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Controllers, Drives & Automation

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Dichiarazione di Conformità CE CE Declaration of Conformity

PRODUTTORE:
PRODUCT MANUFACTURER: CD Automation S.R.L.

INDIRIZZO:
ADDRESS: Via Pablo Picasso 34//36
20025 Legnano (Mi)
Italia

**Dichiara che il prodotto:
Declare that the product:**

Revo TC

SODDISFA I REQUISITI DELLA NORMA :

Specifica di sicurezza EN60947-1 :2008
EN60947-4-3:2001
Specifica sulle emissioni EN60947-4-3:2000
Specifica sulle Immunità EN60947-4-3:2000

FULFILLS THE REQUIREMENTS OF THE STANDARD:

Electrical safety Standard EN60947-1 :2008
EN60947-4-3:2001
Generic Emission standard EN60947-4-3:2000
Generic Immunity standard EN60947-4-3:2000

CDAutomation dichiara che I prodotti sopra menzionati sono conformi alla direttiva
CDAutomation declares that The products above mentioned they am conforming to the directive

EMC 2004/108/CEE e alla direttiva Bassa Tensione (low Voltage) **2006/95/CEE**

DESCIZIONE DEL PRODOTTO: Unità di controllo potenza elettrica
PRODUCT DESCRIPTION: Electric power controll

UTILIZZO: Controllo processi termici
SCOPE OF APPLICATION: Thermal controll process

Data di emissione: 20/04/2010
Issued on: 20/04/2010

Amministratore Unico e
Legale Rappresentante
Claudio Brizzi

A handwritten signature in black ink, appearing to read 'C. Brizzi'.

1 Important warnings for safety

This chapter contains important information for the safety. The not observance of these instructions may result in serious personal injury or death and can cause serious damages to the Thyristor unit and to the components system included.

The installation should be performed by qualified persons.



The Thyristor unit are integral part of industrial equipments. When it is supply, the Thyristor unit is subject to dangerous tensions.

- Don't remove the protection Cover.
- Don't use these unit in aerospace applications and/ or nuclear.



The nominal current corresponds to use at temperature not superior to 45°C.

- The Thyristor unit must be mounted in vertical position and without obstruction above and below to allow a good flow ventilation.
- The hot air of one thyristor unit must not invest the unit positioned above.
- For side by side placed leave a space of 15mm between the unit.



A suitable device must ensure that the unit can be electrically isolated from the supply, this allows the qualified people to work in safety.



Protection (Protection, Protezione)

The unit have IP20 protection rating as defined by the specific international. Is necessary consider the place of installation.



Earth (Terre, Messa a terra)

For safety, the Thyristor unit with isolated heat-sink must be connected to earth. Earth impedance should be correspondent to local earth regulation. Periodically the earth efficiency should be inspected.



Electronic supply (Alimentation électronique, Alimentazione elettronica)

The electronic circuit of the Thyristor unit must be supplied by dedicated voltage for all electronic circuits and not in parallel with coil contactors, solenoids and other. It's recommended to use a shielded transformer.



Electric Shock Hazard (Risque de choque électrique, Rischi di scosse elettriche)

When the Thyristor unit is energized, after the power supply is shut off, wait least a minute for allow the discharge of the internal capacitors where there is a dangerous tension. Before working, make sure that:

- Only authorized personnel must perform maintenance, inspection, and replacement operations.
- The authorized personnel must read this manual before to have access to the unit.
- Unqualified People don't perform jobs on the same unit or in the immediate vicinities.



Important warnings (Attention, Avvertenze importanti)

During the operations with units under tension, local regulations regarding electrical installation should be rigidly observed:

- Respect the internal safety rules.
- Don't bend components to maintain insulation distances.
- Protect the units from high temperature humidity and vibrations.
- Don't touch components to prevent electrostatic discharges on them.
- Verify that the size is in line with real needs.
- To measure voltage current etc. on unit, remove rings and other jewels from fingers and hands.
- Authorized personnel that work on thyristor unit under power supply voltage must be on insulated board

This listing does not represent a complete enumeration of all necessary safety cautions.



Electromagnetic compatibility

(Compatibilità elettromagnétique, Compatibilità elettromagnetica)

Our thyristor units have an excellent immunity to electromagnetic interferences if all suggestions contained in this manual are respected. In respect to a good Engineering practice, all inductive loads like solenoids contactor coils should have a filter in parallel.



Emissions (Emission, Emissioni)

All solid-state power controllers emit a certain amount of radio-frequency energy because of the fast switching of the power devices.

The CD Automation's Thyristor unit are in accord with the EMC norms, CE mark.

In most installations, near by electronic systems will experience no difficulty with interference. If very sensitive electronic measuring equipment or low-frequency radio receivers are to be used near the unit, some special precautions may be required. These may include the installation of a line supply filter and the use of screened (shielded) output cable to the load.

2 Note



Warning: This icon is present in all the operational procedures where the Improper operation may result in serious personal injury or death



Caution: This icon is present in all the operational procedures where the Improper operation can cause damage for the unit.

CD Automation reserves the right to modify the own products and this manual without any advise.



3 Identification and Order Code

3.1 Identification of the unit



Attenzione: Prima dell'installazione, assicurarsi che l'unità a thyristor non abbia subito danni durante il trasporto. In caso di danneggiamento, notificarlo immediatamente al corriere..

The identification's label give all the information regarding the factory settings of the Thyristor unit, this label is on the unit, like represented in figure. Verify that the product is the same thing as ordered.



3.2 Order Code

1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
R		T																													
REVO TC																															
3		Phase Controlled		Description code		Numeric code																									
		1 PHASE UNIT 1PH				1																									
		2 PHASE UNIT 2PH				2																									
		3 PHASE UNIT 3PH				3																									
4,5,6		Phase Current 1PH/2PH/3PH		Description code		Numeric code																									
		30A				0 3 0																									
		35A				0 3 5																									
		40A				0 4 0																									
		60A				0 6 0																									
		90A				0 9 0																									
		120A				1 2 0																									
		150A				1 5 0																									
		180A				1 8 0																									
		210A				2 1 0																									
7		Max Voltage		Description code		Numeric code																									
		480V				4																									
		600V				6																									
8		Aux. Voltage supply		Description code		Numeric code																									
		12:24V ac dc				4																									
9		Input		Description code		Numeric code																									
		Thermocouple				T																									
		Pt 100				N																									
		0:10V dc				V																									
		4:20mA				A																									
10		Output 2		Description code		Numeric code																									
		Relay Output 2				R																									
		Heating Only				0																									
11		Output 3		Description code		Numeric code																									
		1 off D/I 24v d.c.				1																									
		1 off D/O Relay contact				2																									
12		Fuse & Option		Description code		Numeric code																									
		For All Units =<40A				F																									
		Fuse + Fuseholder				Y																									
		Fuse + Fuseholder +TA				H																									
		Fuse + Fuseholder +TA +HB with screw terminal				X																									
		Fuse + Fuseholder +TA +HB with Flat Cable				F																									
		For All Units > 40 A				Y																									
		Fixed Fuse Standard				H																									
		Fixed Fuse + TA																													
		Fixed Fuse + TA + HB																													
13		110 Fan Option		Description code		Numeric code																									
		Without fan unit ≤ 90A				0																									
		With Fan at 110V				1																									
		Unit> 90A				2																									
		With 220V Fan																													
		Unit> 90A																													
14		Approvals		Description code		Numeric code																									
		CE EMC For European Market				0																									
		cUL For American Market up to 210A				L																									
15		Manual		Description code		Numeric code																									
		None				0																									
		Italian Manual				1																									
		English Manual				2																									
		German Manual				3																									
		French Manual				4																									
16		Version		Description code		Numeric code																									
		Standard unit with a single fuse				1																									
		Unit with 2 Fuses + Fuse Holder .=<40A				2																									
		(Just on single phase units)																													
		Units with 2 Fuse + Fuses + Fuse Holder .=<40A				3																									
		(Available with single-phase units)																													

LEGEND
CT = Current Transformer
HB = Heater Break Alarm

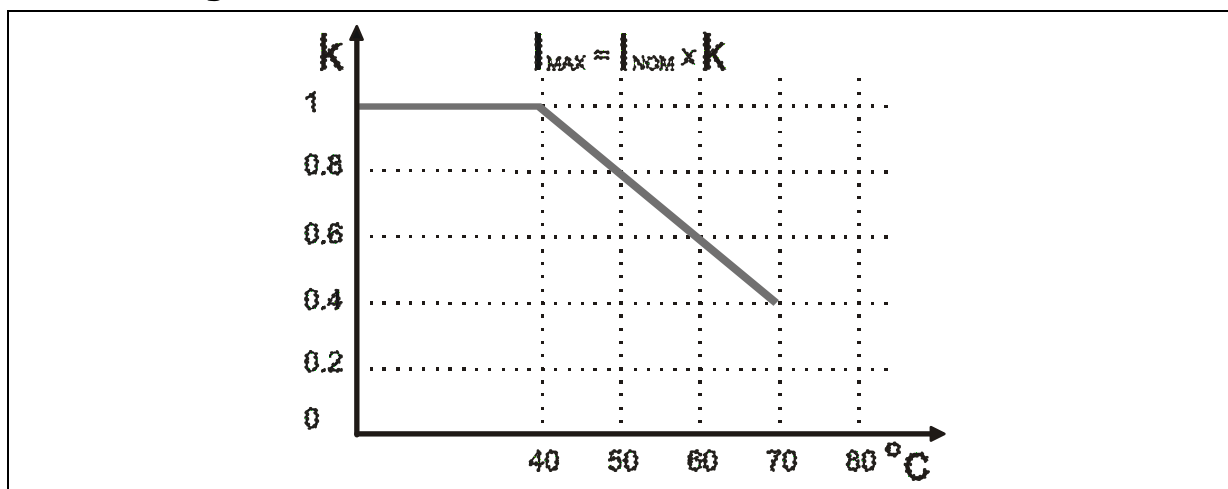
Note (1): Fixed fuses over 40A

4 Technical Specifications

4.1 Environmental installation conditions

Ambient temperature	0-40°C at nominal current. Over 40°C use the derating curve.
Storage temperature	-25°C a 70°C
Installation place	Don't install at direct sun light, where there are conductive dust, corrosive gas, vibration or water and also in salty environmental.
Altitude	Up to 1000 meter over sea level. For higher altitude reduce the nominal current of 2% for each 100m over 1000m
Humidity	From 5 to 95% without condense and ice
Pollution Level	Up to 2nd Level ref. IEC 60947-1 6.1.3.2

4.2 Derating Curve



5 Installation

Before to install, make sure that the Thyristor unit have not damages.

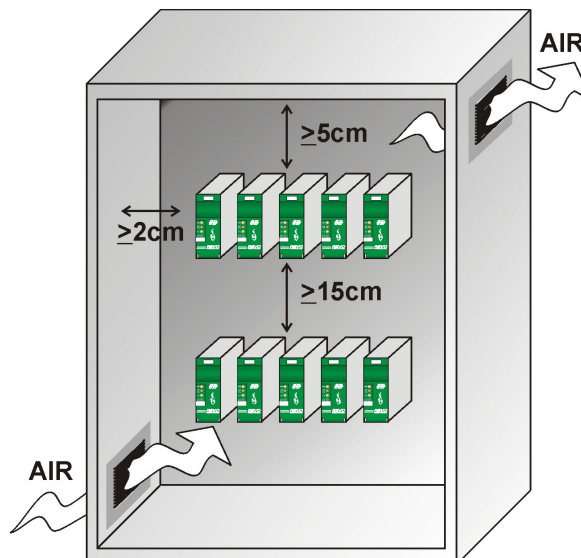
If the product has a fault, please contact the dealer from which you purchased the product. Verify that the product is the same thing as ordered.

The Thyristor unit must be always mounted in vertical position to improve air cooling on heat-sink.

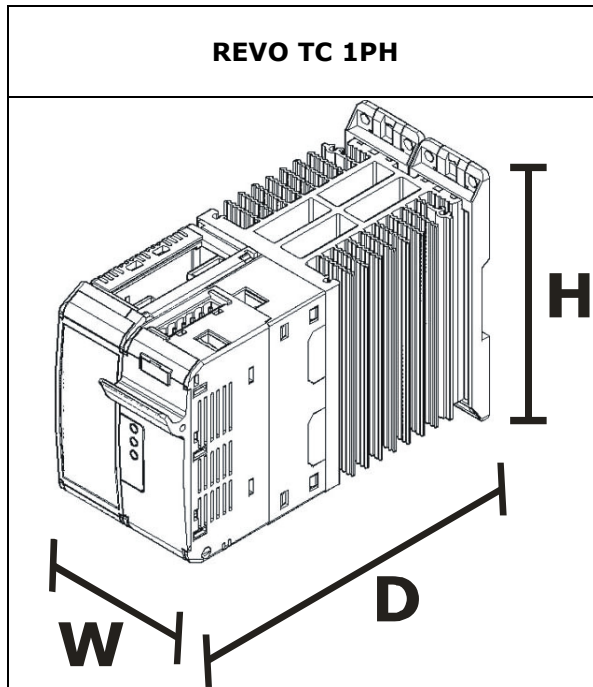
Maintain the minimum distances in vertical and in horizontal as represented.

When more unit has mounted inside the cabinet maintain the air circulation like represented in figure.

Sometimes is necessary installing a fan to have better air circulation.

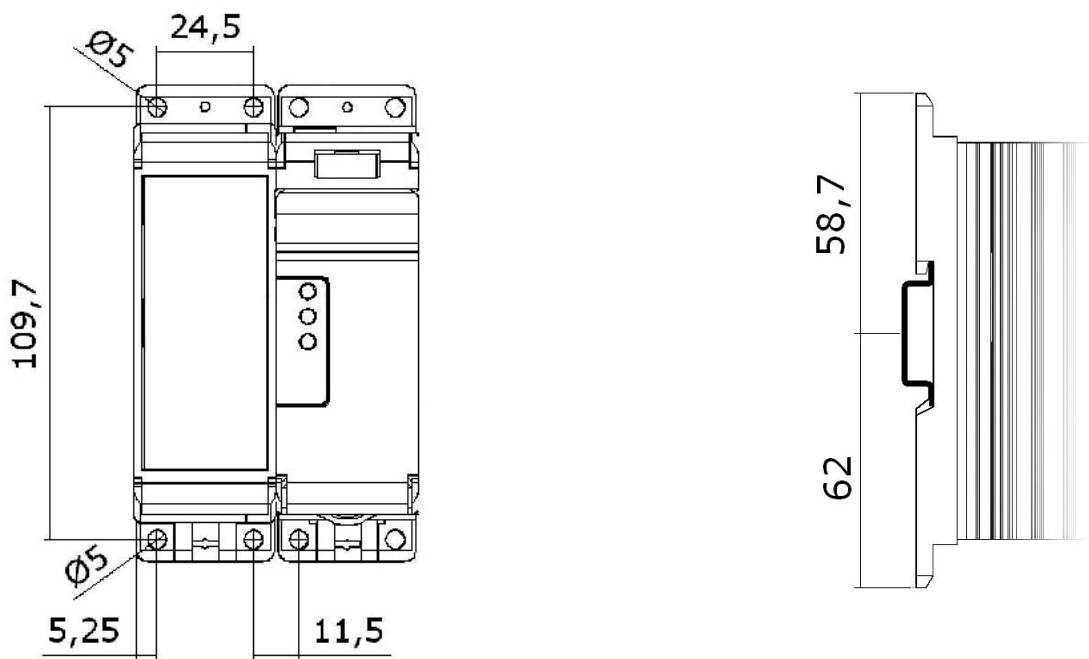


5.1 Dimensions and Weight



W(mm)	H(mm)	D(mm)	Weight (kg)
72	121	185	1,15

5.2 Fixing holes



6 Wiring instructions



Warning: Before connecting or disconnecting the unit check that power and control cables are isolated from voltage sources.

6.1 Out Terminal (Terminal block M1)

Terminal	Description	SSR Out	DI Input	Relay Out	Digital Input/Output
1	OUT4	SSR-	DI2	C	DI/O 2
2	OUT4	SSR+	DI2	NO	DI/O 2
3	OUT3	SSR-	DI1	C	DI/O 1
4	OUT3	SSR+	DI1	NO	DI/O 1
5	OUT2	SSR-	-	C	-
6	OUT2	SSR+	-	NO	-
7	TA	-	-	-	-
8	TA	-	-	-	-
9	OUT1	SSR-	-	C	-
10	OUT1	SSR+	-	NO	-

“-“ = Not available

6.2 Supply Terminal (Terminal block M2)

Terminal	Description
11	Supply 24Vdc/ac
12	Supply 24Vdc/ac

6.3 Communication Terminal RS485 (Terminal block M3)

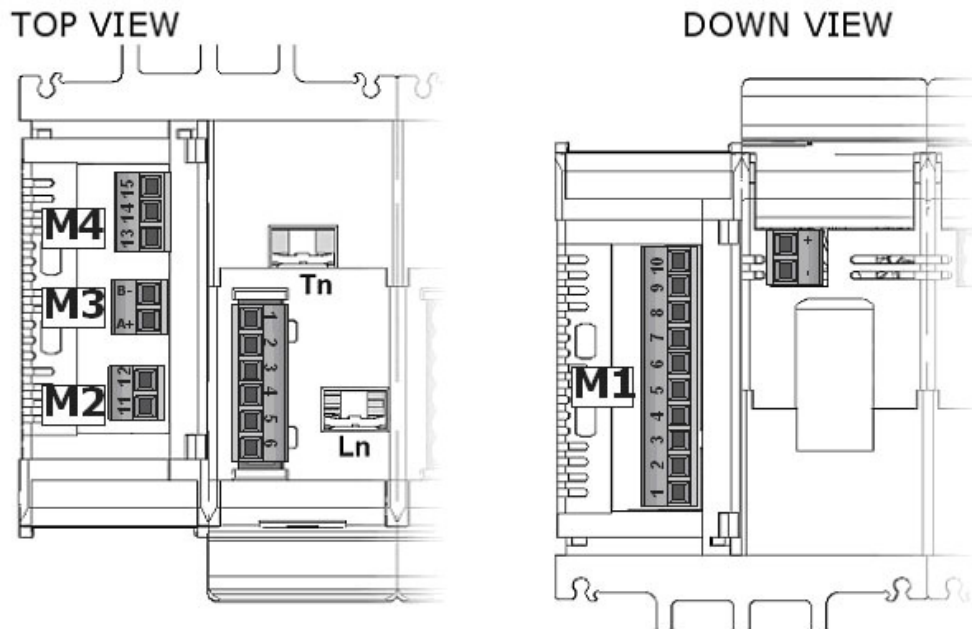
Terminal	Description
A+	RS485 A +
B-	RS485 B -

6.4 Input Terminal (Terminal block M4)

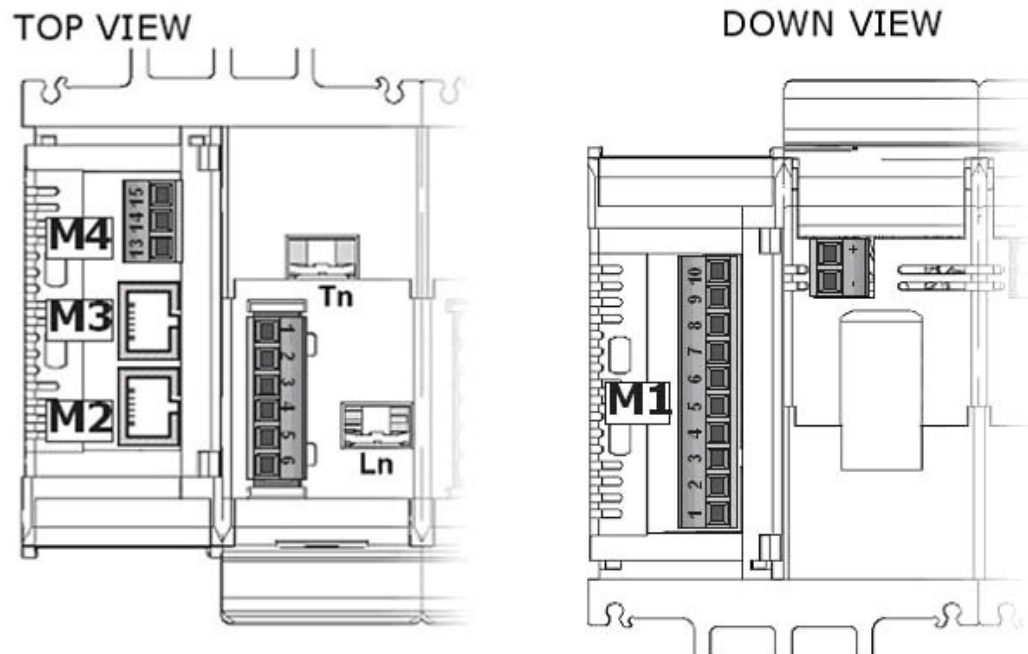
Terminal	Description			
13	PT100			
14	TC+	PT100	V+	mA+
15	TC-	Compensazione	V-	mA-

6.5 Connection Diagram

Revo TC Basic:

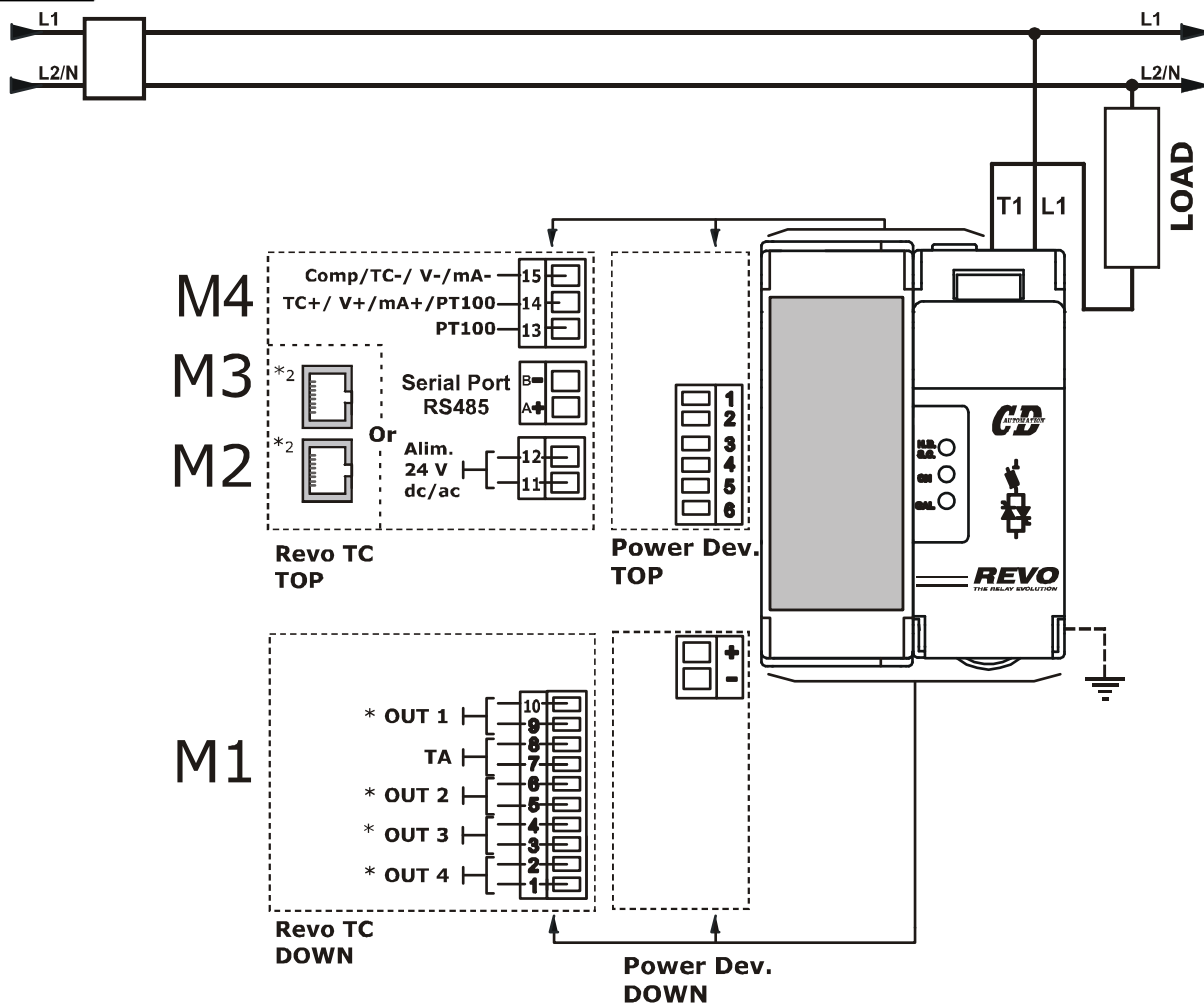


Revo TC with flat wiring system Option:





Caution: this procedure must be performed only by qualified persons.

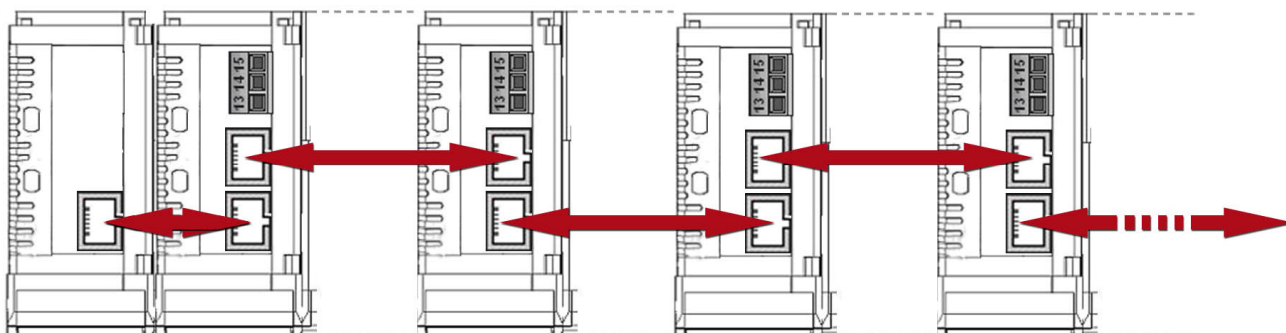


* See Out terminal chapter for more informations

*2 Only with flat wiring system Option: connect with proper cable (RJ45 Cat 5E Patch Cable UTP) as shown:



TU MODULE



The cable supplied by CD Automation are

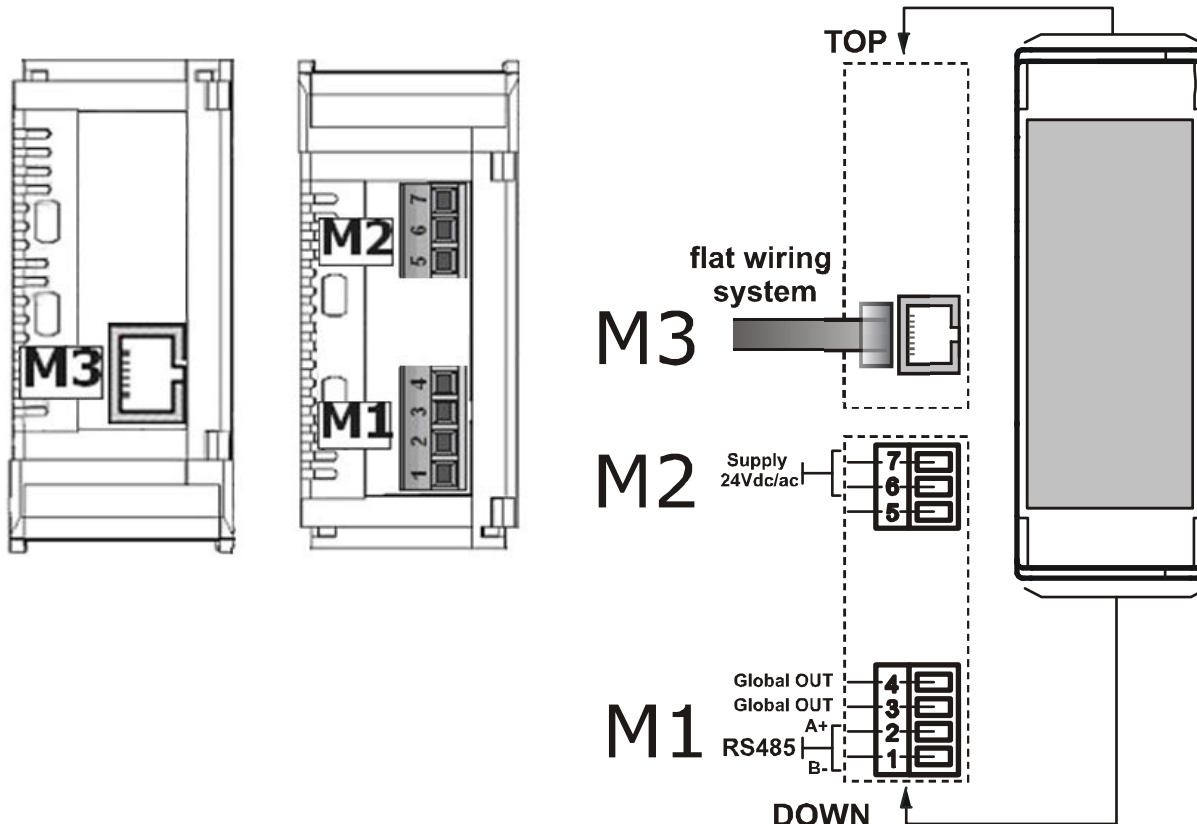
Lenght	Code
0,15 m	ICOC U5EB-001
0,3 m	ICOC U5EB-003-GREE
0,5 m	ICOC U5EB-005-GREE
1 m	ICOC U5EB-010-GREE
2 m	ICOC U5EB-020-GREE
3 m	ICOC U5EB-030-GREE
5 m	ICOC U5EB-050-GREE
7,5 m	ICOC U5EB-075-GREE
10 m	ICOC U5EB-100-GREE
15 m	ICOC U5EB-150-GREE

7 TU Module Basic

Revo TU is a termination unit that provides the power supply and RS485 comms (modbus RTU) for up to max 10 REVO TC units.

TOP VIEW

DOWN VIEW



Terminal block M1

Terminal	Description
1	RS485 B -
2	RS485 A +
3	Global Output
4	Global Output

Terminal block M2

Terminal	Description
5	Not Used
6	Supply 24Vdc/ac
7	Supply 24Vdc/ac

Terminal Block M3 for flat wiring system

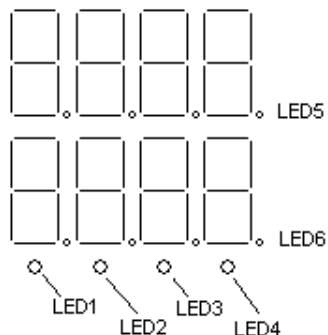
8 Control Panel

The keyboard is composed of **four push button** properly identified and protected: depending on the status of each device button assumes a specific function, as described below.

Text or Combination	Description of function associated
▲	<p><u>Configuration and operational</u> Skip to next parameter or group</p> <p><u>Configuration and ongoing operational and edit</u> Increases the value of the parameter currently displayed</p> <p><u>Operating with manual output</u> Increases the value of control output</p> <p><u>Automatic Operation</u> If enabled, after 3 sec ill set point increases</p>
▼	<p><u>Configuration and operational</u> Skip to the previous group or parameter</p> <p><u>Configuration and ongoing operational and edit</u> Decreases the value of the parameter currently displayed</p> <p><u>Operating with manual output</u> Decreases the value of control output</p> <p><u>Automatic Operation</u> If enabled, after 3 sec the set point decreases</p>
FUNC	<p><u>Operating</u> Release Avoid the Change of the value displayed through the upper LCD. Accept the changed value</p> <p><u>Operating</u> T> 3 sec Special Views: load current, leakage current, heating power, the cooling power, firmware version. Configuration Avoid the Change of the value of information displayed through the upper LCD. Accept the changed value</p>
MAN	<p><u>Operating</u> Exit the current group While editing a parameter abort editing</p> <p><u>Operating</u> T> 3 sec Set automatic or manual control mode</p> <p><u>Configuration</u> Exit the current group While editing a parameter abort editing</p>

(▲ / ▼) + MAN	<u>Operating</u>
	during numeric editing
	Reaches the max / min set for the actual parameter
FUNC + MAN	<u>Configuration</u>
	during numeric editing
	Reaches the max / min set for the current parameter
FUNC + MAN	<u>Operating</u>
	<i>t > 3 sec.</i>
	Input in configuration mode
▲ + FUNC	<u>Operating</u>
	<i>t > 3 sec.</i>
	Lamp test
▼ + FUNC	<u>Operating</u>
	<i>t > 3 sec.</i>
	Input in calibration mode
▼ + MAN	<u>Operative</u>
	Show on the display below the load current or SetPoint

9 Display



During operation, normal operating, the top display shows the process variable while the lower display the current setpoint.

Note: if the restriction is enabled to changes in setpoint (SPU, SPD), the setpoint value displayed may not match the actual value. In fact, if the group parameter SPUS misc configuration is set to appear FNPS the SP arrival, otherwise the current SP.

If properly enabled in the configuration you can increase or decrease the setpoint value directly from the operating mode.

To this should be button for 3 seconds. taken down ▼ or ▲

At this point the change is enabled. Each press of two buttons will cause the 'increase or decrease of the SP.

Failure pressure of either button for more than 5 seconds will stop the 'edit.

To resume editing the SP press again require either button for 3 seconds.

If properly enabled configuration by pressing the UP and MAN on the lower display shows the current in the load. To return to the set point, press the same buttons.

9.1 Indicators

LED1	Switched on when the output 1 is ON state.
LED2	Switched on when the output 2 is ON state.
LED3	Switched on when the output 3 is ON state.
LED4	Switched on when the output 4 is ON state.
LED5	Flashing when the function tune is working and in calculating mode.
LED6	Flashing when the function adaptive is working.

The Led 1, 2, 3 o 4 , if assigned to the status of the alarm 3, take the following feature:

- If the alarm 3 is in OFF state and also alarms Breakdown, leakage or loop-break are in OFF state the assigned LEDs are off
- If the alarm 3 is in ON state and also alarms breakdown, leakage or loop-break are in OFF state the assigned LEDs are On
- If the alarm 3 is in OFF state and one or more of the alarm of breakdown, leakage or di loop-break are in ON state, the assigned LEDs flashes every 1 second.
- If the alarm 3 is in ON state and one or more of the alarm of breakdown, leakage or loop-break are in ON state, the assigned LEDs flashes every 0.5 seconds.

9.2 Possible outputs REVO TCM (Temperature Controller only)

Uscita	RELAY TC07-02	SSR TC07-03	Analogic TC07-01	DI Input TC07-05	Input/Output TC07-04
OUT1	X	X	X	-	-
OUT2	X	X	-	-	-
OUT3	X	X	X	X	X
OUT4	X	X	-	X	X

“-“ = Not available

9.3 Possible outputs REVO TC (SSR + Temperature Controller)

Uscita	RELAY TC07-02	SSR TC07-03	Analogic TC07-01	DI Input TC07-05	Input/Output TC07-04
OUT1	-	Fixed	-	-	-
OUT2	X	-	-	-	-
OUT3	X	-	--	X	-
OUT4	Fixed	-	-	-	-

“-“ = Not available

10 Operative Mode

Description:

In operating mode, parameters can be viewed and modified in the present state of the device: to access the programming procedure, press the **FUNC** button and release it within 3 seconds.

The lower display shows the ID of the current group, while the upper display shows the string "Edt" permanently: the ▲ and ▼ buttons let you select the group to change, and allows the **FUNC** key to enter the selected group.

For each parameter in the group selected, the lower display shows the ID parameter as the upper display shows the current value: to switch to other parameters of the group acts on the ▲ and ▼.

Pressing the **FUNC** enter into modification of the displayed parameter (the upper display starts flashing).

With the ▲ and ▼ changing the current value displayed on the bottom.

Press the **FUNC** key to store the value currently displayed, pressing the MAN you exit without saving changes the new value.

For a list of parameters, see Chapter <Programming procedure>

11 Functions

11.1 Special Functions

By pressing for 3 sec the keys **UP** and **MAN** and the lower display, if enabled, the load current.
The next press the same button for 3 seconds will return to the SetPoint

By pressing the **FUNC** key for 3 seconds, you can see on the lower display in the following order:

- A character **A** followed by the value of the load current output.
- A character **b** followed by the leakage current value of output.
- A character **H** followed by the output value of heating (0-100%)
- A character **C** followed by cooling output value (0 - 100%)
- A **t** character followed by the value of the cold junction temperature detected
- A **v** character followed by the firmware version

Some information is only available if the instrument is properly configured.

The display returns to normal operating mode by pressing the **MAN**.

Pressing the **▲ + FUNC** for 3 seconds activates the lamp test: all segments of all digits of the display and front LEDs are switched on and off with 1 Hz frequency (duty-cycle 50%) until next keypress **MAN**.

11.2 Manual Mode

The manual mode can be activated by holding down the MAN button for 3 seconds, if enabled in the configuration (group misc parameter mnFn <> nonE) and only in normal operating mode.

Il display superiore visualizza la variabile di processo.

Esistono 3 modalità di funzionamento manuale (sempre definite in configurazione nel gruppo misc parametro mnFn):

The upper display shows the process variable.

There are 3 modes of operation manual (always defined in the configuration parameter group misc mnFn):

- **Classic Manual Mode:**

The operator sets the percentage of output power from 0 to 100% for heating only operation, from -100% to 100% for operating heating / cooling.

The lower display shows the current power preceded by the letter **P**.

The change from automatic mode to manual mode (and vice versa) will be in bumpless mode only if the integral action has not been previously excluded.

If the transfer AUTO ► MAN occurred during selftune, at the return in the AUTO mode the instrument will operate in auto-tuning adaptive abled.

- **OFF Mode:** the operator determines the release of relay heating (if output in mA or V brings the power to 0).

- **Displayed load current mode:** in this case does not change any control over the load, but show the load current.

When switch on, the device is always in AUTO mode or, if properly selected in configuration ,the state in which it was turned off.

11.3 Showing break-down alarm

The alarm condition detected in the measurement of current through the current transformer is indicated in **OR** on the relay or on the relays assigned to alarm 3.

The current sampling is done only if the state's output, which is inserted in the current transformer is maintained for at least 200ms **ON**: if during the current cycle time is not carried out any sampling, the value shown by the lower display will be "----".

This is shown only present if the group parameter HCEn Hbdu configuration is set to ON.

11.4 Showing leakage alarm

The alarm condition detected in the measurement of current through the current transformer is indicated in **OR** on the relay or on the relays assigned to alarm 3.

If the current sampling is done only if the state's output, which is inserted in the current transformer is unenergized for at least 200ms: if during the current cycle time is not carried out any sampling, the value shown by the lower display will be "----".

This view is only present if the group parameter HCEn Hbdu configuration is set to ON.

11.5 Showing loop-break alarm

- uscita di controllo al minimo e azione *reverse*
 - uscita di controllo al massimo e azione *direct*

Analogamente, la variabile di processo deve crescere se:

- uscita di controllo al minimo e azione *direct*
 - uscita di controllo al massimo e azione *reverse*

La condizione di allarme viene segnalata in **OR** sul relè o sui relè assegnati all' allarme 3.

The loop-break alarm is generated by the dedicated algorithm when the control output is at the minimum / maximum value and the process variable changes in the time pre-chosen of amplitude below the threshold set in the configuration.

The process variable must decrease if:

- Control output to the minimum and Reverse Action
- Control output to the maximum and direct action

Similarly, the process variable must grow if:

- Control output to the minimum and direct action
- Control output to the maximum and reverse action

The alarm condition is reported in **OR** on the relay or the relays assigned to the alarm 3.

12 Function "Soft start"

When the instrument is switched on the function "soft start" protects temporarily the limit the output power. By limiting the heating power of switch on it's possible to reduce the thermal stress to the heating elements. The user can configure the time and temperature threshold of the function "soft start".

13 Detection of malfunctions

The instrument can detect the following abnormal conditions of the process variable:

- *over-range*
- *under-range*
- *sensor leads break*

The condition of over-range is displayed by the characters "**Undr**" flashing in the upper display.

The condition of over-range is displayed with "**oVrr**" in the upper display.

Table 1 shows the state of OUT1 and OUT2 at the conditions of range of under-and over-range, according to the device settings (control mode heating / cooling and SEcF parameter value). The first four lines delineate the **standard configuration**.

condition	Heating/ Cooling	SEcF	OUT1		OUT2	
			<i>reverse</i>	<i>direct</i>	<i>reverse</i>	<i>direct</i>
<i>under-range</i>	NO	0	ON	OFF	---	---
<i>over-range</i>	NO	0	OFF	ON	---	---
<i>under-range</i>	SI	0		ON		OFF
<i>over-range</i>	SI	0		OFF		ON
<i>under-range</i>	---	1		SEcO		SecO
<i>over-range</i>	---	1		SEcO		SecO
<i>under-range</i>	---	2		<i>standard</i>		<i>standard</i>
<i>over-range</i>	---	2		SEcO		SecO
<i>under-range</i>	---	3		SEcO		SecO
<i>over-range</i>	---	3		<i>standard</i>		<i>standard</i>

Table 1: security state Stati di sicurezza of the output in out-of-range condition.

Breakage of the temperature sensor can be reported as:

- *over-range* o *under-range* (configurable) for input TC/mV
- *over-range* for input RTD
- *under-range* for input mA / V (only with *zero elevation*)

14 Programming Procedure

14.1 Programming procedure Diagram

Figure 1 shows the state diagram of the programming process through which shows the strings displayed by the two front LCD display.

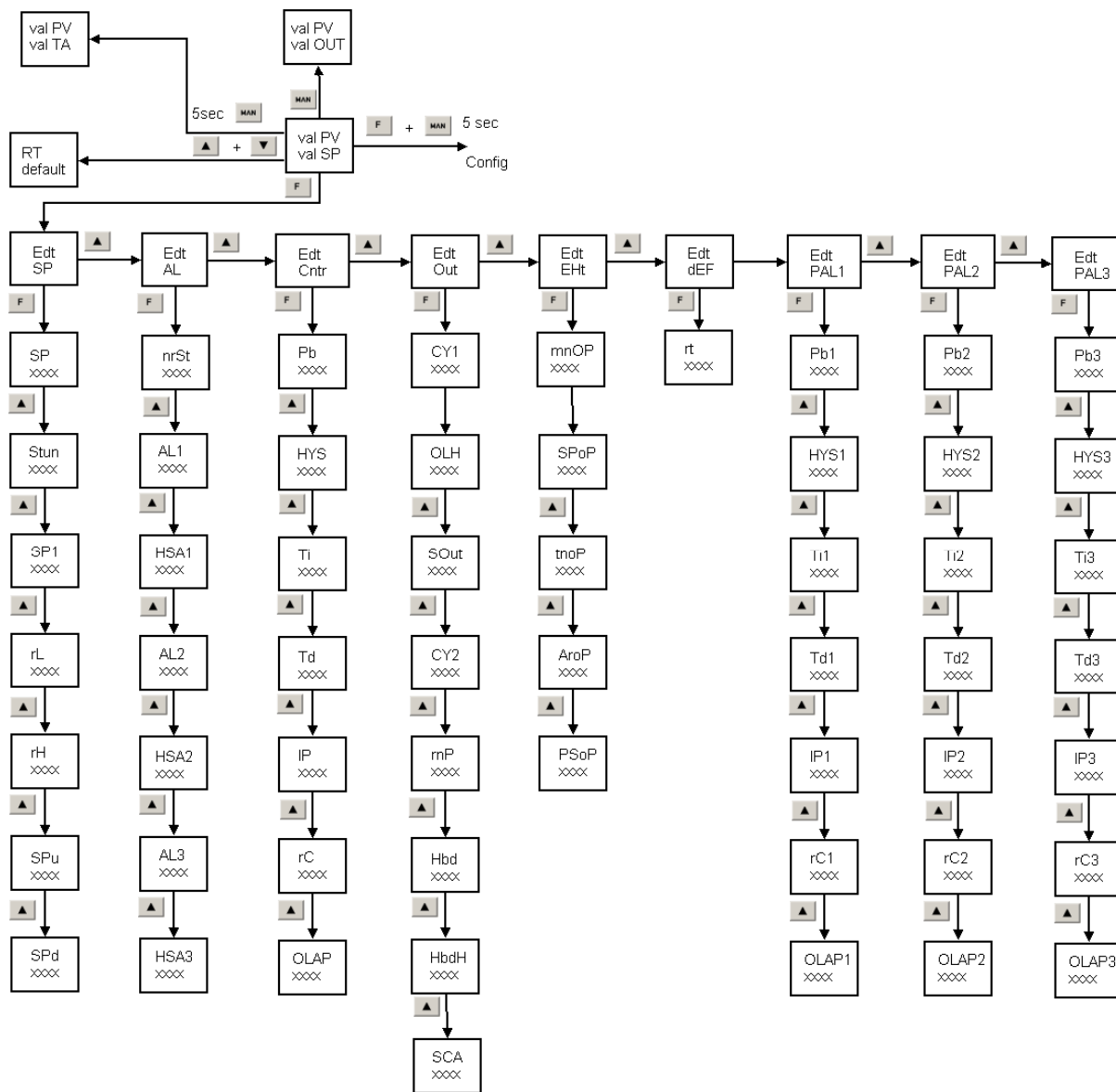


Fig 1

14.2 SET POINT Group (*SP*)

SETPOINT

Upper Display → *SP*
Lower Display → Valore di setpoint

Range

rL ↔ *rH*

SELFTUNE

(available only if can be activated)

Upper Display → *Stun*
Lower Display → *On* or *Off*

AUXILIARY SETPOINT

Upper Display → *SP I*
Lower Display → Setpoint value

Range

rL ↔ *rH*

LOWER SETPOINT LIMIT

Upper Display → *rL*
Lower Display → Lower limit value

Range

LoSc ↔ *rH*

UPPER SETPOINT LIMIT

Upper Display → *rH*
Lower Display → Upper limit value

Range

rL ↔ *H iSc*

RATE OF CHANGE FOR POSITIVE CHANGES OF SETPOINT

Upper Display → **SP_U**
Lower Display → Value of *rate of change* applied to any positive change in setpoint.

Range

1 ↔ 100 digit/min

Inf : rate of change forced to a Step.

RATE OF CHANGE FOR NEGATIVE CHANGES OF SETPOINT

Upper Display → **SP_D**
Lower Display → Valore del *rate of change* applicato a ogni variazione
negativa del setpoint.

Range

1 ↔ 100 digit/min

Inf : rate of change forced to a Step.

14.3 ALARM Group (*AL*)

SILENCED ALARM

(appears only with at least one of programmable alarms with manual reset)

Upper Display → mrSt

Lower Display → on

Functioning:

To silence the active alarms stored, press key **F U N C** .

ALARM1 THRESHOLD

Upper Display → AL1

Lower Display → Actual value

Range

Process alarm

Span limit

Band alarm

0 ↔ 500

Deviation alarm

-500 ↔ 500

HYSTERESIS ALARM1

Upper Display → HSA1

Lower Display → Actual value

Range

0.1% ↔ 100.0% of the span or 1LSD

ALARM2 THRESHOLD

Upper Display → AL2
Lower Display → Actual value

Range

Process alarm

Limit of span

Band alarm

0 ↔ 500

Deviation alarm

-500 ↔ 500

ISTERESI ALARM2

Upper Display → HSA2
Lower Display → Actual value

Range

0.1% ↔ 100.0% of the span or 1LSD

ALARM3 THRESHOLD

Upper Display → AL3
Lower Display → Actual value

Range

Process alarm

Limit of span

Band alarm

0 ↔ 500

Deviation alarm

-500 ↔ 500

ISTERESI ALARM3

Upper Display → HSA3
Lower Display → Actual value

Range

0.1% ↔ 100.0% of the span or 1LSD

14.3.1 Alarm Function

General notes:

An automatic regulation, control and / or supervision takes into consideration different alarms.

In general, the alarms are "digital" elements or rather elements that can take only two values (true or false) because the condition that describes the alarm can only be 'true' (ON) or "false" (OFF).

The condition that describes the alarm is usually summarized by the ALARM FUNCTION because it defines its behavior.

Over the years, depending on the specific needs of various systems have been developed many different types of alarm

(for example alarms, trends, alarms group, put alarms, etc.).

Here we will only considering alarms normally implemented on this controller.

The Functions of the alarms in the controller are 3 as follows:

- 1) Process alarm (or absolute)
- 2) Band Alarm
- 3) Deviation Alarm

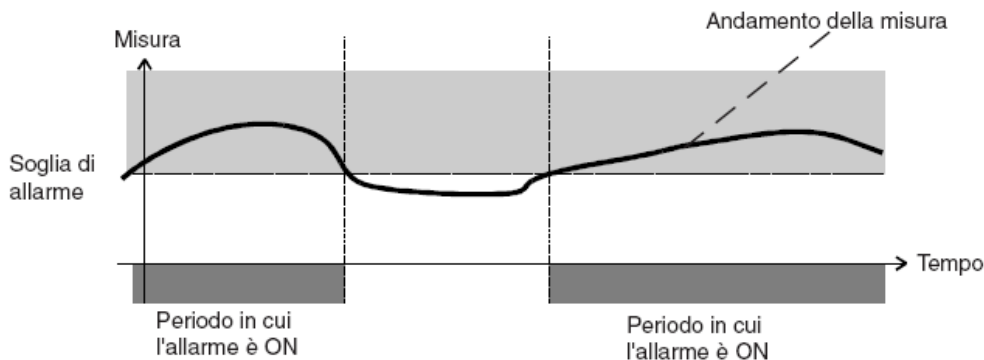
1) Process alarm (or absolute)

The process alarm can be of **two types:**

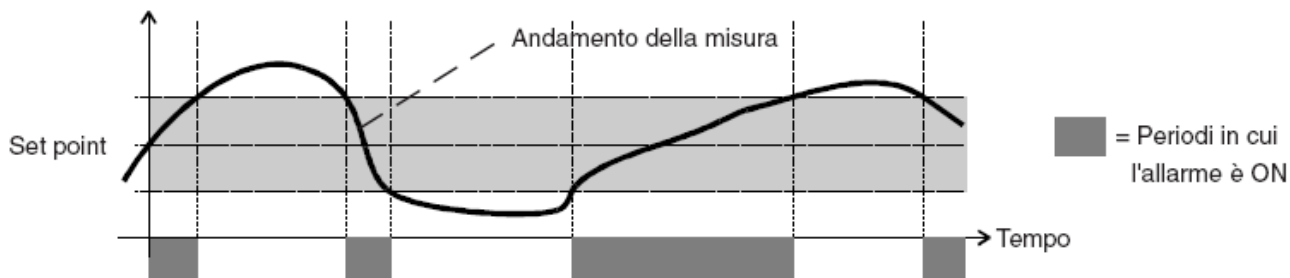
- A) Up alarm
- B) Low alarm

Generally, the process alarm is an alarm which compares the instantaneous value of the measure (**M**) with the value assigned to the alarm (**SA**) (Threshold value)

A) If it is an Up alarm, the alarm will be ON when the measured value exceeds the threshold value



B) If it is a Low alarm, the alarm will be ON when the measured value is less than the threshold value ($M < AS$).



2) Band Alarm

We define "Controlling system" any automated system capable of performing the necessary actions to maintain the controlled variable (which usually coincides with the measured variable) as close as possible to a certain value (which is called set point)

The band alarm is a type of alarm that can only be done on a "Controlling system" because it links the value of the threshold on the Set point (SP).

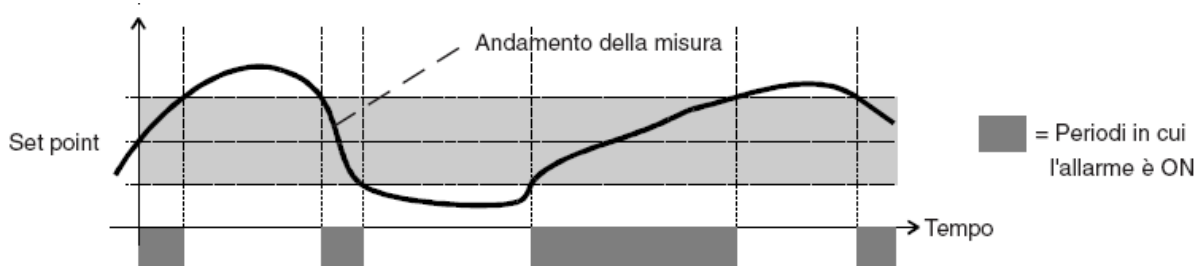
In the Band alarm, the alarm threshold defines an area around the set point.

Again there are **two possibilities**:

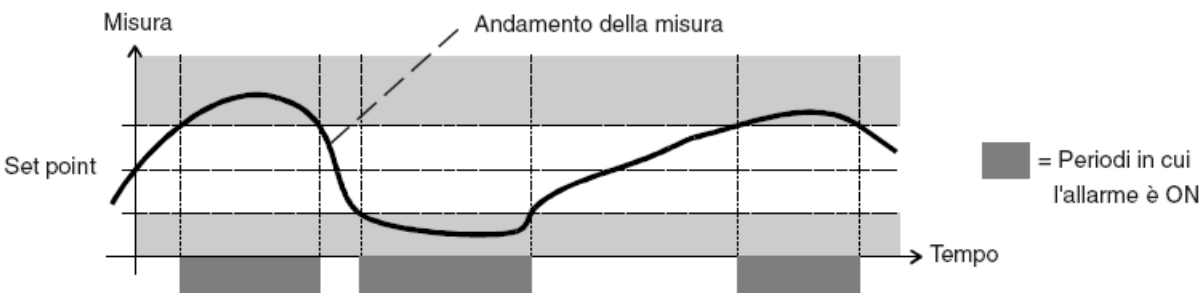
A) ON State when the measure is **within** the bandwidth $[(SP - SA) < M < (SP + SA)]$

B) ON State when the measure is **outside** the bandwidth $[M < (SP - SA) \text{ or } M > (SP + SA)]$

A) ON State within the bandwidth



B) ON State outside the bandwidth



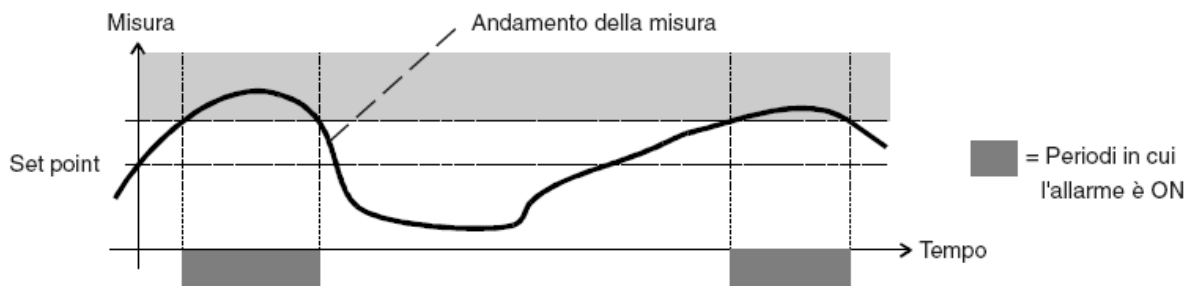
3) Deviation Alarm

Also the deviation alarm can only be done on a "Controlling system" because it links the value of the threshold set point but in some ways is a cross between Process and Band alarm .

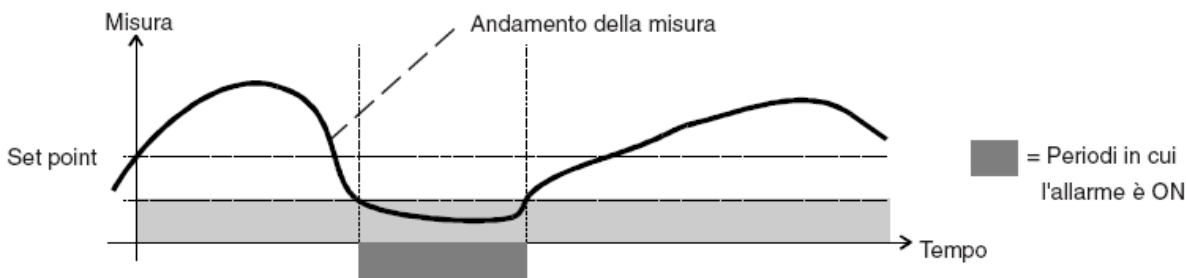
For this reasons the deviation alarm acts as a process alarm where the alert threshold is added or removed from the set point.

Again there are **two possibilities**:

A) deviation alarm **Up** [$M > (SP + SA)$]



B) Deviation alarm **Down** [$M < (SP - SA)$]



Note:

The band and deviation alarms automatically moving the absolute value of the threshold when you change the set point value.

The process alarm, however, is indifferent to changes of set points.

14.3.2 Alarm Hysteresis

The purpose of the hysteresis is to prevent, when the measurement is near the threshold and there are disturbances on the measure, the alarm state changes continuously from ON to OFF and vice versa.

To do this it's possible to define a "safety margin" so that the alarm goes ON when the measure reaches a specified value (A) but does not go OFF before the measure reaches another value (B) more closely to the optimal condition.

Value (A) is used as the threshold and value (B) as the threshold more or less hysteresis;

The following example will clarify the foregoing.

Considering that we want to set a Low alarm process that goes ON at least 300 °C (value A) and returns to OFF only when the measure has risen to 360 °C (B value).

In this case the setting of the threshold is 300 (°C)

In questo caso il valore di soglia da impostare è 300 (°C) while the hysteresis have to be set equal to 60(°C).
note. The hysteresis value is expressed on the instrument in % of full scale.

14.3.3 Alarm Out

Generally the state of an alarm is made visible to the user and can also produce physical actions on the system.

The status indication of an alarm can be:

- 1) Visual indication (a LED on the front of the instrument panel)
- 2) Software indication (state of a boolean variable on the serial communication)
- 3) State of a physical Out (normally a relay)

Note:

- a) These three indications are present both individually than simultaneously.
- b) At " State of a physical Out " are associated also physical action on the system.

14.3.4 Action of alarm output.

(also indicated as "Alarm Action")

When an alarm status is associated with the state of a physical output (ex. relay)

Quando allo stato di un allarme è associato lo stato di un uscita fisica (es. relè) it's necessary to define the relationship between the alarm state and relay state.

Two action are possibile:

1) Direct action: out ON when the alarm is ON (ex.: excited relay when the alarm is ON)

2) Reverse action: Out OFF when the alarm is ON (ex.: un-excited relay when the alarm is ON)

Direct action is the most commonly used but you must remember that the reverse action allows to have an alarm signal when the instrument does not work or is off (because the ON state of alarm is indicated by the OFF state of output, when the instrument is switched off or not working the output will be definitely OFF).

In the case of relay output, the status of Output may not be sufficient to describe the state of the contact. In fact, when the output relay is provided with changeover contacts it is clear that the choice of the normally closed contact (NC) or normally open (NO) allows for equal status of the relay to reverse the state of the contact.

However remains the considerations valid regarding the possibility of having an alarm signal when the instrument is switched off or not working (reverse action).

14.3.5 Resetting of an Alarm

The alarms we have seen are based on the concept that when the measure falls in the OFF area the alarm also goes OFF **automatically**. In these cases it is said that the alarm is equipped with automatic reset.

In some cases it is preferable that the alarm still remains in the ON condition even after the measure is back in the OFF zone, the alarm will return to the OFF condition only after a physical action (pressing a key or other). In this case we say that the alarm has a manual reset.

The reason of this choice is due to the level of danger of the anomaly reported from the alarm, an overcurrent can damage the system and cause fire or dangerous situations for the users

Forcing the user to perform an action also ensures that we take note of the report and eliminate the cause of the problem before resetting the system.

Alarms with manual reset may have different behaviors depending on different situations but, generally, one can identify two families of behavior:

1) Alarm with unconditioned reset

Are those alarms that, when performed manually reset, set the alarm to OFF condition even if the alarm condition is still present.

A typical example are the alarms that drive the sirens, once the user reaches the machinery switch off the siren and then performs the necessary actions to remove the alarm condition. To get a further alarm signal is necessary that the measure goes to the area OFF and back in the ON area.

2) Alarm with conditioned reset

Are alarms that, when is running the manual reset ,activate the alarm in OFF condition only if the alarm condition is no longer present.

For the conditioned alarms we have two types:

I. Alarms that require manual reset only after alarm condition has been eliminated

(Otherwise remain in alarm). **This is the type of reset on this controller.**

II. Alarms that, if they are resetted when the alarm condition is still present, store the reset and run automatically when the alarm condition disappears.

It should however be noted that, even for resetting, has been developed a multitude of variations and types to meet the varied needs of the plant. As mentioned above describes only the most common condition and those normally present on the controllers.

14.3.6 Alarm mask

As we have said in many cases the alarm produces a physical action on the system.

Obviously, however, the alarm is usually set to report defects when the system is "fully operational".

The conditions of the plant startup or after a set point change does not satisfy the condition "fully operational" and can cause unwanted alarmi.

To avoid unwanted alarms were studied different solutions according to the type of system where the alarm is applied.

In the controller has been implemented a solution due to the measure.

If at the start up is detected an alarm condition, this condition is ignored until the measure reaches the area where the alarm is OFF, then the alarm resumed normal function.

If the alarm is programmed as band alarm or deviation, the standby function masks the alarm condition in start un and set point variation, until the value of process variable reaches the alarm threshold with hysteresis .

If is a process alarm the alarm conditions mask only during start up.

Se l'allarme è di processo, maschera le condizioni di allarme solamente in accensione.

14.4 Control Group (*Cntr*)

PROPORTIONAL BAND

Upper Display → Pb
Lower Display → Actual value

Range

No selftune with O2Fn ≠ Cool

1.0% ↔ 100.0% dello span

No selftune with O2Fn = Cool

1.5% ↔ 100.0% dello span

Selftune with O2Fn ≠ Cool

LPb2 ↔ HPb

Selftune with O2Fn = Cool

LPb1 ↔ HPb

HYSTERESIS

(available only with ON/OFF – CntF = onoF (miSC group of configuration))

Upper Display → HYS
Lower Display → Actual value for ON/OFF

Range

0.1% ↔ 10.0% of span or 1LSD

INTEGRAL TIME

(available only with PID or PI - CntF <> onoF (miSC group of configuration))

Upper Display → ti
Lower Display → Actual value

Range

00.01 ↔ 20.00 mm.ss

Beyond the maximum value, on display the integral action is excluded.

With selftune activated, the lower limit is given by Lti

DERIVATIVE TIME

(available only with PI - CntF = Pi (miSC group of configuration))

Upper Display → td

Lower Display → Actual value

Range

00.01 ↔ 10.00 mm.ss

With selftune activated, the derivative time is equal to $t_I / 4$

INTEGRAL PRELOAD

(available only with PID or PI - CntF <> onoF (miSC group of configuration))

Upper Display → iP

Lower Display → Actual value

Range

With O2Fn ≠ Cool

0 ↔ 100

With O2Fn = Cool

-100 ↔ 100

RELATIVE COOLING GAIN

(available only with PID or PI - CntF <> onof (miSC group of configuration) with at least one output set as cooling)

Upper Display → rC
Lower Display → Actual value

Range

0.20 ↔ 1.00

When selftune is active and rCEn = On the range become

PAL = Air

0.85 ↔ 1.00

PAL = OIL

0.80 ↔ 0.90

PAL = H2O

0.30 ↔ 0.60

DEAD BAND/OVERLAP through HEATING/COOLING OUTPUT

(available only with PID or PI - CntF <> onof (miSC group of configuration)) with at least one output set as cooling)

Upper Display → oLAP
Lower Display → Valore attuale.

Negative values indicate dead band, positive values indicate overlap.

Range

-20 ↔ 50

14.5 OUT Group(*Out*)

TIME OF CICLE OUT1

(available only with at least one output set as heating not analogic)

Upper Display → CY1
Lower Display → Actual Value.

Range

1 ↔ 200 seconds

SUPERIOR LIMIT OUTPUT

Upper Display → oLH
Lower Display → Actual Value.

Range

With O2Fn ≠ Cool

0 ↔ 100

With O2Fn = Cool

-100 ↔ 100

TIME OF CICLE OUT2

(available only with at least one output set as heating not analogic)

Upper Display → CY2
Lower Display → Actual Value.

Range

1 ↔ 200 seconds

MAXIMUM RAMP-UP VARIATION ON OUTPUT

Upper Display → rnP
Lower Display → Actual Value.

Range

1% ↔ 25% for second.

Over the max value the display show "*inf*" and the limitation is excluded.

THRESHOLD VALUE FOR BREAK-DOWN ALARM

(available only if HCEn = On)

Upper Display → Hbd
Lower Display → Actual Value (A)

Range

0 ↔ FULL SCALE (see HCHS)

Note

- When the output that is added to the current transformer is in excited state of relays, the instrument measures the current absorbed by the load and generates an alarm if the current is below the value of Hbd parameter (a low current indicates a break-down partial or full load).
- The resolution of the threshold value is equal to 0.1A for range up to 20A, 1A to 20A to 100A range.

HYSTERESIS VALUE FOR BREAK-DOWN ALARM

(available only if HCEn = On)

Upper Display → HbdH
Lower Display → Actual Value

Range

0 ↔ 1.0

THRESHOLD VALUE FOR SHORT CIRCUIT ALARM

(available only if HCEn = On)

Upper Display → SCA
Lower Display → Actual Value (A)

Range

0 ↔ FULL SCALE (see HCHS)

Note

- When OUT1 relay is in unexcited state, the instrument measures the leakage current in the load and generates an alarm if the current exceeds the value of the parameter SCA (a high current indicates a partial break or total of the relay or SSR).
- The resolution of the threshold value is equal to 0.1A for range up to 20A, 1A to 20A to 100A range.

14.6 Group *EHL* (Functions setted also from input1 and input2)

The functions

- Auto/Manual
- SP/SP1
- Tune Insertion
- Silencing the alarm
- Control group selection

may be controlled from key panel, from serial or contact of input. To avoid conflicts, through this group, is possible to select from which of these functions will be controlled.

FUNCTION COMMAND AUTO/MANUAL

(available only if is present a contact module or digital IO on Input1 or Input2 and if one of the two input is configured by command Auto/Manual)

Upper display → mnoP
Lower display → Actual Value

Range

Sutc → Command from Input
Serh → Command from key penel or serial

FUNCTION COMMAND SP/SP1

(available only if is present a contact module or digital IO on Input1 or Input2 and if one of the two input is configured by command SP/SP1)

Upper display → SPoP
Lower display → Actual Value

Range

Sutc → Command from Input
Serh → Command from key penel or serial

COMMAND TUNE INSERTION

(available only if is present a contact module or digital IO on Input1 or Input2 and if one of the two input is configured for tune insertion)

Upper display → tnoP
Lower display → Actual Value

Range

Sutc → Command from Input
Serh → Command from key penel or serial

COMMAND ALARM SILENCING

(available only if is present a contact module or digital IO on Input1 or Input2 and if one of the two input is configured for alarm silencing)

Upper display → AroP
Lower display → Actual Value

Range

Sutc → Command from Input
Serh → Command from key penel or serial

COMMANDO CONTROL GROUP SELECTION

(available only if is present a contact module or digital IO on Input1 or Input2 and if one of the two input is configured for control group selection)

Upper display → Actual Value
Lower display → PSoP

Range

Sutc → Command from Input
Serh → Command from key penel or serial

14.7 Group *dEF* (default of run time Loading)

Upper display	→	rt
Lower display	→	on

By pressing the key **FUNC** the default value are loaded

14.8 Group *PAL 1* (Pallet 1 control parameters)

PROPORTIONALE BAND

Upper display	→	Pb1
Lower display	→	Actual Value

Range

No selftune with O2Fn ≠ Cool

1.0% ↔ 100.0% of span

No selftune with O2Fn = Cool

1.5% ↔ 100.0% of span

Selftune with O2Fn ≠ Cool

LPb2 ↔ HPb

Selftune with O2Fn = Cool

LPb1 ↔ HPb

HYSTERESIS

(available only with ON/OFF – CntF = onoF (group miSC of configuration))

Upper display	→	HYS1
Lower display	→	Actual Value for ON/OFF

Range

0.1% ↔ 10.0% of span or 1LSD

INTEGRAL TIME

(available only with PID or PI - CntF <> onoF (group miSC of configuration))

Upper display → ti1
Lower display → Actual Value

Range

00.01 ↔ 20.00 mm.ss

Beyond the maximum value, the display of the integral action is excluded.

With selftune activated, the lower limit is given by Lti

DERIVATIVE TIME

(available only with PI - CntF = Pi (group miSC of configuration))

Upper display → td
Lower display → Actual Value

Range

00.01 ↔ 10.00 mm.ss

With selftune activated, the derivative time is equal to tl / 4

INTEGRAL PRELOAD

(available only with PID or PI - CntF <> onoF (group miSC of configuration))

Upper display → iP1
Lower display → Actual Value

Range

With O2Fn ≠ Cool

0 ↔ 100

With O2Fn = Cool

-100 ↔ 100

RELATIVE COOLING GAIN

(available only with PID or PI - CntF <> onoF (group miSC of configuration))

Upper display → rC1

Lower display → Actual Value

Range

0.20 ↔ 1.00

When selftune is active and rCEn = On the range become

PAL = Air

0.85 ↔ 1.00

PAL = OIL

0.80 ↔ 0.90

PAL = H2O

0.30 ↔ 0.60

DEAD BAND/OVERLAP TRA HEATING/COOLING OUTPUT

(available only with PID or PI - CntF <> onoF (group miSC of configuration)) e con

o2Fn = Cool)

Upper display → oLAP1

Lower display → Actual Value

Negative value indicates the dead band, positive value indicates the overlap.

Range

-20 ↔ 50

14.9 Group *PAL2* (Pallet 2 control parameters)

See grup 1

14.10 Group *PAL3* (Pallet 3 control parameters)

See grup 1

USER'S MANUAL
Rev. 12/2010

REVO TC

TEMPERATURE CONTROLLER

00004

PART 2



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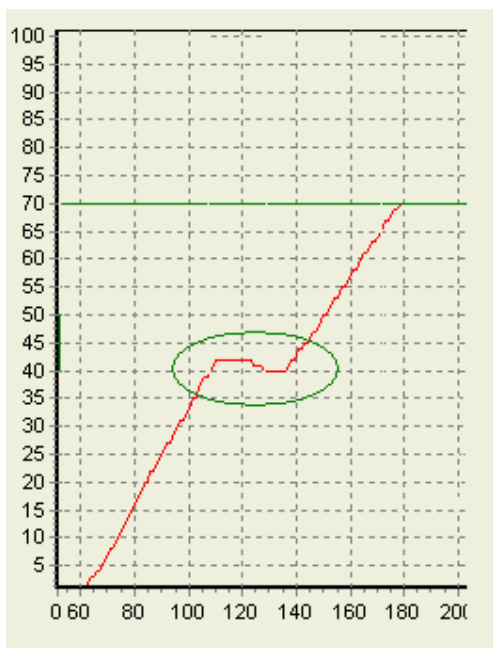
E-Mail: info@cdautomation.com - WEB: www.cdautomation.com

15 SELF-TUNING Algorithms

The instrument implements two different algorithms of self-tuning

- PreTune
- SelfTune

15.1 PreTune



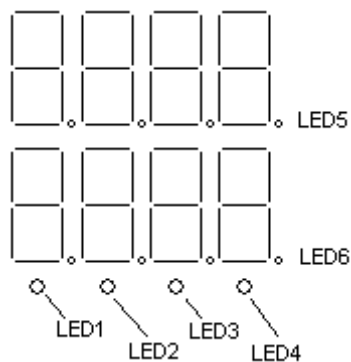
Allows to calculate a first approximation of the parameters of PID controller by induction of instability in the controlled process: the control output is increased to the maximum value until it reaches a certain error (SP-PV, typically between 5% and 10% of span) before being brought to its minimum value (or vice versa).

Pre-tune is activated by parameter Pret = On of menu SP accessible by pressing **FUNC** key.

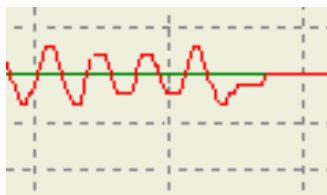
The Pre-Tune function is automatically enabled at the end of calculation or change of setpoint value, it's not inserted if the difference between set and measured temperature is below 20% of span value.

To deactivate manually the Pre-tune set the parameter Pret = On on menu SP accessible by pressing **FUNC** key.

When PRETUNE is active **LED6** is flashing.



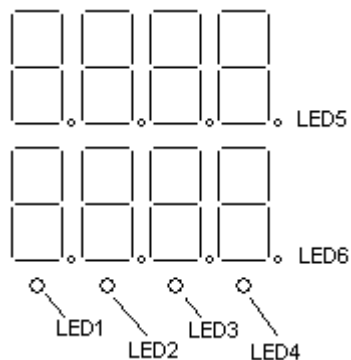
15.2 SelfTune



If enabled, the algorithm is continuously applied during regulation to optimize the coefficients of the PID controller when using it.

The function of self-tune is always enabled to optimize the coefficients of the PID controller when using it.

The self-tune function is enabled by setting the parameter SLFt = On on SP menu accessible by pressing **FUNC** key.



The Self-tune function is always enabled but works only when is between a range of +/- 4% of the span value.

To disable self-tuning function set the parameter SLFt = SP menu accessible by pressing **FUNC** key.

When SELFTUNE is enabled but not working **LED5** is On.
When SELFTUNE is enabled and is working **LED5** is On and flashing.

NOTE: If self-tuning is working the PID parameter can be viewed only without possibility of settings; It also removed the upper limit output OLH.

16 Serial RS485 and USB communication interface

The instrument can be connected to a PC via the RS485 serial interface designed for remote configuration and supervision, or through the Connector USB with RS232 interface for operations of configuration.

In the first case, the serial communications parameters can be setted through the setup configuration of the instrument.

In the second case the parameters are fixed:

- Addres 1
- Baud rate 9600
- Parity none
- Stop bit 1

In both cases, the protocol used is Modbus RTU.

During the operations of remote configuration, the instrument disables the control outputs.

17 Configuration Mode

17.1 Description

From operative mode it's possible to access the configuration mode by pressing **FUNC + MAN** for **3 seconds** and entering the appropriate password (the upper display shows "**PSU**"), that value must be set to "**3**" through **▲** and **▼**, confirmed by pressing the **FUNC**.

The upper display shows the ID of the current group, while the lower display shows the string "CnF" permanently: the **▲** and **▼** keys allows to select the group to change, the **FUNC** key allows to enter the active group.

For each parameter in the group selected, the upper display will show the ID parameter while the lower display will show the current value: to switch to other parameters group acts on the **▲** and **▼**.

By pressing the **FUNC** key it's possible to enter into modification of the displayed parameter (the upper display starts flashing).

Use the **▲** and **▼** keys for changing the current value displayed on the lower display.

Press the **FUNC** key to store the value currently displayed, press the **MAN** to exit without saving the changes of value.

To end the configuration mode, press **MAN** until appears on the upper display END and select YES: by selecting NO the instrument returns to the first group available ..

17.2 Configuration procedure diagram

Figure 2 and Figure 3 shows the complete sequence of the configuration.

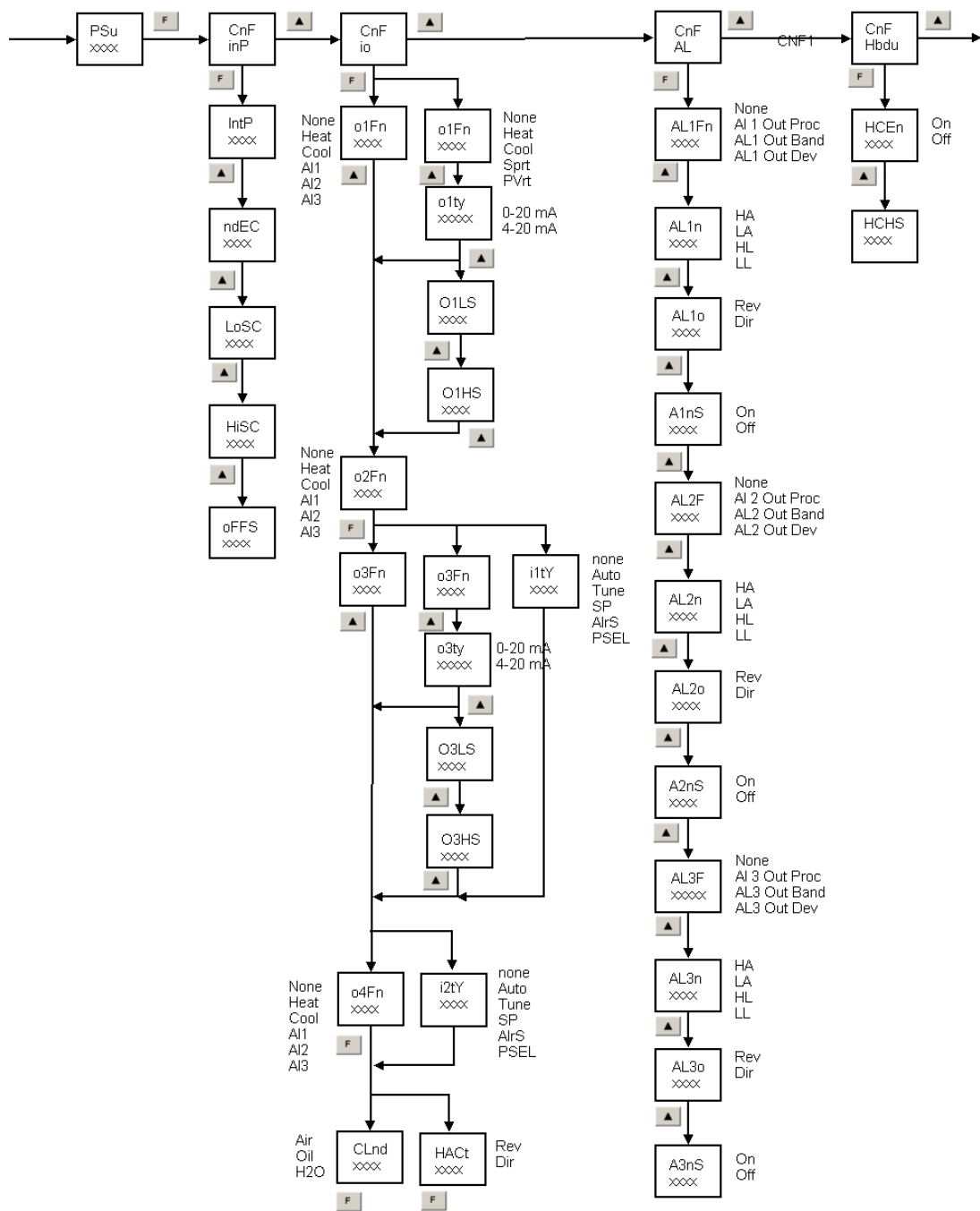


Figure 1: Sequence Diagram Programming - part A

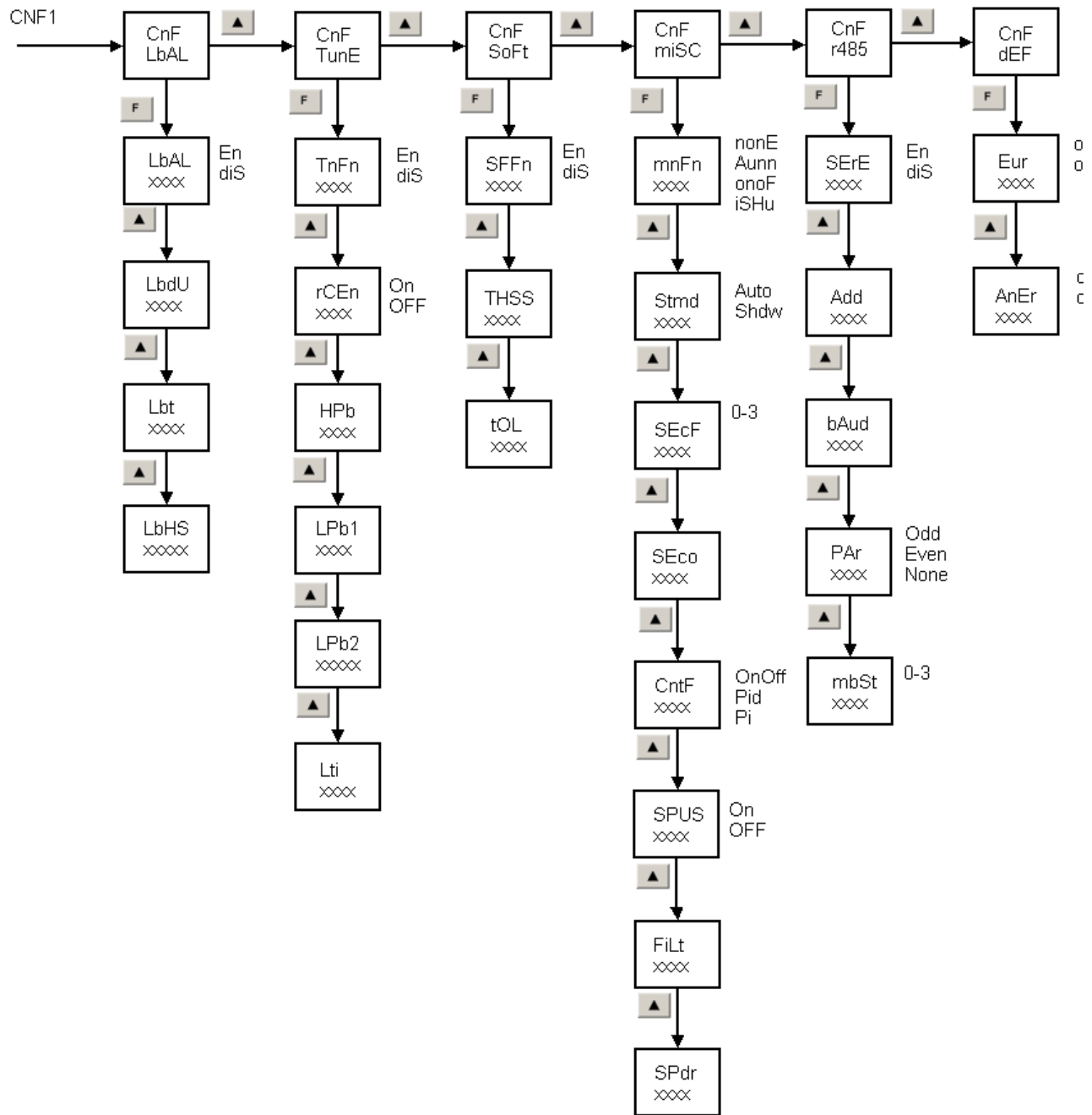


Figure 2: Sequence Diagram Programming - part B

17.3 Group INPUT (mP)

input Typology of input and range

	Display	Typology	Low	High	M.Unit	Regulations
0	<i>Ld C</i>	TC type L	0	400	°C	DIN 43710 - 1977
1	<i>L C</i>	TC type L	0	900	°C	
2	<i>L F</i>	TC type L	0	1650	°F	DIN 43710 - 1977
3	<i>Jd C</i>	TC type J	-100.0	400.0	°C	IEC 584-1
4	<i>J C</i>	TC type J	-100	1000	°C	
5	<i>J F</i>	TC type J	-150	1830	°F	IEC 584-1
6	<i>Kd C</i>	TC type K	-100.0	400.0	°C	IEC 584-1
7	<i>K C</i>	TC type K	-100	1370	°C	
8	<i>K F</i>	TC type K	-150	2500	°F	IEC 584-1
9	<i>N C</i>	TC type N	-100	1400	°C	
10	<i>N F</i>	TC type N	-150	2550	°F	IEC 584-1
11	<i>S C</i>	TC type S	0	1760	°C	
12	<i>S F</i>	TC type S	0	3200	°F	IEC 584-1
13	<i>r C</i>	TC type R	0	1760	°C	
14	<i>r F</i>	TC type R	0	3200	°F	IEC 584-1
15	<i>td C</i>	TC type T	-199.9	400.0	°C	
16	<i>t F</i>	TC type T	-330	750	°F	IEC 584-1
17	<i>Ptd C</i>	RTD type Pt100	-199.9	400.0	°C	DIN 43760
18	<i>Ptd F</i>	RTD type Pt100	-199.9	400.0	°F	DIN 43760
19	<i>Pt C</i>	RTD type Pt100	-200	800	°C	
20	<i>Pt F</i>	RTD type Pt100	-330	1470	°F	DIN 43760
21	<i>20nA</i>	Linear	0	20	mA	
22	<i>2nA</i>	Linear	4	20	mA	
23	<i>60nA</i>	Linear	0	60	mV	
24	<i>6nA</i>	Linear	12	60	mV	
25	<i>10U</i>	Linear	0	10	V	
26	<i>10U_</i>	Linear	2	10	V	

ndE **DECIMAL POINT POSITION** (only linear Input)

No Decimal Point	“----.”
One Decimal Point	“---.”
Two Decimal Points	“--.”
Three Decimal Points	“.-.”

LoSc **TOP RANGE VALUE FOR LINEAR INPUT**

-1999 ↔ 4000 for linear input
For input TC / RTD compare parameter table IntY.
When this parameter is changed, the parameter rL is realigned.

H,Sc **BOTTOM RANGE VALUE FOR LINEAR INPUT**

-1999 ↔ 4000 for linear input
For input TC / RTD compare parameter table IntY.
When this parameter is changed, the parameter rH is realigned.

OFFS **OFFSET** (disabled for linear input)

-199 ↔ 199 for input with range without decimals
-19.9 ↔ 19.9 for input with range with decimals
The value is algebraically added to the measured value.

17.4 Group I/O (IO)

17.4.1 Out 1

0 IFn Visible with Relay , SSR circuit
Function OUT1
nonE
Disabled
HEAt
Heating Function
COOL
Cooling Function
AL1
Out alarm 1 Function
AL2
Out alarm 2 Function
AL3
Out alarm 3 Function

0 IFA Visible with ANALOGIC circuit
Function OUT1
nonE
Disabled
HEAt
Heating Function
COOL
Cooling Function
Sprt
SetPoint retransmission Function
PVrt
Measure retransmission Function

01E9 Visible with ANALOGIC circuit
TYPE OUTPUT OUT1
0 20
out 0-20 mA
4 20
out 4-20 mA
0 10
out 0-10 V
2 10
out 2-10 V

O1LS Visible with ANALOGIC circuit + O1Fn = retransmission
BOTTOM LIMIT OF RETRANSMISSION
Limits of span

O1HS Visible with ANALOGIC circuit + O1Fn = retransmission
TOP LIMIT OF RETRANSMISSION
Limits of span

17.4.2 OUT 2

02Fn Function OUT2

nonE
Disabled

HEAt
Heating Function

COOL
Cooling Function

AL1
Out alarm 1 Function

AL2
Out alarm 2 Function

AL3
Out alarm 3 Function

17.4.3 OUT 3 or Di 1

03Fn Visible with Relay , SSR circuit

Function OUT3

nonE

Disabled

HEAt

Heating Function

COOL

Cooling Function

AL1

Out alarm 1 Function

AL2

Out alarm 2 Function

AL3

Out alarm 3 Function

.1EY Visible with DI circuit, DI/O + O4Fn = none

Function Digital Input 2

nonE

Disabled

Auto

Select mode AUTO / MANUAL

tunE

Start selftune

SP

Select setpoint

ALrS

Alarm Reset

PSEL

Palette Selection

CAUTION:

For the proper functioning of the digital set parameters correctly in the menu **EHL**

03Fn

Visible with ANALOGIC circuit.

Function OUT3

nonE

Disabled

HEAt

Heating Function

COOL

Cooling Function

Sprt

SetPoint retransmission Function

PVrt

Measure retransmission Function

03Ey

Visible with ANALOGIC circuit

TYPE OUTPUT OUT3

0 20

Out 0-20 mA

4 20

Out 4-20 mA

0 10

Out 0-10 V

2 10

Out 2-10 V

03LS

Visible with ANALOGIC circuit + 03Fn = retransmission

BOTTOM LIMIT OF RETRANSMISSION

Limits of span

03HS

Visible with ANALOGIC circuit + 03Fn =

TOP LIMIT OF RETRANSMISSION

Limits of span

17.4.4 Out 4

04Fn Visible with RELE², DI, DI/O circuit
Function OUT4
nonE
Disabled
HEAt
Heating Function
COOL
Cooling Function
AL1
Out alarm 1 Function
AL2
Out alarm 2 Function
AL3
Out alarm 3 Function

,2t4 **Visibile Con Scheda DI, DI/O + O4Fn = none**
Function DIGITAL INPUT 2
nonE
Disabled
Auto
Select AUTO / MANUAL mode
tunE
Start selftune
SP
Setpoint select
ALrS
Alarm Reset
PSEL
Palette Select

CAUTION:

For the proper functioning of the digital Input set parameters correctly in the menu **EHL**

17.4.5 General

CLnd **Visibile with at least one output setted as Cooling (Double action)**

TYPE OF COOLING AGENT

Air

Air cooling

OIL

Oil cooling

H₂O

Water cooling

HAct **COOLING ACTION**

(with no out, cooling out and at least one relè or ssr out)

Rev

Reverse action

dir

Direct action

17.5 ALARM Group(*AL*)

17.5.1 Alarm 1

<i>AL1F</i>	ALARM1 FUNCTION (available only if O2Fn = AL1o) <i>nonE</i> Disabled <i>Proc</i> Process Alarm <i>band</i> Band Alarm <i>dEv</i> Deviation Alarm
<i>AL1n</i>	ALARM1 CONFIGURATION (available only if O2Fn = AL1o and AL1F <> none) <i>hA</i> High alarm with automatic reset <i>lA</i> Low alarm with automatic reset <i>hn</i> High alarm with manual reset <i>ln</i> Low alarm with manual reset
<i>AL1o</i>	ALARM1 ACTION (available only if O2Fn = AL1o and AL1F <> none) <i>d ir</i> Direct action (Out high in alarm condition) <i>rEv</i> Reverse action (Out high in normal condition)
<i>A1nS</i>	ALARM1 STANDBY FUNCTION (available only if O2Fn = AL1o and AL1F <> none) <i>oFF</i> Disabled <i>on</i> Abled

17.5.2 Alarm 2

AL2F	ALARM2 FUNCTION (available only if O3Fn = AL2o) none Disabled Proc Process Alarm band Band Alarm dev Deviation Alarm
AL2n	ALARM2 CONFIGURATION (available only if O3Fn = AL2o and AL2F <> none) hA High alarm with automatic reset lA Low alarm with automatic reset hI High alarm with manual reset lI Low alarm with manual reset
AL2o	ALARM2 ACTION (available only if O3Fn = AL2o and AL2F <> none) dir Direct action (Out high in alarm condition) rev Reverse action (Out high in normal condition)
AL2s	ALARM2 STANDBY FUNCTION (available only if O3Fn = AL2o and AL2F <> none) off Disabled on Abled

17.5.3 Alarm 3

AL3F **ALARM3 FUNCTION** (available only if O4Fn = AL3o)

nonE

Disabled

Proc

Process Alarm

bAnd

Band Alarm

dEv

Deviation Alarm

AL3n **ALARM3 CONFIGURATION** (available only if O4Fn = AL3o and AL3F <> none)

hA

High alarm with automatic reset

lA

Low alarm with automatic reset

hI

High alarm with manual reset

lI

Low alarm with manual reset

AL3o **ALARM3 ACTION** (available only if O4Fn = AL3o and AL2F <> none)

dIr

Direct action (Out high in alarm condition)

rEv

Reverse action (Out high in normal condition)

AL3s **ALARM3 STANDBY FUNCTION** (available only if O4Fn = AL3o e AL2F <> none)

oFF

Disabled

oN

Abled

17.6 Heating Break-Down Group (*HbdU*)

hCEn MEASUREMENT OF CURRENT of LEAKAGE AND BREAK-DOWN
oFF
Disabled
oN
Abled

hCEn SPAN LOAD CURRENT (available with HCEn = On)
Value between 10A e 100°

17.7 Loop break Group(*LbAL*)

lBa LOOP BREAK ALARM CONFIGURATION
d , 5
Disabled
Enb
Abled

lbdU LOOP BREAK DEVIATION ALARM (available with LBa = Enb)
Value between 0 e 500

lbt LOOP BREAK ALARM TIMER (available with LBa = Enb)
Value between 00.01 and 40.00 mm.ss

lbhS LOOP BREAK ALARM HYSTERESIS (available with LBa = Enb)
Value between 1 e 50

17.8 SELFTUNE Group(*tunE*)

t n F n **ENABLING SELFTUNE**

d i S

Disabled

E n b

Abled

r c E n **RELATIVE COOLING GAIN CALCULATION** (available only if O2Fn = Cool)

o F F

Not calculated from selftune

o n

calculated from selftune

h P b **UPPER LIMIT OF PROPORTIONAL BAND**

Valore compreso tra LPb1 o LPb2 e 100.0%

i P b 1 **LOWER LIMIT OF PROPORTIONAL BAND with heating/cooling**

(available if O2Fn = Cool)

Value between 1.5% and HPb

i P b 2 **LOWER LIMIT OF PROPORTIONAL BAND with OUT1 heating**

(available if O2Fn ≠ Cool)

Value between 1.0% and HPb

i t i **LOWER LIMIT INTEGRAL TIME**

Value between 00.01 and 02.00 mm.ss

17.9 SOFT START Group (*Soft*)

<i>SFFn</i>	SOFT START FUNCTION
<i>Enb</i>	Abled
<i>dis</i>	Disabled

<i>thSS</i>	INPUT THRESHOLD FOR ENABLING SOFT START
	Value between thr limits of span

<i>toi</i>	SOFT START TIMEOUT
	Value between 1 e 540 minuti.

17.10 Gruppo PARAMETRI VARI (*nisc*)

<i>nnFn</i>	MANUAL FUNCTION
<i>None</i>	None
<i>Autn</i>	Automatic / manual (out 0 (-100%) / 100%)
<i>OFF</i>	OUT1 = 0
<i>ISHu</i>	Show the load current

<i>Stnd</i>	STARTUP STATE
<i>Auto</i>	In automatic mode
<i>ShdJ</i>	Same settings of switch off : If in manual mode, the setting of power out it's the same when it was off.
<i>Shd0</i>	f in manual mode, the setting of power out it's 0.

SECF **CONDITION FOR OUTPUT SET TO VALUE OF SAFETY**

0

Standard – NO out set to value of safety.

1

Value of safety in *over-range* and *under-range*

2

Value of safety only in *over-range*

3

Value of safety only in *under-range*

SECO **VALUE OF SAFETY** (available only if SECF ≠ 0)

O2Fn = Cool

Value between -100% and 100%

O2Fn ≠ Cool

Value between 0% and 100%

cnTF **CONTROL ACTION**

P ,

Process controlled by algorithm PI

P ,d

Process controlled by algorithm PID

OnoF

Process controlled by algorithm ON/OFF

SPvS **SETPOINT VIEW**

FnSP

View of the final set point in normal operative conditions

oPSP

View of the operative set point in normal operative conditions

Filt **FILTER ON MEASURE**

None NO filter

1 sec

2

3

4

5

6

7

8

9

10

SPdr **DIRECT ENABLING MODE SP**

OFF MODE disabled

on MODE abled

17.11 RS485 Group (*r485*)

SErE **ENABLING RS485 COMMUNICATION**

oFF

Disabled

oN

Abled with Modbus protocol

AdD **DEVICE ADDRESS** (disabled if SErE = Off)

Value between *1 e 255*

bAuD **BAUD RATE** (disabled if SErE = Off)

Value between *600 e 115200* baud

PAR **BYTE FORMAT** (disabled if SErE = Off)

EUEn

8 bit with *even parity*

oDD

8 bit with *odd parity*

noNE

8 bit without *parity*

nbSt **SELECTION OF TABLE MODBUS ADDRESSES**

0 - 4

17.12 Default Configuratiov Group (*dEF*)

Eur Loading European parameters
OFF
No action
On
Loading

AmEr Loading American parameters
OFF
No action
On
Loading

17.13 Notes

- (1) The range of span must be greater (in absolute units) of:
 - 100 units for linear inputs
 - 300°C (550°F) for TC inputs
 - 100°C (200°F) for RTD inputs
- (2) If O2Fn = Cool the parameter O1AC is forced on “**rEV**”
- (3) The default value of cycle time **CY2** and **rC** (*relative cooling gain*) are adjusted according to the type of cooling agent selected:

	CY2	rC
Air	10 seconds	1.00
Oil	4 seconds	0.80
Water	2 seconds	0.40

The parameters CY2 and rC are automatically updated during the storing of the new value of PAL.

- (4) The dedicated out of signals Alarm2 / OUT1 break-down, OUT1 leakage current alarm and loop break alarm are in logic – OR.
- (5) For Band Alarm, H.A. and H.m. means *outside band alarm*.
L.A. and L.m. means *inside band alarm*.
- (6) If the alarm is programmed as band alarm or deviation, the standby function masks the alarm condition in startup and after a variation off set point until the value of process variable reaches the alarm threshold with hysteresis .
If it's a process alarm masks alarm conditions only during startup.
- (7) The alarm of break-down and leakage current are reported on OUT3
- (8) In the setting of the manual reset and action see AL2m and AL2o
- (9) At startup the device initializes the timer limit (tOL) of output by setting its output power OLH, if the value of process variable is below the threshold.

18 Serial communications

18.1 introduction to Modbus Protocol

This protocol half duplex takes a master and one or more slaves.

A single multidrop connection can support up to 128 devices.

The computer must be programmed to serve as a master that controls which slave can have access to the line. All other slaves are waiting. Each slave has a unique address from 1 to 255.

NOTE:

The numerical values in this text are expressed as:

Binary value if followed by b

Decimal value if not followed by any letter

Hexadecimal value if they are followed by h

The Modbus codes supported are:

Function Code 1 And 2: Reading Bits

Function Code 3 and 4: Reading Words

Function Code 5: Single Bit Writing

Function Code 6: Single Word Writing

Function Code 15: Writing Multiple Bits

Function Code 16: Multiple Words Writing.

The codes 1 – 2 can request up to 24 bits.

The code 15 can write up to 24 bits.

The codes 3 – 4 can request up to 64 words

The code 16 can write up to 64 words.

In case of error the instruments gives the following error code:

2	illegal address
3	Value out of bounds
9	illegal Number of bits or words requested
10	Bits or words not modifiable.

All the words and bits can be read in every situation.

Can only be changed if the instrument is in the condition described in column WRITE:

RT	During normal operation
Conf	During the configurations.
Calibr	During calibration operations
Always	Always

To move from one state to another must write in the word 503 a specific code to put an instrument in the desired condition:

0x5A	Configuration	The instrument show SEr Cnf
0xAA	Calibration	The instrument show SEr CAL
0x55	Test	The instrument show SEr tESt
0xA5	Run Time	The instrument returns to normal operation.

The following procedure are illegal RT > Conf , Conf > RT
RT > Calibr , Calibr > RT
RT > Test , Test > RT

To check the status of the single parameter you can control the bit at offset 5000

Bit 0	0=Invalid	1=Valid
Bit 7	0=Not Editable	1= Editable

Es: SP Add=100 Par Staus = 5100

18.2 TABLE 0

Address table for data exchange

18.3 WORDS ADDRESS

	Descriz.	Addr.	Read	Modif.	Note
SP	SP	100	Always	RT	
Stun	Pretune/Adaptive	101	Always	RT	0 = Excluded 1 = Included (a)
SP1	SP1	102	Always	RT	
rL	SP range low	103	Always	RT	
rH	SP range high	104	Always	RT	
SPu	SP rate up	105	Always	RT	1-100 (101 = Infinite)
SPd	SP rate down	106	Always	RT	1-100 (101 = Infinite)
mRSt	Alarm ACK	107	Always	RT	1 = alarm ACK (a)
AL1	Alarm 1 threshold	108	Always	RT	Only if AL1F <> None
HSA1	Alarm 1 hysteresis	109	Always	RT	Only if AL1F <> None
AL2	Alarm 2 threshold	110	Always	RT	Only if AL2F <> None
HSA2	Alarm 2 hysteresis	111	Always	RT	Only if AL2F <> None
AL3	Alarm 3 threshold	112	Always	RT	Only if AL3F <> None
HSA3	Alarm 1 hysteresis	113	Always	RT	Only if AL3F <> None
Pb	Proportional band	114	Always	RT	10 (15 w/C)/1000
HYS	Hysteresis	115	Always	RT	1/100 (only with CntF = 0)
Ti	Integral time	116	Always	RT	1/1200 (1201 = excluded)(only with CntF <> 0)
Td	Derivative time	117	Always	RT	1/600 (1 = excluded)(only for CntF = 2)
IP	Integral preload	118	Always	RT	0(-100 w/C)/100 (only with CntF <> 0)
rC	Relative cooling gain	119	Always	RT	20/100 (Note 3)
OLAP	OLAP	120	Always	RT	-20/50 (Note 3)
CY1	Output 1 cycle 1(10 relè)/2000	121	Always	RT	only with Out 1 <> mA
OLH	Output High Limit	122	Always	RT	0 (-100 w/C)/100
SOOut	Output security limit	123	Always	RT	0 (-100 w/C)/100
CY2	Output 2 cycle	124	Always	RT	1 (10 relay)/2000 (Note 3)
mp	Output max rate	125	Always	RT	1/25 (26 = step)
Hbd	Breakdown threshold	126	Always	RT	Only with HCEn = 1 (enabled)
HbdH	Breakdown hysteresis	127	Always	RT	Only with HCEn = 1 (enabled)
SCA	Leakage alarm threshold	128	Always	RT	Only with HCEn = 1 (enabled)

	Descriz.	Addr.	Read	Modif.	Note
mnOP	Tune operation mode	129	Always	RT	Only if I1tY or I2tY = 2 0 = Keyboard/serial 1 = switches
SPOP	SP operation mode	130	Always	RT	Only if I1tY or I2tY = 3 0 = Keyboard/serial 1 = switches
tnOP	Autotune operation mode	131	Always	RT	Only if I1tY or I2tY = 1 0 = Keyboard/serial 1 = switches
ArOP	Alarm ACK operat. mode	132	Always	RT	Only if I1tY or I2tY = 4 0 = Keyboard/serial 1 = switches
PSOP	Palette operation mode	133	Always	RT	Only if I1tY or I2tY = 5 0 = Keyboard/serial 1 = switches
RT	RTdefault loading	134	Always	RT	1 = load
Pb1	Proportional band 1	135	Always	RT	10(15 w/C)/1000
HYS1	Hysteresis 1	136	Always	RT	1/100 (only with CntF = 0)
Ti1	Integral time 1	137	Always	RT	1/1200 (1201 = excluded)(only with CntF <> 0)
Td1	Derivative time 1	138	Always	RT	1/600 (1 = excluded)(only for CntF = 2)
IP1	Integral preload 1	139	Always	RT	0(-100 w/C)/100 (only with CntF <> 0)
rC1	Relative cooling gain 1	140	Always	RT	20/100 (only with CntF <> 0 and O2Fn = Cool)
OLAP	OLAP 1	141	Always	RT	-20/50 (only with CntF <> 0 and O2Fn = Cool)
Pb2	Proportional band 2	142	Always	RT	10(15 w/C)/1000
HYS2	Hysteresis 2	143	Always	RT	1/100 (only with CntF = 0)
Ti2	Integral time 2	144	Always	RT	1/1200 (1201 = excluded)(only with CntF <> 0)
Td2	Derivative time 2	145	Always	RT	1/600 (1 = excluded)(only for CntF = 2)
IP2	Integral preload 2	146	Always	RT	0(-100 w/C)/100 (only with CntF <> 0)
rC2	Relative cooling gain 2	147	Always	RT	20/100 (only with CntF <> 0 and O2Fn = Cool)
OLAP	OLAP 2	148	Always	RT	-20/50 (only with CntF <> 0 and O2Fn = Cool)
Pb3	Proportional band 3	149	Always	RT	10(15 w/C)/1000
HYS3	Hysteresis 3	150	Always	RT	1/100 (only with CntF = 0)
Ti3	Integral time 3	151	Always	RT	1/1200 (1201 = excluded)(only with CntF <> 0)
Td3	Derivative time 3	152	Always	RT	1/600 (1 = excluded)(only for CntF = 2)
IP3	Integral preload 3	153	Always	RT	0(-100 w/C)/100 (only with CntF <> 0)
rC3	Relative cooling gain 3	154	Always	RT	20/100 (only with CntF <> 0 and O2Fn = Cool)
OLAP	OLAP 3	155	Always	RT	-20/50 (only with CntF <> 0 and O2Fn = Cool)
IntY	Input type	300	Always	Conf	Table 1
nDEC	Decimal point position	301	Always	Conf	Only for linear
LOSC	Low scale	302	Always	Conf	
HISC	High scale	303	Always	Conf	
OFFS	Input offset	304	Always	Conf	Only for TC and RTD

	Descriz.	Addr.	Read	Modif.	Note
O1Fn	Output 1 function	305	Always	Conf	0 = none 1 = heating 2 = cooling 3 = alarm 1 4 = alarm 2 5 = alarm 3
O1Fn	Out 1 function (uscita mA) 1 = heating	306	Always	Conf	0 = none 2 = cooling 3 = SP retransmission 4 = Pv retransmission
O1ty	Output 1 type	307	Always	Conf	0 = 0-20mA 1 = 4-20mA 2 = 0-10 V 3 = 2-10 V
O1LS	Output 1 retrasm. low scale	308	Always	Conf	
O1HS	Output 1 retrasm. high scale	309	Always	Conf	
O2Fn	Output 2 function	310	Always	Conf	0 = None 1 = heating 2 = cooling 3 = alarm 1 4 = alarm 2 5 = alarm 3
O3Fn	Output 3 function	312	Always	Conf	0 = none 1 = heating 2 = cooling 3 = alarm 1 4 = alarm 2 5 = alarm 3
O3Fn	Out 3 function (uscita mA)	313	Always	Conf	0 = none 1 = heating 2 = cooling 3 = SP retransmission 4 = Pv retransmission

	Descriz.	Addr.	Read	Modif.	Note
O3ty	Output 3 type	314	Always	Conf	0 = 0-20mA 1 = 4-20mA 2 = 0-10 V 3 = 2-10 V
O3LS	Output 3 retrasm. low scale	315	Always	Conf	
O3HS	Output 3 retrasm. high scale	316	Always	Conf	
I1tY	Input 1 type	317	Always	Conf	Note 7 Only with O3Fn = None 0 = None 1 = Auto/Manual 2 = Tune/Adaptive ON/OFF 3 = SP/SP1 selection 4 = Alarm reset 5 = Control table selection
O4Fn	Output 4 function	318	Always	Conf	0 = None 1 = heating 2 = cooling 3 = alarm 1 4 = alarm 2 5 = alarm 3
I2ty	Input 2 function	319	Always	Conf	Note 8 Only with O4Fn = None 0 = None 1 = Auto/Manual 2 = Tune/Adaptive ON/OFF 3 = SP/SP1 selection 4 = Alarm reset 5 = Control table selection
CLmd	Cooling mode	311	Always	Conf	Note 3 0 = Air 1 = Oil
HACt	Heating mode	361	Always	Conf	0 = Reverse 1 = Direct 2 = H2O

	Descriz.	Addr.	Read	Modif.	Note
AL1F	Alarm 1 function	320	Always	Conf	0 = None 1 = Process 2 = Band 3 = Deviation
AL1m	Alarm 1 operating mode	321	Always	Conf	0 = High (ACK Auto) 1 = Low (ACK Auto) 2 = High (ACK Manual) 3 = Low (ACK Manual)
AL1o	Alarm 1 action	322	Always	Conf	0 = Reverse 1 = Direct
A1mS	Alarm 1 stand by	323	Always	Conf	0 = ON 1 = OFF
AL2F	Alarm 2 function	324	Always	Conf	0 = None 1 = Process 2 = Band 3 = Deviation
AL2m	Alarm 2 operating mode	325	Always	Conf	0 = High (ACK Auto) 1 = Low (ACK Auto) 2 = High (ACK Manual) 3 = Low (ACK Manual)
AL2o	Alarm 2 action	326	Always	Conf	0 = Reverse 1 = Direct
A2mS	Alarm 2 stand by	327	Always	Conf	0 = ON 1 = OFF
AL3F	Alarm 3 function	328	Always	Conf	0 = None 1 = Process 2 = Band 3 = Deviation
AL3m	Alarm 3 operating mode	329	Always	Conf	0 = High (ACK Auto) 1 = Low (ACK Auto) 2 = High (ACK Manual) 3 = Low (ACK Manual)

	Descriz.	Addr.	Read	Modif.	Note
AL3o	Alarm 3 action	330	Always	Conf	0 = Reverse 1 = Direct
A3mS	Alarm 3 stand by	331	Always	Conf	0 = ON 1 = OFF
HCEn	Breakdown alarm enable	332	Always	Conf	0 = Disabled 1 = Enabled
HCHS	TA high scale	333	Always	Conf	5/1000 (Only with HCEn = 1)
LbAI	Loop alarm enable	334	Always	Conf	0 = Disabled 1 = Enabled
LbdU	Loop alarm deviation	335	Always	Conf	0/500 (Only with LbAI = 1)
Lbt	Loop alarm time	336	Always	Conf	0/600 (Only with LbAI = 1)
LbHS	Loop alarm hysteresis	337	Always	Conf	1/50 (Only with LbAI = 1)
TnFn	Tune enable	338	Always	Conf	0 = Disabled 1 = Enabled
rCEn	RC computed by tune	339	Always	Conf	0 = Disabled 1 = Enabled (Only with TnFn = 1)
HPb	Max PB computed by tune	340	Always	Conf	Only with TnFn = 1 LPb1/1000 with O2Fn <> Cool LPb2/1000 with O2Fn = Cool
LPb1	Min Pb with only Heat	341	Always	Conf	15/HPb (Only with TnFn = 1 and O2Fn <> Cool)
LPb2	Min Pb with Heat/Cool.	342	Always	Conf	10/HPb (Only with TnFn = 1 and O2Fn = Cool)
LTi	Min Ti computed by tune	343	Always	Conf	1/120 (Only with TnFn = 1)
SFFn	Soft start enable	344	Always	Conf	0 = Disabled 1 = Enabled
tHSS	Soft start threshold	345	Always	Conf	Only with SFFn = 1
tOL	Soft start time	346	Always	Conf	1/540 (Only with SFFn = 1)
mnFn	Manual function	347	Always	Conf	0 = None 1 = Auto/Manual 2 = OFF 3 = TA display
SECF	Condition for output safety value	348	Always	Conf	0 = None 1 = In over-range and under-range 2 = In over-range 3 = In under-range
SECO	Output safety value	349	Always	Conf	0(-100 w/C)/100 (only with SECF <> 0)

	Descriz.	Addr.	Read	Modif.	Note
CntF	Control action type	350	Always	Conf	0 = ON/OFF 1 = PID 2 = PI
SPUS	Displayed SP	351	Always	Conf	0 = Final SP 1 = Operative SP
SErE	RS485 enable	352	Always	Conf	0 = Disabled 1 = Enabled
Add	RS485 address	353	Always	Conf	Only with SErE = 1
BAud	RS485 BAud rate	354	Always	Conf	Only with SErE = 1
PAr	RS485 Bits	355	Always	Conf	Only with SErE = 1
EUr	Load Eur default	359	Always	Conf	1 = Load
AmEr	Load Amer default	360	Always	Conf	1 = Load
	Device status (automa)	503	Always	Always	Read 0 = Run time (set up) 1 =Configuration (keybaord) 2 = Run time (Home)(PV+SP) 3 = Run time Manual (PV+OUT) 4 = Run Time (Special) 5 = Lamp Test 6 =Calibration (keyboard) 7 =Configuration (serial) 8 =Calibration (serial) 9 =Test(serial) 10 =Calibration (Farm) 11 = Test (Farm) 12 =Configuration PSW 13 =Calibration PSW 14 = Exit 15 = Error Write 0x5A = SerialConfiguration 0xAA = SerialCalibration 0xA5 = Run time 0x55 = Serial Test
	PV in counts	504	Always	Never	Note 1
	PV	505	Always	Never	Note 1

Descriz.	Addr.	Read	Modif.	Note
Output value	506	Always	RT	only in manual mode
Output heat value	507	Always	Never	
Output cool value	508	Always	Never	Note 3
Operative SP	516	Always	Never	
Final SP	513	Always	RT	
TA value (O1 ON)	509	Always	Never	
Comp.TA value (O1 ON)	510	Always	Never	
TA value (O1 OFF)	511	Always	Never	
RJ measure (counts)	512	Always	Never	
RJ measure (degree)	517	Always	Never	
Out1 module code	518	Always	Never	Table 2
Out2 module code	519	Always	Never	Table 2
Out3 module code	520	Always	Never	Table 2
Out4 module code	521	Always	Never	Table 2
Control param. group selected by switches	514	Always	Never	
Control param. group selected by serial	515	Always	RT	0 = Standar Control Param Group (a) 1 = Control Param Group 1 2 = Control Param Group 2 3 = Control Param Group 3

Status word 522 Always RT

Bit	Desc
0	status tune (RW)
1	status adaptive (RW)
2	Status auto/manual (RW)
3	On off
4	status Out1 (RO)
5	status Out2 (RO)
6	status Out3 (RO)
7	status Out4 (RO)
8	status Alarm1 (RO)
9	status Alarm2 (RO)
10	status Alarm3 (RO)
11	status alarm breakdown (RO)
12	status alarm leakage (RO)
13	status alarm loop break (RO)
14	status alarm sensor failure (RO)
15	status alarm overrange (RO)

	Descriz.	Addr.	Read	Modif.	Note
	Test input	700	Always	Never	
	Test Output Status	702	Always	Never	
	TA value (counts)(O1 ON)	703	Always	Never	
	TA value (counts)O1 OFF)	704	Always	Never	
	SP/SP1 selection	705	Always	RT	0 = SP 1 = SP1 (Note 9)
tCL	Tc low value	900	Always	Calibr	Counts
tCH	TC high value	901	Always	Calibr	Counts
tCt	TC test	902	Always	Calibr	Counts normalized 0-30000
CJ	RJ value	903	Always	Calibr	Counts
tCJ	RJ value	904	Always	Calibr	degree*10
rtdL	RTD low value	905	Always	Calibr	Counts
rtdH	RTD high value	906	Always	Calibr	Counts
rtdt	TestRTD	907	Always	Calibr	Counts normalized 0-30000
mAL	mA low value	908	Always	Calibr	Counts
mAH	mA high value	909	Always	Calibr	Counts
mAt	Test mA	910	Always	Calibr	Counts normalized 0-30000
VL	V low value	911	Always	Calibr	Counts
VH	V high value	912	Always	Calibr	Counts
Vt	Test V	913	Always	Calibr	Counts normalized 0-30000
tAL	TA low value	914	Always	Calibr	Counts
tAH	TA high value	915	Always	Calibr	Counts
tAt	Test TA	916	Always	Calibr	Counts normalized 0-1000
deF	DefaultCalibr.	917	Always	Calibr	1 = load
Sert	Serial Test	920	Always	Test	
mbSt	Modbus table	921	Always	Conf	0-3
Stmd	Start mode	922	Always	Conf	0 = Auto 1 = As at shut down (if manual with the same power) 2 = As at shut down (if manual with tpower = 0)
FiLt	Filter time	926	Always	Conf	0-10
Spdr	SP direct edit enable	927	Always	Conf	0 = desable 1 = enable

18.4 BITS

Bit	Desc	Read	Modif		
101	Status Out 1	Always	Never	1 = ON	
102	Status Out 2	Always	Never	1 = ON	(a)(b)(c)
103	Status Out 3	Always	Never	1 = ON	(d)
104	Status Out 4	Always	Never	1 = ON	(e)
105	Status Allarme 1	Always	Never	1 = alarm	
106	Status Allarme 2	Always	Never	1 = alarm	
107	Status Allarme 3	Always	Never	1 = alarm	
108	Status Heater Breack (HB)	Always	Never	1 = alarm	
109	Status Loop Alarm	Always	Never	1 = alarm	
110	Status Pretune	Always	Never	0 = excluded 1 = included	
111	Status Adaptive	Always	Never	0 = excluded 1 = included	
112	Status Auto/Manual	Always	RT	0 = auto 1 = manual (Note 9)	
113	Status Input 1	Always	Never	0 = open 1 = closed	(f)
114	Status Input 2	Always	Never	0 = open 1 = closed	(g)
115	Selezione SP/SP1	Always	Never	0 = SP 1 = SP1	(h)
116	Status sensor break	Always	Never	1 = alarm	
117	Status Overrange	Always	Never	1 = alarm	
118	Status Underrange	Always	Never	1 = alarm	
119	Misura corrente Valida (HB)	Always	Never	1 = Valida 0 = to update	
120	Misura corrente Valida(SC)	Always	Never	1 = Valid 0 = to update	
121	Status Alm Leakage	Always	Never	1 = alarm	
122	ON/OFF	Always	RT		
500	Reserved				
502	Reserved				
503	Parameter Chanded	Always	Never	1 = if it change (is resetted when reading)	
504	Reserved				
505	Reserved				
506	Reserved				
507	Reserved				
508	Reserved				

NOTE:

- a. Valid only if present in the out module on Out 2
- b. Valid only if present in the out module on Out 2 e O2Fn = 1 (cooling out)
- c. Valid only if present in the out module on Out 2 <> mA/V e O2Fn = 1 (cooling out)
- d. Valid only if present in the out module on Out 3
- e. Valid only if present in the out module on Out 4
- f. Valid only if present in the out module or contact on Out 3
- g. Valid only if present in the out module or contact on Out 4
- h. Valid only if the switch from selection is not abled

18.5 TABLE 1 (WEST 6600)

The Table 1 Redirect only some of the parameters maintain compatibility the compatibility with the West 6600

For parameters that do not appear in the list refer to the table 0

WORDS ADDRESSES

Indirizzi	Nome	Read	Modif	Note
1	Measure	Always	Never	
2	SP	Always	RT	
3	Power	Always	RT se in manuale	
4	Reserved			
5	PB2	Always	RT	
6	PB1	Always	RT	
7	STATUS	Always	Never	
8	Integral	Always	RT	
9	Deriv	Always	RT	
10	TC1	Always	RT	
11	Scale range low	Always	Never	
12	Scale range high	Always	Never	
13	Alm1 Val	Always	RT	
14	Alm2 Val	Always	RT	
15	Manual reset	Always	RT	
16	Overlap	Always	RT	
17	Reserved			
18	Decim pos	Always	Never	
19	TC2	Always	RT	
20	PW Lim	Always	RT	
21	Act SP	Always	Never	
22	SP Hihg Lim	Always	RT	
23	SP Low Lim	Always	RT	
24	Reserved			
25	Input filt	Always	RT	
26	Input offs	Always	RT	
27	Reserved			
28	Reserved			
29	HB current H lim	Always	RT	
30	Reserved			
31	HB Low	Always	RT	
32	HB High	Always	RT	
33	Live current	Always	RT	
34	AM user key	Always	RT	
35	Alarm 1 hysteresis	Always	RT	

Indirizzi	Nome	Read	Modif	Note
36	Alarm 2 hysteresis	Always	RT	
37	Reserved			
38	Reserved			
39	Reserved			

18.6 Status Table (Word 7)

Bit	Desc		
0	Comm write en	RO	1 = Enable
1	Auto Man	RW	1 = Manual , 0= Auto
2	Self-Tune	RW	1 = Active, 0 = Not Active
3	Pre-Tune	RW	1 = Active, 0 = Not Active
4	Alarm 1 Status	RO	1 = Active, 0 = Not Active
5	Alarm 2 Status	RO	1 = Active, 0 = Not Active
6	Alarm 3 tatus	RO	1 = Active, 0 = Not Active
7	Par changed	RO	1 = parameter changed NOTE :reset after each reading of bit 7 or Word 7
8	On/off contr (standby)	RW	1 = OFF, 0 =ON
9	Reserved		
10	HB low	RO	1 = Active, 0 = Not Active
11	HB short Circuit	RO	1 = Active, 0 = Not Active
12	Reserved		
13	Reserved		
14	Reserved		
15	Reserved		

BITS

Bit	Desc	Read	Modif	
1	Comm write en	Always	Never	1 = Enable
2	Auto Man	Always	RT	1 = Manual , 0= Auto
3	Self-Tune	Always	RT	1 = Active, 0 = Not Active
4	Pre-Tune	Always	RT	1 = Active, 0 = Not Active
5	Alarm 1 Status	Always	Never	1 = Active, 0 = Not Active
6	Alarm 2 Status	Always	Never	1 = Active, 0 = Not Active
7	Alarm 3 tatus	Always	Never	1 = Active, 0 = Not Active
8	Par changed	Always	Never	1 = parameter changed NOTA: reset after each reading of bit 7 or Word 7
9	On/off contr (standby)	Always	RT	1 = OFF, 0 =ON
10	Reserved	Always	Never	
11	HB low	Always	Never	1 = Active, 0 = Not Active
12	HB short Circuit	Always	Never	1 = Active, 0 = Not Active
13	Reserved	Always	Never	
14	Reserved	Always	Never	
15	Reserved	Always	Never	
16	Reserved	Always	Never	

19 Default Parameter Loading

19.1 User procedure

In each operative mode (operative, programming and calibration) is possible at any time to invoke the set of default values to be assigned to their parameters.

19.2 Loading Default operative parameter

The performed procedure consists of the following steps:

- Press **func** key to enter in the edit menu.
- With Keys **▲** and **▼** select the group “deF” and press **FUNC**.
- On the upper display appears writing “rt”; On lower display “on”.
- Press **FUNC** key to load the default
- Press **MAN** key to cancel.

Setpoint	Lower range limit
Selftune	Disabled
Manual Reset of alarm condition	Off
Auxiliary Setpoint	Upper range limit
Software protection Key	Unlocked
Threshold Alarm 1	Lower range limit (process alarm) 0 (Band alarm or di deviation)
Hysteresis alarm 1	0.1%
Threshold Alarm 2	Lower range limit (process alarm) 0 (Band alarm or di deviation)
Hysteresis alarm 2	0.1%
Threshold Alarm 3	Lower range limit (process alarm) 0 (Band alarm or di deviation)
Hysteresis alarm 3	0.1%
Proportional band	4.0%
Hysteresis	0.5%
Integral time	04.00 (4 minutes)
Derivative time	01.00 (1 minut)
Integral preload	30 (Only one control Out) 0 (Two control Out)

Cycle time out1	15 seconds (relay) 4 seconds (SSR)
Cycle time out2	10 seconds (Cooling by air) 4 seconds (Cooling by oil) 2 seconds (Cooling by Water)
Relative cooling gain	1.00 (Cooling by air) 0.80 (Cooling by oil) 0.40 (Cooling by Water)
<i>Dead-band / overlap</i>	between
<i>Out heating / cooling</i>	0
Lower setpoint limit	Lower range Input limit
Upper setpoint limit	Upper range Input limit
<i>Rate-of-change</i> for positive changes of sp	Infinite
<i>Rate-of-change</i> for negative changes of sp	Infinite
Superiore Out Limiter	100%
Timeout soft-start	Infinito
Break-down alarm threshold out1	50.0% fo span value
Leakage alarm threshold out1	100.0% fo span value
Limit of output of control changes	Infinite

19.3 Default configuration parameter Loading

The performed procedure consists of the following steps:

- enter in configuration as described above.
- With Keys ▲ and ▼ select the group “deF” and press **FUNC**.
- With Keys ▲ e ▼ select the desired table type (european or american)
- Press **FUNC** key
- With Keys ▲ and ▼ select “on”
- Press **FUNC** key to load the default
- Press **MAN** key to cancel.

19.3.1 European table

Par	Desc	Val
Menu <i>inP</i>		
<i>intP</i>	Input type and range	<i>tC V</i> (-100 ↔ 1000 °C)
<i>ndEC</i>	Decimal point position	"----." (no decimals)
<i>LoSC</i>	Initial scale value for linear inputs	0
<i>HISC</i>	Full scale value for linear inputs	400
<i>oFFS</i>	Offset	0
Menu <i>io</i>		
<i>o1Fn</i>	OUT1 logic function	<i>HEAt</i> Heating
<i>o1FA</i>	OUT1 analogic function	<i>HEAt</i> Heating
<i>o1tY</i>	Output type 1 if analogic	<i>4-20</i> 4-20mA
<i>o1LS</i>	Lower limit for the retransmission	= <i>LoSC</i>
<i>o1HS</i>	Upper limit for the retransmission	= <i>HISC</i>
<i>o2Fn</i>	OUT2 logic function	<i>AL1</i> out allarm1
<i>o3Fn</i>	OUT3 logic function	<i>AL2</i> out allarm2
<i>i1tY</i>	Digital Input 1 Function	<i>Auto</i> Auto/Manual
<i>o3FA</i>	Analogic OUT3 Function	<i>PURt</i> Retransmission PV
<i>o3tY</i>	Output type 1 if analogic	<i>4-20</i> 4-20mA
<i>o3LS</i>	Lower limit for the retransmission	= <i>LoSC</i>
<i>o3HS</i>	Upper limit for the retransmission	= <i>HISC</i>
<i>o4Fn</i>	OUT4 function	<i>AL3</i> out alarm3
<i>i2tY</i>	Digital Input 2 Function	<i>SP</i> 2° SP
<i>CLnd</i>	Type of cooling agent	<i>Air</i> Air
<i>HACt</i>	OUT1 Action	<i>rEU</i> reverse

Menu <i>AL</i>		
<i>AL1F</i>	ALARM1 Function	<i>dEυ</i> Deviation+ automatic reset
<i>AL1n</i>	ALARM1 Configuration	<i>LA</i> Low + automatic reset
<i>AL1o</i>	ALARM1 Action	<i>d ir</i> Direct
<i>A1nS</i>	ALARM1 standby Function	Off
<i>AL2F</i>	ALARM2 Function	<i>dEυ</i> Deviation+ automatic reset
<i>AL2n</i>	ALARM2 Configuration	<i>LA</i> Low + automatic reset
<i>AL2o</i>	ALARM2 Action	<i>d ir</i> Direct
<i>A2nS</i>	ALARM2 standby Function	Off
<i>AL3F</i>	ALARM3 Function	<i>dEυ</i> Deviation+ automatic reset
<i>AL3n</i>	ALARM3 Configuration	<i>LA</i> Low + automatic reset
<i>AL3o</i>	ALARM3 Action	<i>d ir</i> Direct
<i>A3nS</i>	ALARM3 standby Function	Off
Menu <i>Hbdu</i>		
<i>HCEn</i>	<i>break-down and leakage current measure</i>	Off
<i>HCHS</i>	Full scale value for load current	30
Menu <i>LbAL</i>		
<i>LbAL</i>	<i>loop break alarm configuration</i>	<i>d is</i> Disabled
<i>lbdυ</i>	<i>loop break alarm deviation</i>	50
<i>lbt</i>	<i>loop break time alarm</i>	10.00 mm.ss
<i>lbhS</i>	<i>loop break hysteresis alarm</i>	10
Menu <i>tunE</i>		
<i>tnFn</i>	Selftune enabling	<i>tnFn</i> Abled
<i>rCEn</i>	calculation of <i>relative cooling gain</i>	OFF Disabled
<i>hPb</i>	Superior Limit of proportional band	30.0%

<i>IPb1</i>	Lower Limit of proportional band with heating / cooling	1.5%
<i>IPb2</i>	Lower Limit of proportional band with OUT1 heating	1.0%
<i>Iti</i>	Lower Limit of integral time	00.50 mm.ss
Menu <i>Soft</i>		
<i>SFFn</i>	SOFT START FUNCTION	<i>dis</i> Disabled
<i>thSS</i>	Threshold input for enabling soft start	0
<i>toi</i>	Soft start timeout	0
Menu <i>nisc</i>		
<i>nnFn</i>	MANUAL function	<i>OFF</i> On/Off Function
<i>Stnd</i>	Alarm State at Startup	<i>Shdu</i> Reload last state
<i>SECF</i>	Condition for output set to the security value	0 no output setted at safety value
<i>SEco</i>	Security value	0
<i>CntF</i>	Control of Action	<i>Pid</i> Cotrol tipe PID
<i>SPUS</i>	Setpoint view	<i>FnSP</i> Final Setpoint
<i>Fit</i>	Filter on measure	1
<i>SPdr</i>	Direct modify enabling SP	<i>On</i> Abled
Menu <i>r485</i>		
<i>SErE</i>	Communication RS485 Abled	<i>On</i> Abled with modbus protocol
<i>Add</i>	Device address	1
<i>bAud</i>	Baud rate	<i>19.2</i> 19200Baud
<i>PAR</i>	Parità checksum	<i>none</i> 8 bit with no parity
<i>nbSt</i>	MODBUS table selection	0

19.3.2 Americana table

Par	Desc	Val
Menu <i>inP</i>		
<i>intP</i>	Input type and range	<i>tC u F</i> (-150 ↔ 1830 °F)
<i>ndEC</i>	Decimal point position	"----." (no decimal)
<i>LoSC</i>	Initial scale value for linear inputs	0
<i>HISC</i>	Full scale value for linear inputs	1830
<i>oFFS</i>	Offset	0
Menu <i>io</i>		
<i>o1Fn</i>	OUT1 logic function	<i>HEAt</i> Heating
<i>o1FA</i>	OUT1 analogic function	<i>HEAt</i> Heating
<i>o1tY</i>	Output type 1 if analogic	<i>4-20</i> 4-20mA
<i>o1LS</i>	Lower limit for the retransmission	= <i>LoSC</i>
<i>o1HS</i>	Upper limit for the retransmission	= <i>HISC</i>
<i>o2Fn</i>	OUT2 logic function	<i>AL1</i> out allarm1
<i>o3Fn</i>	OUT3 logic function	<i>AL2</i> out allarm2
<i>i1tY</i>	Digital Input 1 Function	<i>Auto</i> Auto/Manual
<i>o3FA</i>	Analogic OUT3 Function	<i>PURt</i> Retransmission PV
<i>o3tY</i>	Output type 1 if analogic	<i>4-20</i> 4-20mA
<i>o3LS</i>	Lower limit for the retransmission	= <i>LoSC</i>
<i>o3HS</i>	Upper limit for the retransmission	= <i>HISC</i>
<i>o4Fn</i>	OUT4 function	<i>AL3</i> out alarm3
<i>i2tY</i>	Digital Input 2 Function	<i>SP</i> 2° SP
<i>CLnd</i>	Type of cooling agent	<i>Air</i> Air
<i>HACt</i>	OUT1 Action	<i>rEU</i> riverse

Menu <i>AL</i>		
<i>AL1F</i>	ALARM1 Function	<i>dEυ</i> Deviation+ automatic reset
<i>AL1n</i>	ALARM1 Configuration	<i>LA</i> Low + automatic reset
<i>AL1o</i>	ALARM1 Action	<i>d ir</i> Direct
<i>A1nS</i>	ALARM1 standby Function	Off
<i>AL2F</i>	ALARM2 Function	<i>dEυ</i> Deviation+ automatic reset
<i>AL2n</i>	ALARM2 Configuration	<i>LA</i> Low + automatic reset
<i>AL2o</i>	ALARM2 Action	<i>d ir</i> Direct
<i>A2nS</i>	ALARM2 standby Function	Off
<i>AL3F</i>	ALARM3 Function	<i>dEυ</i> Deviation+automaticreset
<i>AL3n</i>	ALARM3 Configuration	<i>LA</i> Low + automatic reset
<i>AL3o</i>	ALARM3 Action	<i>d ir</i> Direct
<i>A3nS</i>	ALARM3 standby Function	Off
Menu <i>Hbdu</i>		
<i>HCEn</i>	<i>break-down and leakage current measure</i>	Off
<i>HCHS</i>	Full scale value for load current	30
Menu <i>LbAL</i>		
<i>LbAL</i>	<i>loop break alarm configuration</i>	<i>d , S</i> Disabled
<i>lbdυ</i>	<i>loop break alarm deviation</i>	50
<i>lbt</i>	<i>loop break time alarm</i>	10.00 mm.ss
<i>lbhS</i>	<i>loop break hysteresis alarm</i>	10
Menu <i>tunE</i>		
<i>tnFn</i>	Selftune enabling	<i>tnFn</i> Abled
<i>rCEn</i>	calculation of <i>relative cooling gain</i>	OFF Disabled
<i>hPb</i>	Superior Limit of proportional band	30.0%

<i>IPb1</i>	Lower Limit of proportional band with heating / cooling	1.5%
<i>IPb2</i>	Lower Limit of proportional band with OUT1 heating	1.0%
<i>It1</i>	Lower Limit of integral time	00.50 mm.ss
Menu <i>Soft</i>		
<i>SFFn</i>	SOFT START FUNCTION	<i>d15</i> Disabled
<i>th55</i>	Threshold input for enabling soft start	0
<i>to1</i>	Soft start timeout	0
Menu <i>n,SC</i>		
<i>nnFn</i>	MANUAL function	<i>OFF</i> On/Off Function
<i>Stnd</i>	Alarm State at Startup	<i>ShdJ</i> Reload last state
<i>SECF</i>	Condition for output set to the security value	0 no output setted at safety
<i>SEco</i>	Security value	0
<i>CntF</i>	Control of Action	<i>Pid</i> Control tipe PID
<i>SPUS</i>	Setpoint view	<i>FnSP</i> Final Setpoint
<i>Filt</i>	Filter on measure	1
<i>SPdr</i>	Direct modify enabling SP	<i>On</i> Abled
Menu <i>r485</i>		
<i>SErE</i>	Communication RS485 Abled	<i>On</i> Abled with modbus
<i>Add</i>	Device address	1
<i>bAud</i>	Baud rate	<i>19.2</i> 19200Baud
<i>PAR</i>	Parità checksum	<i>nonE</i> 8 bit with no parity
<i>7bSt</i>	MODBUS table selection	0

