SSi Super Systems

Temperature Controller

Model No. 31095 and 31097

C(UL)US LISTED

Instruction manual
PN 31095
PN 31097

Please read these instructions carefully before proceeding with the installation of the controller.
Class II instrument (for indoor use only).

CE
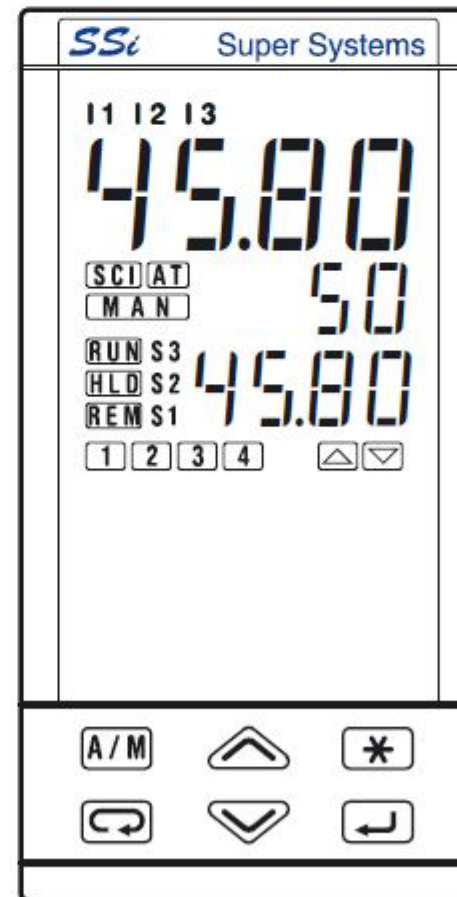
NOTES
ON ELECTRIC
SAFETY AND
ELECTROMAGNETIC
COMPATIBILITY

This controller has been designed in compliance with:
Regulations on electrical apparatus (appliance, systems and installations) according to the European Community directive no. 73/23/EEC amended by the European Comunity directive no. 93/68/EEC and the Regulations on the essential protection requirements in electrical apparatus EN61010-1 : 93 + A2:95.

Regulations on Electromagnetic Compatibility according to the European Community directive no. 89/336/EEC, amended by the European Community directive no. 92/31/EEC, 93/68/EEC, 98/13/EEC and the following regulations:
Regulations on RF emissions
  EN61000-6-3 : 2001   residential environments
  EN61000-6-4 : 2001   industrial environments
Regulation on RF immunity
  EN61000-6-2 : 2001   industrial equipment and system

It is the responsibility of the installer to ensure compliance with regulations on safety requirements and EMC.
The device has no user serviceable parts. Please contact your nearest agent for repair services.
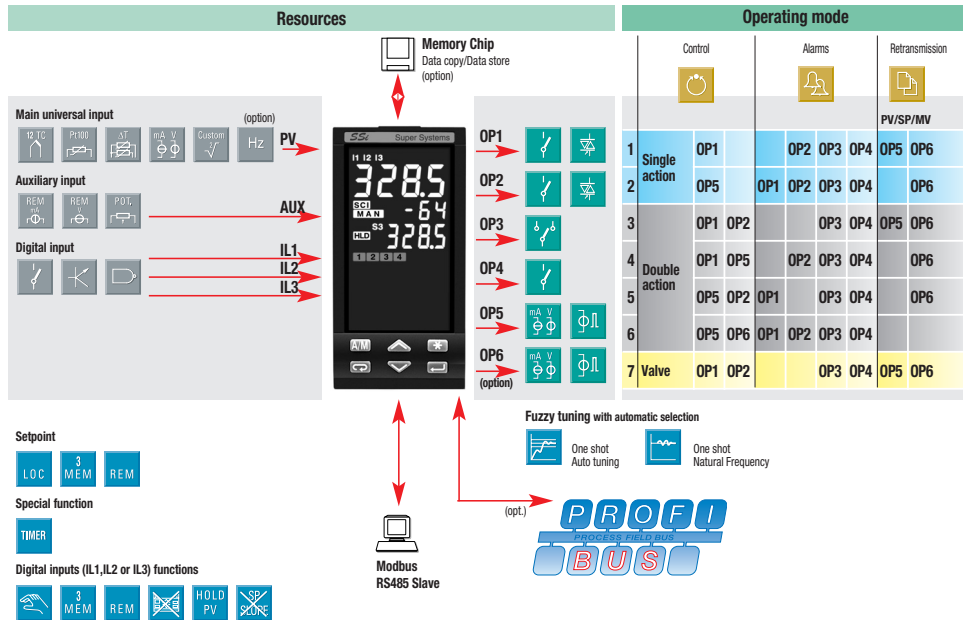
All information and warnings about safety and electromagnetic compatibility are marked with the ⚠CE symbol.

TABLE OF CONTENTS

1 INTRODUCTION
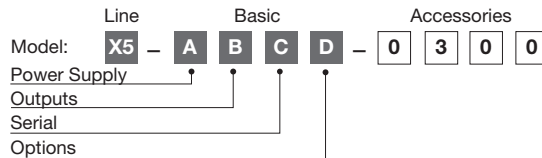
The 31095 has been designed for use in industrial environments. The 31095 is a universal controller with many standard features.

Resources

Main universal input (option)
12 TC | Pt100 | ΔT | mA V | Custom | Hz → PV

Auxiliary input
REM mA | REM V | POT. → AUX

Digital input
→ IL1
→ IL2
→ IL3

Memory Chip
Data copy/Data store (option)

OP1
OP2
OP3
OP4
OP5
OP6 (option)

Modbus RS485 Slave

Setpoint
LOC | 3 MEM | REM

Special function
TIMER

Digital inputs (IL1,IL2 or IL3) functions
3 MEM | REM | HOLD PV | SP SLOPE

Fuzzy tuning with automatic selection
One shot Auto tuning
One shot Natural Frequency

(opt.) PROFIBUS PROCESS FIELD BUS

Operating mode

		Control		Alarms		Retransmission
						PV/SP/MV
1	Single action	OP1		OP2 OP3 OP4	OP5 OP6	
2	Single action	OP5	OP1 OP2 OP3 OP4		OP6	
3	Double action	OP1 OP2		OP3 OP4	OP5 OP6	
4	Double action	OP1 OP5		OP2 OP3 OP4	OP6	
5	Double action	OP5 OP2	OP1	OP3 OP4	OP6	
6	Double action	OP5 OP6	OP1 OP2 OP3 OP4			
7	Valve	OP1 OP2		OP3 OP4	OP5 OP6	

1.1 MODEL CODE

The complete code is displayed on the instrument side label.

The information about product coding is accessible from the front panel by means of a particular procedure described in section 5.1 page 53.

Basic product code

Instrument label

www.supersystem.com
Cincinnati, Ohio USA

PN : 31095
MN : X5-3150-0300
SN : A0A-0819/1208
V~(L-N) : 100÷240V 50/60 Hz - 5W

IND.CON.EQ
23FA
LISTED

	Line	Basic			Accessories			
Model:	X5 –	A	B	C	D –	0	3	0	0
Power Supply								
Outputs								
Serial								
Options								
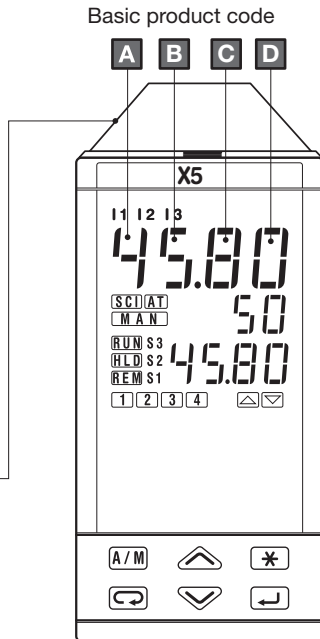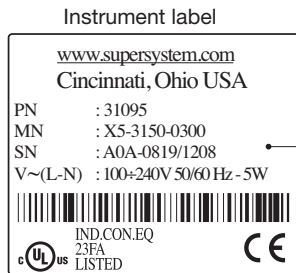
Power supply	A
100...240Vac (- 15% + 10%)	3
24Vac (-25...+12%) or 24Vdc (-15... +25%)	5

Outputs OP1 - OP2	B
Relay - Relay	1
Triac - Triac	5

Serial Communications	C
None	0
RS485 Modbus/Jbus SLAVE	5
PROFIBUS DP SLAVE	7
RS485 Modbus/Jbus SLAVE + PROFIBUS	8

Options	D
None	0
2nd SSR drive/analog output (OP6)	4

2   **INSTALLATION**

2.1 GENERAL DESCRIPTION

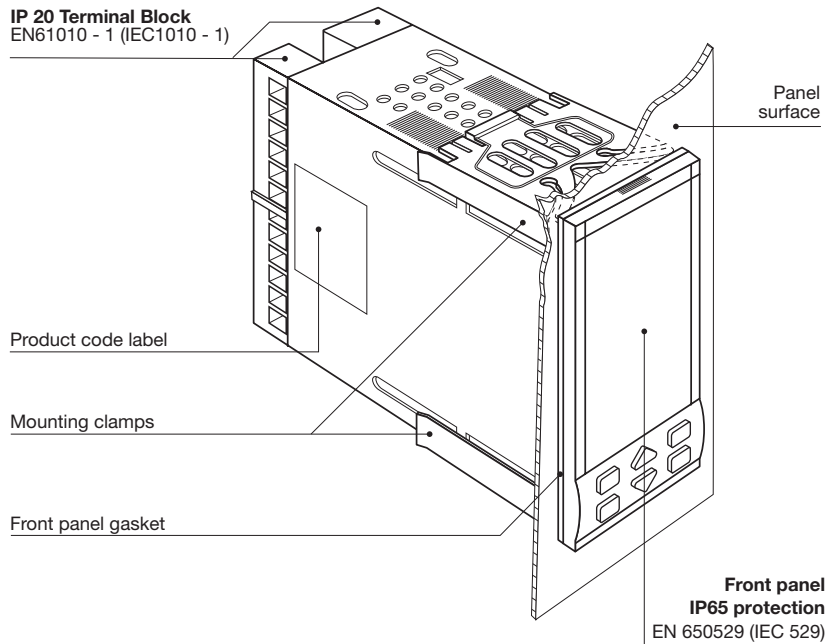**Installation must be carried out by qualified personnel.**

Before proceeding with the installation of this controller, read the instructions in this manual. Pay particular attention to precautions marked with the ⚠CE symbol, related to the European Community directive on electrical protection and electromagnetic compatibility.
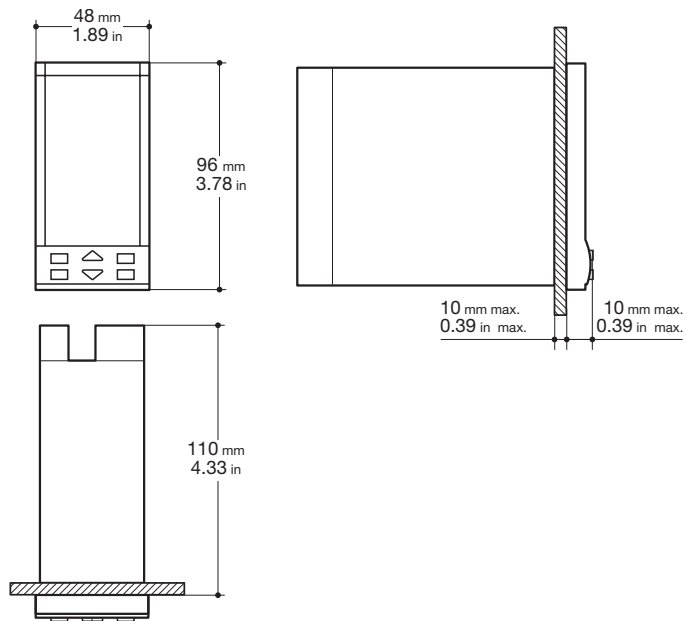
⚠CE

To prevent contact with electronically live components, **the controller must be installed in an enclosure or panel.**
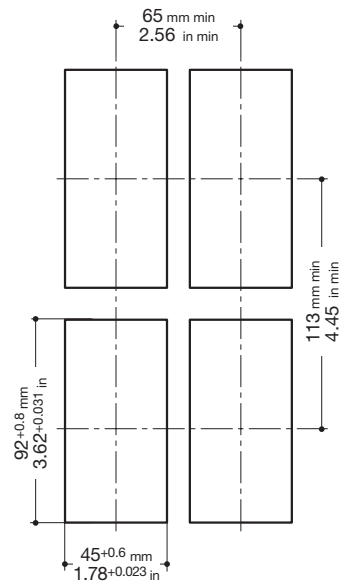

IP 20 Terminal Block
EN61010 - 1 (IEC1010 - 1)

Panel surface

Product code label

Mounting clamps

Front panel gasket

**Front panel
IP65 protection**
EN 650529 (IEC 529)

2.1.1 DIMENSIONAL DETAILS

48 mm
1.89 in

96 mm
3.78 in

110 mm
4.33 in

10 mm max.
0.39 in max.

10 mm max.
0.39 in max.

2.1.2 PANEL CUT-OUT

65 mm min
2.56 in min

113 mm min
4.45 in min

$92^{+0.8}$ mm
$3.62^{+0.031}$ in

$45^{+0.6}$ mm
$1.78^{+0.023}$ in

2.2 ENVIRONMENTAL RATINGS   ⚠CE

Operating conditions

Altitude: up to 2,000 m
Temperature: 0…50°C **[1]**
%Rh	Relative humidity: 5…95 % non-condensing

Special conditions		**Suggestions**
	Altitude: > 2,000 m	Use 24Vac supply version
	Temperature: >50°C	Use forced air ventilation
%Rh	Humidity: > 95 %	Warm up
	Conducting atmosphere	Use filter

Prohibited Conditions 🚫

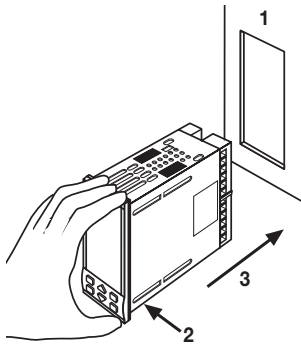|	
	Corrosive atmosphere
	Explosive atmosphere

UL notes
[1] Operating surrounding temperature
    0…50°C

2.3 PANEL MOUNTING [1]

2.3.1 INSERT THE INSTRUMENT

1 Prepare panel cut-out;
2 Check front panel gasket position;
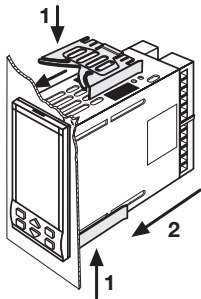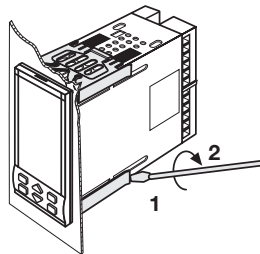3 Insert the instrument through the cut-out.

2.3.2 INSTALLATION SECURING

1 Fit the mounting clamps;
2 Push the mounting clamps towards the panel surface to secure the instrument.

2.3.3 CLAMP REMOVAL

1 Insert the screwdriver in the clips of the clamps;
2 Rotate the screwdriver.

2.3.4 INSTRUMENT REMOVAL ⚠ CE
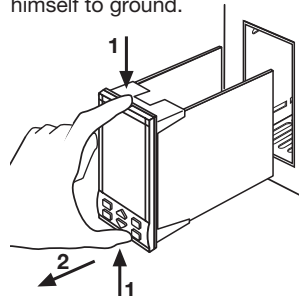
1 Push and
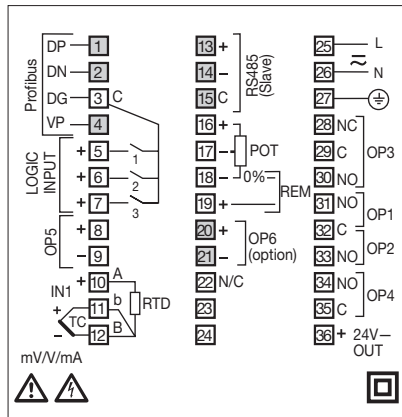2 Pull to remove the instrument.

Electrostatic discharges can damage the instrument.

Before removing the instrument the operator must discharge himself to ground.

UL note

[1] For Use on a Flat Surface of a Type 2 and Type 3 'raintight' Enclosure.

9

3   ELECTRICAL CONNECTIONS

3.1 TERMINAL BLOCK [1]

UL notes

[1] Use 60/70 °C copper (Cu) conductor only.
[2] Wire size 1 mm² (18 AWG Solid/Stranded)
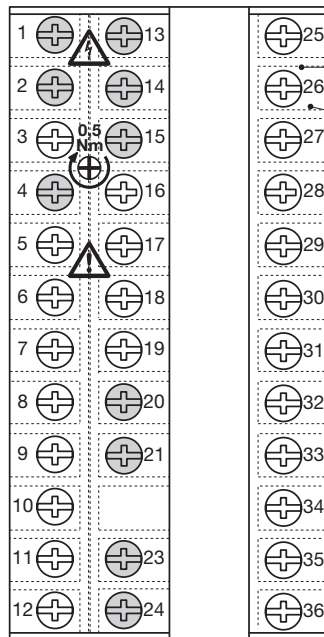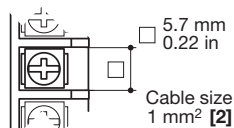
⊞	35 screw terminals M3
⊕	Option terminals
⊕	Holding screw 0.5 Nm
Phillips screwdriver PH1	
Flat blade screwdriver 0.8 x 4 mm	

Terminals
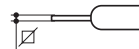
Pin connector ⌀ 1.4 mm - 0.055 in max.	
Fork-shape AMP 165004 Ø 5.5 mm - 0.21 in	
Stripped wire L 5.5 mm - 0.21 in	
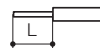
Rear terminal cover

5.7 mm
0.22 in

Cable size
1 mm² **[2]**

PRECAUTIONS ⚠CE

The instrument has been designed to work in an harsh and noisy environmental (level IV of the industrial standard IEC 801-4). It is recommended to follow the following suggestions.

⚠

All the wiring must comply with the local regulations. The supply wiring should be routed away from the power cables. Avoid to place electro-magnetic contactors, power relays and high power motors nearby. Avoid power units in close proximity, especially if controlled in phase angle mode.

Keep the low level sensor input wires away from the power lines and the output wiring. If this is not achievable, use shielded cables on the sensor input, with the shield connected to ground.

3.2 SUGGESTED WIRES ROUTING ⚠CE

A = Supply
B = Outputs
C = Analog inputs
D = Analog output
E = Digital input
Serial Comm.s
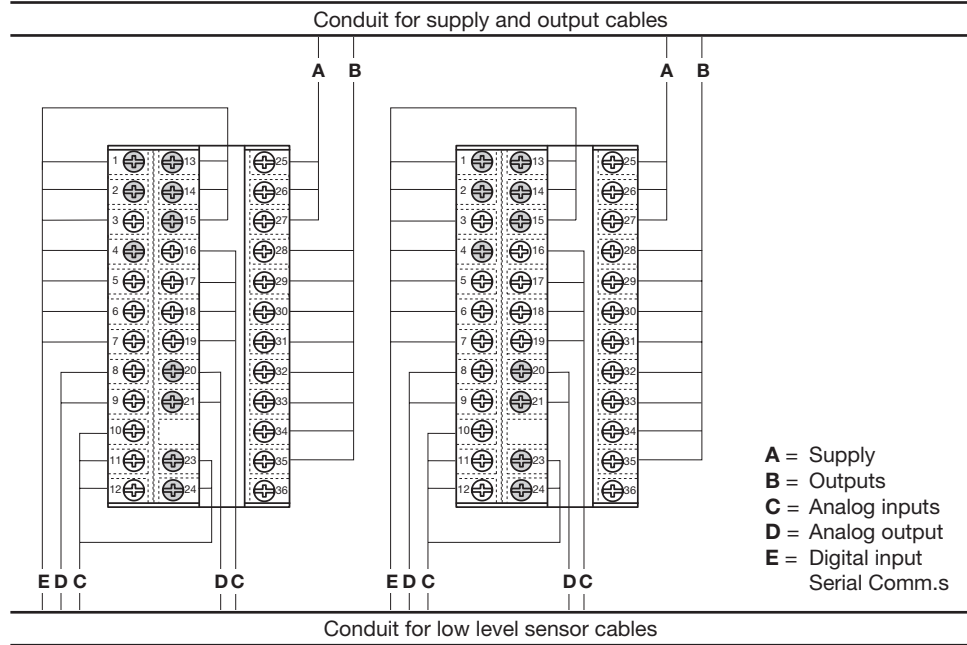
3.3 EXAMPLE OF WIRING DIAGRAM (VALVE CONTROL)
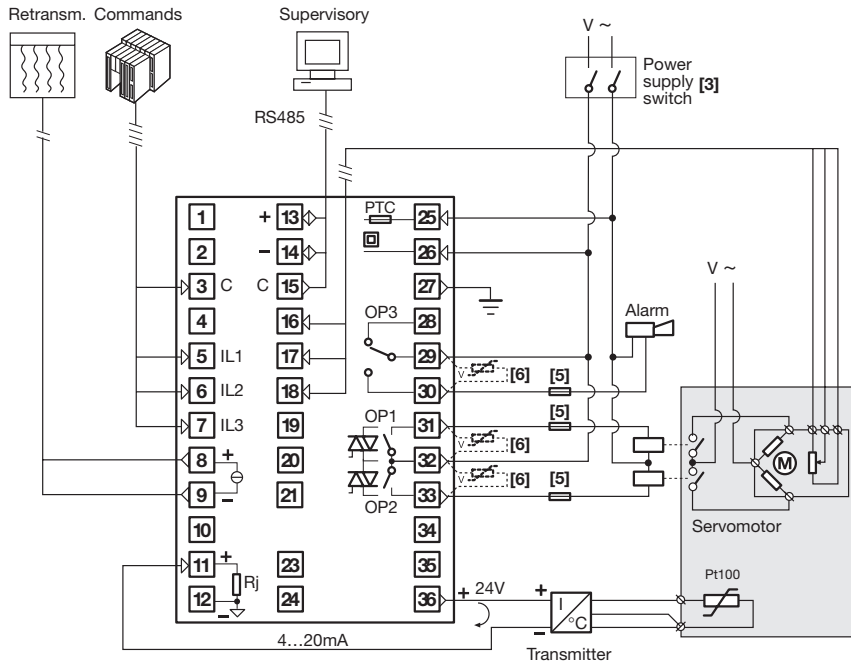
Notes:

1] Ensure that the power supply voltage is the same as that on the instrument label.
2] Switch ON the power supply only after all electrical connections have been completed.
3] In accordance with electrical safety regulations, there must be an easily identifiable and accessable power disconnect.
4] The instrument is PTC protected. In case of failure, return the instrument to the manufacturer for repair.
5] To protect internal circuits use:
  - 2 A∼ T fuse for Relay outputs (220 Vac)
  - 4 A∼ T fuse for Relay outputs (110 Vac)
  - 1 A∼ T fuse for Triac outputs
6] Relay contacts are protected with varistors.
  In case of 24 Vac inductive loads, use model A51-065-30D7 varistors (on request).

3.3.1 POWER SUPPLY ⚠CE

Switching power supply with multiple isolation and PTC protection.

- **Standard version:**
  Nominal voltage:
  100... 240Vac (-15...+10%);
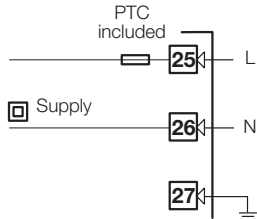 Frequency 50/60Hz.
- **Low Voltage version:**
  Nominal voltage:
  24Vac (-25...+12%);
  Frequency 50/60Hz;
  or 24Vdc (-15...+25%);
  Power consumption 5W max.

3.3.2 PV CONTROL INPUT ⚠CE

A L-J-K-S-R-T-B-N-E-W thermocouple type
- Connect wires with the polarity as shown;
- Always use compensation cable of the correct type for the thermocouple used;
- The shield, if present, must be connected to ground.

Wire resistance 150Ω max.
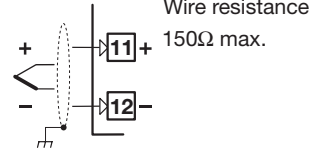
B For Pt100 resistance thermometer
- If a 3 wires system is used, always use cables of the same section (1mm² min.), maximum line resistance 20 Ω/line.
- When using a 2 wires system, always use cables of the same section (1.5mm² min.) and put a jumper between terminals 11 and 12

Only for two wires system, put a jumper between terminals 11 and 12.
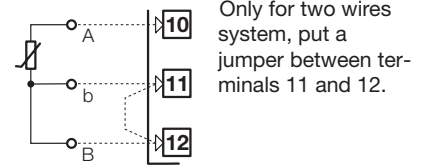
C For ∆T (2x RTD Pt100) Special
⚠ When the distance between the controller and the sensor is 15m, using a cable of 1.5mm² section, produces an error on the measure of 1°C.

R1 + R2 must be <320Ω

Use wires of the same length and 1.5 mm² size. Maximum line resistance 20 Ω/line.
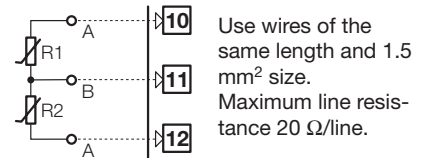
3.3.2 PV CONTROL INPUT

C   For mA, mV
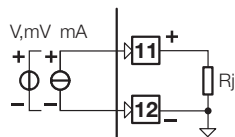
Input resistance = 30Ω   per mA;
Input resistance > 10MΩ per mV;
Input resistance = 10kΩ per Volt;

C1 With 2 wires transducer
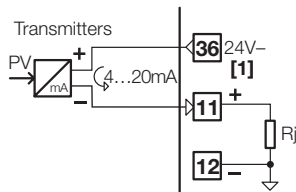
C2 With 3 wires transducer
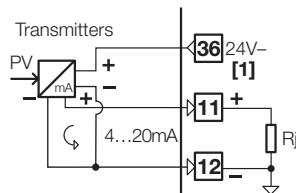
[1] Auxiliary power supply for external transmitter 24Vdc ±20%/30mA max without short circuit protection.

3.3.4 AUXILIARY INPUT ⚠CE

A - From Remote Setpoint

Current 0/4…20mA;
Input resistance = 30Ω.

Voltage 1…5V, 0…5V, 0…10V;
Input resistance = 300kΩ.
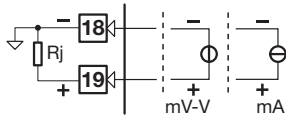
B - From Potentiometer

For the measure of the position of the motor or the valve.

100% **from 100Ω to 10kΩ max.**
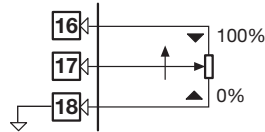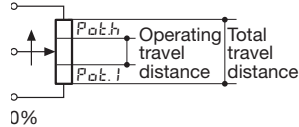
3.3.5 DIGITAL INPUT ⚠CE

- The input is active when the logic state is ON, corresponding to the contact closed.

- The input is inactive when the logic state is OFF, corresponding to the contact open.
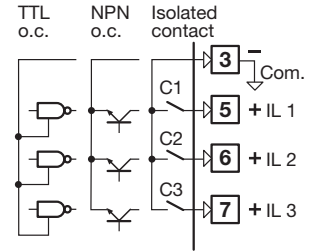
3.3.6 OP1 - OP2 - OP3 - OP4 - OP5 - OP6 OUTPUTS (OPTION)

⚠ CE

The functionality associated to each of OP1, OP2, OP4, OP5 and OP6 is defined during the configuration of the instrument.
The allowed combinations are:

		Control outputs		Alarms				Retransmission	
		Main (Heat)	Secondary (Cool)	AL1	AL2	AL3	AL4	PV / SP / MV	
A	Single	OP1			OP2	OP3	OP4	OP5	OP6
B	action	OP5		OP1	OP2	OP3	OP4		OP6
D		OP1	OP2			OP3	OP4	OP5	OP6
E	Double	OP1	OP5		OP2	OP3	OP4		OP6
F	action	OP5	OP2	OP1		OP3	OP4		OP6
G		OP5	OP6		OP2	OP3	OP4		
L	Valve drive	OP1 ▲	OP2 ▼			OP3	OP4	OP5	OP6

where:

OP1 - OP2	Relay or Triac output
OP3 - OP4	Relay outputs
OP5 - OP6	Analog control or retransmission outputs

3.3.6-A SINGLE ACTION RELAY (TRIAC) CONTROL OUTPUT ⚠CE

3.3.6-B1 SINGLE ACTION LOGIC CONTROL OUTPUT ⚠CE

3.3.6-B2 SINGLE ACTION ANALOG OUTPUT ⚠CE

3.3.6-C DOUBLE ACTION RELAY (TRIAC)/RELAY (TRIAC) CONTROL OUTPUT ⚠CE

3.3.6-D1 DOUBLE ACTION RELAY (TRIAC)/LOGIC CONTROL OUTPUT ⚠CE
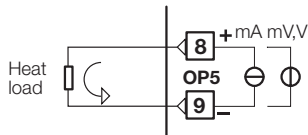
3.3.6-D2 DOUBLE ACTION CONTROL OUTPUT RELAY (TRIAC)/ANALOG CONTROL OUTPUT ⚠CE
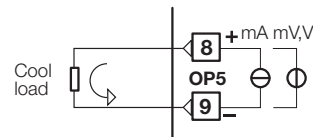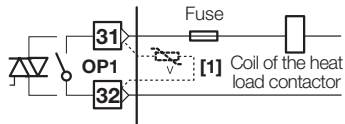
3.3.6-E1 DOUBLE ACTION
DIGITAL/RELAY (TRIAC) CONTROL OUTPUT ⚠ C€
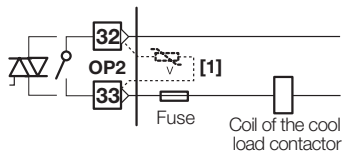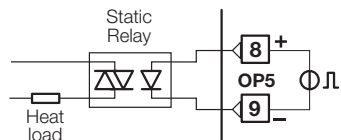
3.3.6-E2 DOUBLE ACTION
ANALOG/RELAY(TRIAC) CONTROL OUTPUT ⚠ C€
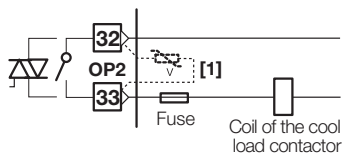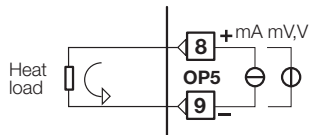
3.3.6-F1 DOUBLE ACTION
DIGITAL/DIGITAL CONTROL OUTPUT ⚠ C€
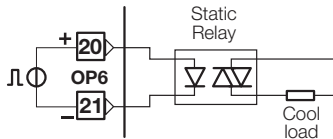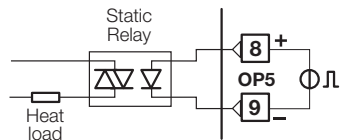
Notes for pages 17 - 18 - 19
OP1 - OP2 Relay output
- SPST Relay N.O., 2A/250 Vac (4A/120Vac) for resistive load,
- Fuse 2A ac T at 250V, 4A ac T at 110V.

OP1 - OP2 Triac output
- N.O. contact for resistive load of up to 1A/250 Vac max.
- Fuse 1A ac T
Isolated digital outputs OP5-OP6
- 0…24Vdc, ±20%, 30 mA max.
Isolated analog outputs OP5-OP6
- 0/4…20mA, 750Ω / 15V max.
  0/1…5V, 0…10V, 500Ω / 20mA max.

[1] Varistor for inductive load 24Vac only

3.3.6-F2 DOUBLE ACTION CONTROL OUTPUT DIGITAL/ANALOG ⚠ CE
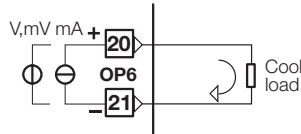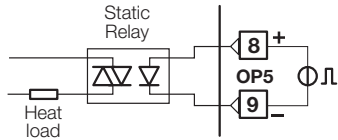
3.3.6-F3 DOUBLE ACTION CONTROL OUTPUT ANALOG/DIGITAL ⚠ CE
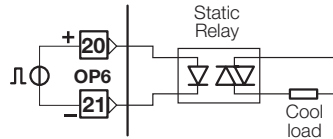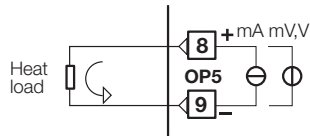
3.3.6-F4 DOUBLE ACTION CONTROL OUTPUT OR SPLIT RANGE ANALOG/ANALOG ⚠ CE
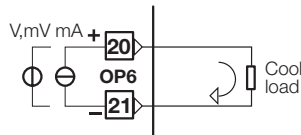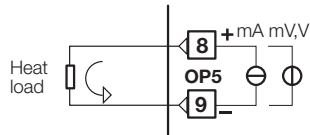
3.3.6-G MOTOR POSITIONER OUTPUT RELAY (TRIAC) / RELAY (TRIAC)

Valve drive PID **without** potentiometer 3 pole output with N.O. contacts (raise, lower, stop)
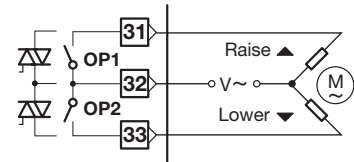
3.3.7 OP1-2-3-4 ALARM OUTPUTS ⚠ CE
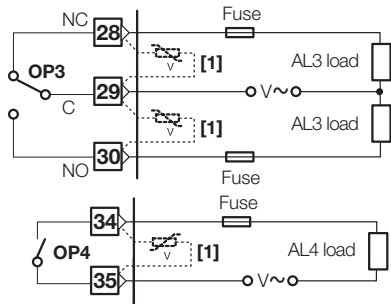
⚠ **The relay/triac output OP1/OP2, can be used as alarm outputs only if they are not used as control outputs.**
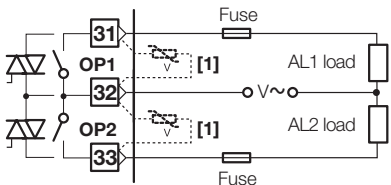
3.3.8 OP5 AND OP6 (OPTION) ANALOG CONTROL OUTPUTS ⚠ CE
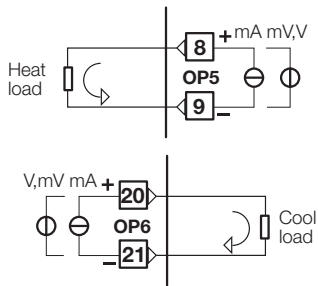
OP5 and OP6 can be configured for control action or PV/SP/MV retransmission:
- Galvanic isolation 500Vac/1 min:
- 0/4…20mA, 750Ω / 15Vdc max.
  0/1…5V, 0…10V, 500Ω / 20mA max..

Notes:

[1] Varistor for inductive load 24Vac only

[2] ⚠ Please, read the user manual: "Serial communications and config-uration software".

3.3.9 SERIAL COMMUNICATIONS (OPTION) [2] ⚠ CE
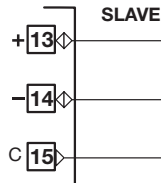
- Galvanic isolation 500Vac/1 min; Compliance to the EIA RS485 standard for Modbus/Jbus;
- Termination setting dip switches.
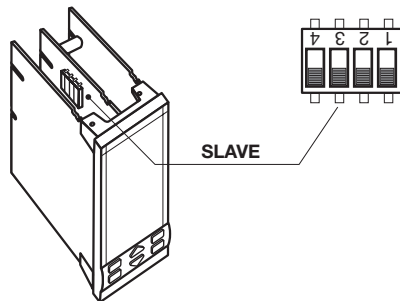
3.3.10 PROFIBUS DP (OPTION)

- DP — 1
- DN — 2
- DG — 3
- VP — 4
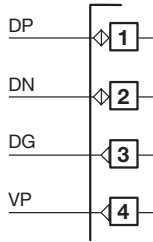
- Galvanic isolation 500 Vac/1 min
- Compliance to the EIA RS485 standard for PROFIBUS DP;
- Connecting cable: twisted pair cable as per PROFIBUS specifications (e.g. Belden B3079A);
- Max. lenght: 100 m at 12 Mb/s

Termination resistors 220Ω and 390Ω ($^1/_4$ W, ±5%) for external mounting on the first and end-ing PROFIBUS stations only.
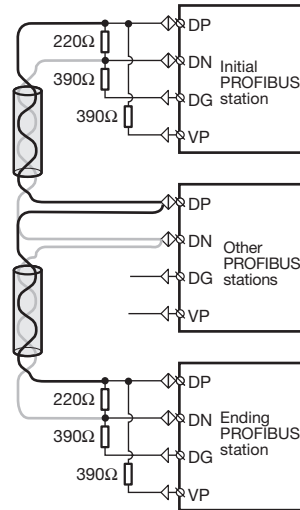
To make the connections easier, a D-Sub type (9 poles) connector, model **AP-ADP-PRESA-DSUB/9P** is provided Must be used with a 9PIN male ERNI type part no. 103648 or similar connector.

4-40UNC-2B
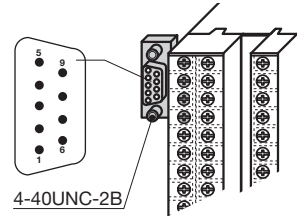
X5	D-SUB 9 poles	Signal	Description according to PROFIBUS specifications
1	3	RxD/TxD-P (DP)	Receive data/transmission data plus
2	8	RxD/TxD-N (DN)	Receive data/transmission data negative
3	5	DGND (DG)	Data transmission potential (ground to 5V)
4	6	VP (VP)	Supply voltage of the terminating resistance-P, (P5V)

Detailed information concerning wiring and cables can be found on the PROFIBUS Product Guide on Internet at:
http://www.profibus.com/online/list

4 OPERATION 4.1.1 KEY FUNCTIONS AND DISPLAYS IN OPERATOR MODE

Digital input status LEDs (yellows)

I 1 - IL1 active
I 2 - IL2 active
I 3 - IL3 active

Status LEDs (greens)

SCI Communications running
(serial communications interface)
AT Tuning running
MAN Manual operating mode
RUN Timer
HLD Program Waiting
REM Remote Setpoint active
S1 First stored Setpoint active
S2 Second stored Setpoint active
S3 Third stored Setpoint active

Alarm status LEDs (reds)

1 AL1 ON
2 AL2 ON
3 AL3 ON
4 AL4 ON

Auto/Man
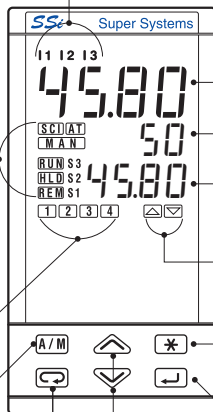
Over range   Under range

PV control input in engineering units

% Control output
or **Program status** (see page 64)

SP operating Setpoint
(Local/Remote or Stored)

Control output LEDs (red)
▲ OP1/OP4 ON - ▼ OP2/OP4 OFF

Run/stop Timer or a program

Entry key for selection and value setting confirmation

Setpoint setting

Menu access

4.1.2 KEY FUNCTIONS AND DISPLAY IN PROGRAMMING MODE

⚠

The parameter setting procedure has a timeout. If no keys are pressed for, at least 30 seconds, the controller automatically switches back to the operator mode.

After selecting the parameter or the code, press ⬆ and ⬇ to display or modify the value.

The value is entered when the next parameter is entered, by pressing the ⏎ key.
The changes are not saved if either the back key ✳ is pressed or if the instrument is left alone for 30 seconds.

From every parameter, pressing the ⟲ key, the controller switches to the operator mode.

SSi Super Systems

35.0

P.b.

Parameter value

Parameter mnemonic

Back to the previous parameter

Entry key for selection and value setting confirmation

Value modification

Access to the menu for:
- Parameter setting
- Configuration
- Access selection
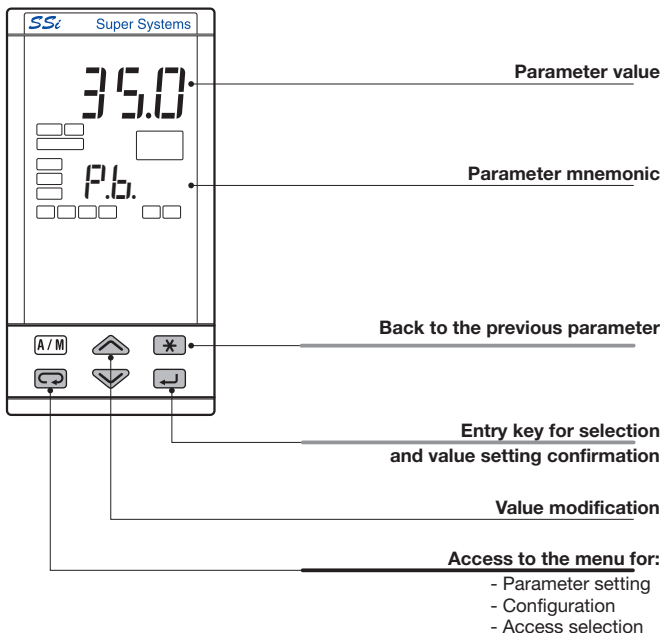
4.2 PARAMETER SETTING

4.2.1 NUMERIC ENTRY

(i.e. the modification of the Setpoint value from 275.0 to 240.0)

Press ⌃ or ⌄ momentarily to change the value by 1 unit every push.

Hold ⌃ or ⌄ to change the value at rate that doubles every second.

The rate of change decreases when the button is released. The change of the value stops when it has reached the max./ min limit set for the parameter.

In case of Setpoint modification: press ⌃ or ⌄ once to display the local Setpoint instead of working Setpoint. To evidence this change the display flashes once. Then the Setpoint can be modified

Operator mode working Setpoint displayed

Local Setpoint display

— Decrease

Setpoint modification

— Increase

⟳ after 2 s

Setpoint entry. The operation is acknowledged by one flash of the display.
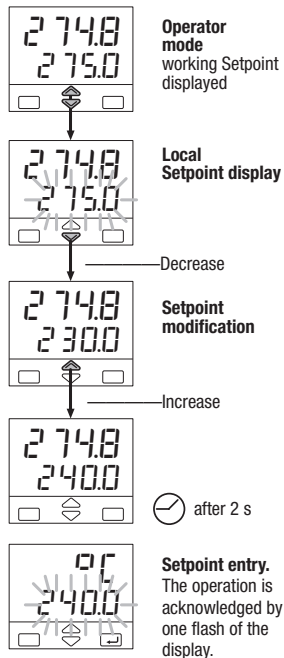
4.2.2 MNEMONIC CODE SETTING

(e.g. configuration see page 26)

Press the ⌃ or ⌄ to display the next or previous mnemonic for the selected parameter.

Continued pressing of ⌃ or ⌄ will display further mnemonics at a rate of one mnemonic every 0.5 s. The mnemonic displayed at the time the next parameter is selected is the one stored and used.

Engineering Units Celsius

Degree Fahrenheit

Degree Celsius

Degree Fahrenheit

no units defined

Ph

4.3 CONFIGURATION PROCEDURE

Enter the configuration password

from -999...9999
(33 default from factory)

Must be equal to the value of the parameter `C.PaS` (see page.50)

(see page 26)

(see page 27)

(see pages 28 and 29)

(see page 30)

(see page 30... 33)

(see page 34)
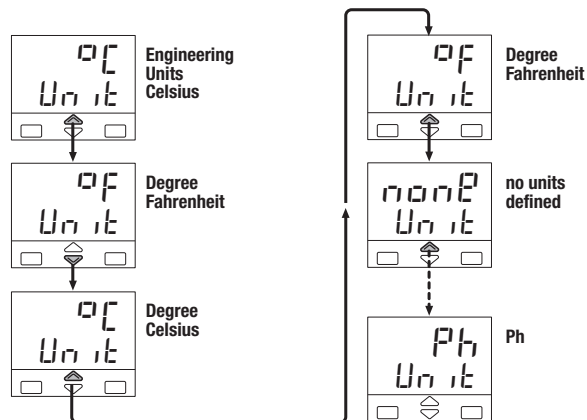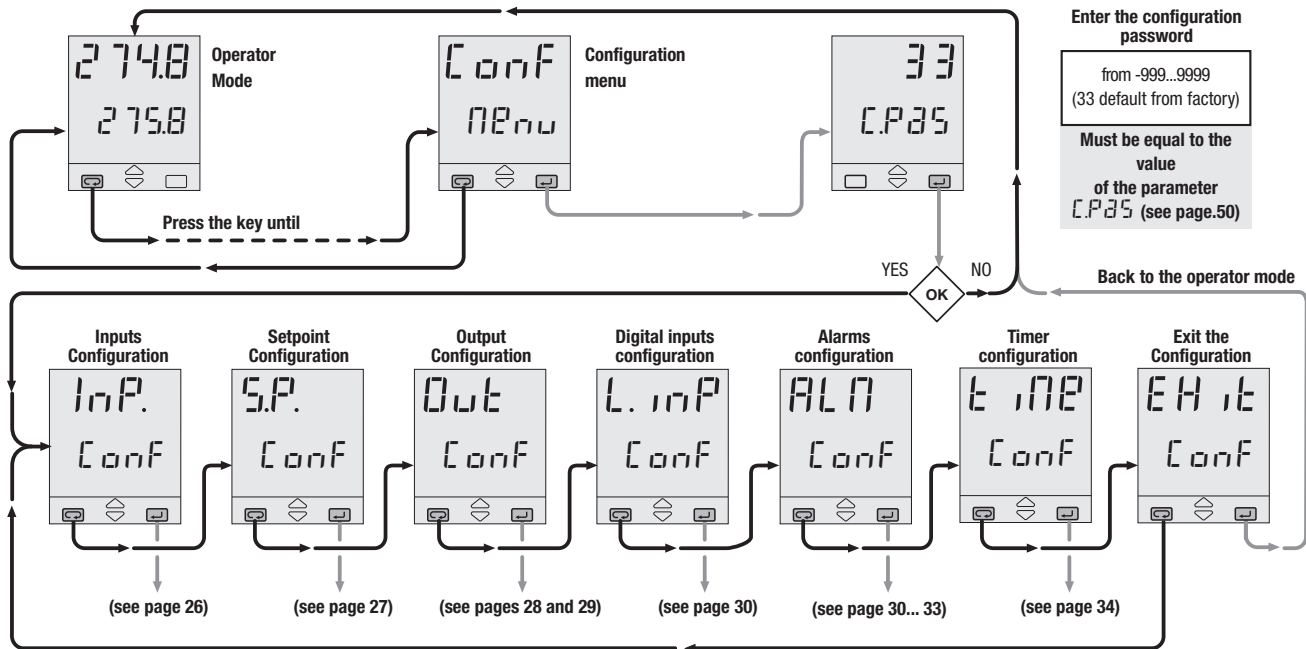
4.3.1 INPUTS CONFIGURATION
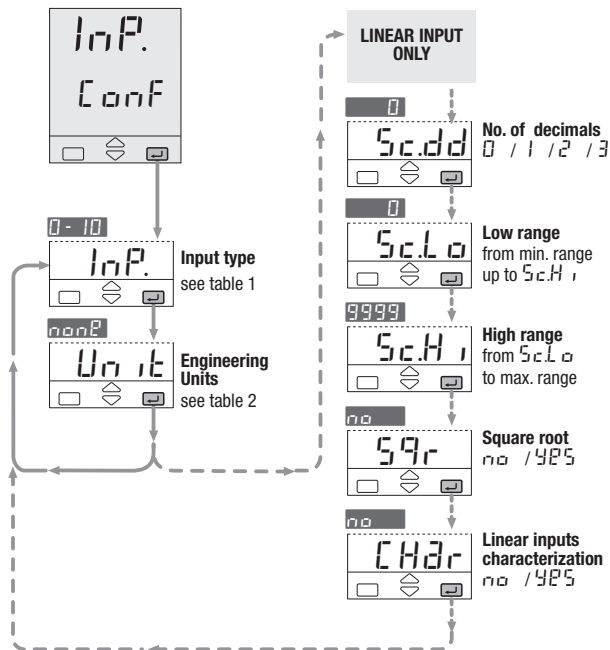
Tab. 1	Input type	
Value	Description	InP.
tc. J	0…600°C	32…1112°F
tc. K	0…1200°C	32…2192°F
tc. L	0…600°C	32…1112°F
tc. S	0…1600°C	32…2912°F
tc. r	0…1600°C	32…2912°F
tc. t	-200…400°C	-328…752°F
tc. b	0…1800°C	32…3272°F
tc. n	0…1200°C [1]	32…2192°F
tc.n i	0…1100°C [2]	32…2012°F
tc.U3	0…2000°C	32…3632°F
tc.U5	0…2000°C	32…3632°F
tc. E	0…600°C	32…1112°F
cuSt	Custom range on request [3]	
rtd1	-200…600°C	-328…1112°F
rtd2	-99.9…300.0°C	-99.9…572.0°F
dPL.t	-50.0…50.0°C	-58.0…122.0°F
n.50	0…50 mV	
n.300	0…300 mV	
0 - 5	0…5 Volt	
1 - 5	1…5 Volt	Engineering units
0 - 10	0…10 Volt	
0 - 20	0…20 mA	
4 - 20	4…20 mA	
Frq.L	0…2.000 Hz	Frequency
Frq.H	0…20.000 Hz	(option)

Tab. 2	Engineering units	
Value	Description	Un it
nonE	None	
°C	Degree centigrade	
°F	Degree Fahrenheit	
mA	mA	
mU	mV	
U	Volt	
bar	bar	
PS1	PSI	
rh	Rh	
Ph	Ph	
H2	Hertz	

Notes:

[1] NiChroSil-NiSil thermocouple.
[2] Ni-Mo thermocouple.
[3] Factory default for the custom range is: type K (32... 2448°F).

4.3.2 SETPOINT CONFIGURATION
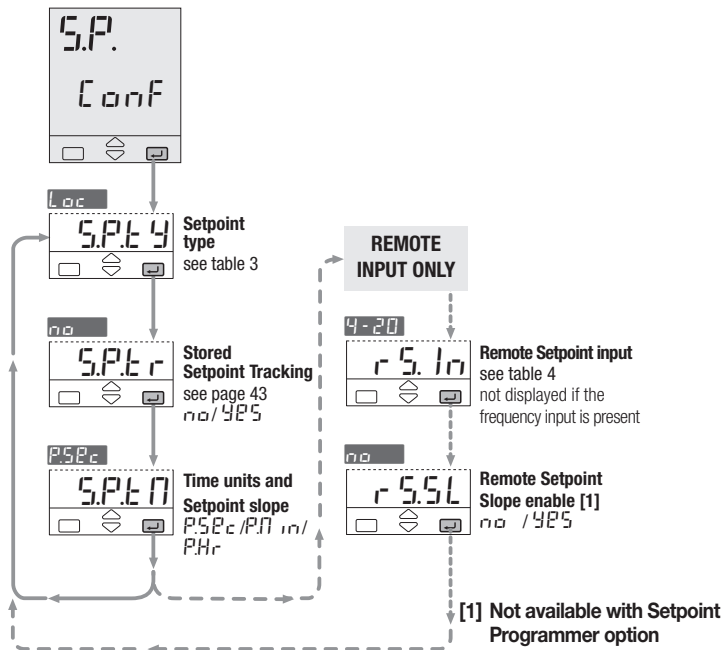
Tab. 3	Setpoint type	
Value	Description	5.P.t.y
Loc	Local only	
rPN	Remote only	
L-r	Local/remote only	
Loc.t	Local - trim	
rPN.t	Remote - trim	

Tab. 4	Rem. Setpoint	r.5.In
Value	Description	
0-5	0…5 Volt	
1-5	1…5 Volt	
0-10	0…10 Volt	
0-20	0…20 mA	
4-20	4…20 mA	

Setpoint type see table 3

Stored Setpoint Tracking see page 43 no/YES

Time units and Setpoint slope P.SEc/P.Nin/ P.Hr

REMOTE INPUT ONLY

Remote Setpoint input see table 4 not displayed if the frequency input is present

Remote Setpoint Slope enable [1] no /YES

[1] Not available with Setpoint Programmer option

4.3.3 OUTPUT CONFIGURATION

Out ConF

Pid.r
Cnt Y — Control type see table 5

OFF
** 17.C.OP** — Main output (Heat) see table 6

OFF
5.C.OP — Secondary output (Cool) (Heat/Cool only) see table 7

no
C.OP.5 — Cool output on OP5 (Heat/Cool only) no/YES

OFF
5.Out — Main output safety value OFF /-100…+100%

OFF
F.Out — Main output forcing value OFF /-100…+100%

OFF
Split range % (split range only) 0.0…+100%

WITH OP5 ANALOG OUTPUT NOT USED AS CONTROL OUTPUT

none
rt. 1 — 1st retransmitted output selection nonE/ P.U./S.P.

4-20
O.rt.1 — 1st retransmission output see table 8

0
rt.L1 — 1st retransmission low range whole range

9999
rt.H1 — 1st retransmission high range whole range

WITH OPTIONAL OP6 ANALOG OUTPUT NOT USED AS COOL CONTROL OUTPUT

none
rt. 2 — 2nd retransmitted output selection nonE/P.U./S.P./P.U.

4-20
O.rt.2 — 2nd retransmission output see table 8

0
rt.L2 — 2nd retransmission low range whole range

9999
rt.H2 — 2nd retransmission high range whole range

Tab. 5	Control mode	
Value	Description	$Cnt\,4$
$OF.rP$	Reverse action	On - Off
$OF.d\,i$	Direct action	
$P\,id.d$	Direct action	PID
$P\,id.r$	Reverse action	
$U.d\,ir$	Direct action	Modul. valves
$U.rPU$	Reverse action	
$HC.Ln$	Linear	Heat/ Cool
$HC.OL$	Oil charac.	
$HC.H2$	Water charac.	

Tab. 6	Main Output (Heat)	
Value	Description	$NC.OP$
OFF	Not used	
$OP\,1$	Relay / Triac	Digital signal
$Lo9$	Digital	
$0 - 5$	0…5 Volt	DC signal
$1 - 5$	1…5 Volt	
$0 - 10$	0…10 Volt	
$0 - 20$	0…20 mA	
$4 - 20$	4…20 mA	

Tab. 7	Secondary output (Cool)	
Value	Description	$SC.OP$
OFF	Not used	
$OP\,2$	Relay / Triac	Digital signal
$Lo9$	Digital	
$0 - 5$	0…5 Volt	DC signal
$1 - 5$	1…5 Volt	
$0 - 10$	0…10 Volt	
$0 - 20$	0…20 mA	
$4 - 20$	4…20 mA	

Tab. 8	Retransmission outputs	
		$O.rt.1$
Value	Description	$O.rt.2$
$0 - 5$	0…5 Volt	
$1 - 5$	1…5 Volt	
$0 - 10$	0…10 Volt	
$0 - 20$	0…20 mA	
$4 - 20$	4…20 mA	

RETRANSMISSION

When OP5 and OP6 outputs are not configured as control output, they can retransmit the PV, SP or MV linearized value.

$rt.\ 1$
$rt.\ 2$ **Retransmitted signal** $nonE/P.U./S.P/N.U.$

$O.rt.1$
$O.rt.2$ **Output range** $0-5/1-5/0-10$ $0-20/4-20$

The following parameters define the low and high range.

$rt.L\ 1$
$rt.L\ 2$ **Retransmission low range**

$rt.H\ 1$
$rt.H\ 2$ **Retransmission high range**

Example:
- T/C S: range 0…1600°C;
- Output range, 4…20 mA;
- Retransmitted signal PV on 800…1200°C range.
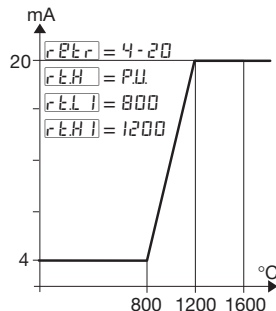
With $rt.L\ 1$ **greater than** $rt.H\ 1$ **it is possible to obtain a reverse scale.**

4.3.4 DIGITAL INPUT CONFIGURATION

L. InP ConF

IL1 digital input function
see table 10

IL2 digital input function
see table 10

IL3 digital input function
see table 10
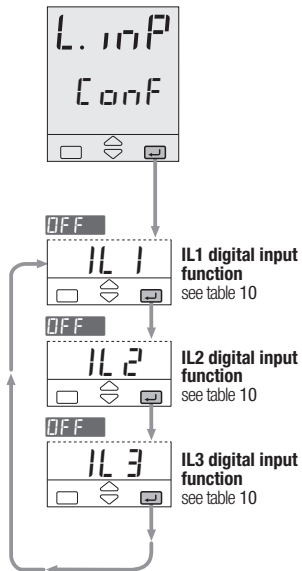
Tab. 10	Digital Inputs functions	IL 1 IL 2 IL 3
Value	Description	
OFF	Not used	
L - r	Local/Remote	
A.Man	Auto/Man	
S.P. 1	1st stored Setpoint	
S.P. 2	2nd stored Setpoint	
S.P. 3	3rd stored Setpoint	
KEb. 1	Keyboard lock	
SL o. 1	S.P. slope disable	
H.PU	Measure hold	
F.Out	Output forcing mode	
bL c K	Reset blocking	
Strt	Start-Hold timer	
tr PS	Reset out timer	
Pnd	Quit timer	

4.3.5 ALARM CONFIGURATION

AL M ConF

[1] OP1 and OP2 outputs can be used as alarm outputs if they are not used as control outputs.

AL. 1
AL1 alarm type
see table 11

NOT AVAILABLE OF AL. 1 = OFF

A 1.Ou
AL1 addressing
OP 1 / OP2 [1]
OP3 / OP4

Lt ch
AL1 latching
no / YES

bL oc
AL1 start-up disabling
no / YES

donb
Disables AL1 if a sensor break occurs
no / YES

AL2 alarm type
see table 11

NOT AVAILABLE
OF $AL.\ 2$ = OFF

AL2 addressing
OP1 / OP2 [1]
OP3 / OP4

AL21 latching
no / YES

AL2 start-up disabling
no / YES

Disables AL2 if a sensor break occurs
no / YES

AL3 alarm type
see table 11

NOT AVAILABLE
OF $AL.\ 3$ = OFF

AL3 addressing
OP1 / OP2 [1]
OP3 / OP4

AL3 latching
no / YES

AL3 start-up disabling
no / YES

Disables AL3 if a sensor break occurs
no / YES

AL4 alarm type
see table 11

NOT AVAILABLE
OF $AL.\ 4$ = OFF

AL4 addressing
OP1 / OP2 [1]
OP3 / OP4

AL4 latching
no / YES

AL4 start-up disabling
no / YES

Disables AL4 if a sensor break occurs
no / YES

Tab. 11	Alarm type		
			AL 1
			AL 2
			AL 3
Value	Description		AL 4
OFF	Not used or used by the program (AL3/AL4)		
FS.H	Active High	Absolute	
FS.L	Active Low		
dEV.H	Active High	Deviation	
dEV.L	Active Low		
bno	Active Out	Band	
bni	Active In		
LbA	Loop break alarm (AL1 only)		
t.inP	Alarm 3 active when Timer ON		

4.3.6 AL1, AL2, AL3, AL4 ALARM CONFIGURATION

Up to four alarms can be configured: AL1, AL2, AL3 and AL4 (see page 31).

For each alarm the following selections can be mode:

- **A** the type and the operating condition of the alarm (table 11 page 31)
- **B** the functionality of the alarm acknowledge (latching) $\boxed{L \, t \, c \, h}$
- **C** the start-up disabling (blocking) $\boxed{b \, L \, o \, c}$
- **D** alarm inhibition on sensor break
- **E** the physical output of the alarm $\boxed{OP \, 1} \ \boxed{OP \, 2} \ \boxed{OP \, 3} \ \boxed{OP \, 4}$

The outputs can be used for alarms if they are not used as control outputs (see par. 3.3.7 page 20).

It is possible to route up to 4 alarm to a single output (OR of the alarms).

Alarm occurrence display

This function can be enabled by the configuration software.

Please, read the user manual:
"Serial communication and configuration software".

The type of alarm is presented flashing, on the front panel in alternation with the PV value.
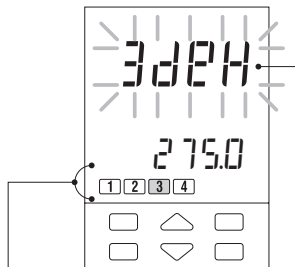
The red led of the activated alarm output is on.

[A] OPERATING CONDITIONS

Absolute alarm
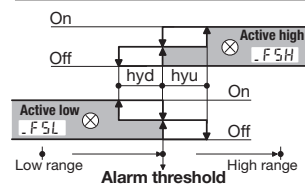
Deviation alarm
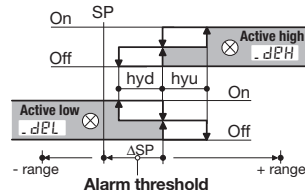
Band alarm
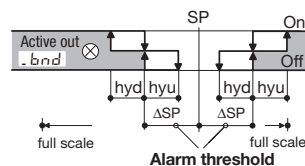
[B] ALARM ACKNOWLEDGE FUNCTION

The alarm, once occurred, is presented on the display until acknowledged. The acknowledge operation consists in pressing any key.

After this operation, the alarm leaves the alarm state only when the alarm condition is no longer present.

[C] START-UP DISABLING
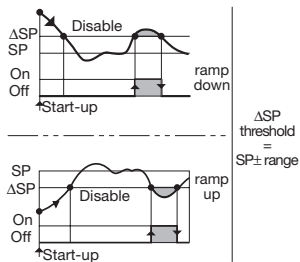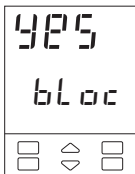
[D] ALARM DISABLING AT SENSOR BREAK

For those alarms that are configured to be different than LBA, it is possible to set the parameter $\boxed{donb}$ (disable on break).

Set:

no   To maintain the alarm status when a sensor break is detected.

4E5 To disable the alarm intervention when a sensor break is detected. Once the sensor has been changed, the alarms that were active before the sensor break are activated again.
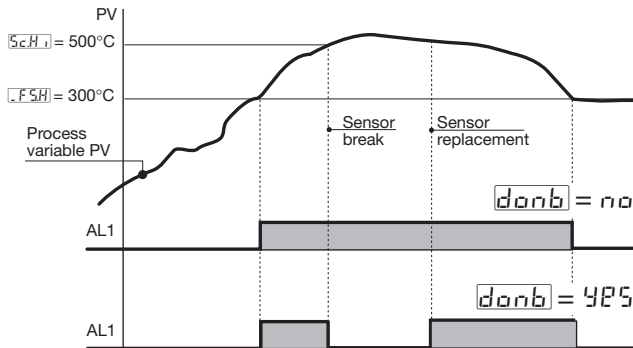
LOOP BREAK ALARM (LBA)

When the controller connection to the sensor is discontinued or other faults are detected in the control loop, AL1 alarm becomes active after a predefined time of 1... 9999 s from the detection of the failure (see page 37). When a sensor failure occours, the LBA interventrion is immediate. The alarm state ceases when the fault condition is no longer present.
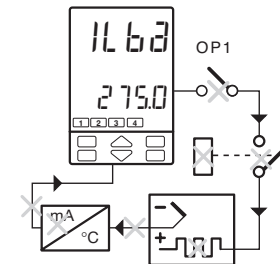
⚠ **In case of ON-OFF control, the LBA alarm is not active.**

4.3.7 TIMER CONFIGURATION

Timer and Start-up Menu

Timer/Start-up operating mode (see table 1 page 37)

TIMER FUNCTION (only with AL3 enabled)

t.Act — **Timer Action** (only if t.Mod not equal to OFF or to 1) (see table 2 page 37)

t.doP — **Timer OP function** Std, EHPd

Pid — **Enable/disble PID** (with t.Mod =7) 0 - disbLE, 1 - EnAbLE

Back to t.Mod parameter

START-UP FUNCTION (only if t.Mod = 1)

t.h.S.U — **Hold time** 0…500 min.

S.P.S.U — **Start-up Setpoint** SP. L …SP. H

OP.HS — **Output high limit during Start-up** 5.0…100.0%

4.4 PARAMETERIZATION - MAIN MENU

Operator mode

⚠

The parameter setting procedure has a timeout. If no keys are pressed for, at least, 30 seconds, the controller switches back, automatically, to the operator mode.

Setpoint menu

S.P. MEnu

(see page 36)

Time menu

t inE MEnu

(see pages 37)

Alarm menu

AL MEnu

(see page 41)

34
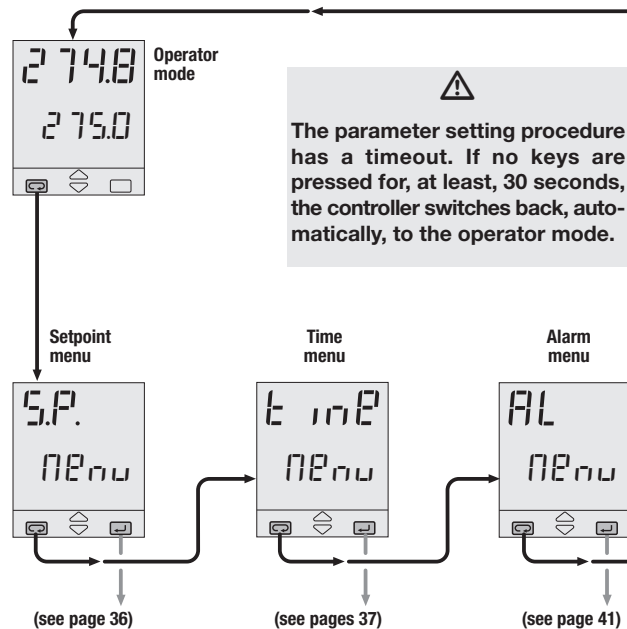
After having selected the parameter or the code, press ⌃ or ⌄ to modify the value (see page 24) The value is entered when the next parameter is selected, by pressing the ↵ key.

Pressing ⟲ go back to the Operator mode

PID menu	Tuning menu	Input menu	Output menu	Communication menu	Access menu	Configuration menu
P Id nEnu	tunE nEnu	InP nEnu	Out nEnu	CoNN nEnu	AccS nEnu	ConF nEnu
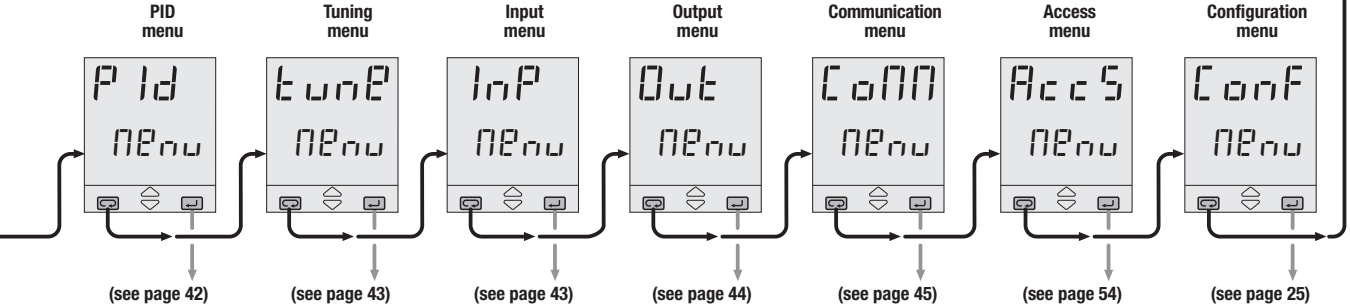
4.4.1 PARAMETERIZATION - SETPOINT MENU

S.P. menu — Setpoint menu

L - r — Setpoint selection local/remote Loc /rEN

Depending on the configuration index shown on page 27, the following parameters may or may not be present.
[1] The units of the slope parameters are Digit/s, digit/min digit/h

LOCAL ONLY
INDEX Loc

- **S.SEL** nonE — Stored Setpoint selection nonE/SLOC/ S.SP1 /S.SP2/ S.SP3
- **S.P. 1** 0 — 1st stored Setpoint full scale
- **S.P. 2** 0 — 2nd stored Setpoint full scale
- **S.P. 3** 0 — 3th stored Setpoint full scale

LOCAL/REMOTE, REMOTE OR PROGRAMMED
INDEX L - r rEN Prog

LOCAL WITH TRIM OR REMOTE WITH TRIM
INDEX Loc.t rEN.t

- **rtio** 1.00 — Ratio Setpoint -9.99…99.99
- **biaS** 0 — Remote Setpoint bias full scale

- **S.P. L** L.range — Setpoint low limit full scale
- **S.P. H** H.range — Setpoint high limit full scale
- **SL. u** OFF — Slope up OFF /1…9999 digit/ [1]
- **SL. d** OFF — Slop down OFF /1…9999 digit/..OFF /1…9999 digit/ [1]

4.4.4.2 TIMER FUNCTION

⚠ **The Timer cannot be enabled with Heat/Cool control.**

To enable this function, perform the following:
1 In order to use this AL3 function, index **Q** must be set to *0* in configuration (see page 22)
2 To select one of the 6 possible functioning modes of the Timer, set the value of the following 2 parameters in parameterization (see p. 29).

Now the other parameter values can be entered:

t.Mod **Timer/Start-up operating mode**
This parameter can be defined:
(see table 1)
- counting start time
- control output status at the end of the counting

table 1

Timer/Start-up counting mode		Value
Disabled		OFF
Start-up function		1
Counting start time	End mode	
When inside the band	Control mode	2
	Output to 0	3
When launched	Control mode	4
	Output to 0	5
When launched. Control disabled	Control mode	6
When launched stand-by Setpoint	Control mode	7

t.Act **Timer Action**
This parameter can be defined:
(see table 2)
- time units
- starting mode
- OP3 status when the timer is running.
When the timer is not running, the OP3 takes the opposite status.

table 2

Time units	Starting mode	[1] OP3 status	Value
Minutes	Manual by keypad	On	4
		Off	5
	Auto at Power ON [2]	On	6
		Off	7

[1] If used by Timer
[2] Using this selection, manual starting mode is also possible.

t.doP **Timer OP function**
Std/EHPd
standard/extended
Standard: t.doP = 0
OP3 is set to 1 at timer lauch and reset 0 on time elapsing.
Extended: t.doP = 1
OP3 is set to 1 at time elapsing and set to 0 by reset command.

P.id **P.I.D enable**
YES/no
Yes:
PID is enabled when time function is enabled.
Extended:
PID is disabled and output is maintained at zero.

4.4.4.2 TIMER FUNCTION

TIMER COUNTING MODES

A - Counting start time inside the band, end in control mode.

The time counting starts only when the error is inside a ±1 digit band. The control action is not affected by the Timer function.
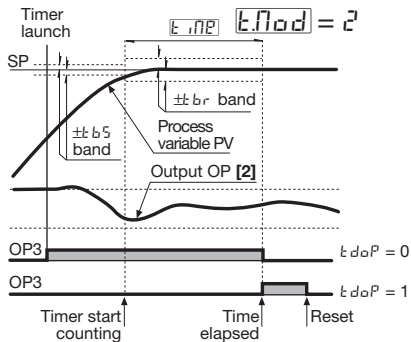
B - Counting start time inside the band, end with control output forced to zero.

The time counting starts only when the error is inside a ±1 digit band. At the end, the control output is forced to zero **[1]**.
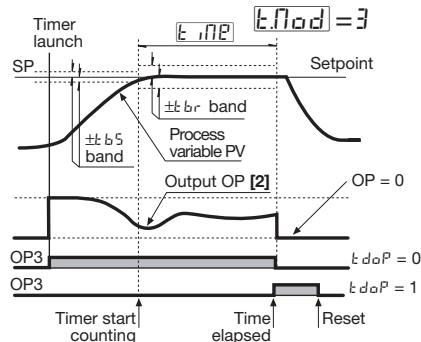
C - Counting start time = timer launch time, end in control mode.

The time counting starts when the timer is launched. The control action is not affected by the Timer function.
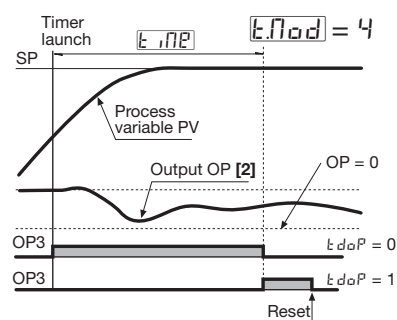
Notes

[1] When the Timer is not running the control output is forced to zero.

[2] When the PID enable parameter is set to "**0**" (PID disabled) the OP output is set to "**0**".

TIMER COUNTING MODES

D - Counting start time = timer launch time, end with control output forced to zero.

The time counting starts when the timer is launched. At the end, the control output is forced to zero **[1]**.
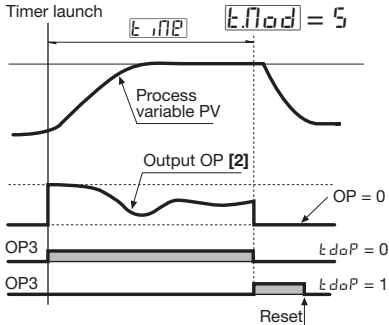
E - No control action during the counting time.

The time counting starts when the timer is launched and the control output is forced to zero. At the end, the control action starts.
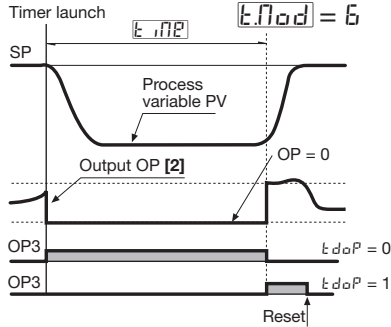
F - Control action with stand-by Setpoint during the counting time.

The time counting starts when the timer is launched and the control action use the Stand-by Setpoint. At the end, the control action use the working Setpoint.
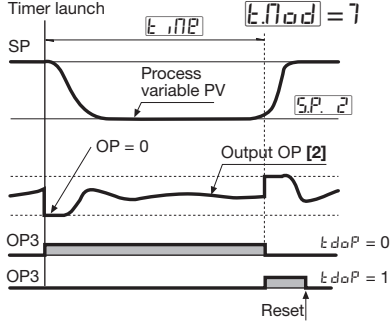
Notes

[1] When the Timer is not running the control output is forced to zero.

[2] When the PID enable parameter is set to "**0**" (PID disabled) the OP output is set to "**0**".

4.4.4.2 TIMER FUNCTION (OPTION)

POWER FAILURE

If there is a power failure during the Timer execution, the value of the elapsed time is lost.

Depending on Timer action $E.\exists cE$ selection, when the controller restarts you can have two different situations:

• with automatic mode

  ($E.\exists cE = 6, 7$), the Timer function starts again and the counting time is re-initialized.

• with manual mode

  ($E.\exists cE = 4,5$), the control output is forced to zero, if $E\Pi\alpha d = 3 \text{ e } 5$; otherwise the control action restarts using the working Setpoint

TIMER START

See the Timer starting procedure on page 50 (chapter 6.2.2)

DISPLAY

```
      850
  ▪   850
 ───  ⇕  ───
```
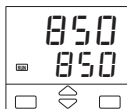
When the Timer is running, the RUN LED is on.

```
      850
      End
 ───  ⇕  ───
```

TIMER REMAINING TIME

When the timer is running it is possible to see the remaining time and to modify it.

To change the value of **Time Remaining**, it is necessary to put (from the $E \, \iota \pi P$ menu) the parameter $E.5E5$ in **HOLD**.

When the user exits the menu, it is possible through the up (⌃) and down (⌄) keys to change the **Time Remaining**.

To restart the timer, select the $E.5E5$ parameter in Time Menu and set it to **RUN**.

4.4.2 PARAMETERIZATION - ALARMS MENU

AL
Alarms menu
NEnu

1 _ _ _
Alarm threshold 1
[1] see table

2 _ _ _
Alarm threshold 2
[1] see table

3 _ _ _
Alarm threshold 3
[1] see table

4 _ _ _
Alarm threshold 4
[1] see table

h 9.1 u
Alarm 1 hysteresis asymmetric upper
0…5% Span
in engineering units

h 9.1 d
Alarm 1 hysteresis asymmetric lower
0…5% Span
in engineering units

t F 1 _
Alarm 1 delay
OFF /1...9999

h 9.2 u
Alarm 2 hysteresis asymmetric upper
0…5% Span
in engineering units

h 9.2 d
Alarm 2 hysteresis asymmetric lower
0…5% Span
in engineering units

t F 2 _
Alarm 2 delay
OFF /1...9999

h 9.3 u
Alarm 3 hysteresis asymmetric upper
0…5% Span
in engineering units

h 9.3 d
Alarm 3 hysteresis asymmetric lower
0…5% Span
in engineering units

t F 3 _
Alarm 3 delay
OFF /1...9999

h 9.4 u
Alarm 4 hysteresis asymmetric upper
0…5% Span
in engineering units

h 9.4 d
Alarm 4 hysteresis asymmetric lower
0…5% Span
in engineering units

t F 4 _
Alarm 4 delay
OFF /1...9999

[1] A code, specifying the No. and the alarm type that has been configured (see page 31), is displayed. At this point, the user must enter the threshold value, according to the following table.

Type and value	Mode	No. and Param.
Absolute full scale	Active high	_ F S.H
	Active low	_ F S.L
Deviation full scale	Active high	_ dP.H
	Active low	_ dP.L
Band full scale	Active out	_ bno
	Active in	_ bn i
L.B.A. 1…9999 s	Active high	_ L bd
Timer ON on timer signal	Alarm 3 active on timer signal	_ t on

41

4.4.3 PARAMETERIZATION - PID MENU (not shown for ON-OFF control action)

PId MEnu — Menu PID

P.b. — Proportional band — 0.5…999.9%c.s.

t. i. — Integral time — OFF /1…9999 s

t.d. — Derivative time — OFF /0.1…999.9 s

d.Err — Error dead band — OFF /0.1…10.0 digits

O.C. — Overshoot control — 0.01…1.00 (not displayed if Heat/Cool)

M.rES — Manual reset — OFF /1…100% output (not displayed if Heat/Cool)

Heat / Cool Algorithm — OK — YES / NO

P.b. C — Proportional band Cool channel — 0.5…999.9%c.s.

t. i. C — Cool Integral time — OFF /1…9999 s

t.d. C — Cool Derivative time — OFF /0.1…999.9 s

4.4.4 PARAMETERIZATION
TUNING MENU (not shown for ON-OFF control action)

Tuning menu

for AT

OK — Yes / No

$P.b.$ **Calculated Proportional band [1]** (display only) (available when adaptive tune is selected)

$t. i.$ **Calculated Integral time [1]** (display only) (available when adaptive tune is selected)

$t.d.$ **Calculated derivative time [1]** (display only) (available when adaptive tune is selected)

$tunE$ **Initial tune start** (One shot tune) no/yES
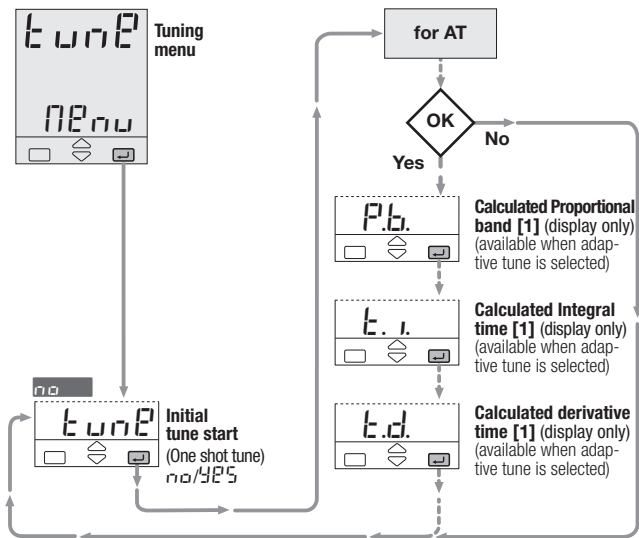
[1] These values are not automatically stored on the PID menu parameters P.b.,t. i.,t.d.

4.4.5 PARAMETERIZATION
INPUT MENU

Input menu

$t.FiL$ **Filter time constant** (user enabled/disabled) OFF /0.2…99.9 seconds

$In.Sh$ **Measure bias** -60…60 digit

$t.SaN$ **Sampling time** 0.1…10.0 seconds

43
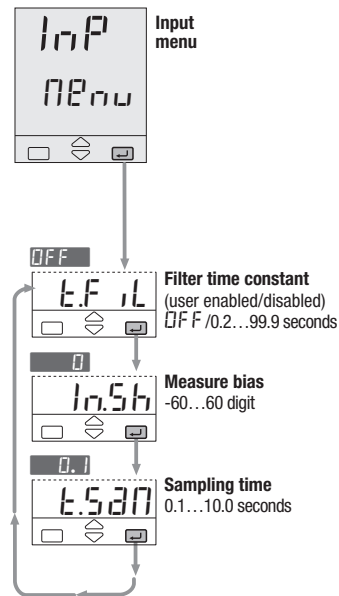
4.4.6 PARAMETERIZATION - OUTPUT MENU

Out NEnu — Output menu

10.0
t.c. — Cycle time (time proportional only) 0.2…100.0 s

On-Off Algorithm

PID Algorithm

0.0
OP. L — Control Output low limit (not available in Heat/Cool configuration) 0…100%

100.0
OP. H — Control output high limit 0…100%

OFF
OP.r — Control output rate limit (user enabled/disabled) OFF /0.01…99.99%s

OFF
St.OP — Control Output soft start value (user enabled/disabled) OFF /1…100%

10
St.t N — Soft start function activation time 1…9999 s

1
OP.hy — Output hysteresis 0…5% Span in engineering units

Valve drive algorithm

60
NU.t N — Motor travel time 15…600 seconds

0.5
NU.hy — Minimum output step 0.1…5.0%

Heat / Cool Algorithm

0.5
d.bnd — Dead band 0.0…5.0%

10.0
t.c. C — Cool cycle time (time proportional only) 0.2…100.0 s

100.0
OP.C.H — Cool control output high limit (PID only) 0.0…100.0%

OFF
OP.r C — Cool output rate limit (user enabled/disabled) OFF /0.01…99.99%s

Serial communication menu

4.4.7 PARAMETERIZATION - SERIAL COMMUNICATION MENU

Depending on serial communication choosen (see model code on page 5), there are the following parameters:

RS485 Modbus/Jbus SLAVE   Index   C = 5

Add.S — SLAVE address communication (if option installed) OFF / 1…247

bdr.S — SLAVE baud rate 1200/2400 4800/9600/ 19200
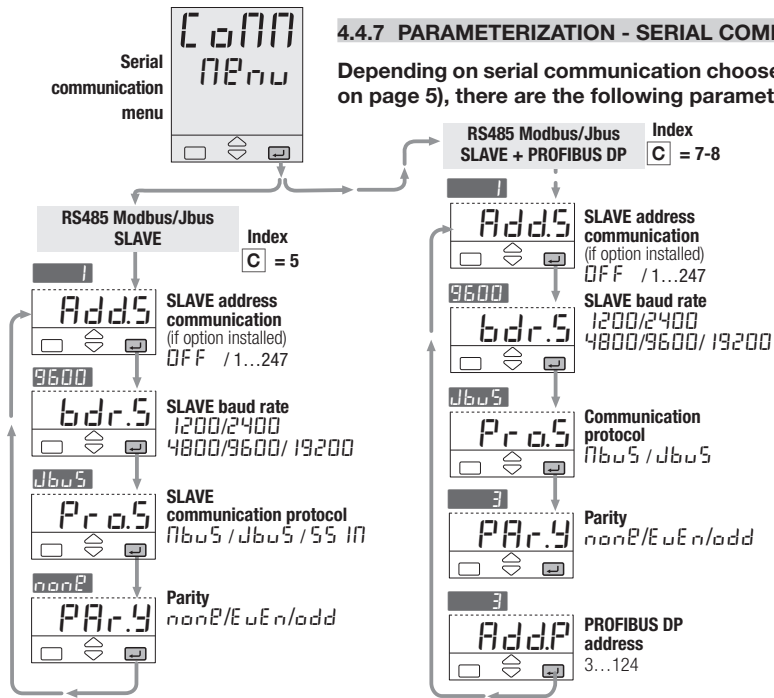
Pro.S — SLAVE communication protocol MbuS / JbuS / SS IN

PAr.Y — Parity nonE/EuEn/odd

RS485 Modbus/Jbus SLAVE + PROFIBUS DP   Index   C = 7-8

Add.S — SLAVE address communication (if option installed) OFF / 1…247

bdr.S — SLAVE baud rate 1200/2400 4800/9600/ 19200

Pro.S — Communication protocol MbuS / JbuS

PAr.Y — Parity nonE/EuEn/odd

Add.P — PROFIBUS DP address 3…124

4.5 PARAMETERS

For a simpler use of the controller, the parameters have been organized in menus, according to their functional area.

4.5.1 SETPOINT MENU

| $5.P. \quad L$ | **Setpoint low limit** |
| $5.P. \quad H$ | **Setpoint high limit** |

High and low limit of the SP. The minimum span (S.P.L - S.P.H) must be greater than 100 digit.

| $5L. \quad u$ | **Setpoint ramp up** |
| $5L. \quad d$ | **Setpoint ramp down** |

This parameter specifies the maximum rate of change of the Setpoint.
Adjustable in digit/s, digit/min and digit/hour (see page 27)

When the parameter is DFF**, this function is disabled and the new Setpoint is reached immediately after being entered.**
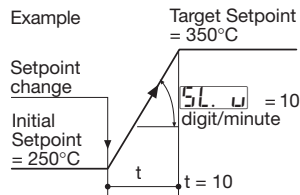
Otherwise, the Setpoint value is obtained according to the configured rate of change.

The new Setpoint value is called "Target Setpoint". It can be displayed by means the parameter $t.5.P.$
(see procedure at page 53).

When Remote Setpoint is configured, we suggest to disable $5L. \quad u$ and $5L. \quad d$ parameters DFF.

Example

Target Setpoint = 350°C

Setpoint change

$5L. \quad u$ = 10 digit/minute

Initial Setpoint = 250°C

t = 10

$5.P. \quad 1$	**1st stored Setpoint**
$5.P. \quad 2$	**2nd stored Setpoint**
$5.P. \quad 3$	**3th stored Setpoint**

Values of the three Setpoints, that are activated by mean of logic inputs, communication parameters, and keyboard. The Setpoint active is indicated by the **S 1**, **S 2** or **S 3** green LED.

See page 56 for further explanation.

| $r \; 5.5L$ | **Remote Setpoint Slope enable** |

To enable or disable slopes when the remote Setpoint is active.

$\boxed{5.P.t.r}$ **Stored Setpoint Tracking**

(see chapter 4.3.2 at page 27)
Two different operation mode can be set:

A Stand-by mode $\boxed{no}$
The selection of any memorized SP (SP1, SP2, SP3) does not overwrite the previous local Setpoint when the memorized SP is no longer active. The previous local SP in unchanged.

B- Tracking mode $\boxed{YES}$
The use of any memorized SP (SP1, SP2, SP3) overwrites the local SP value.
**The previous Local Setpoint value will be lost.**

$\boxed{r\ t\ \ \ \ \ \ io}$ **Remote Setpoint Ratio**

Ratio is the coefficient which defines the remote Setpoint span with respect to the input span.

$\boxed{b\ \ \ \ \ ia5}$ **Remote Setpoint**

Bias defines the starting point of analog Remote Setpoint in engineering units corresponding to the low limit (current or voltage) of the remote signal.

Remote Setpoint Bias and Ratio
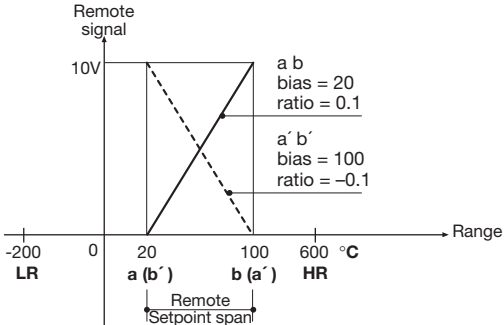
PV = Process Variable
LR = PV low limit
HR = PV high limit
SR = Remote Setpoint
a (a´) = SR starting point
b (b´) = SR ending point

47

4.5.1 SETPOINT MENU

If SR starting point is **lower** than the ending point, both expressed in engineering units:

$b \, i d5$ = starting point = a

$r \, t \, i a = \dfrac{b - a}{HR - LR}$

E.g.: $b \, i d5 = 20$

$r \, t \, i a = \dfrac{100 - 20}{600 - (-200)} = \dfrac{80}{800} = 0.1$

If SR starting point is **higher** than the ending point, both expressed in engineering units:

$b \, i d5$ = starting point = a′

$r \, t \, i a = \dfrac{b' - a'}{HR - LR}$

E.g.: $b \, i d5 = 100$

$r \, t \, i a = \dfrac{20 - 100}{600 - (-200)} = \dfrac{-80}{800} = -0.1$

Working Setpoint (SP) as combination of Local Setpoint (SL) and remote signal
Setpoint $L \, o c t$ (table 3, page 27)

$SP = SL + (r \, t \, i a \bullet REM) + b \, i d5$

Setpoint $r \, P \Pi t$ (table 3, page 27)

$SP = REM + (r \, t \, i a \bullet SL) + b \, i d5$
SIGN = Remote signal %
SPAN = HR-LR

$REM = \dfrac{SIGN * SPAN}{100}$

E.g.: Local Setpoint (SL) with an external Trim with multiplying coefficient of 1/10:
Setpoint type = $L \, o c t$
$r \, t \, i a = 0.1$; $b \, i d5 = 0$

Remote Setpoint (SR) with an internal Trim with multiplying coefficient of 1/5:
Setpoint type = $r \, P \Pi t$
$r \, t \, i a = 0.2$; $b \, i d5 = 0$

Remote Setpoint range equal to the Input range:
Setpoint type = $L \, o c t$
$r \, t \, i a = 1$; $b \, i d5 = LR$
$5L = 0$

4.5.2 ALARM MENU
(see also pages 32 and 33)

$h5\_u$	**Asymmetric upper alarm hysteresis**
$h5\_d$	**Asymmetric lower alarm hysteresis**

Example with high absolute alarm
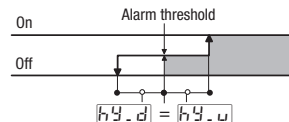
The parameter can be set between 0 and 5% of the configured Span and set in Engineering units. e.g.
Range   = -200…600°C
Span   = 800°C
Max. Hysteresis = 5% 800°= 40°C

For symmetrical hysteresis set $\boxed{h5\_d} = \boxed{h5\_u}$

$tF1$	**Alarm delay**

Delay time for alarm activation.
OFF : alarm activated immediately
1…9999 seconds: alarm activated only if the condition persists for the set time

4.5.3 PID MENU

Not present with On-Off main output or Timer PID = 0.

P.b.	**Proportional Band**
P.b. ⌐	**Cool Proportional Band**

This parameter specifies the proportional band coefficient that multiplies the error (SP - PV)

t. ı.	**Integral Time**
t. ı. ⌐	**Cool integral Time**

This is the integral time value that specifies the time required by the integral term to generate an output equivalent to the proportional term. When *OFF*, the integral term is not included in the control algorithm.

t.d.	**Derivative Time**
t.d. ⌐	**Cool Derivative Time**

This is the time required by the proportional term P to reach the level of D. When *OFF* it is not included in the control algorithm.

O.C.	**Overshoot control**

(Automatically disabled when the adaptive tune is running)
This parameter specifies the span of action of the overshoot control. Setting lower values (1.00—>0.01) the overshoot generated by a Setpoint change is reduced. The overshoot control doesn't affect the effectiveness of the PID algorithm.
Setting 1, the overshoot control is disabled.

N.r ES	**Manual reset**

This term specifies the value of the control output when PV = SP, in a PD only algorithm (lack of the Integral term).

d.Err	**Error Dead Band**

Inside this band for (PV - SP), the control output does not change to protect the actuator (output Stand-by).

### 4.5.4 TUNING MENU (not shown for ON-OFF main control output)

Two tuning method are provided:
• Initial one shoot **Fuzzy-Tuning**
• Continuous, self learning **Adaptive Tuning**

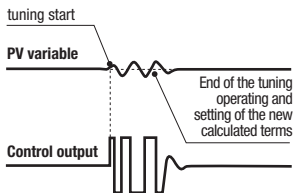**The Fuzzy-Tuning** automatically determines the best PID term with behaviour respect to the process.

The controller provides 2 types of "one shot" tuning algorithms, that automatically are selected according to the process conditions when the tune operation is started.

STEP response

49
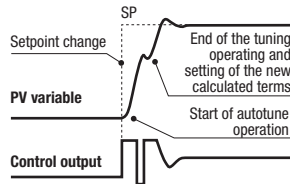
Fuzzy-Tuning is selected when, at the start of the autotune operation, the PV is far from the Setpoint (more than 5% of the span). This method has the advantage of fast calculation with a reasonable accuracy in the term calculated.

Natural frequency

**Natural frequency** is selected when the PV is close to the SP.

This method has the advantage of better accuracy in the terms calculated with reasonable speed.

The Fuzzy Tuning automatically determines the best method to use to calculate the PID term, according the

process conditions.

The self-learning **adaptive autotune** is not intrusive. It does not affect the process during the phase of calculation.

Continuous **adaptive tune**
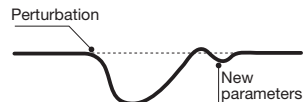
Continuous adaptive tune is particularly suitable for controlling process whose control characteristics change with time or are not linear in relation to the Setpoint values.

It does not require any operation by the user. It continuously samples the process response to the various perturbations, determining the frequency and the amplitude of the signals. On the basis of this data and their statistical values stored in the instrument,

it modifies the PID term parameters.

It is the ideal for all applications where it is required to continuously change the PID terms parameters in order to adjust the PID to the changes of the process dynamic conditions.

In case of power OFF with the Adaptive Tune enabled, the values of the PID terms parameters are stored, in order to be reused at the next power ON.
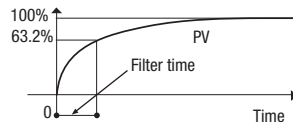
At power on the Adaptive Tune starts automatically.

4.5.5 INPUT MENU

$\boxed{\text{E.F } \text{ iL}}$ **Input filter**

Time constant, in seconds, of the RC input filter on the PV input. When this parameter is OFF the filter is bypassed.
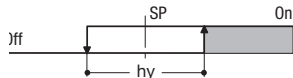
Filter response

$\boxed{\text{ In.Sb}}$ **Measure Bias**

This value is added to the measured PV input value. Its effect is to shift the whole PV scale of its value (±60 digits).

$\boxed{\text{E.SaN}}$ **Sampling Time**

Sampling time, in seconds, of the instrument. This parameter is normally used when controlling slow process, increasing the sampling time from 0.1... 10 s.

4.5.6 OUTPUT MENU

 Control output hysteresis

The parameter can be set between zero and 5% of the configured Span and set in Engineering units.
e.g. Range = -200…600°C
Span = 800°C
Max. Hyst. = 5% 800° = 40°C

$$\boxed{t.c.}$$ **Control output cycle time**

$$\boxed{t.c. \ C}$$ **Cool cycle time**

This is the cycle time of the logic control output. The PID control output is provided by the pulse width modulation of the waveform.

$$\boxed{OP. \ L}$$ **Control Output low limit**

It specifies the minimum value of the control output signal.
It is also applied in manual mode.

$$\boxed{OP. \ H}$$ **Control output high limit**

$$\boxed{OP.C.H}$$ **Cool output high limit**

This specifies the maximum value the control output. It is also applied in manual mode.

$$\boxed{OP.r}$$ **Heat output maximum rate**

$$\boxed{OP.r \ C}$$ **Cool output maximum rate**

This value, specified in %/seconds, with a range from 0.01 to 99.99%/s provides the maximum rate of change of the output. When set to OFF this function is disabled.

$$\boxed{St.OP}$$ **Soft start of the control output**

This specifies the value at which the control output is set during the soft start phase.

$$\boxed{St.t \ m}$$ **Soft start time**

This value specifies the time the soft start phase lasts. The start up phase starts at power up of the controller.
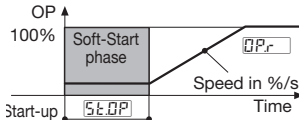
$$\boxed{nU.t \ m}$$ **Travel time**

Provides the time required for the motor positioner to go from the 0% position to 100%
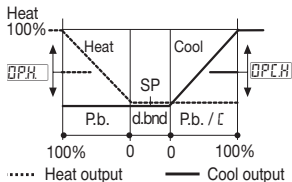
$$\boxed{nU.h.y}$$ **Minimum step**

This specifies the minimum allowed time activation of the output to a motor positioner that produces a sensible effect. It is related to the deadband of the positioner.

$$\boxed{d.bnd}$$ **Heat/Cool deadband**

This parameter specifies the width of the deadband between the Cool and the Heat outputs.

Heat / Cool Algorithm

51

4.5.7 SERIAL COMMUNICATION MENU (OPTION)

$Add.5$ **RS485 address communication**
- 1…247

$Add.P$ **SLAVE Profibus DP address**
- 3…124

All instruments connected to the same supervisor must have different addresses. If set OFF the serial comm.s is not active.

$bdr.5$ **SLAVE Baud rate**
This provides the baud rate in the range 1200... 19200 bit/s.

$PAr.Y$ **Parity**

May be set even ($EuEn$) or odd (odd). If $nonE$ is set, parity will be excluded.

$Prot$ **Protocol selection**
$nbu5$ Modbus
$Jbu5$ Jbus
SSi Modbus SSI

Two serial communication options are available:

A - Modbus/Jbus SLAVE
The parameters value can be read and when possible modified.

B - PROFIBUS DP SLAVE
(**Pro**cess **Fi**eld **bus** protocol)
Industrial standard for peripheral devices connection to a machine in a plant.
The protocol installed in this controller offers the following advantages against the standard normally supplied by other suppliers:
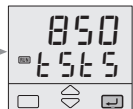• Communications baudrate
Up to 12 Mb/s with electric isolation.

• The list of data transfer (profile file) **is user configurable.**
It can be set by means the configuration software **[1]**

Notes:

**[1] ⚠ Please, read the user manual:
"Serial communications and configuration software".**

4.5.8 TIME MENU

`850` `t5t5`	**Timer functions** r85/run/End/ hold (reset/run/quit/hold)		`t.b5`	**Time band Start** 0… 100
`234` `t.HH`	**Time set (in hour)** 0...9999		`t.br`	**Time band Run** 0… 100 (only for tMod = 2, 3)

These two commands set the band at start time count and the band for the timer running.

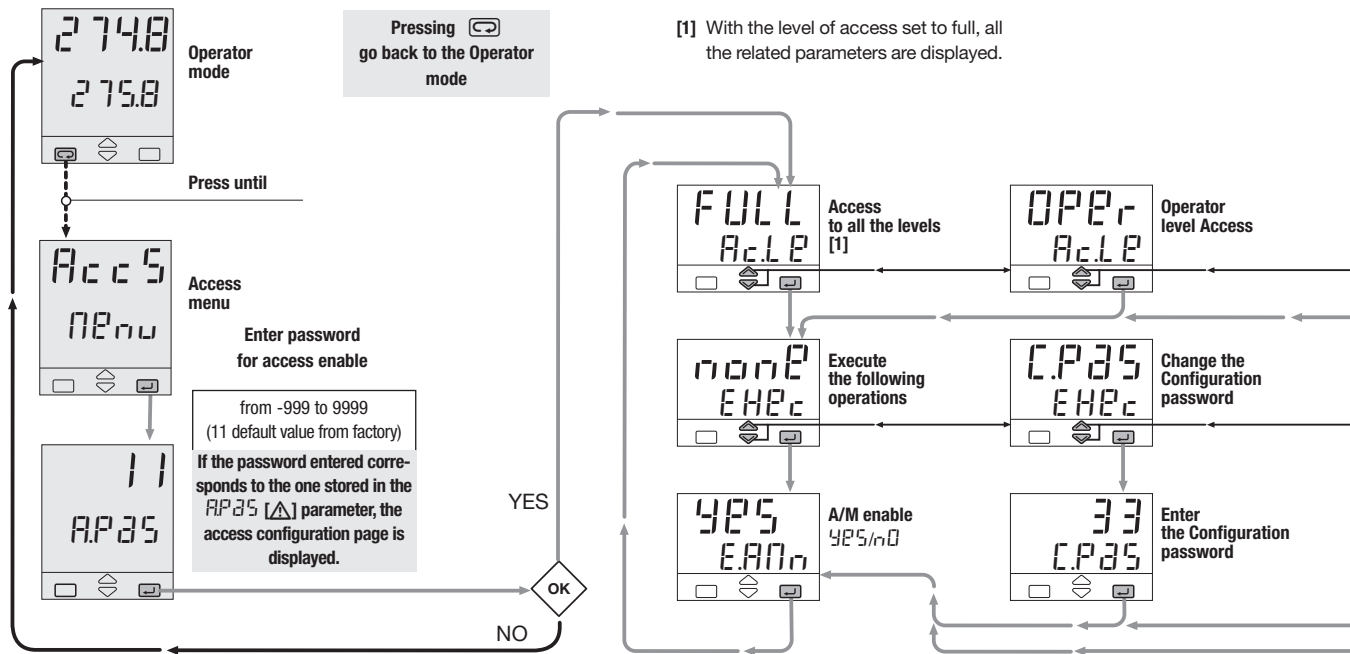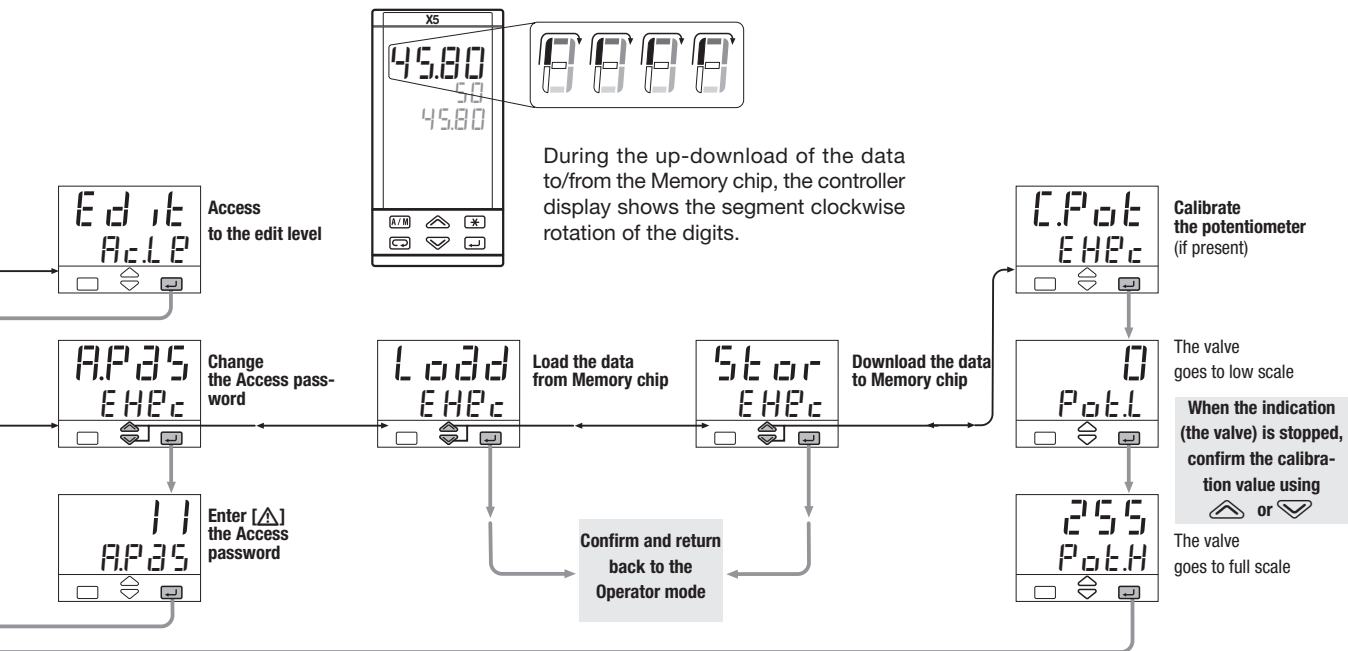|	
`25` `t.NN`	**Time set (in minutes)** 0...9999
`60` `t.b5`	**Band at timer start** 0...100
`60` `t.br`	**Band during timer counting** 0...100

4.6 PARAMETERIZATION - ACCESS MENU - PASSWORD - CALIBRATION

[1] With the level of access set to full, all the related parameters are displayed.

Pressing ⏎ go back to the Operator mode

Operator mode
274.8
275.8

Access menu
Acc5
nEnu

Enter password for access enable

from -999 to 9999
(11 default value from factory)

11
A.PaS

If the password entered corresponds to the one stored in the A.PaS [⚠] parameter, the access configuration page is displayed.

YES
OK
NO

FULL
Ac.LE
Access to all the levels [1]

OPEr
Ac.LE
Operator level Access

nonE
EHEc
Execute the following operations

C.PaS
EHEc
Change the Configuration password

YES
E.ANn
A/M enable
YES/nO

33
C.PaS
Enter the Configuration password

54

Edit / **Ac.LE**
Access to the edit level

During the up-download of the data to/from the Memory chip, the controller display shows the segment clockwise rotation of the digits.

45.80
50
45.80

A.PaS / **EHPc**
Change the Access password

Load / **EHPc**
Load the data from Memory chip

Stor / **EHPc**
Download the data to Memory chip

C.Pot / **EHPc**
Calibrate the potentiometer (if present)

11 / **A.PaS**
Enter [△] the Access password

Confirm and return back to the Operator mode

0 / **Pot.L**
The valve goes to low scale

When the indication (the valve) is stopped, confirm the calibration value using △ or ▽

255 / **Pot.H**
The valve goes to full scale

55

With the access level Edit, the user defines which groups and parameters are accessible to the operator

After selecting and confirming the access level Edit, enter in the parameters menu.
The code of the access level is displayed on the front panel.
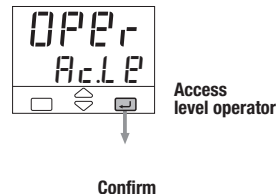
Press the $\wedge\vee$ keys to select the proper level.

Group of parameters	Code	Access level
$P\ Id$ $\quad\quad\quad\quad nEnu$	$rEad$	Visible
	$H\ idE$	Not visible (hidden)

Group of parameters	Code	Access level
35.0 $\quad\quad\quad\quad P.b.$	$Altr$	Visible and changeable
	$FaSt$	**Included in "Fast view"**
	$rEad$	Visible only
	$H\ idE$	Not visible (hidden) and not changeable

The parameters in the access level $FaSt$ are recalled on the front panel through the procedure of fast parameter access illustrated in par. 5.2 page 57. The maximum number of fast parameters is 10.

At the end of the parameter list of the selected group, the controller exits from the Edit access level.
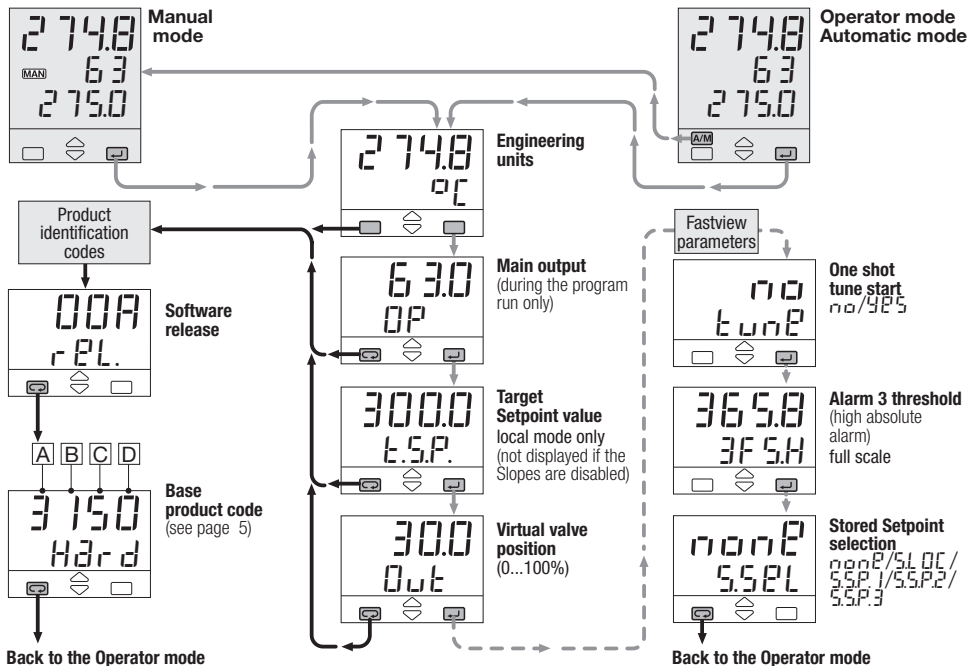**Therefore, the Edit level must be selected for each group of parameters**

The access level of groups and parameters is activated through:

$$OPEr$$
$$Ac.LE$$

Access level operator

Confirm

5   DISPLAYS

5.1 STANDARD DISPLAY

Manual mode

2 7 4.8
MAN 6 3
2 7 5.0

Operator mode / Automatic mode

2 7 4.8
6 3
2 7 5.0

A/M

Engineering units

2 7 4.8
°C

Product identification codes

Software release

0 0 A
r EL.

A B C D

Base product code
(see page 5)

3 1 5 0
HArd

Back to the Operator mode

Main output
(during the program run only)

6 3.0
OP

Target Setpoint value
local mode only
(not displayed if the Slopes are disabled)

3 0 0.0
t.S.P.

Virtual valve position
(0...100%)

3 0.0
Out

Fastview parameters

One shot tune start

no
tunE
no/YES

Alarm 3 threshold
(high absolute alarm)
full scale

3 6 5.8
3F 5.H

Stored Setpoint selection

nonE
5.SEL
nonE/SLOC/
SSP.1/SSP.2/
SSP.3

Back to the Operator mode

5.2 FAST VIEW
(fast access to the parameters)

With this procedure, up to 10 parameters, selected through the fast view (see par 4.6 page 56) are displayed and can be modified by the operator without requiring the standard parameter setting procedure.
Press ⌃⌄ in order to modify the parameters.
The value is entered by pressing ⏎ key.

On left side, please find a sample list of parameters on Fast view menu.

6 ■ COMMANDS   COMMANDS TO THE CONTROLLER AND OPERATING PHASES

The commands can be entered in 3 ways:

6.1 KEYPAD
see page 55

- Setpoint modification
- Manual mode
- Local/remote selection
- Stored Setpoint display
- Tune Run / Stop
- Program start/stop
  (see page 66)

6.2 DIGITAL INPUTS
see page 58
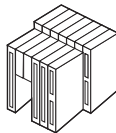
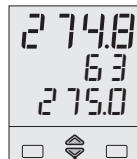## 6.3 SERIAL COMMUNICATIONS
see the manual on this topic

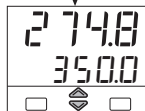## 6.1 KEYPAD COMMANDS

6.1.1 SETPOINT MODIFICATION

The Setpoint is directly modified with the ⬆⬇ keys.
Once entered, the new value is checked and becomes operating after 2 seconds. The end of this phase is flagged by flashing momentarily the display with SP.

Operator mode

Example of Setpoint modification from 275.0 to 350.0

Modified Setpoint value

⊘ after 2 seconds

Flash momentarily the SP **value to confirm** that it has become operating. back to the operator mode

6.1.2 AUTO/MANUAL MODE
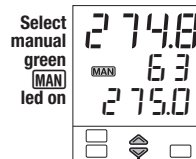
Select manual green MAN led on

Operator mode (automatic)

The bumpless action is present switching between AUTO, MAN and vice versa.

Modification of control output value
⚠
The new value is immediately working without any confirm.

Modify the output value


Back to the operator mode
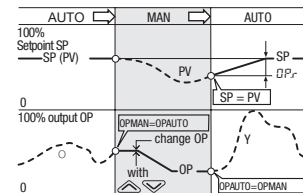
⚠ In case of power failure, the AUTO/MAN status and the output value remain stored in the controller memory.

6.1.3 LOCAL/ REMOTE SELECTION
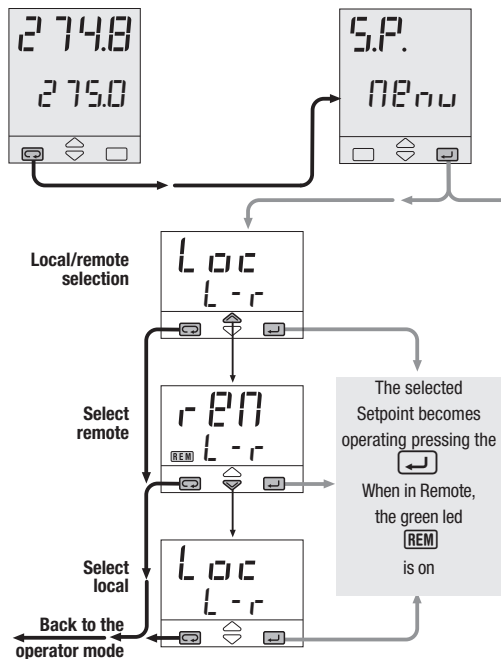
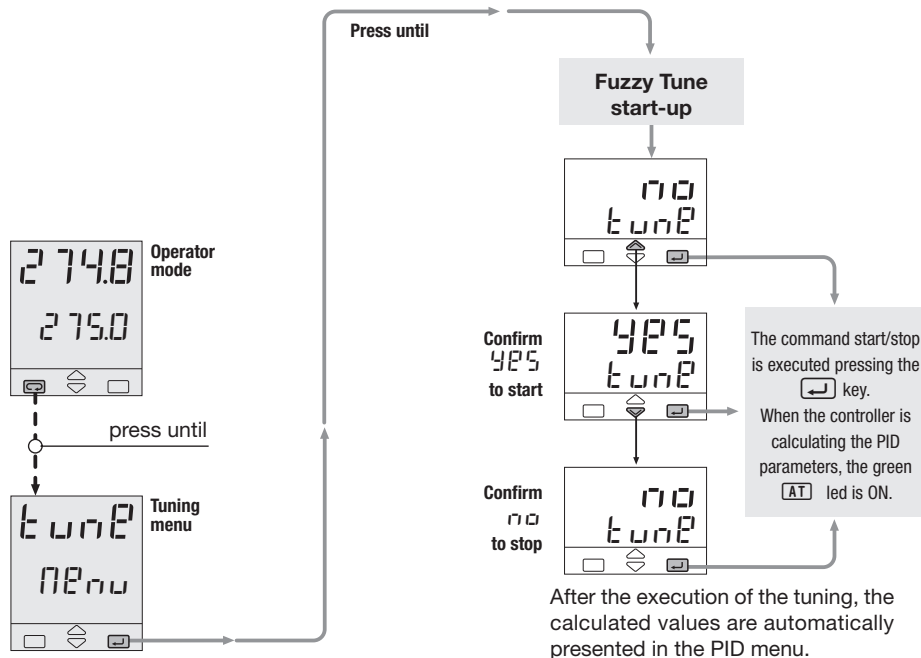## 6.1.4 STORED SETPOINTS SELECTION (see also pages 42, 43)

The Setpoint is directly modified with the ⬆⬇ keys.
Once entered, the new value is checked and becomes operational after 2 seconds. The end of this phase is flagged by flashing momentarily the display with SP.
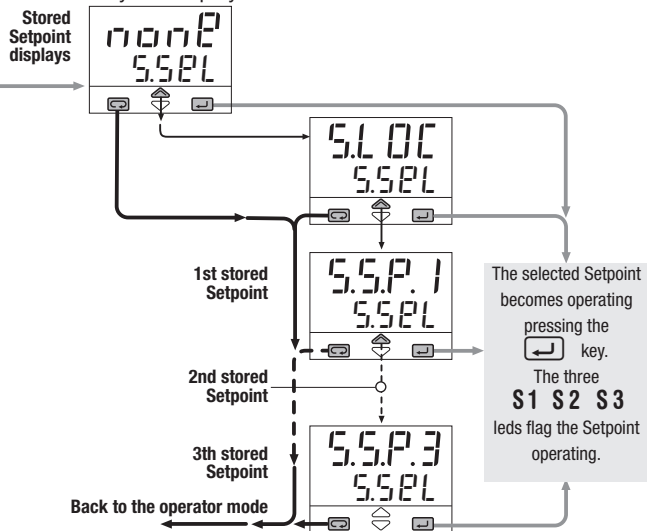
6.1.5 TUNE RUN / STOP

This controller is provided with
2 different Tuning algorithm:
- **Fuzzy tune (one shot tune)**
  for calculating the optimal PID
  term parameters.
- **Adaptive Tune** (continuous tune)
  for a continuous calculation of
  the PID term parameters.

Press until

**Fuzzy Tune
start-up**

274.8

275.0

**Operator
mode**

press until

$tunE$

$nEnu$

**Tuning
menu**

no

$tunE$

yES

$tunE$

Confirm
yES
to start

no

$tunE$

Confirm
no
to stop

The command start/stop
is executed pressing the
⏎ key.
When the controller is
calculating the PID
parameters, the green
[AT] led is ON.

After the execution of the tuning, the
calculated values are automatically
presented in the PID menu.

6.2 DIGITAL INPUTS COMMANDS

6.2.1 DIGITAL INPUTS COMMANDS FOR LOCAL-REMOTE SETPOINT

A function is assigned through the configuration procedure to each IL1, IL3 and IL3 digital input. (see the parameters setting at tab. 10 at page 30).

The configured function is activated when the digital input (free voltage contact or open collector output) is in the On state (closed). It is deactivated by setting the input to the Off state (open).

The activation of the function through the digital input has the highest priority than through the keypad or through the serial communication.

Function	Parameter value	Performed operation Off	Performed operation On	Notes
None	OFF	—	—	Not used
Set manual mode	$A.\!\mathcal{N}an$	Automatic	Manual	
Keyboard lock	$YEb.1$	Unlock	Locked	With the keypad locked the commands from digital inputs and serial communications are still operating
PV measure hold	$H.PU$	Normal operation	PV is hold	The value of PV is "frozen" at the time the digital input goes to the close state
Setpoint slopes inhibition	$SLo.1$	Rate limiting is active	Normal operation	When the input is in the on state, the Setpoint is changed in steps
Output forcing mode	$F.Out$	Normal output	Forced output	With ON command the output is equal to the forced value (see page 28)
1st stored Setpoint	$S.P.\ 1$	Local	1st SP	The permanent closure **forces** the chosen stored value. Setpoint modification is not possible.
2nd stored Setpoint	$S.P.\ 2$	Local	2nd SP	The impulsive closure, **selects** the stored value. Setpoint modification is allowed. If more than one digital input is selecting a Setpoint, the last to be activated is the operating one (see page 43)
3th stored Setpoint	$S.P.\ 3$	Local	3th SP	
Set Remote mode	$L - r$	Local	Remote	
Reactivation of blocking	$bLcY$	—	Reactivation of blocking	The blocking function is activated on closing the command from digital inputs
Start-Hold timer	$Strt$	—	—	Start-Hold timer
Reset Out 3	$trES$	—	—	Reset Output 3 connected to the timer
End timer	End	—	—	Abort timer

8 TECHNICAL SPECIFICATIONS

Features at 25°C env. temp.	Description		
Total configurability (see chapter 4.3 page 25)	From keypad or serial communication the user selects: - the type of input	- the type of Setpoint - the type of control algorithm - the type of output	- the type and functionality of the alarms - control parameter values - access levels
PV Input (see pages 13,14 and page 26)	Common characteristics	A/D converter with resolution of 160,000 points Update measurement time: 50 ms Sampling time: 0.1… 10.0 s Configurable Input shift: - 60… + 60 digit Input filter with enable/disable: 0.1… 99.9 seconds	
	Accuracy	0.25% ±1 digits for temperature sensors 0.1% ±1 digits (for mV and mA)	Between 100…240Vac the error is minimal
	Resistance thermometer (for ΔT: R1+R2 must be <320Ω)	Pt100Ω a 0°C (IEC 751) °C/°F selectable	2 or 3 wires connection Burnout (with any combination)	Max. wire Res: 20Ω max. (3 wires) Input drift: 0.1°C/10° T_{env} <0.1°C/10Ω Wire Res.
	Thermocouple	L, J, T, K, R, B, N, E, W3, W5 (IEC 584) Rj >10MΩ °C/°F selectable	Internal cold junction compensation con NTC Error 1°C/20°C ±0.5°C Burnout	Line: 150Ω max. Input drift: <2µV/°C. T_{env}. <5µV/10Ω Wire Res.
	DC input (current)	4... 20mA, 0... 20mA Rj =30Ω	Burnout. Engineering units conf. decimal point position with or without √ Init. Scale -999… 9999 Full Scale -999… 9999 (min. range of 100 digits)	Input drift: <0.1%/20°C T_{env}. <5µV/10Ω Wire Res.
	DC input (voltage)	0... 50mV, 0... 300mV Rj >10MΩ		
		1... 5, 0... 5, 0... 10V Rj>10kΩ		
	Frequency (option) 0... 2,000/0... 20,000Hz	Low level ≤2V High level 4... 24V		

Features at 25°C env. temp.	Description								
Auxiliary inputs	**Remote Setpoint** Not isolated accuracy 0.1%	Current: 0/4...20mA: $Rj = 30\Omega$				Bias in engineering units and ± range Ratio: -9.99… +99.99 Local + Remote Setpoint				
		Voltage: 1... 5, 0... -5, 0... 10V: $Rj = 300k\Omega$								
	Potentiometer	100Ω... $10k\Omega$				Feedback valve position				

Digital inputs 3 logic	The closure of the external contact produces any of the following actions:	Auto/Man mode change, Local/Remote Setpoint mode change, 3 Stored Setpoint activation, keyboard lock, measure hold, slope inhibit and output forcing
		Program Hold/Run (if option installed), Program Selection and Skip to Next Segment

Operating mode and Outputs	1 single or double action PID loop or On/Off with 1, 2,3 or 4 alarms		Control output		Alarm	Alarm	Alarm	Alarm	Retransmission	
			Main (Heat)	Secondary (Cool)	AL1	AL2	AL3	AL4	PV / SP	
		Single action	OP1 Relay/Triac			OP2 Relay/Triac	OP3 Relay	OP4 Relay	OP5 Analog/Digital	OP6 Analog/Digital
			OP5 Analog/Digital		OP1 Relay/Triac	OP2 Relay/Triac	OP3 Relay	OP4 Relay		OP6 Analog/Digital
		Double action Heat / Cool	OP1 Relay/Triac	OP2 Relay/Triac			OP3 Relay	OP4 Relay	OP5 Analog/Digital	OP6 Analog/Digital
			OP1 Relay/Triac	OP5 Analog/Digital		OP2 Relay/Triac	OP3 Relay	OP4 Relay		OP6 Analog/Digital
			OP5 Analog/Digital	OP2 Relay/Triac	OP1 Relay/Triac		OP3 Relay	OP4 Relay		OP6 Analog/Digital
			OP5 Analog/Digital	OP6 Analog/Digital	OP1 Relay/Triac	OP2 Relay/Triac	OP3 Relay	OP4 Relay		
		Valve drive	OP1 Relay/Triac	OP2 Relay/Triac			OP3 Relay	OP4 Relay	OP5 Analog/Digital	OP6 Analog/Digital

Features at 25°C env. temp.	Description			
	Algorithm	PID with overshoot control or On-off - PID with valve drive algorithm, for controlling motorised positioners		
	Proportional band (P)	0.5…999.9%		
	Integral time (I)	1…9999 s	$OFF = 0$	Single action PID algorithm
	Derivative time (D)	0.1…999.9 s		
	Error dead band	0.1…10.0 digit		
	Overshoot control	0.01…1.00		
	Manual reset	0…100%		
	Cycle time (Time proportional only)	0.2…100.0 s		
	Min./Max output limits	0…100% separately adjustable		
Control mode	Control output rate limit	0.01…99.99%/s	$OFF = 0$	
	Soft-start output value	1…100% - Time 1…9999 s		
	Output safety value	-100…100%		
	Control output forcing value	-100…100%		
	Control output hysteresis	0…5% Span in engineering units		On-Off algorithm
	Dead band	0.0…5.0%		Double action PID algorithm (Heat / Cool)
	Cool proportional band (P)	0.5…999.9%		
	Cool integral time (I)	1…9999 s	$OFF = 0$	
	Cool derivative time (D)	0.1…999.9 s		
	Cool cycle time (Time proportional only)	0.2…100.0 s		
	Control output high limit	0…100%		
	Cool output max. rate	0.01…99.99%/s	$OFF = 0$	
	Motor travel time	15…600 s		Valve drive PID algorithm Raise/Stop/Lower
	Motor minimum step	to 0.1…5.0%		
	Feedback potentiometer	100Ω …10kΩ		

Features at 25°C env. temp.	Description				
OP1 - OP2 outputs	SPST Relay N.O., 2A/250Vac (4A/120Vac) for resistive load Triac, 1A/250Vac for resistive load				
OP3 output	SPDT relay N.O., 2A/250Vac (4A/120Vac) for resistive load				
OP4 output	RSPST relay N.O. 2A/250Vac (4A/120Vac) for resistive load				
Analog/digital OP5 and OP6 (option) **outputs**	Control or PV/SP retransmission	Galvanic isolation: 500 Vac/1 min Short circuit protected Resolution 12 bit Accuracy: 0.1 %		**Analog:** 0/1... 5V, 0...10V, 500Ω/20mA max., 0/4... 20mA, 750Ω/15V max. **Digital:** 0/24Vdc ±10%; 30mA max. for solid state relay	
AL1 - AL2 - AL3 - AL4 alarms	Hysteresis 0…5% Span in engineering units				
	Action	Active high	Action type	Deviation threshold	±range
				Band threshold	0… range
		Active low		Absolute threshold	whole range
		Special functions	Sensor break, heater break alarm		
			Acknowledge (latching), activation inhibit (blocking)		
			Connected to Timer or program (if options installed) (only OP3-OP4)		
Setpoint	Local + 3 memorized	Up and down ramps 0.1...999.9 digit/minute or digit/hour (OFF=0) Low limit: from low range to high limit High limit: from low limit to high range			
	Remote only				
	Local and Remote				
	Local with trim				
	Remote with trim				

Features at 25°C env. temp.	Description		
Tuning	**Fuzzy-Tuning type** . The controller selects automatically the best method according to the process conditions	Step response	
		Natural frequency	
	Adaptive Tune self-learning, not intrusive, analysis of the process response to perturbations and continuously calculation of the PID parameters		
Auto/Man station	Standard with bumpless function, by keypad, digital input or serial communications		
Serial comm. (option)	RS485 isolated, SLAVE Modbus/Jbus protocol, 1200, 2400, 4800, 9600, 19.200 bit/s, 3 wires		
	RS485 isolated, MASTER Modbus/Jbus protocol, 1200, 2400, 4800, 9600, 19.200 bit/s, 3 wires		
	RS485 asynchronous/isolated, PROFIBUS DP protocol, from 9600 bit/s at 12MB/s selectable, max. lenght 100m (at 12 Mb/s)		
Auxiliary Supply	+24Vdc ± 20% 30mA max. - for external transmitter supply		
Operational safety	Measure input	Detection of out of range, short circuit or sensor break with automatic activation of the safety strategies and alerts on display	
	Control output	Safety and forcing value -100...100% separately adjustable	
	Parameters	Parameter and configuration data are stored in a non volatile memory for an unlimited time	
	Access protection	Password to access the configuration and parameters data - Fast wiew	
General characteristics	Power supply (PTC protected)	100... 240Vac (-15% +10%) 50/60Hz or 24Vac (-15% +25%) 50/60Hz and 24Vdc (-15% +25%)	Power consumption 5W max.
	Safety	Compliance to EN61010-1 (IEC 1010–1), installation class 2 (2500V) pollution class 2, **instrument class II**	
	Electromagnetic compatibility	Compliance to the CE standards (see page 2)	
	UL and cUL Approval	File E323812	
	Protection EN60529 (IEC 529)	IP65 front panel	
	Dimensions	$^1/_8$ DIN - 48 x 96, depth 110 mm, weight 380 g max.	

■ FACTORY DEFAULT PARAMETERS

Parameter	Parameter Name	Default value	User settings	Notes
5.5EL	Setpoint selection	NONE		
5P. 1	1st stored Setpoint	0		
5P.2	2nd stored Setpoint	0		
5.P.L	Setpoint low limit	PV.LO		
5.P.H	Setpoint high limit	PV.HI		
5 1.u	Setpoint ramp up	OFF		
5 1.d	Setpoint ramp down	OFF		
rt io	Ratio remote Setpoint	1.00		
b ia5	Remote Setpoint Bias	0		
1	AL1 alarm threshold	0		
2	AL2 alarm threshold	0		
3	AL3 alarm threshold	0		
4	AL4 alarm threshold	0		
HY. 1u	AL1 alarm hysteresis Up	1		
HY. 1d	AL1 alarm hysteresis Down	1		

Parameter	Parameter Name	Default value	User settings	Notes
EF 11	AL1 delay	1		
HY.2u	AL2 alarm hysteresis Up	1		
HY.2d	AL2 alarm hysteresis Down	1		
EF 12	AL2 delay	1		
HY.3u	AL3 alarm hysteresis Up	1		
HY.3d	AL3 alarm hysteresis Down	1		
EF 13	AL3 delay	1		
HY.4u	AL4 alarm hysteresis Up	1		
HY.4d	AL4 alarm hysteresis Down	1		
EF 14	AL4 delay	1		
t.Mod	Timer Operating Mode	0		
t.act	Timer Action	4		
t.dOP	Timer OP Function	1		
t.hSu	Hold time	0		
S.P.S.u	Start Up time	0		
OP.hS	Output limit during Startup	0		
P id	PID Enable/disable	1		
P.b.	Proportional band	3.0		

Factory default parameters

Parameter	Parameter Name	Default value	User settings	Notes
t. i.	Integral time	60		
t.d.	Derivative time	12.0		
d.Err	Error Dead Band	OFF		
O.C.	Overshoot Control	0.8		
O.C.r.b.	Overshoot Control relative band	1.0		
MrES	Manual Reset	50		
P.b. C	Cool proportional band	3.0		
t. i. C	Cool integral time	60		
t.d. C	Cool derivative time	12.0		
tunE	Start/Stop One shot tuning (0=Stop 1=Run)	NO		
AdPt	Start/Stop Adaptive tuning (0=Stop 1=Run)	NO		
t.F i l	Input filter	2.0		
In.Sh	Input shift	OFF		
t.SaM	Sampling time	0.1		
OP.HY	Output Hysteresis	1		
t.c.	Cycle time	5.0		
OP.L	Control ouput low limit	0.0		
OP.H	Control output high limit	100.0		

Parameter	Parameter Name	Default value	User settings	Notes
OP.r	Control output maximum speed	OFF		
St.OP	Soft start output high value	OFF		
St.tM	Soft start time	10		
M .t	Output minimum step Servomotor	60		
M .hY	Output minimum step Servomotor	0.5		
d.bnd	Heat/Cool Dead band	0.5		
tc.C	Cool cycle time	5.0		
OP.C.H	Cool output maximum value	100.0		
OP.r C	Cool output maximum speed	OFF		
Add.S	Communication SLAVE address	247		
dr.S	SLAVE Baud rate	9600		
Pro.S	SLAVE Communication protocol	MBUS		
Par.Y	Parity	NONE		
MASt	Enable MASTER	NO		
dr.M	MASTER Baud rate	9600		
Pro.M	MASTER Communication protocol	MBUS		
Add.P	PROFIBUS DP address	3		
C.PAS	Configuration password	33		

Factory default parameters

Parameter	Parameter Name	Default value	User settings	Notes
A.PAS	Access password	11		
In	Input type selection	0 - 10		
Unit	Engineering units	NONE		
SC.dd	Number of decimals (0... 3)	0		
SC. lo	Low range	0		
SC.Hi	High range	9999		
Sqr	Square root (0 = OFF, 1 = ON)	NO		
Char	Linear input characterization	NO		
S.P.tY	Setpoint type	LOC		
S.P.tr	Stored Setpoint tracking	NO		
S.P.r	Time units and Setpoint slope	P.SEC		
. In	Remote Setpoint input	4 - 20		

◼◼ WARRANTY

We guarantee this product to be free from defects in material and workmanship for 3 years from the date of shipment.
The warranty above shall not apply for any failure caused by the use of the product not in accordance with the instructions in this manual.

■ ICONS TABLE

Main universal input	
TC	Thermocouple
Pt100	RTD (Pt100)
ΔT	Delta Temp (2x RTD)
mA V	mA and mV
Custom	Custom
Hz	Frequency

Auxiliary input	
	Current transformer
REM mA	mA Remote setpoint
REM V	Volt Remote setpoint
POT.	Feedback potentiometer

Digital input	
	Isolated contact
	NPN open collector
	TTL open collector

Setpoint	
LOC	Local
STAND BY	Stand-by
	Keypad lock
	Outputs lock
START UP	Start-up function
TIMER	Timer function
MEM	Memorized
REM	Remote
	Setpoint programmer

Digital input connected functions	
	Auto/Manual
RUN	Run, Hold, Reset and program selection
HOLD PV	PV hold
SP SLOPE	Setpoint slopes inhibition

Output	
	SPST Relay
	Triac
	SPDT Relay
mA	mA
mA V	mA mV
	Logic

Super Systems Inc.
USA Office
Corporate Headquarters:
7205 Edington Drive
Shipping Address:
7245 Edington Drive
Cincinnati, OH 45249
Phone: (513) 772-0060
http://www.supersystems.com

Super Systems Europe
Unit E, Tyburn Trading Estate,
Ashold Farm Road, Birmingham
B24 9QG
UNITED KINGDOM
Phone: +44 (0) 121 306 5180
http://www.supersystemseurope.com

Super Systems México
Sistemas Superiores Integrales S de RL de CV
Acceso IV No. 31 Int. H Parque Industrial
Benito Juarez
C.P. 76120 Queretaro, Qro.
Phone: +52 442 210 2459
http://www.supersystems.com.mx

Super Systems China
No. 369 XianXia Road
Room 703
Shanghai, CHINA
200336
Phone: +86 21 5206 5701/2
http://www.supersystems.cn

Super Systems India Pvt. Ltd.
A-26 Mezzanine Floor, FIEE Complex,
Okhla Indl. Area, Phase – 2
New Delhi, India 110 020
Phone: +91 11 41050097
http://www.supersystemsindia.com