GEFRAN

1200 / 1300

TEMPERATURE CONTROLLER



INSTRUCTIONS FOR USE AND WARNINGS

Software Version 4.0x

code **81801G** / Edition **08 - 07/2011 ENGLISH**

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The contents of each section are summarized immediately following the section heading

Graphic symbols used

To distinguish between the type and importance of the information provided in these instructions for use, graphic symbols have been used as a reference to make interpreting the information clearer.



Indicates the contents of the various manual sections, the general warnings, notes, and other points to which the reader's attention should be drawn.



ndicates a particularly delicate situation that could affect the safety and correct working ope- ation of the controller, or a rule that must be strictly observed to avoid dangerous situations



ndicates a condition of risk for the safety of the ıser, due to the presence of dangerous voltages ıt the points shown



ıdicates a suggestion based on the experien- e of the GEFRAN Technical Staff, which could rove especially useful under given cir- umstances



Indicates a reference to Detailed Technical Documents available on the GEFRAN web site **www.gefran.com**

AL.1

In the programming and configuration flows for the controller, indicates the **typical** parameters of the "**Easy**" configuration, i.e. the minimum controller configuration optimized for the basic version that uses just 2 outputs (OUT1 , OUT2)

AL.2

In the programming and configuration flows for the controller, indicates **all** the parameters that can be set in the "**Extended**" configuration.

1 • PRELIMINARY INSTRUCTIONS



tion contains information and warnings of a general nature which should be read before proceeding with controller installation, configuration and use.

General Description

GEFRAN series 1200 / 1300 digital controllers have been designed for temperature control in any applications involving heating or cooling processes. They represent an exclusive combination of performance, reliability and applicational flexibility. In particular, this new line of Gefran temperature controllers is the ideal solution for application in sectors where performance and service continuity are important, including:

- extrusion lines
- injection molding for plastic materials
- thermoformers
- presses for rubber
- wrapping and packaging machines
- processing plant for the food industry
- cooling switchboards
- climatic chambers and test benches
- ovens
- paint plants
- etc.

The 1200/1300 series temperature controllers are made on an extremely versatile hardware and software platform, that allows the most suitable I/O composition for the plant to be chosen from a series of options, up to a maximum of:

- 4 outputs
- 3 inputs (2 of which are auxiliary)
- 1 RS485 interface.

Basic Version Controller

- **1** universal **input** for TC, 2/3 wire RTD, PTC, NTC, and linear thermocouples, supplied with current and voltage with accuracy better than 0.2% f.s.
- **2** standard **outputs**: one relay and the other relay/logic/triac (depending on request)
- **functions** heat/cool, self tuning, autotuning, soft start
- **alarm** for interrupted load or short-circuited probe
- service **serial line** for configuration by PC (Winstrum)

Options

- **3rd output** retransmission relay/ logic/continuous/analogue
- **4th output** relay/logic
- **2 auxiliary digital inputs** with configurable function, or 1 auxiliary digital input + current transformer input to control the load current
- serial optoisolated RS485 **interface**

Operator Interface

All the operator interface devices are concentrated on the controller faceplate, suitably protected by a membrane in Lexan that guarantees IP65 level protection.

- 4 buttons to be used for manual regulation/ configuration/selection
- 2 green four-digit displays (Process Variable and Set point Variable)
- 4 red LEDs for status indication of same number of relay/logic outputs
- 3 LEDs with program function to indicate controller operating mode.

Electrical Interface

All connection terminals (power supply, inputs, outputs, options) are grouped together on the back of the controller.

For technical specifications and performance details refer to Section 5 “Technical Specifications”.

Preliminary Warnings



The following preliminary warnings should be read before installing and using the series 1200/1300 controller . This will allow the controller to be put into service more quickly and will avoid certain problems which may mistakenly be interpreted as malfunctions or limitations of the controller.

- Immediately after unpacking the controller, make a note of the order code and the other identification data given on the label affixed to the outside of the container and copy them to the table below. These details must always be kept close at hand and referred to the personnel involved in the event of help from Gefran Customer Service Assistance.

SN:	.....	(Serial no.)
CODE:	.....	(Finished product code)
TYPE:	.....	(Order Code)
SUPPLY:	.....	(Type of electrical power supply)
VERS:	.....	(Software version)

- Check also that the controller is complete and has not been damaged at all during transit, and that the package contains not only the controller and these Instructions for Use, but also the two brackets for fixing to the panel and the dust protection seal - see: Installation with Panel Fixing in Section 2. Any inconsistencies, omissions or evident signs of damage should be reported immediately to your Gefran sales agent.
- Check that the order code corresponds with the configuration requested for the application the controller is needed for, referring to Section 7: “Technical - Commercial Information”.
  - No. and Type of Inputs/Outputs available
  - Presence of the necessary options and accessories
  - Mains voltage supply

  Example: 1200 – RT – RR – 00 – 0 – 1
  Model 1200 controller
  Output 1 - Relay; Output 2 - Triac (1A)
  Output 3 - Relay; Output 4 - Relay
  No Digital Input
  No Digital Communication
  Mains Voltage 100...240Vac/dc

- Before installing the series 1200/1300 controller on the control panel of the machine or host system, refer to the paragraph “Dimensions and Cut-out” in Section 2 “Installation and Connection”.
- Where configuration by PC is provided for, make sure the interface RS232 cable is available and the CD- ROM containing the WINSTRUM software. For the order code refer to Section 7 “Technical - Commercial Information”.



Users and/or system integrators who wish to know more about the concepts of serial communication between standard PC and/or Gefran Industrial PC and Gefran Programmable Instruments (including the series 1200/1300 controller), can access the various technical reference Documents in Adobe Acrobat format available in the Download section of the Gefran Web Site **www.gefran.com** including:

- Serial Communication
- MODBus Protocol

In the same Download section of the Gefran Web Site **www.gefran.com** the 1200/1300 Temperature Controller reference manual is available in Adobe Acrobat format, containing a detailed description of all the adjustable parameters and procedures for the Controller. In the event of presumed instrument malfunction, before contacting Gefran Technical Service Assistance, refer to the Troubleshooting Guide given in Section 6 “Maintenance”, and if necessary refer to the F.A.Q. Section (Frequently Asked Questions) on the Gefran Web Site **www.gefran.com**

2 • INSTALLATION AND CONNECTION

This section contains the instructions necessary for correct installation of the 1200/1300 controllers into the machine control panel or the stem and for correct connection of the controller supply, inputs, outputs and interfaces.

Before proceeding with installation read the following warnings carefully!
Remember that lack of observation of these warnings could lead to problems of electrical and electromagnetic compatibility, as well as ating the warranty.

Electrical power supply

- the controller is NOT equipped with an On/Off switch: the user must provide a two-phase disconnecting switch that conforms to the required safety standards (CE marking), to cut off the power supply upstream of the controller.
  The switch must be located in the immediate vicinity of the controller and must be within easy reach of the operator. One switch may control more than one controller.
- if the controller is connected to NOT isolated electrical equipment (e.g. thermocouples), the earth connection must be made with a specific conductor to prevent the connection itself from coming directly through the machine structure.
- if the controller is used in applications with risk of damage to persons, machinery or materials, it is essential to connect it up to auxiliary alarm equipment. It is advisable to make sure that alarm signals are also triggered during normal operation. The controller must NOT be installed in flammable or explosive environments; it may be connected to equipment operating in such atmospheres only by means of appropriate and adequate types of interface, conforming to the applicable safety standards.

Notes Concerning Electrical Safety and Electromagnetic Compatibility:

CE MARKING:
The instrument conforms to the European Directives 2004/108/CE and 2006/95/CE with reference to the generic standards: **EN 61000-6-2** (immunity in industrial environment) **EN 61000-6-3** (emission in residential environment) **EN 61010-1** (safety).
Series 1200/1300 temperature controllers are mainly designed to operate in industrial environments, installed on the switchboards or control panels of productive process machines or plants.
As regards electromagnetic compatibility, the strictest generic standards have been adopted, as indicated in the table below.

EMC conformity has been tested with the following connections.

Function	Cable type	Length
Power supply cable	1mm²	1m
Relay output cables	1mm²	3.5m
Serial connection wire	0,35mm²	3.5m
C.T. connection cables	1,5mm²	3.5m
Thermocouple input probe	0,8mm² compensated	5m
“PT100” temperature resistance input probe	1mm²	3m

EMC Emission		
Generic standards, emission standard for residential commercial and light industrial environments	EN 61000-6-3	
Emission enclosure	EN 61000-6-3	Gruppo1 Classe B
Emission AC mains	EN 61000-6-3	Gruppo1 Classe B
Radiated emission	EN 61326 CISPR 16-2	Classe B
EMC Immunity		
Generic standards, immunity standard for industrial environments	EN 61000-6-2	
Immunity ESD	EN 61000-4-2	4 kV contact discharge level 2 8 kV air discharge level 3
Immunity RF interference	EN 61000-4-3 /A1	10 V/m amplitude modulated 80 MHz-1 GHz 10 V/m amplitude modulated 1.4 GHz-2 GHz
Immunity conducted disturbance	EN 61000-4-6	10 V/m amplitude modulated 0.15 MHz- 80 MHz (level 3)
Immunity burst	EN 61000-4-4	2 kV power line (level 3) 2 kV I/O signal line (level 4)
Immunity pulse	EN 61000-4-5	Power line-line 1 kV (level 2) Power line-earth 2 kV (level 3) Signal line-earth 1 kV (level 2)
Immunity Magnetic fields	EN 61000-4-8	100 A/m (level 5)
Voltage dips, short interruptions and voltage immunity tests	EN 61000-4-11	100%U, 70%U, 40%U,
LVD Safety		
Safety requirements for electrical equipment for measurement, control and laboratory use	EN 61010-1	



Advice for Correct Installation for EMC

Instrument power supply

- The power supply to the electronic equipment on the switchboards must always come directly from an isolation device with a fuse for the instrument part.
- The electronic instruments and electromechanical power devices such as relays, contactors, solenoid valves, etc., must always be powered by separate lines.
- When the electronic instrument power supply is strongly disturbed by the commutation of transistor or power units or motors, an isolation transformer should be used for the controllers only, earthing the screen.
- It is essential that the plant has a good earth connection:
  - the voltage between neutral and earth must not be >1V
  - the Ohmic resistance must be <6Ω;
- If the mains voltage fluctuates strongly, use a voltage stabilizer.
- In the proximity of high frequency generators or arc welders, use adequate mains filters.
- The power supply lines must be separate from the instrument input and output ones.

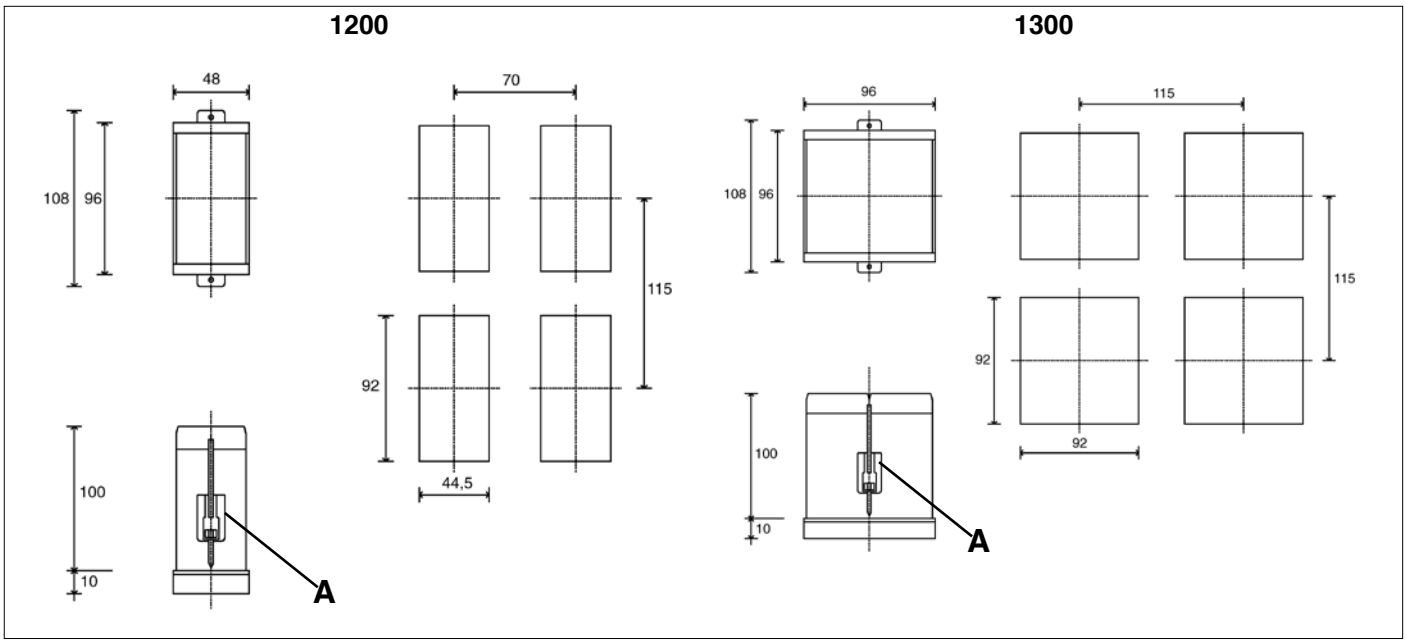
Inputs and outputs connection

- The externally connected circuits must be doubly isolated.
- To connect the analogue inputs (TC, RTD) the following is necessary:
  - physically separate the input cables from those of the power supply, the outputs and the power connections.
  - use woven and screened cables, with the screen earthed in one point only
- To connect the regulating and alarm outputs (contactors, solenoid valves, motors, fans, etc.), fit RC groups (resistance and condensers in series) in parallel to the inductive loads that operate in Alternating Current.
  (Note: all the condensers must conform to VDE (class X2) standards and withstand a voltage of at least 220V AC. The resistances must be at least 2W).
- Fit a 1N4007 diode in parallel with the coil of the inductive loads that operate in Direct Current.



GEFRAN S.p.A. declines all responsibility for any damage to persons or property caused by tampering, neglect, improper use or any use which does not conform to the characteristics of the controller and to the indications given in these Instructions for Use.

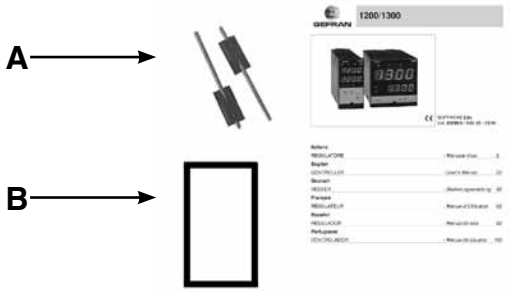
Dimensions and cut-out



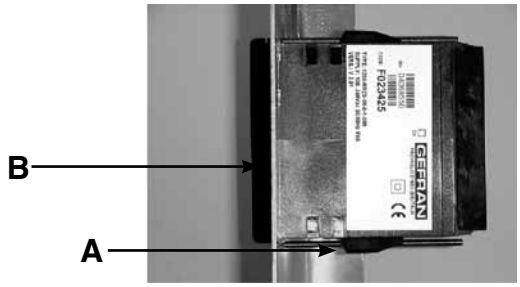
Installation with panel mounting

As well as the actual controller and these instructions for use, the controller package also contains:

- 2 panel fixing brackets (**A**)
- 1 protective seal against dust and water spray (**B**)



Fit the controller to the panel as shown in the figure.



Warnings and instructions for mounting to the panel

Instructions for installation category II, pollution level 2, double isolation.

- only for low power supply: supply from Class 2 or low voltage limited energy source.
- the power supply lines must be separate from the controller input and output ones
- group the instruments together keeping them separate from the powered part of the relay
- do not install high-power remote switches, contactors, relays, thyristor power units (especially the “phase angle” type), motors, etc. in the same switchboard
- avoid dust, humidity, corrosive gasses and heat sources
- do not block the ventilation holes: the working temperature must be between 0...50°C
- surrounding air: 50°C
- use 60/75°C copper (Cu) conductor only, wire size range 2x No 22 - 14AWG, Solid/Stranded
- use terminal tightening torque 0.5N m

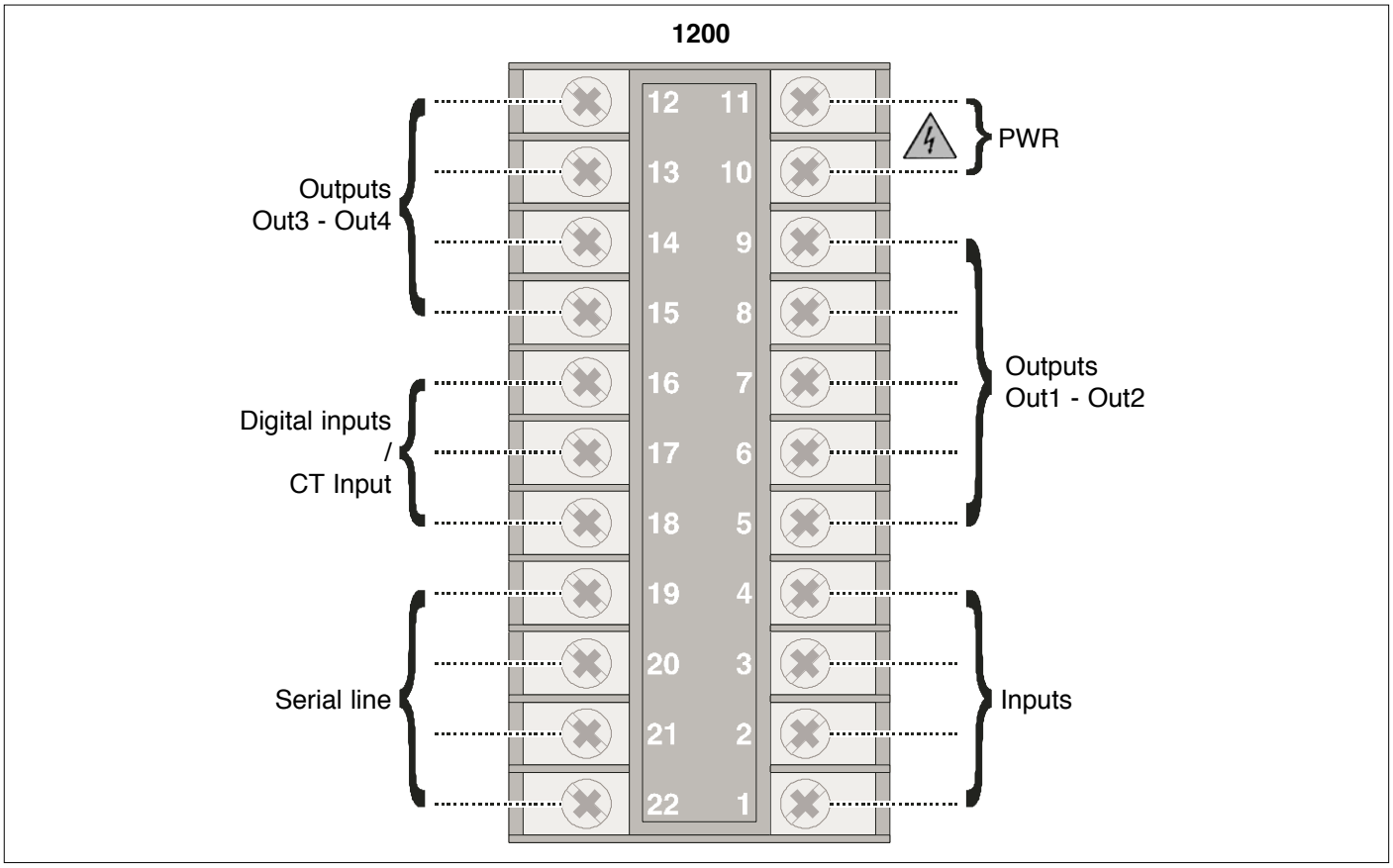
Nominal ambient conditions

Altitude	Up to 2000m
Working/storage temperature	0..50°C/-20...70°C
Non condensing relative humidity	20...85%

Before supplying the Controller with power, make sure that the mains voltage is the same as that shown in the last number of the order code.

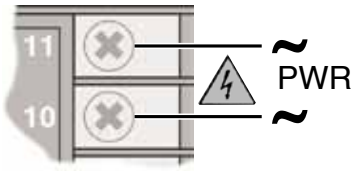
Example:
1200/1300 – xx – xx – xx – x – 1 = 100..240Vac/dc
1200/1300 – xx – xx – xx – x – 0 = 11..27Vac/dc

Electrical Connections



Always make the connections using cable types suitable for the voltage and current limits given in Section 5 - Technical Specifications.
If the Controller has faston terminals these must be protected and isolated.
If it has screw terminals, the wires must be attached, at least in pairs

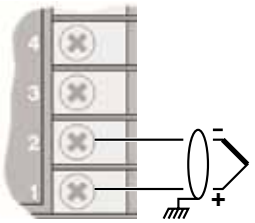
Power Supply



Standard: 100...240Vac/dc ±10% , max 18VA
Optional: 11...27Vac/dc ±10% , max 11VA
50/60 Hz

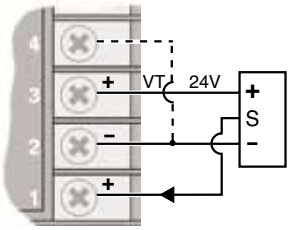
Inputs

TC Input



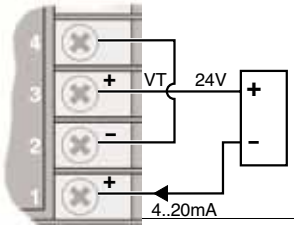
Available thermocouples:
J, K, R, S, T
(B,E, N, L, U, G, D, C possible by inserting a custom linearization)
- Observe polarities
- For extensions, use the correct compensating cable for the type of TC used

Linear input with 3-wire transmitter supplied from the instrument



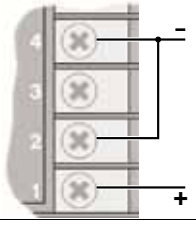
Connect for 0/4..20mA input

Linear input with 2-wire Transmitter supplied from the instrument



Jumper S3 closed on CPU board
(see CAP. 6 Maintenance)

Linear input (I)

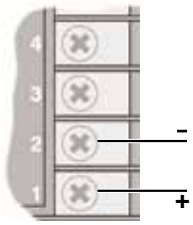


Linear input in Direct Current

0/4..20mA, Ri = 50Ω

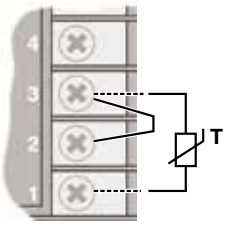
Inputs

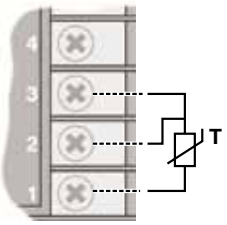
Linear input (V)



Linear input in
Direct Current
60 mV, 1V (Ri > 1MΩ)
5V, 10V (Ri > 10KΩ)

PTC/NTC/Pt100/JPT100 input





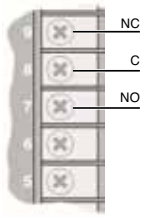
2-wire connection *3-wire connection*

Jumper S2 closed on CPU board (see CAP. 6 Maintenance)

Use wires of adeguate diameter (min. 1mm²)

Outputs Out1, Out 2 — User configurable generic outputs

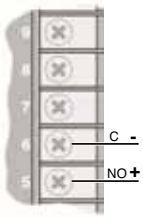
Out 1



- Relay 5A 250Vac/30Vdc

NC not available if Out2 is triac type

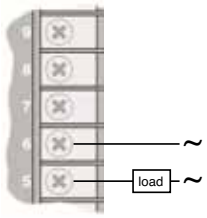
Out 2



- Relay 5A 250Vac/30Vdc

- Logic 24V (10V a 20mA)

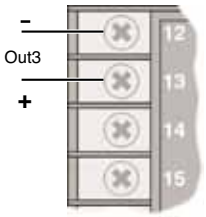
Out 2



Triac
20...240Vac,
max. 1A ± 10%

Outputs Out3, Out 4 — User configurable generic outputs

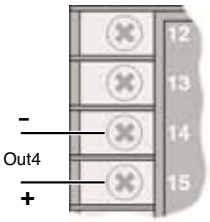
Out 3



- Relay 5A 250Vac/30Vdc
- Logic 24V 10V a 20mA
- Direct 0...10V, 0/4...20mA
- Analogue 0...10V, 0/4...20mA
- 0/2...10V (S1-ON),
  0/4...20mA (S1-OFF)
  S1 is a jumper on the board for continuous or analogic output



Out 4

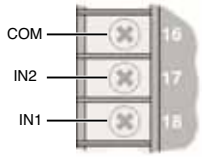


- Relay 5A 250Vac/30Vdc

- Logic 24V (10V a 20mA)

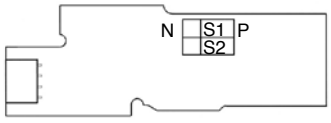
Digital inputs / CT Input — User configurable generic inputs

IN1, IN2 digital inputs

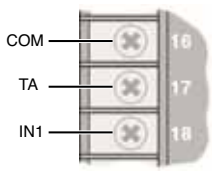


Digital input 24V 5mA
(Jumpers S1, S2 in position P)
or from non-powered terminal
(Jumpers S1, S2 in position N)

Hrd Menù configuration
Parameter diG or di2 = +16



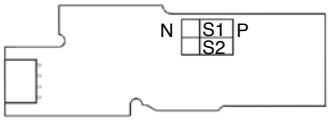
CT, IN1 inputs



- Input from current transformer 50mAac, 10Ω 50/60Hz

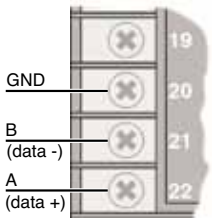
- Digital input 24V 5mA
(Jumpers S1, S2 in position P)
or from non-powered terminal
(Jumpers S1, S2 in position N)

Hrd Menù configuration
Parameter diG or di2 = +16

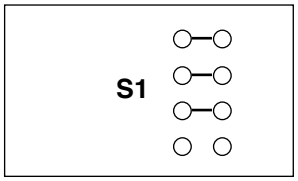


Serial line

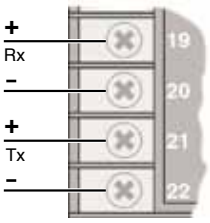
Modbus 2 wires (Standard)



RS485 isolated serial line

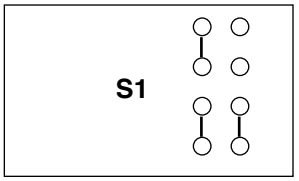


Modbus 4 wires / Cencal



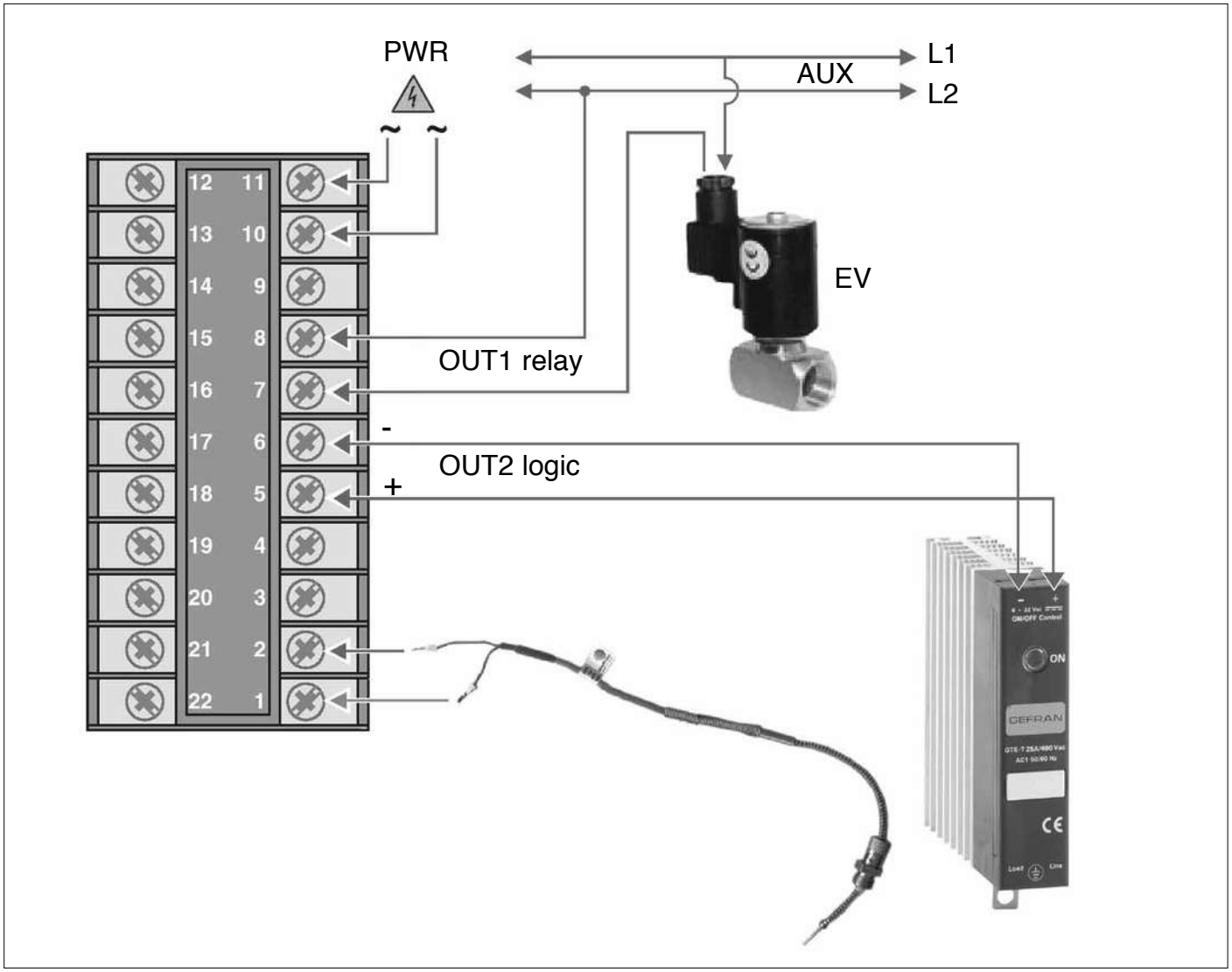
RS485 isolated serial line

For configuration
Modbus 4 wires/Cencal.



Example of connection with TC Input

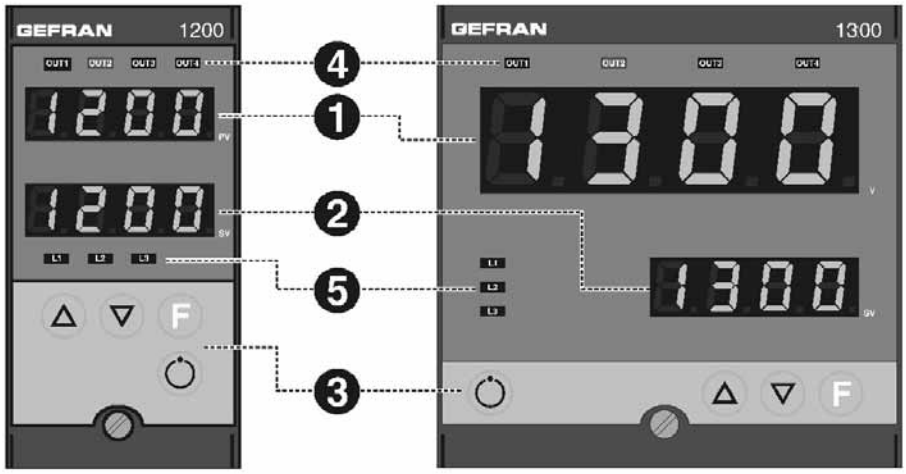
Electric heating with power solid state relay and water cooling with solenoid valve



3 • FUNCTIONS

This section illustrates the functions and operating modes of the displays, the indicator lights and the buttons that make up the operator interface of series 1200/1300 controllers. It is therefore an essential requirement for programming and configuring the controllers correctly.

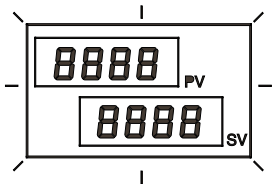
Operator Interface



ID	Symbol	Function
1	1200	PV : Shows the process variable, the menu identification, the parameters identification and the error codes
2	1300	SV : Shows the setpoint value, the value of the parameter displayed in PV and three dashes (- - -) when PV contains a menu heading
3	△ ▽	**Inc**reases/**Dec**reases the value of the parameter displayed in SV until the max/min. value is reached. Held down: progressively increases the speed of increasing/decreasing the value displayed in SV.
	F	Used to move between the various menus and parameters of the controller. Confirms the value of the current parameter (or parameter edited using △ ▽) and selects the next parameter.
		Button with configurable function: with standard configuration commutes the controller operating mode (MANUAL/AUTOMATIC). Is only on when the display 1 shows the process variable. (for configuration see parameter but in the Hrd menu)
	F +	Confirms the value of the current parameter (or parameter edited using △ ▽) and selects the previous parameter.
4	OUT1 OUT2 OUT3 OUT4	Output status indicators: OUT1 (AL1), OUT2 (Main), OUT3 (HB), OUT4
5	L1 L2 L3	Function indicators: with standard configuration they show the controller operating status For configuration see parameter Ld.1, Ld.2, Ld.3 in the Hrd PEnU L1 MAN/AUTO = OFF (automatic control) ON (manual control) L2 SETPOINT 1/2 = OFF (IN1= OFF local Setpoint 1) ON (IN1=ON local Setpoint 2) L3 SELFTUNING = ON (Self activated) OFF(Self deactivated)

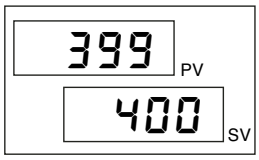
Switching on and using the Controller

Self-diagnostics



- Immediately after switching on the controller carries out a self-diagnostic test. During the test, all the display segments and the 7 indicator lights will flash.
- If the self-diagnostics procedure does not detect any errors the controller enters the normal working status (Level 1)
- Any errors found by the self-diagnostics are memorized in a record and can be displayed with the
  Err function in the InF MEnU

Normal Working - Level 1

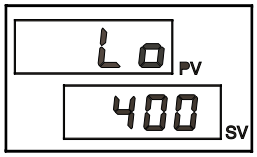


PV Displays the value of the Process Variable.
SV Displays the Setpoint value or the Control Output value if in the Manual working mode.

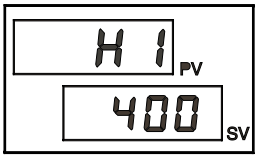
- By pressing briefly F it is possible to see in sequence on the PV display (and if necessary edit) the significant values that condition the way the controller works in Level 1 (Setpoint, Alarm threshold, Control Output, etc.)
- Keeping F pressed down for 3 seconds we enter the Programming/Configuration menu - see Navigation in the Controller Menus for further details.
- By pressing △ ▽ it is possible to increase/decrease the Setpoint value, until the required value is reached.

Errors while working

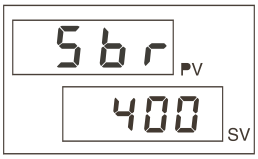
In the event of errors during normal working:
PV Displays the error identification.
SV Continues to display the Setpoint or Control Output value.



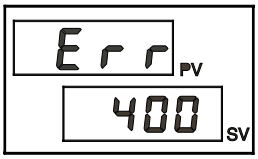
Lo process variable< min. scale limit (param. LoS in the InP MEnU)



hi process variable> max. scale limit (param. HS in the InP MEnU)



Sbr broken probe or input values higher than maximum limits

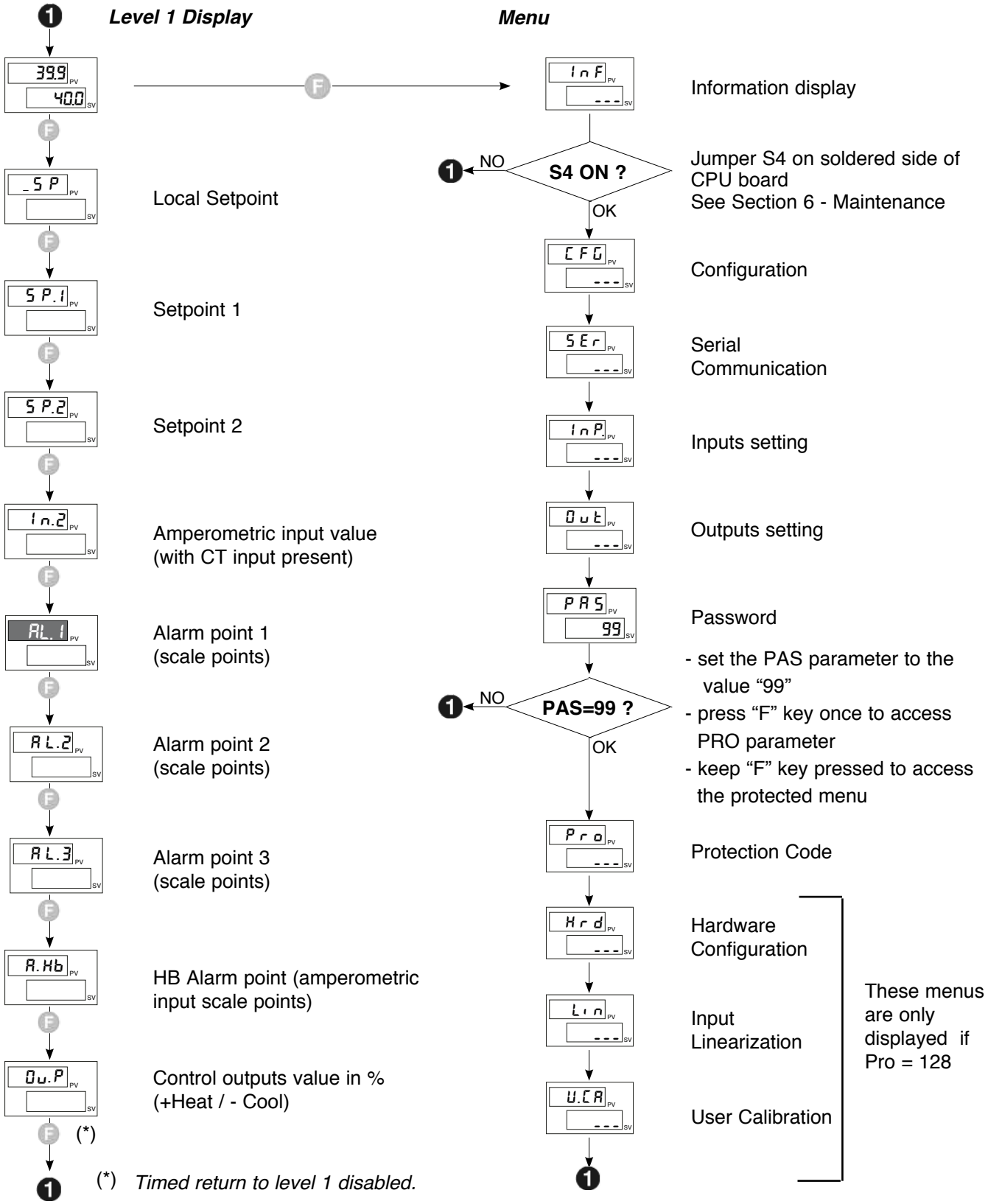


Err third wire broken for PT100,PTC or input values lower than minimum limits (e.g. for TC with wrong connection)

To solve the problem, refer to the paragraph: Troubleshooting Guide in Section 6 Maintenance

Navigating through the Controller Menu

Keep F pressed down to scroll through the menus in sequence and release it when the required menu appears.
Press F to access the parameters of the selected menu.
Keep F + ⟳ to return immediately to level 1.



The parameters and menus not significant for a given configuration are NOT displayed

If the keys ▲ ▼ , F are not pressed within approx. 15 seconds, the display returns to level 1

4 • CONFIGURATION / PROGRAMMING

This section contains the instructions necessary to configure the 1200/1300 Controller according to the needs of the application..

Optimal working operation of the 1200/1300 Controller in the field of application it is intended for depends largely on correct configuration and programming of the relevant control parameters.
The flexibility and high performance level of these instruments is in fact based on the numerous parameters that can be programmed directly by the user with the buttons on the control panel, or transferred from a PC, in the form of configuration files, by means of the RS485 interface available as an option on 1200/1300 Controllers.

Easy configuration
To simplify the Controller configuration and programming process in the most common temperature control applications, that do not require very complex controls, there is a simplified level of configuration ("Easy") suitable for the basic instrument versions, with just two outputs (Out1 - Out2).

The Easy configuration essentially has three menus:
CFG : general Controller configuration
InP : input functioning mode
Out : output functioning mode

which involve setting a limited number of parameters (maximum 13), as well as setting the AL.1 alarm point that can be done directly in level 1.

Extended Configuration
Access to all the configuration / programming menus and to all the parameters available for the 1200/1300 controllers in extended configuration, allows every detail of the Controller to be configured, to satisfy all application requirements.

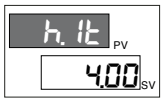
Correct setting of the parameters involved in the extended configuration presumes a high level of knowledge regarding temperature control problems and techniques, and so it is recommended that these parameters are not changed unless the user is fully aware of the consequences, that could arise form incorrect settings.

It is the user's responsibility to check that the parameters are set correctly before putting the Controller into service, in order to avoid damage to persons or property.

*For any doubts or clarification needed, please visit the Web Site **www.gefran.com** and if necessary contact the Gefran Customer Care service..*

To select the Extended configuration mode, 128 must be added to the value of the Pro parameter that appears when scrolling through the Controller menu - see Navigating through the Controller Menus.
The following pages describe one by one the various Controller menus and show for each parameter the concise description of the function performed, any default values and the range of values that can be set.

Example: h.it parameter in the CFG menu



egral heating time
) ... 99.99] % f.s.

(default value)

Supplementary notes on consulting the Configuration/ Programming pages
To set some particularly complex parameters certain tables or detailed explanatory notes must be referred to.
These tables or explanatory notes are shown directly on the right of the page next to the parameter in question.

Application notes
The detailed explanations of certain functioning modes or special techniques the result Gefran's lengthy experience in the field of temperature control are instead contained at the end of the Configuration/Programming Section and can represent a valuable reference tool for the user.
Where necessary, in the configuration / programming flows the appropriate referrals to these Application Notes are provided.

Password: PAS
When scrolling through the menu (keeping F pressed down), following the Out menu, the word PAS appears.
Access to the next menus is only possible if the PAS = 99 parameter is set to 99 by pressing △ ▽ .

Having set the value to 99, press F and keep it pressed down to access the next menus.

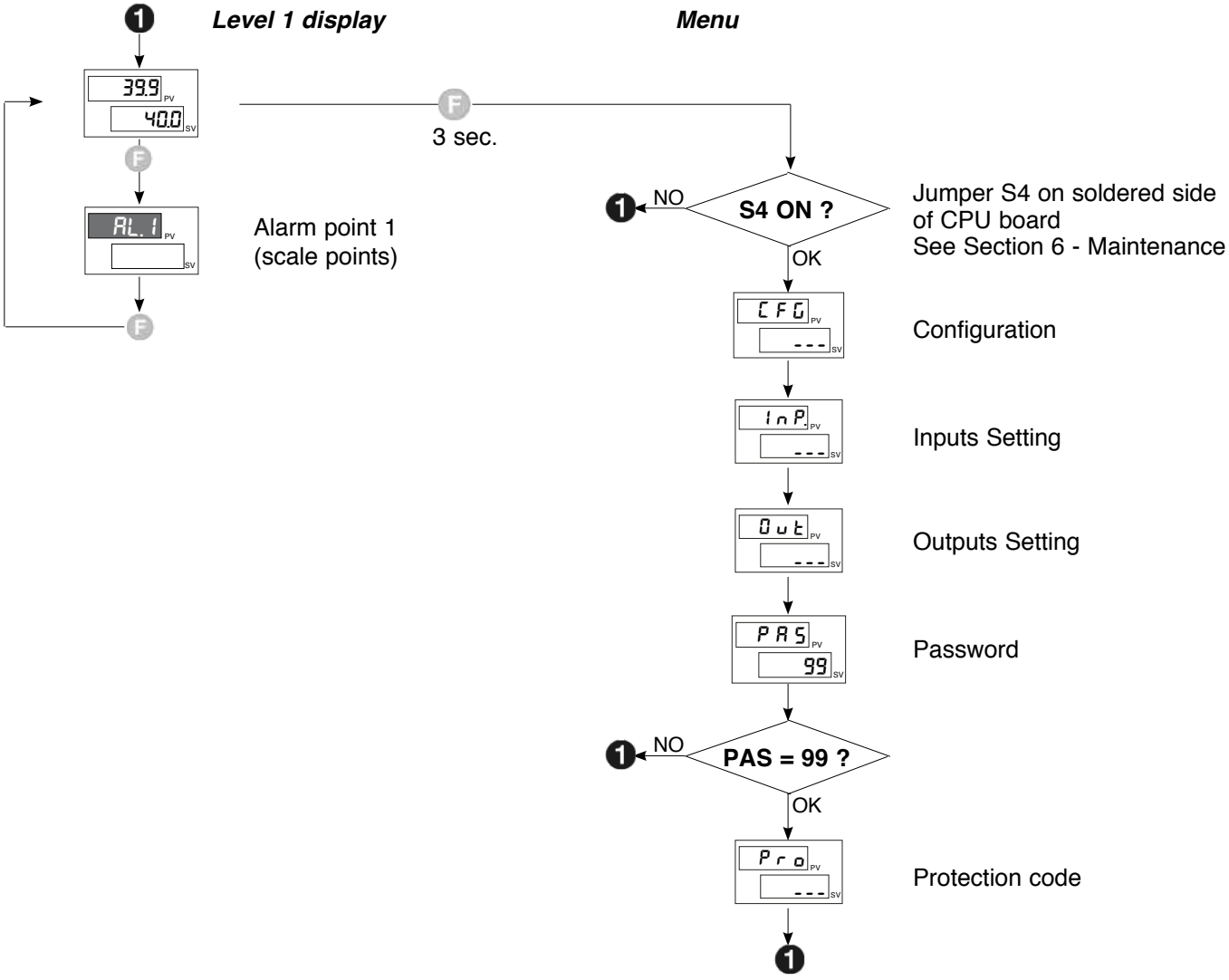
Protection code: Pro
The Pro parameter is used to choose between the "Easy" and the "Extended" configuration, and is also used to enable or disable the display and/or the possibility of editing certain parameters. For further details refer to the description of the Pro parameter in the configuration flows..

Jumper S4 on CPU Board
The absence of jumper S4 on the CPU board of the Controller prevents access to all the menus when the hardware configuration of the instrument does not require the pre-set parameters to be changed.
This jumper is engaged or disengaged during production and normally does not need to be modified by the final user.
For further information, refer to Section 6 - Maintenance.

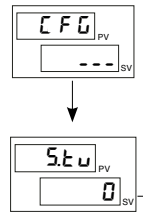
EASY Configuration/Programming

Standard for instrument with 2 Outputs: OUT1 = AL1 / OUT2 = MAIN HEAT

In the EASY configuration, the general navigation flow shown at the end of Section 3 - Functions is considerably simplified, as illustrated in the following figure.



This menu is used to configurare the control parameters in the Easy mode.



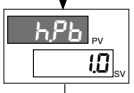
Enabling self-tuning, autotuning, softstart (**)

S.tun	Continuous autotunig	Selftuning	Softstart
0	NO	NO	NO
1	YES	NO	NO
2	NO	YES	NO
3	YES	YES	NO
4	NO	NO	YES
5	YES	NO	YES
6	-	-	-
7	-	-	-

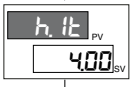
S.tun	Single action Autotuning	Selftuning	Softstart
8*	WAIT	NO	NO
9	GO	NO	NO
10*	WAIT	YES	NO
11	GO	YES	NO
12*	WAIT	NO	YES
13	GO	NO	YES

*) By adding the following figures to the value indicated in the table it is possible to enable a series of supplementary functions:
+16 with automatic switch to GO if PV-SP > 0.5%
+32 with automatic switch to GO if PV-SP > 1%
+64 with automatic switch to GO if PV-SP > 2%
+128 with automatic switch to GO if PV-SP > 4%

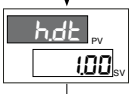
**) For more information on the Self Tuning, Auto Tuning, Soft Start functions, refer to the Operational Notes paragraph.



Proportional band for heating or hysteresis for ON/OFF control **[0 ... 999.9] % f.s**.



Integral time for heating **[0.00 ... 99.99] min.**

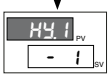


Derivative time for heating **[0.00 ... 99.99] min.**



MAX power limit for heating **[0.0 ... 100.0] %**

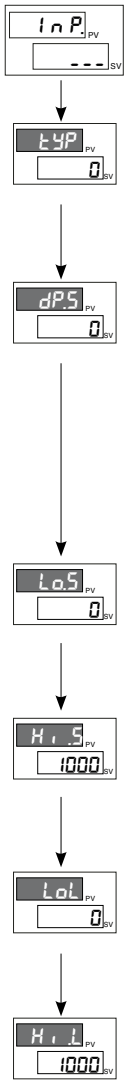
Please note.:
If HEAT/COOL double action control type is enabled (parameter Ctr in menù Hrd) then the COOL action parameters cPb , c It, cdt, cPH are displayed, with the same ranges as the equipment HEAT action parameters.



Hysteresis for Alarm 1 **[±999] scale points**

Adding +32 to the value of A 1.T in the Out menu, the setting range is [**0 … 999**] sec.
Adding +64 to the value of A 1.T in the Out menu, the setting range is [**0 … 999**] min.

With the time scales 0-999sec/0-999min the decimal point has no meaning (for dP.S different from 0")



Type of probe, signal, custom linearization enabling and main scale input

Decimal Point Pos. for Input Scale

dP.5	Format
0	xxxx
1	xxx.x
2	xx.xx (*)
3	x.xxx (*)

Main Input Scale MIN Limit
Min..Max value assigned to input selected with the tYP parameter

Main Input Scale MAX Limit Valore
Min..Max value assigned to input selected with the tYP parameter

Lower limit for SP and absolute alarms Lo.5 ... Hi.5

Upper limit for SP and absolute alarms Lo.5 ... Hi.5

(*) not available for TC, RTD, PTC, NTC probes.

tYP	Probe type	Without dec. point dP.5 = 0	With dec. point dP.5 = 1
	Sensore:	TC	
0	TC J °C	0/1000	0.0/999.9
1	TC J °F	32/1832	32.0/999.9
2	TC K °C	0/1300	0.0/999.9
3	TC K °F	32/2372	32.0/999.9
4	TC R °C	0/1750	0.0/999.9
5	TC R °F	32/3182	32.0/999.9
6	TC S °C	0/1750	0.0/999.9
7	TC S °F	32/3182	32.0/999.9
8	TC T °C	-200/400	-199.9/400.0
9	TC T °F	-328/752	-199.9/752.0
30	PT100 °C	-200/850	-199.9/850.0
31	PT100 °F	-328/1562	-199.9/999.9
32	JPT100 °C	-200/600	-199.9/600.0
33	JPT100 °F	-328/1112	-199.9/999.9
34	PTC °C	-55/120	-55.0/120.0
35	PTC °F	-67/248	-67.0/248.0
36	NTC °C	-10/70	-10.0/70.0
37	NTC °F	14/158	14.0/158.0
38	0...60 mV	-1999/9999	-199.9/999.9
40	12...60 mV	-1999/9999	-199.9/999.9
42	0...20 mA	-1999/9999	-199.9/999.9
44	4...20 mA	-1999/9999	-199.9/999.9
46	0...10 V	-1999/9999	-199.9/999.9
48	2...10 V	-1999/9999	-199.9/999.9
50	0...5 V	-1999/9999	-199.9/999.9
52	1...5 V	-1999/9999	-199.9/999.9
54	0...1 V	-1999/9999	-199.9/999.9
56	200 mV...1 V	-1999/9999	-199.9/999.9

CUSTOM linearization:
LO appears when the variable takes on values lower than the Lo.5 parameter or the minimum calibration value.

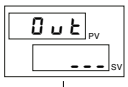
HI appears when the variable takes on values higher than the Hi.5 parameter or the maximum calibration value.

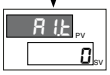
Maximum Non Linearity error for Thermocouples (TC), Temperature resitances (Pt100) and Thermistors (PTC, NTC).

The error is calculated as differing from the theroetical value with reference in % of the full scale value, expressed in degrees Celsius (°C)

Probe type	Probe	Error
Thermocouples	TC type J, K	< 0,2 % f.s.
	TC type S, R	with scale 0..1750 °C: < 0.2 % f.s. (t > 300 °C); for other scales: < 0.5 % f.s.
	TC type T	< 0.2 % f.s. (t > -150 °C)
Thermistors	NTC	< 0.5 % f.s.
	JPT100 / PTC	< 0.2 % f.s.
Temperature than resistances	Pt100	with scale -200..850 °C: accur. better 0.2 % f.s.

This menu is used to configure the type of Alarm 1 and the Output 2 cycle time.

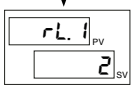




Alarm type 1
If more alarms are enabled *, please set them using the same table
* (A2t, A3t).

A1t	Direct (high limit Inverse (low limit)	Absolute/Relative to active Setpoint	Normal Symmetric (window)
0	Direct	Absolute	Normal
1	Inverse	Absolute	Normal
2	Direct	Relative	Normal
3	Inverse	Relative	Normal
4	Direct	Absolute	Symmetric
5	Inverse	Absolute	Symmetric
6	Direct	Relative	Symmetric
7	Inverse	Relative	Symmetric

By adding the following amounts to the values shown in the table a series of supplementary functions can be enabled
+8: to disable on power up until first interception.
+16: to enable alarm memory.
+32: HY.1 menu CFG = alarm trigger delay time ([0..999] sec. (excluding absolute symmetric)
+64: HY.1 menu CFG = alarm trigger delay time ([0..999] min. (excluding absolute symmetric)



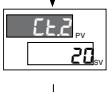
OUT 1
Allocation of reference signal
If more outputs are available *, please set them using the same table
* (rL2, rL3, rL4)

rL.1; rL.2 rL.3; rL.4	Function
0	HEAT (control output for heating)
1	COOL (control output for cooling)
2	AL1 – alarm 1
3	AL2 – alarm 2
4	AL3 – alarm 3
5	AL. HB – HB alarm
6	LBA – LBA alarm
7	IN – repetition of logic input 1
8	Repeat but key (if but menu Hrd = 8)
9	AL1 or AL2
10	AL1 or AL2 or AL3
11	AL1 And AL2
12	AL1 and AL2 and AL3
13	AL1 or AL. HB
14	AL1 or AL2 or AL. HB
15	AL1 and AL. HB
16	AL1 and AL2 and AL. HB

Add +32 to the values indicated in the table to obtain the denied logic level in output, except for codes 0..1 with continuous output

64 * (0.1 ... 20.0 sec.)	rL.2 HEAT: heat control output with fast cycle time
	rL.3 HEAT: continuous output 2 – 10 V
65 *	rL.2 COOL: cool control output with fast cycle time (0.1 ... 20.0 sec.)
	rL.3 COOL: continuous output 2 – 10 V

*) only for rL.3 o rL.2 if continuous OUT3 is not present

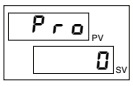


OUT 2 Cycle time (HEAT or COOL)
[1 ... 200] sec.

the same setting range is valid also for Ct1, Ct3, Ct4.

Pro Protection code

This menu is used to enable or disable the display and/or editing of certain parameters and to access the extended configuration.

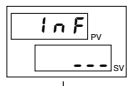


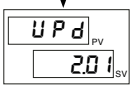
Pro	Display	Modification
0	SP, alarms	SP, alarms
1	SP, alarms	SP
2	SP	

By adding the following amounts to the values shown in the table a series of supplementary functions can be enabled:

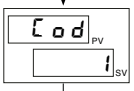
+4: to disable InP, Out
+8: to disable CFG
+128: to enable the display of all the parameters and menus.

This menu provides information on the status and hardware configuration of the controller (number and type of inputs/outputs, software version, etc.).

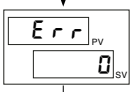




Software version



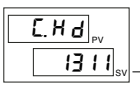
Instrument code



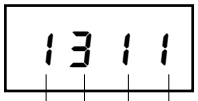
Self diagnostic error code

0	no error
1	Lo
2	Hi
3	ERR
4	SBR

Where there is an error in recognising the boards the value displayed is increased by +8:



Configuration hrd 1

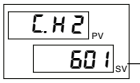


OUTPUT 1
0 = None
1 = Relay

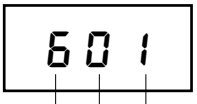
OUTPUT 2
0 = None
1 = Relay
2 = Logic
3 = Triac

OUTPUT 3
0 = None
1 = Relay
2 = Logic
4 = Continuous
5 = Analog

OUTPUT 4
0 = None
1 = Relay
2 = Logic



Configuration hrd 2



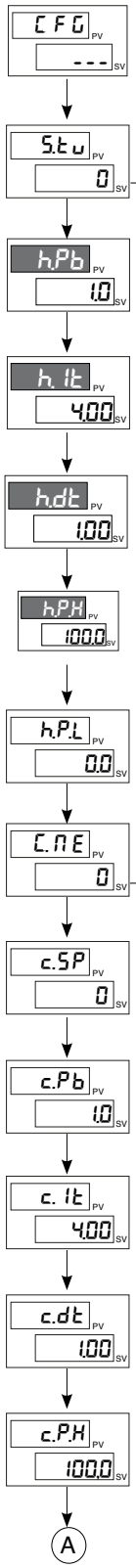
DIGITAL INPUT 2/TA
0 = None
6 = CT
7 = Digital 2

DIGITAL INPUT 1
0 = None
7 = Digital 1

SERIAL
0 = None
1 = RS 485

CFG Configuration Fourth menu to set up

This menu makes it possible to configure various control parameters.



Enabling self-tuning, autotuning, softstart (**)

Proportional band for heating or hysteresis for ON/OFF control
[0 ... 999.9] % f.s.

Integral time for heating
[0.00 ... 99.99] min.

Derivative time for heating
[0.00 ... 99.99] min.

Maximum power limit for heating **[0.0 ... 100.0] %**

Minimum power limit for heating (not available for double heat/cool action)
[**0.0 ... 100.0] %**

Cooling medium
[0 ... 2]

Setpoint for cooling relative to heating setpoint
[±25.0] % f.s.

Proportional band for cooling or hysteresis for ON-OFF control
[0 ... 999.9] % f.s.

Integral time for cooling
[0.00 ... 99.99] min.

Derivative time for cooling
[0.00 ... 99.99] min.

Maximum power limit for cooling
[0.0 ... 100.0] %

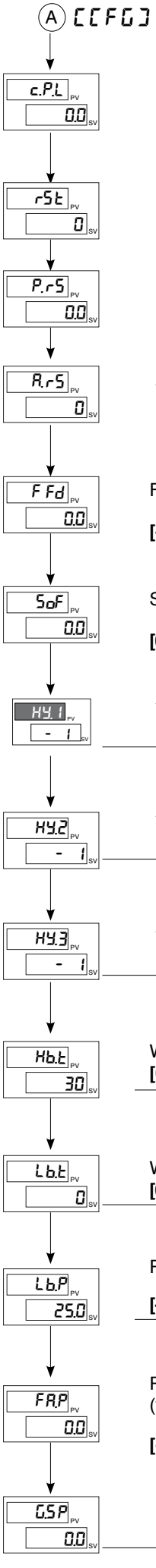
S.tun	Continuous autotunig	Selftuning	Softstart
0	NO	NO	NO
1	YES	NO	NO
2	NO	YES	NO
3	YES	YES	NO
4	NO	NO	YES
5	YES	NO	YES
6	-	-	-
7	-	-	-
S.tun	Single action Autotuning	Selftuning	Softstart
8*	WAIT	NO	NO
9	GO	NO	NO
10*	WAIT	YES	NO
11	GO	YES	NO
12*	WAIT	NO	YES
13	GO	NO	YES

*) By adding the following figures to the value indicated in the table it is possible to enable a series of supplementary functions:
+16 with automatic switch to GO if PV-SP > 0.5%
+32 with automatic switch to GO if PV-SP > 1%
+64 with automatic switch to GO if PV-SP > 2%
+128 with automatic switch to GO if PV-SP > 4%

**) For more information on the Self Tuning, Auto Tuning, Soft Start functions, refer to the Operational Notes paragraph.

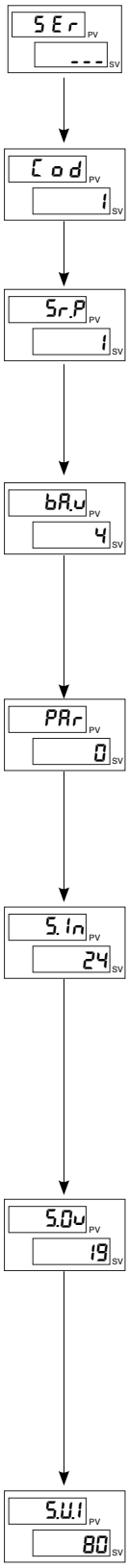
CnE	Type	Relative gain (rG) (see paragraph “Application Notes”)
0	AIR	1
1	OIL	0,8
2	WATER	0,4

Read only parameters if the Heat/Cool control typology is enabled
(parameter CTR = 14 in the HRD menu)


A CFG
c.PL
0.0
Minimum power limit for cooling (not available for heating/cooling double action
[0.0 ... 100.0] %
rSt
0
Manual Reset
[-999 ... +999] scale points
P.rS
0.0
Reset power
[-100.0 ... +100.0] %
A.rS
0
Antireset
[0 ... 9999] scale points
FFd
0.0
Feedforward
[-100.0 ... +100.0] %
SoF
0.0
Softstart time
[0.0 ... 500.0] min
HY.1
- 1
Alarm 1 hysteresis
[±999] scale points
By adding +32 to the value of parameter A1.T of menu 0VT, the set-up range is [0 … 999] sec.
By adding +64 to the value of parameter A1.T of menu 0VT, the set-up range is [0 … 999] min.
HY.2
- 1
Alarm 2 hysteresis
[±999] scale points
By adding +32 to the value of parameter A2.T of menu 0VT, the set-up range is [0 … 999] sec.
By adding +64 to the value of parameter A2.T of menu 0VT, the set-up range is [0 … 999] min.
HY.3
- 1
Alarm 3 hysteresis
[±999] scale points
By adding +32 to the value of parameter A3.T of menu 0VT, the set-up range is [0 … 999] sec.
By adding +64 to the value of parameter A2.T of menu 0VT, the set-up range is [0 … 999] min.
With the time scales 0-999sec/ 0-999min the decimal point has no meaning (for dP.S different from 0")
Hb.t
30
Waiting time for HB alarm intervention
[0 ... 999] sec.
The value must be greater than the cycle time of the output to which the HB alarm is associated
Lb.t
0
Waiting time for LBA alarm intervention
[0.0 ... 500.0] min.
If set on "0", the LBA alarm is disabled.
If the LBA alarm is active, it can be cancelled by pressing keys + when the display indicates the value of the control output (OutP) or by switching to Manual mode
Lb.P
25.0
Power limit for LBA alarm condition
[-100.0 ... +100.0] %.
If the LBA alarm is active, it can be cancelled by pressing keys + when the display indicates the value of the control output (OutP) or by switching to Manual mode.
FAP
0.0
Power output in fault condition
(when probe is faulty)
[-100.0 ... +100.0] % ON / OFF
G.SP
0.0
Set gradient (see "Application Notes" paragraph)
[0.0 ... 999.9] digits/min
Unit of measurement digit / sec : by adding + 2 to the value of the SP.R parameter in the INP menu

SEr Serial communication Fifth menu to set up

This menu makes it possible to configure the various parameters that control serial communication between the controller and the supervisor.



Instrument identification code

[0 ... 247]

Serial interface protocol

[0 ... 1]

Sr.P	**Serial protocol**
0	CENCAL Gefran
1	MODBUS RTU

Select Baudrate

[0 ... 4]

bAu	**Baudrate**
0	1200
1	2400
2	4800
3	9600
4	19200

Parity selection

[0 ... 2]

PAr	**Parity**
0	No parity
1	Odd
2	Even

Virtual instrument inputs

[0 ... 63]

Inputs	**IN2**	**IN1**	**PV**	**AL3**	**AL2**	**AL1**
Bit	5	4	3	2	1	0
Ex.	0	1	1	0	0	0

Set code 24 om S.in to manage PV and IN1 inputs via serial line

Virtual instrument outputs

[0 ... 31]

Outputs	**OUTW**	**OUT4**	**OUT3**	**OUT2**	**OUT1**
Bit	4	3	2	1	0
Ex.	1	0	0	1	1

Set code 19 in S.Ou to manage OUT1, 2 and W outputs via serial line

Virtual instrument user interface

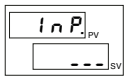
[0 ... 255]

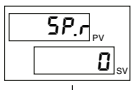
Interf	**LED 1/2/3**	**KEYB**	**DISL**	**DISH**	**LED OUT4**	**LED OUT3**	**LED OUT2**	**LED OUT1**
Bit	7	6	5	4	3	2	1	0
Ex	0	1	0	1	0	0	0	

0 Set code 80 in S.U.I to manage KEYB and DISH interface elements via serial line

InP Input settings third menu to set up

This menu makes it possible to configure the parameters for the Controller input signals.



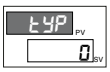


Def. remote setpoint

[0 ... 1]

SP.r	**Type of remote setpoint, Absolute / Relative**
0	Digital (from serial line) Absolute
1	Digital (from serial line) Relative to SP or SP1 or SP2 sets

By adding +2 to the value set out in the table, the Set Gradient (the G.SP parameter of the menu [FG]) is expressed in digit/sec.



Probe type, signal, enable custom linearization, and main input scale

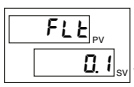
tYP	Probe type	Without dec. point	With dec. point
	Probe:	*TC*	
0	TC J °C	0/1000	0.0/999.9
1	TC J °F	32/1832	32.0/999.9
2	TC K °C	0/1300	0.0/999.9
3	TC K °F	32/2372	32.0/999.9
4	TC R °C	0/1750	0.0/999.9
5	TC R °F	32/3182	32.0/999.9
6	TC S °C	0/1750	0.0/999.9
7	TC S °F	32/3182	32.0/999.9
8	TC T °C	-200/400	-199.9/400.0
9	TC T °F	-328/752	-199.9/752.0
28	TC	CUSTOM	CUSTOM
29	TC	CUSTOM	CUSTOM
30	PT100 °C	-200/850	-199.9/850.0
31	PT100 °F	-328/1562	-199.9/999.9
32	JPT100 °C	-200/600	-199.9/600.0
33	JPT100 °F	-328/1112	-199.9/999.9
34	PTC °C	-55/120	-55.0/120.0
35	PTC °F	-67/248	-67.0/248.0
36	NTC °C	-10/70	-10.0/70.0
37	NTC °F	14/158	14.0/158.0
38	0...60 mV	-1999/9999	-199.9/999.9
39	0...60 mV	Linear custom	Linear custom
40	12...60 mV	-1999/9999	-199.9/999.9
41	12...60 mV	Linear custom	Linear custom

tYP	Probe type	Without dec. point	With dec. point
	Probe:	*TC*	
42	0...20 mA	-1999/9999	-199.9/999.9
43	0...20 mA	Linear custom	Linear custom
44	4...20 mA	-1999/9999	-199.9/999.9
45	4...20 mA	Linear custom	Linear custom
46	0...10 V	-1999/9999	-199.9/999.9
47	0...10 V	Linear custom	Linear custom
48	2...10 V	-1999/9999	-199.9/999.9
49	2...10 V	Linear custom	Linear custom
50	0...5 V	-1999/9999	-199.9/999.9
51	0...5 V	Linear custom	Linear custom
52	1...5 V	-1999/9999	-199.9/999.9
53	1...5 V	Linear custom	Linear custom
54	0...1 V	-1999/9999	-199.9/999.9
55	0...1 V	Linear custom	Linear custom
56	200 mV...1 V	-1999/9999	-199.9/999.9
57	200 mV...1 V	Linear custom	Linear custom
58	Pers.. 10V-20mA	-1999/9999	-199.9/999.9
59	Pers. 10V-20mA	Linear custom	Linear custom
60	Pers. 60 mV	-1999/9999	-199.9/999.9
61	Pers. 60 mV	Linear custom	Linear custom
62	PT100 – JPT	CUSTOM	CUSTOM
63	PTC	CUSTOM	CUSTOM
64	NTC	CUSTOM	CUSTOM

CUSTOM linearization: the L0 message occurs when the variable assumes values less than the LO.S parameter or the minimum calibration value. The KI message occurs when the variable assumes values greater than the K'.S parameter of the maximum calibration value

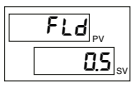
Maximum Non Linearity Error for Thermocouples (TC), Thermoresistances (Pt100) and Thermistors (PTC, NTC). The error is calculated as a departure from the theoretic value, referring in % terms to the of full scale value, expressed in degrees Celsius (°C)

Probe type	Probe	Error
Thermocouples	TC J, K type	< 0,2 % f.s.
	TC S, R type	with range 0..1750 °C: < 0,2 % f.s. (t > 300 °C); for other ranges: < 0,5 % f.s.
	TC T type	< 0,2 % f.s. (t > -150 °C)
	Using a Custom Linearization:	
	TC E, N, L type	< 0,2 % f.s.; E type range 100..750 °C; N type range 0..1300 °C; L type range 0..600 °C
	TC B type	with range 44..1800 °C: < 0,5 % f.s. (t > 300 °C)
	TC U type	with range -200..400 °C: < 0,2 % f.s. (t > -100 C°)
	TC G type	< 0,2 % f.s. (t > 300 °C)
	TC D type	< 0,2 % f.s. (t > 200 °C
	TC C type	with range 0..2300 °C: < 0,2 % f.s.
Thermistors	NTC	< 0,5 % f.s.
	JPT100 / PTC	< 0,2 % f.s.
Thermoresistances	Pt100	with range -200..850 °C: precision better than 0.2 % f.s.

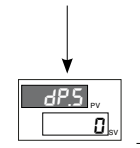


Digital filter on input
[0.0 ... 20.0] sec

If set to "0", the medium filter on the sample value is excluded



Digital filter on input display
[0 ... 9.9] scale points



Decimal point position for input scale

DP.S	Format
0	xxxx
1	xxx.x
2	xx.xx (*)
3	x.xxx (*)

(*) not available for TC, RTD, PTC, NTC probes



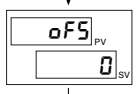
Minimum limit of main input scale

Min... Max value associated with the input selected with the TYP parameter



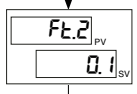
Maximum limit of main input scale

Min... Max value associated with the input selected with the TYP parameter



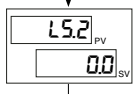
Offset correction of main input

[-999 ... +999] scale points



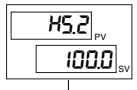
Digital filter on auxiliary input

[0.0 ... 20.0] sec.



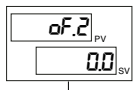
Minimum limit auxiliary input scale

[0.0 ... 999.9]



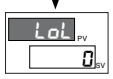
Maximum limit auxiliary input scale

[0.0 ... 999.9]



Offset correction of auxiliary input

[-99.9 ... +99.9] scale points



Lower limit for setting SP and absolute alarms

Lo.S ... Hi.S

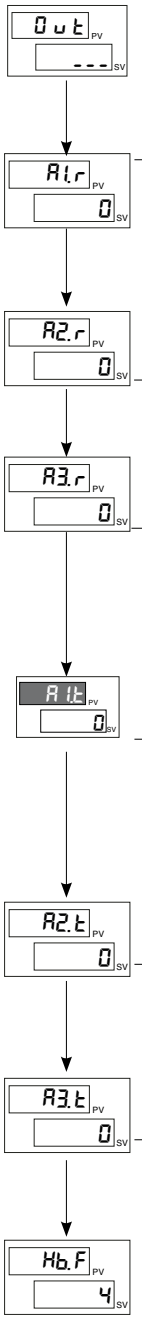


Upper limit for setting SP and absolute alarms

Lo.S ... Hi.S

Out Output settings Second menu to set up

This menu makes it possible to configure the parameters of the Controller outputs.



A1r A2r A3r	Variable to compare	Alarm setpoint
0	PV (process variable)	AL
1	SV (active setpoint)	AL only absolute
2	PV (process variable)	AL only realtive and referred to SP (with multiset function)

A1t A2t A3t	Direct (high limit) Inverse (low limit)	Absolute/Relative to active setpoint	Normal Symmetrical (window)
0	Direct	Absolute	Normal
1	Inverse	Absolute	Normal
2	Direct	Relative	Normal
3	Inverse	Relative	Normal
4	Direct	Absolute	Symmetrical
5	Inverse	Absolute	Symmetrical
6	Direct	Relative	Symmetrical
7	Inverse	Relative	Symmetrical

By adding the following figures to the value in the table it is possible to enable a series of supplementary functions:

+8: to disable on power up until first interception
+16: to latch alarm.
+32: HY.i (2 / 3) menu CFG = delay time for alarm trip [0..999] sec. (excluding symmetrical absolute)
+64: HY.i (2 / 3) menu CFG = delay time for alarm trip [0..999] min. (excluding symmetrical absolute)

Hb.F	Function description
0	Relay, logic output: alarm active on load current level lower than setpoint during the ON time of the control output.
1	Relay, logic output: alarm active on load current level higher than setpoint during the OFF time of the control output.
2	Alarm active if one of functions 0 and 1 is true (OR logic (*)
3	Continuous heat alarm (**)
7	Continuous cool alarm (**)

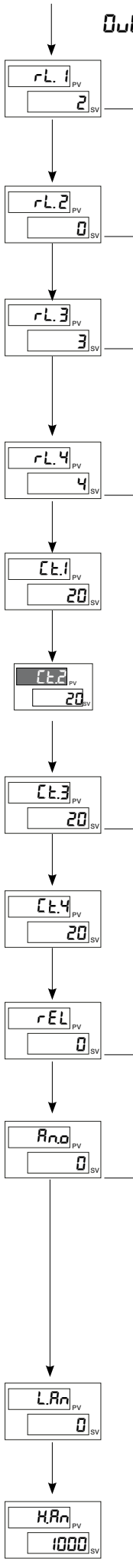
By adding the following figures to the value in the table it is possible to enable a series of supplementary functions:

+0: assigned to output OUT1 (only for Hb.F = 0,1,2).
+4: assigned to output OUT2 (only for Hb.F = 0,1,2).
+8: assigned to output OUT3 (only for Hb.F = 0,1,2).
+12: assigned to output OUT4 (only for Hb.F = 0,1,2).
+16: inverse HB alarm.

NOTE: The HB alarm is disabled if assigned to a rapid output (except codes 3 and 7)

*) minimum setting is fixed at 12% of amperometric full scale

**) cAs type 0 without reference to cycle time



rL.1; rL.2 rL.3; rL.4	**Function**
0	HEAT (control output for heating)
1	COOL (control output for cooling)
2	AL1 – alarm 1
3	AL2 – alarm 2
4	AL3 – alarm 3
5	AL. HB – HB alarm
6	LBA – LBA alarm
7	IN – repetition of logic input 1
8	Repeat but key (if but menu Hrd = 8)
9	AL1 or AL2
10	AL1 or AL2 or AL3
11	AL1 And AL2
12	AL1 and AL2 and AL3
13	AL1 or AL. HB
14	AL1 or AL2 or AL. HB
15	AL1 and AL. HB
16	AL1 and AL2 and AL. HB

Add +32 to the values indicated in the table to obtain the denied logic level in output, except for codes 0..1 with continuous output

64 * (0.1 ... 20.0 sec.)	rL.2 HEAT: heat control output with fast cycle time
	rL.3 HEAT: continuous output 2 – 10 V
65 *	rL.2 COOL: cool control output with fast cycle time (0.1 ... 20.0 sec.)
	rL.3 COOL: continuous output 2 – 10 V

*) only for rL.3 o rL.2 if continuous OUT3 is not present

0.1 sec. if OUT3 is a continuous type output, [T.3 does not appear in the configuration

rEL	Alarm 1	Alarm 2	Alarm 3
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

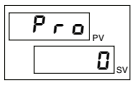
Ano	**Reference value**
0	PV – process variable
1	SSP – active setpoint
2	SP – local setpoint
3	–
4	Deviation (SSP – PV)
5	HEAT (*)
6	COOL (*)
7	AL1 (alarm point)
8	AL2 (alarm point)
9	AL3 (alarm point)
10	–
11	Value acquired from serial line (*)

By adding 16 to code 0, if the input is in an error condition Err - Sbr the output assumes the minimum trimming value

*) – Fixed scale limits
– Retransmission output not available with ON/OFF control action

Pro Protection code

This menu makes it possible to enable/disenable the display and/or modification of specific parameters and to access the Easy configuration.
(For the access to this menu please refer to the section “Navigation in the menus of the controller”)



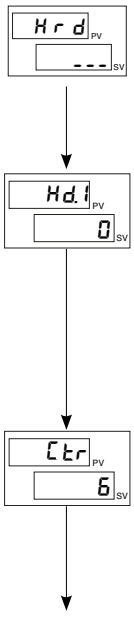
Pro	Display	Modification
0	SP, in2, alarms, OuP, inF	SP, alarms
1	SP, in2, alarms, OuP, inF	SP
2	SP, in2, OuP, inF	

By adding the following figures to the value in the table it is possible to enable a series of supplementary functions:
+4: to disable inP, Out
+8: to disable CFG, SEr
+16: to disable SW “power-up - power down”
+32: to disable manual power latching
+64: to disable manual power modification
+128: to enable display of all the parameters and menus.

NOTA: OuP and inF display only in extended configuration

Hrd Hardware configuration First menu to set up

This menu makes it possible to configure the Controller hardware parameters. (For the access to this menu please refer to the section “Navigation in the menus of the controller”)



Enabling of MultiSet, led and virtual instrument status

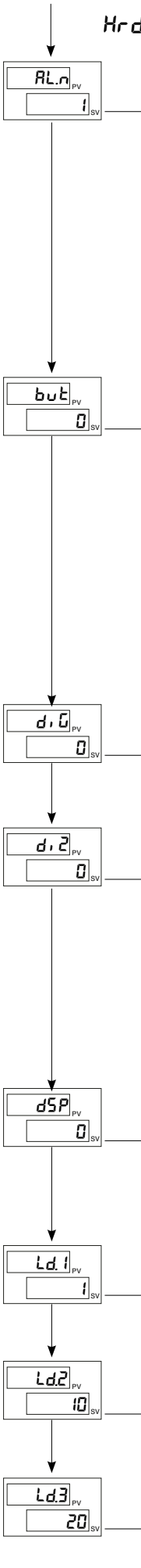
Hd. 1	MultiSet (2SP)	Reversed led status	Virtual instrument Management via Serial
0			
1	X		
2		X	
3	X	X	
4			X
5	X		X
6		X	X
7	X	X	X

Control type

Ctr	Control type
0	P heat
1	P cool
2	P heat / cool
3	PI heat
4	PI cool
5	PI heat / cool
6	PID heat
7	PID cool
8	PID heat / cool
9	ON – OFF heat
10	ON – OFF cool
11	ON – OFF heat / cool
12	PID heat + ON – OFF cool
13	ON – OFF heat + PID cool
14	PID heat + cool with relative gain (see “Application Notes”)

By adding the following figures to the value in the table it is possible to select the sample time of the derivative action:
+0: sample 1 sec.
+16: sample 4 sec.
+32: sample 8 sec.
+64: sample 240 msec.

NOTE: LBA alarm is not enabled with ON/OFF type control



Select number of enabled alarms

AL.n	Alarm 1	Alarm 2	Alarm 3
0	disabled	disabled	disabled
1	enabled	disabled	disabled
2	disabled	enabled	disabled
3	enabled	enabled	disabled
4	disabled	disabled	enabled
5	enabled	disabled	enabled
6	disabled	enabled	enabled
7	enabled	enabled	enabled

By adding the following figures to the value in the table it is possible to enable a series of supplementary functions:
+8: to enable HB alarm
+16: to enable LBA alarm

Function of M/A key

but	Function
0	Key disabled (no function)
1	MAN / AUTO controller
2	LOC / REM
3	HOLD
4	Alarms memory reset
5	Select SP1 / SP2
6	Start / Stop Self Tuning
7	Start / Stop Auto Tuning
8	Set / Reset outputs OUT 1 ... OUT 4

By adding +16 to the value in the table, the “back menu” function is disabled (keys combination - F)

Function of digital input 1 (0 ... 53)

Function of digital input 2 (0 ... 53)

d.I1; d.I2	Function
0	Key disabled (no function)
1	MAN / AUTO controller
2	LOC / REM
3	HOLD
4	Alarms memory reset
5	Select SP1 / SP2
6	Software on/off
7	F key block
8	Start / Stop Self Tuning
9	Start / Stop Auto Tuning

By adding the following figures to the value in the table it is possible to enable a series of supplementary functions:
+16: for inverse logic input (NPN)
+32: to force logic state 0 (OFF)
+48: to force logic state 1 (ON)

Defining SV display function

dSP	Function
0	SSP – setpoint enabled
1	InP.2 – auxiliary input
2	Control output value
3	Deviation (SSP – PV)

Function of led 1

Function of led 2

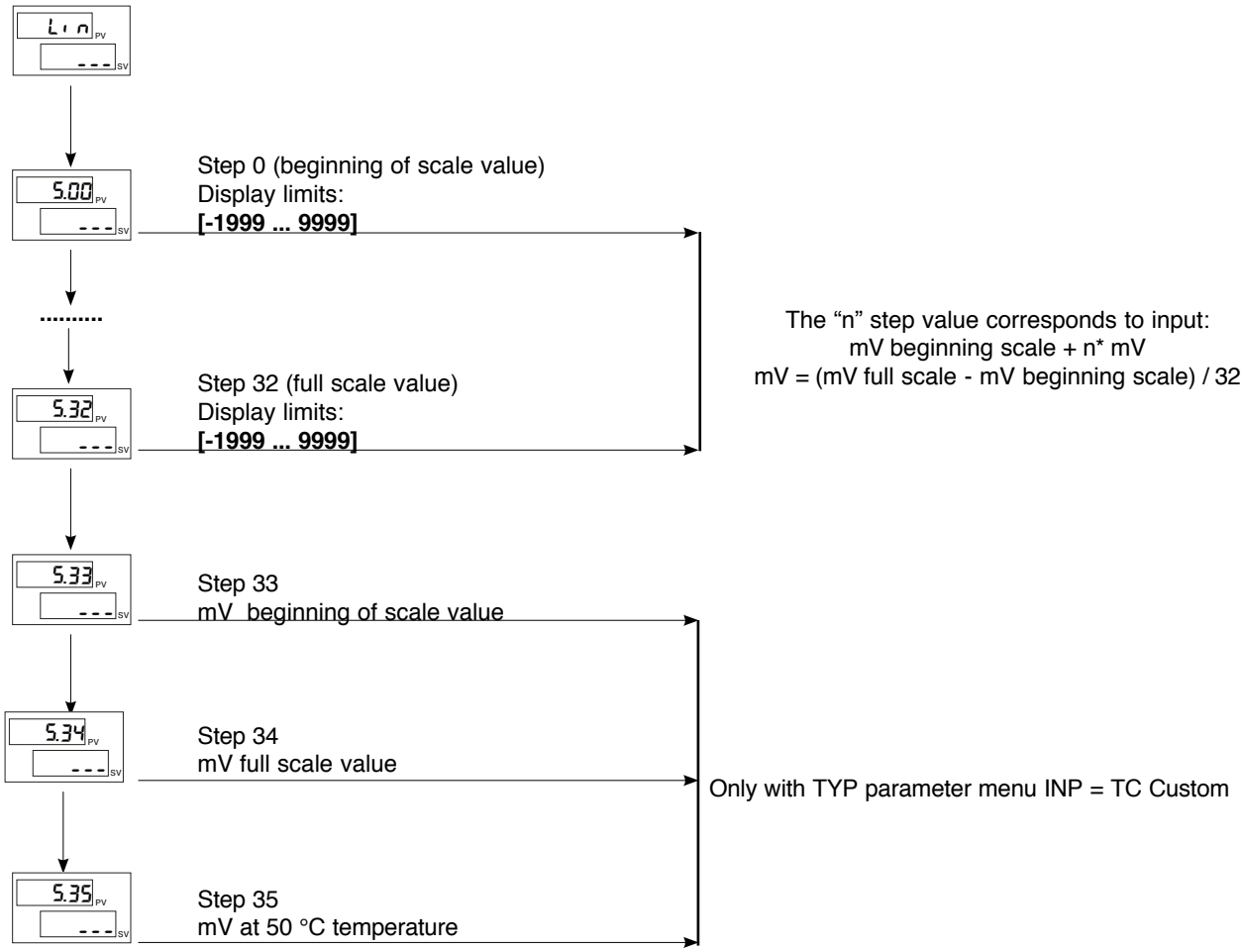
Function of led 3

Ld.1 Ld2 Ld3	Function
0	No function
1	MAN / AUTO controller
2	LOC / REM
3	HOLD
4	Self Tuning enabled
5	Auto Tuning enabled
6	IN 1 repetition
7	Enable serial communication
8	Error
9	Softstart running
10	SP1 ... SP2 indication
11	Set point gradient running

By adding +16 to the value in the table, the LED flashes if active

Lin Input linearization

This menu makes it possible to carry out custom linearization for the main input.



U.CA User calibration

This menu makes it possible to carry out user calibration.



U.CA	Function
1	Analog output (*)
2	Input 1 - custom 10 V / 20 mA
3	Input 1 - custom 60 mV
4	Custom Pt100 / J Pt100
5	Custom PTC
6	Custom NTC
7	Input 2 – custom TA (**)

*) The analog output in 20mA is calibrated with accuracy higher than 0.2 % f.s.
Calibrate when converting to 10V output.

**) In the absence of calibration, accuracy is higher than 1% f.s.
Calibrate only if higher accuracy is required

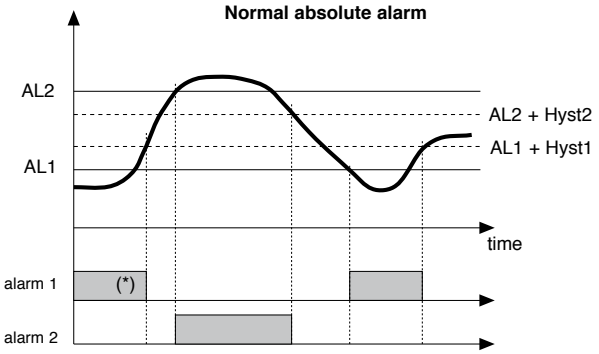
HB Alarm

This type of alarm depends on use of the current transformer (C.T.) input.
It can signal variations in load input by identifying the current value in ammeter input in the range (0 ... HS.2). It is enabled by means of configuration code (AL.n); in this case, the alarm trip value is expressed in HB scale points.
By means of code Hb.F ("Out" phase), select the type of functioning and the assigned control output.
The alarm limit setting is A.Hb.
The direct HB alarm trips when the ammeter input value is below the limit set for Hb.t seconds of the "ON" time for the selected output.
The HB alarm can be activated only with ON times greater than 0.4 seconds (excludes continuous output).
The HB alarm also checks load current during the OFF interval of the cycle time for the selected output. The HB alarm trips if the measured current exceeds approximately 12.5% of the full scale set for HB.t seconds of OFF status of the output (parameter HS.2 in InP).
The alarm is reset automatically if its cause is eliminated.
Setting limit A.Hb = 0 disables both types of HB alarms, with de-energizing of the assigned relay.
You can display the load current by selecting the item In.2. (level 1).
NOTE: ON/OFF times refer to the cycle time set for the selected output.
Continuous alarm Hb_F = 3 (7) is active for a load current value below the set limit. It is disabled if the heating (cooling) output value is below 3%.

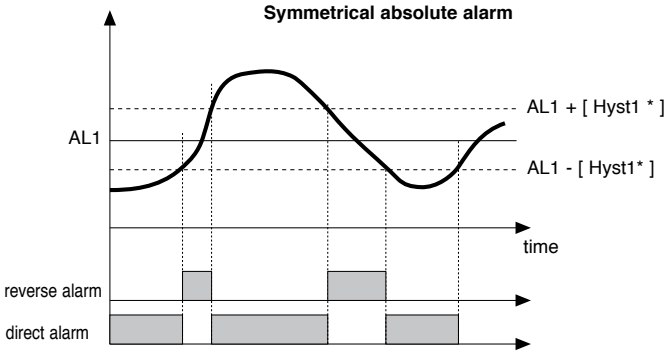
HOLD Function

The input value and alarms are frozen while the logic input is closed.
With logic input closed, a reset turns OFF both the relay outputs and the alarms latch.

Alarms

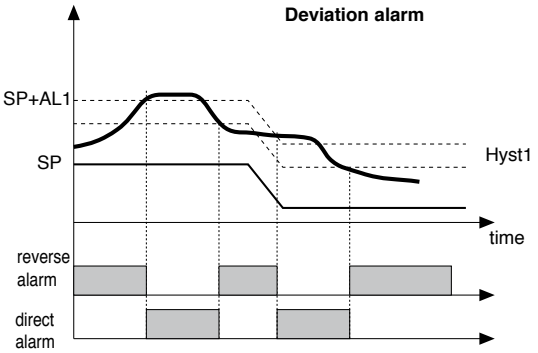


For AL1 = reverse absolute alarm (low) with positive Hyst1, AL1 t = 1
(*) = OFF if disabled on power-up
For AL2 = direct absolute alarm (high) with negative Hyst2, AL2 t = 0

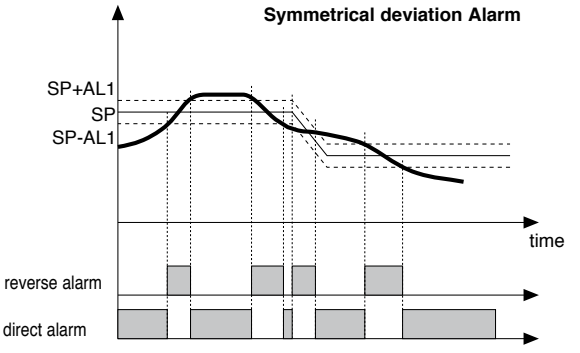


For AL1 = symmetrical Lo absolute alarm with Hyst1, AL1 t = 5
For AL1 = symmetrical Hi absolute alarm with Hyst1, AL1 t = 4

* Minimum hysteresis = 2 scale points



For AL1 = Lo deviation alarm with negative Hyst 1, AL1 t = 3
For AL1 = Hi deviation alarm with negative Hyst 1, AL1 t = 2



For AL1 = Symmetrical Lo deviation alarm with Hyst 1, AL1 t = 7
For AL1 = Symmetrical Hi deviation alarm with Hyst 1, AL1 t = 6

Control actions

Proportional Action:
action in which contribution to output is proportional to deviation at input (deviation = difference between controlled variable and setpoint).
Derivative Action:
action in which contribution to output is proportional to rate of variation input deviation.
Integral Action:
action in which contribution to output is proportional to integral of time of input deviation.

Influence of Proportional, Derivative and Integral actions on response of process under control

* An increase in P.B. reduces oscillations but increases deviation.
* A reduction in P.B. reduces the deviation but provokes oscillations of the controlled variable (the system tends to be unstable if P.B. value is too low).
* An increase in Derivative Action corresponds to an increase in Derivative Time, reduces deviation and prevents oscillation up to a critical value of Derivative Time, beyond which deviation increases and prolonged oscillations occur.
* An increase in Integral Action corresponds to a reduction in Integral Time, and tends to eliminate deviation between the controlled variable and the setpoint when the system is running at rated speed.

If the Integral Time value is too long (Weak integral action), deviation between the controlled variable and the set-point may persist.
Contact GEFRAN for more information on control actions.

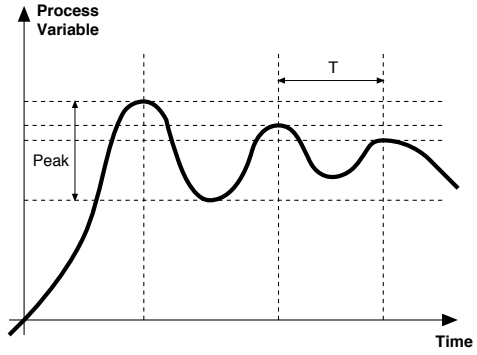
Manual Tuning

A) Enter the setpoint at its working value.

B) Set the proportional band at 0.1% (with on-off type setting).

C) Switch to automatic and observe the behavior of the variable. It will be similar to that in the figure:

D) The PID parameters are calculated s follows: Proportional band



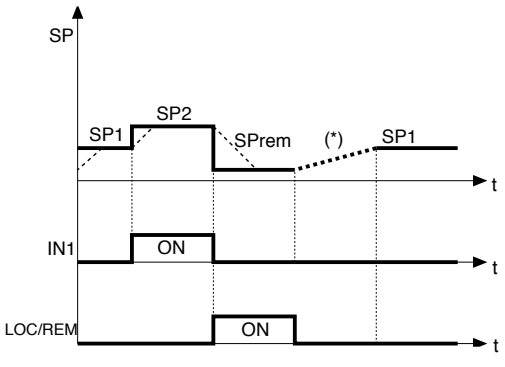
$$P.B.= \frac{\text{Peak}}{(V\,max - V\,min)} \times 100$$

(V max - V min) is the scale range.
Integral time: It = 1.5 x T
Derivative time: dt = It/4

E) Switch the unit to manual, set the calculated parameters. Return to PID action by setting the appropriate relay output cycle time, and switch back to Automatic.

F) If possible, to optimize parameters, change the setpoint and check temporary response. If an oscillation persists, increase the proportional band. If the response is too slow, reduce it.

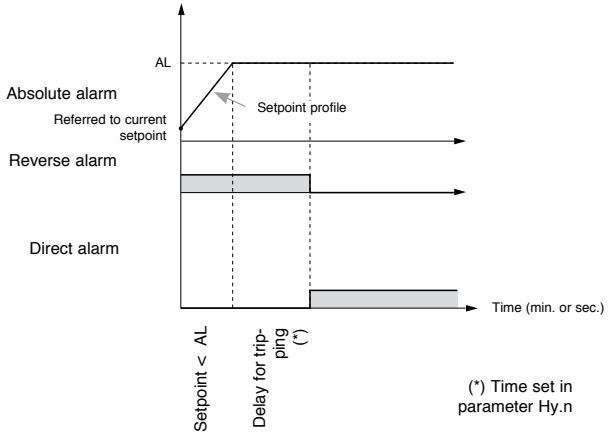
Multiset function, Set gradient



(*) if the set gradient is set

The multiset function is enabled in hd.1.
The gradient function is always enabled.
You can select between setpoint 1 and setpoint 2 with the faceplate key or with digital input.
You can display the setpoint 1-2 selection by means of LED.
SET GRADIENT: if set to ≠0, the setpoint is assumed equal to PV at power-on and auto/man switchover. With gradient set, it reaches the local setpoint or the one selected.
Every variation in setpoint is subject to a gradient.
The set gradient is inhibited at power-on when self-tuning is engaged.
If the set gradient is set to ≠0, it is active even with variations of the local setpoint, settable only on the relative SP menu.
The control setpoint reaches the set value at the speed defined by the gradient.

Twin setpoint application
(ramp + hold + time expiration alarm)



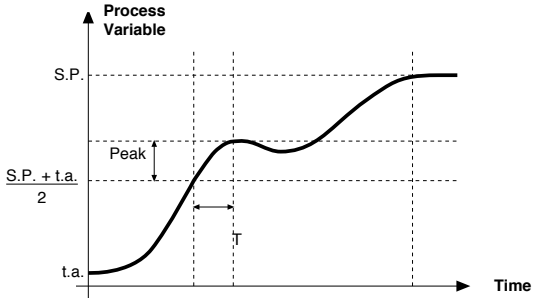
(*) Time set in parameter Hy.n

Software ON/OFF switching function

How to switch the unit OFF: hold down the “F” and “Raise” keys simultaneously for 5 seconds to deactivate the unit, which will go to the OFF state while keeping the line supply connected and keeping the process value displayed. The SV display is OFF.
All outputs (alarms and controls) are OFF (logic level 0, relays de-energized) and all unit functions are disabled except the switch-on function and digital communication.
How to switch the unit ON: hold down the “F” key for 5 seconds and the unit will switch OFF to ON. If there is a power failure during the OFF state, the unit will remain in OFF state at the next power-up (ON/OFF state is memorized).
The function is normally enabled, but can be disabled by setting the parameter Prot = Prot +16. This function can be assigned to a digital input (d.i.G), not é subject to the disabilitazione from parameter “Prot” and excludes deactivation from the keyboard.

Self-Tuning
The function works for single output systems (heating or cooling) and double action (heating/cooling).
The self-tuning action calculates optimum control parameter values during process startup.
The variable (for example, temperature) must be that assumed at zero power (room temperature).
The controller supplies maximum power until an intermediate value between starting value and setpoint is reached, after which it zeros power.
PID parameters are calculated by measuring overshoot and the time needed to reach peak. When calculations are finished, the system disables automatically and the control proceeds until the setpoint is reached.

How to activate self-tuning:
A. Activation at power-on
1. Set the setpoint to the required value
2. Enable selftuning by setting the **Stu** parameter to 2 (CFG menu)
3. Turn off the instrument
4. Make sure the temperature is near room temperature
5. Turn on the instrument again



B. Activation from keyboard
1. Make sure that key M/A is enabled for Start/Stop selftuning (code but = 6 Hrd menu)
2. Bring the temperature near room temperature
3. Set the setpoint to the required value
4. Press key M/A to activate selftuning (Attention: selftuning interrupts if the key is pressed again)

The procedure runs automatically until finished, when the new PID parameters are stored: proportional band, integral and derivative times calculated for the active action (heating or cooling). In case of double action (heating or cooling), parameters for the opposite action are calculated by maintaining the initial ratio between parameters (ex.: CPb = HPb * K; where K = CPb / HPb when self-tuning starts). When finished, the **Stu** code is automatically cancelled.

Notes:
-The procedure does not start if the temperature is higher than the setpoint (heating control mode) or if the temperature is lower than the setpoint (cooling control mode).
In this case , the Stu code is not cancelled.
-It is advisable to eneable one of the configurable LEDs to signal selftuning status.By setting one of parameters LED1, LED2, LED3=4 or 20 on the Hrd menu, the respective LED will be on or flashing when selftuning is active.

Notes.: Action not considered in the type of control ON/OFF

Auto-Tuning

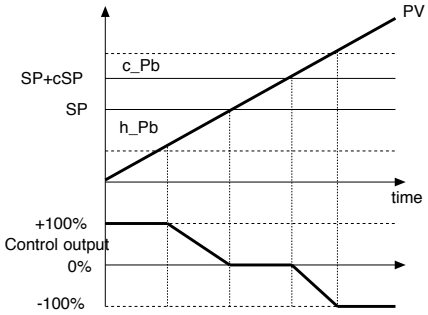
Enabling the auto-tuning function blocks the PID parameter settings.
It can be one of two types: permanent (continuous) or single-action (one-shot).

* Continuous auto-tuning is activated via the Stu parameter (values 1, 3, 5). It continuously reads system oscillations, immediately seeking the PID parameter values that reduce the current oscillation. It does not engage if the oscillations drop below 1.0% of the proportional band.
  It is interrupted if the set-point is changed, and automatically resumes with a constant set-point. The calculated parameters are not saved if the instrument is switched off, if the instrument is switched to manual, or if the configuration code is disabled. The controller resumes with the parameters programmed before auto-tuning was enabled.
  The calculated parameters are saved when the function is enabled from the digital input or from the A/M (start/stop) key if the procedure is interrupted.

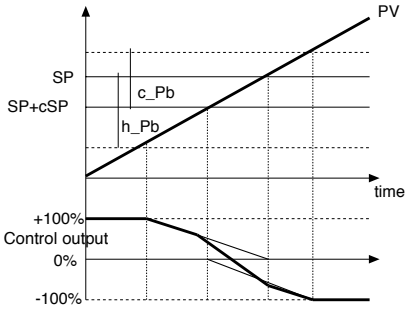
* One-shot auto-tuning can be enabled manually or automatically. It is activated via the Stu parameter (as can be seen on the table, the values to be set depend on whether Self-tuning or Soft-start is enabled.).
  It is useful for calculation of PID parameters when the system is around the set-point. It produces a variation on the control output at a maximum of ± 100% of the current control power limited by h.PH - h.PL (hot), c.PH - c.PL (cold), and assesses the effects in timed overshoot. The calculated parameters are saved.
  Manual activation (Stu code = 8, 10, 12) via direct setting of the parameter or via digital input or via key.
  Automatic activation (Stu code = 24, 26, 28 with error band of 0.5%) when the PV-SP error exceeds the preset band (programmable to 0.5%, 1%, 2%, 4% of full scale).

NB: at power-up, or after a change of set-point, automatic activation is inhibited for a time equal to five times the integral time, with a minimum of 5 minutes.
The same time has to run after one-shot.

Controls



Control output with proportional action only if proportional heating band overlaps proportional cooling band.



Control output with proportional action only if proportional heating band overlaps proportional cooling band.

PV = process value
SP = heating setpoint
SP+cSP = cooling setpoint

h_Pb = proportional heating band
c_Pb = proportional cooling band

Heating/Cooling control with relative gain

In this control mode (enabled with Ctr = 14 parameter) the type of cooling has to be specified.
Cooling PID parameters are therefore calculated based on heating parameters according to the specified ratio.
(for example: C.ME = 1 (oil), H_Pb = 10, H_dt = 1, H_It = 4 implies: C_Pb = 12,5, C_dt = 1, C_It = 4)
We advise you to apply the following values when setting output cycle times:
Air T Cool Cycle = 10 sec.
Oil T Cool Cycle = 4 sec.
Water T Cool Cycle = 2 sec.

NB.: Cooling parameters **cannot be modified** in this mode.

5 · TECHNICAL SPECIFICATIONS

This section contains a list of the Technical Specifications for the 1200/1300 Controller.

Display	2x4 digits, green, height 10 and 7mm
Keys	4 mechanical keys (Man/Auto, INC, DEC, F)
Accuracy	0.2% f.s. ±1 at 25°C room temperature
Thermal drift	0.005% f.s. / °C
Main input (configurable digital filter)	TC, RTD, PTC, NTC 60mV,1V Ri≥1MΩ; 5V,10V Ri≥10KΩ; 20mA Ri=50Ω Sampling time 120 msec.
Type TC (Thermocouples) (ITS90)	J, K, R, S, T (IEC 584-1, CEI EN 60584-1,60584-2) a custom linearization can be inserted
Cold junction error	0.1° / °C
RTD Type (temperature resistance) (ITS90)	Pt100 (DIN 43760), JPT100
Max. line resistance for RTD	20Ω
PTC Type / NTC Type	990Ω, 25°C / 1KΩ, 25°C
Safety	detection of short circuit or opening of probes, LBA alarm, HB alarm
°C / °F selection	configurable from faceplate
Linear scale ranges	-1999...9999, with configurable decimal point position
Controls	Pid, Autotune, on-off
pb - dt - it	0.0...999.9 % - 0.00...99.99 min - 0.00...99.99 min
Action	heat / cool
Control outputs	on / off, continuous
Max. power limit heat / cool	0.0...100.0 %
Cycle time	0...200 sec
Main output type	relay, logic, continuous (0...10V / 4...20mA)
Softstart	0.0...500.0 min
Fault power setting	-100.0...100.0 %
Automatic blanking	maintains PV value display, optional exclusion
Configurable alarms	up to 3 alarm functions assignable to an output and configurable of type: maximum, minimum, symmetrical, absolute/relative, LBA, HB
Alarm masking	exclusion during warm up, memory, reset from faceplate and/or con-
tact	
Type of relay contact	NO (NC), 5A, 250V/30Vdc cosφ=1
Logic output for static relays	24V ±10% (10V min at 20mA)
Triac output	20...240Vac ±10%, 1A max, inductive and resistive load I^2t = 128A
Transmitter power supply	24Vdc, max 30mA short-circuit protection
Analogue retransmission	10V/20mA Rload max 500Ω 12 bit resolution
Digital inputs	Ri = 4,7KΩ (24V, 5mA) or from terminal not supplied with power
Serial interface (optional)	RS485, isolated
Baudrate	1200, 2400, 4800, 9600, 19200
Protocol	Gefran CENCAL / MODBUS
Amperometric input option	C.T. 50mAac, 50/60Hz, Ri = 10Ω
Power supply (switching type)	(standard) 100...240Vac/dc ±10% max 18VA (optional) 11...27Vac/dc ±10% max 11VA 50/60Hz
Faceplate protection	IP65
Working / Storage temperature range	0...50°C / -20...70°C
Relative humidity	20...85% Ur non-condensing
Environmental working conditions	for indoor use, altitudes up to 2000m
Installation	panel, removable faceplate
Installation specifications	installation category II, pollution level 2, double isolation
Weight	160 g (complete version)

6 • MAINTENANCE

This section gives the information and the necessary warnings for routine maintenance of the 1200/1300 controllers and contains a Troubleshooting Guide which should be read before seeking help from the Gefran Customer Service Assistance, in the event of instrument malfunction.

If installed and configured correctly according to the instructions and the recommendations provided in Sections 2 and 4 of these Instructions for use, the 1200/1300 Controller will work normally without any need for maintenance, apart from the usual operations of cleaning the faceplate, and if necessary the internal parts of the instrument.

To gain access to the inside of the instrument (for example for cleaning or to check the jumpers) just undo the screw at the bottom of the faceplate and take out the instrument without having to disconnect the cables.
Make sure that the power is turned off upstream of the instrument however.
Remember that the 1200/1300 Controller is not equipped with an ON/OFF switch.

Cleaning the Controller

To clean the faceplate and the case use only a cloth dampened in water or ethyl alcohol.
Do not use hydrocarbon-based solvents (trichiorethylene, petrol, etc.).
Do not use compressed air to remove dust from the electronic circuit boards, if necessary use a clean brush with soft bristles.

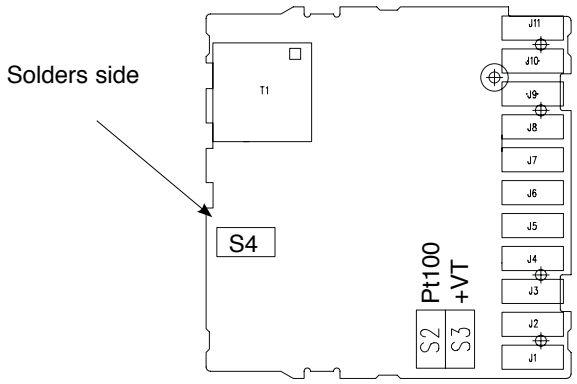
Troubleshooting Guide

Repairs

Repairs to the Controller must only be carried out by qualified technicians, properly trained and authorized by Gefran. Any attempts at repair or modification of the Controller hardware characteristics by unauthorized personnel will invalidate the warrantya.

Checking the jumpers

On the component side of the CPU there are two jumpers: S2 (PT100), S3 (+VT).
Use of these jumpers is reserved Gefran Service Technicians.
The solders side of the CPU board instead contains the jumper S4 which enables (if on) access to the controller menus.



The controller contains components which are sensitive to electrostatic discharge, so the relevant precautions must be taken when handling the electronic circuit boards contained in it, in order to avoid permanent damage to components themselves.

Symptom	Cause and Recommended remedy
The Controller display and Led do not come on	Controller power supply problem. Check that power is being supplied to terminals 10-11. make sure the power supply corresponds with the one stated in the order code: 1200/1300 – xx – xx – xx – x – 1 = 100..240Vac/dc 1200/1300 – xx – xx – xx – x – 0 = 11..27Vac/dc
The characters shown on the display are incomplete or illegible	Possible fault with one of the display segments. Check that all the segments are working properly by switching the controller off and then on again. When it is switched on again a self-diagnostic test is performed that checks intermittent start up of all the segments (displays the value 8888). If one or more segments do not light up contact your Gefran dealer.
When pressing down F none of the configuration menus can be accessed	If the problem occurs in the initial installation phase, it probably means that the Controller hardware configuration does not give the option of editing the preset parameters, apart from the setpoint value and the AL1 alarm point. (Parameter editing is enabled by the jumper S4 on the CPU board. If on the other hand the problem occurs on a Controller that previously gave access to the configuration parameters, this probably means that there is a false contact on the jumper S4. In this case check the continuity of the jumper referring to the previous paragraph.
When pressing down F not all of the parameters and/or configuration menus can be accessed	Access to some menus and/or parameters is controlled by a password (PAS) and by a protection code (Pro) which disables the extended configuration mode, allowing configuration only in the “Easy” (Limited) mode. To set the password and the protection code correctly refer to Section 4 “Configuration/ Programming”.
Instead of the process variable the PV display shows one of the following: Lo - Hi - Sbr - Er Low numerical value (e.g. 22)	In the first four cases it means that an input error has been found (for details refer to Section 3 - Functions) In the last case, it means that the input probe has short-circuited. In this condition the PV display PV shows the room temperature instead of the process variable.

7 • TECHNICAL/COMMERCIAL INFORMATION

This section contains information regarding the Controller order codes and the main accessories available.

As stated in the Preliminary Warnings of these Instructions for Use, correct interpretation of the Controller order code allows the hardware configuration for the controller to be identified immediately and so it is essential to quote the order code each time the Gefran Customer Care Service is contacted for assistance with any problems.

Order code - Temperature Controller 1200/1300

	R						

MODEL	
	1200
	1300

OUTPUT 1	
Relay	R

OUTPUT 2	
Relay	R
Logic	D
Triac (1A)	T

OUTPUT 3	
None	0
Relay	R
Logic	D
Continuous 0...10V (0/4...20mA)	C
Analogue 0/4...20mA (0...10V)	W

OUTPUT 4	
None	0
Relay	R
Logic	D

POWER SUPPLY	
0	11...27Vac/dc
1	100...240Vac/dc

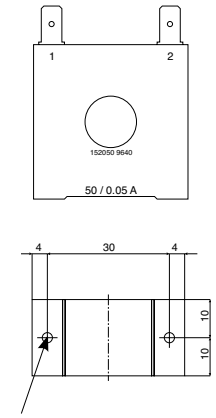
DIGITAL COMMUNICATION	
0	None
2	RS485

DIGITAL INPUTS IN1, IN2 / AUX TA	
00	None
01	IN1 + IN2 PNP (NPN)
02	IN1 PNP (NPN) + IN TA (50mAac)

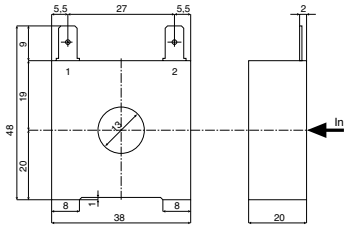
For information on the availability of codes please contact your Gefran dealer.

ACCESSORIES

• Current transformer



Hole for 2.9 x 9
self-threading screws



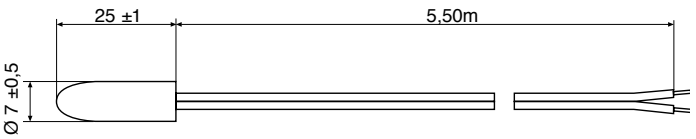
These transformers are used to measure currents of 50 ÷ 60Hz from 25A to 600A (nominal primary current). The peculiar characteristic of these transformers is the high number of secondary turns. This provides a very low secondary current, suitable for an electronic measurement circuit. The secondary current may be detected as voltage on a resistor.

CODE	Ip / Is	Ø Secondary Wire	n	OUTPUTS	Ru	Vu	ACCURACY
TA/152 025	25 / 0.05A	0.16 mm	$n_{1\text{-}2}$ = 500	1 - 2	40 Ω	2 Vac	2.0 %
TA/152 050	50 / 0.05A	0.18 mm	$n_{1\text{-}2}$ = 1000	1 - 2	80 Ω	4 Vac	1.0 %

• ORDER CODE

COD. 330200	IN = 25Aac OUT = 50mAac
COD. 330201	IN = 50Aac OUT = 50mAac

• PTC



• ORDER CODE

PTC 7 x 25 5m

TECHNICAL DATA

Mod. probe:	Ambient probe
Cap material:	Plastic (Ø 7 x 25mm)
Temperature range:	-20...80°C
PTC:	R 25°C = 1KΩ ±1% (KTY 81-110)
Response time:	20sec (in still air)
Isolation:	100MΩ, 500Vd.c. between cap and terminals
Wire material:	Unipolar in PVC (12/0,18)
Wire length:	5,50m

• Interface for GEFRAN instrument configuration

KIT PC USB / RS485 o TTL

GF_eXpress

Kit for PC via the USB port (Windows environment) for GEFRAN instruments configuration:
Lets you read or write all of the parameters
• A single software for all models
• Easy and rapid configuration
• Saving and management of parameter recipes
• On-line trend and saving of historical data
Component Kit:
- Connection cable PC USB ... port TTL
- Connection cable PC USB ... RS485 port
- Serial line converter
- CD SW GF Express installation

• ORDERING CODE

GF_eXK-2-0-0	cod F049095



Side insertion cable

APPENDIX

The appendix contains the list of all the abbreviations of parameters which appear in the various configuration/programming menus with the respective default values and meanings.
The CONF column can be used to indicate the user's modified values with respect to the default configuration, on the basis of application requirements.

Display	Default	CONF	Acronym	Description
Livello 1				
-SP	400		Local Set Point	Local Setpoint setting
SP.1	100		Set Point 1	Setpoint 1 setting
SP.2	200		Set Point 2	Setpoint 2 setting
In.2	0.0		Input 2	Amperometer input value (TA input)
AL.1	500		ALarm 1	Alarm point 1 setting (Scale Points)
AL.2	600		ALarm 2	Alarm point 2 setting (Scale Points)
AL.3	700		ALarm 3	Alarm point 3 setting (Scale Points)
AHb	10.0		Alarm HB	HB Alarm point setting (Amp. Input
OuP	100.0		OutPut	Control outputs value (+HEAT/-COOL)
Menu InF				
UPd	2.01		UPdate	Software version identification
Cod	1		Code	Instrument code identification
Err	0		Error	Error code detected by self diagnostic
C.Hd	1100		Conf Hardware 1	Hardware outputs configuration
C.H2	0		Conf Hardware 2	Hardware inputs configuration
Menu CFG				
St.u	0		Self Tuning	Selftuning, Autotuning, Softstart enablement
hPb	1.0		Heating Proportional band	Hysteresis or heating proportional band
h.It	4.00		Heating. Integral time	Integral time for heating
h.dt	1.00		Heating derivative time	Derivative time for heating
hP.H	100.0		Heating Power High	Maximum power limit for heating
hP.L	0.0		Heating Power Low	Minimum power limit for heating
c.ME	0		Cooling MEdium	Cooling fluid type
c.SP	0.0		Cooling SetPoint	Cooling Setpoint
cPb	1.0		Cooling Proportional band	Cooling proportional band
c.It	4.00		Cooling Integral time	Integral time for cooling
c.dt	1.00		Cooling derivative time	Derivative time for cooling
cP.H	100.0		Cooling Power High	Maximum power limit for cooling
cP.L	0.0		Cooling Power Low	Minimum power limit for cooling
rSt.	0		ReSet	Manual reset
P.rS	0.0		Power reSet	Reset power
A.rS	0		Anti - reSet	Anti - reset
FFd	0.0		Feed Forward	Feed Forward Value
SoF	0.0		SoFt start	Softstart time
HY.1	-1		HYsteresis 1	Hysteresis for alarm 1
HY.2	-1		HYsteresis 2	Hysteresis for alarm 2
HY.3	-1		HYsteresis 3	Hysteresis for alarm 3
Hb.t	30		Hb time	Waiting time for HB alarm intervention
Lb.t	0.0		Lba time	Waiting time for LBA alarm intervention
Lb.P	25.0		Lba Power	Power limit for LBA alarm condition
FA.P	0.0		Fault Action Power	Power output in fault condition
G.SP	0.0		Gradient SetPoint	Set Gradient

Display	Default	CONF	Acronym	Description
Menu SEr				
Cod	1		Instrument Code	Instrument identification code
Sr.P	1		Serial Protocol	Serial interface protocol
bAu	4		bAudrate	Baudrate selection
PAr	0		PArity	Parity selection
S. In	0		S. Input	Virtual instrument inputs
S.Ou	0		S. Output	Virtual instrument outputs
S.U I	0		S. User Interface	Virtual instrument user interface
Menu InP				
SPr	0		SetPoint remote	Remote Setpoint
tYP	0		type of Probe	Type of probe, signal, Linearization enabling etc.
FLt	0.1		FiLter	Digital filter on input
FLd	0.5		FiLter display	Digital filter on display
dP.S	0		dot Position Scale	Decimal point position for input scale
Lo.S	0		Low Scale	Minimum limit main input scale
H I.S	1000		High Scale	Maximum limit main input scale
oFS	0		oFfSet	Offset correction of main input
Ft.2	0.1		Filter 2	Auxiliary input digital filter
L S.2	0.0		Limit Scale 2	Minimum limit auxiliary input scale
HS.2	100.0		High Scale 2	Maximum limit auxiliary input scale
OF.2	0.0		OFfset 2	Offset correction of auxiliary input
Lo.L	0		Low Limit	Lower limit for setting SP and absolute alarms
H IL	1000		High Limit	Upper limit for setting SP and absolute alarms
Menu Out				
A Ir	0		Alarm 1 reference	Select reference value for alarm 1
A2r	0		Alarm 2 reference	Select reference value for alarm 2
A3r	0		Alarm 3 reference	Select reference value for alarm 3
A It	0		Alarm 1 type	Alarm 1 type
A2t	0		Alarm 2 type	Alarm 2 type
A3t	0		Alarm 3 type	Alarm 3 type
HbF	4		Hb Function	HB alarm functions
rL. I	2		reference Line 1	OUT 1 Reference signal allocation
rL.2	0		reference Line 2	OUT 2 Reference signal allocation
rL.3	3		reference Line 3	OUT 3 Reference signal allocation
rL.4	4		reference Line 4	OUT 4 Reference signal allocation
Ct. I	20		Cycle time 1	OUT 1 cycle time (+HEAT/-COOL)
Ct.2	20		Cycle time 2	OUT 2 cycle time (+HEAT/-COOL)
Ct.3	20		Cycle time 3	OUT 3 cycle time (+HEAT/-COOL)
Ct.4	20		Cycle time 4	OUT 4 cycle time (+HEAT/-COOL)
rEL	0		alarm fault action	Alarms status in case of broken probe
An.o	0		Analogue output	OUT W Signal or reference value allocation
LAn	0		Low Analogue	MIN scale for analog repetition output scale
HAn	1000		High Analogue	MAX scale for analog repetition output scale
Menu Pro				
Pro	0		Protection	Parameters access protection code
Menu Hrd				
Hd. I	0		Hardware 1	Virtual instrument, led status and Multiset enabling
Ctr	6		Control	Control type
AL.n	1		Alarm number	Enabled alarms number selection
but	0		button	M/A key function
d IG	0		DiGital	Digital input 2 function 1 (0 ... 53)
d I2	0		digital 2	Digital input 2 function 2 (0 ... 53)
dSP	0		diSPlay	SV Display function
Ld. I	1		Led 1	LED 1 function
Ld.2	10		Led 2	LED 2 function
Ld.3	20		Led 3	LED 3 function

Menu - S00 – S35 Inputs linearization

N°	Default	CONF	N°	Default	CONF	N°	Default	CONF	N°	Default	CONF	N°	Default	CONF
S.00	0		S.08	250		S.16	500		S.24	750		S.32	1000	
S.01	31		S.09	281		S.17	531		S.25	781		S33	0.00	
S.02	62		S.10	312		S.18	562		S.26	812		S.34	0.00	
S.03	94		S.11	344		S.19	594		S.27	844		S.35	0.000	
S.04	125		S.12	375		S.20	625		S.28	875				
S.05	156		S.13	406		S.21	656		S.29	906				
S.06	187		S.14	437		S.22	687		S.30	937				
S.07	219		S.15	469		S.23	719		S.31	969				