND	EXPORT	TREND HISTORY
(page 51)	(page 53)	(page 54)

SERVICE Menu
With this menu you can set the interface languvage, the system parameters, controller date and time and weekly programmer clock.

LANGUAGE	SETUP	DATA TIME	PROGRAM CLOCK
(page 78)	(page 78)	(page 81)	(page 82)

SETUP Menu
With this menu you can set the communication and I/O modules, alarms, the functional device characteristics, manage files and images, reset the device to factory settings, configure PID, edit variables and manage users.

HW CFG	ALARM CFG	SETUP MGR	PID CFG	Var CFG	USER CFG
(page 37)	(page 37)	(page 37)	(page 37)	(page 37)	(page 37)

4.11. MONITOR menu

STATUS sub-menu (page 46)
Digital and analog input and output status

ALARM HISTORY sub-menu (page 46)
Alarm history stored by the controller.

MONITOR PROG sub-menu (page 46)
Opening the monitoring page and managing saved programs.

GETview sub-menu (page 47)
Creating and managing custom pages.

INFO sub-menu (page 47)
Controller configuration management.

ENERGY sub-menu (page 47)
Management of information on the energy consumed by outputs.

4.11.1. STATUS sub-menu

The STATUS submenu shows the status of the controller's inputs and outputs and has a page for the F-MIX module and one for the F-EU16 modules (if present).

You can use the keyboard keys ⬅ and ➡ to switch from one page to another or directly touch the page number displayed on the top right of the screen. The current page is highlighted by illuminating the page number box. The type of I/O module is displayed at the top, in the center of the page.

The page only displays inputs and outputs belonging to the module.The IO terminals show the name of each card.

The status of the digital inputs and outputs is indicated by their background color:

- white = OFF
- red = ON

The status of analog inputs and outputs is shown with their value at the current time, both the converter points and the engineering unit.

All values and status are displayed in the STATUS sub-menu are read-only.

4.11.2. ALARM HISTORY sub-menu

The ALARM HISTORY sub-menu displays the last 1000 alarm events recorded by the controller.
Alarms are displayed in reverse chronological order, meaning it starts from the most recent to continue with the older ones.
The list can be scrolled using the buttons on the left of the display:

⬆ and ⬇ move the list by 3 events;
⬆⬆ and ⬇⬇ move the list by 10 events;

The date and time the alarm triggered and type are displayed for each alarm event.
- ON = alarm becomes active
- OFF = the cause of the alarm disappears
- OFF-ACK = the alarm is acknowledged

4.11.3. MONITOR PROGR sub-menu
For information on the page opened from MONITOR PROGR, see paragraph "4.3. Monitor Program" on page 38.

4.11.4. GETview sub-menu
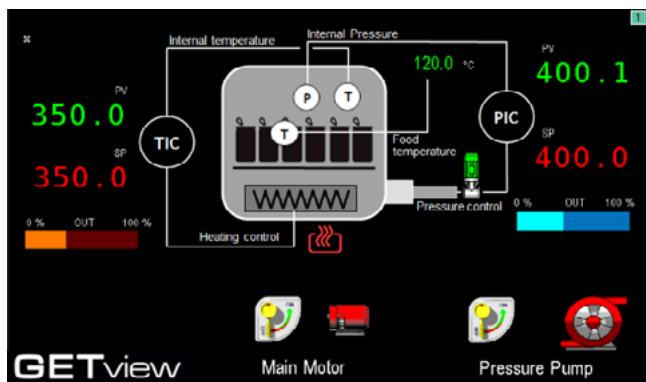
The GETview sub-menu lets you view, create and manage custom interfaces (an example of a custom page is illustrated).

This way you can display the most important information for a specific machine or process and simplify their management. The data and information used are those contained in the controller.

All Level 0 (User) and Level 1 (Service) users will be able to access the custom pages section provided that at least one page contains a graphic component. All Level 2 users (Administrator) will always be able to access the above section regardless of the number of graphic components on the first customised page.

To select the page to view, use keys [←] and [→]. The number of the displayed page appears at the top right.

All Level 0 (User) and Level 1 (Service) users will be able to view all and only those personalised pages that contain at least one graphic component.
Press the appropriate keys to directly open:
Press the specific keys to directly open:

[icon] the first customised page that contains at least one graphic component,
For all Level 0 (User) and Level 1 (Service) users, access is possible provided there is at least one page containing a graphic component

[icon] custom page 2 (3850T interface only).
If the variable is associated with a PID, the LOOP Name will be shown below the button (for 3850 only). This is a customizable parameter for each PID.
To create custom pages, see chapter "5. Custom pages" on page 107.

4.11.5. INFO sub-menu
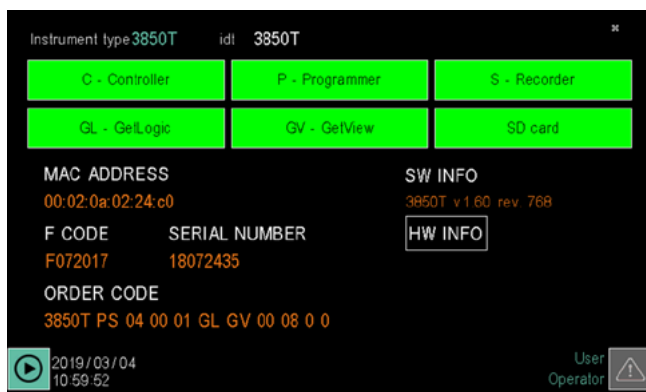
The INFO sub-menu contains all the information about the device:
- **Instrument type**: trade name.
- **Functions**: those available are highlighted in green.
- **MAC Address**.
- Serial Number
- **F Code**: Gefran warehouse code.
- **Order code**: full order code. For the interpretation of the smart code, see paragraphs "11.1. 2850T controller" on page 183 and "11.2. 3850T controller" on page 185.
- **SW INFO:** information about the firmware version
- **HW INFO:** this page displays the hardware configuration and the firmware versions of each card
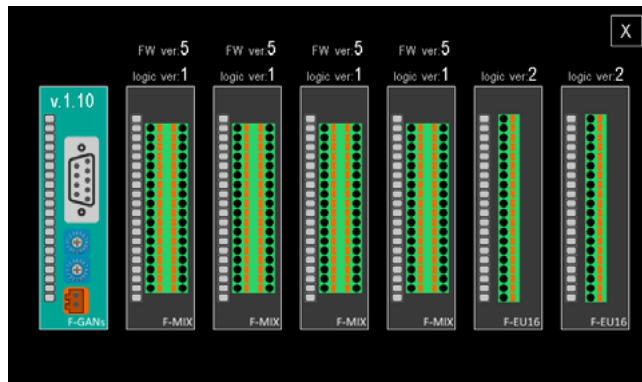
4.11.6. ENERGY sub-menu
The ENERGY sub-menu lets you view and quantify energy consumption by the machine or system managed by the controller.
The sub-menu is divided into 3 sections (synoptic, DO Energy, PID Energy). To move to a section, simply touch its label.

The **Synoptic** section summarises all electricity consumption.

The box at the top displays:
- the **total time** since the last reset (Time tot);
- the **real-time total power absorbed** (Tot pow);
- the **unit cost of electricity** (cost/kWh), which can be entered by touching the field and entering its value;
- the **total cost of electricity** consumed (tot) within the specified time period.

The box in the center displays, for each digital output:
- the **output number** (Digital output);
- the **load power** managed by the output (Power);

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- the **total output on time** (Time ON);
- the **electricity consumed** by the load (Energy).

To view data on the various outputs, use keys **-** and **+**.

For each PID, the lower box displays:
- the **loop number**;
- the **power used in heating** (Pow H);
- the **electricity consumed for heating** (Heat energy);
- the **power used in cooling** (Pow C);
- the **electricity consumed for cooling** (Cool energy);

To view data on the various PID, use keys **-** and **+**.
To reset the counts, touch the **Reset All** button.
The **EN** button may be used to enable or disable use of all counters

⚠️ **Warning!** The DO field shows information on each single digital output, while the PID field shows totals for all outputs used during the PID.
The two calculations are independent. If the energy consumption parameter of a DO (already used by the PID) is set, the total energy count will consider that of the DO twice.
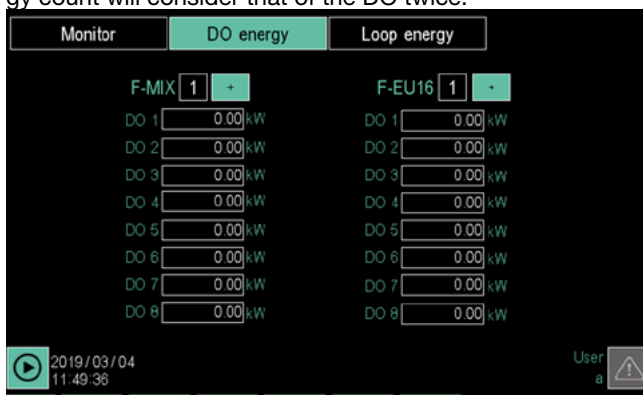
The DO energy section allows you to add the power of the load managed for each output.
To view the outputs of the various modules (F-MIX and R-EU16), use the **+** button.
To enter the power, touch the field next to the output number and enter its value.
The data will be used for Synoptic section views.
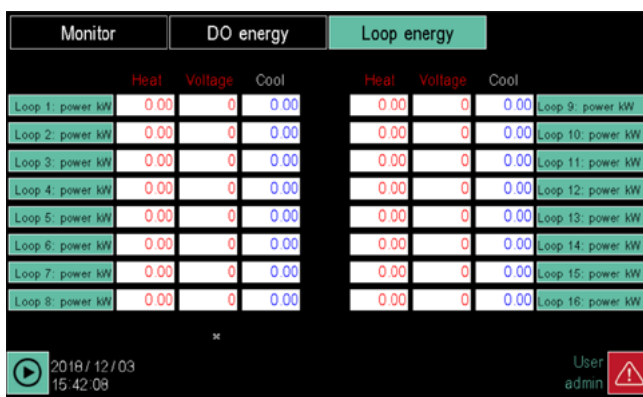
For each of the 16 PID, the PID energy section lets you add:
- PID heating power (**Heat**);
- the supply voltage (**Voltage**), which allows for a more precise calculation of power (power = current x voltage);
- PID cooling power (**Cool**);

To enter power and voltage, touch its field next to the PID number and enter its value.
The data will be used for Synoptic section Monitor.

NOTES
- If a cascade PID occupies PIDs n and n+1, the energy parameter setup will be set ONLY on PID n+1.
- Power may be counted in two ways for the hot PID (setting rated power or using CTs) and one way for the cold one (setting rated power).

ENERGY CALCULATION WITH CT

Energy is calculated on the basis of the current reading obtained from the TAs connected to the PID in question.
The voltage to be entered is the supply line RMS voltage. So if it is single-phase, set 230V, or if it is three-phase, set 400V (in Europe).
To associate CT input to the PID, refer to the configuration page of the HB alarms, paragraph "4.16.4.7. PID HB alarm configuration" on page 98

If the load is single-phase (there must be only one CT set for each PID), multiply the rms current value supplied by the TAs by the concatenated (line) voltage.
If it is three-phase (with 2 TAs set per PID), multiple the average of the two rms current values supplied by the 2 TAs by the set voltage, by the square root of three.
$P=V*(IrmsTA1+IrmsTA2)/2)*sqrt(3)$.

In both cases, the value thus obtained is multiplied by the percentage of power supplied by the PID in question and operates independently of the DO outputs.
IMPORTANT: in this assumption, the calculation is reliable only for actuators using zero crossing.

The active power calculated is in any case an approximation, in that we suppose:
- that the load is totally resistive (cosfi approximately one) and balanced.
- that the grid is symmetrical and supplies an effective value that remains constant over time.

4.12. LOOP Menu
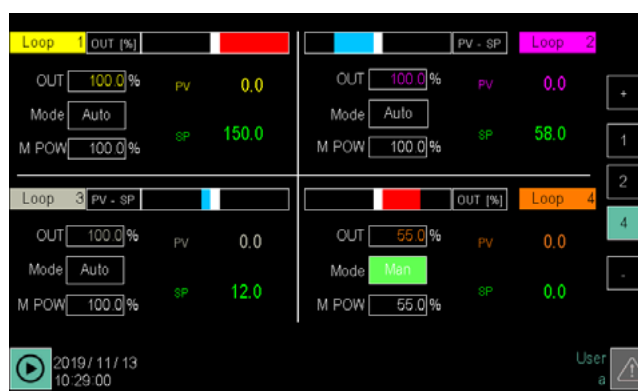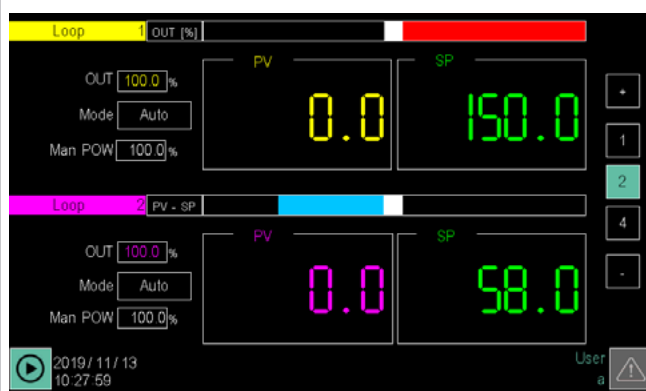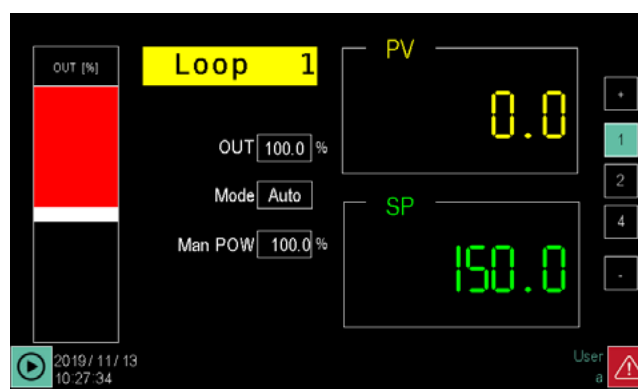
The LOOP menu lets you view 1, 2 (default view) or 4 LOOP on the same page.

To switch from one display to another, touch the page numbers on the right side of the display.

The LOOP to be displayed are selected with the keys and or with the + and - buttons.

With the double view, PID are displayed in set pairs (1-2 / 3-4 / 5-6 / 7-8 / 9-10 / 11-12 / 13-14, 15-16), with the quadruple view, the PID are displayed in set quartets (1-2-3-4 / 5-6-7-8 / 9-10-11-12 / 13-14-15-16).

The following is displayed for each PID:
- The name identifying the LOOP. This is the name that can be customized in the SETUP/PID CFG/ BASE1 page.
- the **LOOP identification number**. This is the number that appears in the LOOP list to identify the LOOPS.
- the **Process Value** (PV), that is, the value the process variable has at that time.
- The **Setpoint** (SP), meaning the set value that the controller must have the machine or system reach and/or maintain.
- The PV and SP **units of measure**.
- **Deviation bar graph**: indicates, in percentage, the difference between PV and SP. If PV is less than SP the bar is lit in blue to the left (or under) of the median point, if PV is greater than SP is lit in red to the right (or above) of the median point.Alternatively, the scroll bar may indicate the power % of loop output. To select one of the two views, touch the button above the bar (or next to it, in multiple page view).

- The **output value** (OUT), expressed in %. The value ranges from -100% (cooling at maximum power) to 100% (heating at maximum power).
- The controller **operating mode** (Mode), which can be automatic (Auto), where the output value is calculated by PID, or manual, where the output value can be set manually with the MAN POW parameter.
- For the valve actuator only, the position of the valve and its opening and closing commands are shown. If mode = MAN is selected, the opening and closing commands will be active

4.12.1. Editing parameters
You can edit some of the parameters displayed, without changing menu.
The type of parameters that can be edited depend on the selected password level. The table below shows which parameters can be edited by the user.

Parameter	User level 0	User level 1
Mode		•
Man POW	•	•
SP		•

4.13. DATALOG Menu
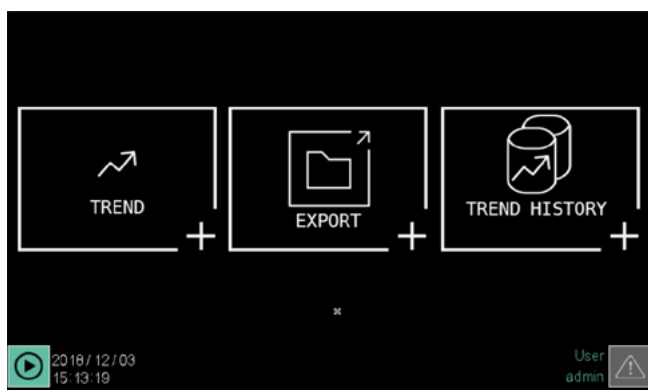
TREND sub-menu (page 51)
Representation of the trend of 24 variables chosen by the user by means of a time graph or display pages

EXPORT sub-menu (page 53)
Exporting recorded controller operating data to maintain a log.

TREND HISTORY sub-menu (page 54)
Graphic display of process variable time trend in previous processes.

4.13.1. The Datalog
The Datalog is the recording function of the values assumed by a series of user-selected variables. The frequency with which these values are read (sampling) is always determined by the user.

4.13.1.1. Archive Mode
The recorded data storage method depends on the instrument configuration:
- Model without SD Card option: data is stored directly on the internal disk.
- Model with SD Card option: the log data for batch reports and Data Logger are saved on SD Card and optionally on internal disk.

With the model without the SD Card option you can:
- Copy or move the log files from the internal disk to USB key.
- Copy or move the log files from the internal disk to your PC using the DataLog Utility application.
- Delete the log files from the internal disk.

With the model with the SD Card option you can:
- Copy or move the log files from SD card to a USB key.
- Copy or move the log files from the internal disk to USB key.
- Delete log files from SD Card.
- Delete the log files from the internal disk.
- Copy or move the log files from SD Card to your PC using the DataLog Utility application.
- Copy or move the log files from the internal disk to your PC using the DataLog Utility application.

4.13.1.2. File compression on the local disk
Log files stored in the local disk are automatically compressed to optimise occupied space. When moved from the local disk to another external media (USB, SD or PC), files are automatically decompressed, recovering their true size. The compression factor for the local disk is about 4:1 (a 1 MB file becomes about 250 kB).

4.13.1.3. Amount of savable sampled data
The amount of sampled data that can be stored depends on:
- capacity of the storage medium;
- number of variables sampled;
- sample frequency;
- saved graphic imagers;
The table shows an estimate of the number of samples and the overall sampling duration for the different instrument configurations.

4.13.1.4. Out of memory alarms
To avoid losing data when the memory is full, the instrument generates two types of alerts.

Warning Signal
Automatic alert in a pop-up window when the amount of free memory, on the internal disk or SD Card, is less than 10 MB. The pop-up is displayed automatically every 10 minutes as long as free memory is less than 10 MB. There is a button in the pop-up window to directly open the management page where you can delete the log files or move them to a USB key.

ESTIMATED NUMBER OF OBTAINABLE SAMPLES				Equivalent to		
Number of variables	Sampling interval	Available storage space (MB)	Number of samples	hours *	days *	months *
6	60 s	260 (local disk without GETview)	2,580,000	43,000	approx. 1790 c.	approx. 59 c.
6	60 s	200 (local disk with GETview) **	2,040,000	34,000	approx. 1,415 c.	approx. 47 c.
6	60 s	1000 (SD support)	10,200,000	170,000	approx. 7,080 c.	approx. 236 c.
15	30 s	260 (local disk without GETview)	1,320,000	11,000	approx. 455 c.	approx. 15 c.
15	30 s	200 (local disk with GETview) **	1,020,000	8,500	approx. 350 c.	approx. 11 c.
15	30 s	1000 (SD support)	5,040,000	42,000	approx. 1,750 c.	approx. 58 c.

*) The maximum sampling durations are approximate.
**) In the case of local disk with GETview, the space occupied by any graphic images must be taken into account. In the table calculations it was assumed that these images occupy about 10 MB, which are added to the space occupied by GETview.

Disk Full Alarm

Automatic alert with alarm (reported in the alarm list) when the amount of free memory on internal disk or SD card, is less than 5 MB.

All new DataLogger type recordings are disabled and Batch reports will not be activated.

If Batch Reports are in progress, these will end normally, but will not be restarted with the following RUN command.

Forced stop of recording

When the threshold of 3 MB is reached, active recordings are also interrupted, while batch execution continues without reporting.

4.13.2. TREND sub-menu
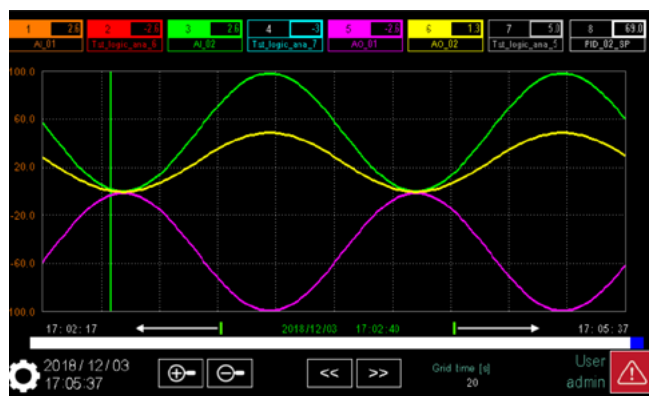
The TREND sub-menu shows, in graphic format, the time trend for variables selected by the user (max 8 simultaneously, 24 in total). Up to 5000 samples are stored for each record.

Use the 🔄 and 🔄 buttons to select the variable intervals to display in the page (1-8, 9-16 or 17-24).

A number of keys corresponding to the number of enabled variables are displayed at the top. Each key:
- enables and disables the graphic display relative to variable that it represents;
- displays the name of the monitored variable;
- if you press without interruption for at least one second the bottom of the scale of this curve appears (the choice of the bottom of the scale may also be made from the "Trend configuration" page)
- If the variable is associated with a PID, the LOOP Name will be shown below the button (for 3850 only). This is a customizable parameter for each PID.

The graph displays the time scale on the x axis and the scale of recorded values on the ordinate y axis.

There is a bar that represents the entire sampling time below the graph. The blue section indicates the sampling time which is displayed in the graph. The displayed start and end sampling times are shown below the x axis.

To scroll the entire sample back and forth, use the ⏮ and ⏭ keys and/or touch the bar.

If you press the 🔄 and 🔄 buttons on the 2850, you can scroll the track buttons.

4.13.2.1. Graph Scale

The scale of values (ordinate) is automatically determined by the controller, taking the values set in the trend configuration as extreme values set and dividing the interval by 5.

The time scale (abscissa) can be changed by the user with the ⊕ and ⊖ keys. The length (in seconds) of each of the 10 horizontal divisions of the grid is indicated below the **Grid time [s]** label.

4.13.2.2. Vertical cursor

We may use the vertical cursor to identify the exact value of the curve at a given instant in time. Date and time identified by the green scrolling vertical line. The cursor may be made to slide by touching the exact spot on the graph or by using the ⬅ and buttons. ➡.
The cursor is always present.

4.13.2.3. Trend configuration

To configure the trend touch the . icon and select the item "Graph Configuration" in the pop-up that appears on the page
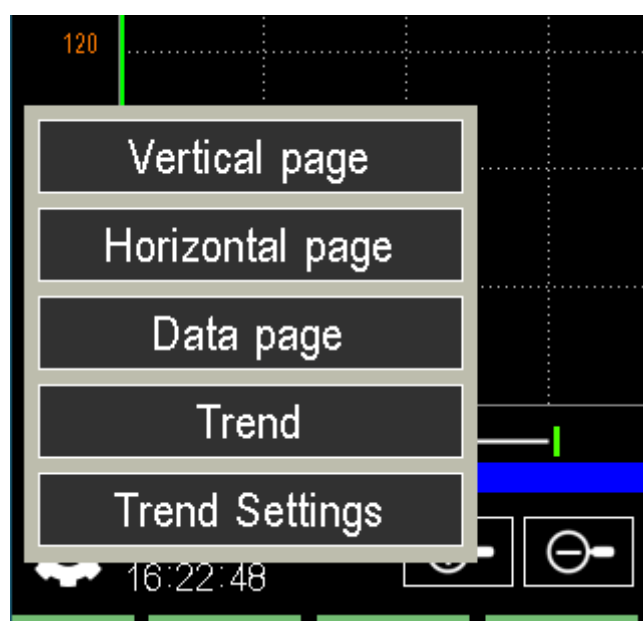
The next page will then be shown

Write access to the page is required to configure the trend and do the following:
1. Set the time, meaning the time interval with which the controller stores the process variables. The time varies from 1 to 60 seconds, in steps of 1 second. The sampling time is the same for all variables.
   To define the sampling time, touch the corresponding field and enter the desired value using the virtual keyboard that appears.

4. CONFIGURATION

2. Enter the variables to be monitored. You can enter analogue or digital values. The digital values will have a fixed scale on two levels. The total number of variables to be entered is 24. Use the ⊙ and ⊙ buttons to select the insertion intervals (1-8, 9-16 or 17-24). For more information on details of the variable selection see the application example "7.1. Multi kiln control" on page 121.
3. Turn on the display of the variable using the check box to the right of the variable name. To stop displaying, just clear the check box (no need to delete the variable from the list of variables to be controlled).
4. Enter the minimum and maximum values of the scale to be used for the variable. The setting is available only for analogue values.
5. Repeat steps 2 to 4 for each variable that you want to enable or disable.
6. Select the reference scale for the entire lot of variables.
7. The Real and RetReal variables cannot be sampled.
8. Reset the data on each individual curve with the Clear function.

To return to the graph page, just touch the ⚙ Icon and select the item "Graph" in the pop-up that appears on the page.

4.13.2.4. Parameter display pages

Parameter display pages "4.13. DATALOG Menu", it is possible to represent the parameters selected in the graph configuration page within three types of display pages.

DISPLAY BY VERTICAL BAR GRAPH

On this page, the current value of the selected parameter is displayed both in numerical form, with the relative unit of measure, and by means of a Vertical bar graph.
In addition to the numerical value, the following are also shown:
• the name of the parameter and, if the latter is the Process Variable of one of the PIDs, also the name of the associated LOOP
• the maximum and minimum values set on the configuration page with the relative units of measurement

DISPLAY BY HORIZONTAL BAR GRAPH
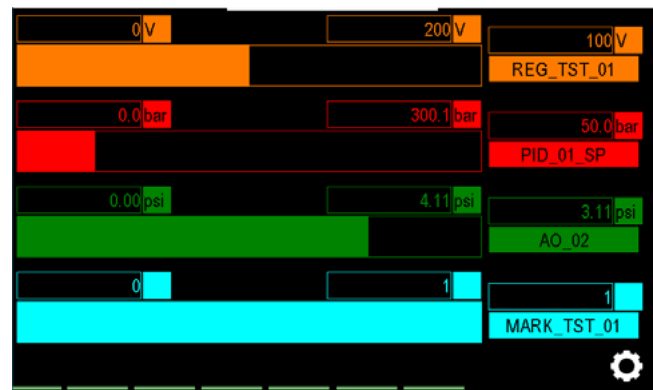
On this page, the current value of the selected parameter is displayed both in numerical form, with the relative unit of measure, and by means of a horizontal bar graph.
In addition to the numerical value, the following are also shown:
• name of the parameter
• the maximum and minimum values set on the configuration page with the relative units of mea surement

DATA DISPLAY
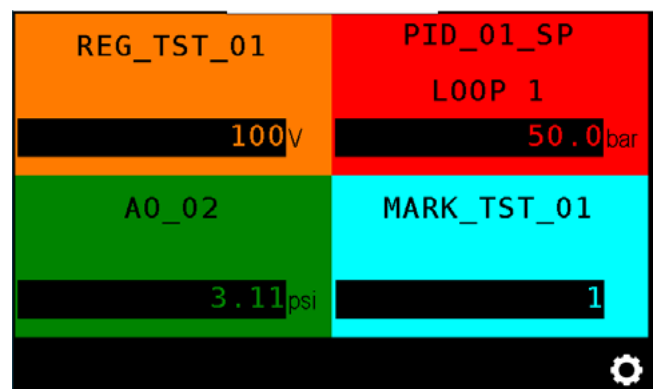
On this page, the current value of the selected parameter is displayed in numerical form, with the relative unit of measure.
In addition to the numerical value, the name of the parameter is also shown and, if the latter is the Process Variable of one of the PIDs, also the name of the associated LOOP
To move within the various pages, just touch the ⚙ icon and select the corresponding item in the pop-up that appears.

4.13.3. EXPORT sub-menu
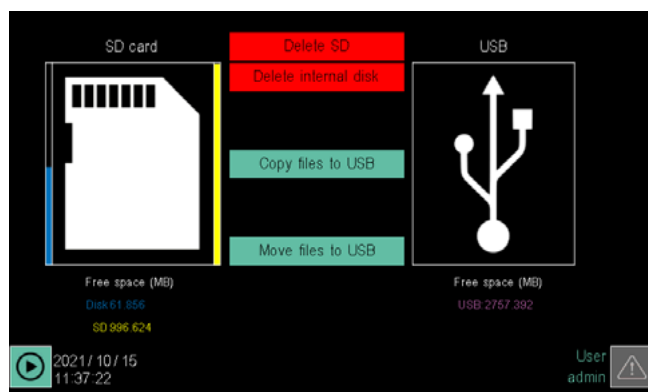
The EXPORT sub-menu allows you to maintain an archive of the processes completed through the following steps:

- Erase all records in internal memory or in the SD card by touching the appropriate button.
- Copy the recording files, or the alarm log file, to a USB key by touching the **Copy files to USB** button.
- Move (copy + delete) all recording files on a USB key by touching the **Move all files** key.

You must have privileges to copy, move and delete files, SERVICE and ADMIN levels have them by default.
When an operation is performed, the state of progress is displayed by a progressive horizontal bar. At the end of the operation, the **Operation completed** message appears.

 Caution! Due to the time required to save to USB (Program reports, Alarm log, Audit Trail if 21-CFR on), we recommend you save to USB while record signal sampling is not running.
The likelihood that saving files to USB will interrupt a recording in progress for a short time is remote enough for normal device use. This may only happen by setting the number of signal samples close to the maximum possible and at a high frequency (below the second).

Using the "Erase SD" and "Erase internal disk" keys, all the Report files on the respective memory media are deleted, including the folders with the names of the programs that contain them.
On the other hand, moving the Report files to USB (or to an FTP server via the integrated client) the moved Report files are deleted on the device but the folders with the program names remain (even if empty).

A USB key must be inserted in the controller before you copy or move files. If the key is missing or is not properly inserted, **Wait USB** appears under the USB bus symbol, to the right.

Note
If an SD card is used, it may be used as the sole filing medium or as a copy of the internal disk. In the first case, moving and deleting will take place only on the SD, while in the second case, the data will be deleted from both the internal disk and the SD card.

Free memory on the internal disk is shown under the Disk or SD box . The percentage of occupied memory compared to total memory is displayed graphically by a vertical bar to the left of the box.
Free USB key space is indicated under the USB box.

Version 1.0													
Name	CFG_ZONE_1		Idt	11									
Step num.	Step name	MINUTES	SECONDS	REPETITIONS	SP1: AI_01_PT100_1	GRAD 1	HBBL 1	HBBh 1	ALl 1	ALh 1		RICETTA PROGRAMMA	
1	uno	1	0	0	100	0	0	0	0	0			
2													
Sample	Date	Time	AI_01_PT1	PID_01_SP		CAMPIONI							
Sample group			0	0									
Sample unit measure			°C	°C									
1	24/08/2016	09.23.17	73,9	15									
2	24/08/2016	09.23.18	80,7	15									
3	24/08/2016	09.23.19	86,7	15									
4	24/08/2016	09.23.20	91,9	15									
5	24/08/2016	09.23.21	96,3	15									
6	24/08/2016	09.23.22	99,8	15									
7	24/08/2016	09.23.23	102,7	15									
8	24/08/2016	09.23.24	104,8	15									
9	24/08/2016	09.23.25	106,2	15									
10	24/08/2016	09.23.26	107	15									
11	24/08/2016	09.23.27	107,2	15									
12	24/08/2016	09.23.28	106,9	15									
2634	24/08/2016	10.07.10	151	150									
2635	24/08/2016	10.07.11	151	150									
2636	24/08/2016	10.07.12	150,9	150									
End of sample						CAMPIONI							
	Date	Time	Event										
1	24/08/2016	09.23.16	Program_Run										
2	24/08/2016	10.07.12	power_Of	EVENTI									
3	24/08/2016	10.07.18	power_On										
4	24/08/2016	10.07.19	Program_Ready										
End of archive													

Example of Datalog reports imported into Excel spreadsheet

4.13.3.1. File format and data structure

The export file is a text file in CSV format (list of values separated by ";"), which can be imported and read in an Excel file.

The picture below shows how a generic file imported into an Excel worksheet can appear.
The following are identified in the example worksheet:
- The instrument version (*Version 1.0*).
- The name of the program (*Name*) and operator ID (Idt).
- The segment name (*Step name*), its duration, any repetitions, applied program recipe, etc.
- The type of parameters tat are recorded in this example: sequential sample number (*Sample*), date (*Date*), time (*Time*), process value (*AI_01_PT100_1*) and setpoint (*PID_01_SP*). Other samples could record a higher number of parameters.
- The list of individual samplings, each of which is identified by date and time and shows the process temperature (*PV*) and that of the setpoint (*SP*).
- The list of events (*Program_Run* etc.) with date and time when they occurred.

Files can be displayed in graph format as well as arranged and display format adjusted using the DataLog Utility application, distributed for free on the Gefran website.

4.13.4. TREND HISTORY sub-menu

The TREND HISTORY sub-menu allows you to select and review, in graphic format, the time trend for process variables selected by the user (max 8) relative to a completed work cycle.
The various lists can be scrolled using the navigation buttons:

⊙ and ⊙ move the list by 3 variables;

⊛ and ⊛ move the list by 10 variables;

Select the work directory by touching its name.
The list of records contained in that directory appears.
If the device has an SD card, the directories and files will be those present on the card; if it is not inserted, the backup files saved on the internal disk will be shown if the option "Save to internal disk and SD card" (see 4.15.3.1.) was enabled at the time of registration.
If the device does not have an SD card, the files available will be those on the disk.

The following is indicated for each record:
- the identification number (**Number**);
- end recording date and time (**Date / Time**);
- name attributed to the record (**Name**).

To select a record, touch its line:
To return to the directory list, touch the **UP** button.

Selecting a record will open the graphic display screen.
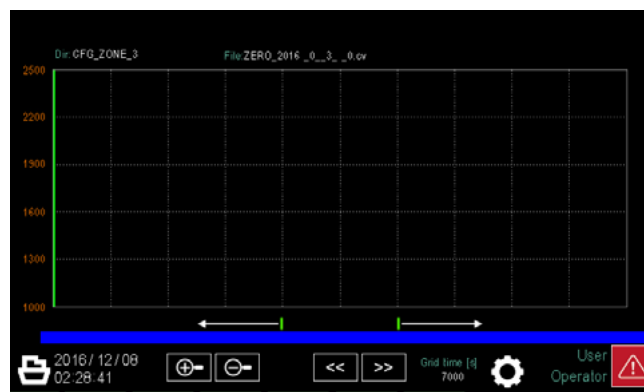
The commands and information available are the same as the TREND sub-menu, with the following exceptions:
- the name of the directory and file data are displayed above the graph;
- the ⊟ button returns to the record list page;
- the ⚙ button opens the window that allows you to select the graphic curves. You can view from 1 to 8 variables out of the 50 available (or 25 in the case of 2850) in one single recording. The selection occurs by choosing the variable in each line and the setting of the relative scaling.

Touch the T**rend log** button to return to the graph window.

4.14. PROGRAMS Menu

Prog List sub-menu (page 55)
Selecting a program to run, edit or delete.

Program Configuration sub-menu (page 57)
Full Program configuration.

Read from disk sub-menu (page 76)
Reading a program stored on the controller.

New prog sub-menu (page 76)
Creating a new program.

4.14.1. What is a Program

A program consists of 3 macro functions to manage a production batch in its entirety.
The 3 macro functions are:
1. Setpoint profile generator.
2. Control logic (GETLogic).
3. Batch reports.

Each program can generate up to 4 synchronous profiles, where synchronous means that the 4 segments will start and finish at the same time. A setpoint profile is a set of segments, each characterised by several parameters, which allow you to adjust the value of a process or a device as a function of elapsed time, of specific conditions and reference values stored in the controller or that are supplied from the outside.

A program may consist of a maximum of 50 segments. In its simplest form, a segment consists of a step, or a variation in the time of the set point. In its most basic form, a segment consists of one step. It is possible to create profiles made of segments with a double step, which are shown in the graphics as two separate lines. In this case, we have:
- a ramp, meaning a variation in a more or less long time of the setpoint value;
- an optional permanence, meaning a period of time in which the process value, after having equalled the setpoint value, is kept constant.
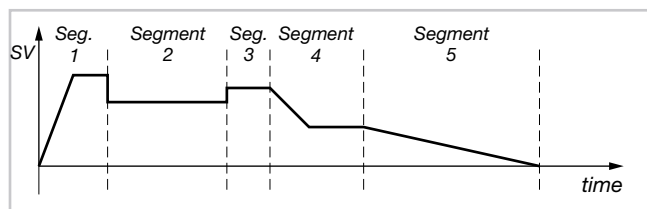
The controller can store up to 200 (model 2850T) or 250 (model 3850T) programs.
Each program is defined by the name that is assigned to it. The program can be controlled using the display, buttons, digital inputs from events (output of GETlogic functions), or commands from the custom pages. For a detailed description of the commands, refer to "13.1.4. SP Programmer" on page 190

4.14.2. Loading and selecting the program

This tool provides up to 8 slots (4 for the 2850T), where you can load in memory, edit, and execute programs. The default is only 1 visible slot. To change this setting, refer to "4.16.3.1. 3850\2850 SETUP" on page 92. The position in which the program is loaded serves as reference for all the related commands. For example, the program in position 3 can be started using the START_3 command. For more information on the commands, refer to "13.1.4. SP Programmer" on page 190
For each of the 8 available slots, in addition to the name, there is an additional field showing the identification number of the program loaded in the slot.
It corresponds to the number to be used in function blocks for remote management of programs.
This is a touch-sensitive field with the same functions as the name field.
To select a program just touch its name in the list on the display. The background becomes green.
The selected program is the one on which all subsequent operations will be carried out (editing, closing, etc.).
If an asterisk appears next to the program name, the original program has been modified without saving the changes.
If the user is level 2, the screen changes and additional buttons appear. Button visibility may be conditioned by the appropriate parameters in the SETUP\SETUP MGR\3850 SETUP page.

The buttons that appear are to:

Monitor	view the Monitor Program page or Monitor Recorder (see page 38);
Edit	access the selected program configuration pages;

close the selected program and delete it from the list;

read a program from the disk;

create or duplicate a program.

4.14.2.1. Loading a program\recording via Modbus command

Specific Modbus commands can be used to load a program\recording to memory, in a pre-established position among those available, as described below:

Variable	Modbus address	Description	Type
LOAD_CMD	9500	On the leading edge of this signal, the loading process is triggered.	BOOL
LOAD_CODE	9501	program/recording code. The code is unique and is shown next to the name of the line in question	UINT
LOAD_POSITION	9502	Location of program/recording to be loaded	UINT
LOAD_STS	9503	10: operation completed successfully 1: operation in progress -1: Unable to load due to program code/recording not found -2: Unable to load due to incorrect loading position -3: Unable to load due to running program/recording -4: Unable to load due to program/recording already found in list	INT

4.14.2.2. Downloading a program\recording via Modbus command

Specific Modbus commands can be used to download a program\recording from memory as described below

Variable	Modbus address	Description	Type
UNLOAD_CMD	9504	On the leading edge of this signal, the downloading process is triggered	BOOL
LOAD_POSITION	9502	Location of the program/recording to be downloaded	UINT
UNLOAD_STS	9505	10: operation completed successfully 1: operation in progress -2: Unable to download due to incorrect position -3: Unable to download due to running program/recording -4: Unable to load due to program/recording already found in list	INT

4.14.3. Configuring the program

Configuring a program consists in defining all the parameters, functions, times, interactions with other programs and commands that characterise it and make it suitable for performing the task for which it is designed.

To configure an existing program, just select it from the PROGRAMS menu list, and then touch the button
[Edit] to access the configuration pages.

The configuration procedure is developed through 4 sections (Base, Segments, GETlogic, Reports), each consisting of one or more configuration pages. Each page contains the name of the program.
If any changes have been made, the **Save** and **Cancel** buttons appear on the pages in order to save the changes or cancel them. Touching these buttons also closes the configuration procedure.

4.14.3.1. Base program configuration

This is the **page (1)** that appears when activating the program configuration procedure.
To navigate to other pages in the Base section, just touch the corresponding number or select the page from the drop-down menu that appears by touching the "Base" label or by using keyboard keys [←] and [→].

BASE - page 1		
Parameter	**Description**	**Possible values**
Program name	Program name. Touching the field opens a pop-up window with which you can select another program.	Alphanumeric string, max. 16 characters long. The name must be unique (duplicates are not allowed). Characters allowed a ... z, A ... Z, 0 ... 9, _.
Number	Absolute program identification number	Automatic value.
Description	Extended program description. It is used to identify the program running on different pages.	Alphanumeric text. The maximum length of the text is 23 (model 2850T) or 30 (model 3850T) characters.
Time unit	It is the time base shared by <u>all</u> program segments. The active base is highlighted in green. To change, touch the time base you want to use.	**m : s** = Minutes : Seconds **h : m** = Hours : Minutes **d : h** = Days : Hours
N° repetitions	Number of automatic program repetitions before it stops. 0 means the program runs one time and then stops; 1 means the program is run twice and then stops, and so on. A program can be run automatically up to 10,000 times.	**0...9999**
Start Mode	Select the reference value at program start (SP = PV or SP can be set).	**Start from SP** **Start from PV**
Stop mode	Operating mode at the end of the program in END status.	**DO off**: **Last step** **Reset**
Ready mode	Behaviour of outputs when the program switches from any state to READY. This case does not include simply loading a program in memory. This behavior is not persistent, and so all parameters will be freely controllable following transition to READY status	**Unchanged Out** **DO off** **Out = PV** **Unchanged Out, DO off** **Out = PV, DO off, PID disabled**
Start state	Status when the controller is switched on. The Run, Hold, and End modes are only active if the program was running (Run or Hold) when turned off, otherwise the program is always brought to the Ready state.	**Ready** **Run** **Hold** **End**

NOTE 1 : Enable the PIDs associated with a profile when the profile starts, using the number in the PID column in the programmer's BASE2 page as reference for association.
NOTE 2 : If the PID operates a valve, it will not be possible to disable it at the end of the programme
NOTE 3 : Before it can start again, the PID must operate empty to reset the integral
NOTE 4 : In the following table, DO off means that the program-controlled outputs are reset

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Program 5 may be assigned different digital inputs with which to manage running when the program is loaded in memory. The command will be implemented on the rising side of the corresponding input signal. È possibile associare più comandi ad una solo ingresso digitale nei casi di DI START/PAUSE oppure START/END. In questo modo il comando di START verrà richiamato sul fronte di salita del segnale e il comando di PAUSE (o END) sul fronte di discesa dello stesso. Per comandi e stato dei programmi si rimanda al capitolo "**4.3. Monitor Program**" on page 38 and "**4.4. Management of program running**" on page 39

BASE - page 1		
Parameter	**Description**	**Possible values**
DI Start	Variable that will generate the START command	
DI Pause	Variable that will generate the PAUSE command	
DI End	Variable that will generate the END command	All digital inputs
DI Reset	Variable that will generate the RESET command	
DI Skip	Variable that will generate the SKIP command	

If the 2850T-3850T does not have the "Programmer" option, but only the "Recorder" option (combinations "0S" and "CS"In the order code), the commands:
- DI Start
- DI Pause
- DI Reset

will appear in the Report section.

BASE - output status			
Mode or status	**Parameter**	**OUT**	**Controlled digital outputs**
Start Mode	Start from SP	Sp Value	
	Start from PV	PV Value	
Stop mode	DO OFF, Out=0	0	off
	Last step	Last SP	Last value
	Reset	it goes in a ready state	it goes in a ready state
Ready mode	Constant out	Last value	Last value
	DO OFF, Out=0	0	off
	Out = PV	PV	Last value
	Constant out, DO off	Last value	off
	Out = PV, DO off, PID disabled	PV	off
Start Mode	Run	Initial value of the last run segment	Initial value of the last run segment
	Hold	Initial value of the last run segment	Initial value of the last run segment
	End	Final last value segment	Final last value segment
	Ready	Constant	Constant

The *BASE table - page 1* lists the page parameters, their meaning, and the values they can take.

The *BASE table - output status* shows how the outputs behave in the various modes.

Program Base configuration **page (2)** lets you configure, for the 4 available profiles, the variables where the generated values are written.

The parameters to be configured are:
- **OUT**: program setpoint variable.
- **PV**: variable used to control the HBB alarm and band alarms.
- **PID**: PID identification number. The number appears on

the Monitor program page as the index of the displayed information.The PIDs controlled are exclusive in terms of programmes in execution, so it will not be possible to start programmes with resources already in use. To free the resource, enter the value 0 in this field.
The number of rows filled out determines the number of synchronised profiles enabled.
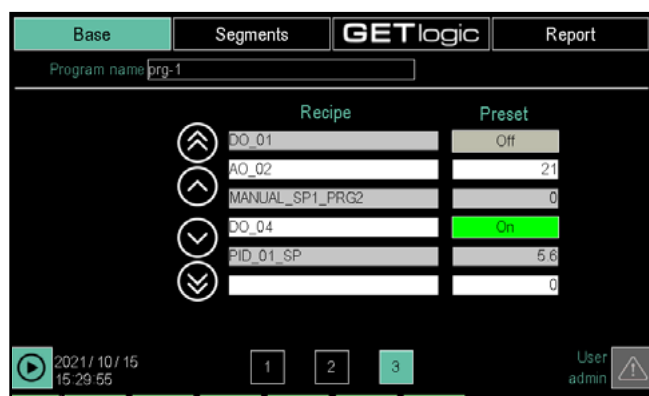To define a variable for OUT or PV touch the line and select the variable from the pop-up list that opens. For details on the pop-up window, see the description on page 119.

Program Base configuration **page (3)** allows you to add variables to the recipe and determine their initial value when the program is started.
Each time the program is started, each "Recipe" variable is simply reinitialised to the value configured on this page or by the "GF_eXpress" program.
These variables can be used, for example, in GETlogic, to initialise counters or default values, as user variables in the program, or in the customisable GETview pages.
Up to 20 variables of the Marker, Register and Real retentive and non-retentive types may be included in the program recipe, in addition to the set-points of the PID controls.

To define a variable, touch the line and select the variable from the pop-up list that opens. For details on the pop-up window, see the description on page 119.

Questa pagina è fruibile anche nel caso non sia presente la funzione di Programmatore. In tal caso l'accesso avviene dalla voce "Report" della registrazione, in quanto la parte "Base" non è presente.

4.14.3.2.   Configuring the Program Segments

The **Segments** page let you configure each segment of the program.

Each program can handle up to 4 synchronous profiles, i.e. profiles that use the same time base for segment change. Segments can belong to groups of contiguous segments that can be repeated.

Touch the icon [icon] to open a pop-up window that allows you to:
- Create a new segment before or after the selected segment (highlighted in green).
- Configure the status of input and output events while running the segment.
- Configuring segment profiles.
- Deleting the segment.

To create a new segment touch **New before** or **New after** depending on whether you want the new segment to appear before or after the selected segment. When creating the first segment, the choice is indifferent.

A blank line appears in the window for the new segment. Touch the individual fields to:
• Give a descriptive name to the segment. The name can be an alphanumeric text up to 16 characters long.
• Set:
  - the duration of the step, in the case of a single step (default)
  - the duration of the ramp phase, in the case of a double step ("**m : sec**" for minutes : seconds, "**h : m**" for hours : minutes or "**d : h**" for days : hours)
• According to the status of the "SP\Gradient" button (see following image)

4. CONFIGURATION
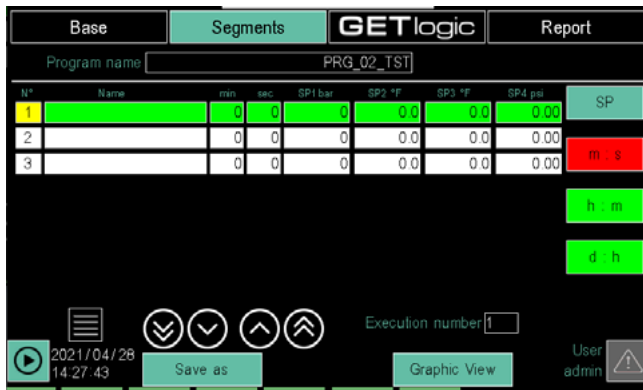
attribute:

- a value to **SP 1**, the setpoint of the 1st synchronous profile. or to **Gradient 1**, gradient of the 1st synchronous profile
- a value to **SP 2**, the setpoint of the 2nd synchronous profile. or to **Gradient 2**, gradient of the 2nd synchronous profile, if any.
- a value to **SP 3**, the setpoint of the 3rd synchronous profile. or to **Gradient 3**, gradient of the 3rd synchronous profile, if any.
- a value to **SP 4**, the setpoint of the 4th synchronous profile. or to **Gradient 4**, gradient of the 4th synchronous profile, if any.

The step number is generated automatically.

Touch **IO step** in the pop-up menu to open Input Event Configuration Window 1 that enables the segment to run. The list corresponds to the corresponding variables set in the Base section.

For each variable you can set:
- **-** : ignore the variable value.
- **ON**: only run the segment if the variable is ON.
- **OFF**: only run the segment if the variable is OFF.

To change the reference value, touch the field next to the variable name repeatedly until the desired value appears. If the start conditions are not met, the program remains in standby (WAIT CONDITION).
Refer to the WAIT_*n* and WAIT_DISABLE_*n* variables

You can switch from one segment to another using the + and - buttons above and below the segment number to the left of the page. You can also jump directly to a particular segment by touching its number and entering, in the virtual keyboard that appears, the desired segment number.
Touching button **2** at the bottom of the page, the output event configuration window 2 opens.
The list corresponds to the corresponding variables set in the Base section.
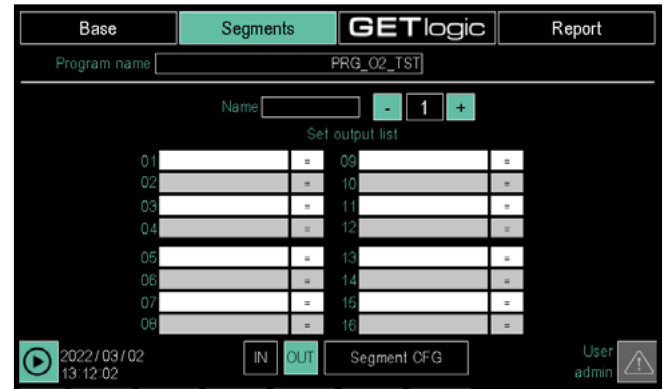
For each variable you can set:
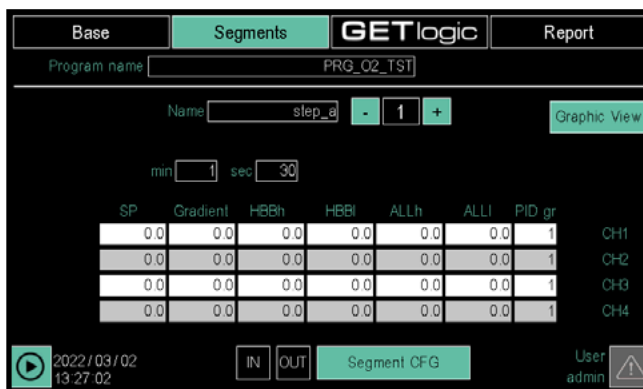- **=** : keep the original variable value.
- **ON**: assign value ON to the variable.
- **OFF**: assign value OFF to the variable.

To change the reference value, touch the field next to the variable name repeatedly until the desired value appears.

Touch the **CFG step** button in the pop-up menu to open the profile configuration window of the individual segments.
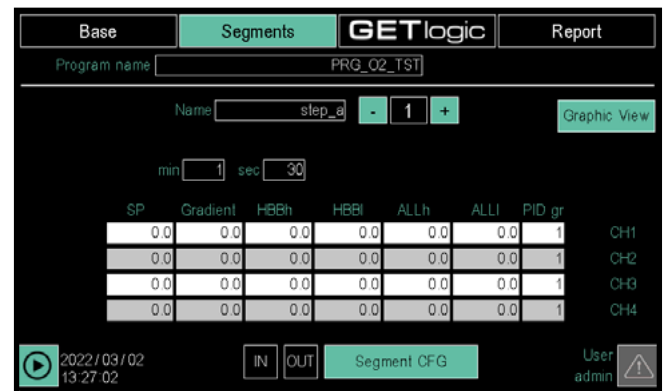
CH1, CH2, CH3 and CH4 correspond to synchronous profiles 1, 2, 3 and 4 respectively (the number of synchronous profiles depends on the settings in Base section page 2).

As a segment run time, you can set a time (unique value valid for all synchronous profiles), a gradient (value that may be different for each synchronous profile), or both.
There are two times (ramp and retention) in the case of a program with a double step, as shown in the figure ABOVE (add number)
The configuration of the single profile can therefore be:
- Time = 0 and Grad ≠ 0: the SP setpoint for the profile is

generated following the gradient value set.
- Time ≠ 0 and Grad = 0: the SP setpoint for the profile is generated following the set time.
- Time ≠ 0 and Grad ≠ 0: the SP setpoint for the profile is generated based on the gradient but also takes into account the set time, as shown below.

Segment behaviour with Time ≠ 0 and Grad ≠ 0

Case 1 - Segment time = Grad.
The set gradient reaches the segment SP setpoint in the set time. The segment change occurs at the end of the set time.
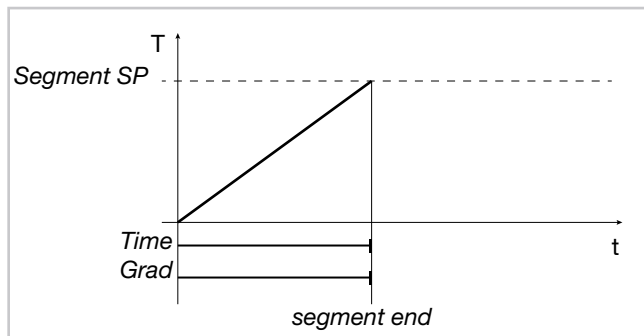
Case 2 - Segment time > Grad.
The set gradient reaches the segment SP setpoint before the set time. The setpoint is maintained and the segment change occurs at the end of the set time.
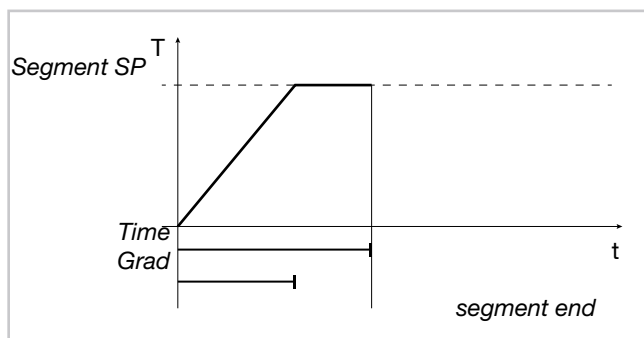
Case 3 - Segment time < Grad.
The set gradient reaches the segment SP setpoint after the set time. The segment change occurs when the setpoint is reached.
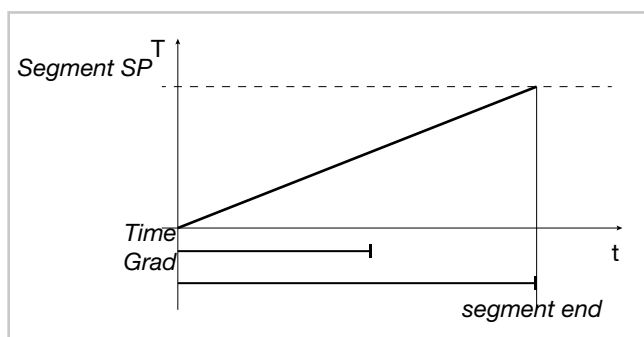
Warning! In order for the process PV to faithfully follow the SP generated by the gradient or the set time, the heating or cooling actuators should be sufficiently powerful.

Set the segment **time** , touching the fields, and using the virtual keyboard to enter the values. The units of measure are the same as those set in the Base section.

Warning! If you have configured input events to enable segments to be run, the concerned variables must have the required value. Otherwise the segments will not run and the controller remains in standby (WAIT CONDITION).

For each segment, set:
- **SP**: final setpoint value in the segment.
- **Grad**: gradient, that is, the "speed" at which the SP setpoint is reached. This figure is indicated in seconds, minutes, or hours depending on whether the time measurement unit is, respectively, m:s, h:m or d:h (always use the lower indicated pair unit of measurement). The increase or decrease ramp is linear. Starting from the process value (PV) at the start of the segment, the controller increments or decreases the setpoint value linearly so that, at the end of the set time, the setpoint corresponds to the final SP value.
- **HBBh**: High range value for HBB alarm
- **HBBl**: Low range value for HBB alarm
- **ALLh**: Generic high temperature alarm value
- **ALLl**: Generic low temperature alarm value
- **Group**: PID group used for the segment. Each individual segment may be characterized by different PID control parameter groups (the reference PID number is the one set as the BASE - page 2) to appropriately control all stages in the process.

HBB and ALL are two relative signals following program OUTPUT. They differ in that HBB stops the cycle with the program running, while ALL
is a generic indication linked with the program.
Linked with these alarm conditions, the following system variables are available::
-CHn_ALL_H_Pp CHn_ALL_L_Pp, an indicator that the upper and lower threshold has been exceeded for 4 channels and 8 programs.
- HBB_n , indicator that the HBB threshold has been exceeded, one per program.
-WAIT_HBB_DIS_n command for ignoring HBB condition and continuing with profile generation. Refer to the section on variables 13.1. System variables for details.

4.14.3.3. Graphic view
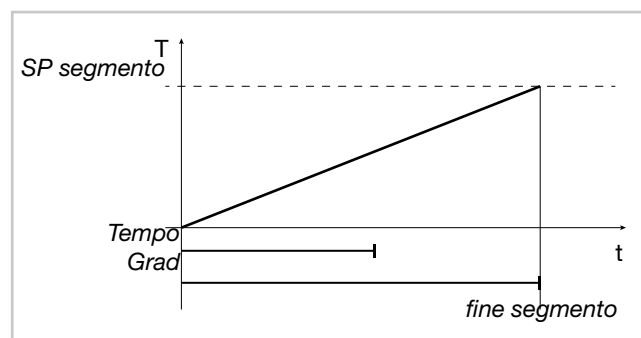
n the Graphic View page you may view a preview of the profiles that will be produced by the program being edited. When the variables associated with the profiles, the SPs and the times of single segments have been configured, the profiles may be analyzed in graphic form.
The Graphic view page is accessed via the drop-down menu that appears under the Segments button, or using the Graphic view buttons on the segment/profile setup page..

The graphic setup may be edited as follows:

4. CONFIGURATION

-Enable or disable viewing of each profile by pressing buttons SP1, SP2, etc.

-Assign the bottom of the scale of a certain SP to the graph by pressing the SPn buttons continuously for at least one second.

-Edit the minimum and maximum bottom of the scale values by pressing the fields next to the letters "m" and "M" in the top part of the graph.

The graph displays the time scale on the abscissa and the scale of recorded values of the SPs on the ordinate axis. There is a bar that represents the entire duration of sampling below the graph. The blue section indicates the time interval displayed in the graph. The instants of time defining the section shown in the graph are shown under the axis of the abscissa. To scroll forward and backward through the entire sample, use the [<<] and [>>] buttons or touch the bar.

Use the [⊕▬] and [⊖▬] buttons to zoom in or out on a certain time range around the cursor.

We may use the vertical cursor to identify the exact value of the curve at a given instant in time. The SP value identifying the cursor for each profile is shown in the fields above the graph. The position in time of the cursor is identified by the green scrolling vertical line. The cursor may be scrolled by touching the exact point on the graph or using the two buttons [◀▬▬▬] and [▬▬▶] .

4.14.3.4. GETlogic configuration

The GETlogic page allows you to configure program functions.

When the program is on, the functions are run cyclically every 25 ms sequentially, from the first to the last.

The list shows all the program functions. If the memory location is free (no function), only the order number is displayed. The selected row is highlighted in green.

The left buttons let you scroll through the list.

Right buttons allow you to:
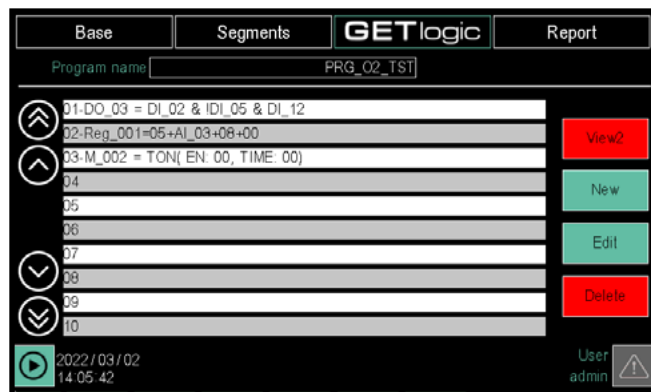- **View1/View2**: displays the list with the name attributed to the function or its formal representation in mathematical-logic language.
- **New**: lets you create a new function.
- **Edit**: lets you edit the function.
- **Delete**: deletes the function.

Press the **New** button to open a pop up window where you can create a new function choosing from the different types available.
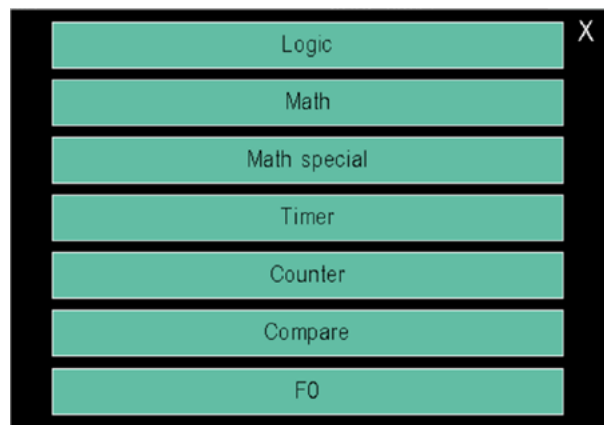
Once created, the new function can be set
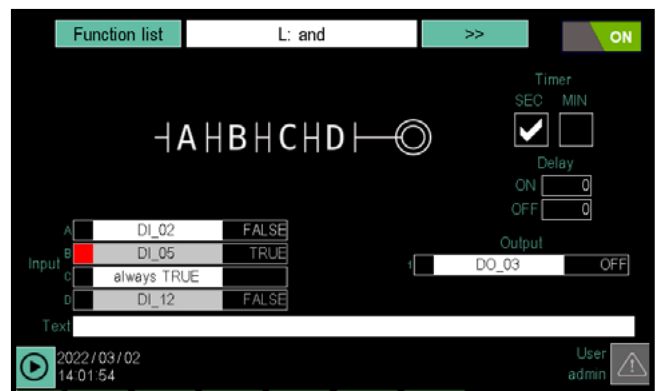
The **List of functions** button at the top left lets you return to the function list. At the top, in the center, there is the number and the arrow button that let you scroll all the functions of the type selected at the time of creation.

The ON/OFF button at the top right lets you disable the function without deleting it.

A **graphic diagram of the function** appears in the middle of the window with input data, processing and output results.

On the right, for some functions, you can set the timer base (**Time**), choosing between seconds or minutes to set the timer excitement delays (**ON**) Or de-energization (**OFF**). If delays are equal to 0, output switching is instantaneous.

1 to 4 inputs are listed in the lower left, according to the chosen function.(**Input**). Each row corresponds to an input. For each input there are:
- The **distinctive input letter**, which corresponds to that shown in the graphic diagram.
- A **box** which, according to the input type, allows you to set:
  – A direct or denied input (NOT). It only applies to digital inputs.
  – A constant or variable. It only applies to analog inputs. When the box is activated it becomes red.
- The **variable name** associated with the input or input value type (for example *constant*). Touch the field to open a pop-up window where you can choose the variable. For details on the pop-up window, see the description on page 119.
- A box that displays the **real status** or **value** of the associated variable.

Depending on the function selected, input fields and values are compiled with default values, which can be changed later.

Outputs are listed at the bottom right according to the function. (**Output**). Each row corresponds to an output.

For each output there are:

- The **distinctive output number**, which corresponds to that shown in the graphic diagram. It only applies to function blocks with multiple outputs.
- A **box** for the denied output logic (NOT). This only applies to digital outputs. When the box is activated it becomes red.
- The **variable name** associated with the output. Touch the field to open a pop-up window where you can choose the variable. For details on the pop-up window, see the description on page 119.
- A box that displays the **real status** of the associated variable.

There is a **Comment** field at the bottom, in the center, where you can enter the name or description of the function that will appear in the list. Touching the field opens a virtual keyboard with which you can enter the name or description. The entered text can be up to 34 characters in the 2850T model and up to 42 characters in the 3850T model.
The tables below detail the various types of functions available and their features.

| | | | **Logic Functions** | | | | |
| Diagram | Formal language | Description | **Inputs** | | | **Outputs** | Timer |
			no.	type	no.	type	
	Out = A | B | C | D	Out = TRUE if at least one input is TRUE (1)	4	Only digital variables are admitted such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*)	1	Only digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	Yes
	Out = A & B & C & D	Out = TRUE if all inputs are equal to TRUE (2)	4	Only digital variables are admitted such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*)	1	Only digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	Yes
SET / RESET / OUT	Out = SR(S:A,R:B)	Flip Flop SR (3)	2	Only digital variables are admitted such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*)	1	Only digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	Yes
RESET / SET / OUT	Out = RS(R:A,S:B)	Flip Flop RS (4)	2	Only digital variables are admitted such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*)	1	Only digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	Yes
A / B AUTO 1-SHOT / OUT	Out = Rtrig one shot cnt out(A) Out = Rtrig full cnt out(A)	Searching for the rising edge (5)	2	Only digital variables are admitted on input **A** such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Only the operating mode can be set on input **B**, selecting from: • full cnt out • one shot cnt out	1	Only digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	
A / B AUTO 1-SHOT / OUT	Out = Ftrig one shot cnt out(A) Out = Ftrig full cnt out(A)	Searching for the trailing edge (5)	2	Only digital variables are admitted on input **A** such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Only the operating mode can be set on input **B**, selecting from: • full cnt out • one shot cnt out	1	Only digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	

& = AND, | = OR

(*) For the list of functions, see paragraph "13.1. System variables" on page 189.

OPERATING MODE FOR BLOCKS *Rtrig* **AND** *Ftrig*

full cnt out: interception of the rising/trailing edge (function block output) remains equal to TRUE for a single cycle of the PLC (25 msec). After this time the output returns to FALSE to the next rising/trailing edge.

one shot cnt out: interception of the rising/trailing edge (function block output) remains equal to TRUE until the output is forced to FALSE. All rising/trailing edges occur while the block output is TRUE are ignored.

Logic Functions

Diagram	Formal language	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer
	Out = (A & B) | (C & D)	Out = TRUE if A and B equal to TRUE or C and D equal to TRUE (7)	4	Only digital variables are admitted such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*)	1	Only digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	Yes
	Out = (A | B) & (C | D)	Out = TRUE if A and B equal to TRUE or C and D equal to TRUE (8)	4	Only digital variables are admitted such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*)	1	Only digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	Yes

& = AND, | = OR
(*) For the list of functions, see paragraph "13.1. System variables" on page 189.

Out = A | B | C | D (1)

A	B	C	D	OUT
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	TRUE	TRUE
FALSE	FALSE	TRUE	FALSE	TRUE
FALSE	FALSE	TRUE	TRUE	TRUE
FALSE	TRUE	FALSE	FALSE	TRUE
FALSE	TRUE	FALSE	TRUE	TRUE
FALSE	TRUE	TRUE	FALSE	TRUE
FALSE	TRUE	TRUE	TRUE	TRUE
TRUE	FALSE	FALSE	FALSE	TRUE
TRUE	FALSE	FALSE	TRUE	TRUE
TRUE	FALSE	TRUE	FALSE	TRUE
TRUE	FALSE	TRUE	TRUE	TRUE
TRUE	TRUE	FALSE	FALSE	TRUE
TRUE	TRUE	FALSE	TRUE	TRUE
TRUE	TRUE	TRUE	FALSE	TRUE
TRUE	TRUE	TRUE	TRUE	TRUE

Out = A & B & C & D (2)

A	B	C	D	OUT
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	TRUE	FALSE
FALSE	FALSE	TRUE	FALSE	FALSE
FALSE	FALSE	TRUE	TRUE	FALSE
FALSE	TRUE	FALSE	FALSE	FALSE
FALSE	TRUE	FALSE	TRUE	FALSE
FALSE	TRUE	TRUE	FALSE	FALSE
FALSE	TRUE	TRUE	TRUE	FALSE
TRUE	FALSE	FALSE	FALSE	FALSE
TRUE	FALSE	FALSE	TRUE	FALSE
TRUE	FALSE	TRUE	FALSE	FALSE
TRUE	FALSE	TRUE	TRUE	FALSE
TRUE	TRUE	FALSE	FALSE	FALSE
TRUE	TRUE	FALSE	TRUE	FALSE
TRUE	TRUE	TRUE	FALSE	FALSE
TRUE	TRUE	TRUE	TRUE	TRUE

Out = (A & B) | (C & D) (7)

A	B	C	D	OUT
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	TRUE	FALSE
FALSE	FALSE	TRUE	FALSE	FALSE
FALSE	FALSE	TRUE	TRUE	TRUE
FALSE	TRUE	FALSE	FALSE	FALSE
FALSE	TRUE	FALSE	TRUE	FALSE
FALSE	TRUE	TRUE	FALSE	FALSE
FALSE	TRUE	TRUE	TRUE	TRUE
TRUE	FALSE	FALSE	FALSE	FALSE
TRUE	FALSE	FALSE	TRUE	FALSE
TRUE	FALSE	TRUE	FALSE	FALSE
TRUE	FALSE	TRUE	TRUE	TRUE
TRUE	TRUE	FALSE	FALSE	TRUE
TRUE	TRUE	FALSE	TRUE	TRUE
TRUE	TRUE	TRUE	FALSE	TRUE
TRUE	TRUE	TRUE	TRUE	TRUE

Out = (A | B) & (C | D) (8)

A	B	C	D	OUT
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	TRUE	FALSE
FALSE	FALSE	TRUE	FALSE	FALSE
FALSE	FALSE	TRUE	TRUE	FALSE
FALSE	TRUE	FALSE	FALSE	FALSE
FALSE	TRUE	FALSE	TRUE	TRUE
FALSE	TRUE	TRUE	FALSE	TRUE
FALSE	TRUE	TRUE	TRUE	TRUE
TRUE	FALSE	FALSE	FALSE	FALSE
TRUE	FALSE	FALSE	TRUE	TRUE
TRUE	FALSE	TRUE	FALSE	TRUE
TRUE	FALSE	TRUE	TRUE	TRUE
TRUE	TRUE	FALSE	FALSE	FALSE
TRUE	TRUE	FALSE	TRUE	TRUE
TRUE	TRUE	TRUE	FALSE	TRUE
TRUE	TRUE	TRUE	TRUE	TRUE

Flip Flop SR (3)

A	B	OUT
FALSE	TRUE	FALSE
TRUE	FALSE	TRUE
FALSE	FALSE	=
TRUE	TRUE	TRUE

= : the value does not change

Flip Flop RS (4)

A	B	OUT
FALSE	TRUE	TRUE
TRUE	FALSE	FALSE
FALSE	FALSE	=
TRUE	TRUE	FALSE

= : the value does not change

Searching for the rising edge (5)

A current	A previous	OUT
TRUE	FALSE	TRUE
TRUE	TRUE	FALSE
FALSE	TRUE	FALSE
FALSE	FALSE	FALSE
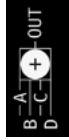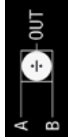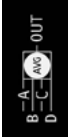
Searching for the trailing edge (6)

A current	A previous	OUT
TRUE	FALSE	FALSE
TRUE	TRUE	FALSE
FALSE	TRUE	TRUE
FALSE	FALSE	FALSE

Mathematical Functions

Diagram	Formal language	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer

	Out = A + B + C + D	Sum of all input values	4	The following are admitted:
				• analog variables such as:
				  – Analog inputs/outputs
				  – Register
				  – Retain Register
				  – Real
				  – Retain Real
				• constant values
					1	Analog variables are admitted such as:
						• Analog outputs
						• Register
						• Retain Register
						• Real
						• Retain Real	

	Out = A - B - C - D	Subtraction of B, C and D from A, in order	4	The following are admitted:
				• analog variables such as:
				  – Analog inputs/outputs
				  – Register
				  – Retain Register
				  – Real
				  – Retain Real
				• constant values
					1	Analog variables are admitted such as:
						• Analog outputs
						• Register
						• Retain Register
						• Real
						• Retain Real	

	Out = A * B * C * D	Multiplication of all input values	4	The following are admitted:
				• analog variables such as:
				  – Analog inputs/outputs
				  – Register
				  – Retain Register
				  – Real
				  – Retain Real
				• constant values
					1	Analog variables are admitted such as:
						• Analog outputs
						• Register
						• Retain Register
						• Real
						• Retain Real	

	Out = A : B	Divides input A by input B	2	The following are admitted:
				• analog variables such as:
				  – Analog inputs/outputs
				  – Register
				  – Retain Register
				  – Real
				  – Retain Real
				• constant values
					1	Analog variables are admitted such as:
						• Analog outputs
						• Register
						• Retain Register
						• Real
						• Retain Real	

	Out = AVG (A, B, C, D)	Instant arithmetic average of inputs A, B, C, D	4	The following are admitted:
				• analog variables such as:
				  – Analog inputs/outputs
				  – Register
				  – Retain Register
				  – Real
				  – Retain Real
				• constant values
					1	Analog variables are admitted such as:
						• Analog outputs
						• Register
						• Retain Register
						• Real
						• Retain Real	

Mathematical Functions

Diagram	Formal language	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer
	Out = MIN (A, B, C, D)	Minimum value between inputs A, B, C, D	4	The following are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	Analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	
	Out = MAX (A, B, C, D)	Maximum value between inputs A, B, C, D	4	The following are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	Analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	
	Out = $\sqrt{A}$	Square root of input A	1	The following are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	Analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	
	Out = log A	Input A base 10 logarithm	1	The following are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	Analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	
	Out = ln A	Natural logarithm of input A	1	The following are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	Analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	

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Mathematical Functions

Diagram	Formal language	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer
A — e^A — OUT	$Out = e^A$	and raised to the power of A	1	The following are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	Analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	
A — A^B — OUT, B	$Out = A^B$	A raised to the power of B	2	The following are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	Analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	

Special mathematical functions

Diagram	Formal language	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer
A R MIN OUT / B IN LATCH	OUT = MIN L(B)RS:(A)	Out = lowest value of B since last reset (input A) (*)	2	**On**ly digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions / **On**ly analog variables are admitted on input B such as: • Analog inputs/outputs • Register • Retain Register • Real • Retain Real	1	**On**ly analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	No

(*) input B also works by function Enable:
- FALSE and trailing edge: the output is NOT cooled and maintains the last input sampling value (DISABLE)
- Rising edge: output is set to input value (RESET)
- TRUE: The function is on (ENABLE)

Special mathematical functions

Diagram	Formal language	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer
MAX IN LATCH (A, R, B) → OUT	OUT = MAX L(B)RS:(A)	Out = highest value of A from last reset (input B) (**)	2	**Only** digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) **Only** analog variables are admitted on input B such as: • Analog inputs/outputs • Register • Retain Register • Real • Retain Real	1	**Only** analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	Np
S.& HOLD (A, H, IN, B) → OUT	OUT = S&H(B)EN:(A)	Out = B if A = ON Out = constant if A = OFF	2	**Only** digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) **Only** analog variables are admitted on input B such as: • Analog inputs/outputs • Register • Retain Register • Real • Retain Real	1	**Only** analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	No
(A, B, C) → OUT	OUT = select[(sel(A),f:(B),t:(C)]	Out = C if A = ON Out = B if A = OFF	3	**Only** digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Input B and C are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real – String • constant values	1	The following types of variable are admitted in input and output: • Analog outputs • Register • Retain Register • Real • Retain Real • String	No

(*) For the list of functions, see paragraph "13.1. System variables" on page 189.
(**) input B also works by function Enable:
- FALSE and trailing edge: the output is NOT cooled and maintains the last input sampling value (DISABLE)
- Rising edge: output is set to input value (RESET)
- TRUE: The function is on (ENABLE)

Special mathematical functions
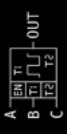
Diagram	Formal language	Description	Inputs		Outputs		Timer
			no.	type	no.	type	
	OUT = average[en:(A),in:(B)]	Out = mean time value of input B from function enable (input A)	2	**Only** digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Input B are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	**Only** analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	No
	OUT = limit[(A),max:(B),min:(C)]	Out = the value of input A if it is between the Max value (input B) and the minimum value (input C) Value of B if A > B, value of C if A < C	3	Inputs A, B and C are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	**Only** analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	No

(*) For the list of functions, see paragraph "13.1. System variables" on page 189.
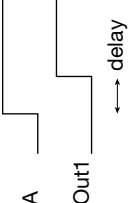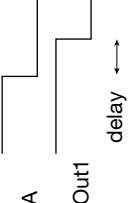
Timer functions

Diagram	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer
OUT 1 / OUT 2 (A–TON/Q, B–PT/T)	Timer with excitation delay. Input A = timer start command. Input B = delay time. Output 1 = output signal generated at the end of the delay. Output 2 = indication of the time elapsed since the delay activation. The elapsed time count is reset to zero only when input A starts to rise again. It is not reset to zero when the signal drops. To manage it differently, use TOFF with input denied. Diagram: A, Out1, ← delay	2	**Only** digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Input B are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	2	**Only** digital variables are admitted on output 1 such as: • Digital outputs • Merker • Retain Merker **Only** analog variables are admitted on output 2 such as: • Analog outputs • Register • Retain Register • Real • Retain Real	Yes
OUT 1 / OUT 2 (A–TOF/Q, B–PT/T)	Timer with de-energizing delay. Input A = timer start command. Input B = delay time. Output 1 = output signal generated at the end of the delay. Output 2 = indication of the time elapsed since the delay activation. The elapsed time count is reset to zero as soon as the input A signal goes up again, so you don't need to wait for it to go down again to reset the signal. To manage it differently, use TON with input denied. Diagram: A, Out1, delay →	2	**Only** digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Input B are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	2	**Only** digital variables are admitted on output 1 such as: • Digital outputs • Merker • Retain Merker **Only** analog variables are admitted on output 2 such as: • Analog outputs • Register • Retain Register • Real • Retain Real	Yes
OUT = BLINK[EN:⟨A⟩,t1:⟨B⟩,t2:⟨C⟩] (A–EN, B–T1, C–T2, OUT)	Flashing timer. Input A = flash enable. Input B = output ON time. Input C = Output OFF time	3	**Only** digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Input B and C are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	1	**Only** digital variables are admitted such as: • Digital outputs • Merker • Retain Merker	Yes

(*) For the list of functions, see paragraph "13.1. System variables" on page 189.

Counter Functions							
Diagram	**Formal language**	**Description**	**Inputs**		**Outputs**		**Timer**
			no.	**type**	**no.**	**type**	
	CU:(A) R:(B) SET:(C) CTU Q:(Out1) CV:(Out2)	Increasing counter Input A = increase command Input B = count reset command Input C = value to be reached with the count Output 1 = Signal generated when the count reaches the value of input C Output 2 = value reached by count *Note: The count increases on the rising edge of input A*	3	**Only** digital variables are admitted on inputs A and B such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Input B are admitted: • analog variables such as: – Analog inputs/outputs – Register – Retain Register – Real – Retain Real • constant values	2	**Only** digital variables are admitted on output 1 such as: • Digital outputs • Merker • Retain Merker **Only** analog variables are admitted on output 2 such as: • Analog outputs • Register • Retain Register • Real • Retain Real	No

(*) For the list of functions, see paragraph "13.1. System variables" on page 189.

Counter Functions

Diagram	Formal language	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer

A — CD, B — R, C — PRESET, OUT 1, OUT 2	CD:(A)
	R:(B)
	PRESEt:(C)
	CTU Q:(Out1)
	CD:(Out2)
		Decreasing counter
		Input A = Decrease command
		Input B = count reset command
		Input C = value to be reached with the count
		Output 1 = Signal generated when the count reaches the value of input C
		Output 2 = value reached by count
		
		Note: The count increases on the rising edge of input A
			3	**Only** digital variables are admitted on inputs A and B such as:
				• Digital inputs/outputs
				• Merker
				• Retain Merker
				• System functions (*)
				Input C are admitted:
				• analog variables such as:
				  – Analog inputs/outputs
				  – Register
				  – Retain Register
				  – Real
				  – Retain Real
				• constant values
					2	**Only** digital variables are admitted on output 1 such as:
						• Digital outputs
						• Merker
						• Retain Merker
						Only analog variables are admitted on output 2 such as:
						• Analog outputs
						• Register
						• Retain Register
						• Real
						• Retain Real
							No

Comparison Functions

Diagram	Formal language	Description	Inputs no.	Inputs type	Outputs no.	Outputs type	Timer

A/B — > OUT	Out = (A > B)	Out = TRUE if A greater than B	2	Inputs are admitted:
				• analog variables such as:
				  – Analog inputs/outputs
				  – Register
				  – Retain Register
				  – Real
				  – Retain Real
				• constant values
					1	**Only** digital variables are admitted on output such as:
						• Digital outputs
						• Merker
						• Retain Merker
							No

A/B — < OUT	Out = (A < B)	Out = TRUE if A less than B					
A/B — ≥ OUT	Out = (A ≥ B)	Out = TRUE if A is greater than or equal to B					
A/B — ≤ OUT	Out = (A ≤ B)	Out = TRUE if A is less than or equal to B					
A/B — = OUT	Out = (A = B)	Out = TRUE if A equals B					
A/B — ≠ OUT	Out = (A ≠ B)	Out = TRUE if A other than B					

Diagram	Formal language	Description	Inputs		Outputs		Timer
		F0 Function (Time equivalent to the exposure time at 121.11 ° C (249.99 °F) applied to a product in the sterilisation process expressed in minutes)					
			no.	**type**	**no.**	**type**	
A EN B TX C TR D Z — F0 — OUT	Out = F0	F0 is the exposure time equivalent to 121.11° C (249.99 °F) of the actual exposure time at a variable temperature calculated for an ideal micro organism with a destruction temperature coefficient equal to 10° C. **Input A** = Enable F0 calculation. (ENABLE) **Input B** = Actually read temperature. (TX) **Input C** = Reference temperature in the selected unit of measure (°C or °F). **Input D** = Distribution temperature coefficient in the selected unit of measure (° C or °F), corresponds to the temperature change to vary the reduction time by a factor of 10. (Z)	4	**Only** digital variables are admitted on input A such as: • Digital inputs/outputs • Merker • Retain Merker • System functions (*) Analog variables are admitted on inputs B, C and D such as: • Analog inputs/outputs • Register • Retain Register • Real • Retain Real • Constant values	1	**Only** analog variables are admitted such as: • Analog outputs • Register • Retain Register • Real • Retain Real	No

(*) For the list of functions, see paragraph "13.1. System variables" on page 189.
NB:
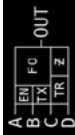With input A (ENABLE) = FALSE, the output value remains frozen at the last calculated F0 value with input A (ENABLE) = TRUE.
On the rising edge of the A input, the output is reset.
With input A (ENABLE) = TRUE the calculation of F0 is on.

Update List function

This function allows a program\recording to be loaded in a predefined position among those available via a function block with three inputs and one output.
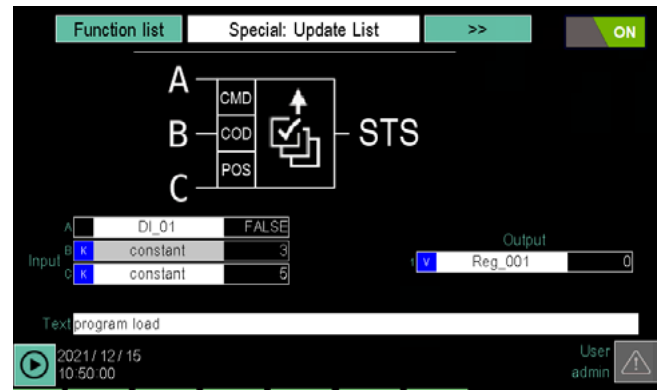
A detailed description follows

In/Out	Variable	Description	Type
IN_1	LOAD_CMD	On the leading edge of this signal, the loading process is triggered.	BOOL
IN_3	LOAD_CODE	program/recording code. The code is unique and is shown next to the name of the line in question	UINT
IN_2	LOAD_POSITION	Location of program/recording to be loaded	UINT
OUT_2	LOAD_STS	10: operation completed successfully 1: operation in progress -1: Unable to load due to program code/recording not found -2: Unable to load due to incorrect loading position -3: Unable to load due to running program/recording -4: Unable to load due to program/recording already found in list	INT

Clear List function

This function allows a program\recording to be loaded in a predefined position among those available via a function block with two inputs and one output.

A detailed description follows

In/Out	Modbus variable	Description	Type
IN_1	UNLOAD_CMD	On the leading edge of this signal, the loading process is triggered.	BOOL
IN_2	LOAD_POS	Location of the program/recording to be downloaded	UINT
OUT_1	UNLOAD_STS	10: operation completed successfully 1: operation in progress -2: Unable to download due to incorrect position -3: Unable to download due to running program/recording -4: Unable to load due to program/recording already found in list	INT

4.14.3.5. Program report configuration
The Report section allows you to configure archived variables such as DataLog and Batch Report.
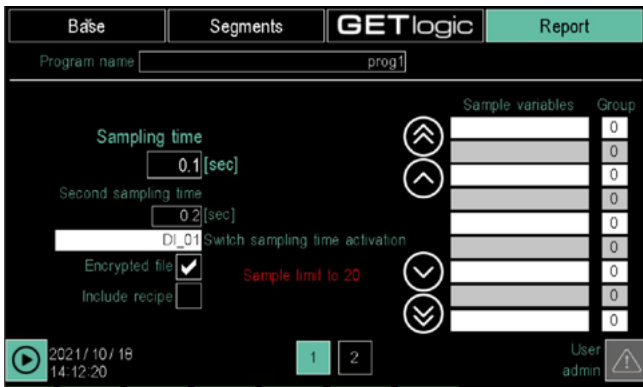
Report (Page 1) allows you to configure the DataLog by determining the information to be stored.
The available parameters are:
- **Sampling time**: determines the sampling frequency. The time interval between one sampling and the next can vary from 0.1 to 3600.0 seconds, with minimum granularity 100ms.
- **Second sampling time:** sampling time used when the "time change activation" parameter is ON.
  - Time change activation: signal that allows the change between the main sampling time (signal OFF) and the second sampling time (when ON)
  - Limitation to 20 samples: warning, in the case of sampling times of less than one second, of limiting the sampled parameters to 20.
- **Include recipes**: includes the program recipe at the top of the DataLog.
- **File name job no.**: includes the production batch number in the file name.
- **Encrypted file**: apply encryption to the DataLog file. The file can be decrypted with the DataLog Utility application.
- **Sampled variables - Group**: allows you to select the variables to be sampled and assign them to a group, so that they can be viewed in the DataLog Utility application.
  Assign the same group to homogeneous variables. Touch the variable field to open a window pop-up to select the variable. For details on the pop-up window, see the description on page 119, while to find out about management of saving on different media on page 50

Report (page 2) allows you to include segments from digital

variables in the event report and to associate a descriptive text for each event. In the report, events are listed after sampling. The available parameters are:
- **Variable**: lets you select digital variables.
  Touch the variable field to open a window pop-up to select the variable.
  For details on the pop-up window, see the description on page 119.
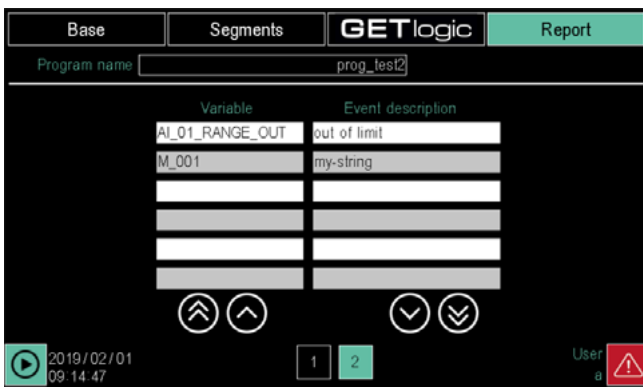- **String**: lets you select a stored text string.
  For details on the pop-up window, see the description on page 119.

4.14.4. Read from disk sub-menu
In order to use this submenu you should be level 1 or 0, depending on the instrument configuration. The visibility of the reading button may be conditioned by parameters in page x850 SETUP\CFG 2.
Opens a pop-up window that lists all programs stored on the disk. For details on the pop-up window, see the description on page 119.

4.14.5. New prog sub-menu
In order to use this submenu you should be level 1 or 0, depending on the instrument configuration.
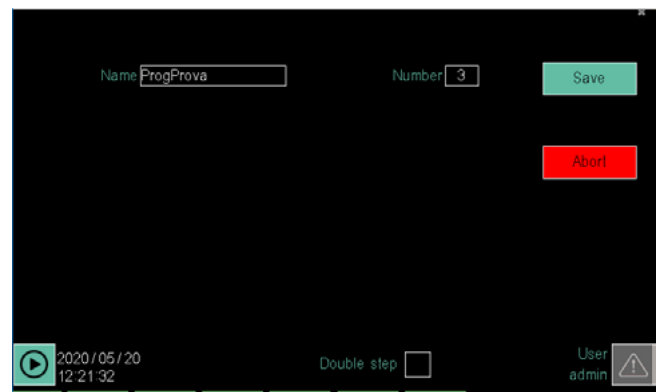
The available parameters are:
- **Program name**: touch the field to open the virtual keyboard to enter the program name. The name can be up to 16 characters long and must be unique.
- **Number**: the program ID number. It is automatically generated by the system and can not be modified.
- **Enable double step:** the double step is a segment composed of a ramp and a retention. If double step is enabled, every single segment will consist of a ramp and a retention; if double step is disabled, each ramp and each retention will constitute a single segment, created independently.
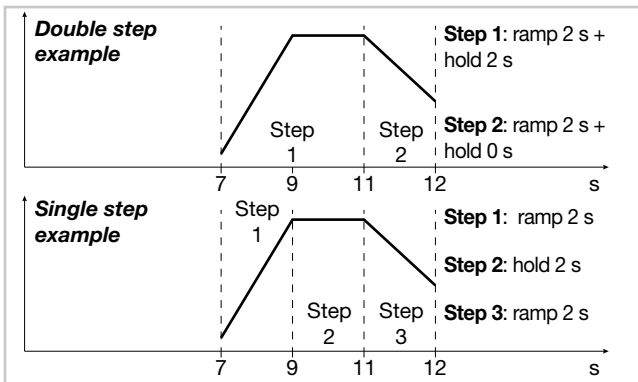
The **Save** button appears when a name is attributed to a program and is used to create the new program. Saving the program opens page 1 in the program configuration Base section. To continue see instructions on page 121 and subsequent.

The **Cancel** button closes the window without saving the changes made.

Special programmes, the ZERO programme

The ZERO programme is a special programme always present in the instrument, a routine without any associated profiles, but only the getLogic and Reporting part, which cannot be deleted by the user. Its most important features are:

- **Continuous execution**: the ZERO programme is executed by default, with no need for the user to start it, but it must be explicitly stopped. It follows from this feature that the associated logical functions and report will always be active.

- **The logical functions of the ZERO programme:** The logical functions of the ZERO programme, unlike those of all the other programmes, are editable while the programme is under way. These functions should be used for all system logic not strictly associated with a single programme. For example, the logic of the ZERO programme may be used to manage alarm chains.

- **Continuous datalog:** The ZERO programme generates a continuous report which has all the features we have seen in the section on reports, such as sampling time and encrypting, but with some differences. As it is a continuous record, the most important of these is the possibility of breaking up the report file hourly, daily or weekly. These files can only be viewed using the **ReportUtility** tool. Another difference is the absence of a recipe for association with the report file, because the ZERO programme has no recipes.

4.15. SERVICE Menu
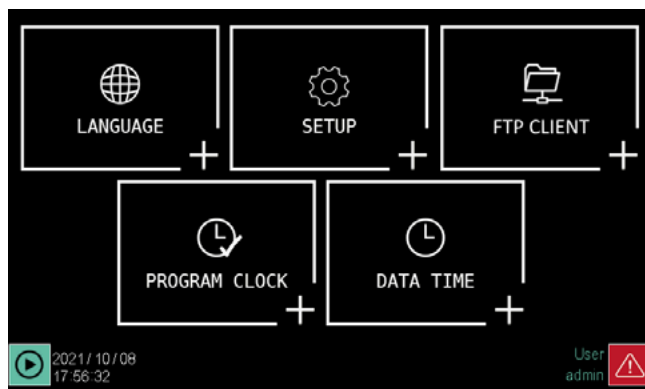
LANGUAGE sub-menu (page 78)
Setting the language used in the instrument.

SETUP sub-menu (page 78)
Network Address Settings and TNP and VNC Connections. Display adjustment. Firmware information. Bus, internal temperature and system message information and configurations.

DATA TIME sub-menu (page 81)
Internal clock time and date settings.

PROGRAM CLOCK sub-menu (page 82)
Weekly clock configuration.

FTP CLIENT sub-menu (pag. 82)
Configuring the FTP client functions for automatic backup to remote server.

4.15.1. LANGUAGE sub-menu
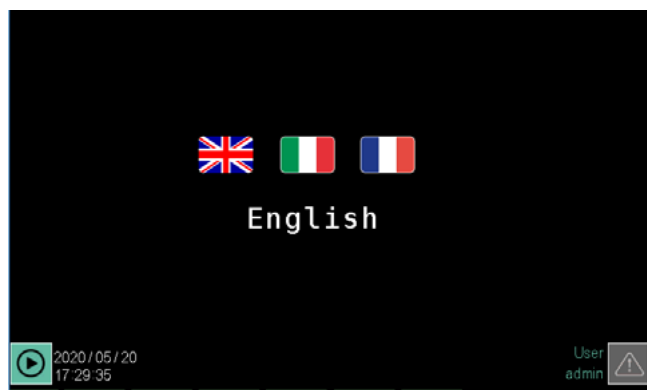
To use this submenu, the user must be level 1 or 2.

The LANGUAGE sub-menu allows you to change the controller language. All system texts will appear in the chosen language. Custom text, to be entered separately, is excluded from the change and remain in one language.

The language currently set appears below the flags. To change the language just touch the flag of the desired language.

4.15.2. SETUP sub-menu
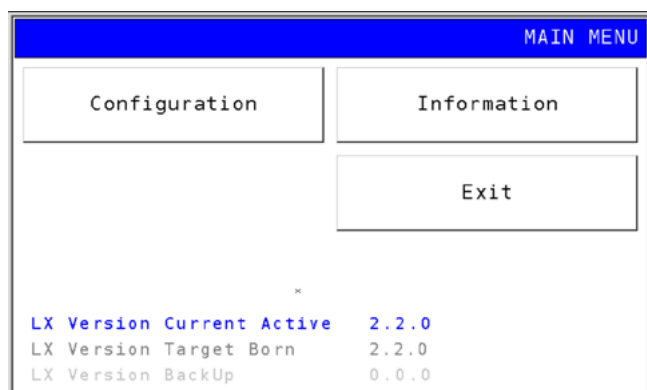
To use this submenu, the user must be level 1 or 2.

The buttons are used to:
- **Configuration**: access the pages for the network configurations and the TNP and VNC links as well as the page to adjust the display.
- **Information**: provides controller firmware information and access to pages that provide bus information and let you configure them, as well as pages about internal controller temperature and system messages.
- **Exit**: closes the sub-menu and restarts the controller with the new settings.

Other indications displayed are technical support information for Gefran.

4.15.2.1. Configuration Section
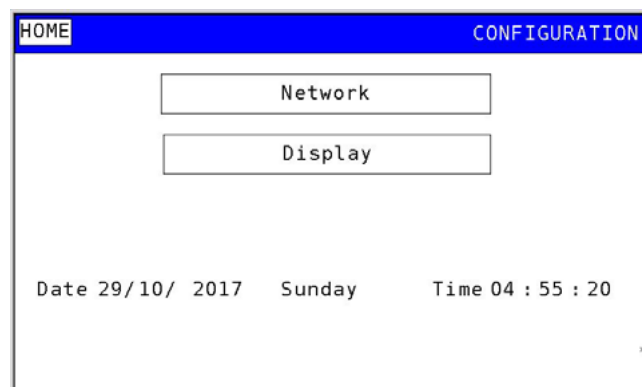
With the buttons you can access:
- **Network**: network settings and NTP and VNC configuration.
- **Display**: adjusting the screen brightness and screen saver.

The **HOME** button returns to the SETUP sub-menu.

4.15.2.2. Network Configuration

On this page you can manually enter the parameters for your corporate Ethernet connection:
- **IP Address**: corporate network address that is assigned to the controller. It must be unique.
- **Subnet**: subnet mask.
- **Gateway**: device address (such as a router) that connects the controller network to other external networks.
- **DNS**: Domain Name Server address.

By touching one of these fields (single box), a virtual keyboard appears where you can edit the field value.
Ask your network administrator for the addresses and parameters to use to connect the multi-purpose controller to your corporate network.

Enable DHCP enables the (Dynamic Host Configuration Protocol). DHCP automatically retrieves information (IP Address, Subnet, Gateway, DNS) required for network connection. By enabling DHCP, a message appears when saving that warns you to restart the controller. Touch the **Yes** button to reboot, **No** to cancel the operation. After rebooting, with the DHCP enabled, the configuration parameters recovered by DHCP appear in the various fields (IP Address, Subnet, Gateway, DNS).
The **Save** and **Cancel** buttons appear when changes have been made and allow them to be saved or cancelled, respectively, leaving the previous configuration.

The **NTP VNC Configuration** button opens the page to configure these two services.

The **HOME** button returns to the SETUP sub-menu and **BACK** to the previous page.

4.15.2.3. Network NTP and VNC Configuration

Enabling **NTP** (Network Time Protocol) the controller's internal clock is constantly synchronised to the time of an external NTP server. When the external signal stops, for any reason, the controller continues to operate using the

internal clock. As soon as the connection to the NTP server is restored, the internal clock re-synchronises.

The address of the NTP server can be entered in the appropriate field both as a name and as an IP address.
The following table lists some free-to-use NTP servers. Other servers may also be used, provided they conform to the NTP standard. If an internal server is used, the Gateway must be configured correctly.

Note
If the NTP function is active and the connection is interrupted, no error message will appear on the instrument

Server address	IP Address
time.google.com	216.239.35.8
it.pool.ntp.org	212.45.144.206
europe.pool.ntp.org	46.4.24.238

The current time and date are displayed on the right while on the left you can set the time difference with the Greenwich time (GMT, same as the USC) with the + and - buttons.
There is no automatic notification of daylight savings time.

Enabling the **VNC** (Virtual Network Computing) you can control the controller from a computer that has access to the Ethernet network on which the controller is connected. More information on the VNC is available in paragraph "2.5. Ethernet Connections" on page 23.
Enter the password that will be used by VNC clients to authenticate with the controller. The password can be from 1 to 34 characters, freely chosen from those displayed on the keyboard.The terminal must be restarted after enabling.

The **Save** and **Cancel** buttons appear when changes have been made and allow them to be saved or cancelled, respectively, leaving the previous configuration.

The **HOME** button returns to the SETUP sub-menu and **BACK** to the previous page.

4.15.2.4. Display Configuration

Changes the brightness of the screen and the screen saver timer.
To edit the set value, use the **-** and **+** keys.
A time of 0 seconds as the screen saver time always leaves

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the screen on.
To turn the screen back on once a screen saver timer has been set, just touch the screen.

Reduce the brightness and do not always leave the screen on to lengthen its life.

The **Save** and **Cancel** buttons appear when changes have been made and allow them to be saved or cancelled, respectively, leaving the previous configuration.

The **HOME** button returns to the SETUP sub-menu and **BACK** to the previous page.

4.15.2.5. Information Section

```
HOME                                 INFORMATION

         ┌─────────────────────────────┐
         │          Fieldbus           │
         └─────────────────────────────┘

         ┌─────────────────────────────┐
         │         Temperature         │
         └─────────────────────────────┘

         ┌─────────────────────────────┐
         │        System Message       │
         └─────────────────────────────┘

      Bootloader ..........  2 . 0 . 1
      Firmware ............  1 . 3 . 6
      FileSystem ..........  2 . 0 . 2
      Runtime .............  2 . 1 . 0
      Setup & Test.........  2 . 1 . 1
```

The page shows the versions of the system software installed in the controller.

The buttons allow you to:
*   **Fieldbus**: open the bus page.
*   **Temperature**: access the internal temperature page detected by the controller.
*   **System Message**: access the system message page.

The **HOME** button returns to the SETUP sub-menu.

4.15.2.6. Fieldbus Information

```
HOME     BACK                           FIELDBUS

         ┌─────────────────────────────┐
         │          CANopen            │
         └─────────────────────────────┘

         ┌─────────────────────────────┐
         │         Modbus TCP          │
         └─────────────────────────────┘

         ┌─────────────────────────────┐
         │         Modbus RTU          │
         └─────────────────────────────┘
```

The **CANopen** button opens the page for the CANopen bus.
The **Modbus TCP** button opens the Modbus/TCP bus page.

The **HOME** button returns to the Information sub-menu and **BACK** to the previous page.

4.15.2.7. CANopen Information

```
HOME     BACK                           CANopen

     Node│    1│

     Status
     ────────────────────────────────────────
     Configured                          No
     Present (operational)               No
     Net Status                       Reset
     Miss counter                         0
     ────────────────────────────────────────
     Emergency              0(Counter)

      Code  │ Register │      Add. code
      0000  │   0000   │   00 00 00 00 00
```

The page shows information about the CANopen bus.

Node shows the controller CANopen node address and allows you to modify it. Leave the value at 1, which must also be set on the F-GCANs communication module. For communication module address settings, see paragraph "2.6. F-GCANs communication module connection diagram" on page 25.

Status displays CAN bus status:
*   **Configured** indicates whether or not the node was correct set.
*   **Present (operational)** indicates whether the node is present or not.
*   **Net Status** displays network status. If other than 5, it signals an error.
*   **Miss counter** shows the errors counted since the last boot.
The values are read-only.

Emergency internal reserved code.

The **HOME** button returns to the Information sub-menu and **BACK** to the previous page.

4.15.2.8. Modbus TCP Information

```
HOME     BACK                         Modbus TCP

     Node     │    1│

     Status
     ────────────────────────────────────────
     Active                              No
     Configured                          No
     Present (operational)               No
     Net Status                Disconnected
     Miss counter                         0
     IP Address
```

The page shows information about the Modbus/TCP bus.

Node shows the controller Modbus/TCP node address and allows you to modify it. The hub can assume a value from 1 to 127 and updates the other related fields.

Status displays Modbus/TCP bus status:
*   **Active** indicates whether or not Modbus/TCP is run-

ning.
- **Configured** indicates whether or not the node was correct set.
- **Present (operational)** indicates whether the node is present or not.
- **Net Status** displays network status. If other than 5, it signals an error.
- **Miss counter** shows the errors counted since the last boot.
- **IP Address** displays the controller IP address.

The values are read-only.

The **HOME** button returns to the Information sub-menu and **BACK** to the previous page.

4.15.2.9. Temperature Information

This page displays information relating to the internal temperature recorded by the instrument (touch panel).

The following are displayed:
- Normal operating temperature limits (**Limits**).
- Read real-time temperature (**Istant.**).
- The maximum (**Max peak**) and minimum (**Min peak**) values recorded for normal operating temperatures. Touching one of the two **Max peak** and **Min peak** buttons opens a window that also specify the date and time when the peak temperature was detected.

The table shows the overtemperature detected by the controller. The last registered value and the date and time it was detected is displayed for each temperature (**Range**).

Touch the button to open a window that displays all the overtemperatures recorded for that temperature range.

The **HOME** button returns to the Information sub-menu and **BACK** to the previous page.

4.15.2.10. Information System Message

The page shows low-level system messages that may be useful for diagnostics in case of malfunction.

The **HOME** button returns to the Information sub-menu and **BACK** to the previous page.

4.15.3. DATA TIME sub-menu

The DATA TIME submenu allows you to adjust the date and time of the controller's internal clock.
The date and time may be changed only when the NTP is disabled and batch processes are stopped.
To adjust, touch the individual fields and enter the desired value using the virtual keyboard that appears.
The daylight savings time / winter time button may be used for manually switching between these two periods of the year, only when the NTP is disabled and batch processes have been stopped.
A string indicates NTP active or NTP disabled.

4.15.4. PROGRAM CLOCK sub-menu
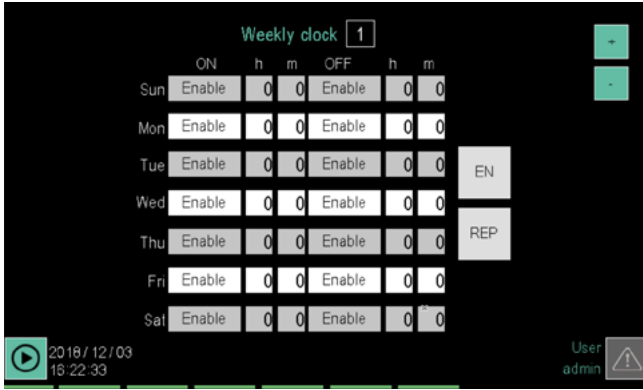
In order to use this sub-menu, the user must have access and editing privileges (SERVICE and ADMIN levels by default).

The PROGRAM CLOCK submenu may be used to create and manage weekly clocks for controlling automatic operations undertaken on the basis of the time and day of the week.
Each clock acts on the "virtual functions" alarm_clkn_cmd1 and alarm_clkn_cmd2, where n is the selected clock number, from 1 to 4:
The PROGRAM CLOCK sub-menu allows you to create and manage weekly clocks to automatically turn the controller on and off.
Each clock operates on two "virtual functions":
• **alarm_clk*n*_cmd1** to turn on and
• **alarm_clk*n*_cmd2** to turn off,
where *n* is the selected clock number.
These functions can be used in logical functions to start a program or to perform any other action, such as commanding a siren, raising or lowering a digital output, etc. The two variables remain high for one second from time on which they were set, to permit interception.
For each day of the week you can set a power-on and one-off time. The time is entered as hour and minute; the time is 24 hour format.
Power off can be before power on. Switching on and off can also take place on different days, meaning you can turn on the controller and leave it on for a few days before turning it off.
You can enable multiple weekly clocks at the same time. This way you can have more than one on and off operation on the same day. The maximum number of weekly clocks that can be enabled simultaneously is 4.

The buttons ⊞ and ⊟ allow you to select the weekly clock, whose identification number appears at the top. The first 3 columns on the left are related to on operations (**ON**), the remaining 3 to off (**OFF**). Each row corresponds to a day of the week.
To set a time, touch the **h** and **m** fields related to the operation and the day that interests you. Then enter with the virtual keyboard that appears, the time and minutes you want.
To enable an on or off operation, touch its **Enable** label: it will turn green to indicate that the operation has been enabled. To disable an operation, touch its green **Enable** label: the color change will indicate that it has been disabled.

The button ▣ enables and disables the entire weekly clock (green = enabled, grey = disabled).
The button ▣ enables and disables the weekly repetition of the clocks (green = enabled, grey = disabled).

4.15.5. FTP CLIENT sub-menu
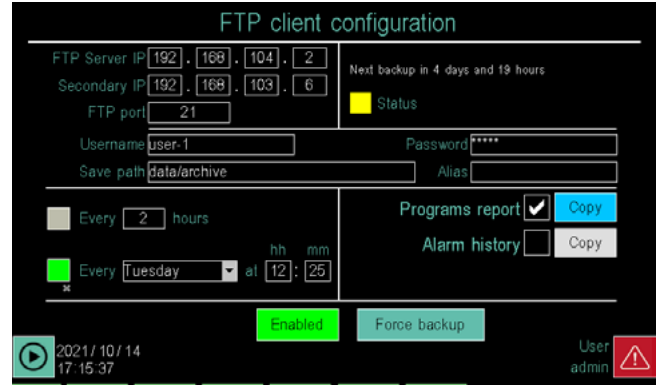
This section allows FTP client function parameters to be set to manage produced report files and alarm log automatic backup to a remote server.

The parameters to be configured to establish a connection to an FTP server are:

• **Server IP**: IP address of the FTP server on which you want to backup the files

• **Secondary IP**: IP address of a second FTP server on which the system relies in case it is unable to connect to the primary server. If both servers are unreachable, the system displays the corresponding error message. A server is considered unreachable after 3 consecutive failed connection attempts.

• **FTP port**: number of the FTP port on which to open a connection, the factory default reset value is 21

• **User and password**: user name and password (maximum 16 characters long) to access the FTP server. They must match the user name and specific password of a selected FTP server account that has the following privileges:

    - Read/write/delete files

    - Read/create/delete folders

• **Path to files**: starting from the FTP server Home folder, this is the path where the system saves the report files and the alarm log (maximum 32 characters long, the following are not allowed: : * ? " < > |). Use the / character as a separator for folders nested in the path. Starting from the specified location, the system creates the following folder structure:

    - … /IP_XXX_XXX_XXX_XXX/Report/… (report folder with null alias)
    - … /IP_XXX_XXX_XXX_XXX/History_Alarm/… (alarm log folder with null alias)
    - ... /Alias/Report/ ... (report folder with defined alias)
    - ... /Alias/History_Alarm/ ... (alarm log folder with defined alias)

• If the alias string associated with the device is empty, the system creates an identification folder using its IP address ("IP_XXX_XXX_XXX_XXX"), otherwise the iden-

tification folder is called using the assigned alias. Two "Report" and "History_Alarm" sub-folders are then created inside the identification folder where the report files and the alarm log are saved respectively

- **Alias**: text string (maximum 16 characters long, the following are not allowed: / : * ? "<> |) to be able to assign a textual identification to the device then used in the construction phase of the file saving path on the FTP server

It is possible to choose between two main automatic file backup modes, plus the possibility of manual activation:

- **Periodic backup mode every N hours**: the system backs up the files on an FTP server every N hours (admissible range of values 1..999 hours) starting from the time the function is enabled or from when the number of hours is set

- **Periodic backup mode once a day**: to set up an FTP server backup once a day at a specific time. A particular day of the week (Monday..Sunday) or every day can be selected. The time can be set in hours (0..23): minutes (0..59).

- **Manual single backup**: using the "Force backup" button you can manually backup files at any time, regardless of the enabled status. Manual backup can also be controlled in other ways through the corresponding system variables:

    - From the customised pages (GETview) - FTP_ BCK_CMD variable set to 1 runs the backup (it is then automatically reset)

    - Via logics (GETlogic) - FTP_BCK_CMD variable

Saving files on an FTP server can be configured in the following ways:

- Program reports

    - **Copy** → makes a copy of the report files on an FTP server while leaving them unaltered in the device memory

    - **Move** → moves the report files to an FTP server by deleting them from the device memory after saving them on the server

- Alarm log

    - **Copy** → copies the file with the alarm history on the FTP server (in this case it is not possible to delete the file on the device)

The system always shows the status of the automatic file backup function via FTP server through a status LED and a text string:

- Backup disabled: Grey LED ▮

- Automatic backup enabled but not in progress: Yellow LED ▮

    - While the backup function is enabled but the actual backup is not in progress, the system displays the time interval (in hours/minutes or days/hours, updated in real time) that is missing until the next scheduled backup event

- Backup in progress and connection to the server: Green LED ▮

- Error status: Red LED ▮

- The following system variables are linked to the auto-

matic backup on FTP server function:

- FTP_CMD_BACKUP: set to 1 it runs manual backup on FTP server (it is then automatically reset)

- FTP_ERROR_CODE: current error code (0 no error)

- FTP_BACKUP_STATUS: current backup status

    - 0 backup disabled

    - 1 backup enabled but waiting for the trigger

    - 2 backup in progress

    - 3 backup error

⚠ **Caution!** If the SD-card is removed from a system with SD option while backing up Report files (or Audit files if in CFR-21 mode), the system will not be able to proceed with backup as the files to be saved reside on the missing media, signalling the appropriate error condition.

4.15.6.   Alarms and error codes

- Automatic file backup on remote server via FTP client can generate different types of errors, such as, for example, server connection problems, login errors etc.

- The possible error codes that the system can generate are listed below, divided into 5 categories, each of which has an associated specific system alarm:

- Category 1 - Connection errors

- Category 2 - Login/Authentication Errors

- Category 3 - File read/write errors

- Category 4 - FTP Protocol Errors

- Category 5 - Other errors

4. CONFIGURATION

FTP error code table

Name	Error code	Description	Category
ftpMissingSDcard	-20	Files not accessible due to missing SD-card	5
ftpAsyncOpAborted	-10	Aborted asynchronous operation	5
ftpInvalidAsyncOp	-9	Invalid asynchronous operation	5
ftpBusyAsync	-8	Another asynchronous operation in progress	5
ftpReadError	-7	Error reading data from server	3
ftpWriteError	-6	Server data write error	3
ftpConnectError	-5	Error connecting to server	1
ftpHostNameError	-4	Host name resolution error	1
ftpSocketError	-3	Generic socket error	1
ftpInvalidTask	-2	Function called by an invalid task	4
ftpInvalidParams	-1	Invalid parameters specified	4
ftpServiceNotAvailable	421	Service not available when the control connection is closed	4
ftpDataConnNotOpen	425	Unable to open data connection	1
ftpConnClosed	426	Closed connection aborted transfer	1
ftpInvalidUserPass	430	Incorrect user name or password	2
ftpHostUnavailable	434	Requested host not available	1
ftpFileActionNotTaken	450	Unprocessed file action	5
ftpLocalError	451	Requested action aborted - local process error	5
ftpInsufficientSpace	452	Action not processed due to insufficient space or file not available	3
ftpSyntaxError	501	Syntax error in parameters or topics	4
ftpCmdNotImplemented	502	Command not implemented	4
ftpBadSequence	503	Incorrect command sequence	4
ftpCmdNotImplementedFor-Param	504	Command not implemented for the specified parameter	4
ftpNotLoggedIn	530	Login failed	2
ftpNeedAccountForStoring	532	Account required to save files	2
ftpSSLRequired	534	Connection to server not possible because SSL is required	1
ftpFileUnavailable	550	Action not processed because the file is not available	3
ftpPageTypeUnknown	551	Action aborted because the page type is not recognised	5
ftpExceedStorage	552	Action aborted due to exceeding the save memory allocation limits	3
ftpFileNameNotAllowed	553	Action not processed because the file name is not valid	3
ftpIntegrityProtected	631	File integrity protection	4
ftpConfidentialityIntegrityPro-tected	632	File confidentiality and integrity protection	4
ftpConfidentialityProtected	633	File confidentiality protection	4

4.16.   SETUP Menu
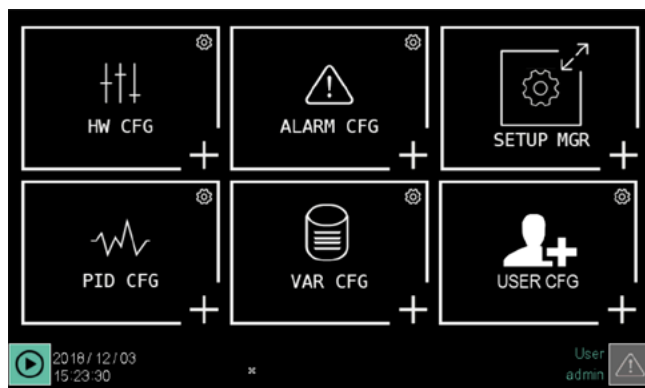
HW CFG sub-menu (page 85)
F-MIX and F-EU16 module configuration and exchanging terminals.

ALARM CFG sub-menu (page 89)
Alarm configuration.

SETUP MGR sub-menu (page 95)
Configuring pages and programs, managing configuration recipe and image management.
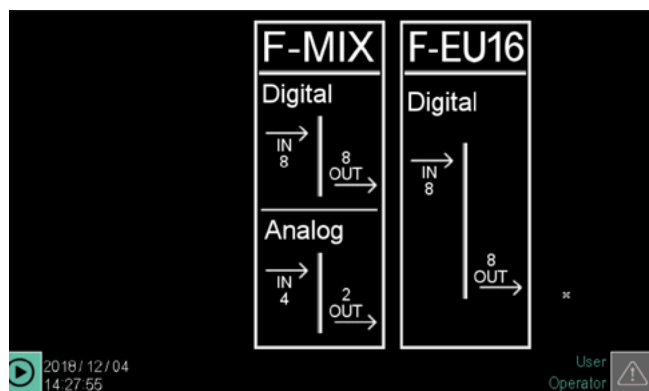
PID CFG sub-menu (page 95)
PID configuration.

VAR CFG sub-menu (page 102)
User variable configuration.

USER CFG sub-menu (page 102)
Creating new users.

4.16.1.   HW CFG sub-menu

To use this sub-menu, the user must be level 1 or 2.

The HW CFG sub-menu lets you to configure the F-MIX and F-EU16 controller modules. The number of keys displayed depends on its composition.

- ![icon]: lets you open the I/O terminal exchange page.
- **F-MIX**: lets you open the configuration page for all F-MIX modules (analog and digital). The first page to appear is the analog input configuration page.
- **F-EU16**: lets you open the configuration page for all F-EU16 modules (digital only). The first page to appear is the input configuration page.

4.16.1.1.   I/O terminal exchange
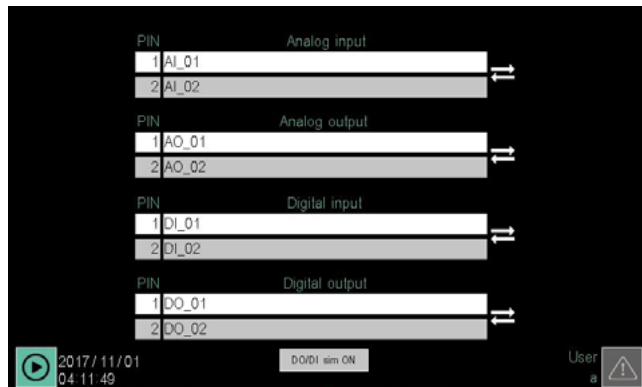
The page lets you to exchange two HW terminals, analog or digital (provided the same type), without any impact on the program and logic functions.

Four pairs are available: analog inputs, analog outputs, digital inputs and digital outputs.
Each row shows the terminal number and the name of the associated variable.

To make an exchange, choose one of the two pair variables one after the other by tapping the name of the variable and selecting it from the pop-up window that opens.
Then tap the ![icon] key to start the exchange.

The DI/DO sim ON button enables control of input by the external GetLogic tool

4.16.1.2. F-MIX analog input configuration

All module analog inputs are listed in the upper group, one per line. Each input is identified by its progressive number, which corresponds to that shown in the module wiring diagram (see paragraph "2.7. F-MIX module connection diagrams" on page 26).

Additional input configuration parameters are shown in the lower group.

- **F-MIX**: identification number of the module to be configured. It can be selected with the **+** key. In the module group, the F-MIX modules are numbered progressively, with the module next to the communication module assuming number 1.

- **F**: set Fahrenheit degrees as temperature unit of measure. Each time the unit of measurement is changed from °C to °F or vice versa, a confirmation window (shown below) is displayed on the corresponding automatic conversion of any temperature parameters involved.

When the conversion is confirmed, the system recalculates the following parameters in the appropriate unit of measurement:

-PID increase and decrease gradients: GRAD-INC and GRAD-DEC, if the LOOP is associated with an analogue temperature input

- LOOP limits: LOS-HIS and LOL-HIL, if the corresponding LOOP is associated with an analogue temperature input

- PID Set Point: SP parameter if the LOOP is associated with an analogue temperature input. The new SP value is however limited within the new range of values [LOL..HIL]]

- Scalar transformation parameters: ENG_MIN-ENG_MAX and ANA_MIN-ANA_MAX, if the analogue input is at temperature and at least one of these parameters is not null; otherwise the set of four numbers is left at 0

- MIN/MAX trend intervals: if the corresponding plotted variable is an analogue temperature inpu.

All PID parameters, possibly modified by the change of unit of measure, are however limited in the range of values [-3276.8..3276.7].

- **INx Type**: input type, which is selected from a pop-up

window. For further information see paragraph "10.4. F-MIX module" on page 178. The selected type is displayed in the **Type** field.

In addition to the types shown in the table (paragraph 10.4), a new "Unused" type has been added (new default value), representing a disabled input that does not read any value and does not produce any alarm.

In this state, the corresponding input stage is electrically configured as Voltage 0..10V.

When the type of an input is changed, if the input is linked to a LOOP, the system at the exit of the page proposes a window confirming updating of the limits of the LOOPs present.

In the sample image above, you can see the three possible states for updating LOOP limits.

If a LOOP is not linked to a modified input, a blank space appears; otherwise a button appears to confirm (green status) updating of the LOOP limits.

Updating of the PID limits consists of recalculating the HIS-HIL and LOS-LOL parameters with the values of the minimum/maximum ranges in the table in paragraph "10.4. F-MIX module" on page 178, taking into account the °C or °F setting, if the input is of the temperature type.

In the case of generic non-temperature input, the values of the engineering unit ranges 'Eng min' to 'Eng max' are used instead.

Following any update of the LOL and HIL parameters (due to a change of input type), the system limits the value of the PID SP in the new interval [LOL..HIL] if necessary.

⚠ **Warning!** The instrument must be restarted after making this change.

- **Name**: the variable name associated with the input. Touching the field opens the virtual keyboard where you can enter an identifying name as you like. The name must be unique for the entire controller and can be up to 16 characters long, chosen from a ... z, A ... Z. 0...9 and _. This name is used in creating programs, in all logical functions etc.

- **Offset**: Positive or negative deviation from analog channel reading. It is used to change the value read, for example, for precision calibration.

- **Value**: actual value read.

- **[mis]**: the temperature unit of measure, or other unit of measure set by choice in the case of it is not temperature.

- **Filter**: filters the input signal to mitigate sudden changes in the sampled value. When setting a number *n* In the Filter field, the controller assumes the average value between the last sampled value and the *n* previously sampled values. With Filter equal to 0, only the last sampled value is valid.

The following parameters are used for analog input calibration and conversion:
- **Ana PV**: points read by the board.
- **Ana min**: minimum number of points for calibration.
- **Ana max**: maximum number of points for calibration.
- **Eng PV**: resulting engineering unit.
- **Eng min**: minimum engineering unit for calibration.
- **Eng max**: maximum engineering unit for calibration.

For more information on calibration and linear conversion, see paragraph "7.3. Correction of linear inputs and outputs" on page 123.

- **D.P.**: set the number of decimal places (max 3) to display the value in engineering units. For temperatures, the precision is set to 1 decimal.

To configure the other module inputs and outputs, tap the key at the top of the screen.

Use the CFG CT button to access calibration of the dedicated inputs to the current transformers

4.16.1.3. Calibration of analogue input Current Transformer
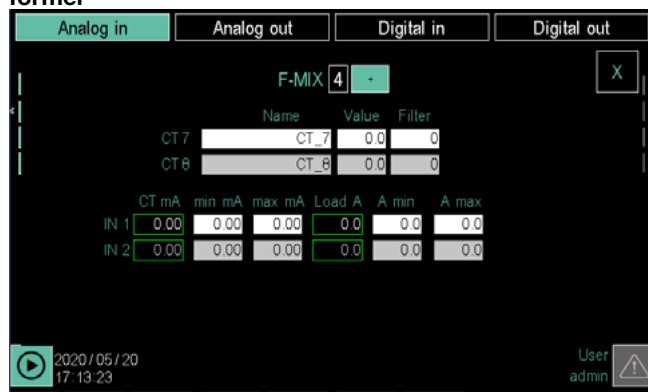
You can change the settings on the two inputs (present on each F-MIX card) for the current transformers (Current transformer CT).
The top part contains configuration parameters:
- F-MIX: number identifying the module to be configured. May be selected with the + button.
- Name: name to be assigned to the variable for use in the rest of the application.
- Value: value effectively measured.
- Filter: filters the input signal to mitigate sudden changes in the sampled value. When setting a number n In the Filter field, the controller assumes the average value between the last sampled value and the n previously sampled values. With Filter equal to 0, only the last sampled value is valid.

In the lower part are the configuration parameters for four-point calibration, described for the analogue IN card. The following parameters are used:
- **CT mA**: card reading in mA.
- **min mA**: minimum number of mA for calibration.
- **max mA**: maximum number of mA for calibration.
- **Load A**: Load amperes.
- **A min**: minimum current for calibration.
- **A max**: maximum current for calibration.

The CT number that appears next to the name is the one to be entered on the PID HB alarm page.
To go back to the analogue IN card, simply press the X button.

4.16.1.4. F-MIX analog output configuration
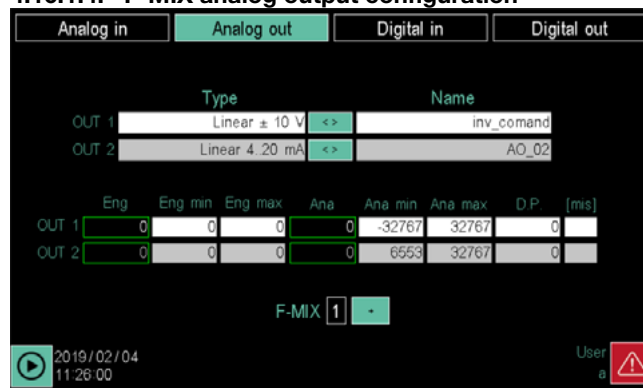
All the module analog outputs are listed in the upper group, one per line. Each output is identified by its progressive number, which corresponds to that shown in the module wiring diagram (see paragraph "2.7. F-MIX module connection diagrams" on page 26).
Additional output configuration parameters are shown in the lower group.

- **F-MIX**: identification number of the module to be configured. It can be selected with the **+** key. In the module group, the F-MIX modules are numbered progressively, with the module next to the communication module assuming number 1.
- **Type**: output type, which is selected by cyclically pressing the + key. For further information see "10.4. F-MIX module" on page 178.
- **Name**: the variable name associated with the output. Touching the field opens the virtual keyboard where you can enter an identifying name as you like. The name must be unique for the entire controller and can be up to 16 characters long, chosen from a ... z, A ... Z, 0 ... 9, and _. This name is used in creating programs and in logical functions.

The following parameters are used for linear calibration and conversion of the analogue output value:
- **Eng PV**: resulting engineering unit.
- **Eng min**: minimum engineering unit for calibration.
- **Eng max**: maximum engineering unit for calibration.
- **Ana PV**: points read by the board.
- **Ana min**: minimum number of points for calibration.
- **Ana max**: maximum number of points for calibration. For further information on calibration conversion, see paragraph "7.3. Correction of linear inputs and outputs" on page 123.

- **D.P.**: set the number of decimal places to display the value in engineering units.
- **[mis]**: unit of measure for values other than temperature, such as pressure or humidity.

To configure the other module inputs and outputs, tap the key at the top of the screen.

4.16.1.5. F-MIX digital input configuration
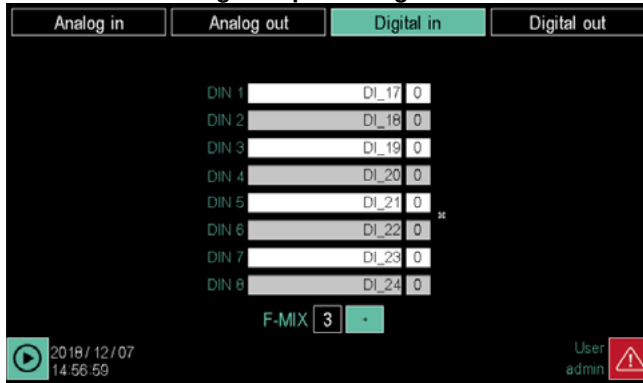
All module digital inputs are listed, one per line. Each input is identified by its progressive number, which corresponds to that shown in the module wiring diagram (see paragraph "2.7. F-MIX module connection diagrams" on page 26).
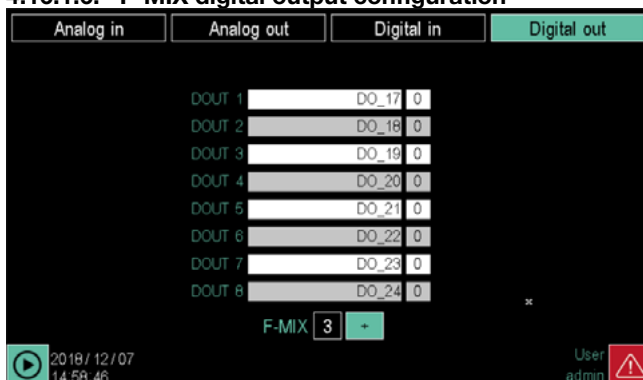
F-MIX: identification number of the module to be configured. It can be selected with the **+** key. In the module group, the F-MIX modules are numbered progressively, with the module next to the communication module assuming number 1.

The list contains the names of the variable associated with the respective input. The default name is **DI_*nn***, where ***nn*** is a sequential number calculated by the first F-MIX module (first all F-MIX modules are numbered, then F-EU16 modules). Touching the field opens the virtual keyboard where you can enter an identifying name as you like. The name must be unique for the entire controller and can be up to 16 characters long, chosen from a ... z, A ... Z, 0 ... 9, and _. This name is used in creating programs and in logical functions.

Digital inputs do not have parameters to configure.
The current status is displayed on the right, next to the name (0 = OFF, 1 = ON).

To configure the other module inputs and outputs, tap the key at the top of the screen.

4.16.1.6. F-MIX digital output configuration

All module digital outputs are listed, one per line. Each output is identified by its progressive number, which corresponds to that shown in the module wiring diagram (see paragraph "2.7. F-MIX module connection diagrams" on page 26).

**F-MIX**: identification number of the module to be con-

figured. It can be selected with the **+** key. In the module group, the F-MIX modules are numbered progressively, with the module next to the communication module assuming number 1.

The list shows the names of the variable associated with the output. The default name is **DO_*nn***, where ***nn*** is a sequential number calculated by the first F-MIX module (first all F-MIX modules are numbered, then F-EU16 modules). Touching the field opens the virtual keyboard where you can enter an identifying name as you like. The name must be unique for the entire controller and can be up to 16 characters long, chosen from a ... z, A ... Z, 0 ... 9, and _. . This name is used in creating programs and in logical functions.

Digital outputs do not have parameters to configure.
The current status is displayed on the right, next to the name (0 = OFF, 1 = ON).

To configure the other module inputs and outputs, tap the key at the top of the screen.

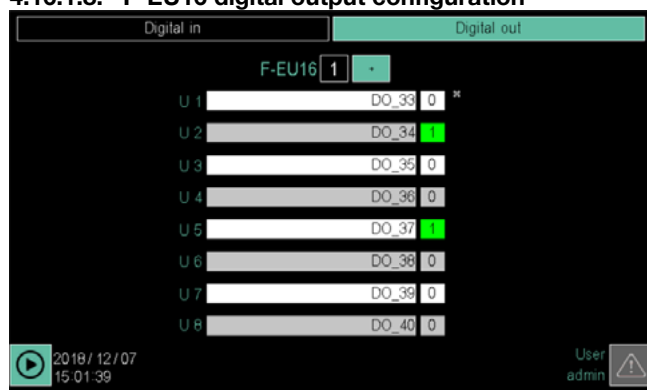### 4.16.1.7. F-EU16 digital input configuration
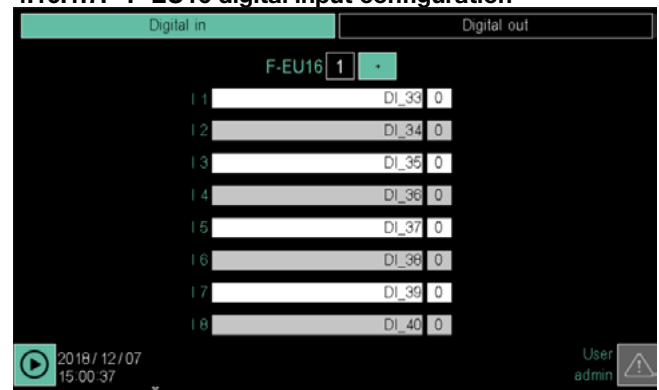
All module digital inputs are listed, one per line. Each input is identified by its progressive number, which corresponds to that shown in the module wiring diagram (see paragraph "2.8. F-EU16 digital I/O module connection diagram" on page 29).
The list contains the names of the variable associated with the respective input. The default name is **DI_*nn***, where ***nn*** is a sequential number calculated by the first F-MIX module (first all F-MIX modules are numbered, then F-EU16 modules). Touching the field opens the virtual keyboard where you can enter an identifying name as you like. The name must be unique for the entire controller and can be up to 16 characters long, chosen from a ... z, A ... Z, 0 ... 9, and _. This name is used in creating programs and in logical functions.

Digital inputs do not have parameters to configure.
The current status is displayed on the right, next to the name (0 = OFF, 1 = ON).

To configure module digital outputs, touch the **OUT digital** key at the top of the screen.

### 4.16.1.8. F-EU16 digital output configuration

All module digital outputs are listed, one per line. Each output is identified by its progressive number, which corresponds to that shown in the module wiring diagram (see paragraph "2.8. F-EU16 digital I/O module connection diagram" on page 29).

The list shows the names of the variable associated with the output. The default name is **DO_nn**, where **nn** is a sequential number calculated by the first F-MIX module (first all F-MIX modules are numbered, then F-EU16 modules). Touching the field opens the virtual keyboard where you can enter an identifying name as you like. The name must be unique for the entire controller and can be up to 16 characters long, chosen from a ... z, A ... Z, 0 ... 9, and _. This name is used in creating programs and in logical functions.

Digital inputs do not have parameters to configure.
Digital outputs do not have parameters to configure.
The current status is displayed on the right, next to the name (0 = OFF, 1 = ON).

To configure module digital inputs, touch the **IN digital** key at the top of the screen.

4.16.2. ALARM CFG sub-menu
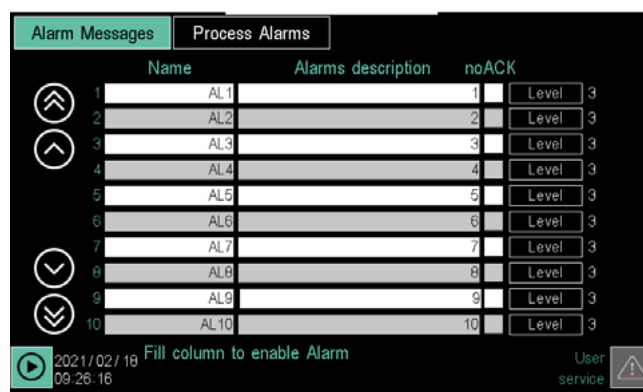
To set this sub-menu, the user must be level 1 or 2.

The level 0 user will have access to the sub-menu in read-only.

The ALARM CFG sub-menu lets you configure controller process alarms.

Process alarms work and are independent of PID operations or enabling. They can therefore be used even if the PIDs are off and with variables not connected to the process control.

The following two sections are used to set the aforementioned alarms:

• Alarm messages

• Process Alarms

4.16.2.1. Variable Configuration and Alarm Messages
This section allows you to define the alarm variables with their characteristics.

Each row in the list represents an alarm. The list can be scrolled using the buttons on the left of the display:

• and move the list by 3 events;

• and move the list by 10 events.

The following parameters can be set for each alarm:

• **Name**: name of the variable that identifies the alarm. The name must be unique for the entire controller and can be up to 16 characters long, chosen from a ... z, A ... Z, 0 ... 9, and _.

• **String**: descriptive text message that can be displayed when the alarm variable switches ON. Text can be up to 32 characters long.

• **noACK**: disables automatic ACK, meaning the alarm is automatically cleared when the conditions that triggered it no longer exist. If the field is not selected, the alarm is manually managed meaning the alarm is cleared by operator confirmation, called ACK.

• **Level**: indicates the alarm order of importance (5 =

4. CONFIGURATION

most important, 1 = least important). Touch the button to cyclically change the value from 1 to 5. The most important alarms are displayed first and, if the event of several alarms, grouped by levels (first all those in level 1 then all those in level 2 and so on).
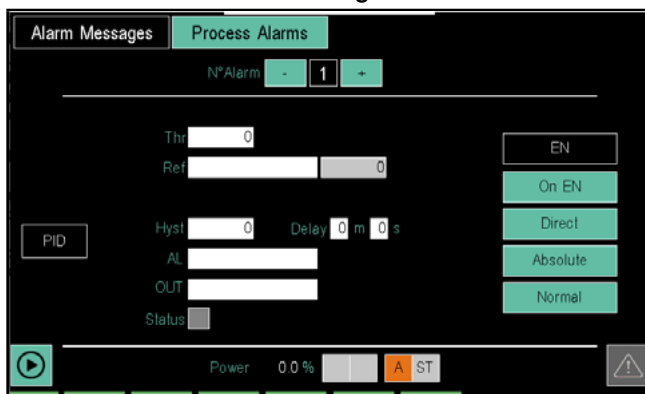
⚠️**Caution!** The alarm can be used once the default name has been changed, or when the String parameter is different from the empty string.

ACK may only be given using the appropriate button on the active alarms page.

For Name and String, touch the field to open the virtual keyboard to enter text.

4.16.2.2. Process Alarm Configuration

This section lets you set process alarm parameters.

The number of the alarm to be configured is displayed at the top of the screen and can be changed:

- with the - and + buttons.
- editing the desired values
- or through the Right Arrow\Left Arrow keys both physical and VNC

Turn the alarm on and off with the EN button. The button turns green when the alarm is enabled.

The value can be entered with the virtual keyboard by touching a number of parameters.

The available parameters are:

- **Thr**: alarm threshold, that can be relative or absolute.
- **Ref**: reference to be compared with the alarm threshold.
- **Hyst**: alarm hysteresis.
- **Delay**: alarm activation delay, expressed in minutes and seconds.
- **AL**: allows you to select one of the alarm variables

defined in the "Alarm messages" section. This way the alarm is also associated with a string.

⚠️**Caution!** Failure to assign this variable will prevent the alarm signal from appearing in the list of active alarms and in the alarm log.

- **OUT**: lets you select a digital variable, excluding digital inputs, that will be turned on (ON) when an alarm is triggered and turned on (OFF) without one.
- **Stato**: LED that displays alarm status (red = alarm, grey = no alarm).

For variable names, the list can be scrolled using the buttons on the right of the display:

- ⊙ and ⊙ move the list by 3 variables
- ⊙ and ⊙ move the list by 10 variables.

You can also jump directly to specific points in the list by touching the alphabetic directory keys. When the key is marked with two characters or digits (for example, A0, B1, etc.) quickly touch the key twice to jump to the second character. The sp button means "space".

Once you see the variable, touch it to select it.

The CLEAR button deletes any variable in the field and closes the window; the field becomes empty.

Touching the X at the top right corner closes the window without confirming any selections.

Touch the buttons on the right to turn the function or operating mode on or off (the green light on means it is enabled).

The settable modes are:

- **On EN / On DIS**: the parameter sets alarm behaviour when the instrument is turned on. If the parameter is "On EN" then, if the process variable exceeds the limits of the alarm threshold, the alarm will go off when the controller is turned on. If the parameter is "On DIS" then the alarm will not go off until the alarm threshold value has been intercepted at least once since the controller was turned on

- **Direct/Reverse**: with Direct, a reference higher than the alarm threshold triggers the alarm, with Reverse, the alarm is triggered when the reference is lower than the alarm threshold.

- **Absolute/Relative**: with Absolute, the reference is compared to a constant alarm threshold. With Relative the reference is compared with the dynamic THRESHOLD linked to the variable set in the **Rel Alarm ref** parameter plus any **Offset** . By default the variable set is the PID Setpoint..

- **Normal/Symmetric**: if Symmetric is selected, a double symmetric alarm threshold is set compared to the reference

Power displays the percent power calculated at that time by the PID and if used for heating (red LED) or cooling (blue LED).

It is possible to jump directly to the respective configuration page by pressing the PID button. The button will be included if the Controller function is available.

Type	Group	Variable name	Use	Description
Boolean	System	PRCS_AL_*n*	R	State of the n-th process alarm. n can range from 1 to 64.
Register	System	PRCS_AL_THR_*n*	RW	Value of the alarm threshold associated with the n-th process alarm. n can range from 1 to 64.

4.16.3. SETUP MGR sub-menu
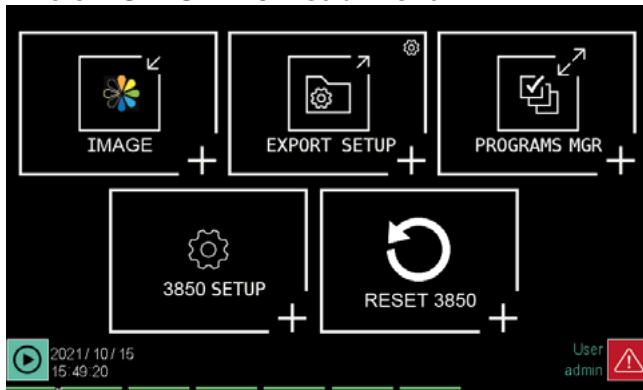
In order to use this sub-menu, the user must have login and edit privileges (SERVICE and ADMIN levels by default).

The SETUP MGR sub-menu keys let you:
- *controller_model* **SETUP**: set up controller pages and programs.
- **SETUP MGR**: manage configuration recipes.
- **IMAGE**: manage images for custom pages.
- **RESET** *controller_model*: reset the controller to factory settings.
- **PROGRAMS MGR**: gestire il trasferimento su USB e la cancellazione dei programmi su disco interno

4.16.3.1. 3850\2850 SETUP

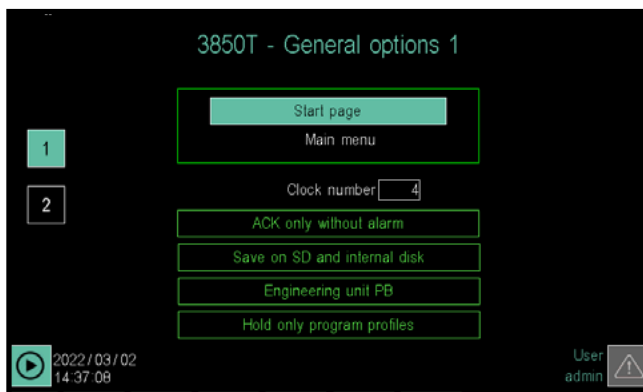**Configuration pages** page 1 lets you set up controller pages. The available parameters are:
- **Home page**: the page displayed when turned on. The currently selected page is displayed under the key. Touch the key to open a selection pop-up window. The possible options are:
  - **StartProgr**: programmer home page. For further information, see paragraph "4.3. Monitor Program" on page 38.
  - **Menu**: Main menu page.
  - **PID (2)**: 2 PID monitor page. For further informa-

tion, see paragraph "4.12. LOOP Menu" on page 49.
  - **PID (1)**: 1 PID monitor page. For further information, see paragraph "4.12. LOOP Menu" on page 49.
  - **Trend**: page with real-time graph of 8 records. For further information, see paragraph "4.13.2. TREND sub-menu" on page 51.
  - **Alarm**: triggered alarm page.
  - **USB exp**: log file export page to USB key. For further information, see paragraph "4.13.3. EXPORT sub-menu" on page 53.
  - **Prog**: running program page.
  - **Step**: programmer segments.
  - **W clock**: weekly clock page. For further information, see paragraph "13.1.6. Weekly clock" on page 192.
  - **Custom x**: If the custom page set in the "Start Page" parameter does not contain at least one graphic element, the Main Menu will be displayed as the start page.
- **Number of clocks**: field where you can specify the maximum number of asynchronous weekly clocks (1...4), using the virtual keyboard.
- **ACK**: determines ACK behaviour (acknowledgement). There are 2 possible behaviours: ACK always possible or ACK only possible without alarms.
  ACK can be used, for example, to confirm having viewed an alarm and reset its display.
- **PB UM**: defines the proportional band unit of measure that can be in tenths of a degree or range percentage (where the bottom of the scale is defined as the difference between the HIS and LOS parameters).
- **Saving on internal disk and SD card**: if this option is active, you have the security of double saving, on the internal disk and the SD card.
- **Pause only for program profiles**: determines whether or not the pause is also activated for recordings of the sampled variables associated with the programs, when a program is paused.

Opening the second page of device options provides access to program section configuration options and further general options.
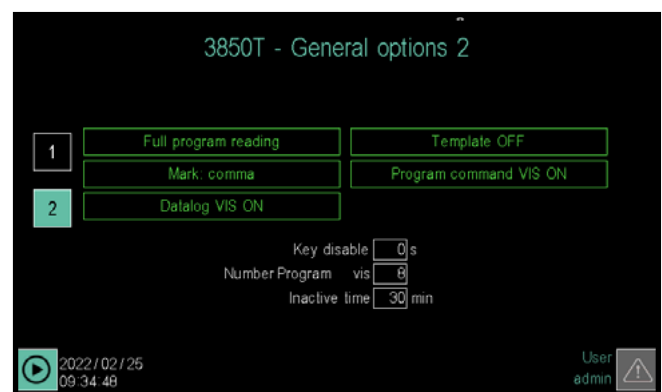
To change a settings, simply touch the relevant field. The available parameters are:
- **Program read**: determines whether programs are partially or fully read. In partial reading, only the temperature profile, made up of segments with name, setpoint, alarms and HBB tied to the step, is read. The "basic programme" parameters remain the same as in the

basic programmes for each zone (CFG_ZONE_n), as do the reporting parameters.

- **Template ON/OFF**: determines template on mode where all programs are derived from the reference program called TEMPLATE. For further information on templates, see paragraph "7.2. Building programs with default segments (TEMPLATE)" on page 122.
- **Decimal mark, comma/dot**: determines the decimal separator choice: comma or dot.
- **Program commands visibility**: determines whether START, STOP, PAUSE and SKIP commands are visible from the programmer home page.
- **VIS Datalog**: determines access to the Datalog page. The possibilities are:
  - ON: the datalog page is visible to all users set as authorised in the GF_eXpress users section
  - Admin: the page is only visible to administrator users
- **Segment setpoint visibility**: at level 0 and 1, determines visibility of setpoints for each segment in the programme, during programme creation. SPs may be changed when you go into the step configuration page.
- **No. visible prog**: determines the number of programs visible to the user (from 1 to 4 for model 2850T and from 1 to 8 for model 3850T).
- **Key disable**: possibility of disabling physical keys by simultaneously pressing the ⬅ and ➡ keys for the indicated amount of seconds (0 = physical keys enabled).This key lock only works in the GetView pages, and locks users in customized pages so that they can only get out of them with the appropriate link and get back into them with the physical button returning to GetView.
- **Downtime:** minuti minutes of inactivity leading to automatic logout (0 = no logout)
- **Monitor page access**: determines the minimum access level required to open the "monitor" menu.
- **Service page access**: determines the minimum access level required to open the "service" menu.
- **Setup page access**: determines the minimum access level required to open the "setup" menu.
- **Prog reading lev**: determines minimum user level for loading and executing programmes. At 0, these operations can be performed by users with a minimum level of 0, while with 1 the user must be at least level 1.
- **Prog creation lev**: determines the minimum user level to create programs. With 0, user level 0 can create programs, with 1 user level 1 can create them.

To open page 1, simply touch its number or use the keyboard ⬅ and ➡ keys.

	Access level	
	1	**0**
Read lev=0 Creation lev=1	Create new programs yes Duplicate programs yes Modify programs yes (all except LOGICS) Load in memory yes Delete from memory yes	Create new no Duplicate no Modify no Load in memory yes Delete from memory yes
Read lev=0 Creation lev=2	Create new no Duplicate no Modify no (modify SP, E REPORT, but not BASIC E LOGIC) Load in memory yes Delete from memory yes	Create new no Duplicate no Modify no Load in memory yes Delete from memory yes

Read lev=1 Creation lev=1	Create new yes Duplicate yes Modify yes (all except LOGICS) Load in memory yes Delete from memory yes	Create new no Duplicate no Modify no Load in memory no Delete from memory no
Read lev=1 Creation lev=2	Create new no Duplicate no Modify no (modify SP E REPORT, but not BASIC E LOGIC) Load in memory yes Delete from memory yes	Create new no Duplicate no Modify no Load in memory no Delete from memory no

4.16.3.2. SETUP MGR
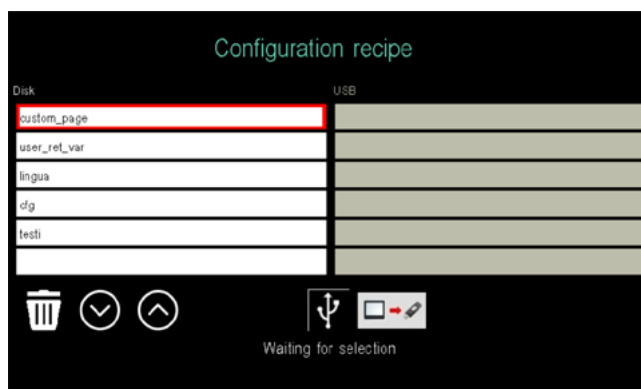
The **Configuration recipe** page lets you transfer configurations from the controller to a USB key and vice versa, or delete them. This way, you can clone a typical configuration on other controllers or make a back-up copy of the current configuration, to be safe or as a precaution before changing the running configuration.

The column on the left lists the configuration files saved in the controller, the one on the right the configuration files in the USB key.

The various configurations are stored in files with standard names, listed in the following table.

File name	Content
user_var_ret	Retentive system memory
language	Translatable strings
text	Non-translatable strings
cfg	1. PID parameters 2. Internal simulator configurations 3. Analog input/output scaling 4. Comma management combined with virtual analog variables (register, ret register, etc.) 5. Unit of measure management combined with variables 6. All instrument configurations are associated with their use modes (number of clocks, home page, program operating mode, etc.) 7. Graph range, both real-time and log
custom_page	Custom page

To select a configuration file just touch its name; the con-

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tour of the corresponding row is highlighted. The icons and buttons are used to:

⊗ Scroll down the list.

⊙ Scrolls the list upwards.

🔌 Indicates that a USB key is connected to the controller.

▭→✎ It transfers the selected file from the USB key to the controller memory.

▭→✎ Moves the selected file from the controller memory to the USB key.

🗑 Deletes the selected file in the list above.

4.16.3.3. IMAGE

Images

The **Image** page allows you to transfer images from a USB key to the controller and vice versa, or erase them.
The images can be used in custom pages, as simple images or in two-state keys (key pressed and key not pressed). Images can have dimensions up to 320 x 240 pixel for model 2850T and 800 x 480 pixel for model 3850T.

Images to be loaded must be in **.plk** format which is a Gefran proprietary format.
Images in this format are authomatically made from GF_ eXpress configurator during download.

By inserting the USB key, the left column lists the images stored in the controller, the right one containing the images in the USB key.

To select an image, just touch its name; the contour of the corresponding row is highlighted.
The icons and buttons are used to:

⊗ Scroll down the list.

⊙ Scrolls the list upwards.

🔌 Indicates that a USB key is connected to the controller.

▭→✎ It transfers the selected image from the USB key to the controller memory.

▭→✎ Moves the selected image from the controller memory to the USB key.

🗑 Deletes the selected image in the list above.

4.16.3.4. "Controller model" RESET
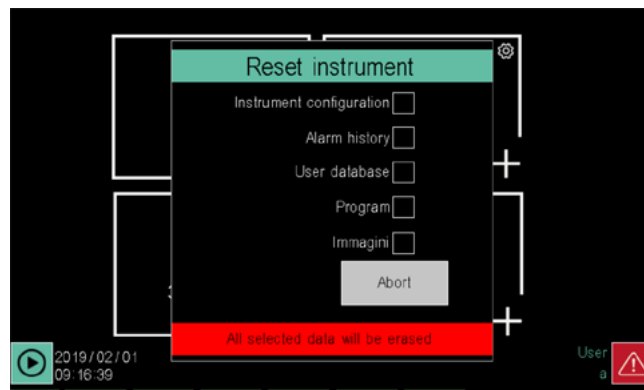
Reset instrument

The **Reset instrument** page lets you delete log, configuration or program files.
Select the files to be deleted:
- **Instrument configuration**: all configurations are deleted and the controller returns to factory settings.
- **Alarm history**: Datalogs and alarm logs are deleted.
- **User Database**: all users are deleted.
- **Program**: all programs are deleted.
-

The **Reset** button deletes data, and the **Cancel** button closes the window without doing anything.

⚠ **Warning!**The reset operation is not reversible. Once deleted, data cannot be recovered unless you have an external back-up copy.

4.16.3.5. PROGRAMS MGR sub-menu
In order to use this sub-menu, the user must have login and edit privileges (SERVICE and ADMIN levels by default).

The PROGRAMS MGR sub-menu allows you to transfer programs from a USB key to the controller and vice versa, or erase them.

Some programs, such as ZERO, TEMPLATE and ZONE_ CFG_n, cannot be deleted from the internal disk, as they are indispensable for instrument operations.

By inserting the USB key, the left column lists the recipes stored in the controller, the right one containing the recipes in the USB key.

To select a recipe just touch its name; the contour of the corresponding row is highlighted.

The icons and buttons are used to:

⊗ Scroll down the list.

⊙ Scrolls the list upwards.

🔌 Indicates that a USB key is connected to the controller.

▭→✎ It transfers the selected file from the USB key to the controller memory.

▭→✎ Moves the selected file from the controller memory to the USB key.

🗑 Deletes the selected file in the list above.

4.16.4. PID CFG sub-menu

In order to use this sub-menu, the user must have login and edit privileges (SERVICE and ADMIN levels by default).

4.16.4.1. PID configuration procedure

The new PID configuration procedure is the following:
1. Log in as a Level 2 user.
2. Select the Synoptic section and set the PID operating type: normal, cascade, valve or ratio.
3. Select the Variable section to link variables to inputs and outputs.
4. Select the Alarm section to set PID alarms.
5. Select the Base section to enter all PID base parameters. This section is made up of several pages accessible via the drop-down menu that opens by clicking on the Base label.

The page configuration sequence is specifically in reverse order because the Base/Alarm/Variable/Synoptic order reflects the order of importance of parameters when edited in an existent PID.

4.16.4.2. PID base configuration

The Base section lets you set PID base parameters. To open the base parameter page, double-click the **Base** button and select **Base** from the drop-down menu. The Base page can be opened from other pages in the Base section by touching key 1 on the left.

The number of the PID to be set is displayed at the top of the screen and can be changed using the **-** and **+** keys. Turn the PID on and off with the **EN** button. The key turns green when the PID is enabled.

The value can be entered with the virtual keyboard by touching some parameters.
The available parameters and functions are:
- **NOME LOOP:** can be customised (max 12 characters). The string will then appear in the LOOP page, and in the Monitor of the programs associated with the PID.
- **RATIO**: indicates the value of the ratio and is only displayed if Ratio operations were set in the Synoptic menu.
- **C.SP (Cooling setpoint compared to the heating setpoint):** The parameter shows and sets the cooling setpoint as a percentage change with respect to the heating setpoint. The value is expressed as a percentage and can be set in the range -25.0%… + 25.0% with respect to the full scale value of the main or auxiliary input. Negative values of the C.SP superimpose the cooling action on the heating one.
- **SP**: setpoint, value to be reached and maintained.
- **PV**: process value, current value (read only).

- **Gruppo**: group of PID parameters used for regulation, chosen from the 10 available. Groups are used to preconfigure sets of operating parameters so they can easily be called up. Their principal use is in combination with the programmer, in which the regulation unit can be chosen for each segment The number of parameters available to groups is limited to those regarding PID control for heating and/or cooling. Specifically, CTR (regulation type), DEAD BAND, PB (both hot and cold), IT (both hot and cold), DT (both hot and cold). The parameters for all groups are overwritten at the end of the self-tuning process.
- The group will be set to 1 at the time of start-up.
- **PID / ON-OFF**: touch the key to alternatively enable automatic regulation (PID) or ON-OFF.
- **HEAT**: turns the heating function on (green) or off.
- **COOL**: turns the cooling function on (green) or off.
- **CT s** : Cycle time, that is, the duration of the digital output cycle. If set to 0, cycle time is as short as possible (Burst Firing mode); otherwise, it will be the time shown in seconds. Available separately for Heat and Cool functions.
- **PB**: Proportional band, meaning the proportional band used for PID regulation. Available separately for Heat and Cool functions. In the case of ON/OFF control, this parameter represents hysteresis (HYS)
- **IT m**: Integral time, meaning the integral time used for PID regulation. Available separately for Heat and Cool functions. The parameter is not displayed if manual or ON-OFF regulation is enabled.
- **DT m**: Derivative time, meaning the derivative time used for PID regulation. Available separately for Heat and Cool functions. The parameter is not displayed if manual or ON-OFF regulation is enabled.

Note

If you choose Burst Firing management (CT=0.0), digital outputs will be controlled (with On and Off times of no less than 100 ms) to distribute dispensation of the required power as uniformly as possible and in as little time as possible. If you choose a cycle time other than zero, on the other hand, control of the On and Off times of digital outputs will be managed simply to ensure that the ratio with the selected CT time corresponds to the required power. In this way, digital outputs may be controlled for times of no less than 25ms.

If, for example, we wish to deliver power at 50.0% with CT=0.0, the outputs will be On for 100ms and Off for 100ms. At 75.0% power, they will be 300ms On and 100ms Off, followed immediately by another 300 ms On, and so on.

In the case of CT=10.0s, on the other hand, at 50.0% we will have a period of 500ms On and another 500ms Off. With power at 75.0% it will be 7500ms On and 2500ms Off, followed by another 7500ms On, and so on.

Power displays the percent power currently in use or if used for heating or cooling.

The value indicated therefore represents the amount of power truly delivered on the physical outputs of the instrument, considering the evental contributions of the parameters GRAD OUT and the SOFT START.

The pure Power % calculated by the PID algorithm is available on the page BASE2 and in the PID_nn_MAN variables.

The **A / M** icon indicates whether the operating mode is automatic (A) or manual (M).

The **ST** icon light turns on during self tuning.

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4.16.4.3. PID advanced configuration
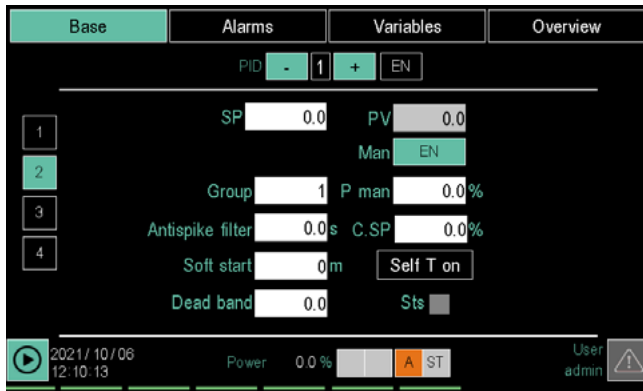
The Base 2 section lets you set PID advanced parameters.

The number of the PID to be set is displayed at the top of the screen and can be changed using the **-** and **+** keys. Turn the PID on and off with the **EN** button. The key turns green when the PID is enabled.

The value can be entered with the virtual keyboard by touching some parameters.
The available parameters and functions are:

- **RATIO**: indicates the value of the ratio and is only displayed if Ratio operations were set in the Synoptic menu.
- **SP**: setpoint, value to be reached and maintained.
- **PV**: process value, current value (read only).
- **Group**: group of PID parameters used for regulation chosen from the 10 available. The groups are used to preconfigure sets of operating parameters that can easily be called up. Their principal use is in combination with the programmer, in which the regulation unit can be chosen for each segment. The number of parameters available to groups is limited to those regarding PID control for heating and/or cooling.Specifically, CTR (regulation type), DEAD BAND, PB (both hot and cold), IT (both hot and cold), DT (both hot and cold). The parameters for all groups are overwritten at the end of the self-tuning process. The group will be set to 1 at the time of start-up.
- **Man**: touch the key to enable or disable manual regulation. The key turns green when on.
- **P man**: percent power that can be set in manual mode. This percentage remains identical to the automatic power when the PID is not in a manual mode. Otherwise, it can be set. The PID_MAN_POW_n variables allow you to manage this parameter in GETlogic and GETview
- **Antispike filter**: antispike filter representing the minimum duration of an ON or OFF impulse on digital outputs, measured in seconds. This parameter is not displayed if manual control or burst firing control (with CT set to 0) is enabled.
- **Soft start**: enables gradual initial power distribution. If enabled (value other than 0), the next time the instrument is turned on power will not be deliverable at 100% right from start-up, but will follow a time ramp set in minutes.
  For example, set 10 minutes to achieve: 1 minute after turning on, maximum power will be 10%, after 5 minutes it will be 50% and maximum power will be reached after 10 minutes. The power shown in the

page PID cfg reveals the effective power delivered at that time on the physical outputs of the PID. The power calculated by the PID algorithm alone is available in the BASE2 page and in the PID_nn_MAN variables.
- **Dead band**: Symmetric dead band around the SETPOINT where the PID does not change power distributed (unless derivative action). The parameter is not displayed if manual regulation is enabled. Proportional band calculation is reconstructed on the basis of dead band. When we enter dead band, global control will also change slightly.
- **Self T on**: touch the key to enable Self Tuning, meaning a one-shot procedure to be run with start from room temperature. If the difference between PV and SETPOINT is smaller (in absolute terms) than 5% of the bottom of the scale (HIS-LOS), self-tuning cannot be activated. The key turns green when on. The parameter is not displayed if manual regulation is enabled. The Self Tuning process modifies the parameters of all 10 parameter groups.
  Self tuning consists of assessment of response to system step, calculating control parameters which optimise power delivery. The Self Tuning phase starts providing the max power untill the PV reaches a value in the middle between the starting value and the setpoint, than the power is switched off and it is evaluated the overshoot of the system. This function is also available via the variable PID_n_SELF_CMD
- **Sts**: self tuning status, indicated by a red LED when on. The parameter is not displayed if manual regulation is enabled. Self tuning status is also available via the variable PID_n_SELF_STS.

Power displays the percent power calculated at that time by the PID and if used for heating (red LED) or cooling (blue LED).

4.16.4.4. PID limit configuration
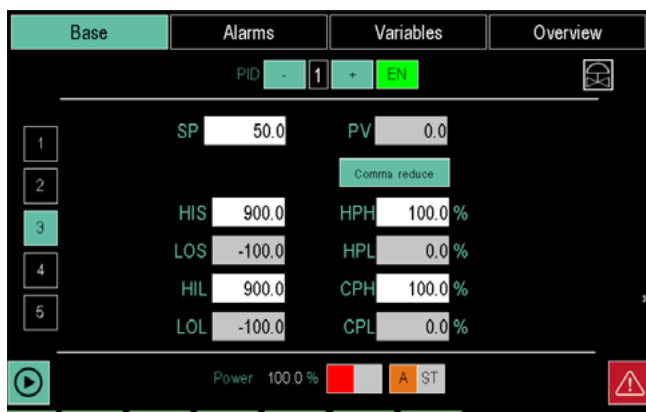
The Base 3 page lets you set PID limits.

The number of the PID being examined, which may be changed using the - and + buttons, appears at the top of the screen.

Turn the PID on and off with the **EN** button. The key turns green when the PID is enabled.

The value can be entered with the virtual keyboard by touching some parameters. The available parameters are:

*   **RATIO**: indicates the value of the ratio and is only displayed if Ratio operations were set in the Synoptic menu.
*   **SP**: Setpoint, value to be reached and maintained.
*   **PV**: Process value, current value (read only).
*   **Comma Red**: shows, in display only mode, PID parameters with one less decimal place than the Process Value variable. Therefore, this operation does not affect controller precision. The key turns green when Comma Red is enabled.
*   **HIS**: Upper range limit.
*   **LOS**: Lower range limit.
*   **HIL**: Maximum settable set point.
*   **LOL**: Minimum settable set point.
*   **HPH**: Maximum power limit in heating.
*   **HPL**: Minimum power limit in heating.
*   **CPH**: Maximum power limit in cooling.
*   **CPL**: Minimum power limit in cooling.

Power displays the percent power calculated at that time by the PID and if used for heating (red LED) or cooling (blue LED).

4.16.4.5. Configuration of PID Gradient
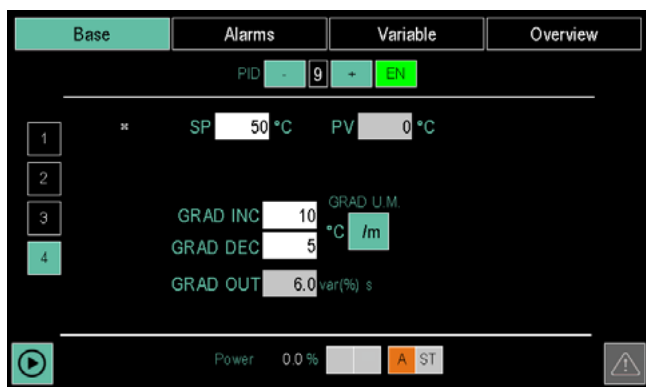
The gradient page is used to set a gradient on variation of the PID SetPoint or variation of power.
There are two parameters for gradient on variation of the SP:

*   **GRAD INC**: SP increase gradient
*   **GRAD DEC:** SP decrease gradient You can also control the PID output power gradient with the parameter:
*   **GRAD OUT:** gradient of the variation in output power, acting on the variation of delivered power (%) per second and active all the time unless the PID is of the VALVE type.

If GRAD INC and GRAD DEC are used, the SSP variable will show the current set point. GRAD OUT has no effect if the PID is of the VALVE type.

GRAD INC and GRAD DEC are expressed in the units of measurement of the PV / seconds or minutes. The time base may be set by pressing the appropriate button. GRAD OUT is expressed as a percentage.

These parameters are only active when PID is set to automatic, Self Tuning is disabled and there is no active programmer for the PID in question.

4.16.4.6. PID valve configuration
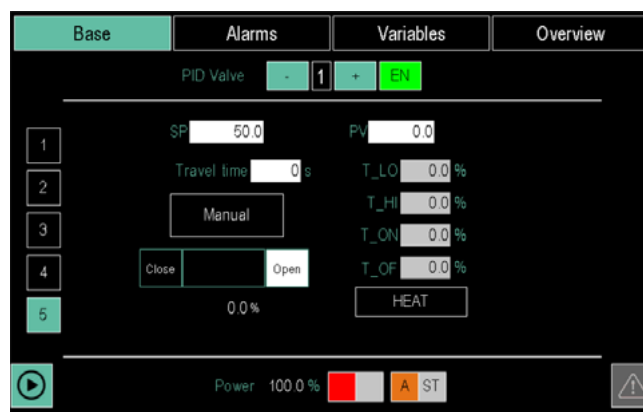
The Valve page lets you configure valve control. This type of control is compatible with both regulation in cascade and regulation as a ratio. The page only opens if Valve mode was set in the Synoptic page for the PID.

To open the valve page, double-click the **Base** button and select **Valve** from the drop-down menu. The Valve page can be opened from other pages in the Base section by touching key 4 on the left.

At the top of the screen is the number of the PID under examination, which may be changed using the - and + buttons.

Turn the PID on and off with the **EN** button. The key turns green when the PID is enabled.

The value can be entered with the virtual keyboard by touching some parameters.
The available parameters are:

*   **SP**: Setpoint, value to be reached and maintained.
*   **PV**: Process value, current value (read only).
*   **travel time**: indicates the time, in seconds, the valve motor requires to move it from the "fully closed" to "fully open" position or vice versa.
*   **Man**: touch the key to enable or disable manual regulation. The key turns green when on.
*   **T_LO**: Minimum pulse: expressed as a percentage (with a resolution of 0.1%) of the actuator time, it

4. CONFIGURATION

represents the minimum valve position variation corresponding to the minimum power variation provided by the controller (power under which the actuator does not respond physically to the command).
Increasing T_LO decreases the wear of actuator to the detriment of positioning precision. The minimum pulse duration can be set in T_ON as a percentage of the actuator time. When you set T_LO, the same value is automatically set in T_ON.

- **T_HI**: Impulsive tripping threshold: expressed as a percentage (with resolution of 0.1%) of the actuator time, it represents the deviation of position (required position - real position) under which the switching request becomes impulsive.
  T_HI is only active with T_OF = 0. The kind of impulsive approach allows fine control of the valve position, which is useful especially in cases of high mechanical inertia.
- **T_ON**: is the minimum time of the control valve pulse expressed as a percentage of the actuator time. You should set T_ON to the same value as T_LO.
- **T_OF**: is the minimum time between two valve ON commands expressed as a percentage of the actuator time.
  Setting T_OF = 0 excludes the function.
  Setting T_OF ≠ 0, valve switching becomes impulsive throughout the position deviation (pulse ON Time = T_ON and OFF time = T_OF). A value set in T_OF <T_ON is forced to T_ON.

A bar graph displays the level of valve opening, even in percent. 0% means valve fully open, 100% valve fully closed.
Warning! The valve opening indication is linear, a percentage value of the total valve travel time, result of a pure linear calculation.
The opening reading is real at the travel limits and in the middle.
In order to have a real information about the phisical position of the valve on all the travel, so the real opening for the fluid flow, a position feedback signal must be used.

Power displays the percent power calculated at that time by the PID and if used for heating (red LED) or cooling (blue LED).
Heat/Cool selects the valve operating mode: Heat controls a heating valve, Cool a cooling valve.
Valves without feedback should e used only if their flight time is greater than 5 seconds. Under this time, estimate resolution is worse than 0.5%

4.16.4.7. PID HB alarm configuration

The HB alarm section lets you set HB alarm parameters. To open the alarm page, double-click the **Alarms** button and select **HB** from the drop-down menu. The HB page can be opened from other pages in the Alarms section by touching key 2 on the left.

The number of the PID to be set is displayed at the top of the screen and can be changed using the **-** and **+** keys. The value can be entered with the virtual keyboard by touching some parameters.
Note: One (single phase load), two (three-phase load) or no CT (current transformer o CT trasformatore amperometrico) can be associated with each PID based on needs and for all available CT (the total number of CT is equal to the number of F-MIX modules × 2).

The available parameters are:
- **CT 1 number**: number of the first CT associated with the PID.
- **CT 2 number**: number of the second CT associated with the PID.
- **low on**: current absorption value under which the HP alarm triggers when the control output is ON.
- **hig on**: current absorption value over which the HP alarm triggers when the control output is ON.
- **time**: minimum time when exceeding LOW_ON, HIG_ON and HI_OFF must be valid before the HB alarm triggers.
- **hig off**: current absorption value over which the HP alarm triggers when the control output is OFF.
- **AL**: lets you associated an alarm to HB alarm detection.
- **OUT**: lets you associate any digital variable (except input digital variables) to the HB signal.

Management of HB alarms
Single-phase load: there is only one current signal, so its management is simple. Simply enter the security band for ON current and the maximum limit for OFF current. Take into consideration that not only a failure (or deterioration) of loads can cause a variation in current, but also oscillation of line voltage. You should therefore set thresholds with a certain amount of margin, capable of "tolerating" oscillation in the power supply.

Three-phase load:
With a three-phase system you will need to set 2 CTs.
Let us consider the case of a symmetrical, balanced three-phase system with balanced loads.

CASE 1) **closed triangle** load, a failure in a resistance (open circuit) generates a drop of about 42% in current on other branches. So if there is a failure, at least one CT will show a drop in current of about 42%.

CASE 2) load is **star without neutral,** a failure in a resistance generates total absence of current on the phase connected with the faulty resistance, and a drop of about 13% in the other two phases.

And so in case 1, the variation in current will be easy to see with good sensitivity in at least one CT. Even if the system is not ratiometric with line voltage, its nominal fluctuation (+10%/-10%) will NOT create false alarms. In conclusion, the breakage of a resistance is always detected by setting the threshold LOW_ON>58%. This means we can practically reach 70% (with no risk of false alarms due to line
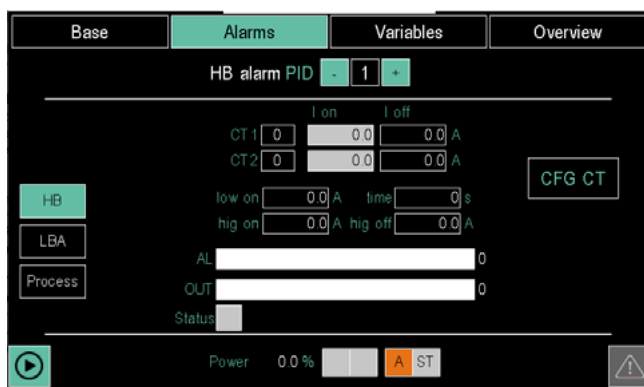
variations).

In case 2, seeing as the CT may not be connected to the faulty line (where the fault is evident), it will be necessary to tighten the alarm threshold and set LOW_ON>87%. As the system is not ratiometric with line voltage, fluctuation of (+10%/-10%) can result in false alarms. It is therefore suggested that you set the value of LOW_ON to 90% (with a slight risk of false alarm due to the line if it drops by 10%).

To ensure secure interception of the failure under any conditions, independently of changes in voltage, use of 3 TAs will be necessary,

Through logical functions and the available CT variables (if the system configuration has at least 3 CTs), you can check that each line does not go down to zero (a clear fault condition). In this way you are immune to line oscillation.

For variable names, the list can be scrolled using the buttons on the right of the display:

[icon] and [icon] move the list by 3 variables;

[icon] and [icon] move the list by 10 variables;

You can also jump directly to specific points in the list by touching the alphabetic directory keys. When the key is marked with two characters or digits (for example, A0, B1, etc.) quickly touch the key twice to jump to the second character. The **sp** button means "space".

Once you see the variable, touch it to select it.

The **CLEAR** button deletes any variable in the field and closes the window; the field becomes empty.

Touching the X at the top right corner closes the window without confirming any selections.

Power displays the percent power calculated at that time by the PID and if used for heating (red LED) or cooling (blue LED).

4.16.4.8.   LBA Alarm Configuration
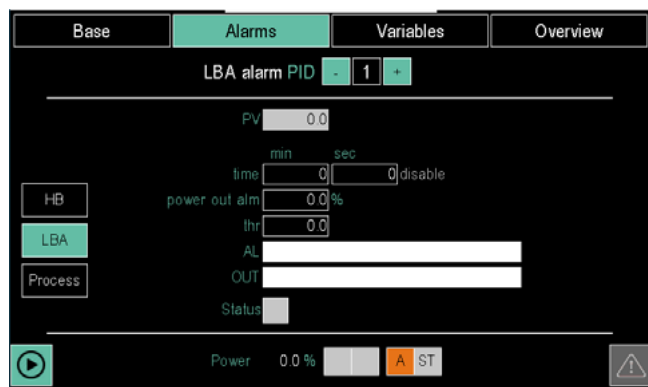
The Loop Break Alarm (LBA) signals an interruption in the control loop as a possible consequence of a short-circuited probe, an inverted probe or a load break. This is made possible by monitoring the PV of the PID according to the power output. The alarm is activated when the PV does not increase its value in heating (or does not decrease it in cooling), when maximum power is supplied for a settable time. Setting the time parameter to 0 disables the LBA function. When the alarm is active, the power supplied by the PID is determined by the set value. The alarm is reset when the PV starts to follow the expected trend (going up during heating, going down while cooling). The alarm can be reset by acknowledging it. It will not be activated with PID disabled, in Self tuning condition, with PID set to manual, during the Softstart phase or in OnOff mode.

Parameter configuration is shown below.

The LBA alarm section allows you set LBA alarm parameters. To open the alarm page, double-click on the Alarms button and select LBA from the drop-down menu. The LBA page can be opened from other pages in the Alarms section by touching key 3 on the left. The number of the PID to be configured is displayed at the top of the screen and can be changed using the - and + keys. The value can be entered with the virtual keyboard by touching a number of parameters.

The available parameters are:
- **TIME**: LBA alarm activation delay time. If the parameter is "0.0", the LBA alarm will be disabled.
- **POWER** value of the power output when the LBA alarm is triggered. The power sign must be consistent with the type of PID: only hot PID will only accept positive powers, and so on..
- **THRESHOLD**: LBA threshold associated with the PV quantity of the PID. This is the amount of deviation that will trigger the alarm if it is not exceeded within LBA time.
- **AL**: allows you to associate an alarm with LBA alarm detection.
- **OUT**: lets you associate any digital variable, such as DO or merker, for the user in the presence of an LBA alarm.

4.16.4.9.   Process Alarms
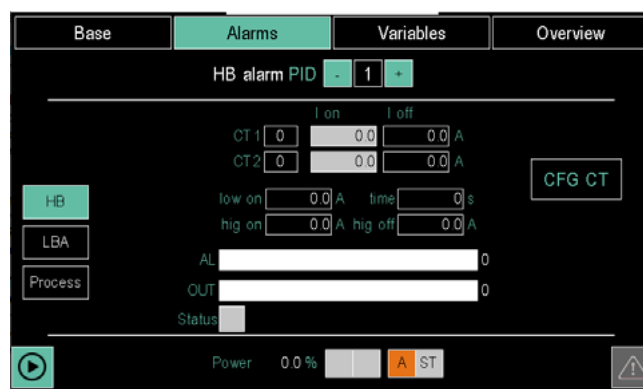
It is possible to jump to the process alarm configuration page by selecting the Process item in the Alarms section. (see paragraph "4.16.2. ALARM CFG sub-menu" on page 89).

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4.16.4.10. PID variable configuration

The Variable section lets you associate variables to PID inputs and outputs.
The displayed screen depends on the PID operating mode, that is set in the Synoptic section.
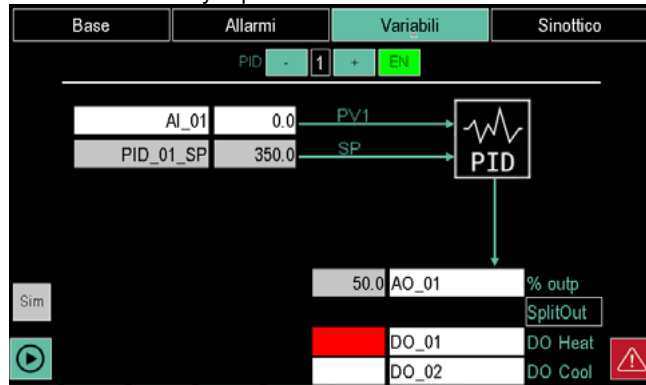
Normal PID
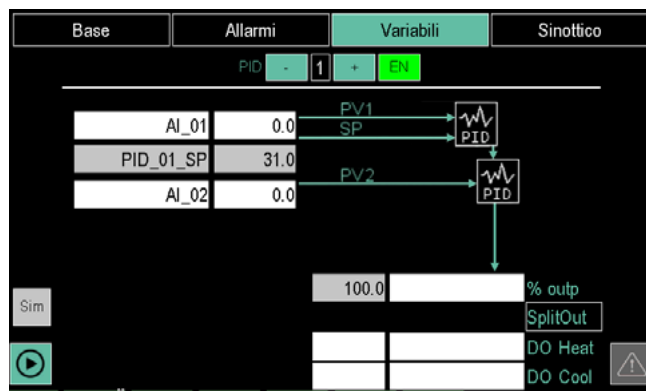
Cascade PID
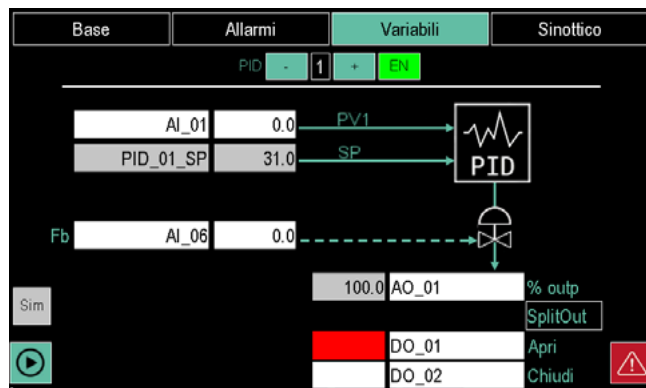
PID Valve
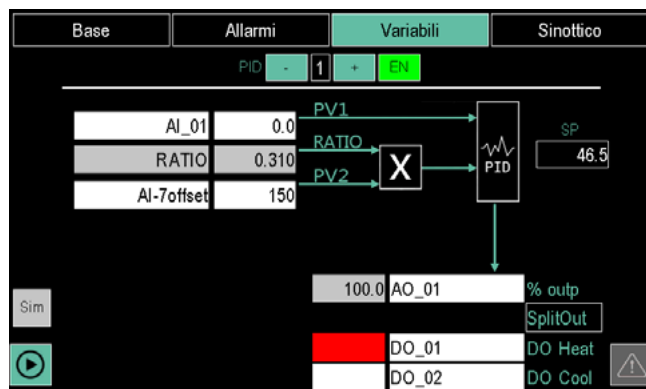
PID Ratio
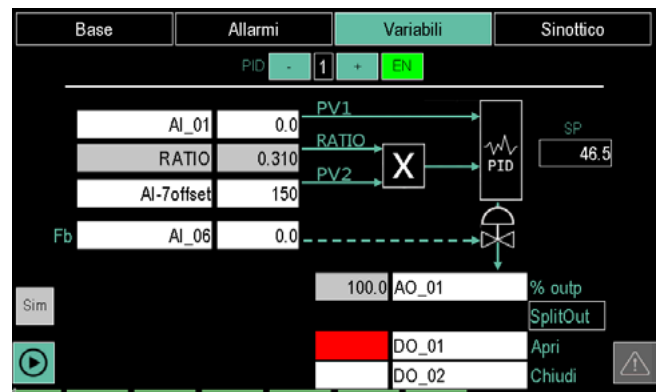
Valve + Ratio PID
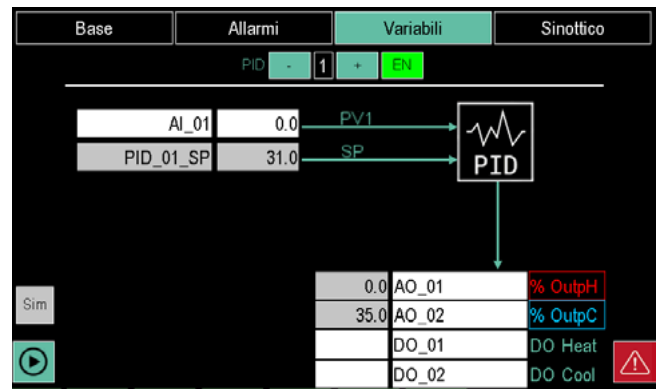
Normal PID with active SplitOut

The number of the PID to be set is displayed at the top of the screen and can be changed using the **-** and **+** keys. Turn the PID on and off with the **EN** button. The key turns green when the PID is enabled.

The diagrams can be interpreted as follows:
• the arrows that enter the PID box identify the input variables that must be processed or compared by the PID;
• the arrows that exit the PID box identify machine or process control signals that were processed by the PID;
• the arrow that enters the valve symbol identifies the valve motor control signal;
• the box marked with an X indicates that process that forces a fixed regulation ratio between two process values.

The values shown in this page cannot be edited, while the names of the variables associated with some parameters can be edited.

The parameters are:
• **PVx**: the name and current value of the input process variable.
• **SP**: the value to be reached or maintained (read only).
• **OUTP**: the name and value of the output variable, or power distributed, that varies from -100.0% to +100.0% for PID hot/cold.
• **DO HEAT**: the name and value of the output heating Boolean variable. The default outputs are Digital Outputs 01, 02, 03, etc.
• **SplitOut**: if the SplitOut function is activated, the power supplied by the PID will be distributed over two analogue variables: one dedicated to power from 0 +100% and the other from 0 to -100%. When the function is active, the fields dedicated to the display of power <0 and the choice of the second %OutC variable will be

shown. The fields previously dedicated to the %Outp variable will now be for %OutH and power >0.
- **DO COOL**: the name and value of the output cooling Boolean variable.
- **Fb**: the name and value of valve feedback with retro-action. Parameter FB is fixed, between 0.0 and 100.0 (with one decimal point).
- **RATIO**: are the name and value of the fixed control ratio between two process values.

The number and type of available variables depends on the type of PID.

The variable list can be scrolled using the buttons on the right of the display:

⊙ and ⊙ move the list by 3 variables;

⊛ and ⊛ move the list by 10 variables;

You can also jump directly to specific points in the list by touching the alphabetic directory keys. When the key is marked with two characters or digits (for example, A0, B1, etc.) quickly touch the key twice to jump to the second character. The **sp** button means "space".
Once you see the variable, touch it to select it.
The **CLEAR** button deletes any variable in the field and closes the window; the field becomes empty.
Touching the X at the top right corner closes the window without confirming any selections.

The **Sim** button lets you open simulator functions.
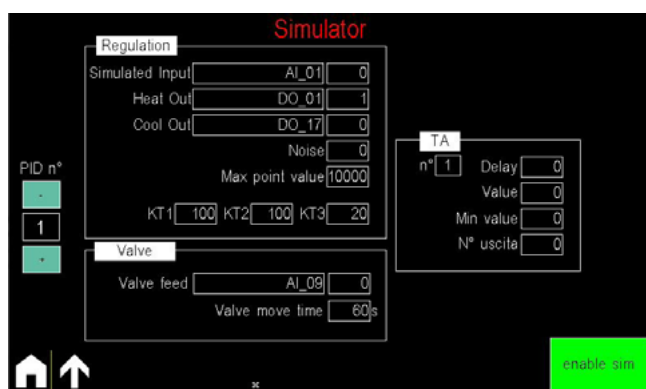
The simulation page is divided into 3 sections: Regulation, Valve and CT (current transformer). Use the **enable sim** button to enable or disable the simulator and use the PID no. + and - buttons to switch from one PID to another. The enable sim button enables the simulator in GF_eXpress from the outside, which allows you to force DI/DO

The **Regulation** section lets you simulate a process variable (simulated input) according to the associated heating or cooling function.
The **noise** field (in points) lets you set white noise to disturb simulation. The maximum range points can be set as the difference between HIS and LOS. The process is modelled with three integrators in cascade whose time constants are **KT1**, **KT2** and **KT3**. The higher these values, the slower the system response.
To reset simulation of the analogue input, set all KT parameters to 0.
The **Valve** section lets you simulate a valve. It is sufficient to set feedback (if present) and valve travel time, which must be consistent with the settings of the PID in question.

The **CT** section (current transformer) lets you simulate an HB alarm.
The available parameters are:
- **Delay**: delay between output variation and simulated CT input variation, in ms.
- **Value**: value simulated with output ON (peak current).
- **MinValue**: value simulated with output OFF (residual current).
- **Output number**: number of the digital output that controls current passage in the simulated TA.

4.16.4.11. PID synoptic configuration
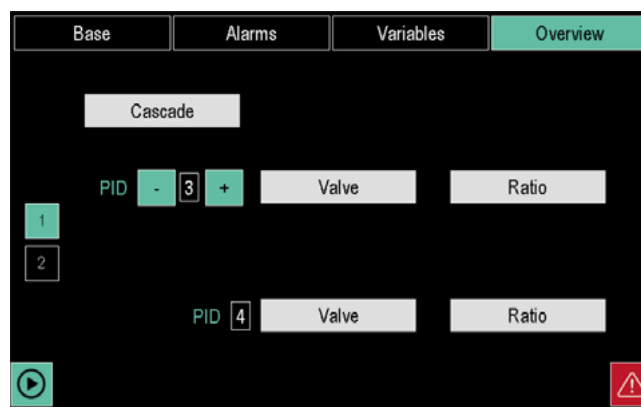
Synoptic section page 1 lets you set the PID operating mode: normal, cascade, driven valve or fixed ratio regulation.

The PID are displayed in default pairs (1-2, 3-4, ...). Changing the first PID number with the - and + keys automatically updates the other.

Touch the **Cascade**, **Valve** or **Ratio** keys to enable that operating mode. The enabled mode button turns green. To disable the function, touch the button again.

When one of these modes is selected, the corresponding symbol appears in the Base and Alarms sections, as a reminder.
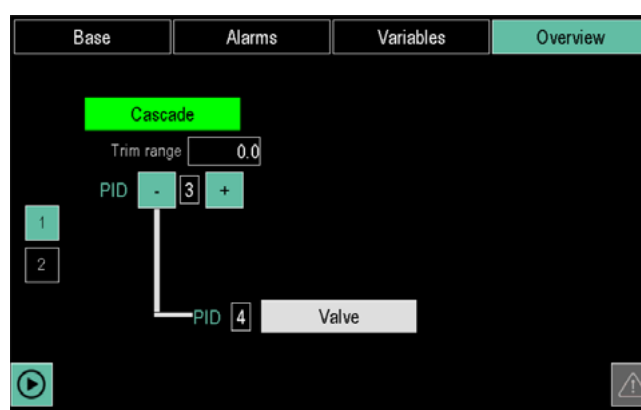
When Cascade is enabled, the first PID controls the second PID in the pair, which, in turn, can control a driven valve.

Trim range only appears in the case of cascade, and is the value of the SP for the PID downstream when the PID1 output is 100.0%.

If Cascade is not enabled, the two PID in the pair are independent and can control a driven valve, fixed ratio regula-

tion or both.
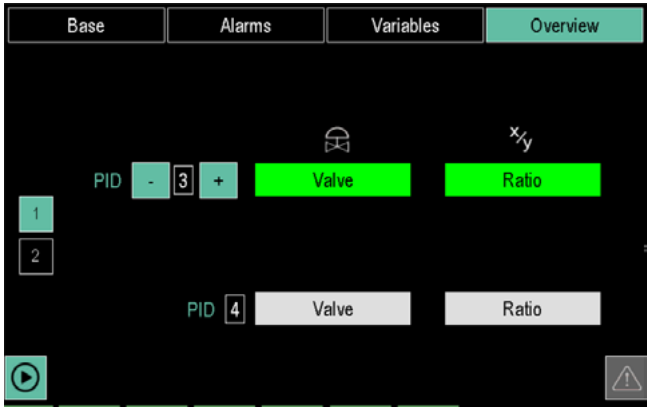
Page 2 (PID overview) displays the operating modes set for all PID.

The operating mode is indicated by the icon next to the PID ID number; the *cascade* label combines the two PID that work in cascade.

IMPORTANT NOTE
To ensure correct functioning of the PID control functions, all the values involved (PV, SP, scale limits, etc.) must stay within certain limits dictated by system architecture, and particularly:
from -32768 to 32767 scale points, where scale point is the plant engineering unit without the decimal point (e.g. 750.0 C° becomes 7500 scale points, 5.00 bar becomes 500 scale points)

4.16.5. VAR CFG sub-menu
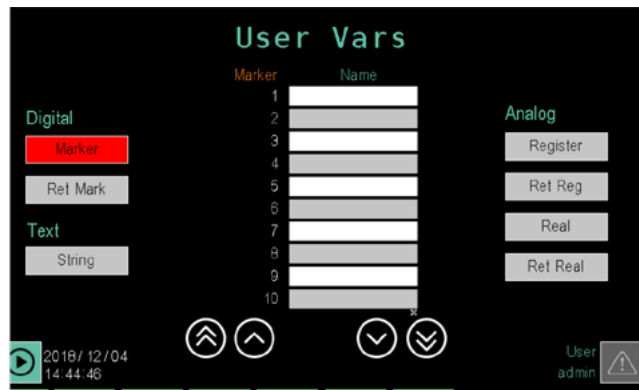
In order to use this sub-menu, the user must have access and editing privileges (SERVICE and ADMIN levels by default)

The VAR CFG sub-menu lets the user create, view and set variables.
There are three types of variables: digital, analog and string.
Digital variables are:
- **Marker**: volatile virtual digital variables.
- **Ret Mark**: non volatile virtual digital variables.

Analog variables are:
- **Register**: volatile virtual numeric variables.
- **Ret Reg**: non volatile virtual numeric variables.
- **Real**: real-type volatile virtual numeric variables, useful for several calculations in cascade to maintain good precision.
- **Ret Real**: real-type non volatile virtual numeric variables, useful for several calculations in cascade to maintain good precision.

The only text variable (messages, names, etc.) is **String**.

Touch one of These buttons to view a list where each row displays a variable of that type. The following is displayed for each variable:
- The full name given by the controller (left column).
- The name (**Name**) attributed to the variable by the user. This name will be used to create programs, set PID and alarms, etc. The variable may be used if the default value is changed.
- The number of decimal points in the variable (**D.P.**).
- Any unit of measure for the variable (**[mis]**).

The list can be scrolled using the buttons on the left of the display:
$\bigcirc$ and $\bigcirc$ move the list by 3 events;
$\bigcirc\!\!\!\bigcirc$ and $\bigcirc\!\!\!\bigcirc$ move the list by 10 events;

To edit or create a name, a decimal number or unit of measure, touch the corresponding field and enter the required value with the virtual keyboard.

⚠ **Caution!** Deleting a non-volatile variable (Ret Mark, Ret Reg and Ret Real) will reset its value to zero.

4.16.6. USER CFG sub-menu

In order to use this sub-menu, the user must have login and edit privileges (ADMIN level by default).
The USER CFG section lets you create a new user or delete an existent one.
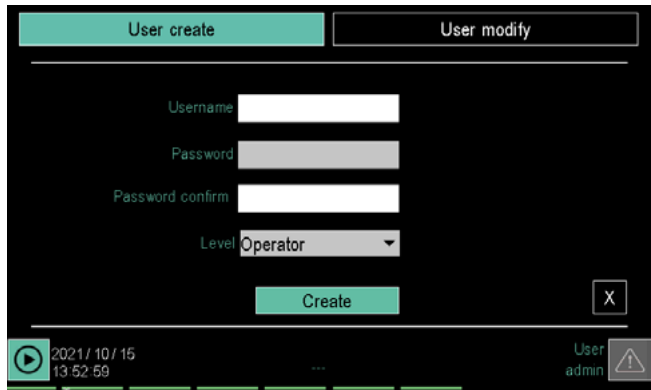
To create a user, touch the "Create users" label.
Enter the following data in the page using the virtual key-

board:
- **User**: user ID. It can be up to 16 characters long (characters not allowed **/ : * ? " < >** °).
- **Password**: login password. It can be up to 16 characters long (characters not allowed **/ : * ? " < >** °).
- **Confirm password**: enter the password again to confirm.
- **Level**: assign a login level to the new user (OPERATOR, SERVICE, ADMIN). For further information on the login levels, see paragraph "4.1. Login password" on page 37.

The **Create** button creates a new user, the **X** button closes the window without creating one.
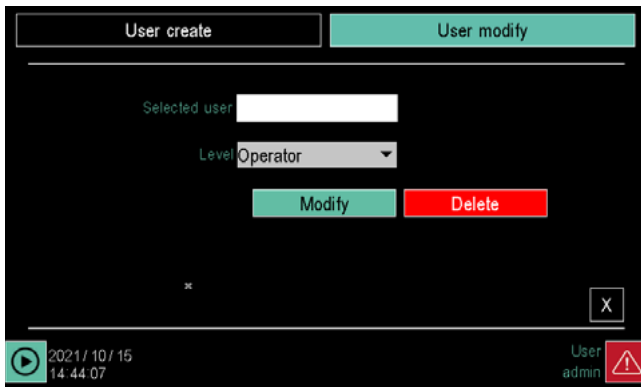
To edit a user, touch th **"Edit user"** label.
Select a user from those in the list that is displayed by touching in the "**Selected user**" field.
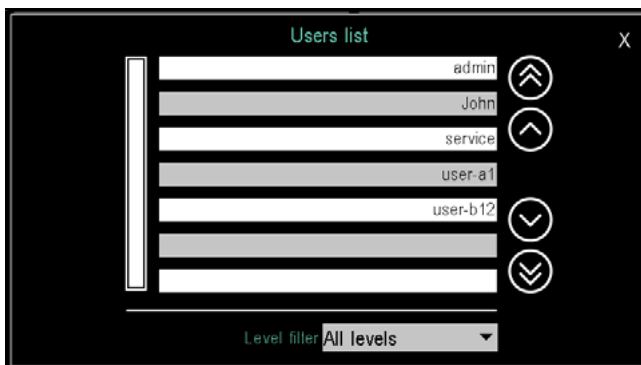
It is then possible to change the level of the selected user (by confirming with the "**Edit**" button) or delete the user via the "**Cancel**" button.

To change a user password, first delete it and then recreate it with the new password.
To close the page without making any changes, press the **X** button.

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4.17. Bar code reader

⚠️ A bar code reader with the following characteristics as minimum requirements to be respected for compatibility can be connected to the device USB port:

Caution: Compatibility requirements for bar code readers

- Operating mode in COM (serial) port emulation on USB

- Need to configure at least one termination character of the string read among the following available combinations:

  - CR → "Carriage Return"

  - LF → "Line Feed"

  - CRLF → "Carriage Return + Line Feed"

Usually, the bar code reader manufacturer provides special "device configuration codes" shown in the user manual, which, read through the reader, configure the options of the various operating modes in a simple way, including COM communication port via USB and the termination character.

Once the bar code reader is connected to a 2850T/3850T, if it is recognised and interfaced correctly by the system, the following icon will appear on one of the pages described below where the reader can be used:

If the icon is not displayed, it means that the system was unable to communicate correctly with the reader, so try to check the settings of the reader and reconnect it to the 2850T/3850T.

A bar code reader can be connected and disconnected from the 2850T/3850T at any time, while the device is powered on, no reboot is required.

4.17.1. Use of bar codes in the 2850T/3850T system

Depending on the current menu page, when the icon , is shown, scanning a bar code can be used to automate the actions described below.

4.17.1.1. User login
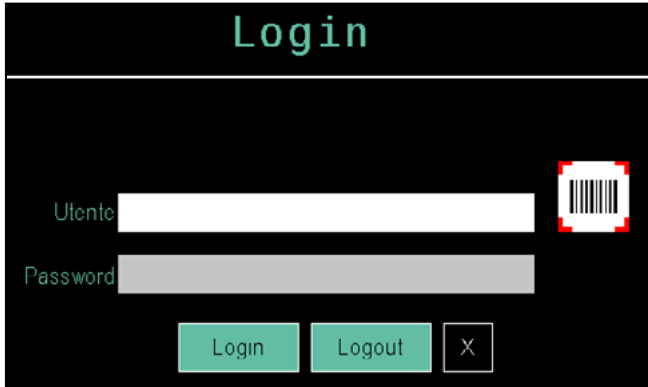
On the user login page, bar code reading is interpreted as the name of the user who intends to log in:

- Maximum 16 characters long. (the system automatically limits the read string)

- The characters **/ : * ? " < > | \ °** not allowed for a user name are automatically replaced with the underscore character "_".

- If the name entered by code is correctly recognised, the system automatically loads the corresponding password and the user can confirm access by pressing the "Login" button.

4.17.1.2. Creating new users
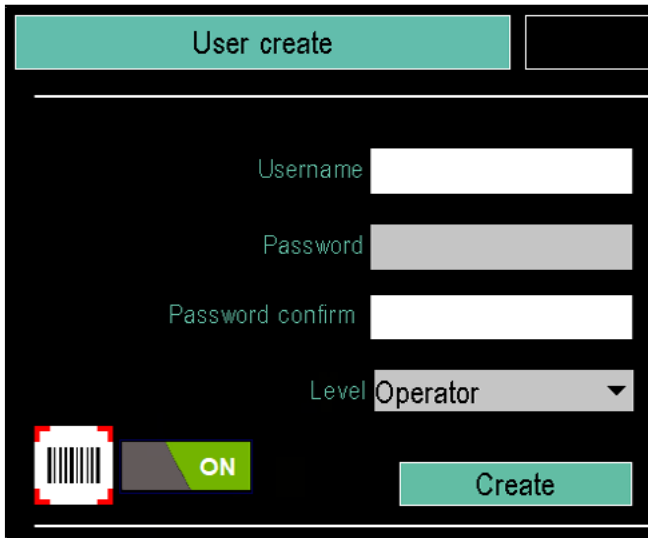
On the new user creation page, auto-fill using a bar code reader can be enabled or disabled at any time using the

button (enabled by default when the device is started with the reader installed or when a reader is installed when the device is already on).

While the configuration of a new user via the bar code reader is active, the manual data entry via the keyboard is not possible, without disconnecting the reader it can be reactivated by turning off the switch. .

With the switch on, reading a bar code sets the value of the user name field:

- Maximum 16 characters long. (the system automatically limits the read string)

- The characters **/ : * ? " < > | \ °** not allowed for a user name are automatically replaced with the underscore character "_".

If the user name entered is accepted, the system automatically generates the corresponding password using the same value as the user name (user name and password are the same), at this point, after setting the desired login level, the creation of the new user can be confirmed with the "**Create**" button

If you want to configure a password other than the user name in auto-fill mode via reader, after getting the name from the bar code, turn off the power switch and change the password manually.

4.17.1.3. Loading programs/recordings from memory
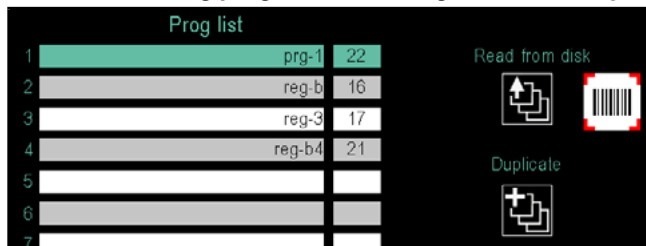
On the page for loading programs/recordings, bar code reading is interpreted as the name of the program/recording to be searched for among those found in the internal disk memory and then loaded in the currently selected position:

- Maximum 16 characters long. (the system automatically limits the read string)

- The characters **/ : * ? " < > | \ °** not allowed for a user name are automatically replaced with the underscore character "_".

Correct program loading in a certain position occurs if:

- The name read actually corresponds to an existing program

- The chosen position is not occupied by another running program

- It must be an admissible position (the two lines of the ZERO and TEMPLATE programs are reserved)

4.17.1.4. Current program/recording change in the control console
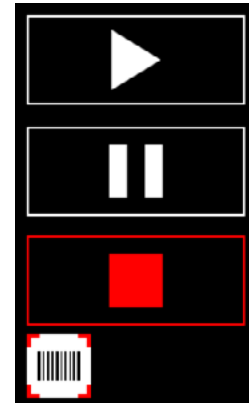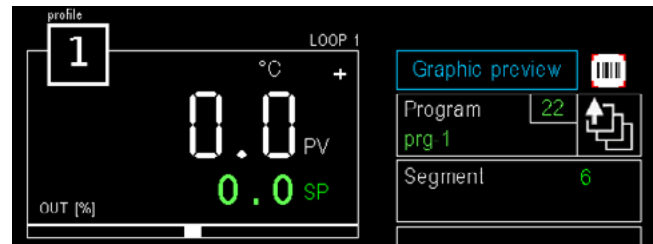
On the program or recording control page, it is possible to replace the current program or recording by loading another one from the internal disk memory using a bar code reader:

- Maximum 16 characters long. (the system automatically limits the read string)

- The characters **/ : * ? " < > | \ °** not allowed for a user name are automatically replaced with the underscore character "_".

The current program changes if:

- The name read actually corresponds to an existing program

- The current program is not running

4.17.1.5. Creating a new program/recording
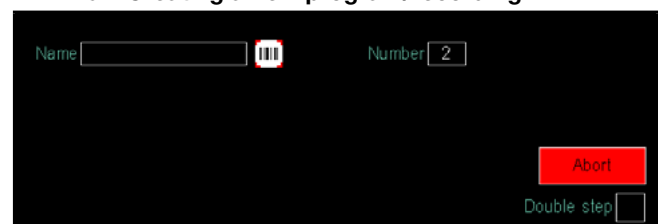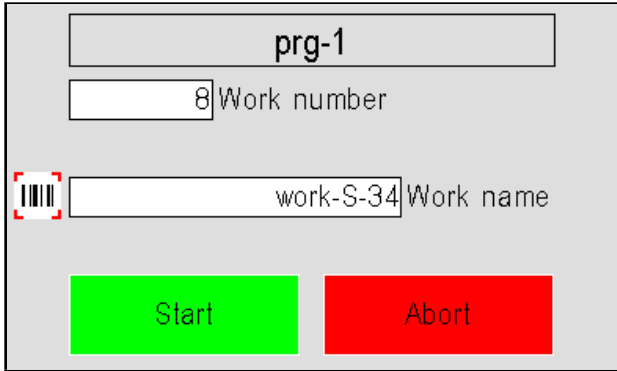
On the page for creating a new program (or registration), a bar code reader can be used to set its name:

- Maximum 16 characters long. (the system automatically limits the read string)

- The characters **/ : * ? " < > | \ °** not allowed for a program name are automatically replaced with the underscore character "_".

As for manual settings, also in this case a check is enabled that prevents the use of a name already used for a program/recording found in the internal disk memory.

4.17.1.6. Setting the name of a new job

```
                    prg-1

              8 Work number


  ▮▮▮        work-S-34 Work name


     Start              Abort
```

When a program or recording is started, the device shows a confirmation window in which it is possible to set a name for the job that is about to be performed; this name can be configured using a bar code:

• Maximum 16 characters long. (the system automatically limits the read string)

• The characters **/ : * ? " < > | \ °** not allowed for a job name are automatically replaced with the underscore character "_".

4.17.1.7. Bar codes on customisable pages
When a bar code is read, the system automatically updates two new system variables, of the text string and numeric type respectively:

• BARCODE_STR: contains the string read from the bar code, limited to a maximum 32 characters long

• BARCODE_NUM: if the read string is a number, integer or with comma (both ',' and '.' symbols are recognised), it contains the value converted into numeric format of the read code

In the customisable pages it is therefore possible to associate these two variables to objects such as "Data View" or "Edit Text" to view the content of the bar code read.

5. CUSTOM PAGES

With the 2850T and 3850T multi-purpose controllers, thanks to Gefran GETView technology you can create custom graphics with the touch of a finger. Using the terminal graphic touch screen you can develop extremely effective man-machine interfaces, both in terms of machine and process management and in terms of visualization and interpretation of their data. Controllers allow up to 10 custom pages, of which one (model 2850T) or two (model 3850T) can be immediately recalled from their keyboard. Different types of components (fields, buttons, completion indicators, LED, text boxes, pictures, navigation keys) are available to view and edit data within the controller. You can also import images, such as machine diagrams or system diagrams, to be used as a backdrop to make their control and use even more intuitive.

To go to the customized pages, press the

 (present on 2850/3850) or press the

 (present on 3850 only)

For all Level 0 (User) or Level 1 (Service) users, direct access via:
- the first button is possible as long as there is at least one customised page with a graphic component
- the second button is possible provided that the second customised page contains at least one graphic component.

5.1. Examples of custom pages

5.1.1. Example of Pit Kiln
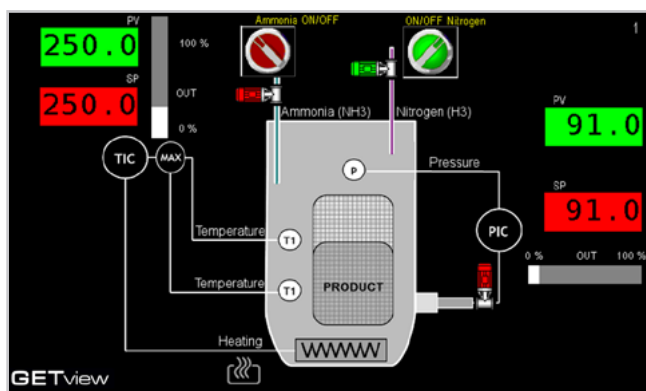
The controller controls the processing temperature via a PID (TIC), using the highest of the two T1 temperatures read in the kiln as the reference temperature. One of the two values read are selected with a Selection Logic Function (MAX).
The controller also controls the pressure (P) in the kiln through a second PID (PIC).
The page shows the process value (PV) and setpoint (SP) values of both PIDs in numeric format, while two distinct Bar graphs display the 2 PID control value percent. Setpoint values can be edited from the page.
In addition, there are two components (ON/OFF buttons) for entering the 2 process gases: ammonia (NH3 ammonia) and nitrogen (Nitrogen H3).

5.1.2. Example of a Food Steriliser
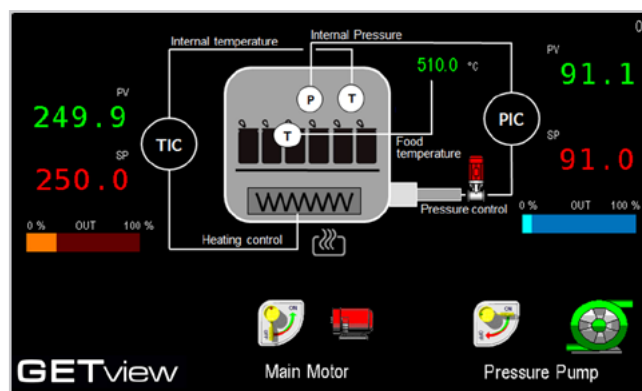
The controller uses two distinct PID loops for internal temperature (TIC) and internal pressure (PIC) control of the sterilisation cycle.
The page shows the process value (PV) and setpoint (SP) values of both PIDs in numeric format, while two distinct Bar graphs display the 2 PID control value percent. Setpoint values can be edited from the page.
The page also displays the temperature of the product (Food temperature).
Also on the page there are two components (ON/OFF buttons) to control pump pressure and the main motor.

5.1.3. Example of Kiln heat processing
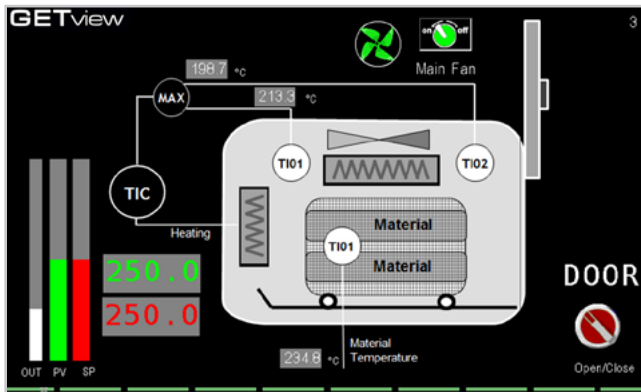
The controller controls the processing temperature via a PID (TIC), using the highest of the two T01 and T02 temperatures read in the kiln as the reference temperature. One of the two values read are selected with a Selection Logic Function (MAX).
The page shows the values of process value (PV) and setpoint (SP) in numeric format, while 3 Bar graphs graphically display the two PV and SP values and the PID (OUT) control value percent. The setpoint value is editable from the page.
The page also displays the temperature (Material Temperature) of the material being processed.
Also on the page are two components (ON/OFF and Open/Close buttons) for air recirculation inside the kiln (Main Fan) and to open and close the material door (Door).

5.1.4. Example of autoclave
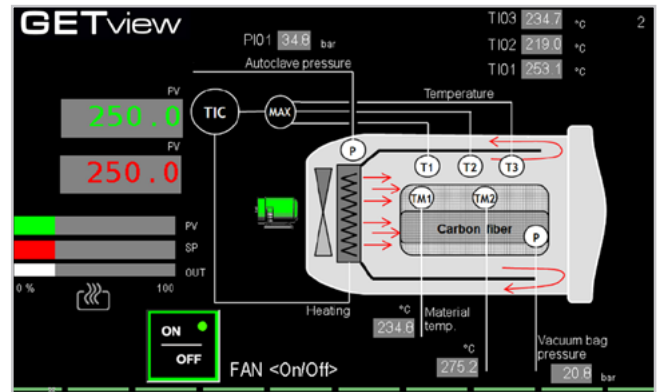
The controller controls the processing temperature via a PID (TIC), using the highest of the 3 T1, T2 and T3 temperatures read in the autoclave as the reference temperature. One of the three values read are selected with a Selection Logic Function (MAX).
The page shows the values of process value (PV) and setpoint (SP) in numeric format, while 3 Bar graphs graphically display the two PV and SP values and the PID (OUT) control value percent. The setpoint value is editable from the page.
The page displays the internal pressure of the autoclave (Autoclave pressure), the pressure inside of the bag containing the material (Vacuum bag pressure) and two temperatures of the material (TM1 and TM2).
Also on the page there is a component (ON/OFF button) for the control of air recirculation inside the autoclave (Fan).

5.2. Go to the menu page

2 operating modes are possible for custom pages:
- **View**, that permits their use;
- **Edit**, that permits their creation or configuration.

View mode is activated by accessing custom pages on the path MAIN MENU/MONITOR/ GETview. Pages can be accessed faster using the dedicated keys on the keyboard for direct access:
- to the first customised page containing at least one graphic component
- to the second customised page (available in model 3850T only).

To switch between View mode and Edit mode, select the page you wish to configure and press the direct access button the first customised page containing at least one graphic component. Edit mode is secured by level 2 password. With a user level of 0 or 1, only pages with content will be displayed. At level 2, all pages will be accessible, including empty pages.

To return to View mode from Edit mode, press the direct access key on the first customised page containing at least one graphic component.

5.3. Creating a custom page

Once you have accessed the custom page creation section, select the first empty page with the help of the [←] and [→] keys.
The number of the displayed page appears at the top right.

Press the Custom Page 1 button again to display a **+** button on the screen.
Touch the button to open a pop-up window with 10 buttons, one for each of the types of components that can be added.
The X button at the top right will close the pop-up window without making any changes. The object limits per page are:
Max 20 LED widgets per page
Max 20 Button widgets per page

Max 16 Progress Bar widgets per page
Max 10 Image widgets per page
Max 40 numerical widgets per page (Data set, Data view)
Max 40 text widgets per page (Edit Text, Text, Note)
1 Change Page Button per type

The available components are:
- **Led**: add a LED.
- **Edit Text**: enter a field whose content is a message contained in the controller message database. The message is editable.
- **Text**: add a field to display a fixed message stored in the controller.
- **Note**: add a field where you can write a message. The message is stored in the controller and its translation is not available.

- **Progress**: adds a rectangular component that is colored, horizontally or vertically, in proportion to the value of a variable.
- **Data View**: adds a field in which a number is displayed (read-only, for reading and writing see the Edit Field).
- **Data Set**: adds a field in which a number is viewed and set.
- **Button**: adds a button that allows you to view the status of a digital data and change it.
- **Image**: adds an image taken from the collection of images stored in the controller.
- **Change page**: add buttons to change page.

5.3.1. Screen coordinates

The screen is measured in pixels and every point is defined by the distance in pixels from the upper left corner. Horizontal distances are identified by the letter X (abscissa), those vertically by the letter Y (ordinate). Each point is then defined by a pair of values X, Y. The pixel at the top left of the screen has 0, 0 coordinates.

The position and size of the components are defined by the coordinates of their upper left corner and their width and height measured in pixels.

5.3.2. Creating and editing a component

To add a component, touch its button in the pop-up window and then, when the window is closed, touch the custom page where you want it to appear. The component will be drawn automatically on the screen, in a default format that can then be Customized and completed, using the contact point on the screen as the coordinate of its top left corner.

To change the component that you just created, or an existing one, touch it. You can select multiple components in sequence. Multiple components may be selected in sequence; the selected objects will appear in pink.
On the display, to the right, 4 new buttons appear below the + button:
- **-**: delete the selected component(s).
- **Deselect**: cancel the component(s) selection
- **At left**: align two or more selected component on the left side of the last selected component.

Al. top: align two or more selected component on the top of the last selected component.

4 arrow buttons appear to the right which, held down, move the component or components you select, pixel by pixel, in the direction of the arrow.
The component can also be moved by selecting it and then dragging it on the screen.

5.3.2.1. Precision component configuration

Quickly touch a component twice to open its configuration where you can define its operating properties.
Each page has a set of parameters that are common to all pages and others that are specific to that component.

5.3.2.2. Color

You can customize the color of one or more component elements. To do this, just touch the 🎨 button in the component detail page and select the desired color in the pop-up window. Alternatively, you can touch the adjacent field and enter the RGB color code in hexadecimal notation.

5.3.2.3. Overlapping components

The various different components may not be overlapped, with the exception of images, which may be overlapped by all other components.

5.3.3. LED Component
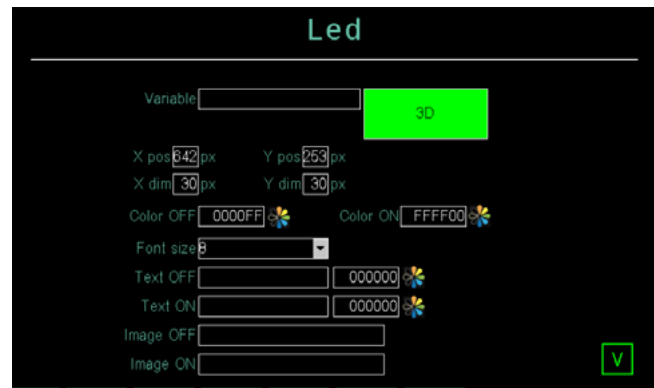
This page allows you to configure the LED component parameters. The available parameters are:
- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Variable**: name of the variable associated with the LED component.
- **3D / Flat**: three-dimensional or flat aspect of the component.
- **Color OFF**: LED component color when the associated variable is OFF.
- **Color ON**: LED component color when the associated variable is ON.
- **Dim font**: font size, if the LED has text. Possible choices 8, 12, 16, 20, 24, 36, 50 pixel.
- **Text OFF**: optional text included in the LED component that appears when the associated variable is OFF. Text color can be customized with the field or button next to it.
- **Text ON**: optional text included in the LED component that appears when the associated variable is ON. Text color can be customized with the field or button next to it.
- **Image OFF**: optional image included in the LED component that appears when the associated variable is OFF.
- **Image ON**: optional image included in the LED component that appears when the associated variable is ON.

The **X** button at the lower right closes the window, saving changes .

5.3.4. Edit Text component

This page allows you to configure the parameters of the field set to contain a message can be viewed and edited from the controller message database. The available parameters are:

- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Variable**: name of the variable associated with the field.
- **Font**: character size. Possible choices 8, 12, 16, 20, 24, 36, 50 pixel.
- **Text color**: text color.
- **Background color**: component background color.

The **X** button at the lower right closes the window, saving changes.

5.3.5. Text component

This page allows you to configure field parameters set to contain a fixed message. The available parameters are:

- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Font**: character size. Possible choices 8, 12, 16, 20, 24, 36, 50 pixel.
- **Text color**: text color.
- **Background color**: component background color.
- **Text**: message text that appears in the component. Text can be up to 16 characters long. Excess text is truncated.

Touching the **X** at the bottom right corner closes the window without saving changes.

5.3.6. Note component
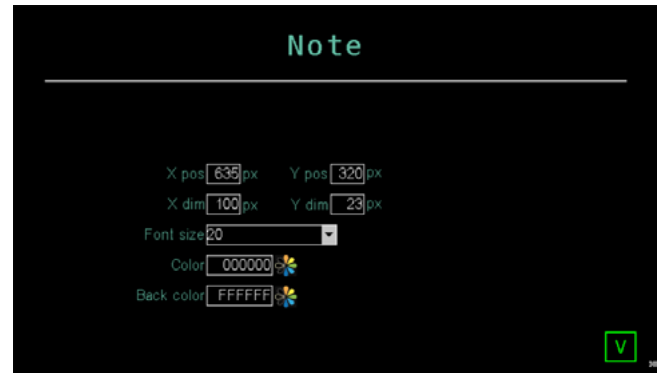
This page allows you to configure the parameters of a component that contains the text entered directly from the graphics page. The operator can then enter custom notes and descriptions, for example as an indication for the next operator. The entered text is saved when the controller is switched off. The available parameters are:

- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Font**: character size. Possible choices 8, 12, 16, 20, 24, 36, 50 pixel.
- **Text color**: text color.
- **Background color**: component background color.

Touching the **X** at the bottom right corner closes the window without saving changes.

5.3.7. Progress Bar component

This page allows you to enter a bar to graphically display the value of a variable. The available parameters are:

- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Variable**: name of the variable associated with the

field, that determines progress bar status.
- **Format**: vertical or horizontal bar layout.
- **Maximum**: absolute maximum value of the variable that is displayed with the bar. The value that is scaled on the component size, is managed as a whole number, with no decimal point.
- **Minimum**: absolute minimum value of the variable that is displayed with the bar, is managed as a whole number, with no decimal point.
- **Bar color**: color used to display the value of the variable according to the minimum-maximum range (bar size).
- **Background color**: bar background color.

Switching these by setting MIX and MAX in the opposite way creates a progress bar which works the opposite way, that is, it fills from the top down and from right to left. Real variables are not accepted in progress bars.

The **X** button at the lower right closes the window, saving changes.

5.3.8. Data View component

This page allows you to configure the parameters of the field set to only display numeric type data. The available parameters are:
- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Variable**: name of the variable associated with the field.
- **Font**: character size. Possible choices 8, 12, 16, 20, 24, 36, 50 pixel.
- **Color**: value color.
- **Background color**: component background color.

Touching the **X** at the bottom right corner closes the window without saving changes.

5.3.9. Data Set component

This page allows you to configure field parameters set to display and modify numeric data, such as a setpoint. The available parameters are:
- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Variable**: name of the variable associated with the field.
- **Edit level**: user level necessary to change the value of the variable.
- **Font**: character size. Possible choices 8, 12, 16, 20, 24, 36, 50 pixel.
- **Color**: value color.
- **Background color**: component background color.

Touching the **X** at the bottom right corner closes the window without saving changes.

5.3.10. Button component

This page allows you to configure the parameters of the component button that allows you to view and force the status of a given digital. The available parameters are:
- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Var button**: digital variable associated with the button.
- **Edit level**: user level necessary to change the value of the variable.

- **3D / Flat**: three-dimensional or flat aspect of the component.
- **Normal / Toggle**: with Normal the digital variable is forced as long as the button is pressed, with Toggle it is forced until the button is pressed again.
- **Color** : button color when the associated variable is OFF.
- **Selizi** : button color when the associated variable is ON.
- **Dim font**: font size, if the button has text. Possible choices 8, 12, 16, 20, 24, 36, 50 pixel.
- **Text OFF**: optional text included in the Button component that appears when the associated variable is OFF. Text color can be customized with the field or button next to it.
- **Text ON**: optional text included in the Button component that appears when the associated variable is ON. Text color can be customized with the field or button next to it.
- **Image OFF**: optional image included in the Button component that appears when the associated variable is OFF.
- **Image ON**: optional image included in the Button component that appears when the associated variable is ON.

The **X** button at the lower right closes the window, saving changes.

5.3.11.   Image component
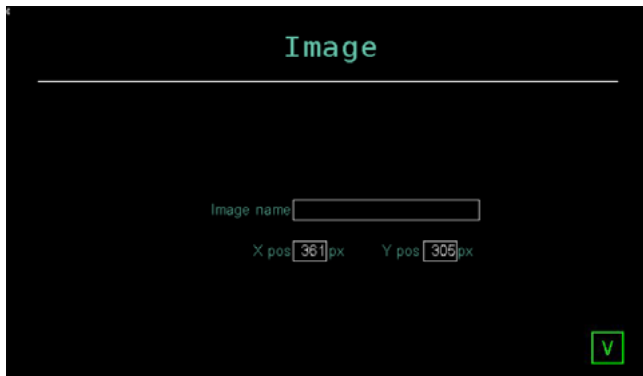
This page allows you to configure the parameters of an image to be added to the page. The image appears in 1:1 format, without resizing.
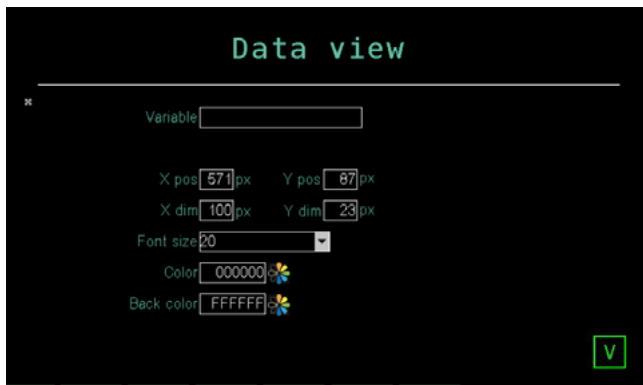The available parameters are:
- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.
- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **Image name**: name of the image to be added, to be chosen among the images already uploaded to the controller.

The **X** button at the lower right closes the window, saving changes.

5.3.12.   Change page component
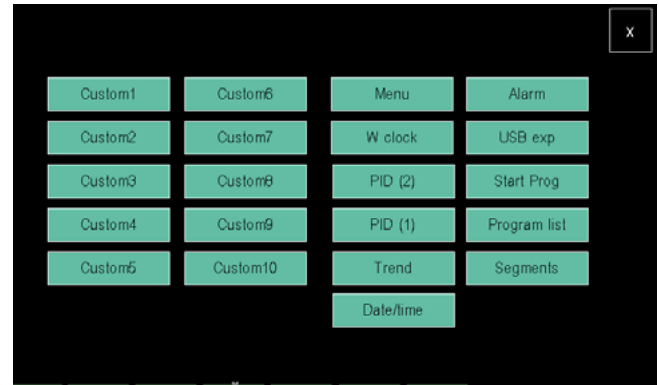
This page allows you to choose and add a button that jumps to a particular page. On the custom page you can only enter one button per type (for example, you cannot have two Trend buttons). The available pages, which are standard controller pages, are:
- **StartReg**: program monitor page.
- **Menu**: Menu page with selection of 6 groups of pages.
- **PID (2)**: 2 PID view page.
- **PID (1)**: 1 PID view page.
- **Date/time**: SERVICE menu page that allows you to set the date and time of the controller.
- **Trend**: page of current trends
- **Alarm**: real alarm list page.
- **USBexp**: SERVICE menu Program manager page.
- **Prog**: Menu menu Programs page.
- **Segment**: programmer segment configuration page.
- **W clock**: SERVICE menu Weekly clock configuration page.
- **Custom 1**: GETView page 1.
- **Custom 2**: GETView page 1.
- **Custom 3**: GETView page 1.
- **Custom 4**: GETView page 1.
- **Custom 5**: GETView page 1.

Warning! For all Level 0 (User) or Level 1 (Service) users, it will be possible to go directly to a custom page using the "Change page" component if and only if the custom page to be accessed contains at least one graphic component. The **X** button at the upper right closes the window, saving changes.
Double touch the newly created button to open a configuration page
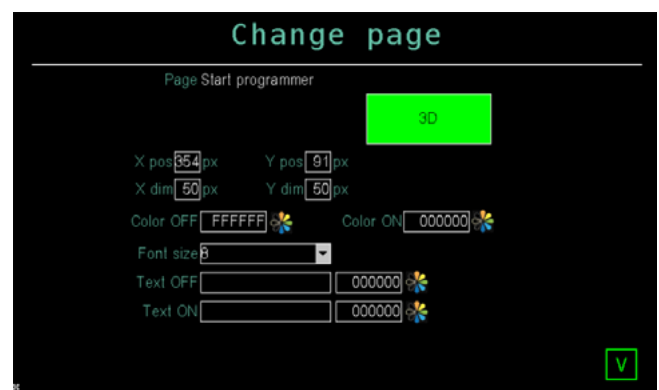
The available parameters are:
- **X pos**: distance in pixels from the top left corner of the component to the left side of the screen.

- **Y pos**: distance in pixels from the top left corner of the component to the top of the screen.
- **X dim**: component width in pixels.
- **Y dim**: component height in pixels.
- **Font size**: character size. Possible choices 8, 12, 16, 20, 24, 36, 50 pixel.
- **ON color**: color of the button when pressed.
- **OFF color**: color of the button when not pressed.
- **ON text**: color of the text on the button when pressed.
- **OFF text**: color of the text on the button when not pressed.
- **3D/FLAT**: 3D or 2D (flat) button.

Touching the **X** at the bottom right corner closes the window without saving changes.

5.4.   Custom page creation tutorial
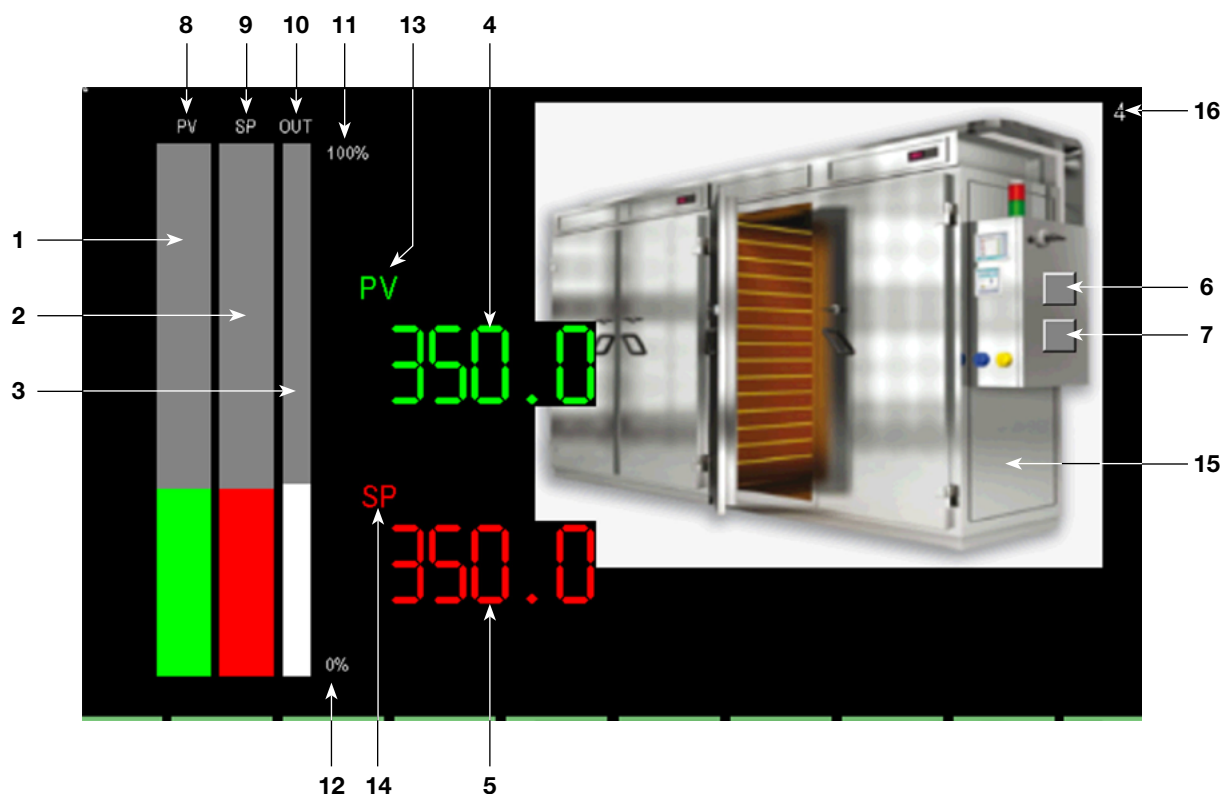
The tutorial below illustrates how to create the GETView sample page shown above. This custom page allows you to manage a single PID (PID1) loop and display an image of the machine controlled by the controller.

The following components will be added and set in the page:
1. Bar to graphically display the PID1 process value (PV) percentage.
2. Bar to graphically display the PID1 setpoint value (SP) percent.
3. Bar to graphically display the PID1 output value (OUT) percentage.
4. Numeric display of the PID1 process value (PV).
5. Numeric display of the PID1 setpoint (SP) and its ability to be edited.
6. PID1 HEAT control status display LEDs.
7. PID1 COOL control status display LEDs.
8. "PV" text label
9. "SP" text label
10. "OUT" text label
11. Max bar percent value text label.
12. Min bar percent value text label.
13. "PV" text label
14. "SP" text label
15. Image of the controlled machinery.

The custom page in use is indicated directly from GETView:
16. Custom page number.

5.4.1.   Page Creation Procedure

To create the sample page, proceed as follows:
1. Calls a custom page (see page 47).
2. Activates EDIT mode (see page 108).
3. Add the various component to the page and set them (see later paragraphs).
4. Test page operations.

5.4.2. Adding Bar Graphs

Add the three bars to the page to graphically display process data percent.

For general instructions on adding and configuring a Bar Graph, see paragraph "5.3.7. Progress Bar component" on page 110.

Bar Graph for PV (1)
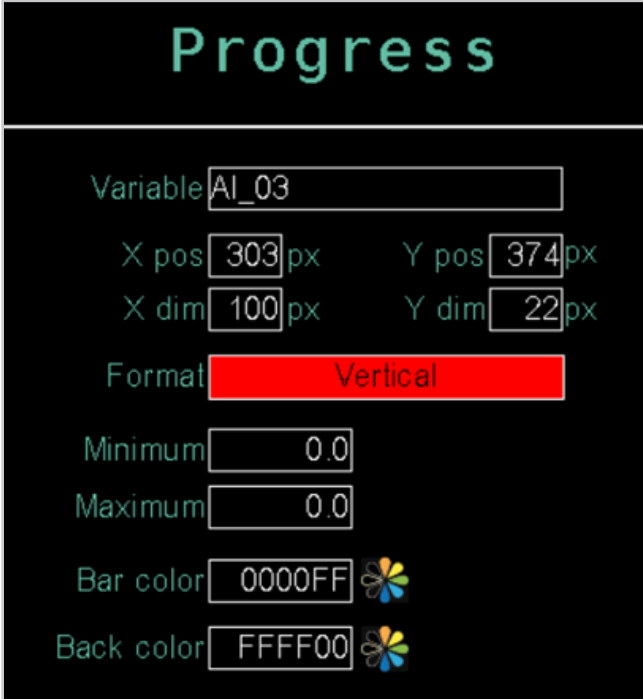
Add a Bar Graph component and set parameters to display the PID1 PV value.

Bar Graph for SP (2)
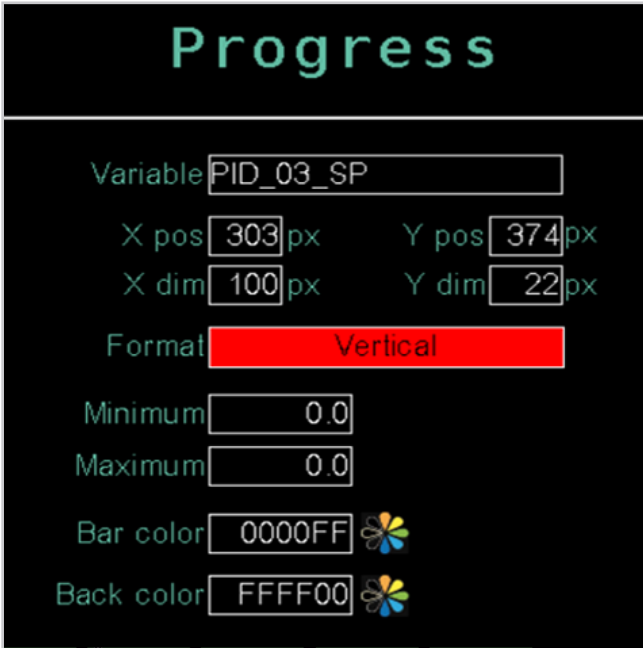
Add a Bar Graph component and set parameters to display the PID1 SP value. Notice how the Xdim, Ypos, and Ydim values are the same as those of the Bar Graph component for PV.

Bar Graph for OUT (3)
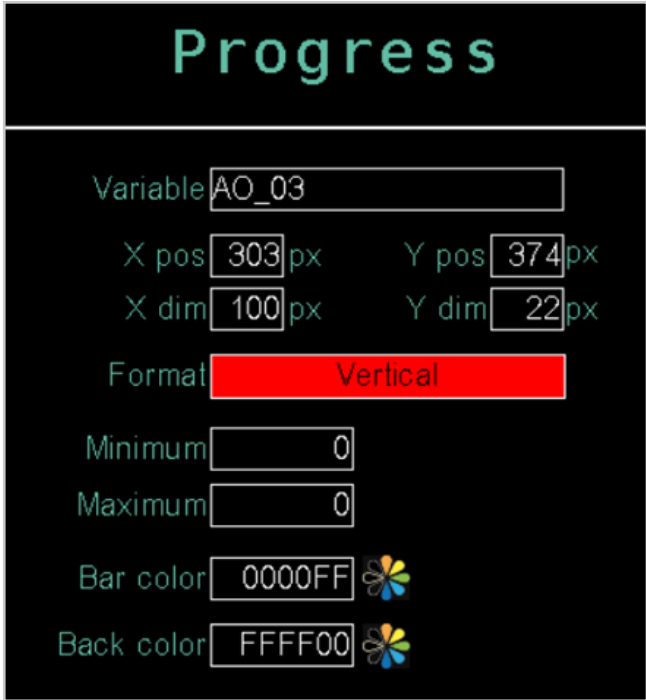
Add a Bar Graph component and set parameters to display the PID1 OUT value. Notice how the Ypos and Ydim values are the same as those of the Bar Graph component for PV.

5.4.3. Adding Data View

Add the Data View component to the page to display the numeric value of the PV process value.

For general instructions on how to enter and configure a Data View read-only component see paragraph "5.3.8. Data View component" on page 111.
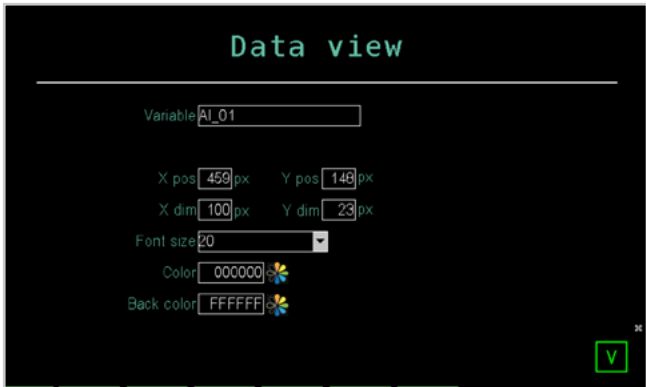
Configure Data View (4) component parameters to display the PID1 PV value.

5.4.4. Adding a Data Set

Add the component to the page to view and modify the numeric value of the SP setpoint.

For general instructions on how to enter and configure a Data Set read and write component see paragraph "5.3.9. Data Set component" on page 111.

Configure Data View (5) component parameters to display the PID1 SP value. Notice how the Xpos, Xdim, and Ydim values are the same as those of the Data View component.

5.4.5. Adding LEDs

Add two LEDs to the page that show the status of the PID1 HEAT and COOL control outputs.

For general instructions on adding and configuring a LED, see paragraph "5.3.3. LED Component" on page 109.

HEAT control output LED (6)
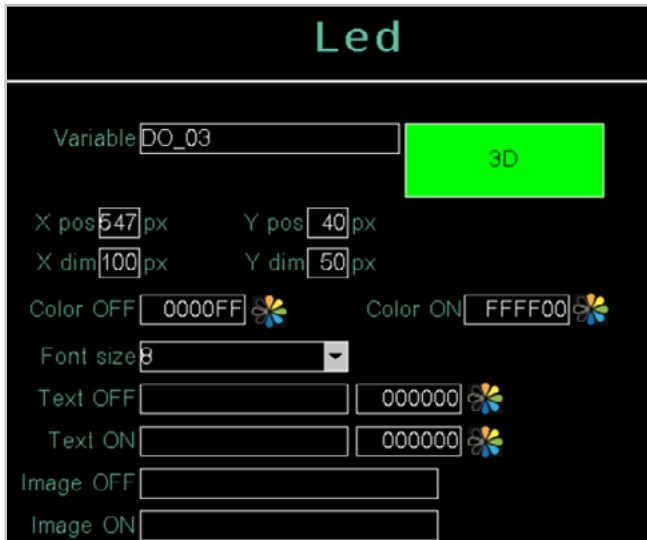
Add a LED component and configure parameters to view the PID1 HEAT output control status value.

COOL control output LED (7)

Add a Led component and configure its parameters to display the PID1 COOL control output status value. Note that Xdim, Xpos, and Ydim values are the same as those of the HEAT control output LED component.

5.4.6. Adding Text

Add different labels on the page that identify the various components.

For general instructions on adding and configuring Text, see paragraph "5.3.5. Text component" on page 110.

PV label (8)

Add a Text component and configure the parameters to display the PV label.

SP label (9)

Add a Text component and configure the parameters to display the SP label.

OUT label (10)

Add a Text component and configure the parameters to display the OUT label.

100% label (11)

Add a Text component and configure parameters to display the PID1 Bar Graph OUT full scale label.

0% label (12)

Add a Text component and configure the parameters to display the label at the beginning of the PID1 Bar Graph OUT range.

PV label (13)

Add a Text component and configure the parameters to display the PV label for the numerical value of the PID1 PV process value.

SP label (14)

Add a Text component and configure the parameters to display the SP label for the PID1 setpoint SP numeric value.

5.4.7. Adding an image

Add the image of the machine (15) controlled by the controller.

For general instructions on how to convert and add an image see the paragraph "4.16.3.3. IMAGE" on page 94

Configure the Image component parameters (15).

6.   SERVICE PAGES

6.1.   Variable selections

This opens a pop-up window where you can select the concerned variable.

The list can be scrolled using the buttons on the right of the display:

 and shifting the list by 3 variables;

 and shifting the list by 10 variables;

6.2.   Active alarm
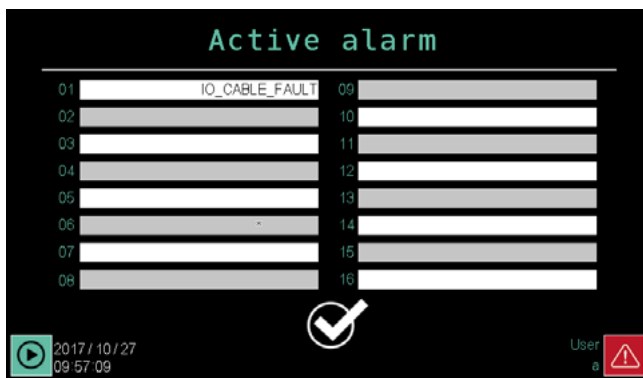
Users of all levels can access Active Alarms from any page

using the button. Active alarms permit viewing of the last 16 active alarms.
The button flashes if there are alarms or if alarms have not

yet been acknowledged using the central button .
If there are no alarms and display has been acknowledged, the button will not flash; if touched, it will lead to the ALARM HISTORY page.

You can also jump directly to specific points in the list by touching the alphabetic directory keys. When the key is marked with two characters or digits (for example, A0, B1, etc.) quickly touch the key twice to jump to the second character. The sp button means "space".
Once you see the variable, touch it to select it.
The Clear button deletes any variable in the field and closes the window; the field becomes empty. Touching the X at the top right corner closes the window without confirming any selections. The del button deletes the last entered character.

7. EXAMPLES AND APPLICATION NOTES

7.1. Multi kiln control

Multi-kiln control consists in the management of several kilns (up to 4 for 2850T and 8 for 3850T) with a single controller.
Requirements are:

- the temperature of each kiln is controlled by a different PID loop;
- for the different kilns, the same temperature profile (SP program) is used, which was previously saved as a recipe;
- the temperature profiles of the various kilns can be carried out at different times.

To meet the requirements, use the configuration called "Partial program read".

This configuration, enabled in device setup page, allows to manage recipes of "segments". The other parts of the programs, like the "Base" part, the "GETlogic" part, the "Report" part does not change.

For default "Base", "GETlogic" and "Report" parameter groups, the product includes a series of system recipes called CFG_ZONE *n*, where *n* takes values from 1 to 4 for model 2850T and from 1 to 8 for model 3850T.

If "Partial Program Reading" is enabled, whenever the controller is switched on, these recipes are automatically loaded into memory at positions 1 to 8 of the program list with the following criteria: CFG_ZONE1 in position 1, CFG_ZONE2 in position 2, ... CFG_ZONE8 in position 8.

7.1.1. Managing parameter groups

For simplicity, three kilns are considered.
With authorisation level 2 (OEM), the "Base", "GETlogic" and "Report" parameters are configured for the two kilns. The two configurations can be different from each other.

Kiln 1
Program: CFG_ZONE1

	Segments	

Kiln 2
Program: CFG_ZONE2

Base	Segments	GETlogic	Report

Kiln 3
Program: CFG_ZONE3

Base	Segments	GETlogic	Report

With authorisation level 1 (maintenance), you configure the "Segments" parameters for the *prod1* program.

Program: prod1

Base	Segments	GETlogic	Report

When running, the controller runs three separate *prod1* programs, one for Kiln 1, one for Kiln 2 and one for Kiln 3, so designed:
Program position 1: prod1

	Segments	

Program position 2: prod1

	Segments	

Program position 3: prod1

Base	Segments	GETlogic	Report

7.1.2. Configuration Procedure

To configure the multi-kiln controller, proceed as follows:

1. Authenticate with level 2 (OEM).
2. Open the **Program configuration** page (Home Page > SETUP > SETUP MGR > *Controller* SETUP > *page* 2).
3. On the page, enable the "Partial Program Reading" mode, enter "3" for the parameter *No. visible prog*, to enable the display of 3 programs in the selection list.
4. Open the **Prog list** page (Home Page > PROGRAMS).
5. In the list of programs "CFG_ZONE1" for position 1, "CFG_ZONE2" for position 2 and "CFG_ZONE3" for position 3.
6. For the 3 programs configure the "Base", "GETlogic" and "Report" parameters. These parameters will be used by all programs that are later loaded in the same location in the program list.
7. Authenticate with level 1 (Maintenance).
8. Touch the **New prog** button.
9. Enter the name of the new program (*prod1* in the example)and touch **Save**.
10. For the new program, configure the "Segments" parameters. This way, the instrument will automatically associate all "Base", "Functions" and "Report" group parameters previously configured to the new *prod1* program (system program CFG_ZONEx, where x is the position in the program list).
11. To run this program (*prod1*) on the 3 kilns, it is necessary to load it in positions 2 and 3 of the program list.
12. Specify if duplication is done by a programme in position one but is not among the default ZONE_CFG_x al Reference will in any case be made to the default one in the current position.

7. EXAMPLES AND APPLICATION NOTES

7.2. Building programs with default segments (TEMPLATE)

The template is a set of default segments that can be re-used for building various programs.

The use of the template is particularly useful if the machine needs to manage different processes, but where the individual processing steps are repeatable and standard.

7.2.1. Program composition with TEMPLATES
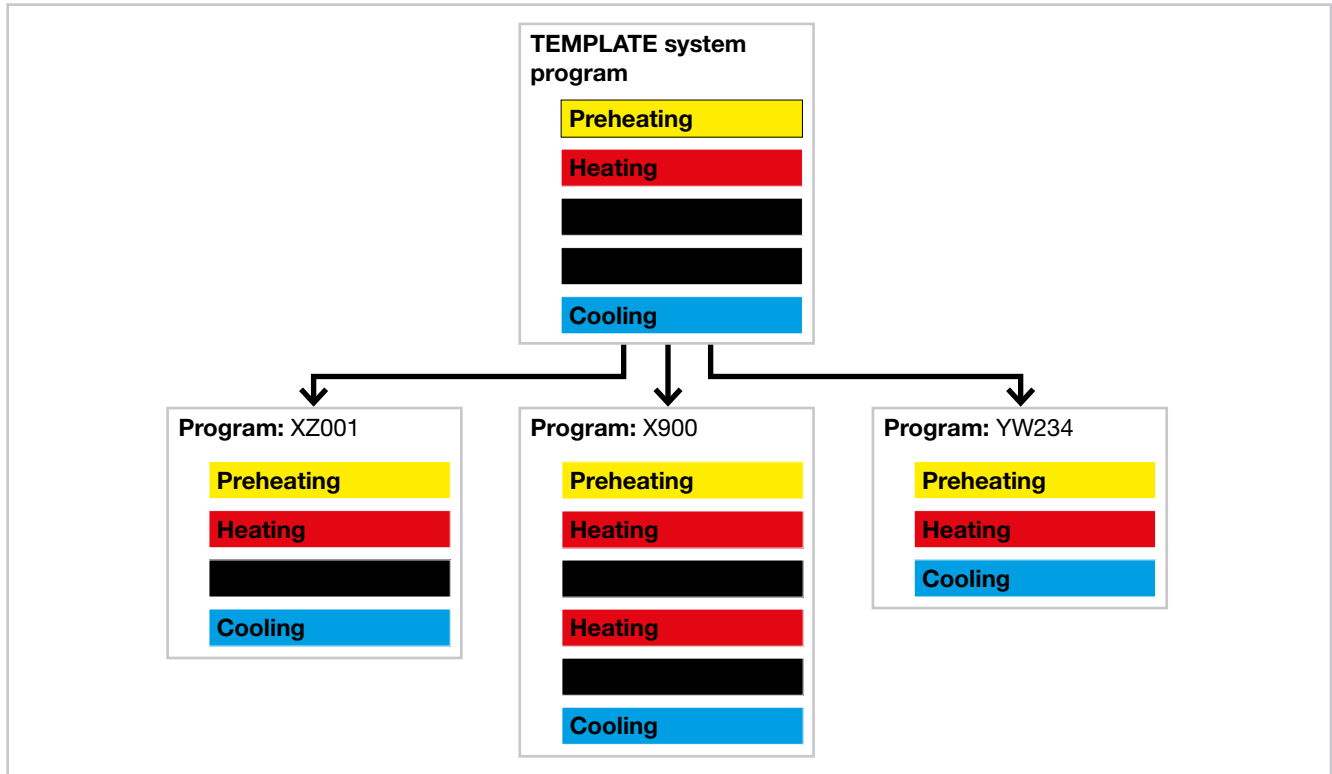
7.2.2. Configuration Procedure

To set a template and build derivative programs, proceed as follows:

1. Authenticate with level 2 (OEM).
2. Open the **Program configuration** page (Home Page > SETUP > SETUP MGR > *Controller* SETUP > *page* 2).
3. In the page, set "Template enable ON", to enable the template mode.
4. Open the **Prog list** page (Home Page > PROGRAMS). The "TEMPLATE" system program is displayed.
5. Set <u>all the types of segments</u> needed to control the machine, which can then be used when processing programs are created. Segment configuration in the "TEMPLATE" program follows the standard program rules.
6. Authenticate with level 1 (Maintenance).
7. Create a new template-based program by touching the **New prog** button.
8. When you need to enter a new segment in the "Segments" section, press the |:::| button and then "new segment". A pop-up window will displayed that lists all the segment types in the previously configured "TEMPLATE" program.This allows you to configure the processing program segments based on default segments.

9. In the new program you can change the properties of individual segments (name, SP setpoint, times, etc.).
10. Create, if desired, other template-based programs, repeating steps 7 to 9.

⚠️ **Warning!** Template-based programs inherit all the properties defined in the "Base" and "Functions" sections from the "TEMPLATE" program. These properties cannot be changed.

7.3. Correction of linear inputs and outputs

7.3.1. Calibration of input

Calibration and conversion of linear input permits calibration and conversion into plant engineering units of the value read by an analogue input by setting four values:

- Ana min (Minimum number of points)
- Ana max (Maximum number of points)
- Eng min (Minimum converted value, corresponding to the number of points of Ana min)
- Eng max (Maximum converted value, corresponding to the number of points of Ana max)

The four values are set via the menu "4.16.1.2. F-MIX analog input configuration" on page 86 .

Example

If you wish to calibrate input 0...10 V as a percentage of 0.0%...100.0%. Let us take, for example, the case in which the minimum input signal actually corresponds to 100 points, and the maximum to 65000.

To obtain an input variable as a percentage from 0.0% to 100.0%:

- D.P. = 1

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

- Ana min = 100
- Ana max = 65000

The corresponding points on the curve, calibrated and converted (indication), are :

- Eng min = 0.0
- Eng max = 100.0

Applying the calibration and conversion reported above, an input value of 32000 points will be displayed as 49.3%.

7.3.2. Correction of input

Correction of temperature input permits linearisation of the signal normally read by the card as required. This is why the parameters describing part of the linearisation scale are used

- Ana min (Minimum temperature level, in tenths of a degree)
- Ana max (Maximum temperature level, in tenths of a degree)
- Eng min (Minimum converted value, corresponding to the number of points of Ana min in degrees)
- Eng max (Maximum converted value, corresponding to the number of points of Ana max in degrees)

The four values are set via the menu "4.16.1.2. F-MIX analog input configuration" on page 86.

Example

We wish to calibrate the input of a probe around 300.0 °C.

By entering the following values:

- Ana min = 2950
- Ana max = 3060
- Eng min = 296.0 °C
- Eng max = 305.5 °C

the temperatures read by the card will be recalculated on the basis of a straight line passing through two points (Ana min;Eng min) (Ana max;Eng max).

7.3.3. Correction of output

Calibration and conversion of linear output permits calibration and conversion through particular points of the value into engineering units associated with the analogue output through the setting of four values:

- Eng min (Minimum value of the engineering unit)
- Eng max (Maximum value of the engineering unit)
- Ana min (minimum value of the number of points)
- Ana max (maximum value of the number of points)

When the output is set at an engineering value equal to Eng min, the physical output will reach the Ana min value set. Eng max and Ana max torque will also be handled using this criterion. All Eng output values, both those within the limits (Eng min - Eng max) and those falling outside them, will be converted according to the proportion joining the parameters entered.

The setting is limited to within the preset scale of 0...32767 for current output, ±32767 for voltage output. This conversion can be applied to analogue output of all kinds (±10 V, 0...20 mA, 4...20 mA).
The four values are set via the menu "4.16.1.4. F-MIX analog output configuration" on page 87.

Example

Output selection 0..20mA.

The values in engineering units (indication) are:

- Eng min = 0.0
- Eng max = 100.0

The corresponding points on the curve, calibrated and converted (real output values) are:

- Ana min = 100
- Ana max = 32000

With the correct curve, an output value equal of 49.3% will produce generation of a current signal around 9.9mA (16000 points).

7. EXAMPLES AND APPLICATION NOTES

7.4.   Alarms

7.4.1.   Generic alarms

Generic alarms AL1 ... 64 can be predominantly of 4 types, shown below:

Normal type absolute alarm

AL1 inverse and absolute, AL2 direct and absolute.
Two alarm thresholds are set, AL1 (lower threshold) and AL2 (upper threshold), which correspond to two hysteresis values Hyst1 (positive) and Hyst2 (negative). The alarm is triggered when the measured value remains below AL1 or greater than AL2 for the set activation delay times (**delay**). The alarm condition stops when the measured value is greater than AL1 + Hyst 1, or is less than AL2 - Hyst2. This avoids repeated alarms caused by slight variations in the measured value.

Any alarm signal on power-up, when the equipment is not running, can be avoided by disabling it when power is turned on.

Note: in the event of a direct alarm, hysteresis creates a band lower than the reference value, while in the case of an inverse alarm, it creates it higher than this value.
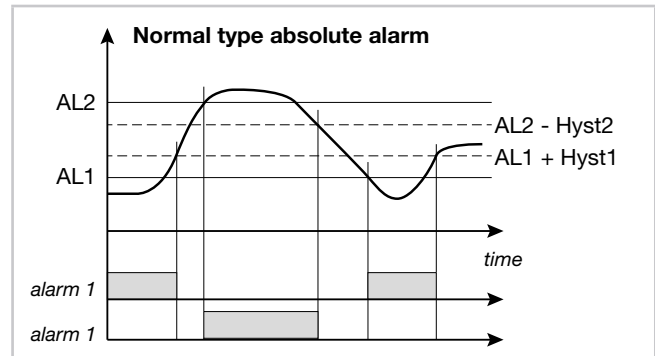
Symmetric type absolute alarm

A single AL1 alarm threshold and a single Hyst1 hysteresis value are set.
With the direct alarm setting, the alarm is triggered when the measured value is less than AL1 - Hyst1 or greater than AL1 + Hyst1 for the set delay activation time (**delay**)
With the inverse alarm setting, the alarm is triggered when the measured value is greater than AL1 - Hyst1 or less than AL1 + Hyst1 for the set delay activation time (**delay**).
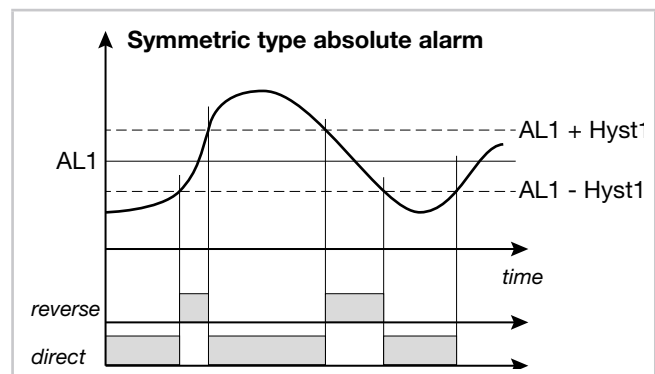
Normal type setpoint alarm

A single alarm limit AL1 and Hyst1 hysteresis value (negative) are set.
With the direct alarm setting, the alarm is triggered when the measured value is greater than SP + AL1 for the set delay activation time (**delay**). The alarm condition stops when the measured value is less than SP + AL1 - Hyst1.
With the inverse alarm setting, the alarm is triggered when the measured value is less than SP + AL1 - Hyst1 for the set delay activation time (**delay**). The alarm condition stops when the measured value exceeds SP + AL1.
The setpoint alarm allows you to implement dynamic thresholds that automatically follow the setpoint time trend.
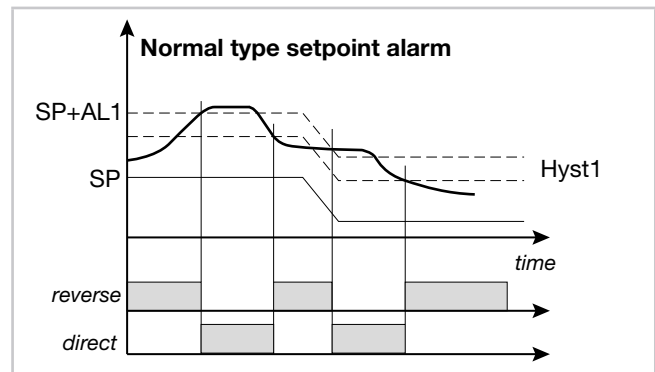
Symmetric type setpoint alarm

A single AL1 alarm threshold and a single HYST1 hysteresis value are set.
With the direct alarm setting, the alarm is triggered when the measured value is less than SP-AL1 or higher than SP + AL1.
With the inverse alarm setting, the alarm is triggered when the measured value is between SP - AL1 and SP + AL2.

Normal type absolute alarm

Symmetric type absolute alarm

Normal type setpoint alarm

Symmetric type setpoint alarm
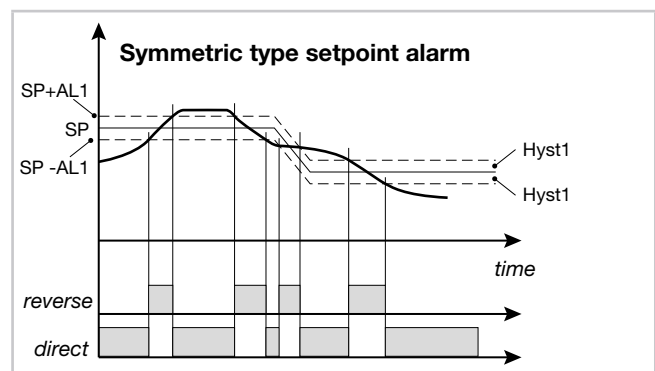
7.5. Control

7.5.1. Control actions

Control actions are divided into 3 categories:
- **Proportional Action**: action where the output contribution is <u>proportional to the input deviation</u>.
- **Derivative Action**: action where the output contribution is <u>proportional to the input deviation variation rate</u>.
- **Integral Action**: action where the output contribution is <u>proportional to the input deviation time integral</u>.

Deviation is the difference between the value read by the adjusted variable and the desired value.

Control actions serve to achieve the optimised regulation of the controlled process at each stage.

7.5.1.1. Proportional, Derivative and Integral action influence on the controlled process feedback

The controlled process feedback depends on the type of control action set. Specifically:
- Increasing the Proportional Band reduces oscillations but increases deviation.
- Decreasing the Proportional Band reduces deviation but causes oscillations of the regulated variable (too low values of the Proportional Band make the system unstable).
- Increasing the Derivative Action, corresponding to an increase in Derivative Time, reduces deviation and avoids fluctuations up to a critical value of Derivative Time beyond which the deviation increases and prolonged oscillations occur.
- Increasing the Integral Action, corresponding to a decrease in Integral Time, tends to cancel the deviation between the controlled variable and the setpoint (setpoint).
- If the value of the Integral Time is too long (weak integral action) deviation may persist between the controlled variable and the setpoint.

For more information about control actions, contact Gefran customer service.

7.5.2. Self-Tuning

Self-tuning is a simplified and automatic tuning mode, depending on the state of the process.
The purpose of self-tuning activation is to calculate the optimal adjustment parameters at process startup. The variable (i.e.: temperature) must be that which can be detected at zero power (room temperature).

You can automatically activate tuning using the appropriate key on page PID CFG > Base > 2 or using the variables PID_n_SELF_CMD and PID_n_SELF_STS. With PID_n_SELF_CMD you can request Selftuning, which will only start once the necessary conditions are in place. With PID_n_SELF_STS you know whether Selftuning is operating (ON) or completed (OFF). These variables are available for custom pages or program logic.
If the difference between PV and SETPOINT is smaller (in absolute terms) than 5% of the bottom of the scale (HIS-LOS), self-tuning cannot be activated and the command will be rejected.

The procedure is automatically done by optimizing the approach in relation to the actual temperature value.
Power is initially forced to 100%, up to half of the value between PV and SP, and then to 0% to assess over-elongation of the system.
At the end of this procedure, the new parameters will be memorised in all 10 PID groups:
- proportional band,
- integral and derivative times calculated for active action (heat or cool). In the case of double action (heat + cool)

The active tuning condition is signalled by a LED.

⚠️ **Warning!** Self-Tuning is not applicable with an ON/OFF control.
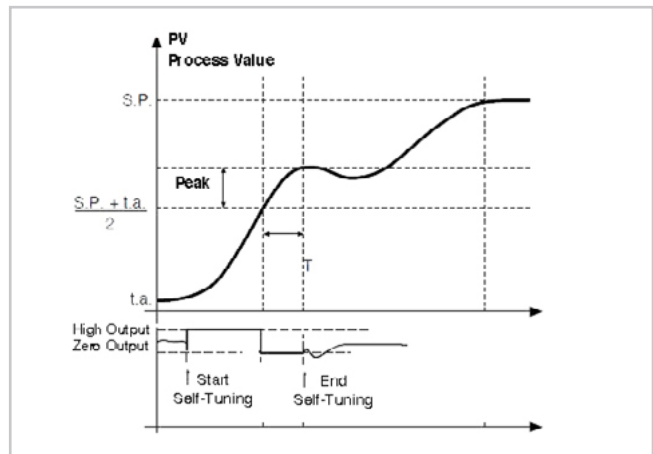
Single action example, PV less than SP / 4

7.5.3. Cascade control
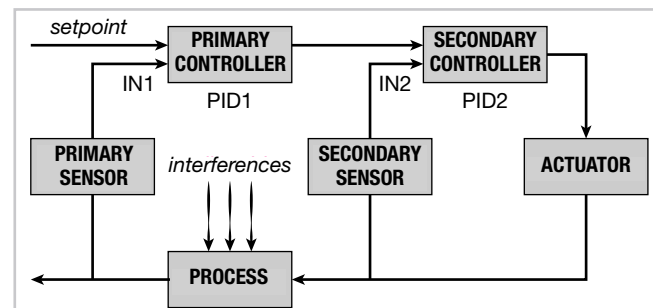
Two controllers are arranged in cascade when the output signal from the first becomes the input signal in the second, which in turn sends a signal to the controller. The controller that compares the controlled variable with the setpoint is defined as primary, while the one that compares the value of the variable using the signal from the primary controller is defined as secondary.

The advantage of cascade control consists of faster control of the value of the primary variable in response to disturbance of the secondary variable. Moreover, the primary variable is less subject to deviations. The secondary controller keeps the flow constant by changing it only on the directions of the primary controller.

The cascade controller is used especially in very slow processes. In such processes, in fact, the error is recovered over a long period of time: when a problem enters the process, the error occurs after a long time, so corrective action does not start immediately.

7. EXAMPLES AND APPLICATION NOTES

After corrective action has started, you will still have to wait a long time to see the result of the action itself.

Performing a cascade control consists in finding intermediate controlled variables that can act with quick corrective action due to possible disturbances.
The two controllers (primary and secondary) are arranged in cascade: each has its own process variable and only the secondary has an output that controls the process.

The main advantages of cascading control are:
- Disturbances occurring within the secondary loop are corrected by the secondary controller before they can affect the primary variable.
- Existing delays in the secondary part of the process are considerably reduced by the secondary loop and this increases the response speed of the primary loop.
- The gain variations in the secondary part are compensated for within the respective chain.
- The secondary loop allows the primary controller to work accurately on the flow of matter or energy.

Cascading control is of utmost importance when imposing high efficiency in controlling noise or when the secondary part of the process involves a high delay (phase-out).

In cascade control there are two controllers, one primary and one secondary. The choice of control actions, depending on the speed of the process, must normally be as follows:
- **Medium fast processes**:To achieve precision in control, proportional integral action on the primary variable and proportional action on the secondary variable will be sufficient (primary controller PI, secondary controller P).
- **Very slow processes on average**: for faster reaction, precision and stability, the system set the primary controller PID and secondary controller PI.

The simplest example of a cascade control is a controller on valve positioner. Cascade control is not normally provided in fast control loops (flow rates, pressures, etc.) and is most useful in temperature control.

7.5.3.1.   Tuning two PIDs configured for cascade control
If you need to tune two PIDs configured for cascade control, we recommend that you follow these steps:
1. Set the primary PID to Manual, keeping the secondary PID in Automatic.
2. Set the value of the power delivered from the primary PID (setpoint del PID secondario, multiplied by the Trim Range parameter to become the setpoint of the secondary PID).
3. Activate the self-tuning procedure of the secondary PID.
4. After completing the self-tuning procedure on the secondary PID, return the primary PID to Automatic.
5. Return the system to idle.
6. Activate the self-tuning procedure of the primary PID.

7.5.4.   Ratio control

In ratio control, the variable to be controlled is not a physical value, but its ratio to another value, whose value must of course be available.

This type of control is commonly used, for example, in processes in which it is necessary to feed a reactor in which we wish to control the ratio between two reactants.

In practical applications the primary variable is not checked or controlled externally, as in the case of mixing between two fluids (Fluid1/Fluid2).

The control is obtained by simply calculating the setpoint of the substance A (Fluid1), on which you can exercise control, as a product of other substance B (Fluid2) multiplied by an appropriate coefficient (RATIO), which expresses the ratio that you want to keep between the two substances.
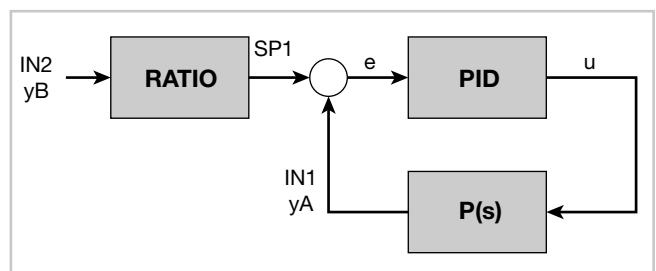
RATIO is the value of ratio you want between 1 (PV1) and IN2 (PV2 range from 0.01 to 99.99). i.e.

$$RATIO = IN1 / IN2$$

This ratio is automatically calculated in manual -> automatic change and can be edited.
Use of two input signals (PV1 and PV2) with the same number of decimal points is recommended.
Example: how the Ratio calibration procedure might take place on the basis of delivered power.
- Activate manual mode
- Keep PV2 as constant as possible
- Modify manual power until PV1 reaches the desired point leading to balance in the process.
- The PV1\PV2 ratio will be calculated automatically.
- Switch back to automatic mode.
- The RATIO will be maintained invariable at the last value calculated at the end of the manual regulation process. Output power in the final conditions will be the balanced power.

7.6.   Motorised valve control

In a control procedure, a motorized valve has the task of varying the flow of a fluid according to the signal coming from the controller.
Speaking of an industrial process, the fluid could be a fuel often corresponding to the thermal energy introduced in the process itself.

In order to vary its flow rate, the valve is equipped with an actuator that can change its opening value by overcoming the resistance produced by the fluid passing through it.
The control valves modulate flow in a modulated manner, resulting in finite variations of the fluid passage section at finite variations of the input signal in the actuator (signal coming from the actuator).
The system permits entry of the real valve position to make control more precise.

A typical actuator consists of an electric motor connected through a reducer and a mechanical transmission system to the valve shutter.
The actuator can be integrated with various auxiliary components, such as mechanical and electrical safety endurance, manual drive systems, position detection.
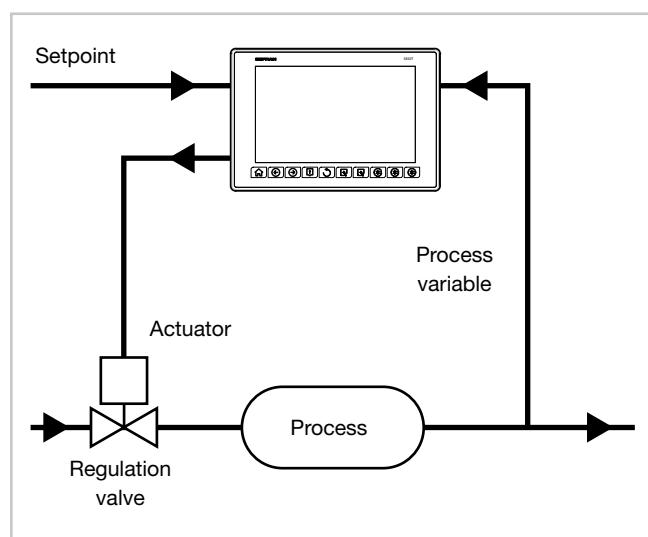
Figure 16 - Valve connection diagram

The controller determines, depending on the dynamics of the process, the output value that drives the valve actuator so that the opening of the valve is such as to maintain the desired value of the process variable.

7.6.1.   Valve control parameters

For valve control, the controller uses the following VALVE sub-menu parameters:

- **TRAVEL TIME - Actuator time**: it is the time taken by the valve to switch from fully open to fully closed (or vice versa). Settable with a resolution of one second, it is a mechanical feature of the valve + actuator set. NOTE: if the actuator stroke is mechanically limited, the TRAVEL TIME value must be reduced proportionally.

- **T_LO - Minimum pulse**: expressed as a percentage (with a resolution of 0.1%) of the actuator time, it represents the minimum valve position variation corresponding to the power variation provided by the controller (power under which the actuator does not respond physically to the command). Increasing T_LO decreases the wear of actuator to the detriment of positioning precision. The minimum pulse duration can be set in T_ON as a percentage of the actuator time. When you set T_LO, the same value is automatically set in T_ON.

- **T_HI - Impulsive tripping threshold**: expressed as a percentage (with resolution of 0.1%) of the actuator time, it represents the deviation of position (required position - real position) under which the switching request becomes impulsive.
T_HI is only active with T_OF = 0.
The kind of impulsive approach allows fine control of the valve position, which is useful especially in cases of high mechanical inertia.

- **T_ON**: is the minimum time of the control valve pulse expressed as a percentage of the actuator time. You should set T_ON to the same value as T_LO.

- **T_OF**: is the minimum time between two valve ON command expressed as a percentage of the actuator time.
Setting T_OF = 0 excludes the function.
Setting T_OF ≠ 0, valve switching becomes impulsive throughout the position deviation; pulse ON Time = T_ON and OFF time = T_OF.
A value set in T_OF <T_ON is forced to T_ON.

HEAT/COOL: in the first case, the open valve corresponds to heating of the system (e.g. letting in hot air), while in the second it corresponds to cooling (e.g. letting in coolant)

7.6.2.   Valve control mode

In the valve control, every switch request greater than the minimum pulse is sent to the actuator.

Each action updates the presumed position of the virtual potentiometer calculated according to the stated actuator stroke time. In this way, there is always a presumed position of the valve, which is compared with the controller position request.

Having reached a prominent position (open or closed, determined by the "virtual potentiometer"), the controller provides a further command in the same direction, thus ensuring that the real prominent position is reached.

The actuators are normally protected against the full open position OPEN or CLOSE command in fully closed position.

7. EXAMPLES AND APPLICATION NOTES

There are two ways of approaching the setpoint:

- **Non impulsive behaviour**
  For non impulsive behaviour, set T_HI T_OF = 0 and T_OF = 0: each request greater than T_LO is continuously sent to the actuator on OPEN/CLOSE outputs.
  The minimum duration of the pulse is settable in T_ON as a percentage of the actuator time, you should set T_ON = T_LO.
  With power equal to 100.0% or 0.0%, the corresponding output remains active.

- **Impulsive behaviour**
  - *T_HI ≠ 0 and T_OF = 0*
    For impulsive behaviour, set T_HI ≠ 0 and T_OF = 0: each request greater than T_LO is sent to the actuator on OPEN/CLOSE outputs with T_ON duration pulses. The Off time of the impulses will become longer in proportion as we approach the position to be reached.
    T_HI defines the deviation within which switching becomes impulsive.

Example with T_HI 20.0%
  or deviation of 15% to 75% will be:
    - from 15 to 55 continual
    - from 55 to 75 with amplitude impulses T_ON (T_OFF cannot be set as parameter T_HI is already in use and will create conflict)

  With power equal to 100.0% or 0.0%, the corresponding output remains active.

  - *T_HI = 0 and T_OF ≠ 0*
    T_HI = 0 and T_OF ≠ 0: any request greater than T_LO is sent to the actuator via OPEN/CLOSE outputs with T_ON and T_OF duration pulses.
    With power equal to 100.0% or 0.0%, the corresponding output remains in modulation.

  - *T_HI ≠ 0 and T_OF ≠ 0*
    Floating Valve
    This setting is not recommended for use with a valve without feedback.

    The T_HI parameter must always be ignored, and movement is managed in terms of impulses only.
    With power ≤ 10.0%, or ≥ 90.0%, impulse management is suspended, and the opening or closing command is forced until required power falls within the range of 10.0-90.0%.
    In the case of a floating valve, consider that when the threshold of requested power is exceeded, the valve's internal model will be updated immediately with the position 9.9% or 89.9%, as appropriate.

    Feedback valve
    Parameter T_HI is ignored and all operation is impulse.

Warning
With a power of 100.0% or 0.0%, even if the parameters selected for movement specify impulses, they will not be implemented.
If a generic movement is required in any valve position, it will be performed with the specified impulse time, but if the requested movement leads to 0.0% or 100.0% of the position, it will be reached while keeping the corresponding digital output high.

T_HI ≠ 0 and T_OF = 0

Non impulsive behaviour

T_OF ≠ 0 and T_HI = 0
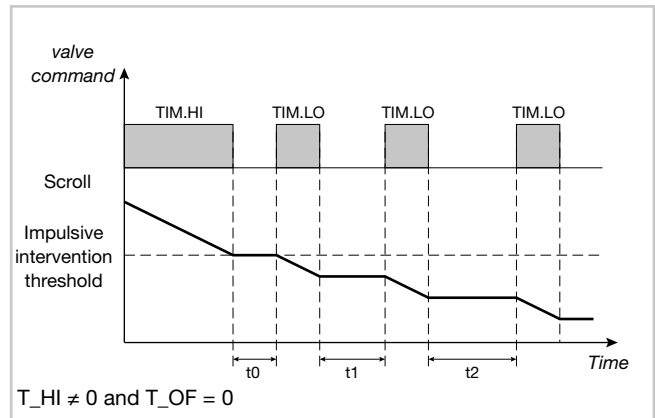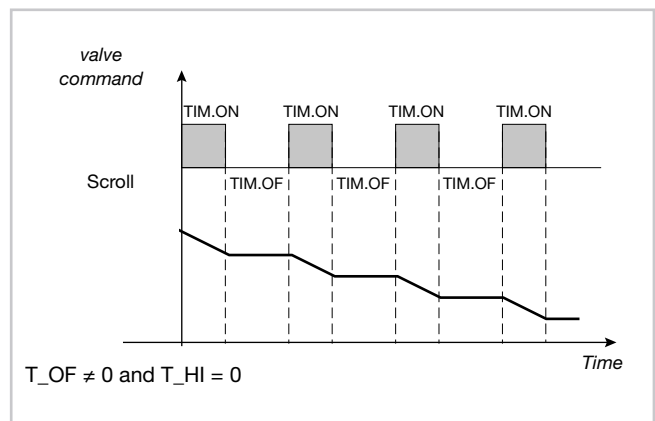
Impulsive behaviour

With the controller in manual mode, open and close valve commands can be directly controlled by the OPEN/CLOSE.
In the transition from automatic to manual controller, in the case of a floating valve, power will be set as equal to the percentage position reached by the valve just before the transition. The two values will be similar to the extent that the drive parameters permit good tracking of power by the estimated position.
In the transition from automatic to manual controller, in the case of a floating valve, the presumed position will be calculated on the basis of the manual power set.

7.7. Practical configuration examples

7.7.1. Loop configuration

The example describes the procedure for configuring a PID with the following features:
- Heat/Cool action;
- K thermocouple input;
- digital control output with Heat/Cool action;
- 2 absolute Maximum and Minimum alarms.

For the configuration of the PID, the following variables (signals) of the F-MIX module are used:

Type	Name	Description
Analog input (AI1)	AI_01	Input signal 1
Digital Output (DO1)	DO_01	Digital output 1 - Heat action
Digital Output (DO2)	DO_02	Digital output 2 - Cool action
Digital Output (DO3)	DO_03	Digital output 3 - HIGH alarm
Digital Output (DO4)	DO_04	Digital output 4 - LOW alarm

To configure the PID loop, proceed as follows:

1. Login with level 2 password.

2. Select **SETUP**.

3. Select **HW CFG**.

4. Select module **F_MIX**.

5. Configure the type of thermocouple associated with channel 1 (AI1) of the F-MIX module.

Touch **IN1 Type** and select **TC_K** (K thermocouple). The default variable associated with the temperature value of channel 1 is AI_01.

6. Select **OUT Digital** to access the digital signal configuration.

The default variable associated with the digital control of channel 1 (DO1) is DO_01. This command will be associated with the HEAT action of the PID controller. The default variable associated with the digital control of channel 2 (DO2) is DO_02. This command will be associated with the COOL function of the PID controller. The default variable associated with the digital control of channel 3 (DO3) is DO_03. This command will be associated with the PID controller's maximum alarm state. The default variable associated with the digital control of channel 4 (DO4) is DO_04. This command will be associated with the minimum alarm status of the PID controller.

7. Press the 🔼 button twice to return to the HW CFG menu.
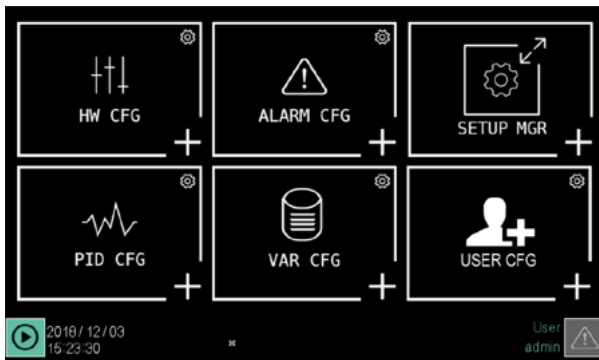
8. Select **ALARM CFG** to access the alarm message configuration.
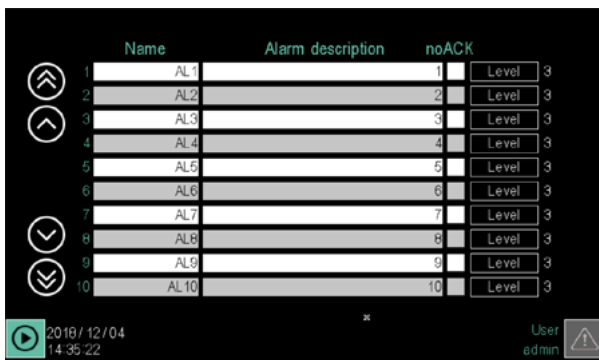
In the "Name" column, change the alarm name by entering AL1_HIGH_T1, and in the "String" column, enter the message "HIGH ALARM PID1", which will be matched with the first alarm threshold on the PID controller.

Edit the text of the second line with the name AL2_LOW_T2 and the message "LOW ALARM PID1", which will be matched to the second PID controller alarm threshold.
AL1_HIGH_T1 and AL2_LOW_T2 will be the names identifying the alarms in the configuration screens, in the custom pages and in the logical functions, while HIGH ALARM PID1 and LOW ALARM PID1 will be the messages that appear in the list of active alarms and the alarm history.

9. Press the 🔼 button once to return to the HW CFG menu.
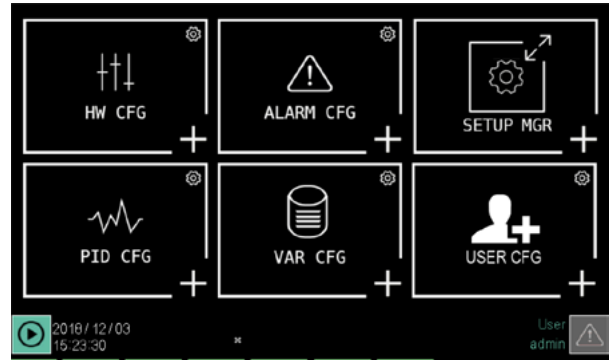
10. Select **PID CFG** to access the PID controller parameter configuration.

11. Select **Overview** to access the PID control type configuration page.
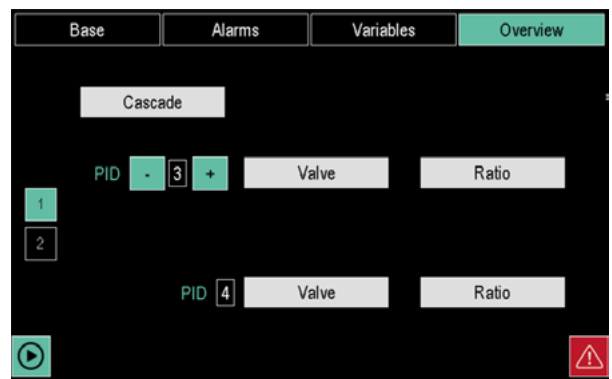
The default operating mode is base PID control. PID base means that PID Cascade, Valves, or Ratio are not enabled.

12. Select **Variable** to access the configuration page of the variables associated with the PID controller.
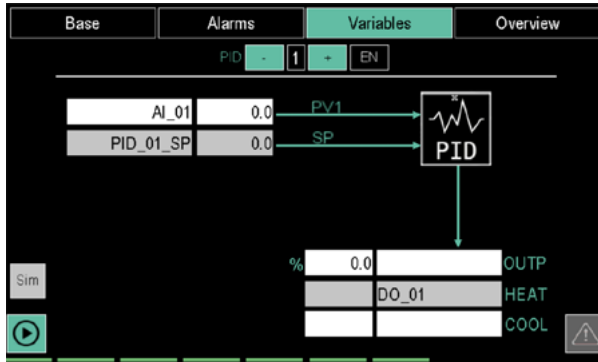
Configure the PV parameter by selecting the variable AI_01.
Configure the parameter OUT HEAT by selecting the variable DO_01.
Configure the OUT COOL parameter selecting the variable DO_02.

13. SSelect the **Process** key in the **Alarms** section to access the Process alarms configuration page in order to define the PID alarm thresholds.

Select the first alarm by setting the correct index in the Alarm No. parameter (by editing the value or using the + or - keys)
Touch "EN" to enable alarm operation.
Configure the alarm reference variable by setting the variable (AI_01), in the "Ref" parameter
Configure the parameter "AL" selecting the variable (AL1) associated with alarm string 1.
Configure the "OUT" parameter selecting the variable DO_03.
Touch + on the alarm number selector to select alarm number 2.
Touch "EN" to enable alarm operation.
Configure the alarm reference variable by setting the variable (AI_01), in the "Ref" parameter
Configure the parameter "AL" selecting the variable (AL2) associated with alarm string 2.
Configure the "OUT" parameter selecting the variable DO_04.

14. Select **Base** to access the PID controller control parameter configuration page.

With the parameters displayed, you can configure the actions of the PID controller.

7.7.2. Configuring a LOOP controller with input equal to the average value of 3 variables

The example describes the procedure for configuring a PID that uses the average value of 3 variables as an input. The control is Heat/Cool type.
For this type of configuration, the instrument must have the GETLogic option, necessary to calculate the average value.

For the configuration of the PID, the following variables (signals) of the F-MIX module are used:

Type	Name	Description
Analog input (AI1)	AI_01	Input signal 1
Analog input (AI2)	AI_02	Input signal 2
Analog input (AI3)	AI_03	Input signal 3
Digital Output (DO1)	DO_01	Digital output 1 - Heat action
Digital Output (DO2)	DO_02	Digital output 2 - Cool action

The following user variables are also used to calculate the average value:

Type	Name	Description
Register	Average_value	Average value for PID input

To configure the PID loop with input value equal to the average of the value of three input variables, proceed as follows:

1. Login with level 2 password.

7. EXAMPLES AND APPLICATION NOTES
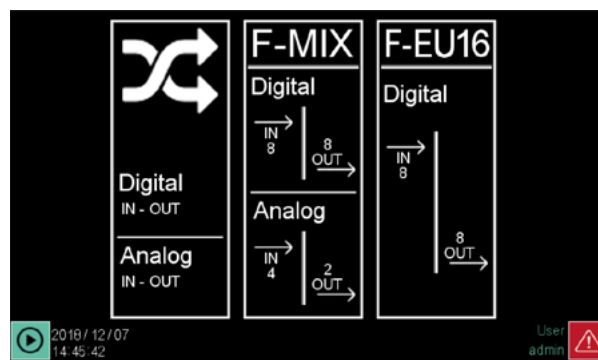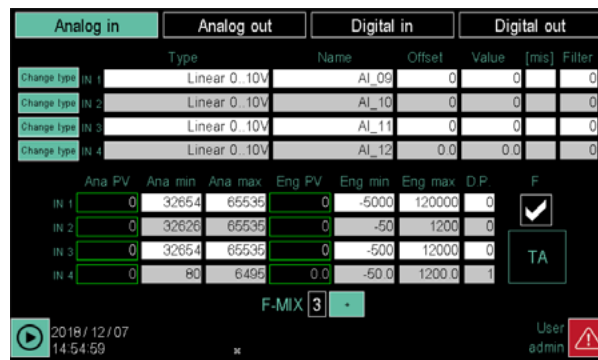
2. Select **SETUP**.
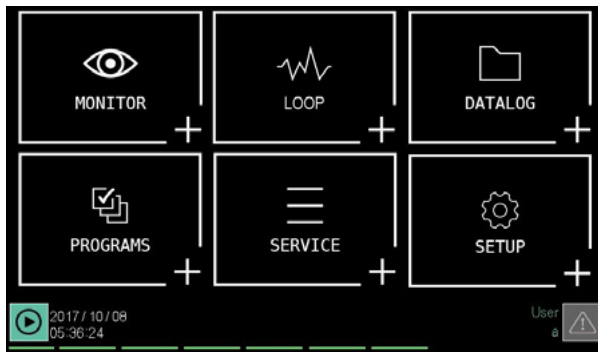
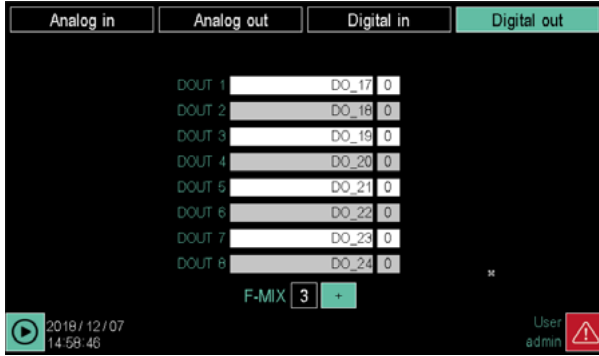3. Select **HW CFG**.
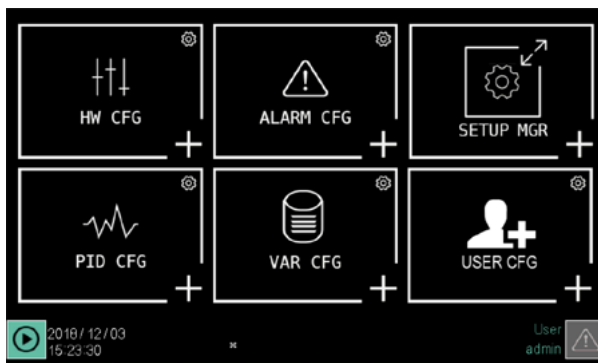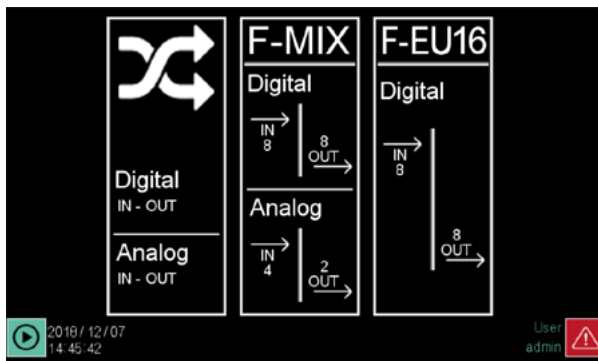
4. Select module **F_MIX**.

5. Configure the type of thermocouple associated with channel 1 (AI1) of the F-MIX module.
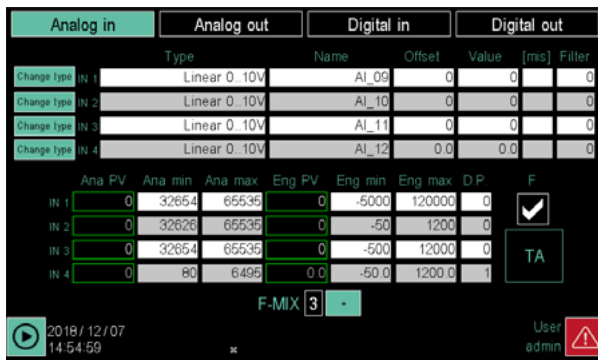
Touch **IN1 Type** and select **TC_K** (K thermocouple). The default variable associated with the temperature value of channel 1 is AI_01.
Touch **IN2 Type** and select **TC_K** (K thermocouple). The default variable associated with the temperature value of channel 2 is AI_02.

Touch **IN3 Type** and select **TC_K** (K thermocouple). The default variable associated with the temperature value of channel 3 is AI_03.

6. Select **OUT Digital** to access the digital signal configuration.
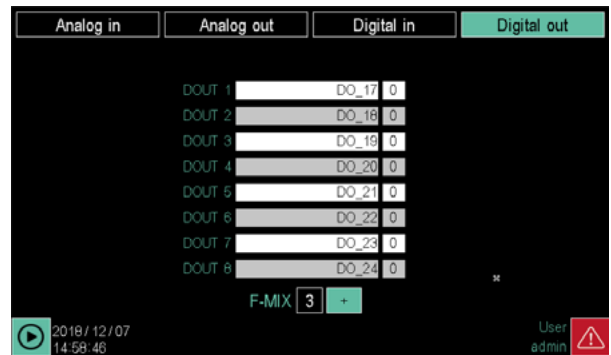
The default variable associated with the digital control of channel 1 (DO1) is DO_01. This command will be associated with the HEAT action of the PID controller. The default variable associated with the digital control of channel 2 (DO2) is DO_02. This command will be associated with the COOL function of the PID controller.

7. Press the [↑] button twice to return to the HW CFG menu.
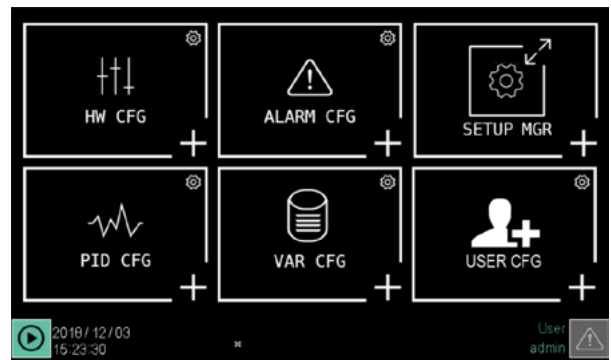
8. Select **VAR CFG** to access the user variable configuration.
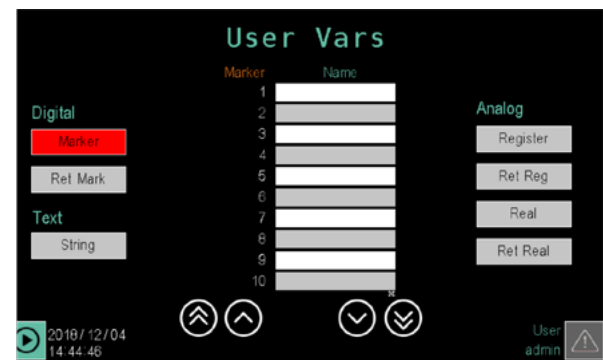
Select the list of "Register" type variables by touching the **Register** key in the Analog section.
Enter variable name "Average_value" in the first empty row.In the D.P. (decimal point) column, set 1

9. Press the ⬆ button twice to return to the HW CFG menu.

10. Select **PID CFG** to access the PID controller parameter configuration.

11. Select **Type** to access the PID control type configuration page.
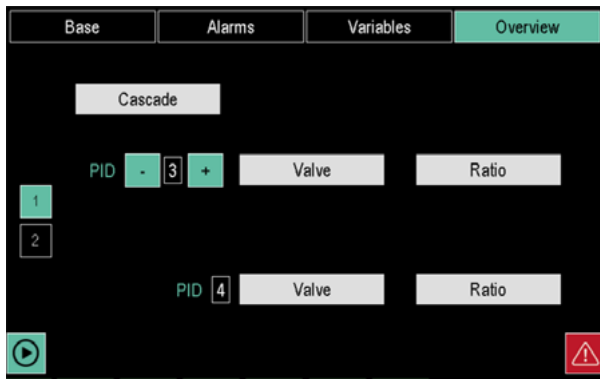
The default operating mode is base PID control. PID base means that PID Cascade, Valves, or Ratio are not enabled.

12. Select **Variable** to access the configuration page of the variables associated with the PID controller.
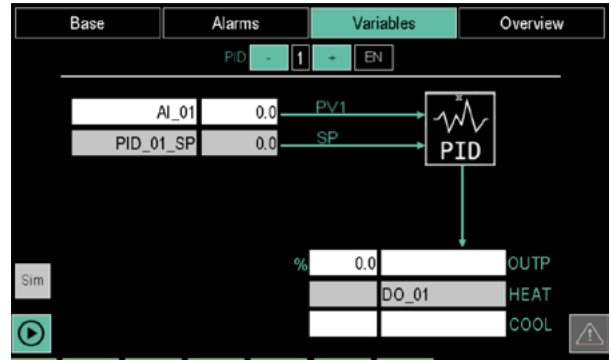
Configure the PV parameter by selecting the Average_ value variable.
Configure the parameter OUT HEAT by selecting the variable DO_01.
Configure the OUT COOL parameter selecting the variable DO_02.

13. Select **Base** to access the PID controller control parameter configuration page.

With the parameters displayed, you can configure the actions of the PID controller.

14. Press the ⬆ button twice to return to the main menu.
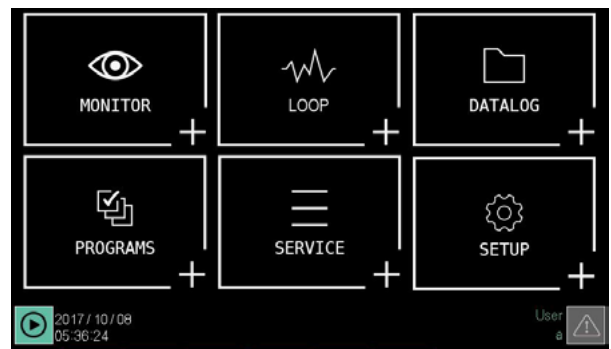
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15. Select **PROGRAMS** to access GETlogic logic/mathe-
matical configuration.
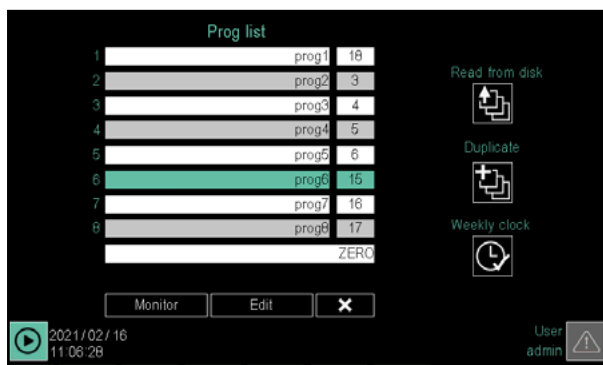
16. Select the program name **ZERO** (last row) and edit the
list of instructions.
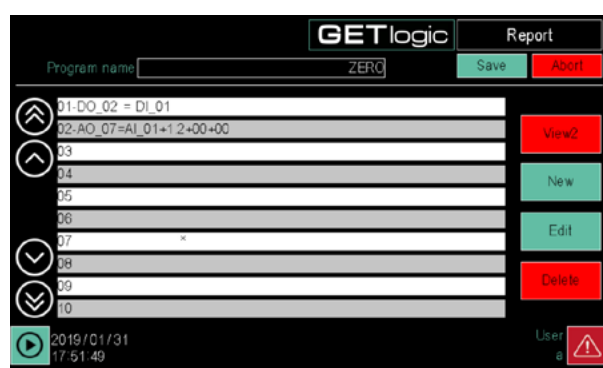
Select **New** and select **Mathematics** from the function
group list.
A new feature will be added in the instruction list.
Select the new function and edit its parameters.

17. By clicking on the button >> at the top right, select the
mathematics function "AVG" (value average).
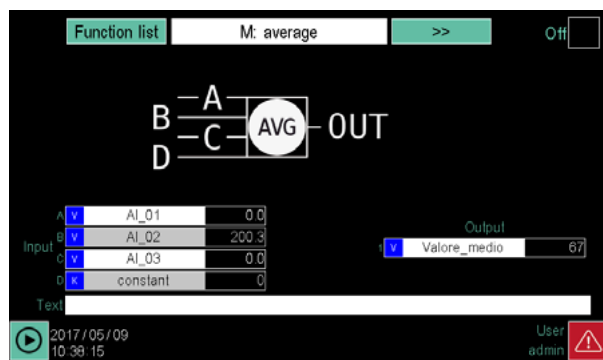
Configure the input A parameter of the function with
variable AI_01.
Configure the input B parameter of the function with
the variable AI_02.
Configure the input C parameter of the function with
the variable AI_03.
Configure the output parameter of the function with the
variable Average_value.
For diagnostic purposes, at the set input and output
variables, their real value is displayed.

18. Press the [Functions list] button to return to the list of
functions. Touch the **Save** button to store the new
control logic.

7.7.3. 2-curve setpoint profile

The example describes the sequence of operations to configure a profile that manages 2 SPs and 4 output events.
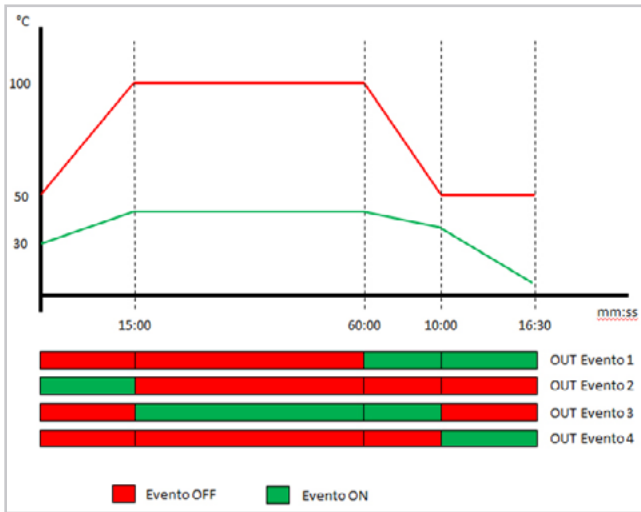
The curve drawn in red (Profile 1) is associated with the PID1 controller SP and the green curve (Profile 2) is associated with the SP of the PID2 controller.

For the configuration, the following variables are used as output events:

Type	Name	Description
Digital Output (DO5)	DO_05	Event 1 command output
Digital Output (DO6)	DO_06	Event 2 command output
Digital Output (DO7)	DO_07	Event 3 command output
Digital Output (DO8)	DO_08	Event 4 command output

The t*abel summarises times and setpoints* (SPs) used to generate profiles.

To configure the 2-curve setpoint profile, proceed as follows:

1. Login with level 2 password.

2. Select **PROGRAMS** to access SP profile configuration.
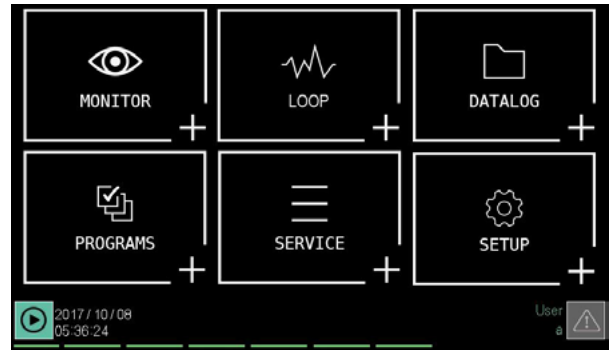
3. Press the button to enter a new program.

4. In the "Program Name" field, enter the name that will identify the SP profile generation program.

Touch **Save** to store the new program and access its configuration.

TIME AND SETPOINT SUMMARY TABLE							
Segment number	Time (mm:ss)	SP profile 1	SP profile 2	Event OUT1	Event OUT2	Event OUT3	Event OUT4
		50	30				
1	15:00	100	40	OFF	OFF	ON	ON
2	60:00	100	40	ON	OFF	OFF	OFF
3	10:00	50	35	OFF	ON	ON	OFF
4	16:30	50	10	OFF	OFF	OFF	ON

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5. "Base" configuration page 1 opens.

As the "Unit of Time" parameter, select **m:s** (minutes: seconds).
As "Start mode" parameter, select **Start from SP**.

6. Select "Base" configuration page 2.

Delete the variables in rows 3 and 4 from the "OUT" and "PV" columns. This will only generate SP profiles for 2 curves.
Configure the following parameters:
- Column "OUT", row 1 = PID_01_SP.
- Column "OUT", row 2 = PID_02_SP.
- "PV" column, row 1 = AI_01 (check that variable AI_01 is the input of the PID1 controller).
- "PV" column, row 2 = AI_02 "PV" (make sure that the variable AI_02 is the input of the PID2 controller).
- Column "PID", row 1 = 1.
- Column "PID", row 2 = 2.

7. Select "Base" configuration page 4.

Configure the following parameters:
- Column "Level 2", row 01 = DO_05.
- Column "Level 2", row 02 = DO_06.
- Column "Level 2", row 03 = DO_07.

- Column "Level 2", row 04 = DO_08.
Delete parameter settings from rows 05 to 16.

8. Select **Segments** to set the SP profile.

9. Touch the button and add the 4 SP profile segments.

10. Edit the list of available parameters for each segment.

Use the selector in the page to display the various segments.

Configure the individual segment parameters as follows:

Parameter	Segment number			
	1	2	3	4
Time (mm:ss)	15:00	60:00	10:00	16:30
Start SP1	50			
SP 1	100	100	50	50
Start SP2	30			
SP 2	40	40	35	10
HBBh	0	0	0	0
HBBl	0	0	0	0
ALLh	0	0	0	0
ALLl	0	0	0	0
Group	0	0	0	0

11. Select **Segments** to view the segment list.

12. Touch the button ▤. In the window that opens, select the "I/O step" item.

13. Select "CFG step" page 2 (set outputs).

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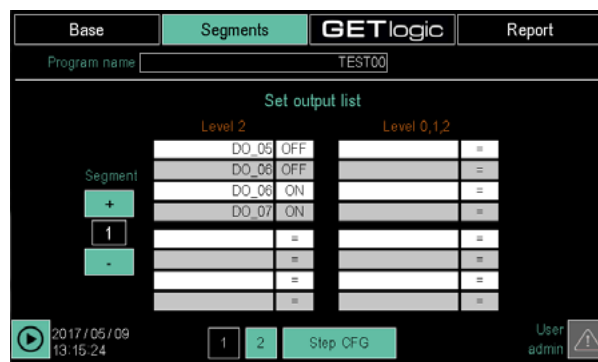
To view the various segments, use the segment selector on the left side of the screen.
Configure the individual segment parameters as follows:

Parameter	Segment number			
	1	2	3	4
Event OUT1	OFF	ON	OFF	OFF
Event OUT2	OFF	OFF	ON	OFF
Event OUT3	ON	OFF	ON	OFF
Event OUT4	ON	OFF	OFF	ON

14. Select **SAVE** to save settings.
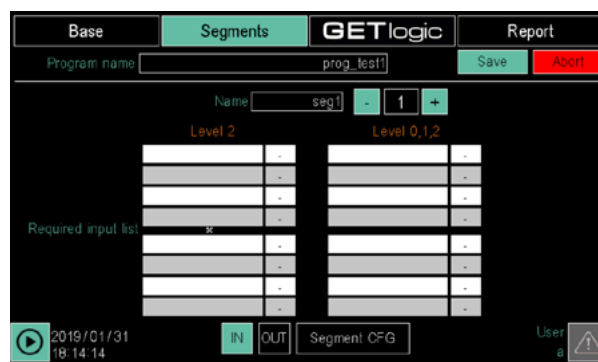
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One of the most important regulations in the world of **pharmaceuticals** and **medical devices** is FDA **CFR21 part 11**. This is a set of guidelines on **data processing**, with the aim of defining some rules to follow to track and detect any errors and / or faults before these can lead to serious consequences on the final products.

The basic core of the rules of the aforementioned legislation is as follows:

1) *track and record any settings or changes in device settings*
2) *always have a certainty of who has performed a task on the system*
3) *guarantee the quality and incorruptibility of the recorded data*
4) *administrate the different levels of system users in a safe and homogeneous way*

The first consequence is that any device, compliant with FDA CFR21 part11, must produce and store a log called **Audit Trail**, where who did what and when must be recorded in order to fully respond to what is stated in points 1) and 2).

Data encryption must guarantee the **integrity** of the same, which will therefore be unchangeable from the moment of their creation.

A control system must be able to acquire the real state and trend of the process variables. The date and batch number of the product must be indicated and the electronic signature of the operator responsible must be affixed to the report relating to a certain **production batch**. The

procedures must ensure that errors do not occur and that the signatures are always uniquely traceable to their owner through a system of authentication. Records must be securely stored and maintained for an adequate period and must be protected against unauthorised access.

Lastly, **user data** must be managed securely, for example it is important that a minimum user password length is set, which should not be less than 4 characters. It should also be possible to establish the minimum number of numeric characters and mandatory special characters when defining user passwords. The addition of new users by the administrator should be managed in such a way as to involve the subsequent re-entry of the user password, at the first subsequent Log In and so on.

Gefran **complies** with the CFR21 part 11 regulation with the **2850T** and **3850T** series, both as regards the process control part and as regards the data recording part. In other words, Gefran, with these products, provides all the features necessary for system certification in the medical and pharmaceutical world.

For lengthy sections similar to **CFR21 part 11**, the European reference legislation is called **EU GMP Annex 11**, and the 2850T/3850T multifunction controllers also comply with the relevant European legislation. For simplicity, and because it is universally recognised by the market as a reference standard, we will only discuss the CFR21 in the following chapter, also implying the European ANNEX11 regulation.

7.8.   CFR-21 Function Management - Part 11

The description of the new device functions in CFR-21 configuration for applications that require certification according to CFR-21 part 11 will be dealt with in the following chapter.

When the CFR21 option is available on the instrument, the situation shown in the following image will be shown in the Monitor section Info page

Meeting the requirements of this legislation provides for two main changes compared to the standard version:
- New user administration and specific user accesses for this configuration
- The introduction of the secure tracking system (Audit Trail) of the device configuration and use parameters together with specific events allows subsequent consultation by the control bodies responsible for the purpose
-

7.8.1.   User administration in CFR-21 mode

The CFR-21 certification requires the presence of a generic user level where all the possible actions for modifying parameters and running commands on the device are blocked, unless specific pages can only be browsed in read-only mode. This status must be activated each time the device is started and when no user of a different level is logged in.

The number of access levels available to users has therefore been extended as follows
- GUEST
  - Non-configurable level: active each time the device is started. it does not allow any command to be run or any parameter to be entered
  - A new user profile of this level cannot be created
  - Name of the only default profile: "**guest**" without password
  -
- OPERATOR
  - Configurable level: It is the same as the standard version OPERATOR level by default mapping
  - Default profile name: "**operator**" with password "**111111**" (the default "operator" profile has no password in the standard version)
  -
- SERVICE
  - Configurable level: It is the same as the standard version SERVICE level by default mapping
  - Default profile name: "**service**" with password "**222222**" (the "service" profile

password in the standard version is "5678" by default)
- SUPERVISOR
    - Configurable level: New level introduced with CFR-21, whose default mapping is at an intermediate level between SERVICE and ADMIN
    - Default profile name: "**supervisor**" with password "**333333**"
- ADMIN
    - Non-configurable level: As in the standard version, it has full access to all device features
    - Default profile name: "**admin**" with password "**444444**" (the "admin" profile password In the standard version is "1234" by default)

7.8.1.1. New properties and user functions in CFR-21 mode

The following new features have been introduced for each user:
- Enabled/disabled status: each user in the database can be enabled or disabled
    - A disabled user is still included in the user database but cannot log in
    - Upon creation, a user is automatically enabled
    - Users can be disabled for the following reasons:
        - Manually disabled on the user edit page
        - When the password validity time expires
        - When the maximum number of consecutive failed logins is reached
- Password change request at the next user login (automatically activated when a user is created to request a change at the first login and replace the temporary one assigned by the system administrator when the account was created)
    - It can be manually enabled on the user edit page
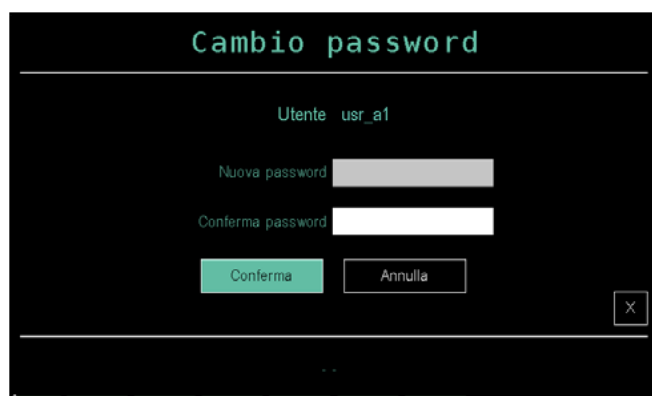
- Checking the time validity of the user password
    - The system automatically activates the request to change the password for any user after a set time interval in which the user password has never changed.
    - The expiration time is configurable in the device CFR-21 options page in the value range [1..365] days, 90 by default
- Minimum user password length check
    - When a new password value is set, its length in characters is checked. the new

password is accepted only if it meets the minimum set length
- The minimum user password length can be set in the device CFR-21 options page in the value range [1..10] characters, 6 by default
- Maximum number of consecutive failed access attempts check
    - The system automatically disables the user when a maximum number of failed, consecutive logins is reached
    - The count of failed login attempts is retentive (it is kept when the device is turned off) and is reset at each successful login
    - A warning window appears on the next to last failed attempt to warn the user of the last attempt before being disabled
- Using a strong password: By enabling the appropriate option in the CFR options menu, it will be possible to force the user to use different types of characters in order to consider the password valid when creating or changing the password.
In particular, the user must include at least the following in the password: a capital letter, a lower-case letter, a number, a special character chosen from the following characters: *space ! % & ( ) + , - . = @ # _*
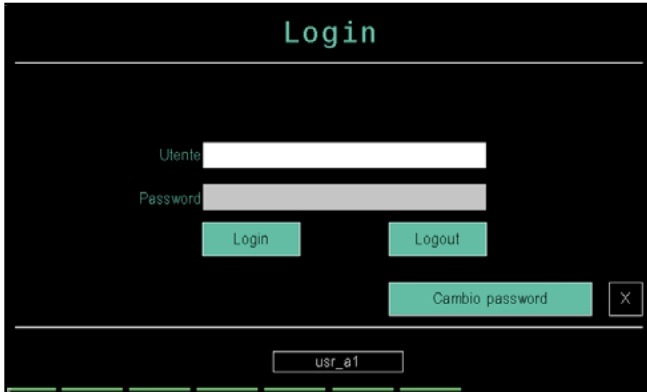
- The maximum number of attempts can be set in the device CFR-21 options page in the range of [1..10] times, 3 by default

⚠ **Caution!** In the case of the last ADMIN level user, failed login attempts are not counted because at least one active ADMIN user must always be present in the database.
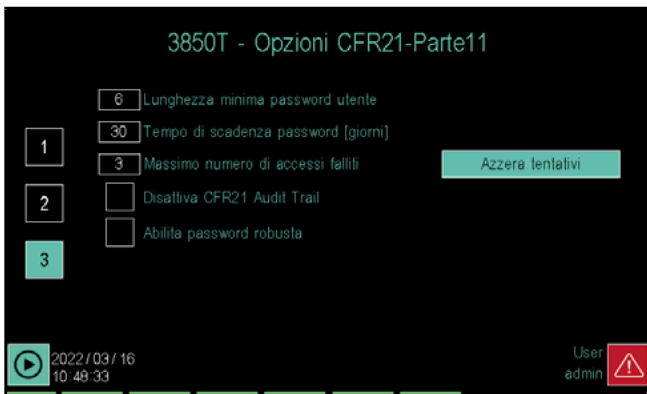
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- Possibility for each user to be able to change their password, after logging in, from the login page with the "Change password" button (the change password page shown above is proposed again)

The options for configuring and setting the new features introduced in CFR-21 mode are grouped in an options page that has been added to the device menu:

The "Reset attempts" button resets the number of failed login attempts accumulated up to that moment for all set users.

⚠️ **Caution!** In CFR-21 mode, the login and creation of a new user via the bar code reader are disabled in order to meet the new requirements.

7.8.1.2. User creation and editing in CFR-21 mode

The creation of a new user shares the same setting page as the standard version, where the new "Supervisor" level has been added among those selectable in the level setting drop-down menu ("Guest" is not included because no specific user can be this type).

In addition to the possibility of changing the level and deleting the standard version user, the following new setting/editing options appear in the edit user page (for users already in the database):

- The "Password" and "Confirm password" fields that allow you to reset the password of the selected user (leave the fields blank to leave the current password unchanged)
- The "Force password" button to activate the password change request at the selected user's next login
- The "Enable" button to enable/disable the selected user

7.8.2. Tracking parameters in 21-CFR mode - Audit Trail

The audit trail function will also be automatically enabled with the CFR21 option, as required by the 21 CFR Part 11 regulation. This feature allows you to record and collect all sensitive operations performed by different users in historical archives that cannot be tampered with. Each Audit Trail event generated will contain various information useful for reconstructing the history of the process, including:

1. Type of event triggered with description and characteristic parameters of the event
2. Date and time of the event
3. User name and level of the user who caused the event
4. Previous value and current value in the event of a parameter change
5. Any optional note by the operator who performed the operation

These events will be collected in encrypted files equipped with a control code to detect any tampering that can be viewed in plain text only by using the specific tool for viewing the audits "Report Utility".

⚠️ **CAUTION!** By changing the system date and time and setting a value earlier than the current one, such as setting switching to daylight saving time, the Audit Trail event tracking sequence currently under construction is interrupted and closed at the last date/time change event to then restart with a new sequence starting from the new date/time set in the system.

The Report Utility tool will then be able to view all the events of a single time sequence and be able to search by date ranges within it, but events belonging to different sequences at the same time cannot be accessed.

This solution was adopted in order to ensure the consistency of a progressive time sequence of the events tracked and managed through the Report Utility tool.

7.8.2.1. Generation of new events and addition of notes in the system pages

An audit trail event will be automatically generated and immediately recorded using the tool and modifying any parameter within the system pages. Event recording will be transparent to the user, who, however, can assign a note to the operation just performed if deemed appropriate. In fact, after an event is generated, an icon representing a yellow note will appear on the page where the change was made. Press the icon to add text.

If the icon is ignored, the event will be recorded without notes after 60 seconds from event generation. If, on the other hand, the icon is pressed, the following window opens:

The following is shown in the note window

① Field containing the title of the note referring to the last modification made

② Note input field: the note to be associated with the audit event can be entered in this field.

③ Button to confirm and save the note

④ Button to discard the entered note and record the event without a note

7.8.2.2. Audit trail events within custom pages

The device allows user variables to be generated and custom pages to be created to allow the user to set the instrument according to specific needs. For this reason, the programmer who customises the tool has been allowed to decide how to manage the audit trail within custom pages. Depending on the application, there may be variables that are irrelevant to process progress which, consequently, do not need to be tracked. In fact, it is possible to customise the behaviour of the individual variables to allow this within the *GF_eXpress* programming tool in the *"Variables and alarms"* menu:

By enabling the checkBox ①, the programmer will ensure that the corresponding audit trail event will also be generated whenever the selected variable is modified within the custom pages. The Audit field default value is enabled.

By enabling the checkBox ② in addition to the generation of the event, the note request field will also be shown on the screen as described in the previous paragraph.

For further details on customising variables in *GF_eXpress* see the specific section in paragraph **9.4.1. "PROGRAMMER EDITOR" section"** on page 156.

The note field is not in a permanent position within the custom pages but can be added and moved at will. Note fields are added as described in paragraph **5.3.12. Change page component"** on page 112 following the choice of the new dedicated CFR Note component as shown in the following image:
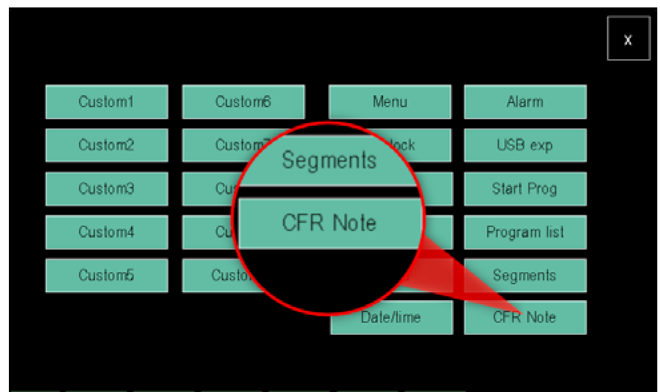
After selecting the new button on the page, it can be positioned at will within the custom pages.

In the event that a variable value changes and requires a note, the icon colour will change from grey to yellow and can be clicked to allow the operator to open the note creation menu as seen in previous paragraph.

⚠️ The system will automatically restore the previous value when the user tries to assign an illegal value from the custom pages to the system variables shown in the following table.

This forcing will not be tracked in the Audit file. Only the (not allowed) variation made by the user will be tracked in the aforementioned file.

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the conditions that cause the value to be automatically forced in the respective system variable are found in the table.

SYSTEM VARIABLES		CONDITION
MANUAL_SEL_x	with **x** from **1** to **8**	The command is only enabled if the respective program is in READY. If you enable the command from the custom pages when the respective program is in a different state, the parameter will be forced FALSE by the system.
PID_x_SP	with **x** from **1** to **16**	The set value must fall within the range delimited by the "LO.L" and "HI.L" parameters of the relative PID. Trying to set a value outside this range from the Custom pages, the system will force it back to the previous value.
PID_x_SELF_CMD	with **x** from **1** to **16**	The command is ONLY effective when the respective PID is enabled. By enabling the command when the PID is disabled, it will be forced back to zero/OFF

7.8.2.3. Further changes to the custom pages due to the presence of CFR21

In addition to the possibility of tracking the changes made to the variables present on the pages in the audit trail as seen in the previous paragraph, the CFR-21 option also introduces further changes:

- The Guest user, only present with the CFR21 option enabled, can only access the custom pages in read-only mode but cannot perform any modification or interaction with the page elements.
- The corresponding checkBox can be enabled for each element added to the pages in order to choose which class of users is enabled to interact with them as shown in the following figure:
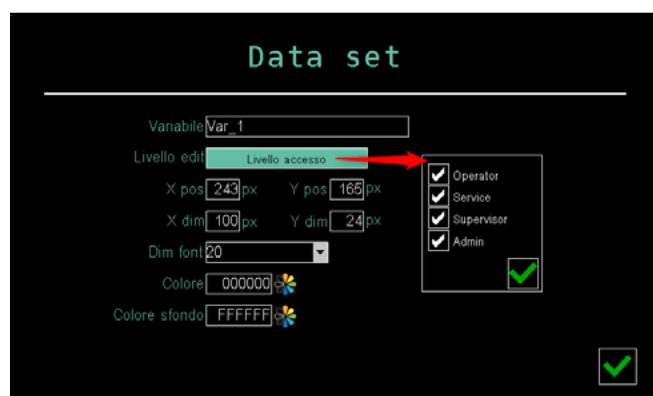
- In addition to the traditional levels in the list, the new Supervisor level will also be available if CFR-21 is enabled

7.8.2.4. Temporary blocking of the audit trail:

It may be useful to temporarily disable the audit trail function in some plant commissioning phases and then re-enable it at the end of this phase. To allow this, a special checkBox has been included in the Setup page presented in paragraph **"4.16.3.1. 3850\2850 SETUP"** on page 92.

In the event the checkBox status changes, the audit enabling and disabling event will in any case be tracked in the audit trail, as well as information relating to the operator who performed the action, the date and time.

7.8.2.5. Audit Trail backup, export and copy

The logs generated during audit trail operations must somehow be periodically removed to prevent the device memory from becoming saturated over time and making it impossible to generate new events. (The user is alerted of this condition when the space available on the device is about to run out)

Audit files can be saved in different ways, some of which are periodic and automatic and therefore strongly recommended. Some of these methods are indicated below:

- Manual export of audits to USB from the Datalog-> Export menu:
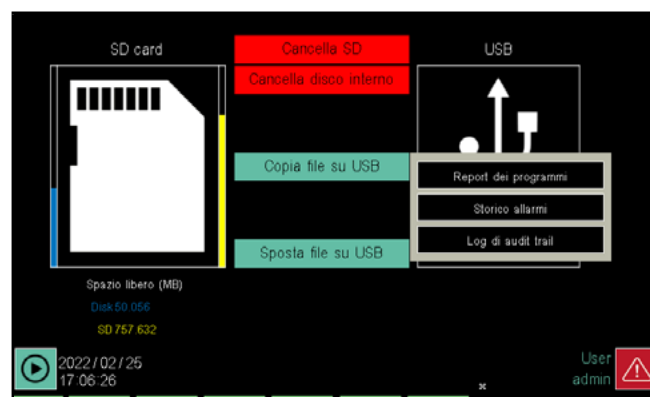
After installing a USB stick, the Audit Trail Log can be copied or moved from this menu. If you choose to move the audit following the operation, a new event will be generated which will keep track of the operation just performed. The user will then be responsible for properly saving the data.

- Exporting logs via FTP: By setting the automatic periodic backup option you will be able to upload audit logs to a defined ftp server. This is definitely an excellent option to keep the memory free and at the same time periodically secure the logs.
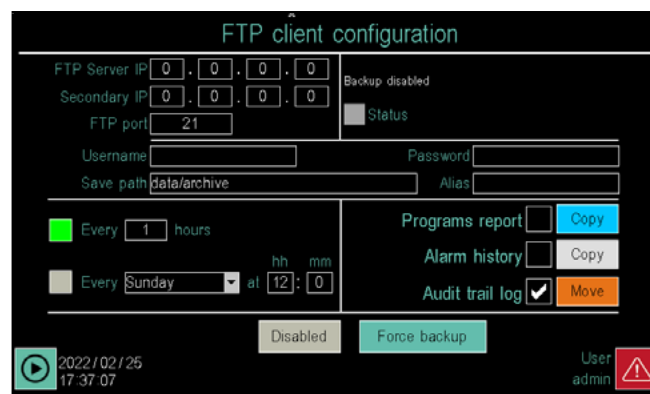
Backup frequency and what to transfer can be selected in the specific page. You can choose to move the files or simply copy them. Moving files will always generate a corresponding audit trail event in the initialised log immediately after the operation is completed.

- Using the "Report Utility" tool: logs can be periodically backed up using this tool, exactly as with the FTP client. For additional information on how the tool works, please refer to the specific operating manual.

7.8.3. Dedicated management for CFR-21 mode

7.8.3.1. Inhibit launching unsaved programs or recordings

A program or recording with unsaved changes cannot be launched when CFR-21 management is running.

For this reason, the button shown in the pop-up window that appears when launching a program, or a recording, will save the program or the recording followed by the actual launch of the same in case the latter has unsaved changes (see following image).
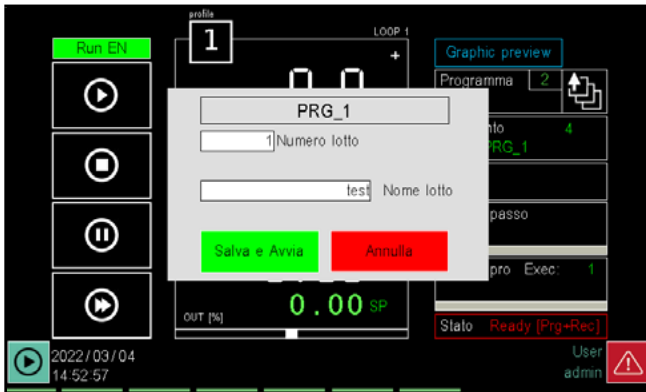
In the event that the program, or the recording, does not contain any changes, the key will only launch as when the CFR-21 mode is not running.

7.8.3.2. Inhibit launching unnamed programs or recordings

A new program, or a new recording, cannot be launched as long as the name assigned to the job/recording is null when CFR-21 management is running. Furthermore, at the launch of each new process or registration, the field containing the name will be cleared, thus forcing the user to enter a valid one (see following image).
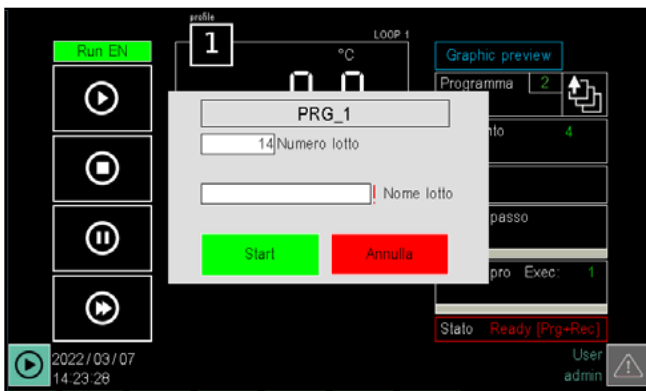
CLEAR the string proposed at the start of each new process and DO NOT repeat the used previously name

7.8.3.3. File transfer inhibition to target from USB memory devices

The following files cannot be transferred to the target when CFR-21 management is running:
- configuration
- programs or recordings
- images
- Report
- Audit Trail
- with the Alarm Log

taking them from the USB stick.

7.8.3.4. Audit Trail part factory reset

It is possible to delete all the Audit Trail files currently saved on the device memory, on the SD-card and on the internal disk, using a specific option in the factory reset window:
- There will be a single Audit Trail file that has tracked 3 events at the next device reboot:
  - Audit Trail file reset event
  - Power-off event
  - Power-on event
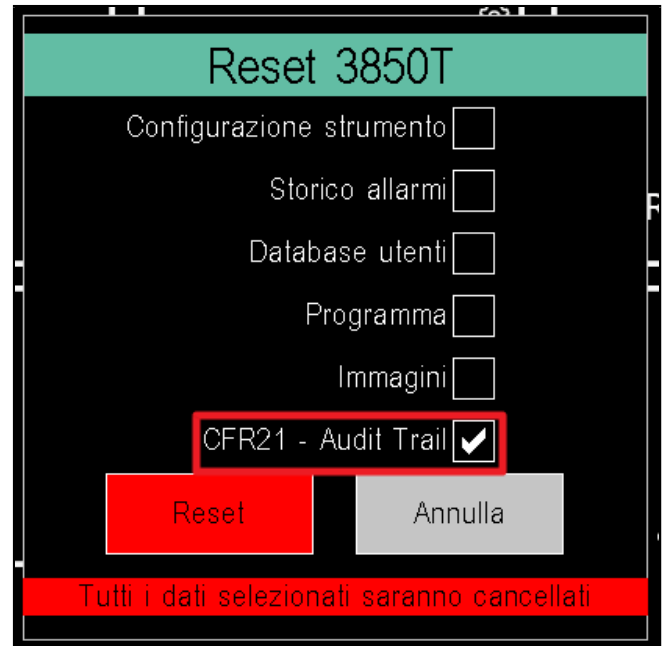
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If Audit Trail tracking has been disabled with the appropriate option on the device third configuration page, this section cannot be reset.

Even if the SD-card is not inserted (with the SD option on), resetting the Audit Trail section is not possible, as the files on the SD-card are not accessible. In the meantime, the user is warned with a specific message in the factory reset window:
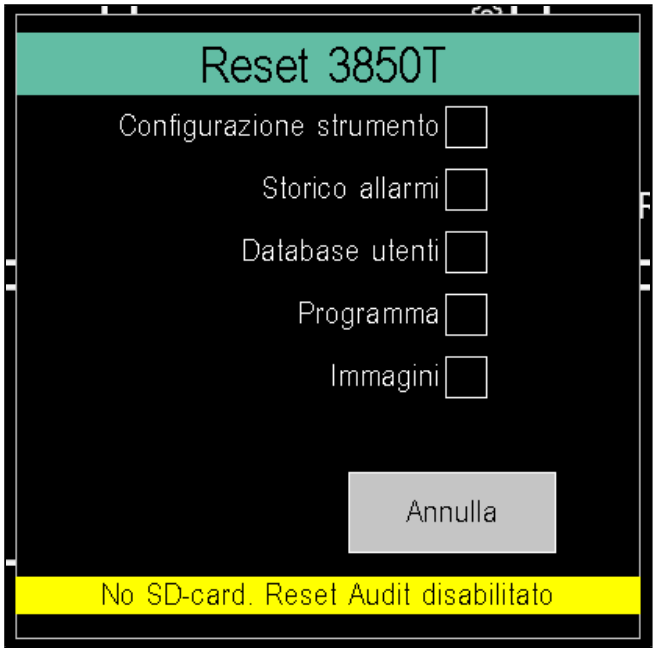
7.8.4.   GF_eXpress

The 21 CFR functionality in GF_eXpress is enabled by selecting the option defined 'Software' on the instrument's initial wizard configuration page.

Selecting or deselecting the relative option involves the addition and/or modification of functions within GF_eXpress:

-   -   Variable configurability
-   -   User Management
-   -   GETview

7.8.4.1.   Variable configurability

Enabling CFR21 involves tracking data modified by users on the target. This data also includes the variables modified by the user on the custom pages through the available components (EditText, Button,. .).

It is possible to choose whether (1) to track them in the audit and whether once tracked (2) whether a note explaining the reason for the modification is required for each of the variables that can be modified by the user.

This information (1) and (2) can be configured by the GF_eXpress user on the "Variables" page accessible from the 'Variables and Alarms' button on the initial Wizard page.

With CFR21, in addition to the standard columns for variable configuration (name, unit of measure, paragraph,. . .) there are 2 further columns (accessible and modifiable through the variable editing window):

-   Audit (1): the presence of a checkbox informs the user about the possibility of tracking the related variable in the audit. Tracking will be enabled when the checkbox is selected.
-   Note (2): for each variable that can be entered in audit (with a checkbox in the audit column) there is a checkbox in the notes column. The request for the reason for the change will be active when the checkbox is selected.

Deselecting the audit checkbox (1) causes the relative checkbox notes (2) to be deselected

Selecting the note checkbox (2) involves selecting the relevant audit checkbox (1)

By default, all the system variables that can be modified via custom pages and all user variables ([Ret] Register, [Ret] Real, [Ret [Marker] are inserted with the audit selected (therefore tracked in the audit) and a note not selected (thus without request for motivation).

Below is an example of the 'myRegister' variable of the Register type entered by the user.

Nome	Valore	Indirizzo	Virgola	Unità	Tipo ▽	Impostata	Usata	Descrizione	Sola lettura	Audit	Note
mioRegister		1	0		Register					☑	☐

The modifiability of the two checkboxes can be carried out, as for all the other parameters, from the dialogue box dedicated to variable editing that will manage the two new settings.

Below is an example of editing the note checkbox selection for the user variable 'myRegister'.
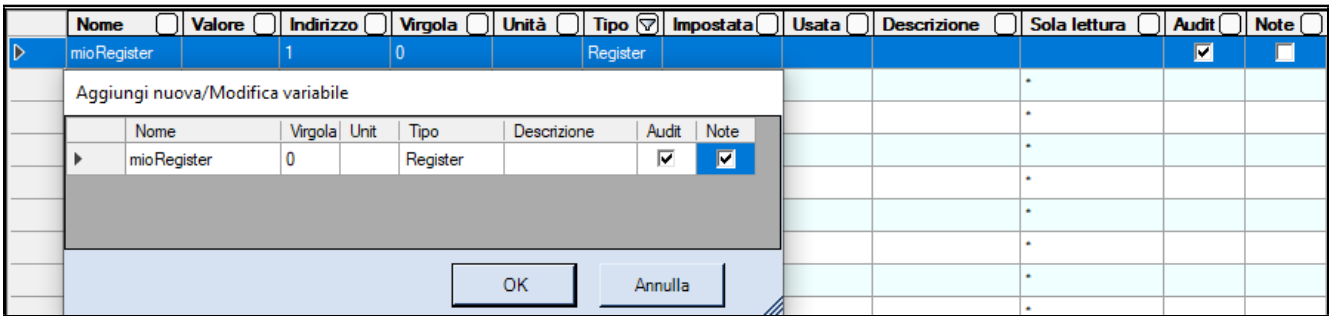
7.8.4.2. User Administration

Enabling CFR21 involves a change in user administration.
The change follows what was done on the target:
- administration of up to 4 user levels (compared to the two in standard administration).
- Minimum password length check
- Password change request (timed or on request)

Two additional settings are added for each user.
- The request to change the password at the first useful login

  o Valid password

  o Password change required

- - User enabling or disabling

  o **User enabled**

  o **User disabled**

The configuration of the levels follows what is found in standard mode, but extended to 3 configurable levels, in addition to the Admin and the Guest (user not logged in). Admin users are not configurable.

7.8.4.3. GET view

Enabling CFR21 involves a change to the components that can be used on GETview.
The new user levels are manageable by bringing them to four (compared to the two by default)
The presence of a new component, included among the page change ones, called CFR note
.

The inclusion of this component allows the target to show the request for motivation following a modification of a variable (configured in the variables grid with the Note checkbox selected).

Caution, the component must be added on each custom page on which you want to have the operator enter the motivation. Failure to add this component will prevent the request for motivation even if the request is set on the variables configuration grid
.

8.   MAINTENANCE

⚠️ **Warning!** Repairs to the controller must only be carried out by Gefran's suitably trained and authorised technical personnel. Any attempt to repair or modify the controller hardware features by unauthorised personnel will void the warranty.

8.1.   Gasket replacement

With time and based on environmental conditions, the sealing gasket can lose its features.

Periodically replace the gasket between the interface and panel to preserve the IP65 front guard.
To replace the gasket between the box and the panel, disassemble and reassemble the interface from the panel.

8.2.   Configuration cloning

You can clone the controller configuration on another controller using the following procedure:
1.   Insert a blank USB key into the master controller interface.
2.   Log in as a Level 2 user.
3.   Select the SETUP menu, SETUP MGR sub-menu, EXPORT SETUP sub-menu.
4.   Copy all the configuration recipes to the USB key. A folder to hold the files will automatically be created in the USB key.
5.   Select the SERVICE menu, PROGRAMS MGR sub-menu.
6.   Copy all the program recipes to the USB key. A folder to hold the files will automatically be created in the USB key. At the end, remove the USB key.
7.   Select the SETUP menu, SETUP MGR submenu, IMAGE submenu.
8.   Copy all image files onto the USB key. A folder to hold the files will automatically be created in the USB key.
9.   Insert the USB key in the interface of the controller for which the USB key is to be cloned, and log in as a level 2 user. The order of the next series of operations is essential for cloning.
10.   Select the SETUP menu, SETUP MGR submenu, IMAGE submenu, and copy the files from the USB key to the controller.
11.   Select the SERVICE menu, PROGRAMS MGR sub-menu and copy the files from the USB key to the controller.
12.   At the end of the copying operation, take out the USB key.
13.   Select the SETUP menu, SETUP MGR sub-menu, EXPORT SETUP sub-menu and copy the files from the USB key to the controller.

8.3.   Cleaning

Only use a soft cloth dampened with water or alcohol to clean the front panel and the case. Do not use solvents derived from hydrocarbons (triethylene, benzene, etc.).

Modules do not require cleaning. Do not use compressed air to remove dust from electronic boards. If necessary use a clean brush with soft bristles.

8.4.   Disposal

The 2850T and 3850T controllers must be disposed of in accordance with applicable regulations.

Some of the components used in the devices can cause damage to the environment if incorrectly disposed.

8.5. Troubleshooting

8.5.1. LED signals

I/O module F-MIX

LED color	Scope	Description
Yellow	Voltage	On: 24 VDC external power supply on
Green	Input status	ON: digital input ON.
Green	Output status	ON: digital output ON.
Green (RUN)	Operating status	Slow flashing = module awaiting configuration (not operating) Fast flashing = module on
Red (ERR)	Alarm	On: short-circuit or overload on digital outputs; short-circuit or overload on analog outputs configured in voltage; open circuit or load with impedance beyond the limit of current analog outputs; microprocessor malfunction. When the LED is on, the analog and digital outputs are reset and the module fault is reported to the master.

I/O module F-EU16

LED color	Scope	Description
Yellow	Voltage	On: 24 VDC external power supply on
Green	Input status	ON: digital input ON.
Green	Output status	ON: digital output ON.
Red	Alarm	On: short-circuit or overload on digital outputs; microprocessor malfunction. When the LED is on, the analog outputs are reset and the module fault is reported to the master.

F-GCANs module

LED color	Scope	Description
Yellow	Voltage	On: 24 VDC external power supply on
Green (RUN)	Input status	Slow flashing = module awaiting configuration (not operating) Fast flashing = module on
Red (ERR)	Alarm	Flashing: communication error. On: manufacturer error; generic error.

8.5.2. System signals

Any controller malfunctions will be signalled using appropriate variables or system alarms, indicating the type of problem identified in appropriate messages. The table below lists these messages, possible causes and possible remedies to apply.

Error message	Description	Possible causes	Possible solutions
PROBE FAULT	The signal from the probe does not arrive or the signal level is not the one expected.	Probe not connected.	Check the connection between the probe and I/O module
		Probe signal out of range.	Verify that the type of probe connected corresponds to that configured in the controller
		Probe fault.	Replace the probe
COMMUNICATION FAULT	No communication between the panel and the I/O modules.	Communication cable not connected.	Check the connection between panel and F-GCANs. Replace the cable if necessary
		No F-GCANs module power.	Check the F-GCANs module power (the PWR power LED should be on).
		No I/O module power.	Check I/O module power (the yellow LED 1 should be on).
		F-GCANs module address incorrect.	Verify the F-GCANs module CAN Bus address.
SIMULATION ACTIVE	Warning that SIMULATOR mode is on.	Operation with SIMULATOR on.	Disable SIMULATOR if not required.
MEMORY FREE SPACE WARNING	Free local memory is lower than the default limit (free memory less than 5 MB).	Archive files in local memory have not been deleted or moved.	Delete or move record archive files. Delete any excess image files.
MEMORY FULL ERROR	Local memory almost full (less than 2 MB of free memory).	Archive files in local memory have not been deleted or moved.	Delete or move record archive files. Delete any excess image files.
SD CARD NOT PRESENT	The SD card is not present.	The controller is equipped with the SD Card option but the SD card is not installed.	Install the SD card.
		The SD card is installed but is not formatted or is formatted incorrectly.	Format the SD card (FAT32 formatting).
SD FREE SPACE WARNING	Free SD card memory is lower than the default limit (free memory less than 5 MB).	Archive files on the SD card have not been deleted or moved.	Delete or move record archive files. Replace the SD card with a new, formatted, and empty one.
SD FULL ERROR	The SD card memory is almost full (free memory less than 2 MB).	Archive files on the SD card have not been deleted or moved.	Delete or move record archive files. Replace the SD card with a new, formatted, and empty one.

⚠ **Warning!** The SD card must be put in while the instrument is turned off. Taking out the SD card while the controller is in operation will result in loss of the batch files or datalog under way

9.   2850T-3850T CONFIGURATION IN GF_EXPRESS

This chapter describes the configuration methods for products 2850T and 3850T in the GF_eXpress Gefran product configurator

The starting condition for proper functioning is the presence of products 2850T-3850T in the catalogue installed on the user's computer.

9.1.   Target Selection

Products 2850T and 3850T belong to the Controller category, and so the choice of model to be configured with GF_eXpress will take place through the following selection process

After choosing the model, the user must set:
1. the FW version
2. the network parameters (IP address)

the target to be configured, and decide whether to work:
- directly connected to a specific target (with the "Online mode" option enabled)

- not directly connected to a specific target (with the "Online mode" option disabled)

9.2.   Offline Target Configuration

In this case, device configuration takes place entirely offline, starting with the following basic configuration:
- 1 F-MIX board,
- no F-EU16 board,
- "GETlogic" option enabled
- "GETview" option enabled
- "controller PID" option enabled
- "Recorder" option enabled
- "Programmer" option enabled

see image below
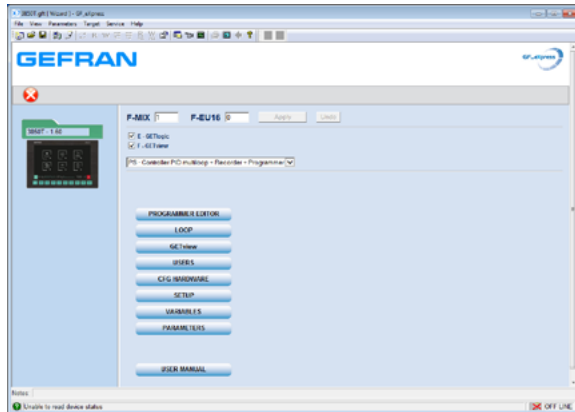
> ⚠ **Warning!**
> The user must align the HW and functional options set in the configurator with those present on the target to be used in the field, using the appropriate fields (see fields that may be set in the upper part of the image above).
> No configuration can be sent to the target until the configurator and the target are aligned.

When the user changes at least one of the HW items or functional options, a red square will appear containing a message informing the user that they must press "Apply" to make the change(s) effective (see image below)
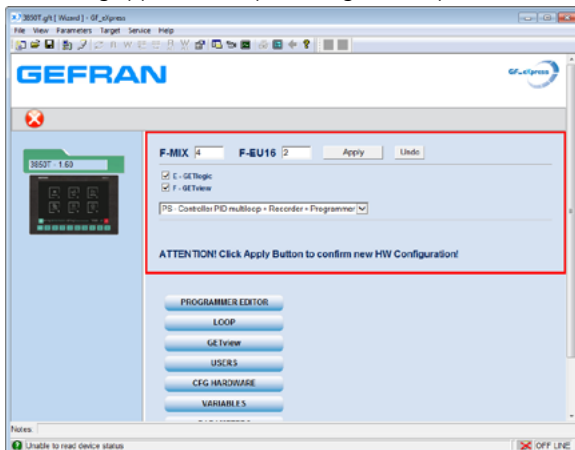
Press "Undo" to cancel the changes made (see image below).
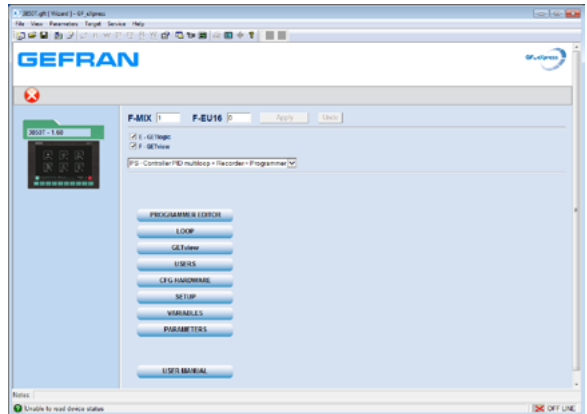
Depending on the functional options selected, a number of buttons appearing on the page will be disabled to prevent the user from configuring sections which are not actually available on the product purchased (see image below).
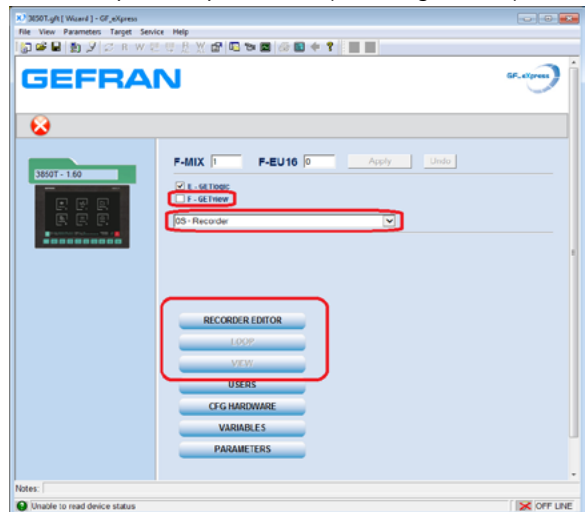
> ⚠ **Warning!**
> Addition\removal of functional options and changes to HW resources will result in addition\removal of certain files (such as those associated with programs) and IO variables. Addition of files and IO variables always takes place using the default values.

Additional software-defined options are also included among the available options.
These options are always disabled by default. Their selection will be managed by GF_eXpress in a similar way to the other options already present.
Currently the available options are:
 - Carbon
 + CFR 21

9.3. Online Target Configuration

In this case the configurator will attempt to connect to the target using the network parameters set by the user.
If:

- the device is not present in the network, the following error message will appear
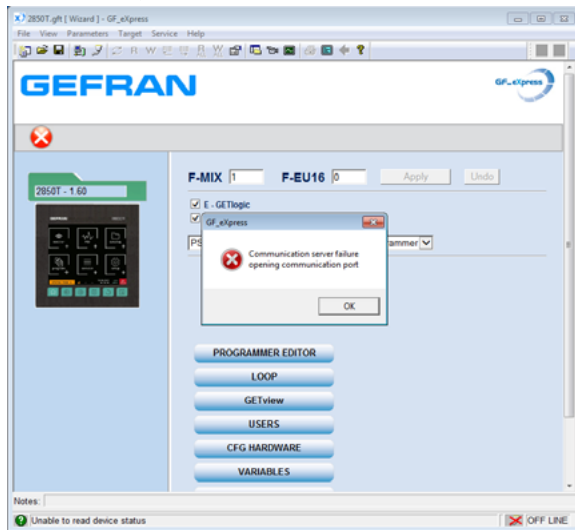
- the type of device selected by the user does not correspond to that of the connected target, the following error message will appear
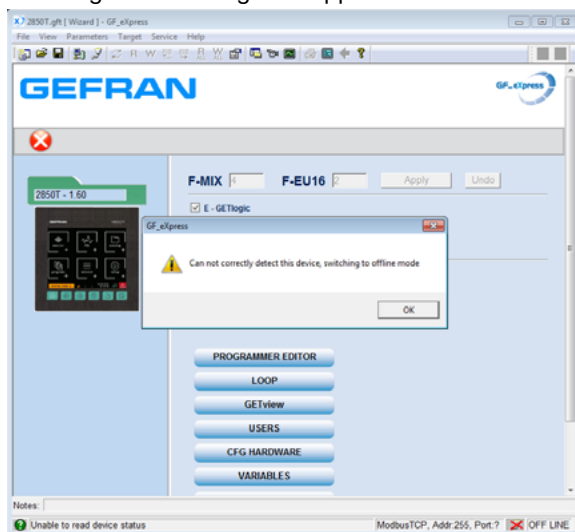
If the device is present in the network and coincides with the type of device selected by the user, the configurator will connect up to the target and check whether the HW present and the functional options on the device are aligned with those actually present in the configurator.
There are now two possible scenarios:

- HW and functional options of the target aligned with those of the configurator
- HW and functional options of the target not aligned with those of the configurator

The next two paragraphs provide more information on these two scenarios.

9.3.1. HW and functional options of the target aligned with those of the configurator

If the HW and functional options of the target are aligned with those of the configurator, the dialog box shown below will appear
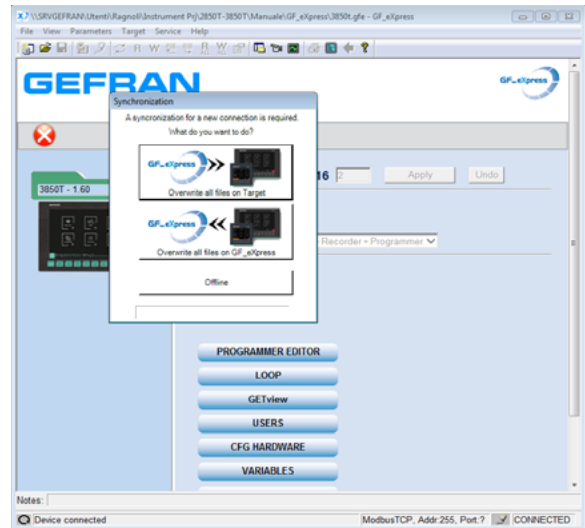
In which the user can:

- send configuration files from GF_eXpress to the target

- acquire configuration files from the target and import them into GF_eXpress

- disconnect from the target and work offline
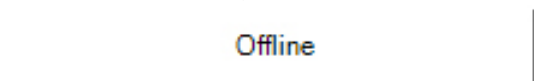
When one of the three actions listed above has been completed, the user can start editing the various sections of interest in the configurator in order to save them on the PC or transfer them to the target.

9.3.2.   HW and functional options of the target not aligned with those of the configurator

If the HW and\or functional options of the target are different from those of the configurator, the dialog box shown below will appear

and configuration files may not be sent from the GF_eXpress to the target.
The user can only:
- acquire configuration files from the target and import them into GF_eXpress

- disconnect from the target and work offline

- Press the button at the top (see image below)

a window will appear showing the differences between the current configuration and the one on the target.
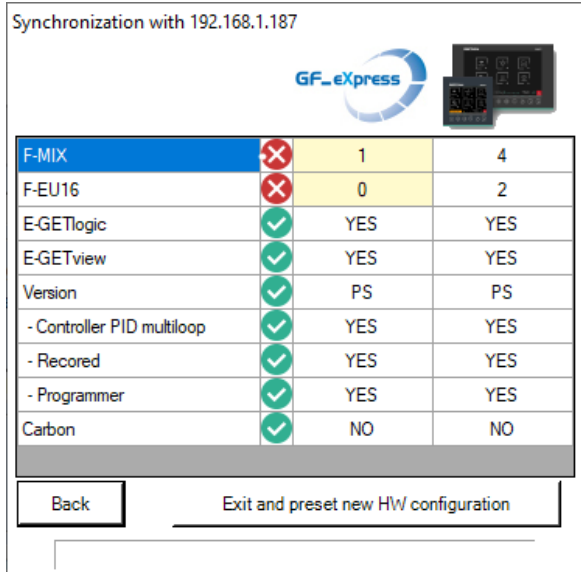
The "Back" button may be used to return to the previous window.
Use the "Exit and preset new HW configuration" button to return to the GF_eXpress Wizard page with the new required configuration preset. The user may decide to "Apply" and try the synchronisation again, or to "Undo".

Once the HW resources and functional options have been aligned with those of the target, it will be possible to send files from the configurator to the target (see image below)
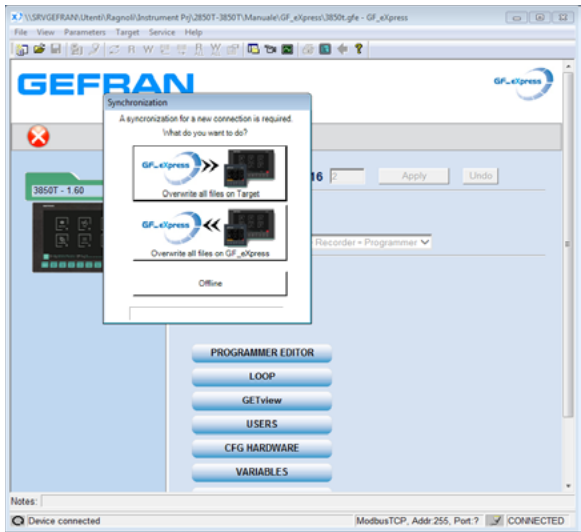
When one of the three actions listed above has been completed, the user can start editing the various sections of interest in the configurator in order to save them on the PC or transfer them to the target.

9.4.   Making changes to the configurator

The buttons on the main page (see image below)
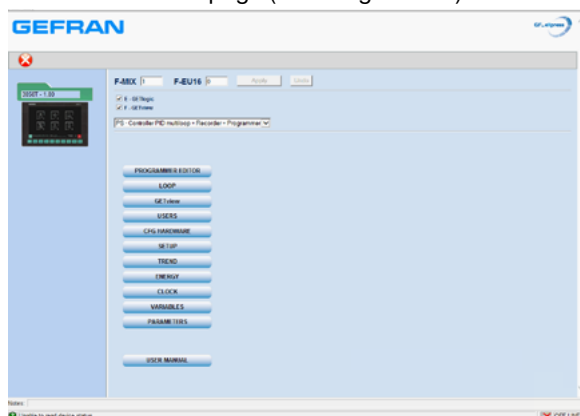
can be used to make changes to various sections of the device. In particular,

- the "PROGRAMMER EDITOR" button can be used to set the sections of the 2850T-3850T product in relation to the programs
- the "LOOP" button can be used to set the sections of the 2850T-3850T product in relation to the control loops
- the "GETview" button can be used to set the sections of the 2850T-3850T product in relation to custom pages
- the "USERS" button can be used to set the sections of the 2850T-3850T product in relation to users
- the "CFG HARDWARE" button can be used to set the 2850T-3850T product sections in relation to the hardware configuration
- the "SETUP" button can be used to set the 2850T-3850T product sections in relation to optional functions
- the "TREND" button may be used to set the product sections pertaining to graphic trendsthe "ENERGY" button can be used to set the 2850T-3850T production sections in relation to the Energy count
- the "CLOCK" button may be used to set the product sections pertaining to the weekly clock
- the "VARIABLES" button can be used to set the 2850T-3850T product sections pertaining to the variables and alarms used in the product
- the "VARIABLES" button can be used to set the 2850T-3850T product sections in relation to the variables used in the product
- the "PARAMETERS" button can be used to access the parameter grid managed via Modbus TCP for the 2850T-3850T product
- the "USER MANUAL" button can be used to access the part of the Gefran web site about controllers

Whenever the user makes any changes in any of the sections of the project listed above, the words "Sync required" will appear next to the corresponding button (see image below)
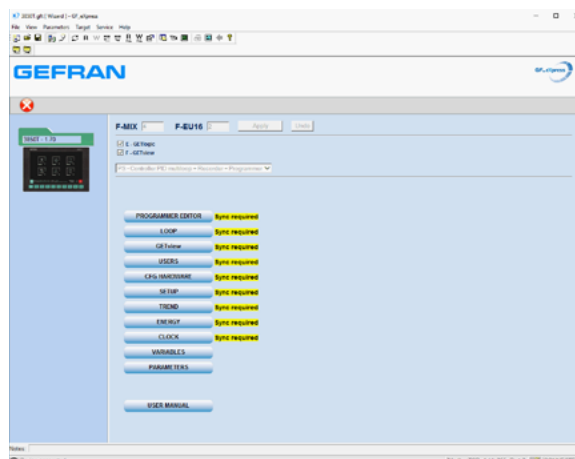
to remind the user to transfer the files to the target in order to make the changes effective.

⚠ **Warning!**
Changes made directly on the target are not automatically detected by the configurator. In these cases, the user must remember to reread the files from the target in order to update the configurator. If this is not done, all the changes made on the device will be lost the next time files are transferred from the configurator to the target.

When the configurator is connected to the target (HW configuration and functional options aligned between the configurator and the 2850T-3850T device), the user may decide to:

- send all the files in the application to the target, with the changes made using the configurator, using the "Write files to target" command (see image below)
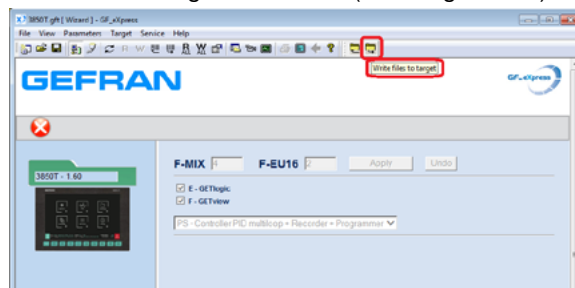
- reread all the application files from the target, losing all the changes made using the configurator, using the "Read files from target" command (see image below)
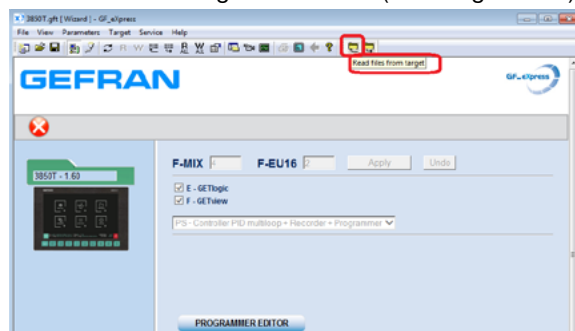
- The paragraphs below describe the configurations associated with the various buttons appearing on the main page.

9.4.1. "PROGRAMMER EDITOR" section

As stated above, the "PROGRAMMER EDITOR" button can be used to set the sections of the 2850T-3850T product corresponding to programs.
Press this button to go to the start page listing all the (and index) available programs (see image below)
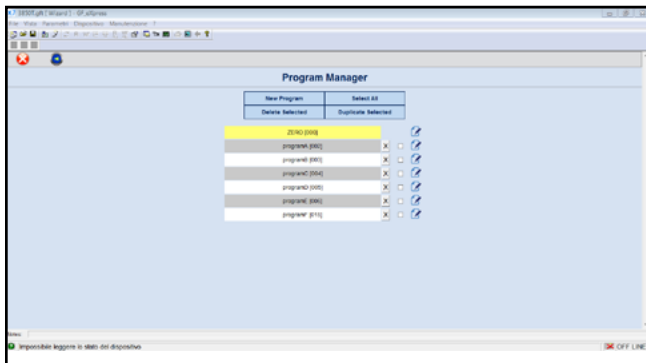
The possible states of the programmes may be:

- New, i.e. created in gfExpress and not yet downloaded to the instrument

- Modified, i.e. modified in gfExpress and not yet downloaded to the instrument

- Waiting to be downloaded because they are running. The changes will be applied at the end of the current cycle

At this point, you may:

- Edit one of the programs already present using the icon
- Add a new program using the "New Program" button
- Duplicate an existing program (selected with the "X" button) using the "Duplicate Selected" button
- Select\Deselect all the programs using the "Select All" button
- Delete all the selected programs with the "Delete All" button
- Delete a single program with the "X" button

When you edit the generic program, you will go into the configuration pages for the various parameters organised in different tabs:
- Base
- Segments
- GETLogic
- Report
- Graphics
(see image below)
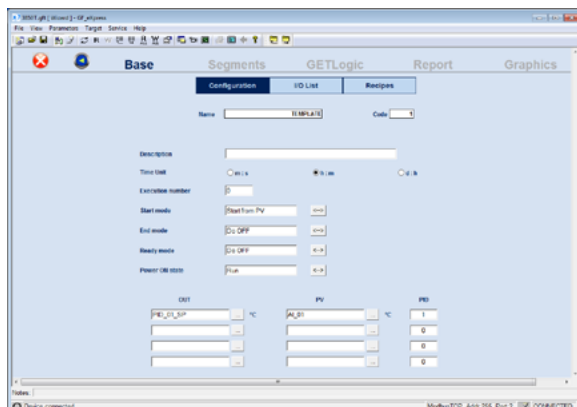
The meaning of the various parameters appearing in the different tabs is as described in the chapter entitled "4.14.

PROGRAMS Menu" on page 55 and the various sections thereof.
The content and functioning of the following tabs:
- GETLogic
- Graphics
will be described in the chapters about them.

9.4.1.1. "GETLogic" section

The "GETLogic" tab may be used to configure the logical\ mathematical functions associated with the selected program (see image below).
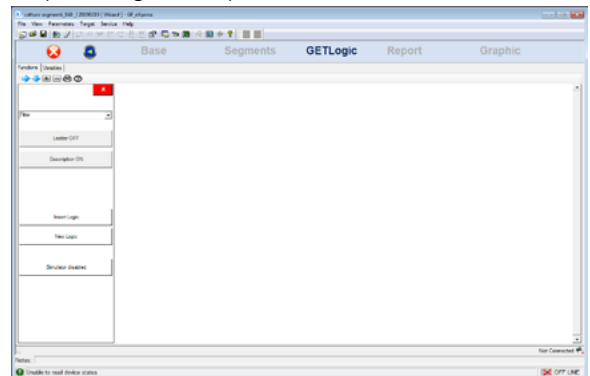
The area on the left contains a series of buttons which may be used to:
- enable\disable representation of Logical\Mathematical functions in a format typical of contact ladder languages ("Ladder OFF\Ladder ON" button)
- enable\disable display of the descriptions associated with the logical\mathematical functions ("Description OFF\Description ON" button)
- Enter a new Logical\Mathematical function in the selected position ("Insert Logic" button)
- Enter a new Logical\Mathematical function after the ones already present ("New Logic" button)

When either "Insert Logic" or "New Logic" is pressed, a dialog box appears containing a list of the different types of Logical\Mathematical functions that may be used (see image below).
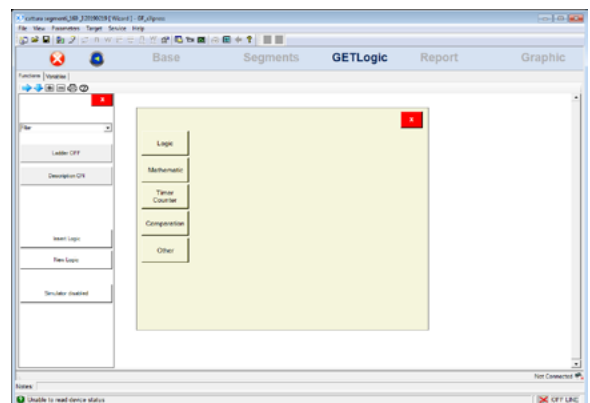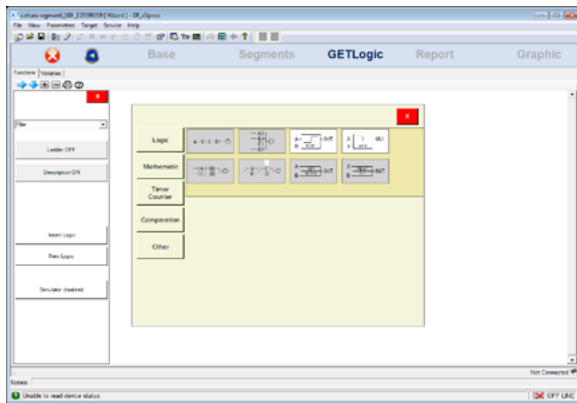
A description of the functioning and configuration of the available Logical\Mathematical functions appears in the paragraph entitled "4.14.3.4. GETlogic configuration" on page 62.

When one of the Logical\Mathematical functions entered is selected, press the right mouse button and a context-specific menu will appear containing the following items:

- "Add" to add a new Logical\Mathematical function following those already present (
- "Insert" to insert a new Logical\Mathematical function in the position:
- "Before"
- "After"
- the selected position
- "Duplicate" to duplicate the selected Logical\Mathematical function in the next position
- "Move" to move the selected Logical\Mathematical function:
- up one position ("Up")
- down one position ("Down")
- before all the others ("First")
- after all the others ("Last")
- "Modify Type" to change the type of Logical\Mathematical function to another in the same category (if there are any)
- "Delete" to delete the selected Logical\Mathematical function (see image below)
- The combination ALT + "up arrow" / "down arrow" can be used to move a function into the list.a
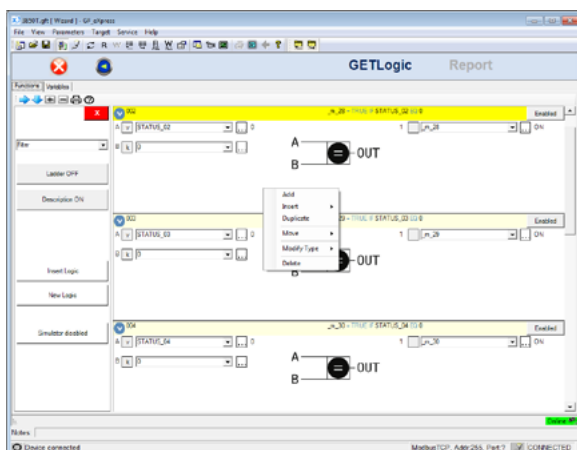
When the configurator is connected to the target, you may view in real time:

- the value of the quantities constituting the input of the various Logical\Mathematical functions
- and the corresponding value of the quantities constituting the output of the various Logical\Mathematical functions

(see image below).
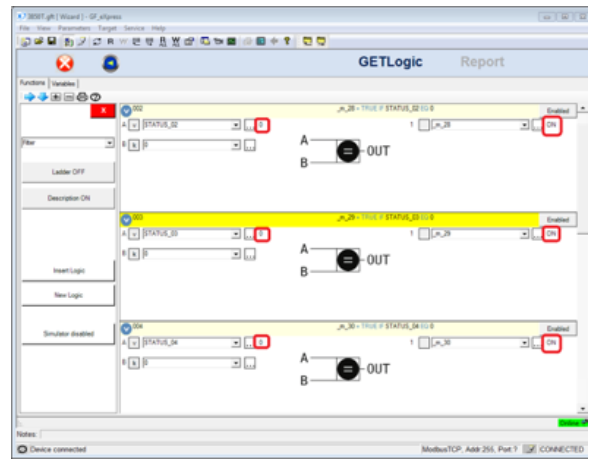
Warning!
The values of the variables appearing in the configurator are correct as long as the Logical\Mathematical functions are updated to align them with those in the target. If the user makes one or more changes to the configurator, the words "ProgramModified" will appear in yellow at the lower right, reminding the user to transfer the change to the target in order to align it with the configurator (see image below).
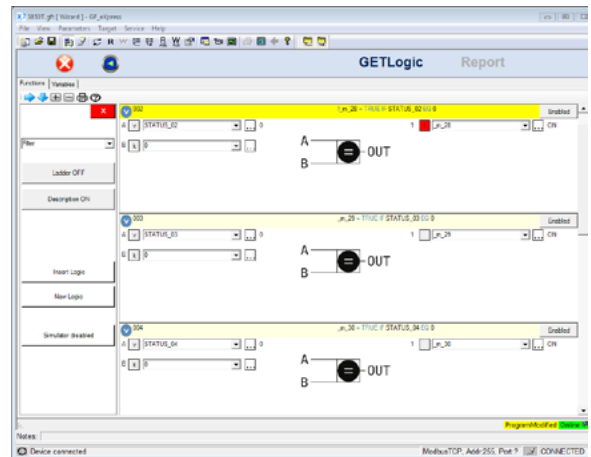
9.4.1.2. "GRAPHICS" section

In the "Graphics" tab:

- N (where N is 1 to 4) synchronous profiles the user has decided to define
- the status of digital inputs are shown/set to enable transition to the next step ("INPUT EVENTS")
- the value of digital outputs is shown\set at the end of the generic step ("OUTPUT EVENTS")

(see image below)
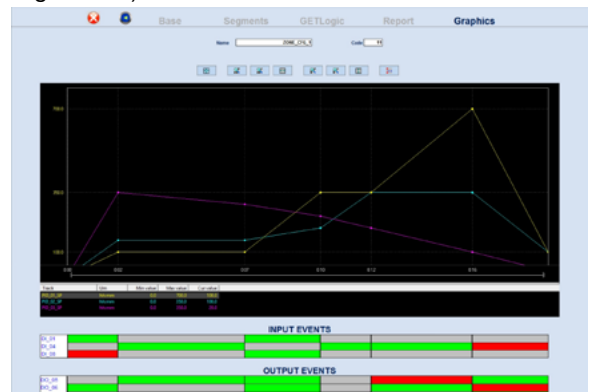
By clicking the mouse on the individual boxes in the sections:

- "INPUT EVENTS"
- "OUTPUT EVENTS"

the user can establish, respectively:
- the status the digital input must have, indicated at the head of the row, at the start of the step under examination to permit the profile generator to continue
- the value to be attributed to the digital output, indicated at the head of the row, for the step under examination

The admissible values are:
- green square: digital input status = 1 - digital output value = 1
- red square: digital input status = 0 - digital output value = 0
- grey square: digital input status to be ignored - digital output value same as in previous step

The buttons positioned above the graph may be used to:

	rescale the entire graph so it fits into the usable area
	zoom in on the x axis
	zoom in on the y axis
	make the horizontal and vertical cursors appear/disappear
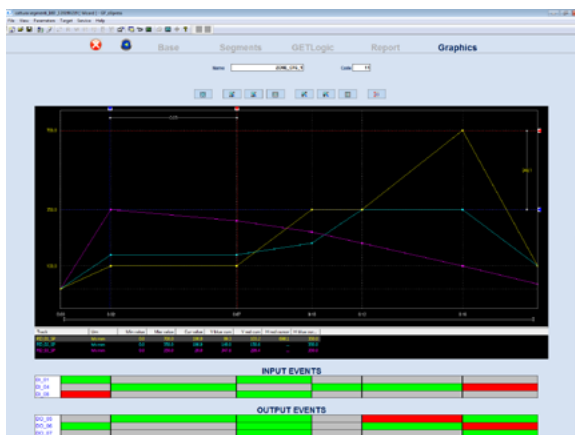
9.4.2. "LOOP" section

As stated above, the "LOOP" button may be used to set the sections of the 2850T-3850T product corresponding to the control loops

When the button is pressed, the user goes into the configuration page for the various LOOPS (see image below)
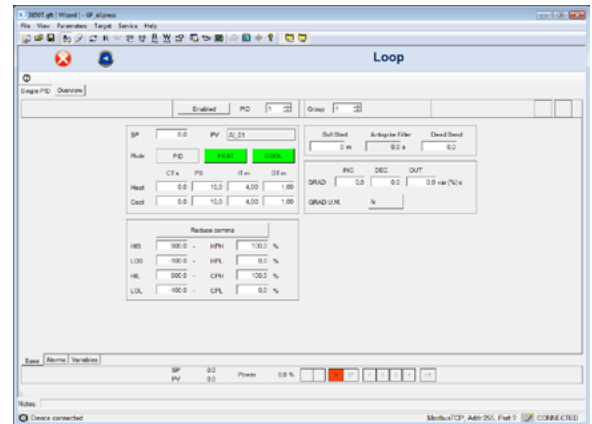
The meaning of the various parameters making up the different tabs is described in the section entitled "4.16.4. PID CFG sub-menu" on page 95 and its sub-sections.

9.4.3. "Overview" section
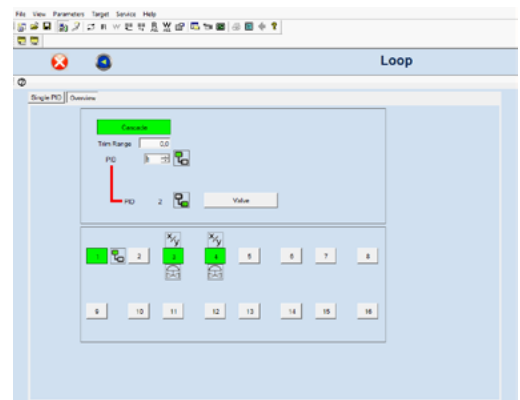
In addition to having an overview of all the Loops, you may enable/disable each Loop individually by clicking on the corresponding button.
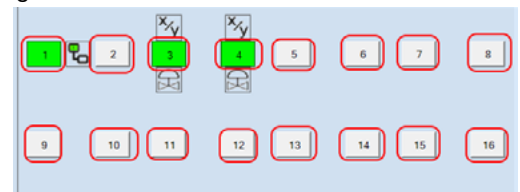
From this page it is also possible to copy data from one Loop to paste into another Loop through the context menu of the right mouse button. The Loop or two Loops, in the case of a waterfall, will be highlighted in yellow.
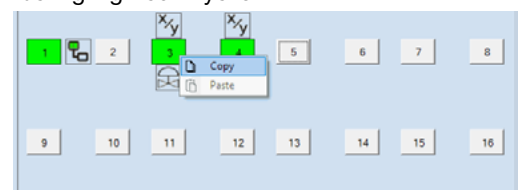
The Loop or the two Loops, in the case of a waterfall, will be highlighted in yellow.

9.4.4. "GETview" section

As stated above, the "VIEW" button may be used to set the sections in the 2850T-3850T product in relation to custom pages
When the button is pressed, the user goes into the custom configuration page (see image below)

On the left side of the screen are the buttons corresponding to various different graphic components that may be used in custom pages. The characteristics and configuration of these elements appear in the chapters entitled "5.3. Creating a custom page" on page 108 and "5.4. Custom page creation tutorial" on page 114 and their sub-sections.
The lower part of the screen contains buttons for selecting the custom pages to be edited.
On the right side of the page is an area for setting:

- the background image to be adopted for the custom page selected ("background image" parameter)
- the resolution of the grid in which to deposit graphic components ("grid" parameter). The default grid resolution is 1 pixel ("grid" parameter of 0 or empty string)

The graphic components for image management can process images in the bmp, gif, jpeg, png and tiff formats.
If the image is not in an acceptable format, no matter what its file extension, the error message "Invalid image file" will appear.
If the image to be used takes up more than the available amount of space, it may be rescaled to fit it into the available space.

⚠ Even if the image is rescaled to fit it into the available area on the page, it will still take up the same amount of space in memory, so it is not advisable to use images that take up too many MB and then rescale them in the pages.
Use of images with a size already appropriate for the area in which they will be used is recommended.

The selection is eliminated as a result of the following actions:
- exiting the TAB overview
- performing any command on the Overview page
- pressing ESC on the keyboard
- new selection
- performing the paste command
The copy-paste operation is subject to certain limitations on copying and pasting.
Copy:
- copy of a single loop (always allowed)
- copy of a waterfall (allowed only if the odd or parent loop is selected)
Paste:
- paste a single loop on a single loop (always allowed)
- paste a single loop on a waterfall (never allowed)
- paste a waterfall on a waterfall (only allowed if the odd or parent loop is selected)
- paste a waterfall onto a single loop (only allowed if odd loops are selected)
In the copy/paste operation, all the data on a loop except for its 3 outputs will be copied.

9. 2850T-3850T configuration in GF_eXpress

9.4.4.1. Management of graphic components

To add a component:
1. select the corresponding button
2. mouse click on the point in the page (black area) where you wish to deposit the component
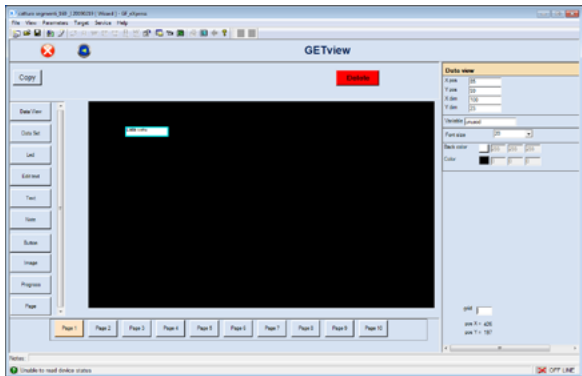
Once deposited, the component will also be selected, and a section for its configuration will appear on the right side of the page. This section varies depending on the component selected.

The upper part of the page contains buttons for:

Copy	copying the selected components
Delete	deleting

the selected components

To copy a page:
1. select all the graphic components of the source page
2. press "Copy" in the upper part of the screen
3. select a new page (preferably empty) and use the buttons to position the cursor in the lower part of the screen
4. click the left mouse button on the recipient page

To delete the contents of a page:
1. select all the graphic components in the page to be deleted
2. press "Delete" in the upper part of the screen

Press the "Esc" button on the keyboard to deselect all the graphic components selected in the current page and go back to the condition shown in the image in the previous paragraph.

If more than one component is selected in the page, a series of buttons will appear in the upper part of the screen for:

≡	aligning all the selected components, and only these components, on the left
≡	aligning all the selected components, and only these components, on the right
‖‖	aligning all the selected components, and only these components, at the top
‖‖	aligning all the selected components, and only these components, at the bottom
⊢⊣	making the width of all the selected components, and only these components, the same
⊤⊥	making the height all the selected components, and only these components, the same
·‖·‖·	equally spacing all the selected components, and only these components, horizontally
≑	equally spacing all the selected components, and only these components, vertically
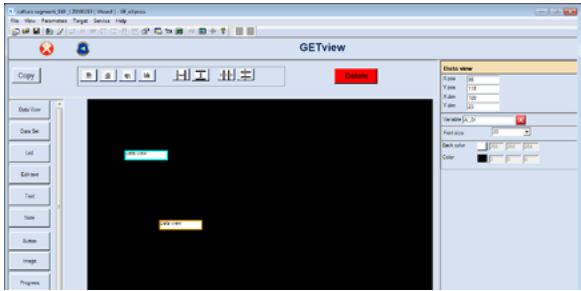
If more than one component is selected in the page, when the following buttons are pressed at the same time:
- the "CTRL" button and the right arrow on the keyboard, you can increase the horizontal size of all the selected components, and only these components, on the page
- the "CTRL" button and the left arrow on the keyboard, you can decrease the horizontal size of all the selected components, and only these components, on the page
- the "CTRL" button and the up arrow on the keyboard, you can increase the vertical size of all the selected components, and only these components, on the page
- the "CTRL" button and the down arrow on the keyboard, you can decrease the vertical size of all the selected components, and only these components, on the page
- the "SHIFT" button and the right arrow on the keyboard, you can move all the selected components, and only these components, on the page to the right (one pixel at a time)
- the "SHIFT" button and the left arrow on the keyboard, you can move all the selected components, and only these components, on the page to the left (one pixel at a time)
- the "SHIFT" button and the up arrow on the keyboard, you can move all the selected components, and only these components, on the page upwards (one pixel at a time)
- the "SHIFT" button and the DOWN arrow on the keyboard, you can move all the selected components, and only these components, on the page downwards (one pixel at a time)

When more than one component is selected in the page, if you edit one of the properties/settings of the generic component, the same property/setting will automatically be changed for all the selected components.

9.4.5. "USERS" section

9.4.5.1. User configuration

As stated above, with the "USERS" button you can set the 2850T-3850T product sections regarding users
Press the button to go into the user configuration page (see image below)
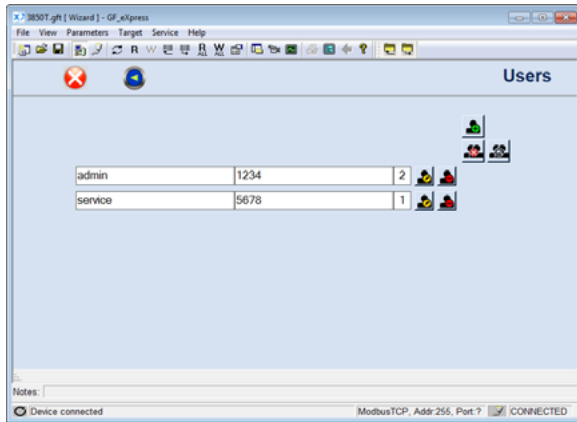
At this point, you may:

- add a new user with the button
- remove all users, restoring the default conditions, with the button
- cancel all changes made since:
  - last entering the page
  - last saving the page
  - last sending the file to the target

with the button (when active)

- remove a single user with the button
- change :
  - Username
  - Password

of one of the users already entered with the button

⚠ **Warning!**
You cannot enter two users with the same Username.
You cannot enter a user with an empty Username.
The Username and Password parameters are case-sensitive
You cannot remove all level 2 (=Administrator) users.

The button allows access to the section for configuration of custom levels.

9.4.5.2. Configuration of custom levels

This window displays a grid describing the access levels of Menus/Pages/SubPages.
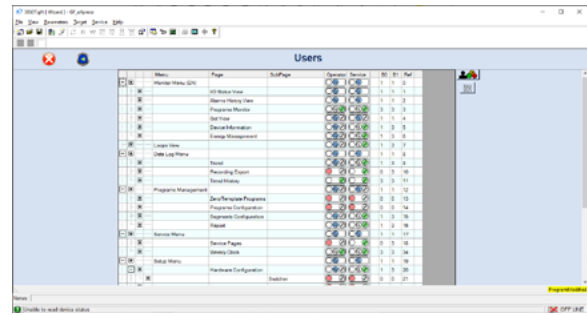
There is a multi-state button for each of the two configurable levels (Operator and Service).
The button shows the admissible states and the selected state.
There are 3 admissible states (not always all available):
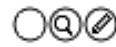
In order from left to right, when highlighted, they represent:

 Not accessible

 Visible

 Visible and editable

Click on the button to change status. The selected status is shown by its colour.
Any configurations considered inconsistent (Service level with access below the relevant Operator level) are indicated by a warning icon, but are in any case accepted.
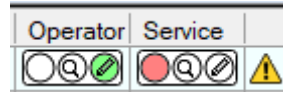
You may navigate the grid, hiding and displaying submenus, using the [+] [-] buttons as usual.

9. 2850T-3850T configuration in GF_eXpress

If a main menu is set as inaccessible, its submenus will be hidden and their configuration will have no effect.

Navigating with the mouse over the grid lines will display a preview of the Menu/Page/Subpage in the lower part of the screen. You may zoom in and out on the preview with the lower splitbar.
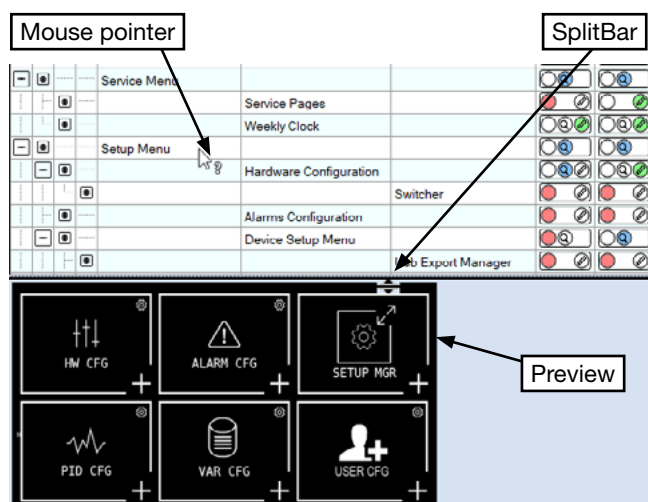
As with users and passwords, the button

may be used to cancel all changes made since:
- last accessing the page
- last saving the page
- last sending the file to the target

and via the button

 It is possible to reset all levels by restoring the default conditions

9.4.6. "CFG HARDWARE" section

As stated above, with the "CFG HARDWARE" button, the user can set the 2850T-3850T product sections regarding hardware configuration
Press the button to enter the configuration page for 2850T-3850T controller hardware resources (see image below)
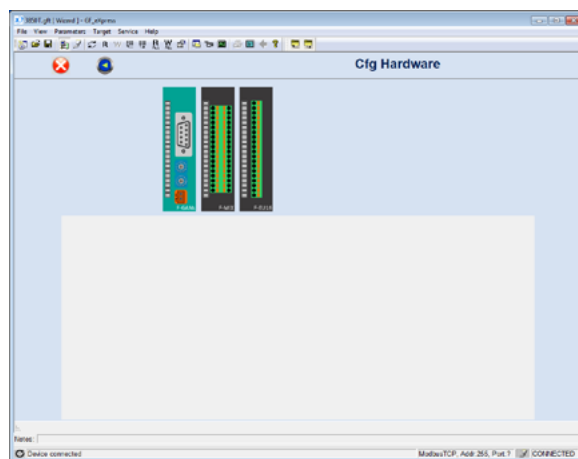
In the top part of the screen, you will see the combination of boards:
- set by the user on the main page (if working Offline)
- on the target (if working Online)

Select the generic board and the section for configuring the various terminals on this board will appear in the lower part of the screen (see images below)
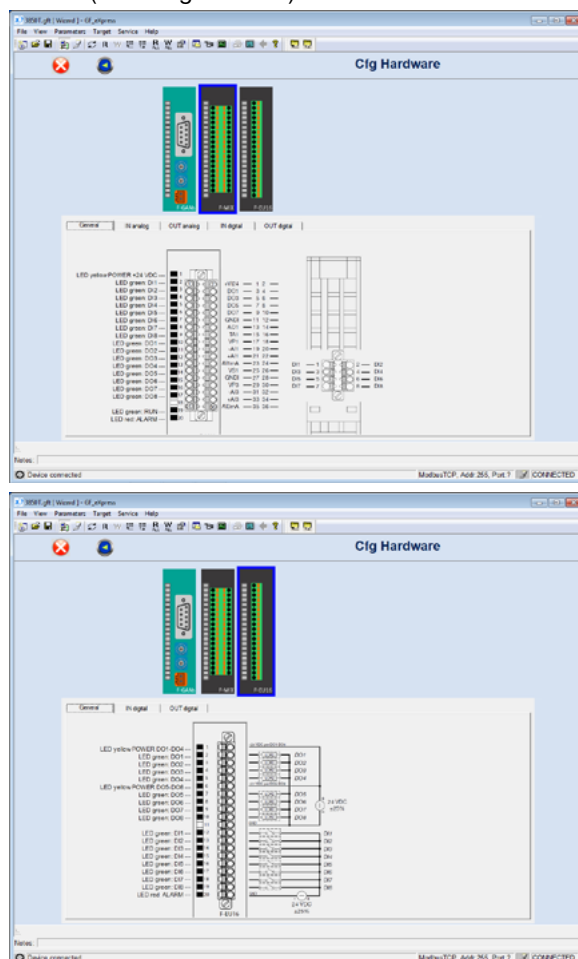
The wiring diagram of the various terminals will appear in the "General" tab of each board.
In the tabs:
- IN analog
- OUT analog
- IN digital
- OUT digital

of the various boards, the parameters described in the paragraph entitled "4.16.1. HW CFG sub-menu" on page 85 with related sub-paragraphs.

When the probe type is changed, the system checks whether that input is directly connected to the PID; if it is, the page output asks whether to automatically modify the HIS and LOS threshold values according to the characteristics of the corresponding probe.

Changing the unit of measurement of the temperature will also trigger a request for automatic updating of the HIS, LOS, HIL, LOL thresholds when you leave the page.

9.4.7. "SETUP" section

As stated above, the "SETUP" button may be used to set the sections in the 2850T-3850T product in relation to optional functions

Press the button to enter the configuration page for 2850T-3850T controller optional functions (see image below)
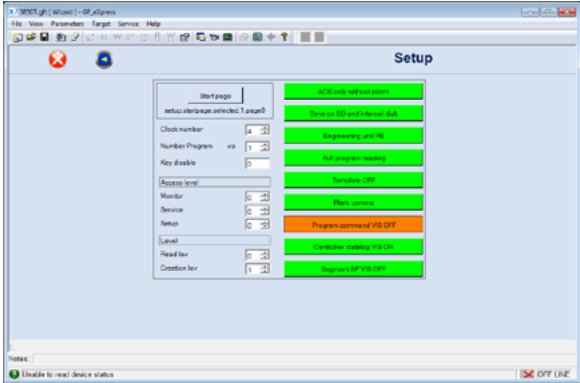
IThe meaning of the various parameters appearing on the configuration page is described in the section entitled "4.16.3.1. 3850\2850 SETUP" on page 92.

9.4.8. "TREND" section

As stated above, the "SETUP" button may be used to set the sections in the 2850T-3850T product pertaining to graphic trend functions (see image below)
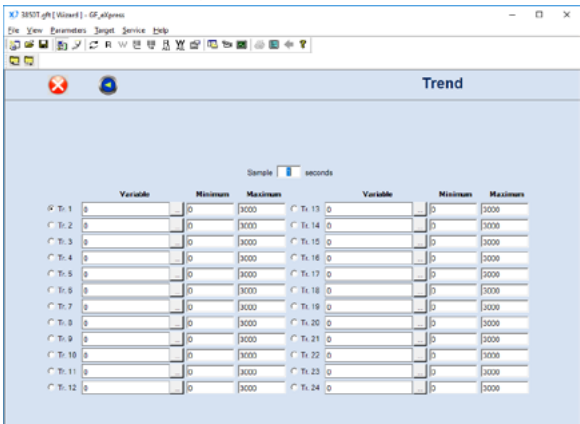
You can configure the 24 possible tracks by selecting variables and their display limits. You can also select the sampling time and what limits to use as a scale. For information on the meaning of the various parameters, refer to point "4.13.2.3. Trend configuration" on page 51

9.4.9. "ENERGY" section

As stated above, the "ENERGY" button may be used to set the sections of the 2850T-3850T product corresponding to the energy counter.

Press the button to go to the configuration/display page (see image below)
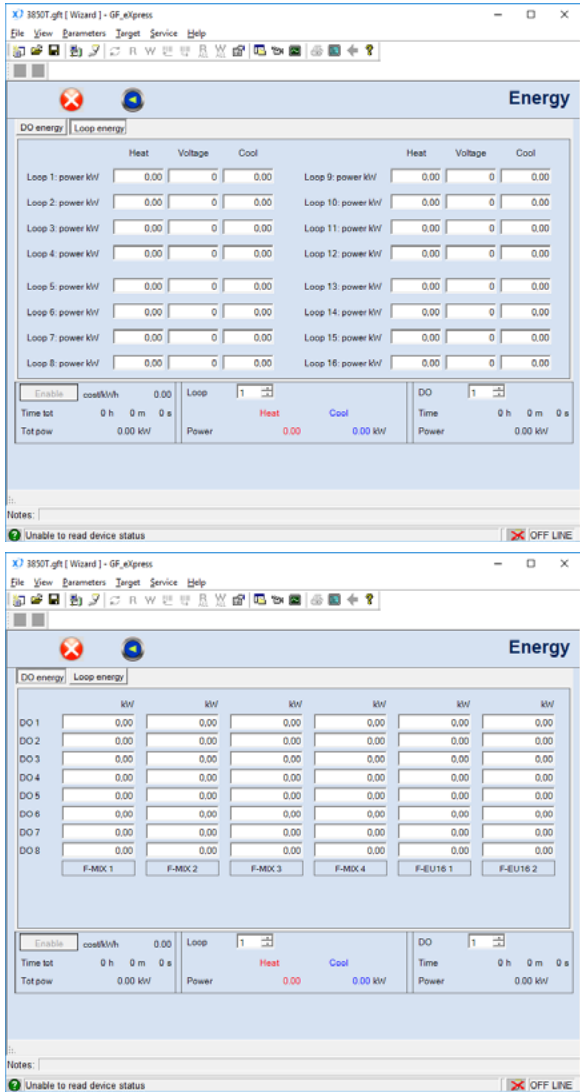
The meaning of the various parameters appearing on the configuration/display page is described in the section entitled "4.11.6. ENERGY sub-menu" on page 47.

9.4.10. "CLOCK" section

As stated above, the "CLOCK" button may be used to set the sections in the 2850T-3850T product pertaining to optional functions
Press the button to go to the clock page (see image below)
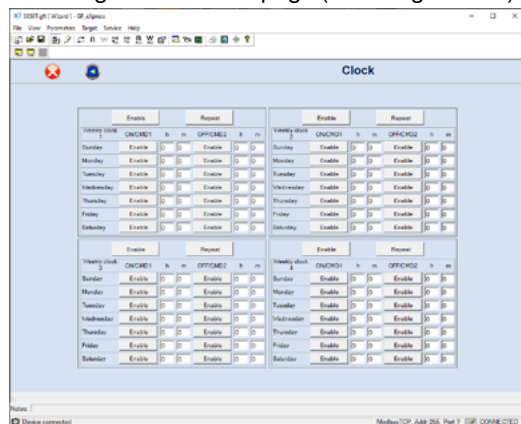
The meaning of the various parameters appearing on the clock page is described in the section entitled "link to "4.15.4. PROGRAM CLOCK sub-menu" on page 82.

9.4.11. "VARIABLES" section

As stated above, the "VARIABLES" button may be used to set the sections in the 2850T-3850T product in relation to the variables to be used in the application.
Press the button to go into the variable configuration page (see image below)
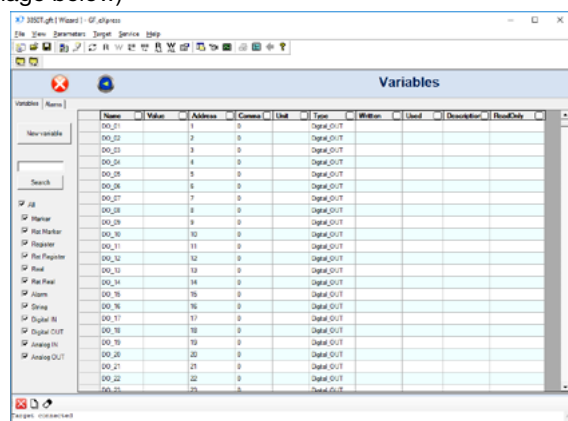
Use the "New variable" button to enter a new variable, defining:
- its name ("Name")
- number of decimal points ("Comma")
- type ("Type")
- description ("Description")

(see image below)
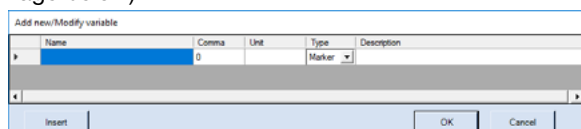
When one of the rows in the table is selected, press the right mouse button and a context-specific menu will appear containing the following items:
- Add a new variable
- Rename\Edit the selected variable

(see image below)
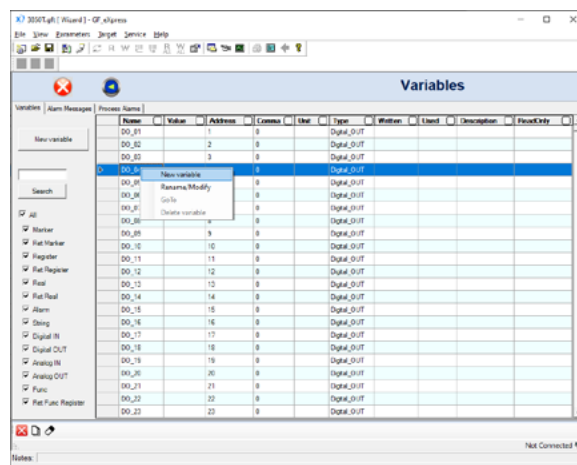
The table can be sorted by column (up to 2 columns simultaneously). Variables may be filtered by type (all variables are active by default).
A Search field is available; click on the button to position the selection on the first occurrence found; continue to click on the button to display the next occurrence.
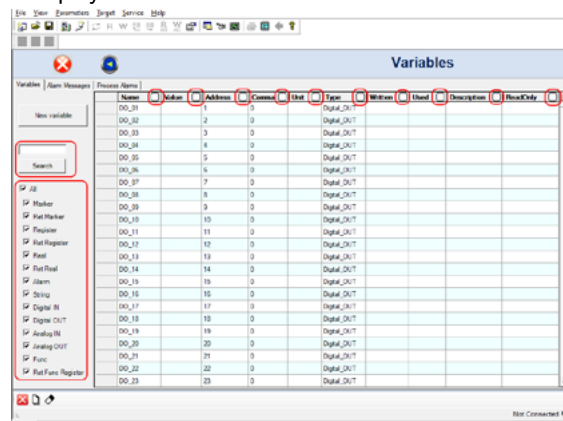
9.4.12. "Alarm Messages" section

There is a second TAB that allows you to manage the alarms (which can only be displayed on the alarm grid).
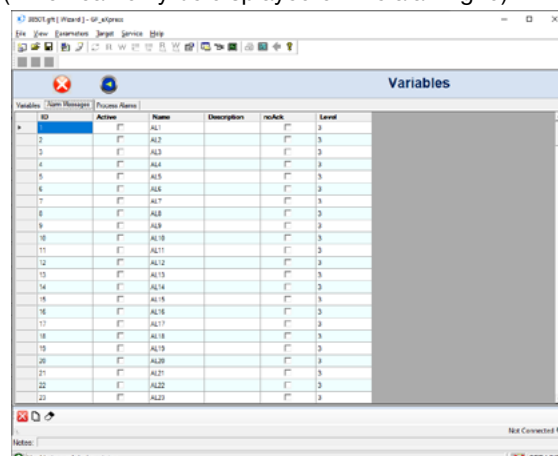
251 alarms are available, which can be configured as described in paragraph "4.16.2. ALARM CFG sub-menu" on page 89.

9.4.13. "PROCESS ALARMS" section

There is a third TAB that allows you to manage process alarms).
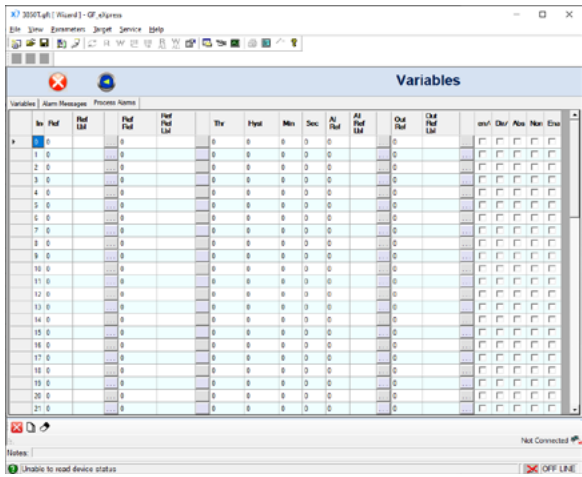
- The alarms are the 64 alarms that can also be accessed and configured from the Loop/Pid page in the same way as described in paragraph "4.16.4.7. PID HB alarm configuration" on page 98 .

9.4.14. "FTP" section

Accessing the page allows you to set the options relating to file backup/save via FTP in a similar way to what is on the terminal.
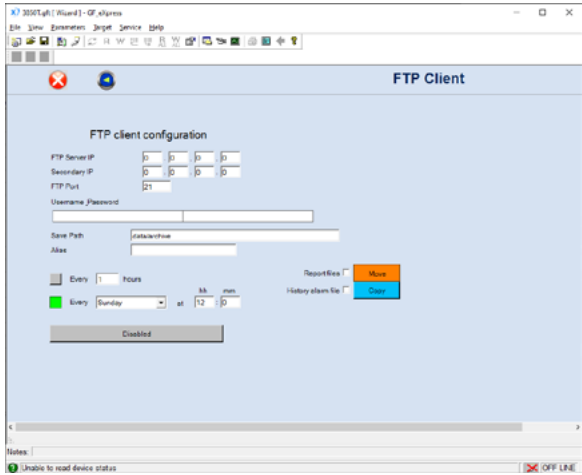
9.5.   Compare

As with any device managed by GF_eXpress, the 2850T-3850T also has a compare feature.
This function is accessible from the GF_eXpress menu: "Parameters / Compare parameters".

Through this interface
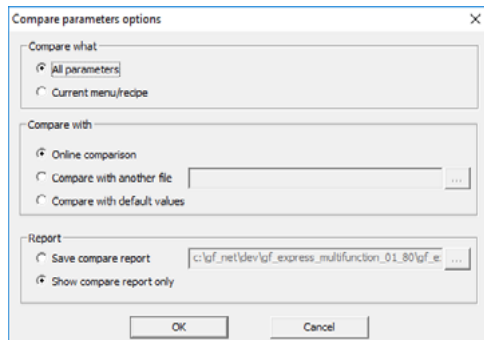
you can compare the status of the instrument opened by GF_eXpress with:
- the status of an online device
- the content of a previous file (*.gfe)
- the default values of the instrument
The resulting report, which can be saved if the appropriate option is enabled, shows the differences between the projects, compared by dividing them into 'sections'; for example:
 - Hardware comparison
 - Userc comparison
 - Loop comparison
 - Clock comparison
 - . . .
Please note:
2 options are available:
- All parameters
- Current menu/recipe
The compare function is available only if the first option ("All parameters") is enabled.
The reason is that this interface is common to all devices managed by GF_eXpress and is designed to compare the values contained in the data listed in the "Parameters" section. The 2850T-3850T, however, contains all its information outside the "Parameters" section.

10. TECHNICAL SPECIFICATIONS

10.1. 2850T controller

OPERATOR INTERFACE		
DISPLAY	Type	TFT Touch Screen with 4-wire resistive type technology
	View area	Diagonal: 3,5" Dimensions (L × H): 70 × 52,5 mm (2.57" x 2.07")
	Lighting	Back lit with LED, duration 50.000 hours @ 25 °C (77 °F)
	Resolution (pixel)	320 × 240 (QVGA)
	Colors	262,000
	Max brightness	400 cd/m^2
	Contrast	400:1
	View angle	Horizontal: 60° Vertical: +45° ... -60°
KEYBOARD		Number of keys: 6 Type: mechanical

CONTROL FUNCTIONS		
LOOP (Regulation)	Type	Single loop; Cascade (2 consecutive PID: PID1-PID2, PID3-PID4 …); Ratio; Valve
	PID	Number: 8 max Parameter groups: 10 max
	Regulation type	PID ON/OFF Single action heat or cool Double action heat or cool
	Control output	Type: continuous (0... 100%) or ON/OFF with PWM modulation. Cycle time: constant or optimised (Burst Firing)
	Valve control	Open/close for floating type motorized valve Open/close for motorized valve with feedback (potentiometer position control)
	Sampling time	25 ms
	Tuning	Automatic Self Tuning algorithms
	Alarms	load interrupted or partially interrupted alarm (HB alarm) and Loop Break Alarm (LBA alarm)
SETPOINT PROGRAMMER	Programmer type	Synchronous and asynchronous setpoint programs Single-segment setpoint or ramp + maintenance profile Integrated function blocks
	Program profile	From 1 to 4 synchronous profiles
	Program	Max number of programs: 200 Maximum number of programs running at the same time: 4 Available commands: START, HOLD/PAUSE, RESET, END, SKIP Status outputs: RUN, READY,END, HOLD
	Segments	Setting: time segments (hh: mm / mm: ss / dd: hh) or gradient configuration Maximum number of segments per program: 50 Maximum number of ramps and holds per program: 100 (50 ramps - 50 holds) High/low limit threshold configurable for each segment PID group activation for each segment
	IN profile events	Max number of settable IN events: 16 Acknowledged events: digital IN-resource, digital OUT, system merker
	OUT profile events	Max number of settable OUT events: 16 ON/OFF while running the profile segment Events acknowledged: digital OUT resource, logic operation, programmer status
	Simplified configurability	Template Configuring and running the same program on several PIDs simultaneously
	HBB alarm	Alarm range configuration per single segment High/low range setpoint

10. TECHNICAL SPECIFICATIONS

GETLogic	Scope	Sequential execution of logical and mathematical instructions
	Running sequences	1 for each program (max 4) + 1 global always active
	Function blocks	Max number per program: 400
	Logic function blocks	AND, OR with default logic patterns Set/Reset, Reset/Set Rising edge, trailing edge
	Timer function blocks	Excitation delay timer (TON) De-energising delay timer (TOFF) Flip/flop timer
	Counter function blocks	Increasing counter Decreasing counter
	Basic mathematical function blocks	+ , - , × , : , average, minimum value, maximum value, square root, base 10 logarithm, natural base A logarithm, and raised to the power A, A raised to the power B
	Special mathematical function blocks	Max peak, minimum peak, hold of a value, average of 2 values, minimum/maximum limit of a value
	Special mathematical function blocks	Selection between two values Greater/Lesser/Equal/Greater-Equal/Lesser-Equal/Different
	Process function blocks	F0 (sterilisation coefficient)
	Resources for mathematics operators	Analog IN/OUT, SP controller, System Log/Real data
	Resources for logical operators	Digital In/Out, Alarm Status, System Merker
DATA LOGGER	Scope	Continuous configured data recording
	Recordable values	Max number of analog values: 25 Max number of digital events: 50
	Sampling	Sampling interval: 0,1 sec ... 1h Sampling mode: single record with time information (date/time) and values/events/actions detected Closing the sequential log file: automatic every hour/day/week (configurable)
	Data storage	File format: CSV Data file encryption: optional Log file name with close date/time indication Storage media: internal memory File export: manual via USB key or manual/automatic via Ethernet via *Gefran - DataLog Utility PC* application *- Report Utility*
	Graphic display	Graph: stored log data trend Max number of viewable curves: 8 Data selection by association: 8 curves Single curve scaling Available functions: enable single curve, full scale selection, zoom +/-, scroll +/- and cursor
PRODUCTION REPORT (Batch report)	Scope	Synchronous recording when running the program profile
	Recordable values	Max number of analog values: 25 Max number of digital events: 50 Batch name/description (selectable) Running profile data (selectable)
		Sampling interval: 0,1 sec ... 1h Sampling mode: single record with time information (date/time) and values/events/actions detected
	Data storage	File format: CSV Data file encryption: optional Log file name with close date/time indication and Job ID reference (optional) Storage media: internal memory File export: manual via USB key or manual/automatic via Ethernet via *Gefran - DataLog Utility PC* application *- Report Utility*
	Graphic display	Graph: stored log data trend Max number of viewable curves: 8 Data selection by page: 8 curves Single curve scaling Available functions: enable single curve, full scale selection, zoom +/-, scroll +/- and cursor

TREND GRAPH REAL TIME	Scope	Continuous recording of data configured without archiving
	Recordable values	Max number of analog and digital values: 24
	Graphic display	Max number of viewable curves by page: 24 Number of samples: 5,000 Single curve scaling Available functions: enable single curve, full scale selection, zoom +/-, scroll +/- and cursor
PROGRAM RECIPE	Data file	Programmer profile segment/event configuration Synchronised programmer logic operations Synchronised programmer mathematics functions DataLog/Batch data configuration
	References	Descriptive name and ID code (easy loading and activation)
	Data import and export	Via USB key
CONFIGURATION RECIPE	Types	System: number of clocks, home page, program modes ... PID: all single PID configuration parameters GETView: custom page configuration InOut: analog channel range, decimal point configuration, unit of measure configuration Messages: custom text list
	Data import and export	Via USB key
GETView	Scope	Configure custom graphic pages directly from the controller panel
	Number of customisable pages	10 max
	Components	Available types: • Led: digital variable with color/text/image change • Notes: default text display • Text: fixed text display • Edit text: text view and edit • Progress: display a value as a bar (vertical/horizontal) • Data display: display of a numeric value • Data edit: view and edit a numeric value • Button: change the status of a digital value with status display (color/text/image) and change mode selection (momentary/toggle) • System: page change function with default list selection Maximum number of components of the same type per page: • Text (Note, Text, Edit text) and numerical (Display date, Edit date): max 40 • Key: max 20 • LED: max 20 • Progress: max 16 • Image: max 10 • System: max one link of each type
	Available functions	Add a new component Edit component parameters Delete a component Move a component Multiple component selection for move or delete Align multiple components left Align multiple components top
	Image functions	Image conversion tool from the most popular graphic file formats Image file import and export via USB key
WEEKLY CLOCK	Scope	Event (ON/OFF) on a weekly or daily basis
	Function	Configure ON/OFF event status by single day of the week Event time settings in hh:mm Enable the weekly clock Enable weekly repetition
	Number	4 max
MULTILINGUAL	Scope	Change message language
	Function	UNICODE support Custom message translation File import and export via USB key
	Available languages	Italian (ITA), English (ENG), French (FR)

10. TECHNICAL SPECIFICATIONS

DIAGNOSTICS	Scope	Controller operating status
	PID loop	Short circuit or probe opening Interrupted or partially interrupted load (HB alarm) Loop Break Alarm (LBA alarm)
	Communication	Communication status between panel and I/O modules Communication error alarm
	I/O modules	Signal status and single channel values
	System	Disk Full Alarm
ALARMS	Number	254 generic alarms of which 64 configurable Process alarms (Type: maximum, minimum, symmetrical, absolute/relative)
	Function	Alarm message customisation ACK/no ACK selection Real alarm display priority order level settings
VARIABLES	Available types	Merker (boolean) Retain Merker (boolean) Register (32 bit with sign) Retain Register (32 bit with sign) Real (32 bit) Retain Real (32 bit) String (text message) Function
	Number	max 256 per type
AUDIT TRAIL	complete history of user settings	only with the SW CFR-21 option, the encrypted Audit Trail with all user settings is available.
USERS	Levels	Number of default levels: 3 (operator, level 0; Maintenance, level 1; OEM manufacturer, level 2)
	Safety	Password Automatic timed logout at operator level
	Internal functions	Add new user
	Note	User administration with the SW CFR21 option is different and more complex. For further info see the specific chapter ("7. Examples and application notes" on page 121)
REMOTE CONNECTIVITY	Modbus TCP	Modbus TCP Slave HMI/SCADA/DCS Data exchange systems
	VNC	Remote page standard interface Remote machine maintenance
DATALOG UTILITY PC (remote application)	Connection	Ethernet Server NTP (option)
	Function	Remote DataLog and batch management Encrypted DataLog and batch file decryption Manual controller file copy or deletion Timer Configuration for automatic controller file copy or deletion Data trend graphic display (with graph zoom and scroll) Data display in spreadsheet mode Data export in .CSV or .PDF format
GF_eXpress (PC configuration)	Connection	Ethernet
	Function	PID controller configuration read and write Graphic display and setting of parameters useful for Programmer functions Logic and mathematics operation settings and display Creating custom graphic pages
NON-VOLATILE MEMORY	Type	FRAM
	Capacity	32 kB retentive variables
	Write	Max number: > 10^{12} cycles Retention: > 10 years @ 55 °C (95 °F), > 55 years @ 35 °C (131 °F)

GENERAL DATA		
VOLTAGE	Operating voltage	24 VDC ±25%
	Current absorption	300 mA max
	Dissipated power	7.5 W max
	Protections	For polarity exchange For short circuit
	Connection	Removable 3-pin polarised connector Screw terminals, max 2,5 mm^2 (0.0038 in2) (13 AWG) cable section
BUFFER BATTERY	Type	MI2032, not replaceable
	Specifications	Rechargeable Li-Al, 3 V 65 mAh
	Duration	10 years. High temperatures can reduce battery life.
	Power reserve in the absence of current	> 20 months
	Ethernet (ETH)	Connector: RJ45 Speed: 10 / 100 Mbit/s Signals: Green LED = connection, yellow LED = data transfer Protocols: FTP (File Transfer Protocol), Modbus TCP/IP Master/Slave
	USB	Connector: type A Type: Host Port Version: 2.0 Full Speed Current: 100 mA max File system for USB key (Flash Drive): FAT32
ENVIRONMENTAL CONDI-TIONS	Indoor	Use
	Operating temperature	0 ... +55 °C (32.. 131 °F) (according to IEC 68-2-14)
	Storage temperature	-20 ... +70 °C (-4.... 158 °F) (according to IEC 68-2-14)
	Relative humidity	Max 95% RH non condensing (according to IEC 68-2-3)
PROTECTION RATING		IP 65 on the front (according to IEC 68-2-3)
ASSEMBLY	Positioning	On panel, front pull-out
	Installation requirements	Installation category: III Pollution rating: 2 Insulation: double
DIMENSIONS	(L × H × D)	100 × 100 × 59,5 mm (3.94" x 3.94" x 2.34") max
WEIGHT		0.25 kg (0.55 lb)
EC REGULATIONS	EMC conformity (electromagnetic compatibility)	Compliance with the 2014/30/EU Directive EMC Emission: EN 61000-6-4 EMC Immunity: EN 61131-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11
	LV conformity (Low Voltage)	Compliance with the 2014/35/EU Directive LVD safety: EN 61010-1
UL REGULATIONS		Compliance with UL508 standard

10. TECHNICAL SPECIFICATIONS

10.2. 3850T controller

OPERATOR INTERFACE		
DISPLAY	Type	TFT Touch Screen with 4-wire resistive type technology
	View area	Diagonal: 7" Dimensions (L × H): 152 × 90 mm (5.98" x 3.54")
	Lighting	Back lit with LED, duration 50.000 hours @ 25 °C (77 °F)
	Resolution (pixel)	800 × 480 (WVGA)
	Colors	262,000
	Max brightness	240 cd/m^2
	Contrast	1000:1
	View angle	Horizontal: 60° Vertical: +45° ... -60°
KEYBOARD		Number of keys: 10 (of which 3 programmable) Type: mechanical

CONTROL FUNCTIONS		
LOOP (Regulation)	Type	Single loop; Cascade (2 consecutive PID: PID1-PID2, PID3-PID4 …); Ratio; Valve
	PID	Number: 16 max Parameter groups: 10 max
	Regulation type	PID ON/OFF Single action heat or cool Double action heat or cool
	Control output	Type: continuous (0... 100%) or ON/OFF with PWM modulation. Cycle time: constant or optimised (Burst Firing)
	Valve control	Open/close for floating type motorized valve Open/close for motorized valve with feedback (potentiometer position control)
	Sampling time	25 ms
	Tuning	Automatic Self Tuning algorithms.
	Alarms	load interrupted or partially interrupted alarm (HB alarm) and Loop Break Alarm (LBA alarm)
SETPOINT PROGRAMMER	Programmer type	Synchronous and asynchronous setpoint programs Single-segment setpoint or ramp + maintenance profile Integrated function blocks
	Program profile	From 1 to 4 synchronous profiles
	Program	Max number of programs: 250 Maximum number of programs running at the same time: 8 Available commands: START, HOLD/PAUSE, RESET, END, SKIP Status outputs: RUN, READY,END, HOLD
	Segments	Setting: time segments (dd:hh / hh:mm / mm:ss) or gradient configuration Maximum number of segments per program: 50 Maximum number of ramps and holds per program: 100 (50 ramps - 50 holds) High/low limit threshold configurable for each segment PID group activation for each segment
	IN profile events	Max number of settable IN events: 16 Acknowledged events: digital IN-resource, digital OUT, system merker
	OUT profile events	Max number of settable OUT events: 16 ON/OFF while running the profile segment Events acknowledged: digital OUT resource, logic operation, programmer status
	Simplified configurability	Template Configuring and running the same program on several PIDs simultaneously
	HBB alarm	Alarm range configuration per single segment High/low range setpoint

GETLogic	Scope	Sequential execution of logical and mathematical instructions
	Running sequences	1 for each program (max 8) + 1 global always active
	Function blocks	Max number per program: 400
	Logic function blocks	AND, OR with default logic patterns Set/Reset, Reset/Set Rising edge, trailing edge
	Timer function blocks	Excitation delay timer (TON) De-energising delay timer (TOFF) Flip/flop timer
	Counter function blocks	Increasing counter Decreasing counter
	Basic mathematical function blocks	+ , - , × , : , average, minimum value, maximum value, square root, base 10 logarithm, natural base A logarithm, and raised to the power A, A raised to the power B
	Special mathematical function blocks	Max peak, minimum peak, hold of a value, average of 2 values, minimum/maximum limit of a value
	Special mathematical function blocks	Selection between two values Greater/Lesser/Equal/Greater-Equal/Lesser-Equal/Different
	Process function blocks	F0 (sterilisation coefficient)
	Resources for mathematics operators	Analog IN/OUT, SP controller, System Log/Real data
	Resources for logical operators	Digital In/Out, Alarm Status, System Merker
DATA LOGGER	Scope	Continuous configured data recording
	Recordable values	Max number of analog values: 50, 20 in case of time <1 second Max number of digital events: 50
	Sampling	Sampling interval: 1 s ... 1 h Sampling mode: single record with time information (date/time) and values/events/actions detected Closing the sequential log file: automatic every hour/day/week (configurable)
	Data storage	File format: CSV Data file encryption: optional Log file name with close date/time indication Storage media: internal memory File export: manual via USB key or manual/automatic via Ethernet via *Gefran - DataLog Utility PC* application - *Report Utility*
	Graphic display	Graph: stored log data trend Max number of viewable curves: 8 Data selection by association: 8 curves Single curve scaling Available functions: enable single curve, full scale selection, zoom +/-, scroll +/- and cursor
PRODUCTION REPORT **(Batch report)**	Scope	Synchronous recording when running the program profile
		Max number of analog values: 50, 20 in case of time <1 second Max number of digital events: 50 Batch name/description (selectable) Running profile data (selectable)
	Sampling	Sampling interval: 1 s ... 1 h Sampling mode: single record with time information (date/time) and values/events/actions detected
	Data storage	File format: CSV Data file encryption: optional Log file name with close date/time indication and Job ID reference (optional) Storage media: internal memory File export: manual via USB key or manual/automatic via Ethernet via *Gefran - DataLog Utility PC* application - *Report Utility*
	Graphic display	Graph: stored log data trend Max number of viewable curves: 8 Data selection by page: 8 curves Single curve scaling Available functions: enable single curve, full scale selection, zoom +/-, scroll +/- and cursor

10. TECHNICAL SPECIFICATIONS

WEEKLY CLOCK	Scope	Event (ON/OFF) on a weekly or daily basis
	Function	Configure ON/OFF event status by single day of the week Event time settings in hh:mm Enable the weekly clock Enable weekly repetition
	Number	4 max
MULTILINGUAL	Scope	Change message language
	Function	UNICODE support Custom message translation File import and export via USB key
	Available languages	Italian (ITA), English (ENG), French (FR)
DIAGNOSTICS	Scope	Controller operating status
	PID loop	Short circuit or probe opening Interrupted or partially interrupted load (HB alarm) Loop Break Alarm (LBA alarm)
	Communication	Communication status between panel and I/O modules Communication error alarm
	I/O modules	Signal status and single channel values
	System	Disk Full Alarm
ALARMS	Number	254 generic alarms of which 64 configurable Process alarms (Type: maximum, minimum, symmetrical, absolute/relative)
	Function	Alarm message customisation ACK/no ACK selection Real alarm display priority order level settings
VARIABLES	Available types	Merker (boolean) Retain Merker (boolean) Register (32 bit with sign) Retain Register (32 bit with sign) Real (32 bit) Retain Real (32 bit) String (text message) Function
	Number	max 256 per type
AUDIT TRAIL	complete history of user settings	only with the SW CFR-21 option, the encrypted Audit Trail with all user settings is available.
USERS	Levels	Number of default levels: 3 (operator, level 0; Maintenance, level 1; OEM manufacturer, level 2)
	Safety	Password Automatic timed logout at operator level
	Internal functions	Add new user
	Note	User administration with the SW CFR21 option is different and more complex. For further info see the specific chapter ("7. Examples and application notes" on page 121)
REMOTE CONNECTIVITY	Modbus TCP	Modbus TCP Slave HMI/SCADA/DCS Data exchange systems
	VNC	Remote page standard interface Remote machine maintenance
REPORT UTILITY (external tool)	Connection	Ethernet Server NTP (option)
	Function	Remote DataLog and batch management Encrypted DataLog and batch file decryption Manual controller file copy or deletion Timer Configuration for automatic controller file copy or deletion Data trend graphic display (with graph zoom and scroll) Data display in spreadsheet mode Data export in .CSV or .PDF format
GF_eXpress (PC configuration)	Connection	Ethernet
	Function	PID controller configuration read and write Graphic display and setting of parameters useful for Programmer functions Logic and mathematics operation settings and display Creating custom graphic pages

NON-VOLATILE MEMORY	Type	FRAM
	Capacity	32 kB retentive variables
	Write	Max number: > 10^{12} cycles Retention: > 10 years @ 55 °C (131 °F), > 55 years @ 35 °C (95 °F)
TREND GRAPH REAL TIME	Scope	Continuous recording of data configured without archiving
	Recordable values	Max number of analog and digital values: 24
	Graphic display	Max number of viewable curves by page: 24 Number of samples: 5,000 Single curve scaling Available functions: enable single curve, full scale selection, zoom +/-, scroll +/- and cursor
PROGRAM RECIPE	Data file	Programmer profile segment/event configuration Synchronised programmer logic operations Synchronised programmer mathematics functions DataLog/Batch data configuration
	References	Descriptive name and ID code (easy loading and activation)
	Data import and export	Via USB key
CONFIGURATION RECIPE	Types	System: number of clocks, home page, program modes ... PID: all single PID configuration parameters GETView: custom page configuration InOut: analog channel range, decimal point configuration, unit of measure configuration Messages: custom text list
	Data import and export	Via USB key
GETView	Scope	Configure custom graphic pages directly from the controller panel
	Number of customisable pages	10 max
	Components	Available types: • Led: digital variable with color/text/image change • Notes: default text display • Text: fixed text display • Edit text: text view and edit • Progress: display a value as a bar (vertical/horizontal) • Data display: display of a numeric value • Data edit: view and edit a numeric value • Button: change the status of a digital value with status display (color/text/image) and change mode selection (momentary/toggle) • System: page change function with default list selection Maximum number of components of the same type per page: • Text (Note, Text, Edit text) and numerical (Display date, Edit date): max 40 • Key: max 20 • LED: max 20 • Progress: max 16 • Image: max 10 • System: max one link of each type
	Available functions	Add a new component Edit component parameters Delete a component Move a component Multiple component selection for move or delete Align multiple components left Align multiple components top
	Image functions	Image conversion tool from the most popular graphic file formats Image file import and export via USB key

10. TECHNICAL SPECIFICATIONS

GENERAL DATA			
VOLTAGE	Operating voltage	24 VDC ±25%	
	Current absorption	300 mA max	
	Dissipated power	8.5 W max	
	Protections	For polarity exchange For short circuit	
	Connection	Removable 3-pin polarised connector Screw terminals, max 2,5 mm² (0.0038 in2) (13 AWG) cable section	
BUFFER BATTERY	Type	Ml2032, not replaceable	
	Specifications	Rechargeable Li-Al, 3 V 65 mAh	
	Duration	10 years. High temperatures can reduce battery life.	
	Power reserve in the absence of current	> 20 months	
	Ethernet (ETH)	Connector: RJ45 Speed: 10 / 100 Mbit/s Signals: Green LED = connection, yellow LED = data transfer Protocols: FTP (File Transfer Protocol), Modbus TCP/IP Slave	
	USB	Connector: type A Type: Host Port Version: 2.0 Full Speed Current: 100 mA max File system for USB key (Flash Drive): FAT32	
ENVIRONMENTAL CONDI-TIONS	Indoor	Use	
	Operating temperature	0 ... +50 °C (32... 122 °F) (according to IEC 68-2-14)	
	Storage temperature	-20 ... +70 °C (-4 .... 158 °F) (according to IEC 68-2-14)	
	Relative humidity	Max 95% RH non condensing (according to IEC 68-2-3)	
PROTECTION RATING		IP 65 on the front (according to IEC 68-2-3)	
ASSEMBLY	Positioning	On panel, front pull-out	
	Installation requirements	Installation category: II Pollution rating: 2 Insulation: double	
DIMENSIONS	(L × H × D)	198 × 134.4 × 65,8 mm (7.79" x 5.29" x 6.63") max	
WEIGHT		0.5 kg (1.10 lb)	
EC REGULATIONS	EMC conformity (electromagnetic compatibility)	Compliance with the 2014/30/EU Directive EMC Emission: EN 61000-6-4 EMC Immunity: EN 61131-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11	
	LV conformity (Low Voltage)	Compliance with Directive 2014/35/EU LVD safety: EN 61010-1	
UL REGULATIONS		Compliance with UL508 standard	

10.3. F-GCANs communications module

GENERAL DATA			
VOLTAGE	Operating voltage	24 VDC ±25%	
	Current absorption	2 A max	
	Dissipated power	2.5 W	
	Connection	Polarised connector with spring terminals, cable 1 mm² (0.0015 in2) (17 AWG) max	
CONNECTIONS	CAN	Connector: DB9 Protocol: CANopen 2.0B, level CAN DS301 v.3.0, v4.0	
SIGNAL ELEMENTS	Error	Red LED	
	Running	Green LED	
	Voltage	Yellow LED	
ENVIRONMENTAL CONDI- TIONS	Indoor	Use	
	Operating temperature	0 ... +55 °C (32.... 131 °F)	
	Storage temperature	-20 ... +70 °C (-4 .... 158 °F)	
	Relative humidity	max 95% RH non-condensing	
PROTECTION RATING		IP20	
ASSEMBLY	Positioning	Vertical	
	Mount	On DIN 35 mm (1.38") rail	
DIMENSIONS	(L × H × D)	25.4 × 92 × 90 mm (1" x 3.62" x 3.54")	
WEIGHT		0.15 kg (0.33 lb)	
EC REGULATIONS	EMC conformity (electromagnetic compatibility)	Compliance with the 2014/30/EU Directive EMC Emission: EN 61000-6-4 EMC Immunity: EN 61131-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11	
UL REGULATIONS		Compliance with UL508 standard	

10.4. F-MIX module

INPUTS					
	Number	4 configurable + 2 by amperometric transformer			
	Sensor type	TC, RTD (PT100, PT1000), IR sensor, linear DC			
	Single-ended voltage input	Voltage: 0...10 V, 0...2,5 V Impedance: >5 MΩ (channel 1: > 50 MΩ)			
	Differential voltage input	Voltage: 0...60 mV Impedance: >5 MΩ			
	Current input	Current: 0...20 mA, 4...20 mA Load: 100 Ω			
	Potentiometer input	Potentiometer resistance: 100 Ω min. Impedance: >5 MΩ (channel 1: > 50 MΩ)			
	Extensometer input	Voltage: -5...35 mV, -10...130 mV Impedance: > 5 MΩ			
	TC input (thermocouple)	Thermocouple: J, K, R, S, T, N, C, D, E, B, L (CJ internal) Impedance: > 5 MΩ			
	RTD input (thermoresistance)	Number of wires) 2, 3 or 4 Thermoresistance: PT100, PT1000			
	Input from a current transformer	rms current: 0…50 mA RMS Frequency: 50/60 Hz Impedance: 50 Ω			
	Temperature unit of measure	° C or ° F, selectable			
	Probe voltage	Voltage: stabilized 10 VDC or 1 VDC, selectable Current: 130 mA max			
	Resolution	16 bit			
ANALOG	Format and resolution	*Input type*	*Number*	*Min*	*Max*	*Resolution*

	Input type	Number	Min	Max	Resolution
	Voltage 0...10 V	Number	0	65535	0,15 mV
	Voltage 0...2,5 V	Number	0	65535	0,04 mV
	Voltage 0...60 mV	Number	0	65535	0,9 µV
	Current 0...20 mA	Number	0	65535	0,3 µA
	Current 4...20 mA	Number	13107	65535	0,3 µA
	Potentiometer	Number	0	65535	
	Extensometer -5...35 mV	Number	0	65535	0,6 µV
	Extensometer -10...130 mV	Number	0	65535	2,14 µV
	J thermocouple	°C °F	-210,0 -346	1200,0 2192	0,1 °C 0,2 °F
	K thermocouple	°C °F	-270,0 -454	1372,0 2501	0,1 °C 0,2 °F
	R thermocouple	°C °F	-50,0 32	1768,0 3182	0,1 °C 0,2 °F
	S thermocouple	°C °F	-50,0 -58	1768,0 3214	0,1 °C 0,2 °F
	T thermocouple	°C °F	-270,0 -454	400,0 752	0,1 °C 0,2 °F
	N thermocouple	°C °F	-270,0 -454	1300,0 2372	0,1 °C 0,2 °F
	C thermocouple	°C °F	0,0 32	2300,0 4172	0,1 °C 0,2 °F
	D thermocouple	°C °F	0,0 32	2300,0 4523	0,1 °C 0,2 °F
	E thermocouple	°C °F	-270,0 -454	1000,0 1832	0,1 °C 0,2 °F
	B thermocouple	°C °F	44,0 32	1800,0 3272	0,1 °C 0,2 °F
	L thermocouple	°C °F	-200,0 -328	900,0 1652	0,1 °C 0,2 °F
	RTD PT100	°C °F	-200,0 -328	850,0 1562	0,1 °C 0,2 °F
	RTD PT1000	°C °F	-200,0 -328	850,0 1562	0,1 °C 0,2 °F
	TA	mA	0,0	50,0	0,01 mA

ANALOG	Accuracy	<u>TC input (*) (**)</u> Calibration: < ±(0,25% of value read in °C + 0,1 °C / 0,2 °F) Linearisation 1,8 % of value read Cold joint: < ±1 °C (34,7 °F) at 25 °C (77 °F) room temperature Cold joint compensation > 30:1 rejection at room temperature change <u>RTD input</u> Calibration: < ±(0.15% of value read + 0.4 °C / 0,72 °F) Linearisation: 0.1% of value read Thermal shift: < ±(0.005% of the value read in °C + 0.015°C / 0,072 °F) /°C starting from 25 °C (77 °F) room temperature <u>Linear inputs:</u> Calibration: < 0.1% full scale Thermal shift: < ±0.005% full scale /°C starting from 25 °C (77 °F) room temperature <u>CT input</u> Calibration : <0,5% full scale Thermal shift : <+/- 0,01% full scale/°C starting from 25°C (77 °F)
	Conversion time	5 ms
	Protection	Polarity inversion Power surge: max 1 kV per 1 ms
	Electric insulation	Channel-bus: 2.0 kV
	Diagnostics	Module state: LED and software
DIGITAL	Number	8
	Voltage	Rated: 24 VDC (according to EN 61131-2 type 1 and type 3) Max: 32 V, 10 mA
	Switch limit	Low level: ≤ 8 VDC High level: ≥ 11 VDC
	Protection	Polarity inversion Power surge: max 1 kV per 1 ms
	Electric insulation	Channel-bus: 2.0 kV
	Diagnostics	Module state: LED and software Channel state: LED and software

(*) For TC S valid with T>100°C; for TC B valid with T>200°C
(**) With TC input J / K/ N / S Factory Calibration 0.1% of value read according to AMS2750

ANALOG						
OUTPUTS	Number	2				
	Voltage output single-ended	±10 V, 15 mA max				
	Current output	0...20 mA, 4…20 mA Max load: 600 Ω				
	Resolution	16 bit				
	Format and resolution	*Output type*	*Number*	*Min*	*Max*	*Resolution*
		±10 V	*Number*	-32768	32767	0.3 mV
		0...20 mA	*Number*	0	32767	0.6 µA
		4...20 mA	*Number*	6550	32767	0.6 µA
	Accuracy	Calibration precision: ±0,1% full scale @ 25 °C (77 °F)				
	Conversion time	5 ms				
	Adjustment time	100 µs				
	Protection	Short circuit: ±10 V Overload ±10 V: 16 mA max per each channel Open circuit 0...20 mA / 4...20 mA: Alarm status for open circuit Power surge: max 1 kV per 1 ms				
	Electric insulation	Channel-channel: No Channel-bus: 2.0 kV				
	Diagnostics	Module state: LED and software Channel state: LED and software				
DIGITAL	Number	8				
	Voltage	24 VDC ±25%				
	Current	Single output: 1 A max Total outputs: 4 A max				
	Groups	1 group with 8 outputs				
	Protection	Short circuit Overload per output @ I ≥ 2,2 A for 500 ms min. Over temperature Power surge: max 1 kV per 1 ms				
	Electric insulation	Channel-bus: 2.0 kV				
	Diagnostics	Module state: LED and software Channel state: LED and software				

GENERAL DATA		
CHANNELS	Number	24
VOLTAGE	Operating voltage	24 VDC ±25%
	Current absorption	150 mA max
	Dissipated power	7.8 W
CONNECTIONS	Connector	Front 36 pole Wire connection with self-locking spring terminals, max cable section 0,2...1,5 mm² (24...15 AWG)
ENVIRONMENTAL CONDITIONS	Indoor	Use
	Operating temperature	0 ... +55 °C (32 ....131 °F)
	Storage temperature	-20 ... +70 °C (-4 ....158 °F)
	Relative humidity	max 95% RH non-condensing
PROTECTION RATING		IP20
ASSEMBLY	Positioning	Vertical
	Mount	On DIN 35 mm (1.38") rail
DIMENSIONS	(L × H × D)	25,4 × 92 × 90 mm (1" x 3.62" x 3.54")
WEIGHT		0.13 kg (0.29 lb)
CERTIFICATIONS		CE, UL If the appropriate calibration is performed in the field, the Controller meets the requirements of standard AMS2750 and may be used in applications requiring the NADCAP directive

10.5. F-EU16 module

INPUTS			
DIGITAL	Number	8	
	Voltage	Rated: 24 VDC (according to EN 61131-2 type 1 and type 3) Max: 32 V, 25 mA	
	Switch limit	Low level: ≤ 8 VDC High level: ≥ 11 VDC	
	Filter	Hardware: 100 Hz or 5 kHz selectable from software	
	Protection	Polarity inversion Power surge: max 1 kV per 1 ms	
	Electric insulation	Channel-bus: 2.0 kV	
	Diagnostics	Module state: LED and software Channel state: LED and software	
ANALOG			
DIGITAL	Number	8	
	Groups	2 group with 4 outputs	
	Voltage	24 VDC ±25%	
	Current	Single output: 2 A max Single group: 5 A max Total outputs: 8 A max	
	Protection	Short circuit Overload per output @ I ≥ 2,2 A for 500 ms min. Over temperature Power surge: max 1 kV per 1 ms	
	Electric insulation	Channel-bus: 2.0 kV	
	Diagnostics	Module state: LED and software Channel state: LED and software	
GENERAL DATA			
CHANNELS	Number	16	
VOLTAGE	Operating voltage	24 VDC ±25%	
	Current absorption	8 A max	
	Dissipated power	9 W	
CONNECTIONS	Connector	Front 26 pole Wire connection with self-locking spring terminals, max cable section 0,2...1.5 mm² (24...15 AWG)	
ENVIRONMENTAL CONDITIONS	Indoor	Use	
	Operating temperature	0 ... +55 °C (32 ....131 °F)	
	Storage temperature	-20 ... +70 °C (-4 ....158 °F)	
	Relative humidity	max 95% RH non-condensing	
PROTECTION RATING		IP20	
ASSEMBLY	Positioning	Vertical	
	Mount	On DIN 35 mm (1.38") rail	
DIMENSIONS	(L × H × D)	25.4 × 92 × 90 mm (1" x 3.62" x 3.54")	
WEIGHT		0.13 kg (0.29 lb)	
CERTIFICATIONS		CE, UL	

11. ORDER CODES

11.1. 2850T controller

Order code: **2850T** - XX - XX - XX - XX - XX - XX - XX - XX - X - X

(positions labeled A B C D E F G H I L)

Version (A)	
PID multiloop controller	0C
Recorder	0S
PID multiloop controller + Recorder	CS
PID multiloop controller + Programmer + Recorder	PS

HW configuration (B)	
4 analog inputs + 2 analog outputs + 8 digital inputs + 8 digital outputs	04
8 analog inputs + 4 analog outputs + 16 digital inputs + 16 digital outputs	08

SW Options (C)	
None	00
CFR21	01

Smart function (D)	
No	00
SD Data Storage + SD Card 1 GB [1]	01

Reserved to Gefran (L)	
	0

Reserved to Gefran (I)	
	0

I/O digital expansions (H)	
No	00
8 digital inputs + 8 digital outputs	08
16 digital inputs + 16 digital outputs	16

Reserved to Gefran (G)	
	00

GETView (F)	
No	00
Yes	GV

GETLogic (E)	
No	00
Yes	GL

1) SD option includes a 1 GB SD Card
   The SD option is not available for the Multiloop model (0C)

GETLogic: Logic and mathematics function control technology
GETView: Custom interface page management technology
Note: Check code availability before any request.

11. ORDER CODES

Code examples

F code	Model	PID loop controller	Programmer	Data Logger + Batch Reports	Inputs Analog	Inputs Digital	Outputs Analog	Outputs Digital	RS485 modbus RTU	Ethernet modbus TCP	Logic + mathematics functions	Custom page	Modbus TCP + VNC remote connection	I/O digital expansions Digital inputs	I/O digital expansions Digital outputs
F073007	2850T-CS-04-00-01-GL-GV-00-00-0-0	X		X	4	8	2	8		X	X	X	X		
F067227	2850T-PS-04-00-00-GL-GV-00-00-0-0	X	X	X	4	8	2	8		X	X	X	X		
F067228	2850T-PS-04-00-00-GL-GV-00-08-0-0	X	X	X	4	8	2	8		X	X	X	X	8	8
F072304	2850T-PS-08-00-00-GL-GV-00-00-0-0	X	X	X	8	16	4	16		X	X	X	X		
F074828	2850T-PS-08-00-01-GL-GV-00-00-0-0	X	X	X	8	16	4	16		X	X	X	X		

11.2. 3850T controller

Order code:
            A   B   C   D   E   F   G   H   I L

3850T - XX - XX - XX - XX - XX - XX - XX - XX - X - X

Version (A)	
PID multiloop controller	0C
Recorder	0S
PID multiloop controller + Recorder	CS
PID multiloop controller + Programmer + Recorder	PS

HW configuration (B)	
4 analog inputs + 2 analog outputs + 8 digital inputs + 8 digital outputs	04
8 analog inputs + 4 analog outputs + 16 digital inputs + 16 digital outputs	08
12 analog inputs + 6 analog outputs + 24 digital inputs + 24 digital outputs	12
16 analog inputs + 8 analog outputs + 32 digital inputs + 32 digital outputs	16

SW Options **(C)**	
None	00
CFR21	01

Smart function (D)	
No	00
SD Data Storage + SD Card 1 GB [1]	01

Reserved to Gefran **(L)**	
	0

Reserved to Gefran (I)	
	0

I/O digital expansions (H)	
No	00
8 digital inputs + 8 digital outputs	08
16 digital inputs + 16 digital outputs	16

Reserved to Gefran **(G)**	
	00

GETView (F)	
No	00
Yes	GV

GETLogic (E)	
No	00
Yes	GL

1) SD option includes a 1 GB SD Card
   The SD option is not available for the Multiloop model (0C)

GETLogic: Logic and mathematics function control technology
GETView: Custom interface page management technology
Note: Check code availability before any request.

11. ORDER CODES

Code examples

F code	Model	PID loop controller	Programmer	Data Logger + Batch Reports	Inputs Analog	Inputs Digital	Outputs Analog	Outputs Digital	RS485 modbus RTU	Ethernet modbus TCP	Logic + mathematics functions	Custom page	Modbus TCP + VNC remote connection	I/O digital expansions Digital inputs	I/O digital expansions Digital outputs
F072132	3850T-PS-04-00-01-GL-GV-00-00-0-0	X	X	X	4	8	2	8		X	X	X	X		
F071754	3850T-PS-04-00-00-GL-GV-00-00-0-0	X	X	X	4	8	2	8		X	X	X	X		
F067231	3850T-PS-08-00-00-GL-GV-00-00-0-0	X	X	X	8	16	4	16		X	X	X	X		
F072017	3850T-PS-08-00-01-GL-GV-00-00-0-0	X	X	X	8	16	4	16		X	X	X	X		
F072949	3850T-PS-12-00-01-GL-GV-00-08-0-0	X	X	X	12	24	6	24		X	X	X	X	8	8
F073323	3850T-PS-16-00-00-GL-GV-00-00-0-0	X	X	X	16	32	8	32		X	X	X	X		

12. ACCESSORIES

Code		Description	Compatible	
			2850	**3850**
F067612		2 m communication cable	•	•
F068066		10 m communication cable	•	•
F069369	F-MIX	Module 4 AI + 2 AO + 8 DI + 8 DO	•	•
F067224	F-EU16	Module 8 DI + 8 DO	•	•
F035293	F-GCANs	CANOpen communication module	•	•
F057679	USB_PEN1G	1 GB USB key	•	•
F029933	GT_USBPAN	A-A USB extension with panel mount, IP65 cap and fastening screws	•	•
F057777	SD_CARD1G	1 GB SD Card	•	•

13. ANNEXES

13.1. System variables

The following tables list all default variable names, grouped by use. A default variable is a variable already set in the controller and that can be used to set and know its status.

Type
Indicates the type of variable:
- <u>Boolean</u>: logic value (true or false).
- <u>Register</u>: numeric value with decimal point, the admissible value interval is specified in the *Interval* column.
- <u>String</u>: alphanumeric character string (a...z, A...Z, _).

Group
Indicates the variable group:
- <u>System</u>: internal memory to store system variables.
- <u>Ret Reg</u>: non-volatile memory for variables.

Variable name
The default variable name. When the variable name is repetitive, meaning it follows the same layout only changing one or two only changing the numeric ID (e.g. the variable FUNCT_1 has the numeric ID "1"), it is listed only once in the table and the variable element is highlighted in script.

Interval
The admitted value interval, for numeric values, or maximum number of characters, for String variables.

Use
Shows whether the variable can be read (R) or write (W).

13.1.1. General

Type	Group	Variable name	Use	Description
Boolean	System	PW_ON	R	Marks instrument power on in reports.
Boolean	System	PW_OFF	R	Marks instrument power off in reports.
Boolean	System	BATCH_DISABLE	R W	BATCH recording on/off
Boolean	System	DISK_FULL	R	Disk Full Alarm
Boolean	System	IO_CABLE_FAULT	R	No communication cable alarm
Boolean	System	NO_SD_CARD	R	NO SD card alarm.
Boolean	System	FUNCT_n	R	Display of pressing of front function keys 8-9-10. n can take on values from 1 to 3. 3 variables equivalent to digital inputs (and therefore RO) which become ON when function keys 8-9-10 are pressed, OFF otherwise (3850 only)
Boolean	System	LED_n	RW	Variables equivalent to digital inputs controlling LEDs 8-9-10. n may have a value of 1 to 3 (3850 only)
Boolean	System	SYSTEM_TEMP_UM	R	False (0) if the unit of temperature is C° and true(1) if the unit of temperature is F°.

13.1.2. New general variables

Type	Group	Variable name	Use	Description
String	System	BARCODE_STR	R	Text string read by bar code
Register	System	BARCODE_NUM	R	Converting the bar code into numeric format
Functionality	System	FTP_CMD_BACKUP	RW	Backup command on FTP server
Functionality	System	FTP_BACKUP_STATUS	R	Status of backup on FTP server
Ret Register	System	FTP_ERROR_CODE	R	FTP client error code

13. ANNEXES

13.1.3. PID loop

Type	Group	Variable name	Use	Description
Register	Ret Reg	PID_*n*_SP	R W	PID setpoint *n*. *n* can take on values from 1 to 16.
Register	Ret Reg	ALL_*pid_n*	R W	Alarm threshold for alarm *n* for PID *pid*. *pid* can take on values from 1 to 16. *n* can take on values from 1 to 4.
Boolean	Ret Reg	PID_*n*_MAN	R W	Manual command for PID *n*. *n* can take on values from 1 to 16.
Boolean	Ret System	PID_*n*_EN	R W	Enabling a PID.*n* can take on values from 1 to 16.
Boolean	System	PID_*n*_SELF_CMD	R W	Command for the Selftuning procedure. *n* can take on values from 1 to 16.
Boolean	System	PID_*n*_SELF_STS	R	Status of the Self tuning phase. When it is ON, Selftuning is under way.*n* can take on values from 1 to 16.
String	System	LOOPn_NAME	R W	Customisable name of the PID. *n* can take on values from 1 to 16..
Register	Ret System	SSP_ACTIVE_n	R	Set Point Active, usually coinciding with Set Point; differs in the case of gradient

13.1.4. SP Programmer

Type	Group	Variable name	Use	Description
Register	Ret Reg	STATUS_n	R	Program status *n*. *n* can take on values from 1 to 8. The variable can be 0 = ready, 1 = run, 2 = hold, 3 = end.
Boolean	System	START_*n*	R W	Start program *n*. The status switches to RUN (STATUS_n = 1) *n* can take on values from 1 to 8.
Boolean	System	START_ZERO	R W	Start program ZERO
Boolean	System	RESET_*n*	R W	Reset program *n*. The status switches to READY (STATUS_n = 0) *n* can take on values from 1 to 8.
Boolean	System	RESET_ZERO	R W	Reset program ZERO
Boolean	System	PAUSE_*n*	R W	Pause program *n*. The status switches to HOLD (STATUS_n = 2) *n* can take on values from 1 to 8.
Boolean	System	END_*n*	R W	End program *n*. The status switches to END (STATUS_n = 3) *n* can take on values from 1 to 8.
Boolean	System	SKIP_*n*	R W	From the HOLD condition, program n passes to the following segment *n* can take on values from 1 to 8.
Boolean	System	WAIT_*n*	R	Waiting for the consents before executing the step of program n. *n* can take on values from 1 to 8.
Boolean	System	CH*n*_ALL_H	R	Top range exceeded alarm for channel *n* in the program in position 1. *n* can take on values from 1 to 4.
Boolean	System	CH*n*_ALL_H_P*p*	R	Top range exceeded alarm for channel *n* in the program in position *p*. *n* can take on values from 1 to 4. *p* can take on values from 2 to 8.
Boolean	System	CH*n*_ALL_L	R	Bottom range exceeded alarm for channel *n* in the program in position 1. *n* can take on values from 1 to 4.
Boolean	System	CH*n*_ALL_L_P*p*	R	Bottom range exceeded alarm for channel *n* in the program in position *p*. *n* can take on values from 1 to 4. *p* can take on values from 2 to 8.
Boolean	System	WAIT_p	R W	Disable waiting for consent in the program step *n*. *n* can take on values from 1 to 8.
Boolean	System	HBB_*n*	R	Deactivates freezing of profile generation if it is intercepted by the HBB function. Acts only during the step under way; the HBB function will become active again when the next step beings
Boolean	System	*WAIT_HBB_DIS_n*	R W	command to override the condition of HBB and continue with profile generation; when this signal is high, the programmer ignores the HBB signal and continues with profile generation
Boolean	System	START_ENABLE	R W	Indicates the possibility to start the program. You can reset it to prevent the programs from starting.

Type	Group	Variable name	Use	Description
Boolean	System	SUSPEND_n	R W	Suspends program *n*. *n* can take on values from 1 to 8. Works like the PAUSE command, but status is not changed and as soon as the SUSPEND signal is OFF again, the program automatic restarts.
Boolean	System	SUSPEND	R W	Suspends all programs
Boolean	System	MANUAL_SEL_*n*	R W	Program n command in manual mode, valid only when the program is in READY status, i.e. not being executed. *n* can take on values from 1 to 8.
Ret Register	System	MANUAL_SPm_n	RW	Set the manual SP of profile m in program n
String	System	Record_n_name	R	Program name *n*. *n* can take on values from 1 to 8.
String	System	Record_n_descr	R	Program n description n can take on values from 1 to 8.
String	System	Program_n_step	R	Name of the step currently being executed by the n-th program. n can take on a value of 1 to 8
String	System	WORK_NAME_*n*	R W	Program batch name *n*. *n* can take on values from 1 to 8.
String	System	TIME_STEP_n	R	Time missing to the subsequent step of program n
String	System	TIME_INC_n	R	Total time from the Program n START
String	System	POWER_ON	R	Start text: "Power on".
String	System	POWER_OFF	R	Stop text: "Power off".
String	System	PROGRAM_STOP	R	Idle program text: "Program ready".
String	System	PROGRAM_START	R	Running program text: "Program run".
String	System	PROGRAM_HOLD	R	Paused program text: "Program hold".
String	System	PROGRAM_END	R	End program text: "Program end".
String	System	PROGRAM_SKIP	R	Skip program text: "Program skip".
String	System	PROGRAM_STEP_TIME	R	Time until next step for program in 1st position.
Register	System	CP_PRGp_STEP_NUM	R O	Indicates the segment currently under way in a given program
Register	System	CP_RUN_PRGp_SPn	R O	Indicates the current set point attuale of a given program
String	System	SYS_TIME	R O	String containing system time
String	System	SYS_DATE	R O	String containing system date

NB:
The 09 program index corresponds to the TEMPLATE program.
The 10 program index corresponds to the ZERO program.

13.1.5. Alarms

Type	Group	Variable name	Use	Description
Boolean	System	STOP_LOGGING	R	Report recording and Audit Trail tracking stopped due to lack of storage space
Boolean	System	AUDIT_BLOCKED	R	Audit Trail tracking disabled due to missing SD-card
Boolean	System	ALARM_PRESENT	R	At least one alarm triggered.
Boolean	System	NEW_ALARM	R	No alarm triggered.
Boolean	System	PROBE_FAULT_*n*	R	Probe *n* fault. *n* can take on values from 1 to 16. PROBE_FAULT_n is a system flag that may be used in custom pages and logic, while AI_xx_RANGE_OUT is a system alarm, and is therefore already tracked in the alarm history.
Alarm	System	AI_n_RANGE_OUT	R	Probe n fault n can take on values from 01 to 16

13. ANNEXES

Alarm	System	NO_SD_MODULE	R	SD card configured, but not present. Recording not active.
Alarm	System	DISK_FULL_NO_REC	R	Disc full, no new records will be made
Alarm	System	IO_CABLE_FAULT	R	CANopen communication error
Alarm	System	SIMULATOR_ON	R	Simulator active
Alarm	System	DO_SC_M_N	R	Digital outputs in short circuit. The card number (1-4) and output number (1-8) are indicated
Alarm	System	FMIXn_AO_SC	R	Analogue outputs in short circuit or overloaded. The number of the FMIX card involved is specified
Alarm	System	FMIXn_AO_OC	R	Analogue outputs without load or with non-standard load. Typically indicates that wiring has been hooked up on a given output. The number of the FMIX card involved is specified
Alarm	System	IO_GUARD_TIME	R	CANopen error
Alarm	System	IO_COMM_ERROR	R	CANopen communication error
Alarm	System	IO_WRONG_CARD_n	R	Error in a specific card
Alarm	System	IO_WRONG_STATE	R	Generic card error; may, for example, indicate a card change.
Alarm	System	PID_n_RANGE_OUT	R	A number of PID variables have gone off the scale (+32767, -32768 without considering decimal points). Control not possible
Alarm	System	HW_CFG_CHANGE	R	Hardware configuration changed
Alarm	System	AI_n_RANGE_OUT	R	Analog input value beyond maximum or minimum
Alarm	System	AI_n_LOW	R	Analog input value below minimum
Alarm	System	AI_n_HIGH	R	Analog input value above maximum
Alarm	System	AI_n_SBR	R	Analog input value in damaged sensor range
Alarm	System	CT_n_SBR	R	Value read by current transformer over maximum value
Alarm	System	CT_n_HIGH	R	Value read by current transformer too high
Alarm	System	AO_n_OPEN_C	R	Analog output open circuit
Alarm	System	AO_n_SHORT_C	R	Analog output short circuit

13.1.6. Weekly clock

Type	Group	Variable name	Interval	Use	Description
Boolean	System	ALARM_CLK*n*_CMD*m*		R	Clock *n* command *m*. *n* can take on values from 1 to 4. *m* can take values 1 or 2.
Boolean	System	ALARM_CLK*n*_SET		R	Enable clock *n* (true = enabled). *n* can take on values from 1 to 4.

13.1.7. Energy

Type	Group	Variable name	Use	Description
Boolean	Ret System	ENERGY_RESET	R W	Reset energy count.
Boolean	Ret System	ENERGY_ENABLE	R W	Enable energy counter command.
Register	Ret System	ENERGY_TOTAL	R	Total energy counter
Register	Ret System	DO_*n*_TON	R	Timer for ON status for digital output *n*. *n* can take on values from 1 to 48.
Register	Ret System	DO_*n*_KWH	R	kWh distributed by digital output *n*. *n* can take on values from 1 to 48.
Register	Ret System	PIDH_n_KWH	R	Total kWh for HEAT action of the PID controller. *n* can take on values from 1 to 16.
Register	System	PIDC_n_KWH	R	Total kWh for COOL action of the PID controller. *n* can take on values from 1 to 16.

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