USER'S MANUAL
Rev. 2/2016

00001

Revo TC 2PH

Temperature Controller

Part 2

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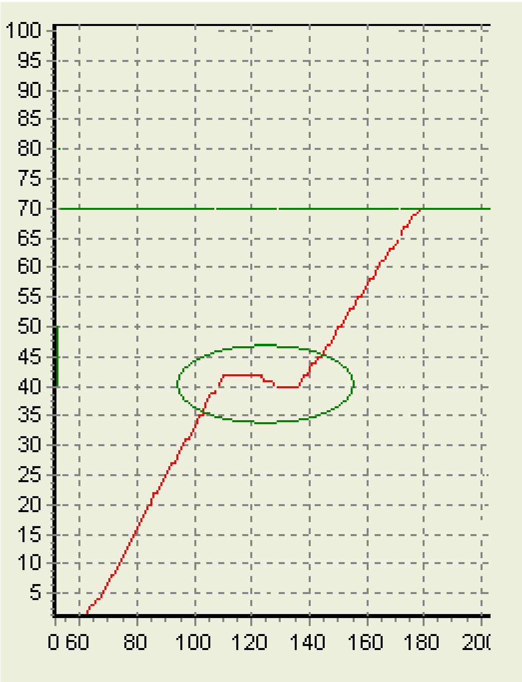
15 SELF-TUNING Algorithms

The instrument implements two different algorithms of self-tuning

- PreTune
- SelfTune

15.1 PreTune



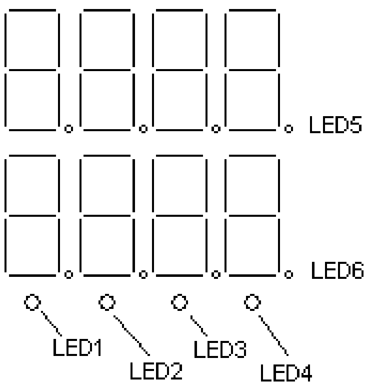
Allows to calculates a first approximation of the parameters of PID controller by induction of instability in the controlled process: the control output is increased to the maximum value until it reaches a certain error (SP-PV, typically between 5% and 10% of span) before being brought to its minimum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

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

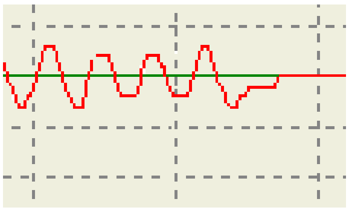
The Pre-Tune function is automatically enabled at the end of calculation or change of setpoint value, it's not inserted if the difference between set and measured temperature is below 20% of span value.

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

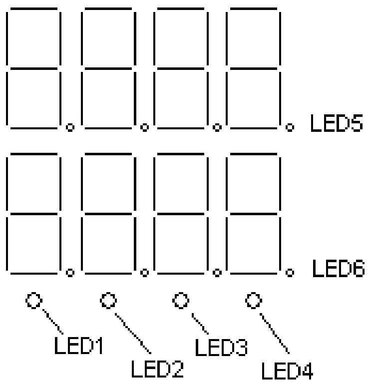
When PRETUNE is active **LED6** is flashing.



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 alway enabled but works only when is between a range of +/- 4% of the span value.
To disabile self-tuning functiond set the paramente 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 ben viewed only without possibilità 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.

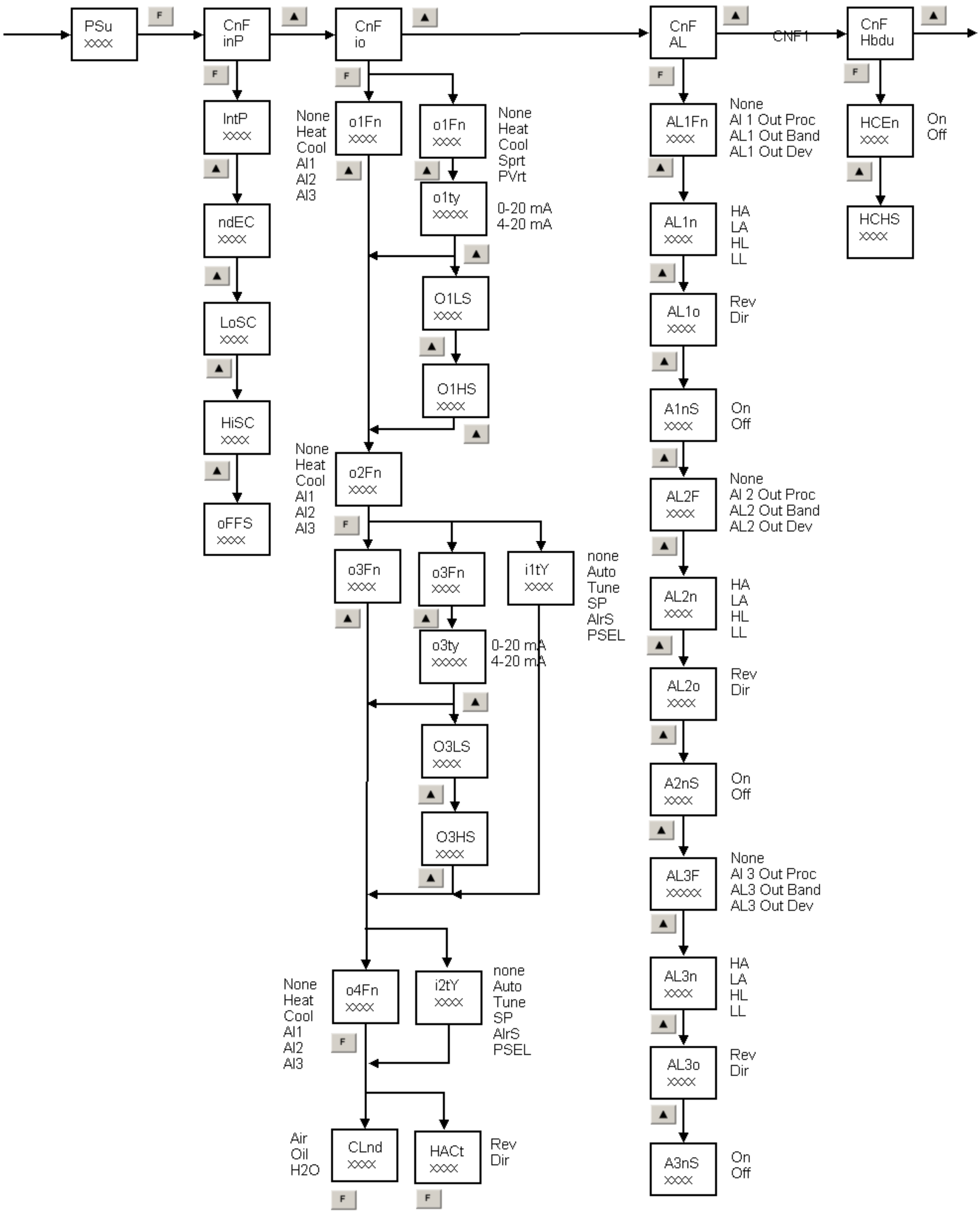


Figure 1: Sequence Diagram Programming - part A

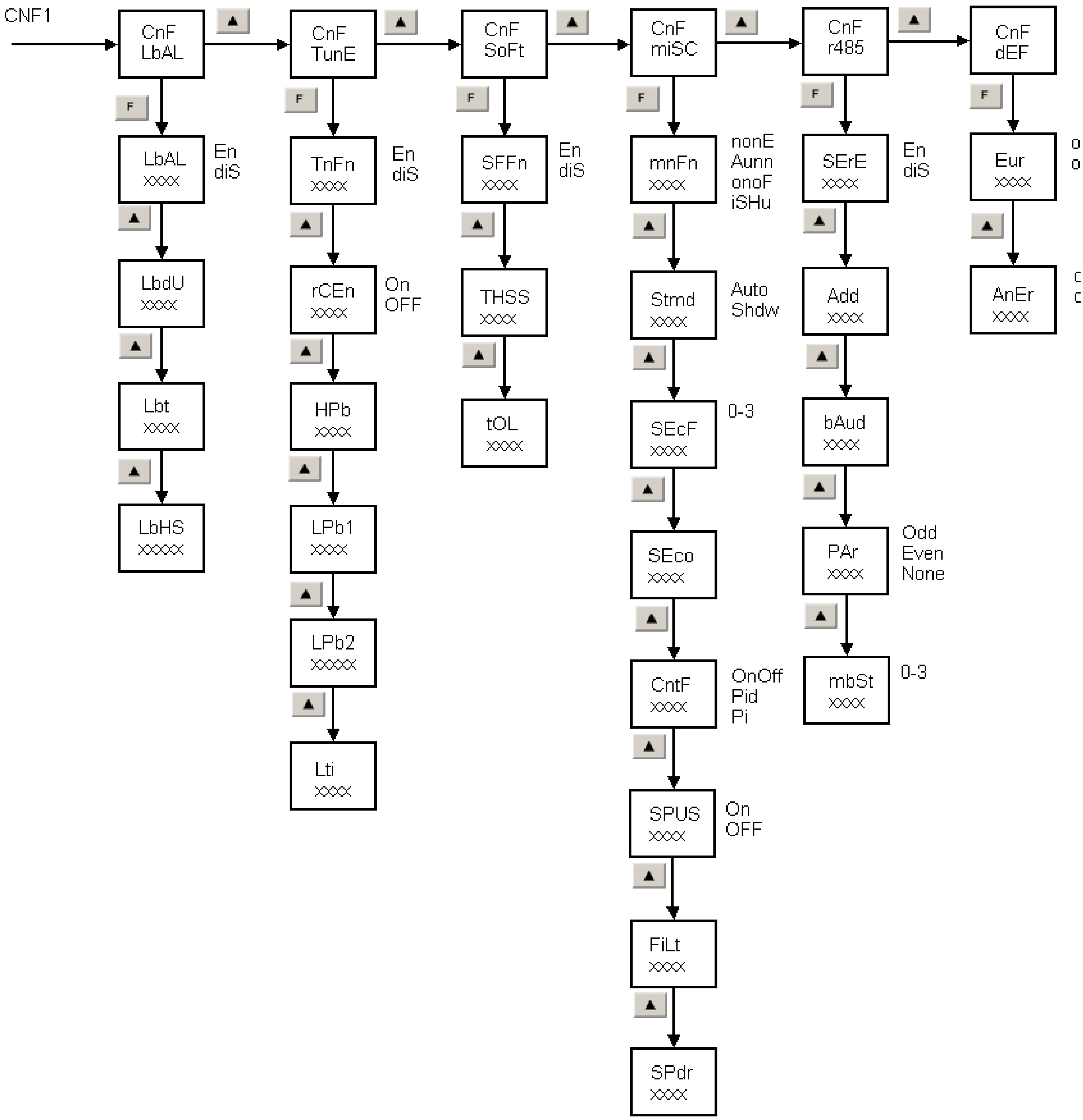


Figure 2: Sequence Diagram Programming - part B

17.3 Group INPUT (inP)

InTY **Typology of input and range**

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

ndEC — **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.

HiSc — **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

O1Fn	**Visible with Relay , SSR circuit** **Function OUT1** nonE Disabled **H E A t** Heating Function **COOL** Cooling Function **AL1** Out alarm 1 Function **AL2** Out alarm 2 Function **AL3** Out alarm 3 Function
O1FA	**Visible with ANALOGIC circuit** **Function OUT1** nonE Disabled **H E A t** Heating Function **COOL** Cooling Function **Sprt** SetPoint retransmission Function **PVrt** Measure retransmission Function

O1tY	**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

O2Fn	**Function OUT2** nonE Disabled **H E A t** 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

O3Fn	**Visible with Relay , SSR circuit** **Function OUT3** nonE Disabled **H E A t** Heating Function **COOL** Cooling Function **AL1** Out alarm 1 Function **AL2** Out alarm 2 Function **AL3** Out alarm 3 Function
i1tY	**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 EHt

O3Fn	**Visible with ANALOGIC circuit.**
	Function OUT3
	nonE
	Disabled
	H E A t
	Heating Function
	COOL
	Cooling Function
	Sprt
	SetPoint retransmission Function
	PVrt
	Measure retransmission Function
O3tY	**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
O3LS	**Visible with ANALOGIC circuit + O3Fn = retransmission**
	BOTTOM LIMIT OF RETRANSMISSION
	Limits of span
O3HS	**Visible with ANALOGIC circuit + O3Fn =**
	TOP LIMIT OF RETRANSMISSION
	Limits of span

17.4.4 Out 4

O4Fn	**Visible with RELE', DI, DI/O circuit** **Function OUT4** nonE Disabled **H E A t** Heating Function **COOL** Cooling Function **AL1** Out alarm 1 Function **AL2** Out alarm 2 Function **AL3** Out alarm 3 Function
i2tY	**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 EHt

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)** rEu Reverse action dir Direct action

17.5 ALARM Group(AL)

17.5.1 Alarm 1

AL1F	**ALARM1 FUNCTION** (available only if O2Fn = AL1o) nonE Disabled Proc Process Alarm bAnd Band Alarm dEu Deviation Alarm
AL1n	**ALARM1 CONFIGURATION** (available only if O2Fn = AL1o and AL1F <> none) hA High alarm with automatic reset 1A Low alarm with automatic reset hn High alarm with manual reset Ln Low alarm with manual reset
AL1o	**ALARM1 ACTION**(available only if O2Fn = AL1o and AL1F <> none) dir Direct action (Out high in alarm condition) rEu Reverse action (Out high in normal condition)
A1nS	**ALARM1 STANDBY FUNCTION** (available only if O2Fn = AL1o and AL1F <> none) oFF Disabled on Abled

17.5.2 Alarm 2

AL2F	**ALARM2 FUNCTION** (available only if O3Fn = AL2o) nonE Disabled Proc Process Alarm bAnd Band Alarm dEu 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) rEu Reverse action (Out high in normal condition)

A2nS	**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 dEu 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) rEu Reverse action (Out high in normal condition)
A3nS	**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** dis 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)

tnFn	**ENABLING SELFTUNE** dіS Disabled Enb Abled
rcEn	**RELATIVE COOLING GAIN CALCULATION** (available only if O2Fn = Cool) oFF Not calculated from selftune on calculated from selftune
hPb	**UPPER LIMIT OF PROPORTIONAI BAND** Valore compreso tra LPb1 o LPb2 e 100.0%
lPb1	**LOWER LIMIT OF PROPORTIONAL BAND with heating/cooling** (available if O2Fn = Cool) Value between 1.5% and HPb
lPb2	**LOWER LIMIT OF PROPORTIONAL BAND with OUT1 heating** (available if O2Fn ≠ Cool) Value between 1.0% and HPb
ltі	**LOWER LIMIT INTEGRAL TIME** Value between 00.01 and 02.00 mm.ss

17.9 SOFT START Group (SoFt)

SFFn — **SOFT START FUNCTION**

- Enb — Abled
- d iS — Disabled

thSS — **INPUT THRESHOLD FOR ENABLING SOFT START**

Value between thr limits of span

to 1 — **SOFT START TIMEOUT**

Value between 1 e 540 minuti.

17.10 Gruppo PARAMETRI VARI (n iSC)

nnFn — **MANUAL FUNCTION**

nonE

None

Au7n

Automatic / manual (out 0 (-100%) / 100%)

OFF

OUT1 = 0

ISHu

Show the load current

St7d — **STARTUP STATE**

Auto

In automatic mode

ShdJ

Same settings of switch off :

If in manual mode, the setting of power out it's the same when it was off.

Shd0

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 I

Process controlled by algorithm PI

P Id

Process controlled by algorithm PID

OnoF

Process controlled by algorithm ON/OFF

SPuS — **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*
7bSt	**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 automaticaly 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 instument show SEr Cnf
0xAA	Calibration	The instument show SEr CAL
0x55	Test	The instument 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	121	Always	RT	only with Out 1 <> mA
	1(10 relè)/2000				
OLH	Output High Limit	122	Always	RT	0 (-100 w/C)/100
SOut	Output security limit	123	Always	RT	0 (-100 w/C)/100
CY2	Output 2 cycle	124	Always	RT	1 (10 relay)/2000 (Note 3)
rnp	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 = switchs
SPOP	SP operation mode	130	Always	RT	Only if I1tY or I2tY = 3
					0 = Keyboard/serial 1 = switchs
tnOP	Autotune operation mode	131	Always	RT	Only if I1tY or I2tY = 1
					0 = Keyboard/serial 1 = switchs
ArOP	Alarm ACK operat. mode	132	Always	RT	Only if I1tY or I2tY = 4
					0 = Keyboard/serial 1 = switchs
PSOP	Palette operation mode	133	Always	RT	Only if I1tY or I2tY = 5
					0 = Keyboard/serial 1 = switchs
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)	306	Always	Conf	0 = none
	1 = heating				
					2 = cooling
					3 = SP retrasmission
					4 = Pv retrasmission
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 retrasmission
					4 = Pv retrasmission

	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)
LbAl	Loop alarm enable	334	Always	Conf	0 = Disabled 1 = Enabled
LbdU	Loop alarm deviation	335	Always	Conf	0/500 (Only with LbAl = 1)
Lbt	Loop alarm time	336	Always	Conf	0/600 (Only with LbAl = 1)
LbHS	Loop alarm hysteresis	337	Always	Conf	1/50 (Only with LbAl = 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 switchs	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/manaual (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 contol 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)
Dead-band / overlap	**between**
Out *heating / cooling*	**0**
Lower setpoint limit	**Lower range Input limit**
Upper setpoint limit	**Upper range Input limit**
Rate-of-change for positive changes of sp	**Infinite**
Rate-of-change 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 inP		
intP	Input type and range	tC J (-100 ↔ 1000 °C)
ndEC	Decimal point position	"----." (no decimals)
LoSC	Initial scale value for linear inputs	0
HiSC	Full scale value for linear inputs	400
oFFS	Offset	0
Menu io		
o1Fn	OUT1 logic function	hEAt Heating
o1FA	OUT1 analogic function	hEAt Heating
o1tY	Output type 1 if analogic	4-20 4-20mA
o1LS	Lower limit for the retransmission	= LoSC
o1HS	Upper limit for the retransmission	= HiSC
o2Fn	OUT2 logic function	AL1 out allarm1
o3Fn	OUT3 logic function	AL2 out allarm2
i1tY	Digital Input 1 Function	Auto Auto/Manual
o3FA	Analogic OUT3 Function	PVrt Retransmission PV
O3tY	Output type 1 if analogic	4-20 4-20mA
o3LS	Lower limit for the retransmission	= LoSC
o3HS	Upper limit for the retransmission	= HiSC
o4Fn	OUT4 function	AL3 out alarm3
i2tY	Digital Input 2 Function	SP 2° SP
CLnd	Type of cooling agent	Air Air
HACt	OUT1 Action	rEV reverse

Menu AL		
AL1F	ALARM1 Function	dEu Deviation+ automatic reset
AL1n	ALARM1 Configuration	LA Low + automatic reset
AL1o	ALARM1 Action	dir Direct
A1nS	ALARM1 standby Function	**Off**
AL2F	ALARM2 Function	dEu Deviation+ automatic reset
AL2n	ALARM2 Configuration	LA Low + automatic reset
AL2o	ALARM2 Action	dir Direct
A2nS	ALARM2 standby Function	**Off**
AL3F	ALARM3 Function	dEu Deviation+ automatic reset
AL3n	ALARM3 Configuration	LA Low + automatic reset
AL3o	ALARM3 Action	dir Direct
A3nS	ALARM3 standby Function	**Off**
Menu Hbdu		
HCEn	*break-down* and *leakage current measure*	**Off**
HCHS	Full scale value for load current	**30**
Menu LbAL		
LbAL	*loop break* alarm configuration	diS Disabled
Ibdu	*loop break* alarm deviation	**50**
Ibt	*loop break* time alarm	**10.00 mm.ss**
IbhS	loop break hysteresis alarm	**10**
Menu tunE		
tnFn	Selftune enablng	tnFn Abled
rCEn	calculation of *relative cooling gain*	OFF Disabled
hPb	Superior Limit of proportional band	**30.0%**

1Pb1	Lower Limit of proportional band with *heating / cooling*	**1.5%**
1Pb2	Lower Limit of proportional band with OUT1 *heating*	**1.0%**
1ti	Lower Limit of integral time	**00.50 mm.ss**
Menu SoFt		
SFFn	**SOFT START FUNCTION**	diS Disabled
thSS	Threshold input for enabling soft start	**0**
to1	Soft start timeout	**0**
Menu niSC		
nnFn	MANUAL function	OFF On/Off Function
Stnd	**Alarm State at Startup**	Shdu Reload last state
SECF	Condition for output set to the security value	**0** no otput setted at safety value
SEco	Security value	**0**
CntF	Control of Action	Pid Cotrol tipe PID
SPUS	Setpoint view	FnSP Final Setpoint
Fi1t	**Filter on measure**	**1**
SPdr	**Direct modify enabling SP**	On Abled
Menu r485		
SErE	Communication RS485 Abled	On Abled with modbus protocol
Add	Device address	**1**
bAud	Baud rate	19.2 19200Baud
PAr	Parità checksum	nonE 8 bit with no parity
7bSt	**MODBUS table selection**	**0**

19.3.2 Americana table

Par	Desc	Val
Menu inP		
intP	Input type and range	tC J F (**-150 ↔ 1830 °F**)
ndEC	Decimal point position	"----." (no decimal)
LoSC	Initial scale value for linear inputs	0
HiSC	Full scale value for linear inputs	1830
oFFS	Offset	0
Menu iO		
o1Fn	OUT1 logic function	hEAt Heating
o1FA	OUT1 analogic function	hEAt Heating
o1tY	Output type 1 if analogic	4-20 4-20mA
o1LS	Lower limit for the retransmission	= LoSC
o1HS	Upper limit for the retransmission	= HiSC
o2Fn	OUT2 logic function	AL1 out allarm1
o3Fn	OUT3 logic function	AL2 out allarm2
i1tY	Digital Input 1 Function	Auto Auto/Manual
o3FA	Analogic OUT3 Function	PUrt Retransmission PV
O3tY	Output type 1 if analogic	4-20 4-20mA
o3LS	Lower limit for the retransmission	= LoSC
o3HS	Upper limit for the retransmission	= HiSC
o4Fn	OUT4 function	AL3 out alarm3
i2tY	Digital Input 2 Function	SP 2° SP
CLnd	Type of cooling agent	Air Air
HACt	OUT1 Action	rEU riverse

Menu AL		
AL1F	ALARM1 Function	dEu Deviation+ automatic reset
AL1n	ALARM1 Configuration	LA Low + automatic reset
AL1o	ALARM1 Action	dir Direct
A1nS	ALARM1 standby Function	**Off**
AL2F	ALARM2 Function	dEu Deviation+ automatic reset
AL2n	ALARM2 Configuration	LA Low + automatic reset
AL2o	ALARM2 Action	dir Direct
A2nS	ALARM2 standby Function	**Off**
AL3F	ALARM3 Function	dEu Deviation+automaticreset
AL3n	ALARM3 Configuration	LA Low + automatic reset
AL3o	ALARM3 Action	dir Direct
A3nS	ALARM3 standby Function	**Off**
Menu Hbdu		
HCEn	*break-down* and *leakage current measure*	**Off**
HCHS	Full scale value for load current	**30**
Menu LbAL		
LbAL	*loop break* alarm configuration	diS Disabled
1bdu	*loop break* alarm deviation	**50**
1bt	*loop break* time alarm	**10.00 mm.ss**
1bhS	*loop break* hysteresis alarm	**10**
Menu tunE		
tnFn	Selftune enablng	tnFn Abled
rCEn	calculation of *relative cooling gain*	OFF Disabled
hPb	Superior Limit of proportional band	**30.0%**

IPb1	Lower Limit of proportional band with *heating / cooling*	**1.5%**
IPb2	Lower Limit of proportional band with OUT1 *heating*	**1.0%**
Iti	Lower Limit of integral time	**00.50 mm.ss**
Menu SoFt		
SFFn	**SOFT START FUNCTION**	diS Disabled
thSS	Threshold input for enabling soft start	**0**
to I	Soft start timeout	**0**
Menu niSC		
nnFn	MANUAL function	OFF On/Off Function
Stnd	**Alarm State at Startup**	ShdU Reload last state
SECF	Condition for output set to the security value	**0** no otput setted at safety
SEco	Security value	**0**
CntF	Control of Action	PiD Cotrol tipe PID
SPUS	Setpoint view	FnSP Final Setpoint
FiIt	**Filter on measure**	**1**
SPdr	**Direct modify enabling SP**	On Abled
Menu r485		
SErE	Communication RS485 Abled	On Abled with modbus
Add	Device address	**1**
bAud	Baud rate	19.2 **19200Baud**
PAr	Parità checksum	nonE 8 bit with no parity
MbSt	**MODBUS table selection**	**0**

USER'S MANUAL
Rev. 07/2010

REVO TC
TEMPERATURE CONTROLLER

2 Part

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20 Calibration Procedure

20.1 Description

From The operating mode you can access the calibration mode by pressing **FUNC** + ▼ keys for at least ***3 seconds*** and by entering the appropriate password protection (upper disply shows ***"PSuC"***),
The value have to be settede at velue ***"5"*** by ▲ and ▼ keys, and confermed by **FUNC KEY**.
The lower display show
Il display inferiore visualizza the identifier of the actual group, while the upper display show the string *"CAL"* permanently: The keys▲ and ▼ allows to choose the group to calibrate, the **FUNC** key allows to enter in the active group.
For each calibration point in the group selected, the upper display will show the ID parameter while the lower display shows the currently stored value: to switch to other parameters of the group acts on the ▲ and ▼ keys.
By pressing the **FUNC** key allows to enter into calibration mode of the parameter shown (the upper display starts flashing).
The lower display will show the values (in count) read from the conversion circuit.
The value can get to 30000,so the counts are displayed on both displays.
To end the calibration process, press **MAN** until appears on the upper display END and select YES: By selecting NO the instrument returns to the first group available.

20.2 Guidelines for calibration

For an accurate calibration proceed as follows:
a) - To calibrate the instrument must be mounted in its case, to obtain a stable internal temperature.
b) - The ambient temperature must be stable. Should be avoided all the variations due to the temperature conditioner or other.
c) - The relative humidity must not exceed 70%.
d) -The instrument must be switched on for at least 20 minutes.
e) - If possibile work in ambient without electromagnetic interference.
f) - During calibration, connect an input at a time.

For calibration is necessary to use calibrators with the following resolutions:

ACCURACY
1) For Current Input + 0.025% output + 0.0025% range + 0.01 mA
2) For voltage inputs: + 0.005% output + 0.001% range + 5 mV
3) For TC inputs: + 0.005% output + 0.001% range + 5 mV
4) For RTD inputs: + 0.02 % + 0.0025 W/decade.
5) For cold junction compensation: better than 0.1 °C

20.3 Calibration from keypad

The calibration parameters are divided into groups.

Each group includes two parameters (initial scale and full scale) and one control point.

Follows a list of groups of calibration:

A) Input TC
B) Cold junction
C) Input RTD
D) Linear Input mA
E) Linear input 10 V
F) Current Input TA
G) Default configuration parameter loading

NOTE:

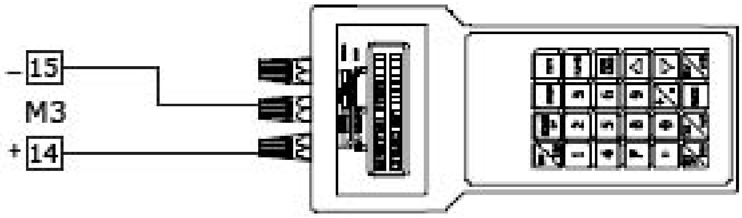
During calibration, the display of measured counts, may also involve the upper display.

In fact, if the value exceeds 9999 to display the first digit to the right of the upper display is used for the most significant digit of the counts.

If instead of viewing the data currently stored, if the 9999 figure exceeds the lower display will show "uuuu".

20.3.1 TC and linear input calibration

Link the instrument as shown:



"tCL" –Initial scale value

The upper display shows “tCL” while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 0.000 mV
- Press FUNC key. The upper display shows “C” letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

"tCH" – Final scale value

The upper display shows “tCH” while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 60.000 mV
- Press FUNC key. The upper display shows “C” letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

Calibration Check

The upper display shows “t” while the lower display shows the value in counts actually stored:

- Check that, by setting the calibrator at 0.000 mV, the display shows 0 +- 10 counts.
- Check that, by setting the calibrator at 60.000 mV, the display shows 30000 + - 10 counts
- Check that, by setting the calibrator at 30.000 mV, the display shows 15000 + - 10 counts

20.3.2 Cold Junction Calibration

The upper display shows "tCJ" " while the lower display shows the value in counts actually stored:

- Place a precision thermometer on the input terminals.
- Wait a few seconds to stabilize all the devices (sensors, instrument calibration, thermometer).
- Read the value on the thermometer
- Press **FUNC** key.
- With ▲ and ▼ keys set on lower display the temperature value.
- Press **FUNC** key.

20.3.3 RTD Input Calibration

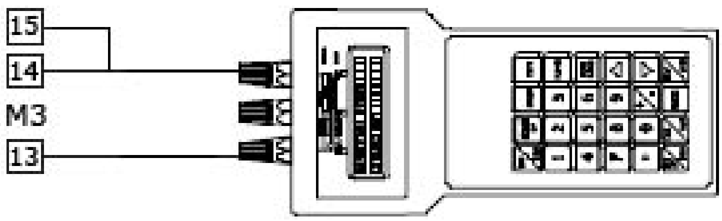
"rtdL" – Initial scale value

The upper display shows "rtdL" while the lower display shows the value in counts actually stored:

- Put on short circuit terminals 13, 14 and 15 of M3 of calibration instruments.
- PressFUNC key. The upper display will show "C"; The lower display the measured counts.
- After few secconds, maybe necessary to stabilize the measure, press **FUNC**. The new data will be stored

"rtdH" – Final scale value

Link the instrument as shown:



The upper display shows "rtdH" while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 375.00 Ohm.
- Press FUNC key. The upper display shows "C" letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

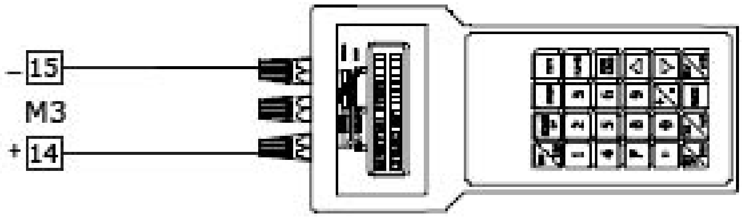
Calibration Check

The upper display shows "t" while the lower display shows the value in counts actually stored:

- Check that, by setting the calibrator at 50.00 Ohm, the display shows 4100 +- 10 counts.
- Check that, by setting the calibrator at 250.00 Ohm, the display shows 20189 +- 10 counts
- Check that, by setting the calibrator at 375 Ohm, the display shows 30000 +- 10 counts

20.3.4 Input Calibration mA

Link the instrument as shown:



"mAL" – Initial scale value

The upper display shows "mAL" while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 0.000 mA
- Press FUNC key. The upper display shows "C" letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

"mAH" – Final scale value

The upper display shows "mAH" while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 20.000 mA
- Press FUNC key. The upper display shows "C" letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

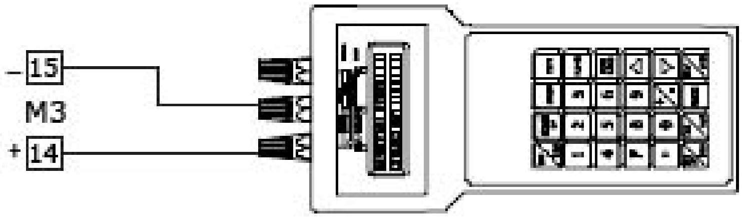
Calibration Check

The upper display shows "t" while the lower display shows the value in counts actually stored:

- Check that, by setting the calibrator at 0.000 mA, the display shows 0 +- 10 counts.
- Check that, by setting the calibrator at 20.000 mA, the display shows 30000 +- 10 counts
- Check that, by setting the calibrator at 10.000 mA, the display shows 15000 +- 10 counts

20.3.5 Input 10 V Calibration

Link the instrument as shown:



"UL" – Initial scale value

The upper display shows “UL” while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 0.000 V
- Press **FUNC** key. The upper display shows “C” letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

"UH" – Final scale value

The upper display shows “UH” while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 10.000 V
- Press FUNC key. The upper display shows “C” letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

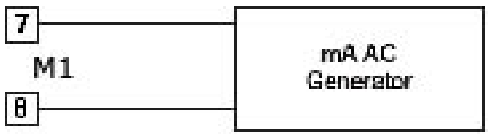
Calibration Check

The upper display shows “t” while the lower display shows the value in counts actually stored:

- Check that, by setting the calibrator at 0.000 V, the display shows 0 +- 10 counts.
- Check that, by setting the calibrator at 10.000 V, the display shows 30000 +- 10 counts
- Check that, by setting the calibrator at 5.000 V, the display shows 15000 +- 10 counts

20.3.6 Current transformer Input calibration

Link the instrument as shown:



"tAL" – Initial scale value

The upper display shows "tAL" while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 0.000 mA AC
- Press **FUNC** key. The upper display shows "C" letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

"tAH" – Final scale value

The upper display shows "tAH" while the lower display shows the value in counts actually stored:

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 50.000 mA AC
- Press FUNC key. The upper display shows "C" letter; the lower display shows the measured counts.
- After several seconds, necessary to stabilize the measure eventually, press **FUNC**. The new data is stored.

Calibration Check

The upper display shows "t" while the lower display shows the value in counts actually stored:

- Check that, by setting the calibrator at 0.000 mA AC, the display shows 0 +- 10 counts.
- Check that, by setting the calibrator at 50.000 mA AC, the display shows 1000 +- 10 counts
- Check that, by setting the calibrator at 25.000 mA, the display shows 500 +- 10 counts

20.4 Calibration from serial

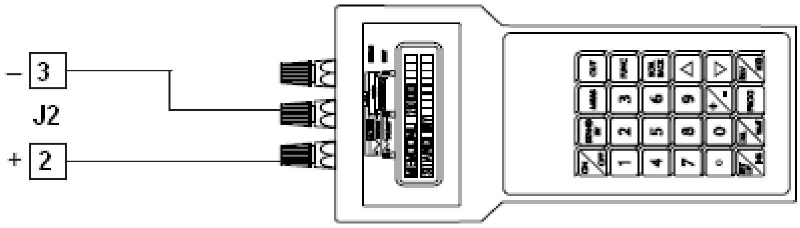
To calibrate the instrument by serial you must first set the instrument under calibration by setting the word 503 on value 0xAA.

The upper display shows "SEr".

The lower display shows "CAL"

20.4.1 Input TC and LINEAR Input calibration

Link the instrument as shown:



Initial scale value

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 0.000 mV
- After several seconds, necessary to stabilize the measure eventually, write 1 in word 900 (tCL). The new data is stored.

Final scale value

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 60.000 mV
- After several seconds, necessary to stabilize the measure eventually, write in word 901 (tCH). The new data is stored.

Calibration Check

The upper display shows "t" while the lower display shows the value in counts actually stored:

- Check that, by setting the calibrator at 0.000 mV, the word 902 shows 0 + - 10 counts
- Check that, by setting the calibrator at 60.000 mV, the word 902 shows 30000 + - 10 counts
- Check that, by setting the calibrator at 30.000 mV, the word 902 shows 15000 + - 10 counts

20.4.2 Cold Junction Calibration

- Place a precision thermometer on the input terminals.
- Wait a few seconds to stabilize all the devices (sensors, instrument calibration, thermometer).
- Read the value on the thermometer
- Write the value (in tenths of degree) in the word 903 (CJ)

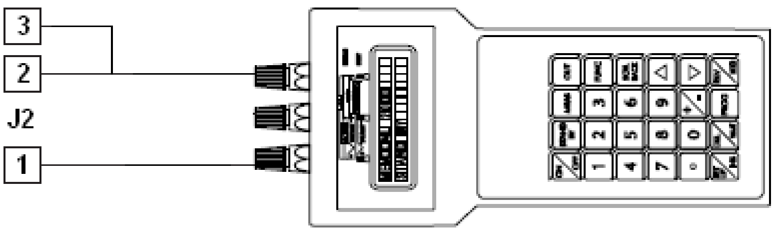
20.4.3 RTD Input Calibration

Initial scale value

- Put on short circuit terminals 1, 2 and 3 of J2 of calibration instruments.
- After few secconds, maybe necessary to stabilize the measure, write 1 in 905 (rtdL). The new data will be stored

Final scale value

Link the instrument as shown:



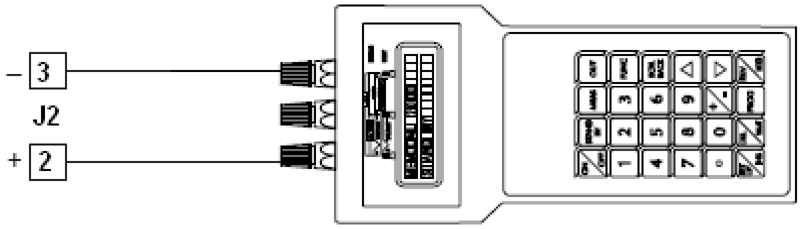
- Link the instrument in calibration mode to calibrator.
- Set calibrator on 375.00 Ohm.
- After several seconds, necessary to stabilize the measure eventually, write 1 in 906 (rtdH) word. The new data is stored.

Calibration Check

- Check that, by setting the calibrator at 50.00 Ohm, the word 907 shows 4100 +- 10 counts
- Check that, by setting the calibrator at 250.00 Ohm, the word 907 shows 20189 +- 10 counts
- Check that, by setting the calibrator at 375 Ohm, the word 907 shows 30000 +- 10 counts

20.4.4 Input Calibration mA

Link the instrument as shown:



Initial scale value

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 0.000 mA
- After several seconds, necessary to stabilize the measure eventually,write 1 in 908 (mAL) word. The new data is stored.

Final scale value

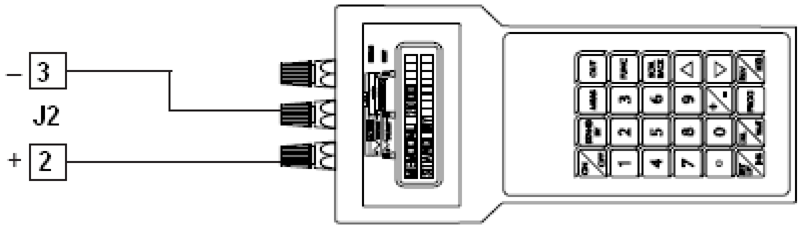
- Link the instrument in calibration mode to calibrator.
- Set calibrator on 20.000 mA
- After several seconds, necessary to stabilize the measure eventually, write 1 in 909 (mAH) word. The new data is stored.

Calibration Check

- Check that, by setting the calibrator at 0.000 mA, the word 910 shows 0 +- 10 counts.
- Check that, by setting the calibrator at 20.000 mA, the word 910 shows 30000 +- 10 counts
- Check that, by setting the calibrator at 10.000 mA, the word 910 shows 15000 +- 10 counts

20.4.5 Input 10 V Calibration

Link the instrument as shown:



Initial scale value

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 0.000 V
- After several seconds, necessary to stabilize the measure eventually, write 1 in 911 (VLH). word.. The new data is stored.

Final scale value

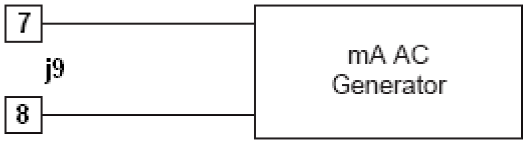
- Link the instrument in calibration mode to calibrator.
- Set calibrator on 10.000 V
- After several seconds, necessary to stabilize the measure eventually, write 1 in 912 (VLH). The new data is stored.

Calibration Check

- Check that, by setting the calibrator at 0.000 V, the word 913 shows 0 +- 10 counts
- Check that, by setting the calibrator at 10.000 V, the word 913 shows 30000 +- 10 counts
- Check that, by setting the calibrator at 5.000 V, the word 913 shows 15000 +- 10 counts

20.4.6 Calibrazione Input Trasformatore Amperometrico

Link the instrument to calibrator as shown:



Initial scale value

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 0.000 mA AC
- After several seconds, necessary to stabilize the measure eventually, write 1 in 914 (tAL). word . The new data is stored.

Final scale value

- Link the instrument in calibration mode to calibrator.
- Set calibrator on 50.000 mA AC
- After several seconds, necessary to stabilize the measure eventually, write 1 in 915 (tAH). word. The new data is stored.

Calibration Check

- Check that, by setting the calibrator at 0.000 mA AC, the word 916 shows 0 +- 10 counts.
- Check that, by setting the calibrator at 50.000 mA AC, the word 916 shows 1000 +- 10 counts
- Check that, by setting the calibrator at 25.000 mA, the word 916 shows +- 10 counts

20.5 Caricamento valori di calibrazione di default

By writing 1 in 917 (deF) word the default value are loaded.

21 Tables:

21.1 Table 1

0	TC type L 0 400.0 °C DIN 43710 - 1977
1	TC type L 0 900 °C
2	TC type L 0 1650 °F DIN 43710 - 1977
3	TC type J -100.0 400.0 °C IEC 584-1
4	TC type J -100 1000 °C
5	TC type J -150 1830 °F IEC 584-1
6	TC type K -100.0 400.0 °C IEC 584-1
7	TC type K -100 1370 °C
8	TC type K -150 2500 °F IEC 584-1
9	TC type N -100 1400 °C
10	TC type N -150 2550 °F IEC 584-1
11	TC type S 0 1760 °C
12	TC type S 0 3200 °F IEC 584-1
13	TC type R 0 1760 °C
14	TC type R 0 3200 °F IEC 584-1
15	TC type T -199.9 400.0 °C
16	TC type T -330 750 °F IEC 584-1
17	RTD tipo Pt100 -199.9 400.0 °C DIN 43760
18	RTD tipo Pt100 -199.9 400.0 °F DIN 43760
19	RTD tipo Pt100 -200 800 °C
20	RTD tipo Pt100 -330 1470 °F DIN 43760
21	Lineare 0 20 mA
22	Lineare 4 20 mA
23	Lineare 0 60 mV
24	Lineare 12 60 mV
25	Lineare 0 10 V
26	Lineare 2 10 V

21.2 Table 2

0	Relay type
1	SSR type
2	mA type
3	Digital type
4	Contact type
7	None

22 Test Hardware via seriale

By writing on word 920 a number from 1 to 28 it's possibile to make a series of tests on hardware instrument. The tests are:

0	Fine test
1	Display Test
2	Led Test
3	FUNC key Test
4	MAN key Test
5	UP key Test
6	DOWN key Test
7	Eeprom Test
8	RS485 Test
9	USB Test
10	Rele 1 Test
11	Rele 2 Test
12	Rele 3 Test
13	Rele 4 Test
14	Out 4 mA Test
15	Out 20 mA Test
16	Input 1 Test
17	Input 2 Test
18	10 mV measure Test
19	60 mV measure Test
20	4 mA measure Test
21	20 mA measure Test
22	0 ohm measure Test
23	300 Ohm measure Test
24	1 V measure Test
25	10 V measure Test
26	RJ Test
27	TA 5 mA Test
28	TA 50 mA Test

22.1 Display Test

Appear in sequence all the cipher and numbers.

The check must be done visually. There is no feedback on the serial.

22.2 Led Test

All the LEDs Are switched on in sequence.

Also decimal points are considered of the two numbers to the right LEDs.

The check must be done visually. There is no feedback on the serial.

22.3 FUNC key Test

It's necessary to press and release the FUNC key. The tool writes 1 on 702 word on when the key is pressed and 0 when it is released.

22.4 MAN Key Test

It's necessary to press and release the MAN key. The tool writes 1 on 702 word on when the key is pressed and 0 when it is released.

22.5 UP key Test

It's necessary to press and release the UP key. The tool writes 1 on 702 word on when the key is pressed and 0 when it is released.

22.6 DOWN key Test

It's necessary to press and release the DOWN key. The tool writes 1 on 702 word on when the key is pressed and 0 when it is released.

22.7 EEPROM Test

The instrument performs a control read / write to all locations of EEPROM.

At the end write 1 on 702 word if the test result positive, 0 if negative.

22.8 Relè 1 Test

This test is possible only if there is a relay module or SSR, or digital on output 1.

Relay 1 is energized and de-energized cyclically

The word 702 is written to 1 when the relay is energized, 0 when it is de-energized.

There is no control if the relay is energized actually.

22.9 Relè 2 Test

This test is possible only if there is a relay module or SSR, or digital on output 2.

Relay 2 is energized and de-energized cyclically

The word 702 is written to 1 when the relay is energized, 0 when it is de-energized.

There is no control if the relay is energized actually.

22.10 Relè 3 Test

This test is possible only if there is a relay module or SSR, or digital on output 3.

Relay 3 is energized and de-energized cyclically

The word 702 is written to 1 when the relay is energized, 0 when it is de-energized.

There is no control if the relay is energized actually.

22.11 Relè 4 Test

This test is possible only if there is a relay module or SSR, or digital on output 4.

Relay 4 is energized and de-energized cyclically

The word 702 is written to 1 when the relay is energized, 0 when it is de-energized.

There is no control if the relay is energized actually.

22.12 Out 4 mA Test

This test is possible only if there is a mA module on output 1.

The output is set with the value corresponding to 4 mA.

The control must be performed externally. There is no feedback on the serial.

22.13 Out 20 mA Test

This test is possible only if there is a mA module on output 1.

The output is set with the value corresponding to 20 mA.

The control must be performed externally. There is no feedback on the serial.

22.14 Input 1 Test

This test is possible only if there is a contact or digital I/O module on out 3.

It’s necessary to close and open contact 1 . The instrument write 1 on word 702 when the contact is close and 0 when it’s open.

22.15 Input 2 Test

This test is possible only if there is a contact or digital I/O module on out 4.

It’s necessary to close and open contact 2. The instrument write 1 on word 702 when the contact is close and 0 when it’s open.

22.16 10 mV measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 10 mV.
- After few seconds, necessary to stabilize the measure, write 18 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.17 60 mV measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 60 mV.
- After few seconds, necessary to stabilize the measure, write 19 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.18 4 mA measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 4 mA.
- After few seconds, necessary to stabilize the measure, write 20 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.19 20 mA measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 20 mA.
- After few seconds, necessary to stabilize the measure, write 21 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.20 0 ohm measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 0 Ohm.
- After few seconds, necessary to stabilize the measure, write 22 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.21 300 ohm measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 300 ohm.
- After few seconds, necessary to stabilize the measure, write 23 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.22 1 V measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 1V.
- After few seconds, necessary to stabilize the measure, write 24 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.23 10 V measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 10V.
- After few seconds, necessary to stabilize the measure, write 25 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.24 RJ Test

By writing 26 on the word 920, on word 702 will be written the temperature (in tenths of a degree) measured from the junction.

22.25 TA 5 mA measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 5 mA AC.
- After few seconds, necessary to stabilize the measure, write 27 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.

22.26 TA 50 mA measure Test

- Connect the terminals input to calibrator, as described in the calibration chapter.
- Generate 50 mA AC.
- After few seconds, necessary to stabilize the measure, write 28 in word 920.
- On word 702 is written 3 until the measurement is completed. At the end will be written 0 if the measure will be in the limits, otherwise 1.