Temperature Controller
$^1/_{16}$ DIN - 48 x 48

82
S E R I E S

M3 line

CE

^{C} (UL) ^{US}
LISTED

ASCON spa

ISO 9001
C e r t i f i e d

Temperature
Controller
$^1/_{16}$ DIN - 48 x 48

M3 line

CE

^{C} (UL) ^{US}
LISTED

M3

1
2
3

274.8

RUN 275.0
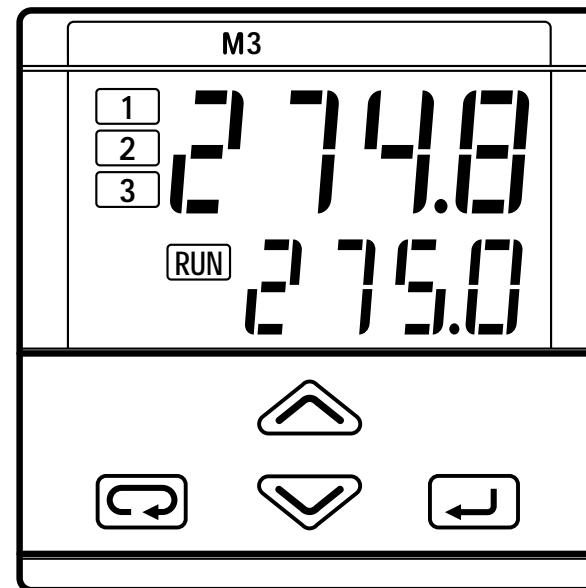
NOTES ON ELECTRIC SAFETY AND ELECTROMAGNETIC COMPATIBILITY.

Please, read carefully these instructions before proceeding with the installation of the controller.
Class II instrument, real panel mounting.

This controller has been designed with compliance to:
Regulations on electrical apparatus (appliance, systems and installations) according to the European Community directive 73/23 CEE amended by the European Comunity directive 93/68 CEE and the Regulations on the essential protection requirements in electrical apparatus EN 61010-1 (IEC 1010 - 1) : 90 +A1:92 + A2:95.

Regulations on Electromagnetic Compatibility according to the European Community directive n089/336/CEE, amended by the European Community directive n° 92/31/CEE and the following regulations:
Regulations on RF emissions
EN50081 - 1   residential environments
EN50081 - 2   industrial environments
Regulation on RF immunity
EN500082-2   industrial equipment and system

It is important to understand that it's responsibility of the installer to ensure the compliance of the regulations on safety requirements and EMC.
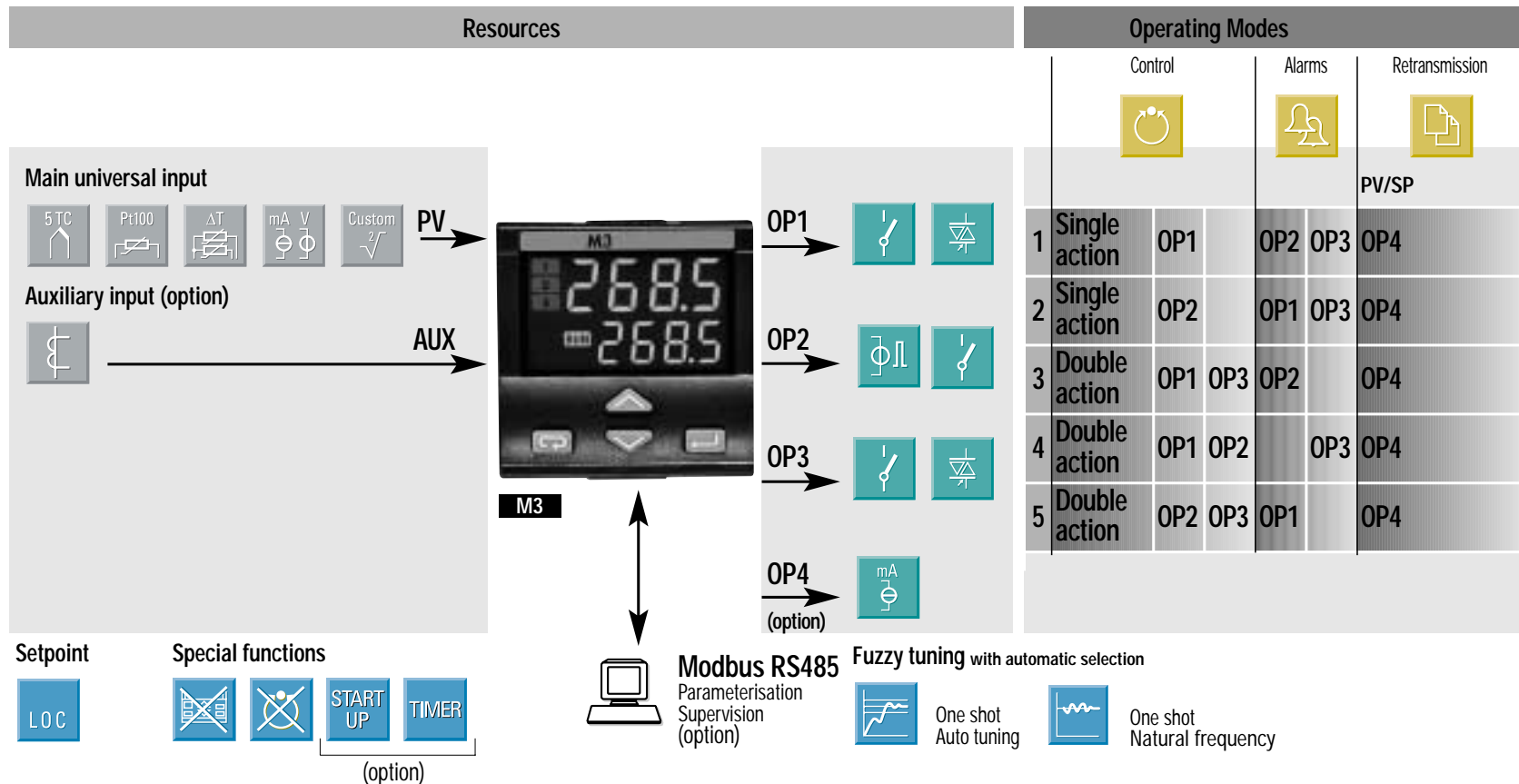
The device has no user serviceable parts and requires special equipment and specialised engineers. Therefore, a repair can be hardly carried on directly by the user. For this purpose, the manufacturer provides technical assistance and the repair service for its Customers.
Please, contact your nearest Agent for further information.

All the information and warnings about safety and electromagnetic compatibility are marked with the ⚠CE sign, at the side of the note.

TABLE OF CONTENTS

Resources

Main universal input

5 TC | Pt100 | ΔT | mA V | Custom → PV

Auxiliary input (option)

→ AUX

M3

Setpoint

LOC

Special functions

START UP | TIMER
(option)

Modbus RS485
Parameterisation
Supervision
(option)

OP1
OP2
OP3
OP4 (option)

Operating Modes

	Control		Alarms			Retransmission
						PV/SP
1	Single action	OP1		OP2	OP3	OP4
2	Single action	OP2		OP1	OP3	OP4
3	Double action	OP1	OP3	OP2		OP4
4	Double action	OP1	OP2		OP3	OP4
5	Double action	OP2	OP3	OP1		OP4

Fuzzy tuning with automatic selection

One shot Auto tuning

One shot Natural frequency

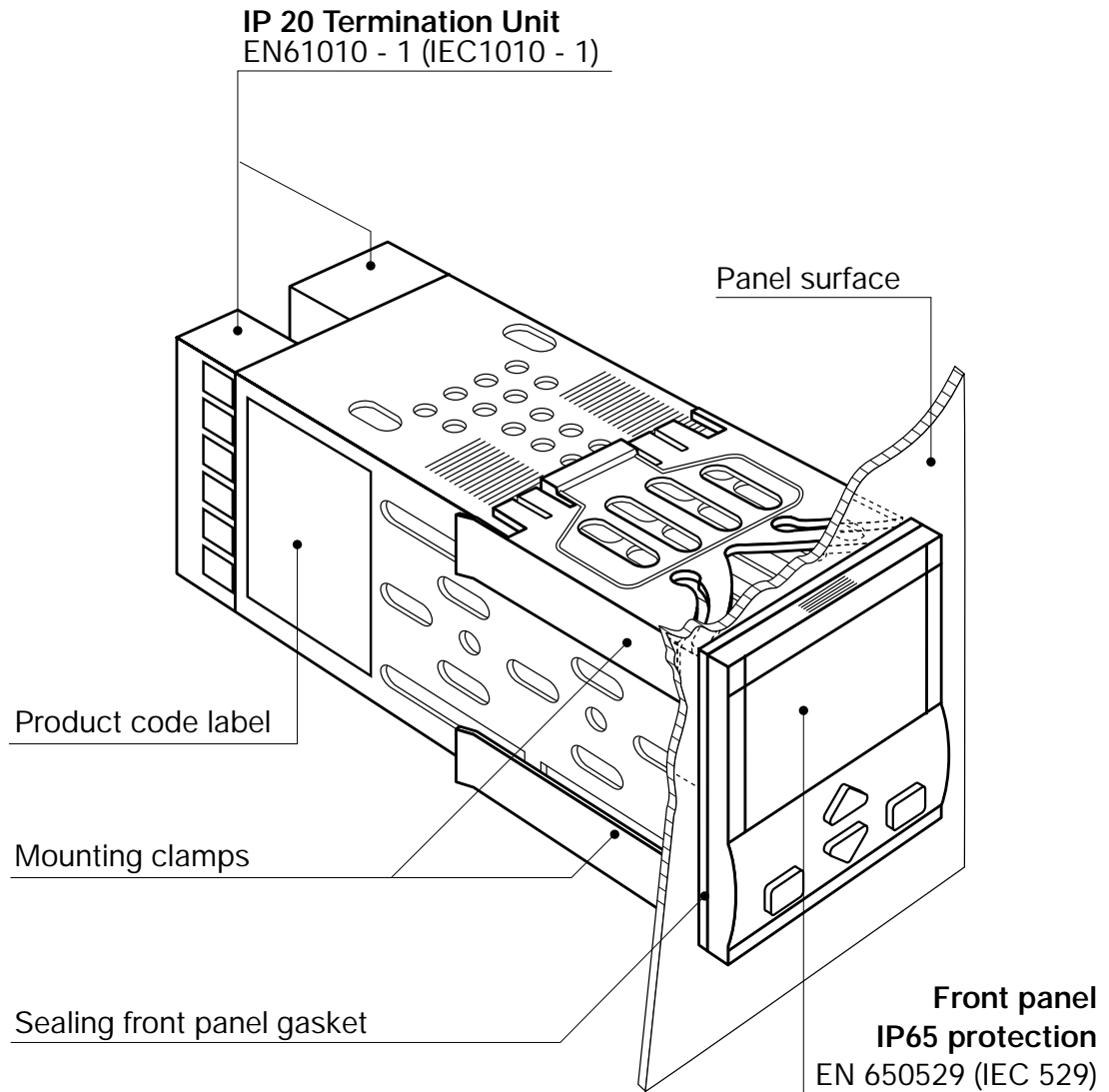3

1 ▮ INSTALLATION

1.1 GENERAL DESCRIPTION

Installation must only be carried out by qualified personnel.

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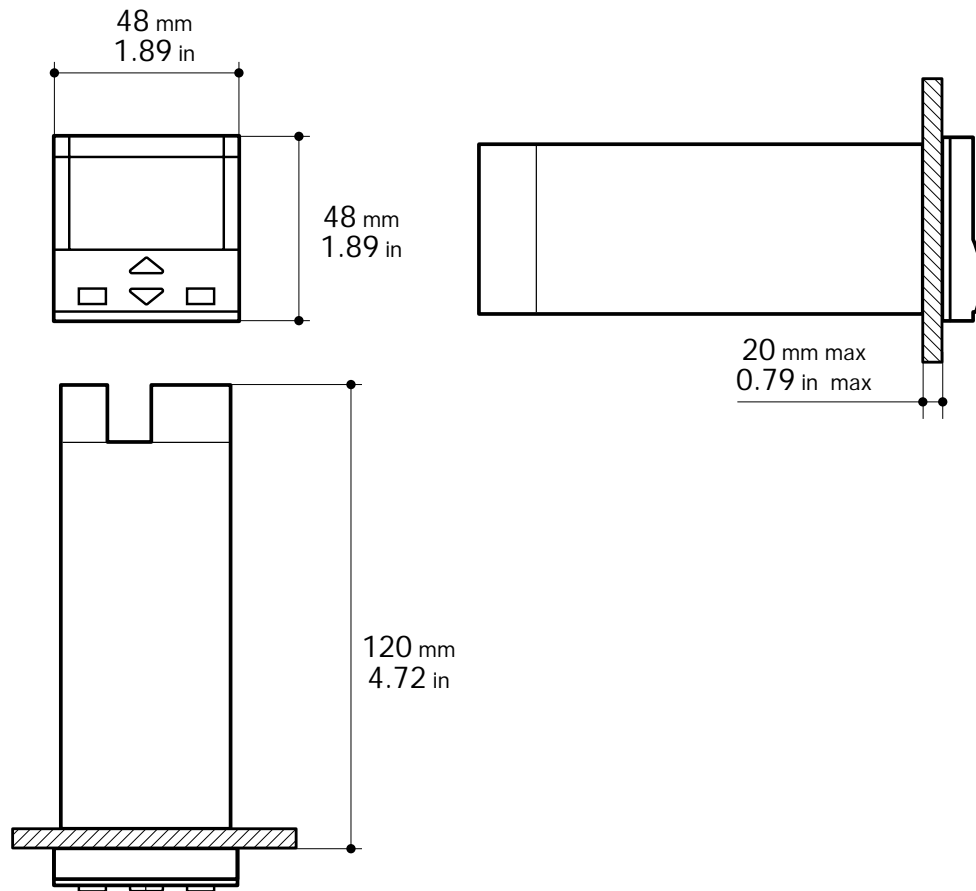
⚠ CE

To prevent hands or metal touching parts that may be electrically live, **the controllers must be installed in an enclosure and/or in a cubicle.**
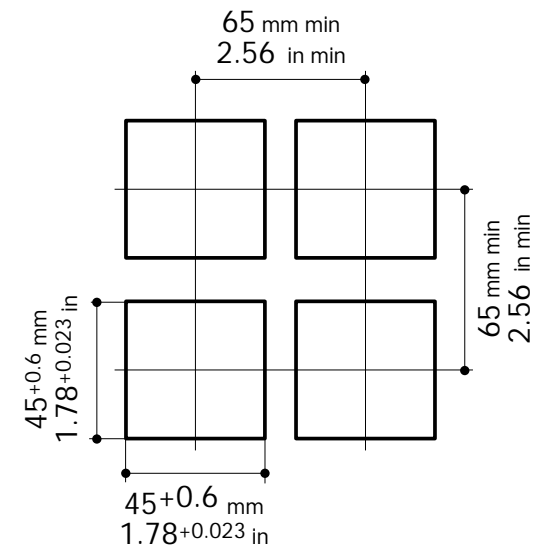
IP 20 Termination Unit
EN61010 - 1 (IEC1010 - 1)

Panel surface

Product code label

Mounting clamps

Sealing front panel gasket

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

1.2 DIMENSIONAL DETAILS

48 mm
1.89 in

48 mm
1.89 in

20 mm max
0.79 in max

120 mm
4.72 in

1.3 PANEL CUT-OUT

65 mm min
2.56 in min

65 mm min
2.56 in min

45+0.6 mm
1.78+0.023 in

45+0.6 mm
1.78+0.023 in

1.4 ENVIRONMENTAL RATINGS

Operating conditions

2000	Altitude up to 2000 m
°C	Temperature 0…50°C
%Rh	Relative humidity 5…95 % non-condensing

Special conditions		Suggestions
2000	Altitude > 2000 m	Use 24V~ supply version
°C	Temperature >50°C	Use forced air ventilation
%Rh	Humidity > 95 %	Warm up
	Conducting atmosphere	Use filter

Forbidden Conditions 🚫

	Corrosive atmosphere
	Explosive atmosphere

1.5 PANEL MOUNTING [1]

1.5.1 INSERT THE INSTRUMENT

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

1.5.2 INSTALLATION SECURING

1 Fit the mounting clamps
2 Push the mounting clamps towards the panel surface to secure the instrument
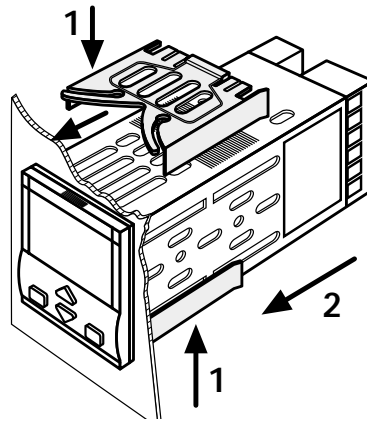
1.5.3 CLAMPS REMOVING

1 Insert the screwdriver in the clips of the clamps
2 Rotate the screwdriver
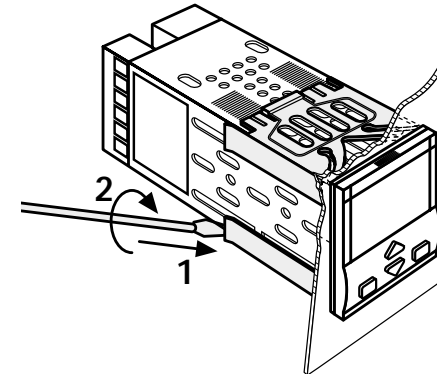
1.5.4 INSTRUMENT UNPLUGGING

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

1MΩ

UL note

[1] For Use on a Flat Surface of a Type 2 and Type 3 'raintight' Enclosure.
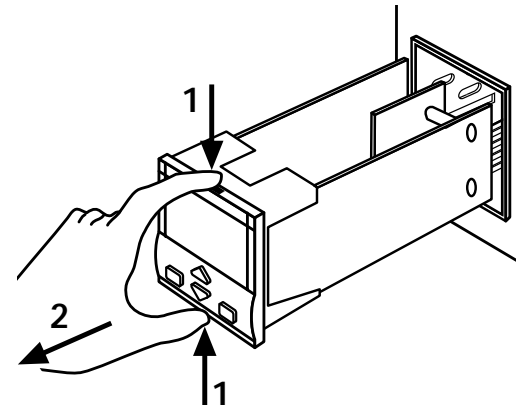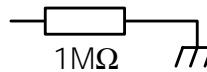
2 ELECTRICAL CONNECTIONS
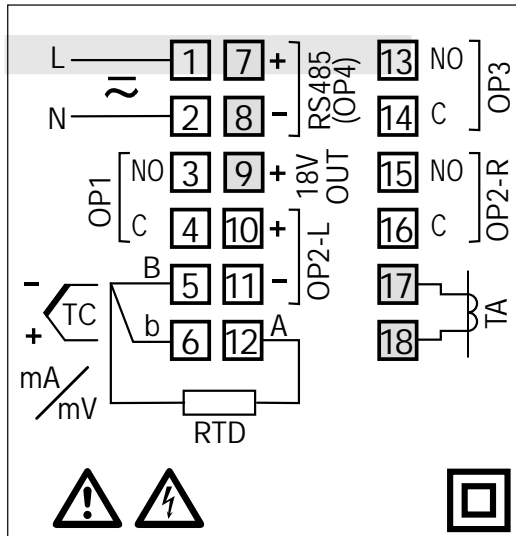
2.1 TERMINATION UNIT [1]
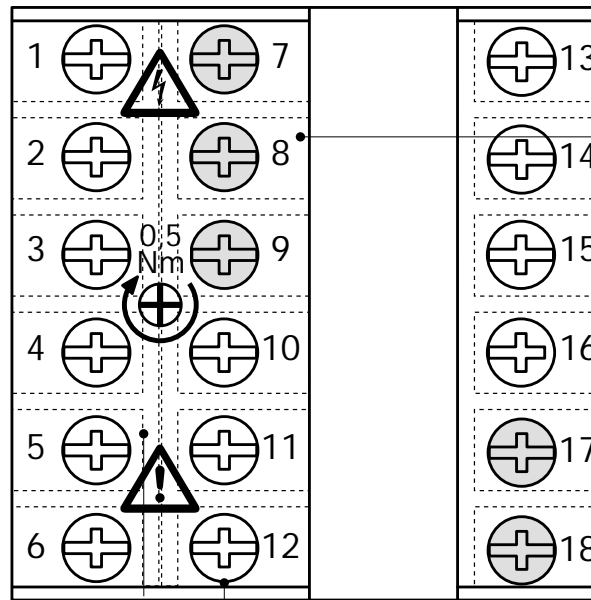
Rear terminal cover

5.7 mm
0.22 in

Cable size
1 mm²
18 AWG

18 screw terminals	
Option terminals	
Holding screw 0.5 Nm	
Positive screw driver PH1	
Negative screw driver 0,8 x 4 mm	

Terminals

Pin connector	Ø 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
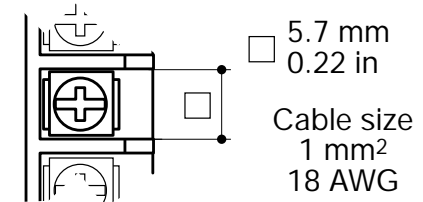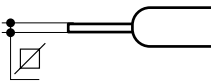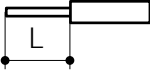
UL note
[1] Use 60/70 °C copper (Cu) conductor only.

PRECAUTIONS ⚠CE

Despite the fact that 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 use electromagnetic contactors, power Relays and high power motors nearby.
Avoid power units nearby, especially if controlled in phase angle

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

2.2 PRECAUTIONS AND ADVISED CONDUCTOR COURSE ⚠CE

Conduit for supply and output cables

B   A   B B   A   B

A = Supply
B = Outputs
C = Analog inputs
D = Analogue Output
    Serial Comm.s
E = SSR drive output

C   E D   C   C   E D   C

Conduit for low level sensor cables
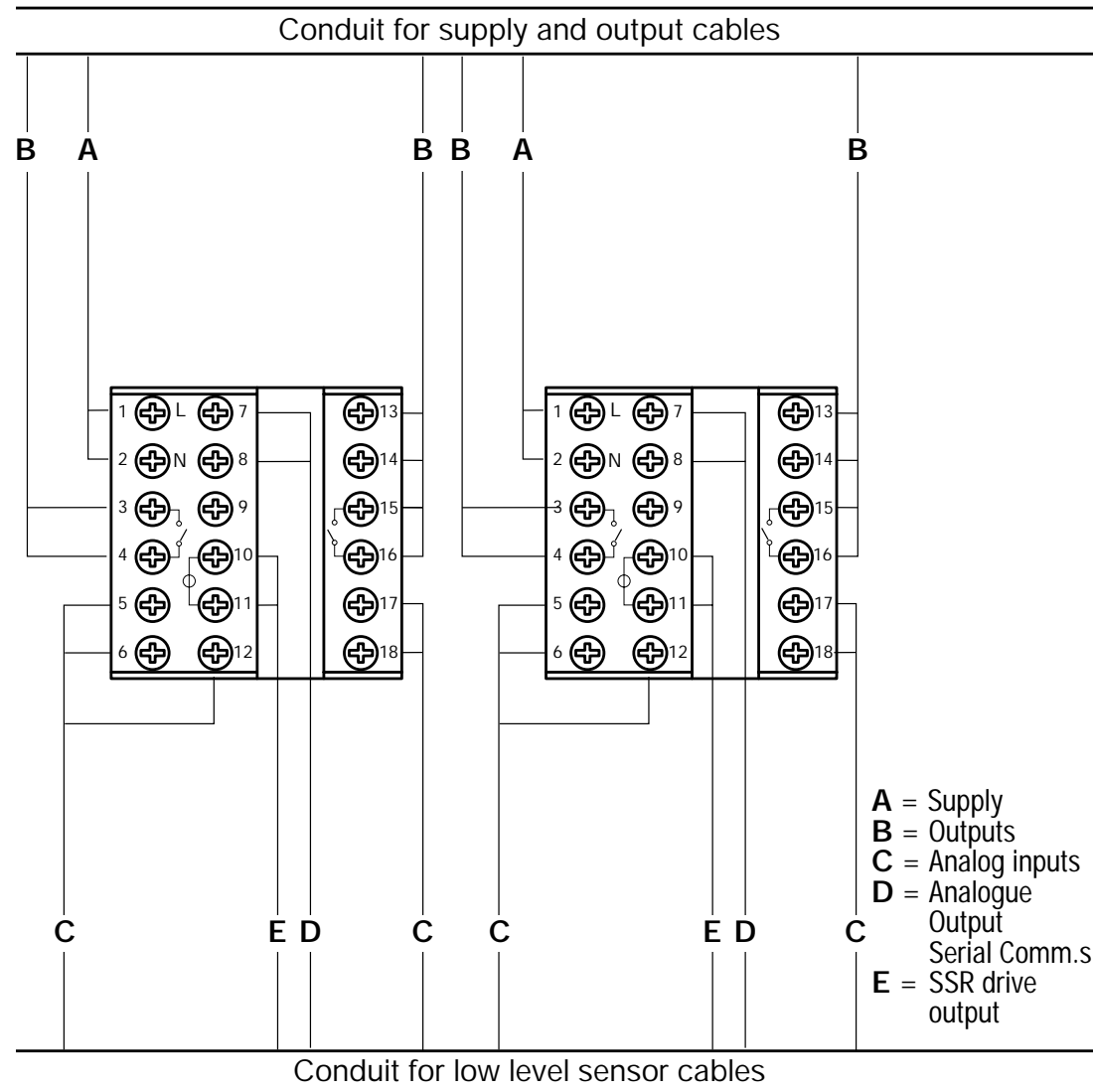
2.3 EXAMPLE OF WIRING DIAGRAM (HEAT COOL CONTROL)
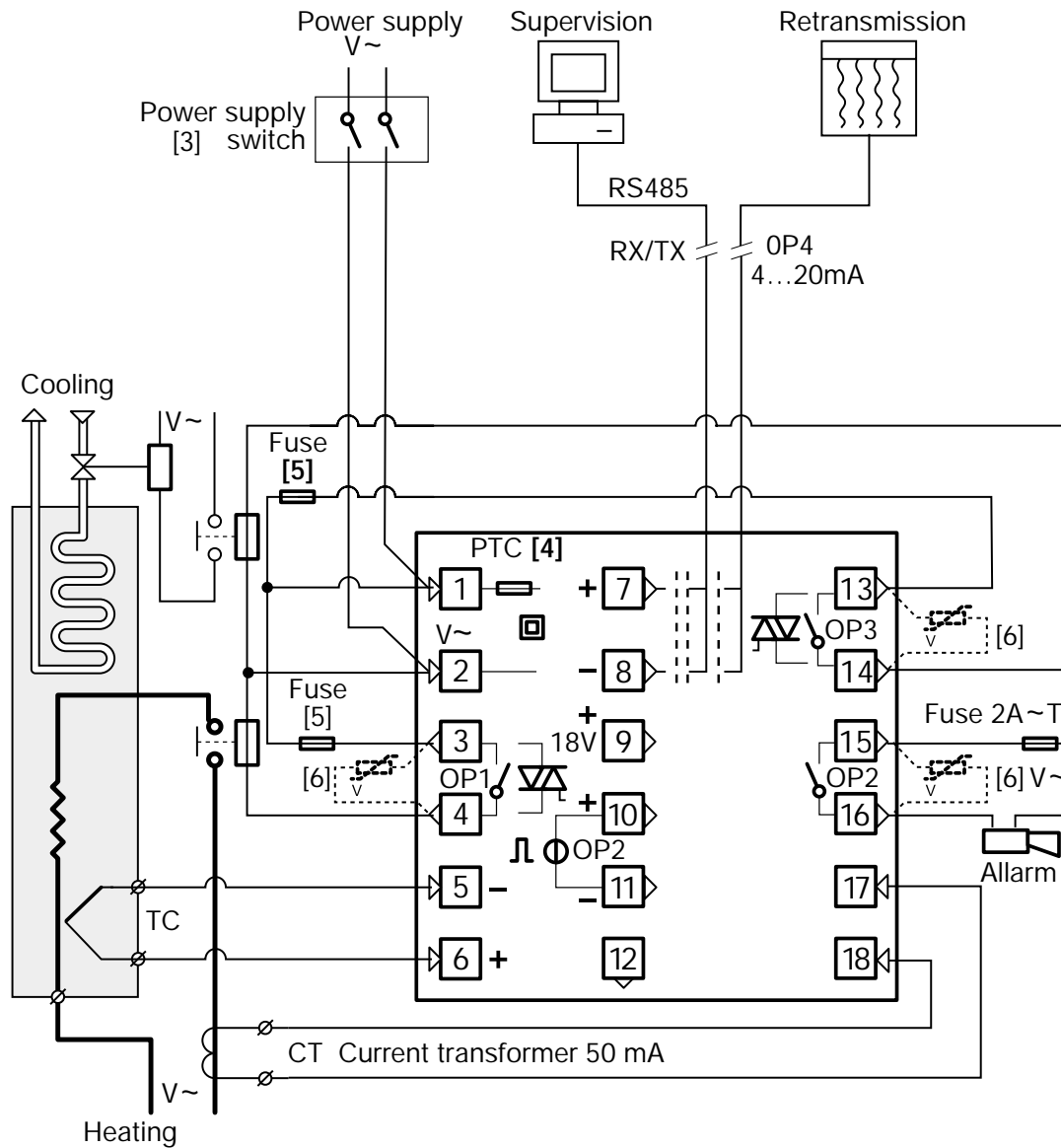
Notes:
1] Make sure that the power supply voltage is the same indicated on the instrument.
2] Switch on the power supply only after that all the electrical connections have been completed.
3] In accordance with the safety regulations, the power supply switch shall bring the identification of the relevant instrument. The power supply switch shall be easily accessible from the operator.
4] The instrument is is PTC protected. In case of failure it is suggested to return the instrument to the manufacturer for repair.
5] To protect the instrument internal circuits use:
   - 2 A~ T fuses for Relay outputs
   - 1 A~ T fuses for Triac outputs
6] Relay contacts are already protected with varistors.
   Only in case of 24 V ~ inductive loads, use model A51-065-30D7 varistors (on request)

2.3.1 POWER SUPPLY

Switching power supply with multiple isolation and internal PTC
- Standard version:
  nominal voltage:
  100 - 240V∼ (- 15% + 10%)
  Frequency 50/60Hz
- Low Voltage version:
  Nominal voltage:
  24V∼ (- 25% + 12%)
  Frequency 50/60Hz
  or 24V– (- 15% + 25%)
- Power consumption 2.6W max

included PTC

L — 1

Supply ▣

N — 2
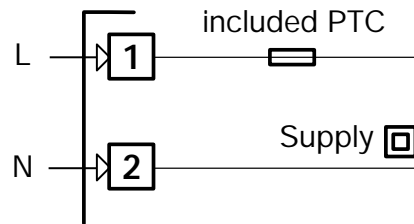
2.3.2 PV CONTROL INPUT

A For L-J-K-S-T thermocouple type
- Connect the wires with the polarity as shown
- Use always compensation cable of the correct type for the thermocouple used
- The shield, if present, must be connected to a proper earth.

wire resistance 150Ω max
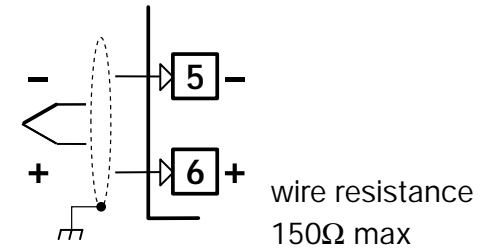
B For Pt100 resistance thermometer
- If a 3 wires system is used, use always cables of the same diameter (1mm^2 min.)   (line 20 Ω/lead maximum resistance)
- When using a 2 wires system, use always cables of the same diameter (1,5mm^2 min.) and put a jumper between terminals 5 and 6

For 3 wires only
Maximum resistance/line 20 Ω
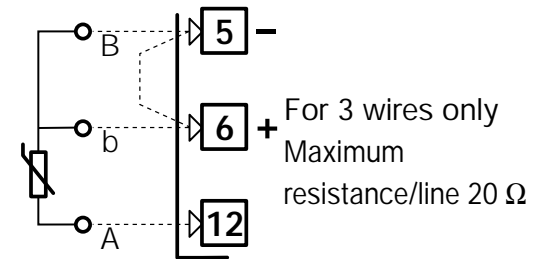
C For ΔT (2x RTD Pt100) Special
⚠ When the distance between the controller and the sensor is 15 mt. using a cable of 1.5 mm^2 diameter, produces an error on the measure of 1°C (1°F).

Use wires of the same length and 1.5 mm^2 size.
Maximum resistance/line 20 Ω
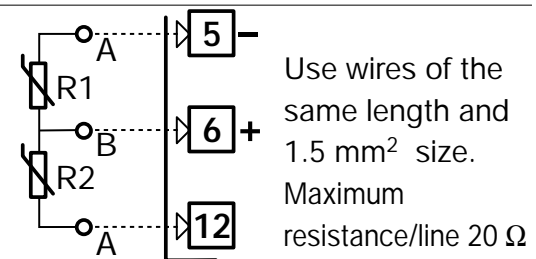
R1 + R2 must be <320Ω

2.3.2 PV CONTROL INPUT

D   For mA, mV

mV   mA

External Shunt 2.5Ω

5

6 +   Rj >10MΩ
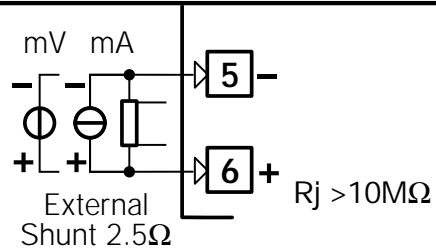
D1 With 2 wires transducer

4…20mA

PV

Transducer

9 18V– **[1]**

5 –

6 +

external shunt 2.5Ω
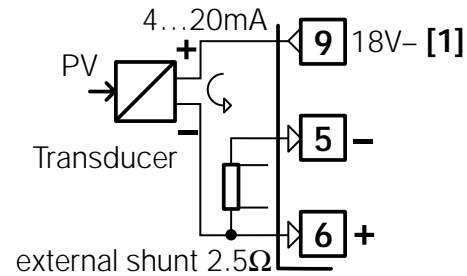
D2 With 3 wires transducer

PV

Transducer

9 18V– **[1]**

5 –

6 +

external shunt 2.5Ω
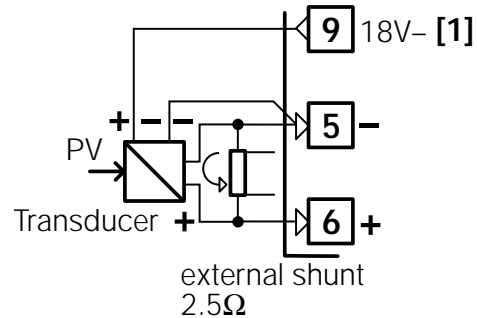
[1] Auxiliary power supply for external transmitter 18V– ±20% /30mA max. without short circuit protection

2.3.3 AUXILIARY INPUT (option)

For current transformer CT
Not isolated

For the measure of the load current (see page 34)

• Primary coil10A…100A
• Secondary coil 50mA default 100mA jumper selectable

5 watt burden resistor
0.5Ω for 1A secondary transformer coil
0.1Ω for 5A secondary transformer coil

CT   load

17

18

~

50/100mA   10…100A
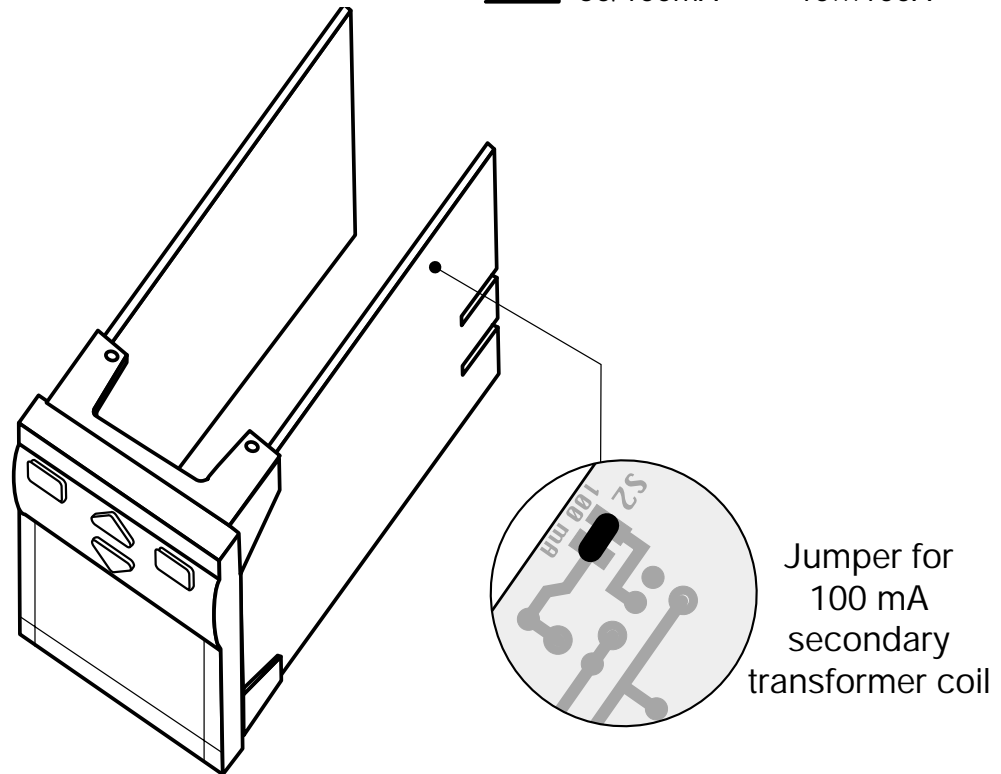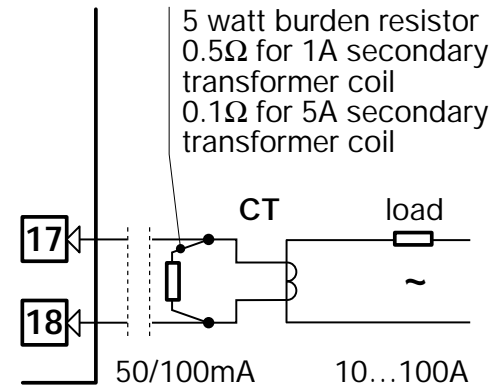
Jumper for 100 mA secondary transformer coil

2.3.4 OP1 - OP2 - OP3 OUTPUTS

The functionality associated to each of the OP1, OP2 and OP3 input is defined during the configuration of the instrument index $\boxed{L}$ (see page 18).
The suggested combinations are:

		Control		Alarms	
				AL2	AL3
A	Single action	OP1 Heat		OP2-R	OP3
B	Single action	OP2-L Heat		OP1	OP3
C	Double action	OP1 Heat	OP3 Cool	OP2-R [1]	
D	Double action	OP1 Heat	OP2-L Cool		OP3 [1]
E	Double action	OP2-L Heat	OP3 Cool	OP1 [1]	

OP1 - OP3	Relay or Triac output
OP2 - L	SSR drive output
OP2 - R	Relay output

Note
[1] With heat / cool control AL2 and AL3 share in or mode the same output
  (the free one)

OP2 output can be Relay (Std) or SSR drive.
The "jumper" on the auxiliary board selects the output type:

Link Pins 1-2 for OP2-Relay
Link Pins 2-3 for OP2-SSR drive

Jumper

Auxiliary board

13
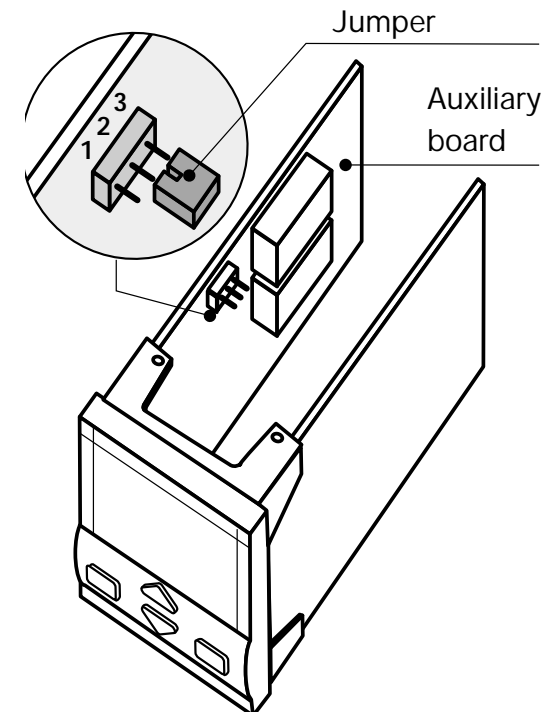
2.3.4-A SINGLE ACTION RELAY (TRIAC) CONTROL OUTPUT

Fuse

3
OP1
4

Coil of the heat load contactor

Varistor for inductive load 24V~ only
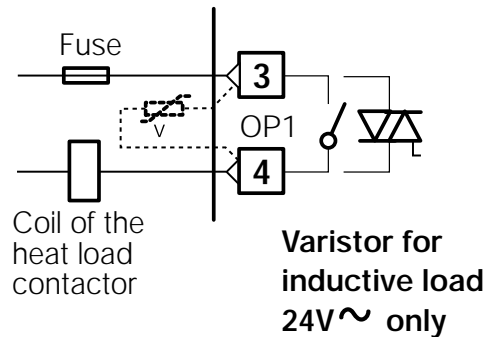
2.3.4-B SINGLE ACTION SSR DRIVE CONTROL OUTPUT

Static relay

+ 10
OP2
– 11
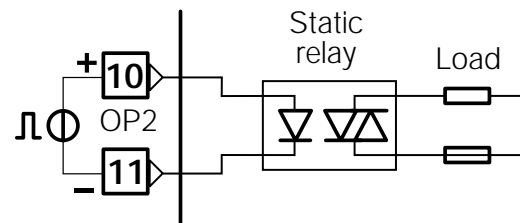
Load

Relay output
• SPST Relay N.O., 2A/250 V~ for resistive load, fuse 2A~ T

Triac output
• N.O. contact for resistive load of up to 1A/250 V~ max, fuse 1A ~ T

SSR drive output not isolated
• 0…5V–, ±20%, 30 mA max

2.3.4-C DOUBLE ACTION RELAY (TRIAC)/RELAY (TRIAC) CONTROL OUTPUT

Fuse

3
OP1
4

Coil of the heat load contactor

13
OP3
14

Fuse

Varistor for inductive load 24V~ only

Coil of the cool load contactor
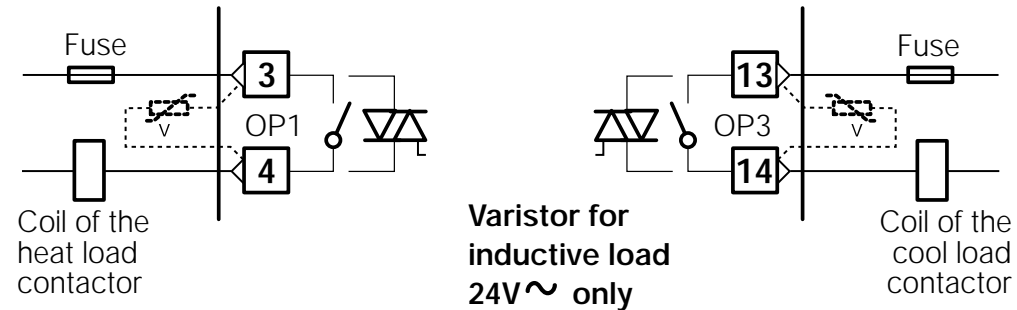
2.3.4-D DOUBLE ACTION RELAY (TRIAC)/SSR DRIVE CONTROL OUTPUT

Fuse

3
OP1
4

Coil of the heat load contactor

Varistor for inductive load 24V~ only

Static relay

+ 10
OP2
– 11

Cool load
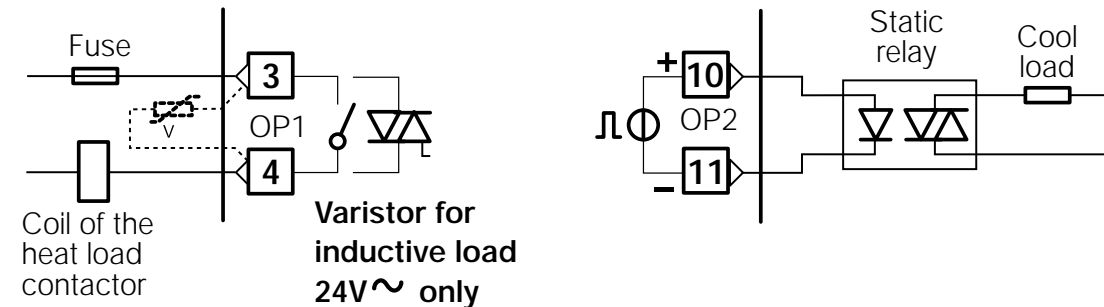
2.3.4-E DOUBLE ACTION SSR DRIVE/RELAY (TRIAC) CONTROL OUTPUT

Static relay

+ 10
OP2
– 11

Heat load

13
OP3
14

Fuse

Varistor for inductive load 24V~ only

Coil of the cool load contactor
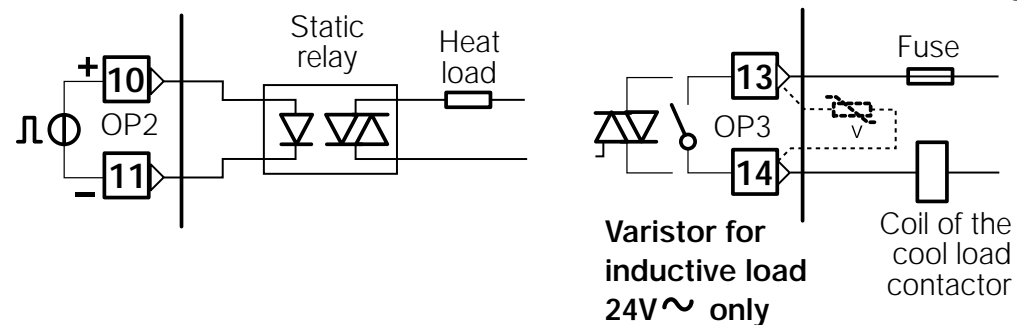
2.3.5 ALARMS OUTPUTS ⚠CE

⚠ **The outputs OP1, OP2 and OP3, can be used as alarm outputs only if they are not used as control outputs.**

Fuse

```
  3
OP1
  4
```

Coil of the
load alarm contactor

```
 15
OP2
 16
```

Fuse

Coil of the
load alarm contactor

```
 13
OP3
 14
```

Fuse

Coil of the
load alarm contactor
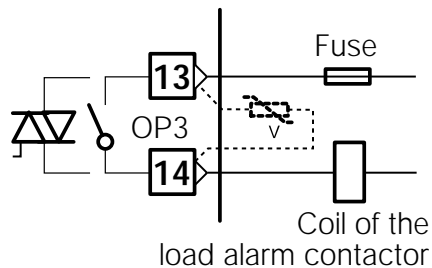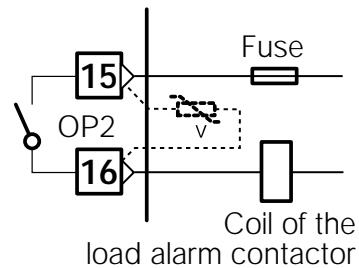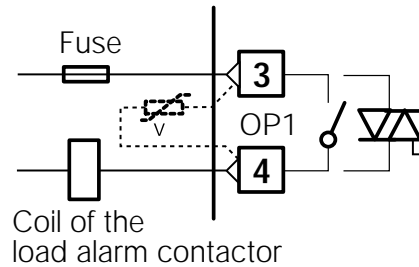
**Varistor for inductive load
24V~ only**

2.3.6 OP4 OUTPUT (option) ⚠CE

PV or SP retransmission
• Galvanic isolation
  500V~/1 min
• 0/4…20mA, (750Ω or 15V– max)

```
+
  7
mA ⊖  OP4    Load
  8
-
```
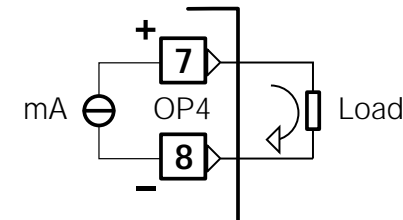
2.3.7 SERIAL COMMUNICATIONS (option) ⚠CE

• Galvanic isolation 500V~/1 min
• Compliance to the EIA RS485
  standard for Modbus/Jbus

⚠ Please, read:
  gamma**due**® and delta**due**®
  controller series serial com-
  munication and configuration

```
+ 7
- 8
```

15
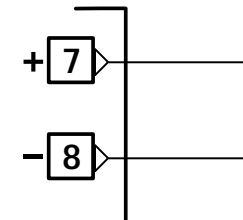
3 ■ PRODUCT CODING

The complete code is shown on the instrument label. The informations about product coding are accessible from the front panel by mean of a particular procedure described at section 4.2.2 page 21

Instrument Label

P/N   : M3-3150-0000
CONF   : 2002
S/N   : A0A-9809/0013
V~(L-N).100÷240V 50/60 Hz - 2,6W

Basic product code (hardware)

Configuration code (software)
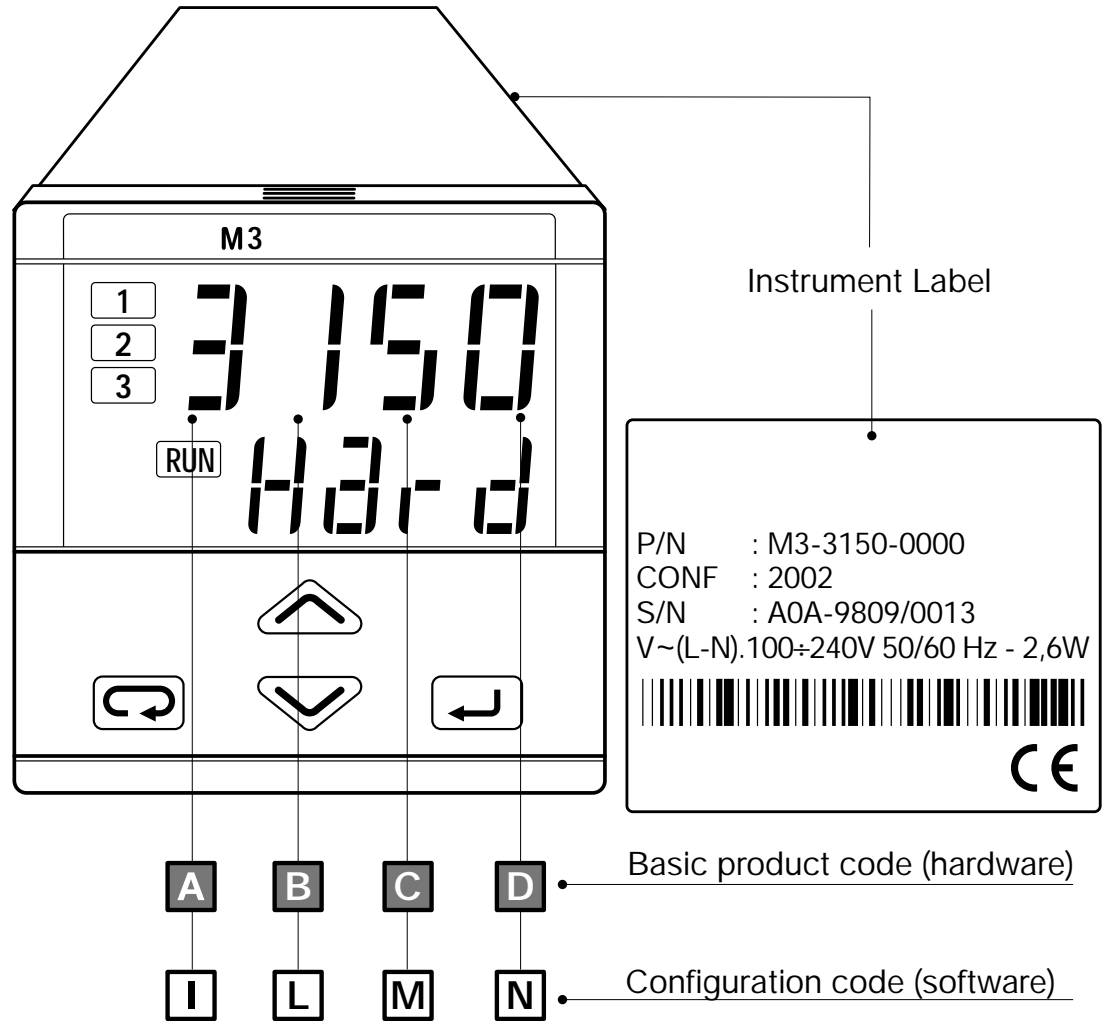
3.1 MODEL CODE

The product code indicates the specific hardware configuration of the instrument, that can be modified by specialized engineers only.

	Line	Basic	Accessories	Configur.
Model:	M 3	A B C D	- E F G 0	/ I L M N

Line	M 3

Power supply	A
100 - 240V∼ (- 15% + 10%)	3
24V∼ (- 25% + 12%) or 24V− (- 15% + 25%)	5

OP1 - OP3 Outputs	B
Relay - Relay	1
Relay - Triac	2
Triac - Relay	4
Triac - Triac	5

Serial Communications	Options	C	D
Not fitted	None	0	0
	Current transformer input (CT)	0	3
	Transmitter Power Supply (P.S.)	0	6
	Transmitter P.S. + Retransmis.	0	7
	Transmitter P.S. + CT	0	8
	Transmitter P.S. + Retransmis. + CT	0	9
RS485 Modbus/Jbus protocol	None	5	0
	Transmitter Power Supply	5	6
	Transmitter P.S. + CT	5	8

Special functions	E
Not fitted	0
Start up + Timer	2

User manual	F
Italian/English (std)	0
French/English	1
German/English	2
Spanish/English	3

Front panel colour	G
Dark (std)	0
Beige	1

3.2 CONFIGURATION CODING

The configuration code consists of 4 digits that identify the operating characteristic of the controller, as chosen by the user.
Section 4.6 at page 35 reports the instructions how to set a new configuration code.
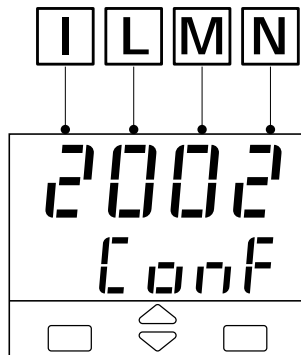
The configuration code can be displayed on the front panel, following the instructions at page 21 section 4.2.2.

Input type and range			I
TR Pt100 IEC751	-99.9…300.0 °C	-99.9…572.0 °F	0
TR Pt100 IEC751	-200…600 °C	-328…1112 °F	1
TC L Fe-Const DIN43710	0…600 °C	32…1112 °F	2
TC J Fe-Cu45% Ni IEC584	0…600 °C	32…1112 °F	3
TC T Cu-CuNi	-200 …400 °C	-328…752 °F	4
TC K Cromel -Alumel IEC584	0…1200 °C	32…2192 °F	5
TC S Pt10%Rh-Pt IEC584	0…1600 °C	32…2912 °F	6
DC input 0…50 mV, linear	Engineering units		7
DC input 10…50 mV, linear	Engineering units		8
Custom input and range [1]			9

Note

[1] For instance, other thermocouples types, ΔT (with 2 PT 100), custom linearisation etc.

Control mode	Output configuration	L
PID	Control OP1 / alarm AL2 on OP2	0
	Control OP2 / alarm AL2 on OP1	1
On - Off	Control OP1 / alarm AL2 on OP2	2
	Control OP2 / alarm AL2 on OP1	3
Heat/Cool action	Control OP1- OP3 / alarm AL2 on OP2	6
	Control OP1- OP2 / alarm AL2 on OP3	7
	Control OP2- OP3 / alarm AL2 on OP1	8

Control action type		M
Reverse (single action)	Linear Cool (Heat/Cool double action)	0
Direct (single action)	On-Off Cool (Heat/Cool double action)	1

⚠

If, when the controller is powered up for the first time, the display shows the following message
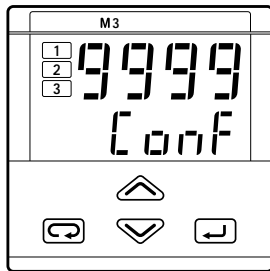
it means that the controller has not been configured yet.

The controller remains in stand-by until the configuration code is set correctly (see chapter 4.6 page 35).

Alarm 2 type and function		N
Disabled		0
Sensor break alarm / Loop Break Alarm		1
Absolute	active high	2
	active low	3
Deviation	active high	4
	active low	5
Band	active out	6
	active in	7
Heater break by CT **[2]**	active during ON output state	8
	active during OFF output state	9

Alarm 3 type and function		O
Disabled or used by Timer		0
Sensor break alarm / Loop Break Alarm		1
Absolute	active high	2
	active low	3
Deviation	active high	4
	active low	5
Band	active out	6
	active in	7
Heater break by CT **[2]**	active during ON output state	8
	active during OFF output state	9

For alarm 3 type and function 𝐶𝑜𝑛2 see page 36

Note
[2] Only with CT options.

4 ▮ OPERATIONS

4.1.A KEYS FUNCTIONS AND DISPLAY IN OPERATOR MODE

PV control input in engineering units

When the measured value is greater than sensor high range

When the measured value is less than the sensor low range

Operating Setpoint

Output status LEDs (red):
OP1 output ON
OP2 output ON
OP3 output ON

Start-up/Timer running (green)

Tune running (green): blinking

Menu access

Setpoint setting

Enter key for selection and value setting confirmation

4.1.B KEYS FUNCTIONS AND DISPLAY IN PROGRAMMING MODE

Parameter value

Parameter mnemonic

Access to the menu for:
- configuration
- parameter setting

Values modification

Enter key for selection and value setting confirmation
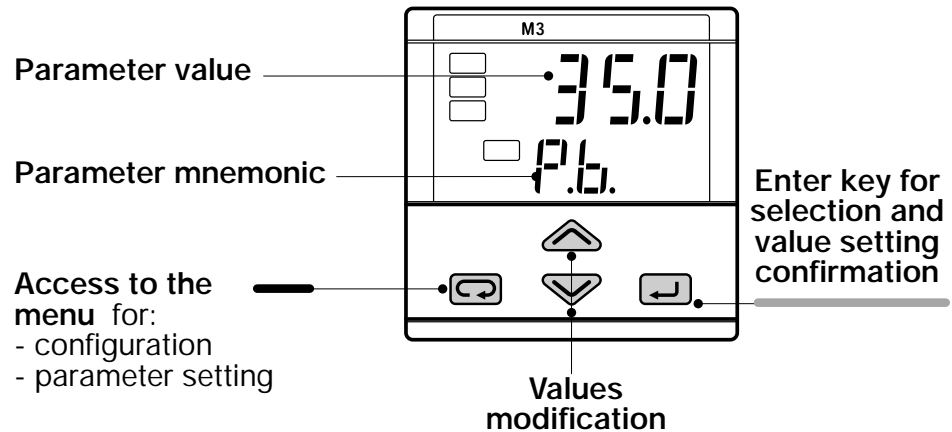
4.2   DISPLAY

During the operation, the para-meters values cannot be modi-fied by the user

4.2.1 OF THE PROCESS VARIABLES

```
2 74.8
2 75.0
```
Operator mode

```
2 74.8
oC
```
Engineering units [1]

```
6 3.4
Out
```
OP1 output [2]

```
4 7
t.Cur
```
Load current [3]

```
3 3
t Nr.
```
Timer remaining time [4]

4.2.2 OF THE CONFIGURATION CODES

```
2 74.8
2 75.0
```
Operator mode

```
2 74.8
oC
```
Engineering units [1]

```
3 150
Hard
```
Basic product code (see page 16)

```
2002
ConF
```
Configuration code (see page 18)

```
00A
rEL.
```
Software **release**
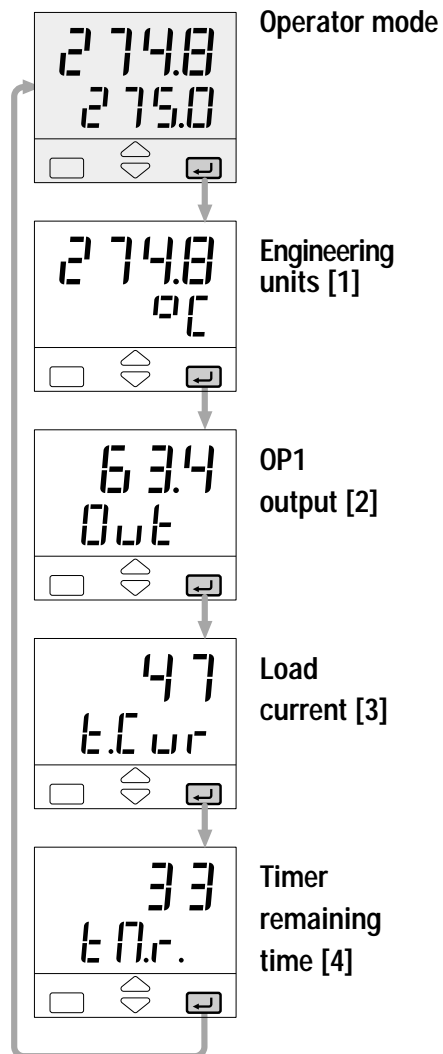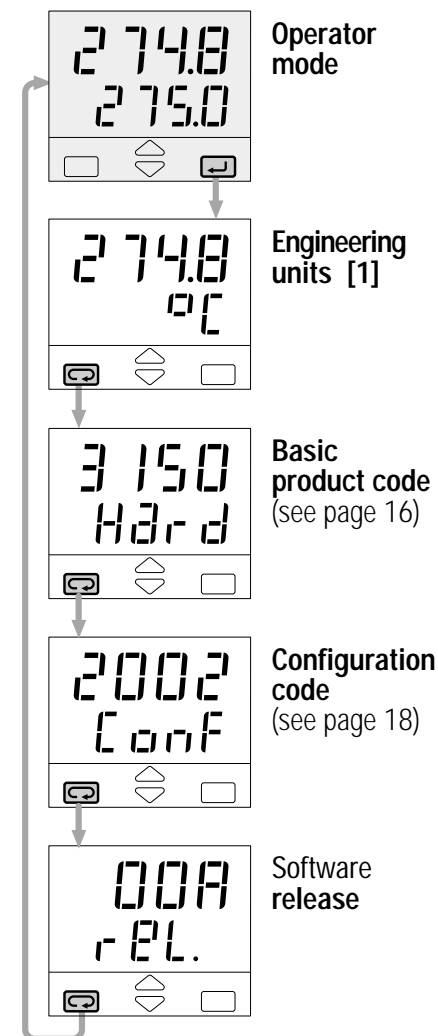
Example:
M3 - 3150 - 2002 / Release 00A

Note
[1] See table page 37
[2] This display is not presented if the instrument has been configured as an On - Off controller
[3] Value in Ampere. Only with CT option (see page 34)
[4] Only with Timer option selected (see page 41)

4.3 PARAMETER SETTING

4.3.1 NUMERIC ENTRY

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

Press △ or ▽ momentarily to change the value of 1 unit every push
Continued pressing of △ or ▽ changes the value, at rate that doubles every second. Releasing the button the rate of change decreases.
In any case 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

```
274.8
275.0
```
Operator mode
working Setpoint displayed

```
274.8
275.0
```
Local Setpoint display

—Lower

```
274.8
230.0
```
Setpoint modification

—Raise

```
274.8
240.0
```

⊘ after 2 sec.

```
°C
240.0
```
Setpoint entry.
The operation is acknowledged by one flash of the display.
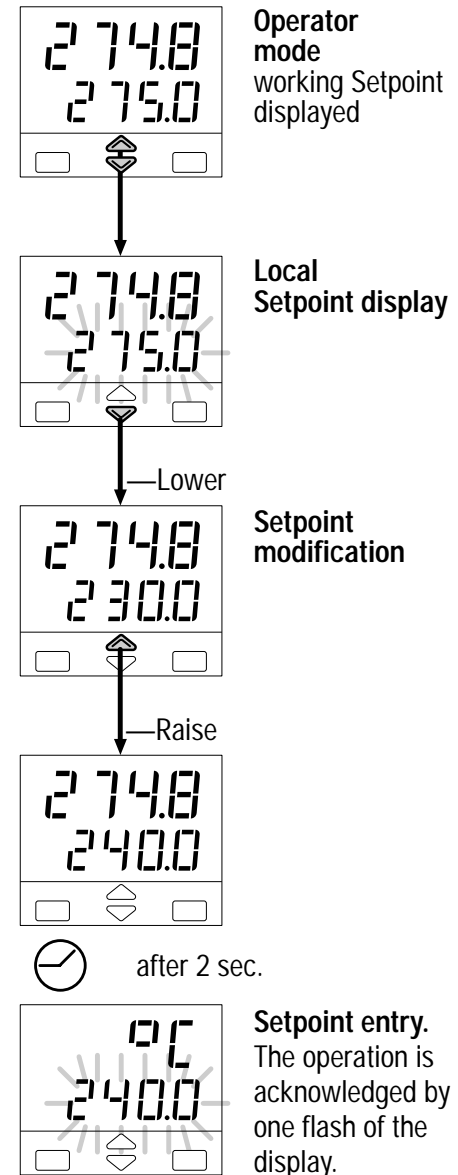
4.3.2 MNEMONIC CODES SETTING

(e.g. configuration see page 35)

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 sec. The mnemonic displayed at the time the next parameter is selected, is the one stored in the parameter.

Display	
°C Unit	Engineering Units Degree Centigrade
°F Unit	Degree Fahrenheit
°C Unit	Degree Centigrade
°F Unit	Degree Fahrenheit
non2 Unit	no units defined
Ph Unit	Ph
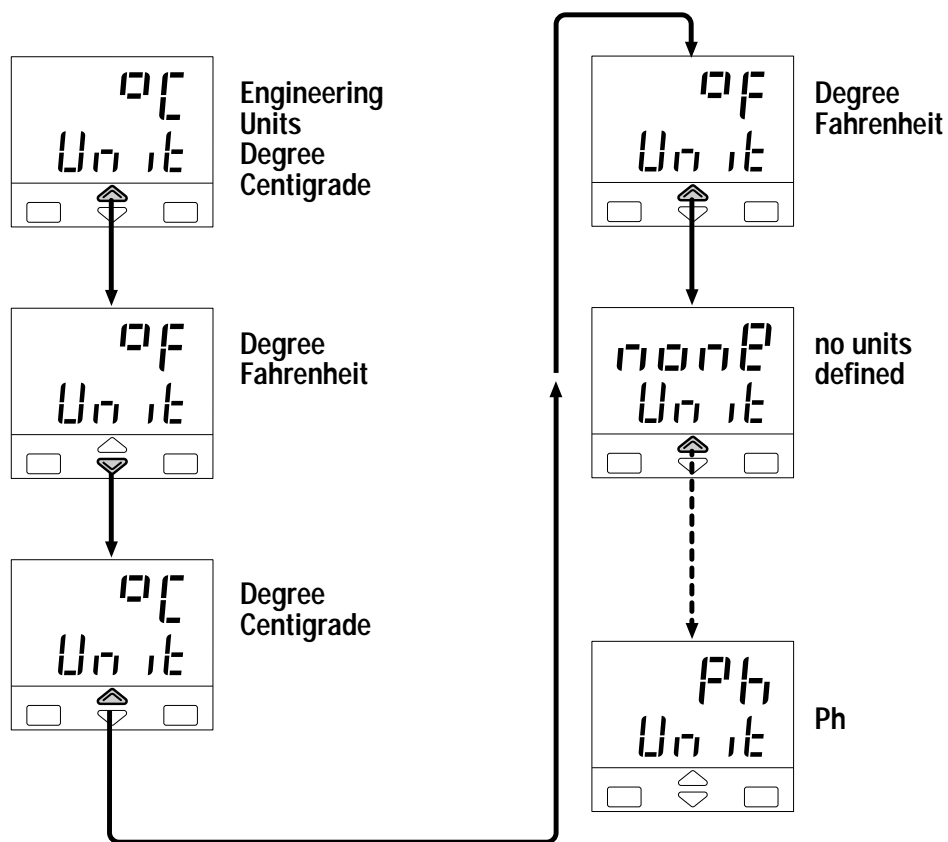
4.3.3 KEYPAD LOCK

To lock/unlock the keypad press the keys 🔲 and 🔲 simultaneously for 2 seconds.
To confirm the keypad lock/unlock the display flashes once.
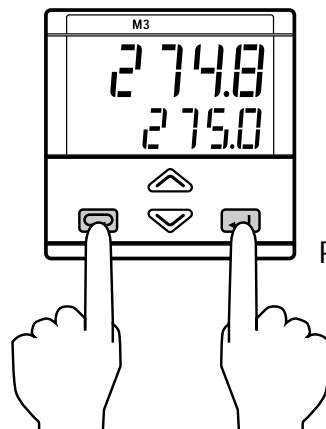
operator mode
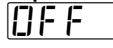
Press simultaneously for 2 seconds

The keypad lock/unlock can be achieved by serial communications too.

⚠ The keypad lock is maintained in case of power failure.

4.3.4 OUTPUTS LOCK

The outputs are switched to the OFF status by pressing the keys 🔲 and ⬇ together.
When the outputs are locked , the message ┌OFF┐ is displayed instead of the Setpoint value.
To unlock the outputs press again the keys simultaneously
(the Soft-start will be enabled).
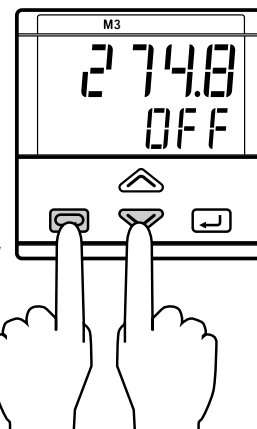
The outputs lock/unlock can be achieved by serial communications too

⚠ The outputs lock/unlock is maintained in case of power failure.

4.4 PARAMETERISATION

Parameter value

Parameter mnemonic

Values modification

Prameter menu selection

Modification/ selection enter

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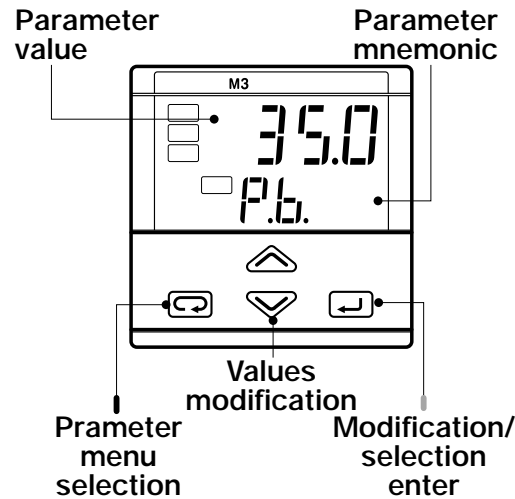
The parameter setting procedure has a timeout. If no keys are pressed for, at least, 30 seconds, the controller switches back, automatically, to the operator mode.

After having selected the parameter or the code, press ⬘ and ⬙ to display or modify the value (see page 22) The value is entered when the next parameter is selected, by pressing the ⏎ key.

Pressing the ⟲ key, the next group of parameters is presented on the display.

Operator mode

Timer run/stop
(if option installed)

Note

[1] It is not presented if the controller has been configured with alarm n° 2 not active or of sensor break type. Digit N/M of the configuration code is assigned to 0 or 1.

A 35.P — **AL3 alarm threshold [1]**
(see page 28)

P.b. — **Proportional band**
(PID algorithm only)
0.5…999.9% of span

t. i. — **Integral time**
(PID algorithm only)
OFF / 0.1…100.0 min

t.d. — **Derivative time**
(PID algorithm only)
0.5…999.9% of span

t.c. — **Cycle time**
(Time proportioning only)
1…200 sec

O.C. — **Overshoot control**
(PID algorithm only)
0.01…1.00

33

PASS

Password entry
only if *Code* value
≥5000
(see pages 35…37)

5000

Code entry
from 5000 to 9999
Must be equal to the
value of the parame-
ter *Code*

OK

NO   YES

0

A25.P

1st GROUP
AL2 alarm threshold [1]
(see page 28)

tune

2nd GROUP
Tune run/stop
(PID algorithm only)

1

time

Timer setting
(if option installed)
1…9999 sec. or min.

0

S.P. 2

Stand-by Setpoint
(only if *t.Mod* = 7)
S.P. L …*S.P. H*

OFF

SL. u

Setpoint ramp up
OFF /0.1…999.9
digit/min

OFF

SL. d

Setpoint ramp down
OFF /0.1…999.9
digit/min

L. range

S.P. L

Setpoint low limit
low range… *S.P. H*

H. range

S.P. H

Setpoint high limit
S.P. L…high range

20

t.c. C

Cool cycle time
(heat/cool time proportioning only)
1…200 sec

1.0

r.C.Ga

Cool relative gain
(heat/cool configuration only)
0.1…10.0

0.5

hy. C

Cool output hysteresis
(On-Off control only)
0.1…10.0% range

0.5

d.bnd

Dead band
(heat/cool configuration only)
-10.0…10.0%

100.0

OP. H

Control output high limit
(PID algorithm only)
10.0…100.0%

100.0

OP.HC

**Cool control output
high limit**
(heat/cool PID configuration only)
10.0…100.0%

0.5

hy.

Control output hysteresis
(On-Off control only)
0.1…10.0% of span

Back to the   1st parameter group

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PaSS — **Password entry**
only if **CodE** value
<5000 (see pages 35…37)

Direct access
to the configuration
(pages 35 … 37)

`0`

S.P.S.U — **Start-up Setpoint**
(if option installed)
S.P. L…S.P. H

`1`

t.h.S.U — **Start-up hold time**
(if option installed)
0…500 min.

`100.0`

OP.HS — **Output high limit during Start-up**
(if option installed)
5.0…100.0%

`0.5`

A2hy — **AL2 hysteresis**
0.1…10.0% of span **[1]**

`nonE`

A2L.b — **AL2 latching and blocking functions**
nonE / Ltch
bLoc / Lt.bL

`0.5`

A3hy — **AL3 hysteresis**
0.1…10.0% of span **[1]**

`nonE`

A3L.b — **AL3 latching and blocking functions**
nonE / Ltch
bLoc /Lt.bL

`OFF`

t.LbA — **LBA delay**
(see page 31)
OFF = sensor break
1…9999 sec LBA

`OFF`

t.F iL — **Filter time constant**
OFF / 1…30 sec

`OFF`

In.Sh — **Input shift**
OFF / -60…60 digits

`OFF`

d.Err — **Error dead band**
(PID algorithm only)
OFF /0.1…10.0 digits

`OFF`

St.OP — **Soft-start output value**
(PID algorithm and
t.Nod =OFF)
OFF /0.1…100.0%

`1`

St.tN — **Soft-start activation time**
(only if StOP different than
OFF) 1…9999 sec.

`0`

Sa.OP — **Output safety value**
0.0…100.0%
(-100.0…100.0% for
heat/cool)

`1`

Addr — **Communication address**
(if option installed)
OFF / 1…247

`L. range`

rt.Lo — **Retransmission low range**
(if option installed)
full scale

`H. range`

rt.H i — **Retransmission high range**
(if option installed)
full scale

Back to the | **2nd parameter group**

27

4.5   PARAMETERS

FIRST GROUP

The controller parameters have been organised in group, according to their functionality area.

$A2\,S.P$	**AL2 alarm threshold**
$A3\,S.P$	**AL3 alarm threshold**

The alarm occurrences handle the OP1, OP2 and OP3 outputs, in different ways, according to the configured types of alarms, as illustrated.

With double action control output, AL2 and AL3 share in or mode the same output (the free one) (see table on page 13)

Sensor break or input disconnection

over-range

under-range
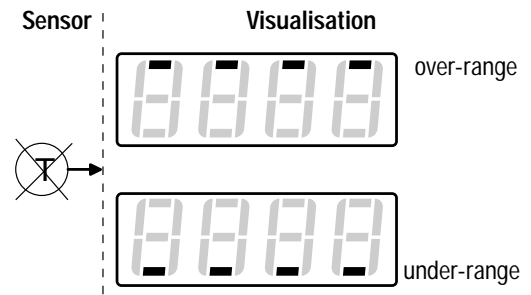
Absolute alarm (full scale)
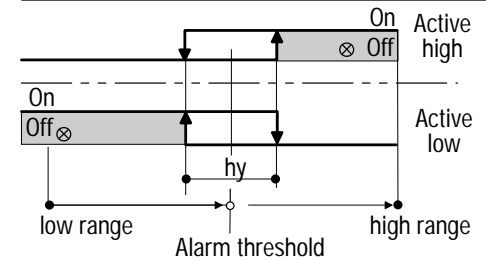
Deviation alarm

Band alarm
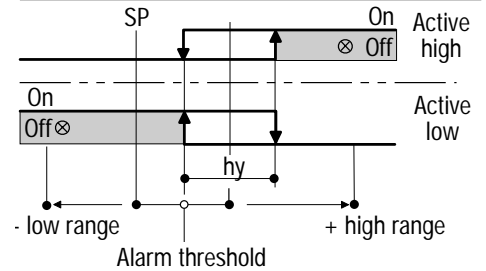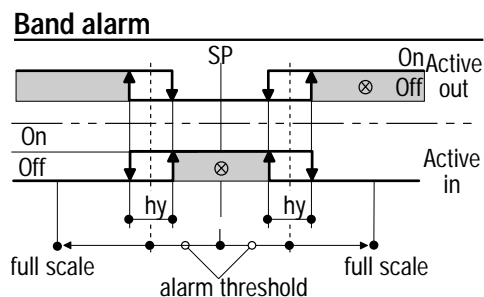
P.b. Proportional band

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

t. ı. Integral time

It 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

It is the time required by the proportional term P to repeat the output provided by the derivative term D. When OFF the derivative term is not included in the control algorithm.

t.c. Control output cycle time

t.c. C Cycle time cool

It's the cycle time of the time proportioning control output. The PID control output is provided through the pulse width modulation of the digital waveform.

O.C. Overshoot control

This parameter specifies the span of action of the overshoot control. Setting lower values (0.99 → 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.

d.bnd Heat/Cool dead band

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

OP. H Control output high limit

OP.HC Cool output high limit

It specifies the maximum value the control output can be set

hy. Control output hysteresis

hy. C Cool output hysteresis

Hysteresis of the threshold
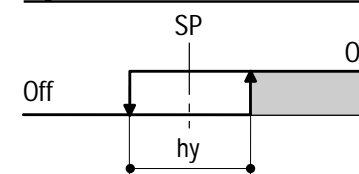
Control output hysteresis span, set in % of the full scale.

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SECOND GROUP

$5L. \ u$ **Setpoint ramp up**
$5L. \ d$ **Setpoint ramp down**
This parameter specifies the maximum rate of change of the Setpoint in digit/min. When the parameter is OFF, this function is disabled.

$5.P. \ L$ **Setpoint low limit**
$5.P. \ H$ **Setpoint high limit**
Low / high limit of the Setpoint value.

$A2hy$ **AL2 alarm hysteresis**
$A3hy$ **AL3 alarm hysteresis**
Hysteresis of the threshold of both the alarms, that activate OP1 and OP2 control output. It is specified as a % of the full scale.

$A2L.b$ **AL2, AL3 latching**
$A3L.b$ **and blocking functions**
For each alarm it is possible to select the following functions
$nonE$ none
$Ltch$ latching
$bLoc$ blocking
$Lt.bL$ both latching and blocking

$Ltch$ **ALARM ACKNOWLEDGE FUNCTION**
The alarm, once occurred, is presented on the display until to the time of acknowledge.
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.

$bLoc$ **START-UP DISABLING**

Ramp down
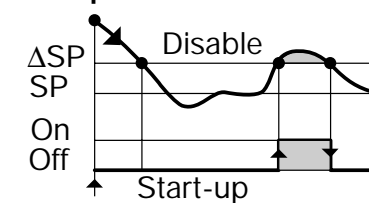
Ramp up
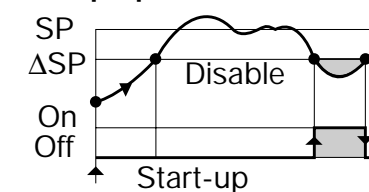
ΔSP Threshold = SP ± range

ALARMS WITH LBA (LOOP BREAK ALARM) AND SENSOR BREAK OPERATION

Select the code 1 on $\boxed{N}$ or $\boxed{O}$ configuration indexes (see pages 18 or 19). The following parameter is then available:

$\boxed{\text{t.L bA}}$ **LBA delay**

Setting a value between 1 and 9999 sec the alarm works as LBA+Sensor break with delay [1]
This condition is shown by means a red led as well as the blinking PV display.
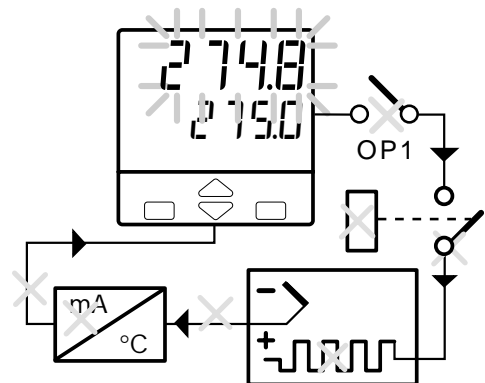
Setting OFF the alarm works as Sensor break with immediate action.
This condition is shown by means the red led of the selected alarm as well as:

or
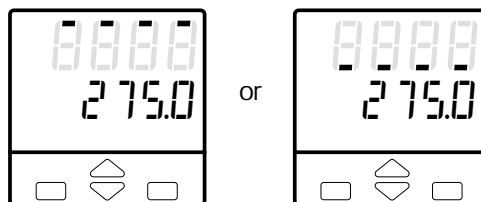
Note [1] In case of sensor break, condition, the alarm action is immediate.

$\boxed{\text{t.F iL}}$ **Input filter time constant**

Time constant, in seconds, of the RC input filter applied to the PV input. When this parameter is set to OFF the filter is bypassed.

Filter response
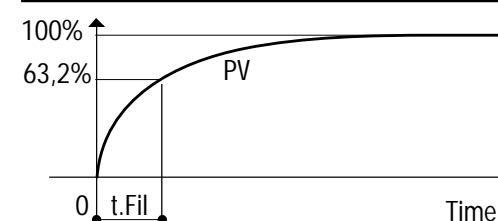
$\boxed{\text{In.Sh}}$ **Input shift**

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

$\boxed{\text{d.Err}}$ **Error Dead Band**

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

When the cause of the alarm disappears, the alarm status stops.

| SECOND GROUP | | HEAT COOL CONTROL |

SECOND GROUP

$St.OP$ **Soft-start control output value**

Value of the control output during the Soft-start activation time.

$St.tП$ **Soft-start activation time**

Time duration (starting from the power on) of the Soft-start function.
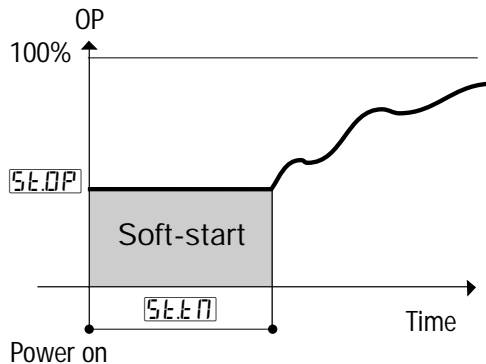
$SA.OP$ **Output Safety Value**

Output Value in case of input anomaly

$Addr$ **Controller address**

the address range is from 1 to 247 and must be unique for each controller on the communication bus to the supervisor.

When set to OFF the controller is not communicating

HEAT COOL CONTROL

By a sole PID control algorithm, the controller handles two different outputs, one of these performs the Heat action, the other one the Cool action.

It is possible to overlap the outputs.

The dead band parameter $d.bnd$ is the zone where it is possible to separate or overlap the Heat and Cool actions.

The Cool action can be adjusted using the relative cool gain parameter $r.C.Gd$.

To limit the Heat and Cool outputs the parameters $OP.\ H$ and $OP.HC$ can be used.

When there is an overlap, the displayed output OUt shows the algebric sum of the Heat and Cool outputs.

RETRANSMISSION

A Heat /Cool actions separated

Insert positive $\boxed{d.b.n.d}$ value (0…10%)
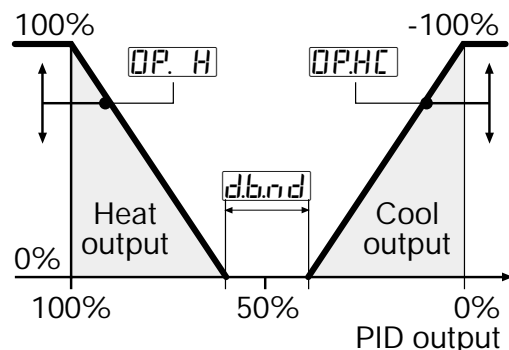
B Heat /Cool actions overlapped

Insert negative $\boxed{d.b.n.d}$ value (-10…0%)
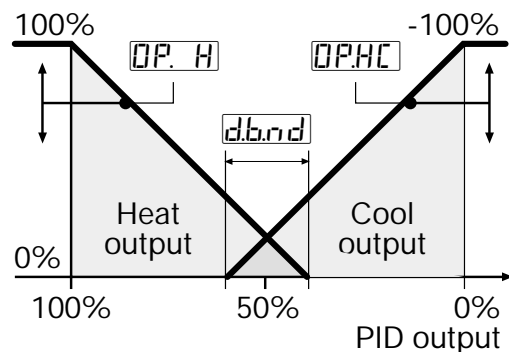
C Cool action adjusting

Example with different relative cool gains

- - =2.0 $\boxed{r.C.G.a}$ 0.1…10.0
── =1.0
--- =0.5
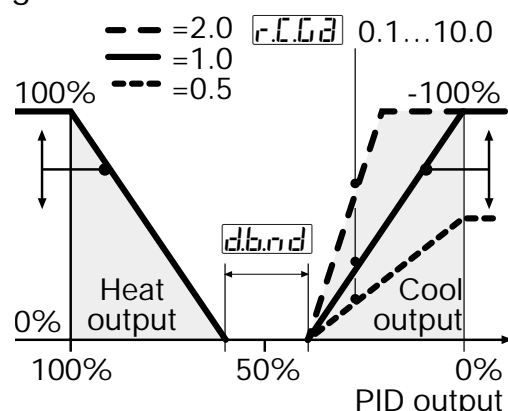
D On-Off Cool action
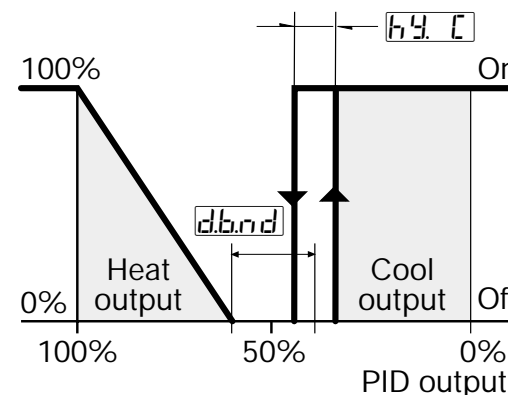
OP4 output, if present, retransmits linearised PV or the SP.
On configuration (see page 37) it is possible to set:

$\boxed{r\ E\ t\ r}$ **Output range** $0 - 20 / 4 - 20$

$\boxed{r\ E.H}$ **Retransmitted signal** $P.U. /$ $5.P.$

The following parameters define the low and high range of the OP4 retransmission output corresponding to 0…4mA or 20mA (see page 27):

$\boxed{r\ E.L\ o}$ **Retransmission low range**

$\boxed{r\ E.H\ i}$ **Retransmission high range**

4 - Operations

CURRENT TRANSFORMER INPUT

Example:
- T/C S,
  range 0…1600°C
- Output range, 4…20 mA
- Retransmitted signal PV on 800…1200°C range

mA

$\boxed{rPtr} = 4\text{-}20$
$\boxed{rt.H} = P.U$
$\boxed{rt.Lo} = 800$
$\boxed{rt.Hi} = 1200$

20

4

°C

800 1200 1600
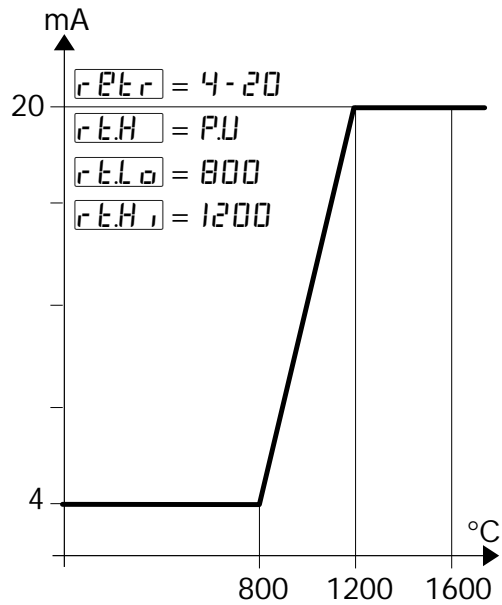
With $rt.Lo$ greater than $rt.hi$ it is possible to obtain a reverse scale.

With CT option it is possible to display the load current and set an alarm threshold.

It is possible to set AL2 or AL3 (index 8 and 9) to have an alarm when, during the ON time of the time proportional output, the load current is less then the specified threshold or, during the OFF time, there is at least 3% of full scale load current

The alarm condition must be longer than 120 ms to set the alarm.
During the OFF time the parameter $t.Cur$ latches the last on time current value

Example:
CT input on OP1, alarm on AL2 during on time (configuration digit N = 8)

120 ms   120 ms

OP1   ON   OFF   ON

$t.Cur$

A2S.P

Load current

3%

AL2   OFF   ON   OFF   ON   OFF

4 - Operations
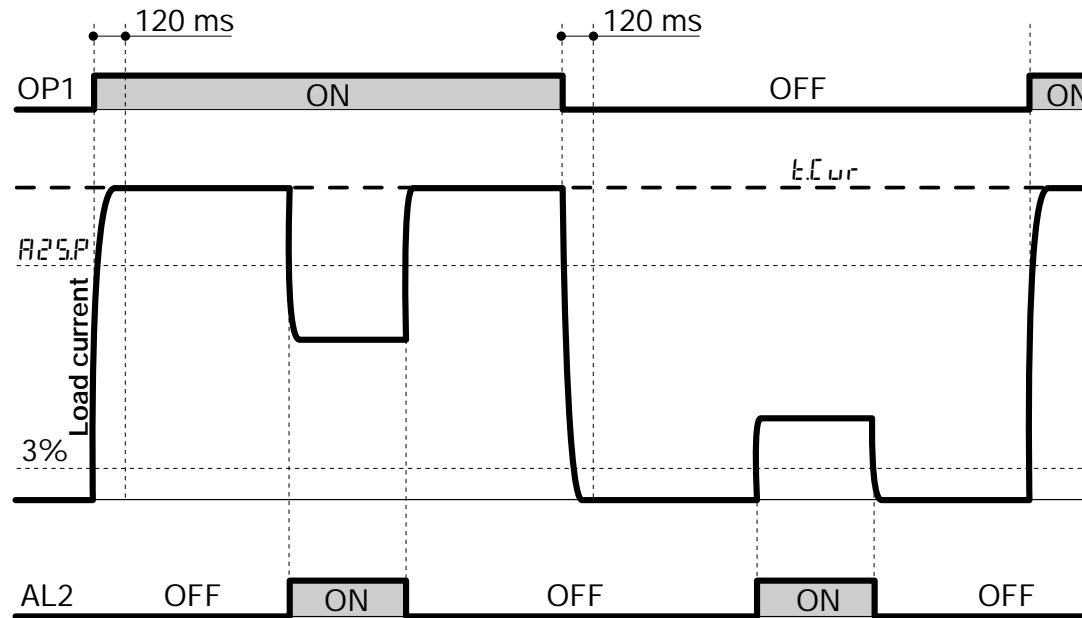
4.6 CONFIGURATION

The configuration of the controller is specified through a 4 digit code that defines the type of input, of control output and of the alarms. (sect. 3.2 page 18)

Parameter value — **Parameter mnemonic**

Configuration menu access

Values modification

Enter key for selection and value setting confirmation
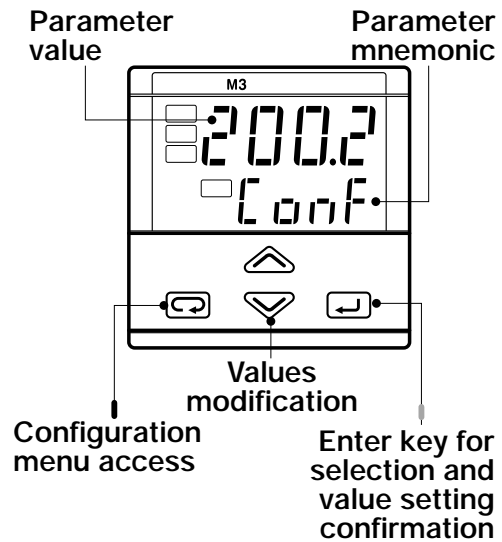
Press △ or ▽ to display the next parameter or the next code and change its value.
The new value entered is stored into the controller when the next parameter is selected by pressing ↵.
Pressing the ⊡ the next group of parameters is displayed.

274.8 / 275.0 Operator mode

t.run Timer run/stop (if option installed)

rtH Retransmitted signal (only if OP4 is present) *P.U. / S.P.*

Ht.F.S CT primary high range (only if installed) 10…200 A

Code Password [3] 0…9999 *33 di default from factory*

Prot Communication protocol (only if communication is installed) *M.buS / J.buS*

baud Baude rate (only if comm. is installed) *1200/2400 4800/9600*

rEtr Retransmission range (only if present) *0 - 20 / 4 - 20* mA

35

`A2S.P` **1st GROUP**

`tunE` **2nd GROUP**

`PASS` **Password entry**
only if `Code` value
≥5000

`5000` **Code entry**
from 5000 to 9999
Must be equal to the
value of the parameter
`Code`

Direct access
to the configuration

OK
NO   YES

**Entry of digits
I-L-M-N
of the
configuration code**
(chapter 3.2 page
18 and 19)

| I | L | M | N |

`Sc.Hi` **High range [2]**
(linear scale only)
-999…9999

`Unit` **Engineering units[1]**
(see table)

`2002`

`ConF`

`t.Mod` **Timer/Start-up
operating mode**
(if option installed)
(see page 39 and table 1
page 41)

`Sc.d.d` **N° of decimals**
(linear scale only)
0…3

`t.Act` **Timer Action**
(only if `t.Mod` not equal
to `OFF` or to 1)
(see table 2 page 41)

`Sc.Lo` **Low range [2]**
(linear scale only)
-999…9999

`Con2` **AL3 configuration code**
(see table 0, page 19)

P∂SS

Password entry
only if *Code* value <5000

33

Code entry
from 0 to 4999
(*33* default from factory)
The entered password must correspond to
the one store in the *Code* parameter.

OK
YES   NO

⚠️

Direct access to the configuration

A From parameterisation (see page 27).
B At the first power on when the
controller is not configured:

9999
ConF

In this situation, the controller has its outputs and inputs not active.
This situation ends when a correct configuration code is entered.

Note
[1] Table of the supported Engineering
Units.

Centigrade degrees*	°C
Fahrenheit degrees *	°F
none	nonE
mV	nU
Volt	U
mA	nA
Ampere	A
Bar	bAr
PSI	PSI
Rh	rh
pH	Ph

*   For inputs from thermocouple or
     resistance thermometer, the choice
     is between °C and °F only.
[2] Minimum Range 100 digits.
[3] **To avoid free parameter access**
    insert 5000...9999

5 ▪ AUTOMATIC TUNE

**Start/stop of the Fuzzy Tuning
The Tuning operation can be started or stopped any time.**

```
2 74.8
2 75.0
```
**Operator
mode**

press until

```
StoP
tunE
```
To start
select
`Strt`

```
Strt
tunE
```
To stop
select
`StoP`
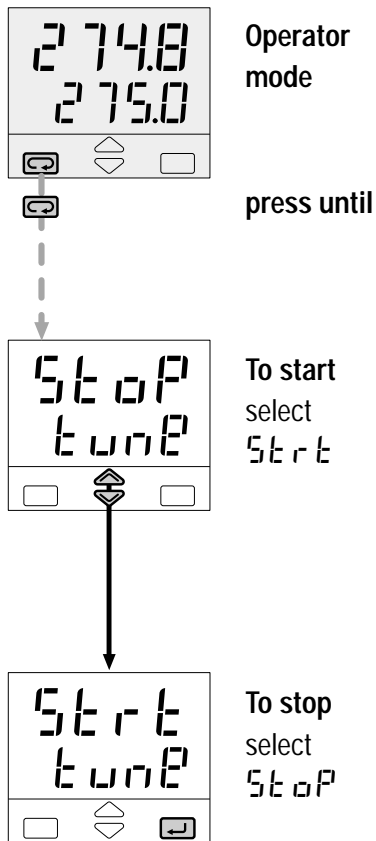
The green led ▦MAN▦ blinking goes on when the Fuzzy Tuning is in progress. At the end of this operation, the calculated PID terms parameter are stored and used by the control algorithm and the controller goes back to the operator mode. The green led MAN becomes off.

This function allows the calculation of the optimal PID terms parameters, monitoring the response of the process to disturbances.
The controller provides 2 types of "one shot" tuning algorithm, that are selected automatically according to the process condition when the operation is started.

Step response
This type is selected when, at the start of the autotune operation, the PV is far from the Setpoint of more than 5% of the span.
This method has the big advantage of fast calculation, with a reasonable accuracy in the term calculation.

Natural frequency
This type is selected when the PV is close to the SP Setpoint.

This method has the advantage of a better accuracy in the term calculation with a reasonable speed calculation.
The Fuzzy Tuning determines automatically the best method to use to calculate the PID term, according the process conditions.

Step response

SP
Setpoint change
End of the tuning operating and setting of the new calculated terms.
PV variable
Start of autotune operation
Control output

Natural frequency
tuning start
PV variable
End of the tuning operating and setting of the new calculated terms.
Control output
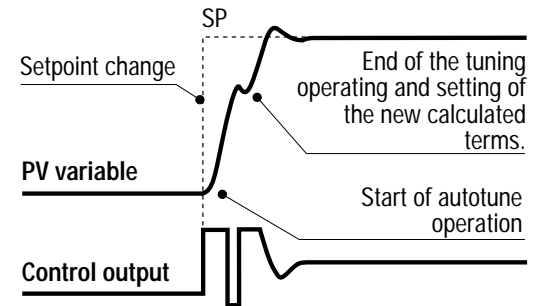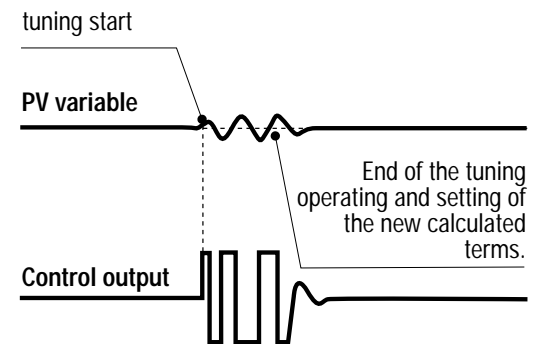
6 ■ SPECIAL FUNCTIONS

Two special functions are available:
6.1 Start-up
6.2 Timer

In order to have the above functions the product code digit **E** must be **2** (see page 17)
For example: M3 3100-**2**000

To select these functions use the parameter:

| t.Nod | Timer/Start-up operator mode (see page 35).

⚠ **Selecting Timer or Start-up, the Soft-start function is disabled, therefore the parameters** | St.OP | **and** | St.tN | **will not be shown.** (see page 27)

6.1 START-UP FUNCTION

By means of this function it is possible to manipulate the control output when the controller is switched on.
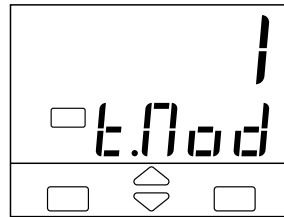
To configure Start-up function the parameter "Timer/Start-up operating mode" must be set to | 1 |.

Three parameters are associated to the Start-up function, they appear on the second group. (see page 27)

| S.P.SU | Start-up Setpoint (SP. L …SP. H)

| t.h.SU | Start-up hold time (0…500 min.)

| OP.HS | Output high limit (5.0%…100.0% min)

The Start-up function includes three phases:

1st "Limy" - The control output is limited to the | OP.HS |

2nd "Hold" - The process variable is maintained to the Start-up Setpoint for the time fixed by the parameter | t.h.S.U |

3rd "Off" - When the | t.h.S.U | time is elapsed the process variable is maintained to the working Setpoint.

Whether the process variable, for any reason (e.g. load change), decreases at a value lower than (| S.P.SU | - 40 digits), the Start-up function starts again from the "Limy" phase.

When the Start-up is in Hold phase, if the local Setpoint becomes lower than the Start-up Setpoint, the Start-up function passes to the "Off" phase.

continued **6.1 START-UP FUNCTION**

There are two possibilities:

A **Start-up Setpoint** $\boxed{5.P.5.U}$ **lower than the local Setpoint.** The "Hold" phase starts when the process variable PV achieves the $\boxed{5.P.5.U}$ (with a tolerance of 1 digit).

B **Start-up Setpoint** $\boxed{5.P.5.U}$ **greater than or equal to the local Setpoint.**

When the process variable PV achieves the local Setpoint (with a tolerance of 1 digit), the Start-up function passes directly to the "Off" phase.

If, at the controller power-on, the process variable PV is greater than the lowest between the $\boxed{5.P.5.U}$ and the working Setpoint , the next phase ("Hold" or "Off") will be executed instead of the "Limy" phase.
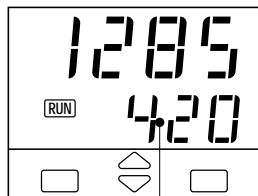
During the "Limy" and "Hold" phases the $\boxed{RUN}$ led is on.

Start-up Setpoint

A $\boxed{5.P.5.U}$ **< local Setpoint SP**

power-on · noise · Setpoint SP

PV

$\boxed{t.h.5.U}$ · 1 digit · $\boxed{t.h.5.U}$ · $\boxed{5.P.5.U}$

40 digit

OP=$\mathit{OP.H5}$ with TC = 25% 1sec min.

1st "Limy" | 2nd "Hold" | 3rd "Off" | 1st "Limy" | 2nd "Hold" | 3rd "Off"

B $\boxed{5.P.5.U}$ **≥ local Setpoint SP**

power-on · $\boxed{5.P.5.U}$

PV · 1 digit · noise · Setpoint SP

40 digit

OP=$\mathit{OP.H5}$ con TC = 25% 1sec min.

1st "Limy" | 3rd "Off" | 1st "Limy" | 3rd "Off"
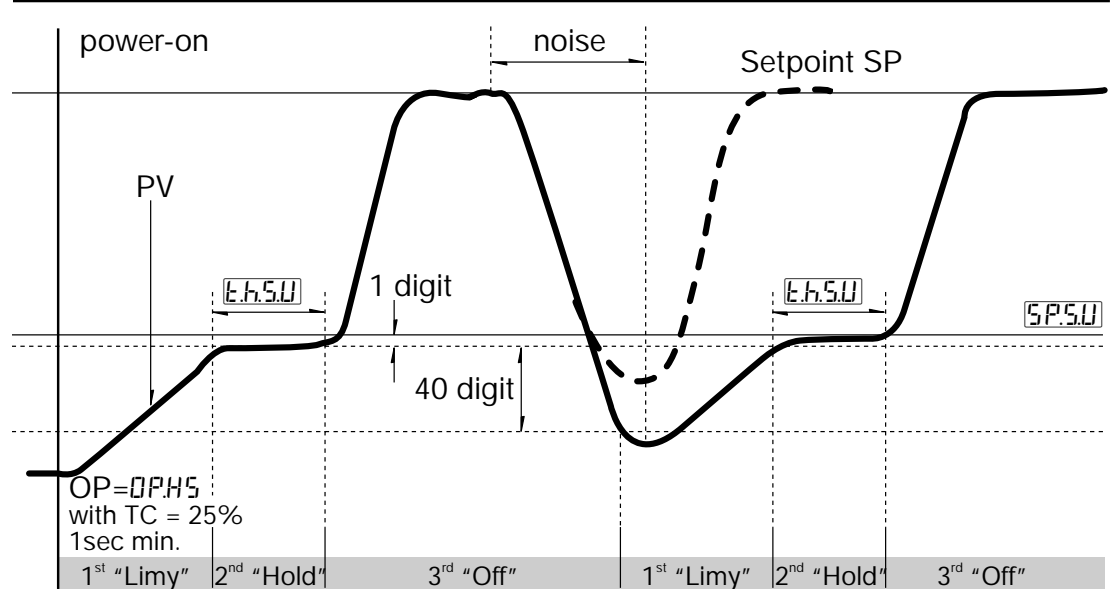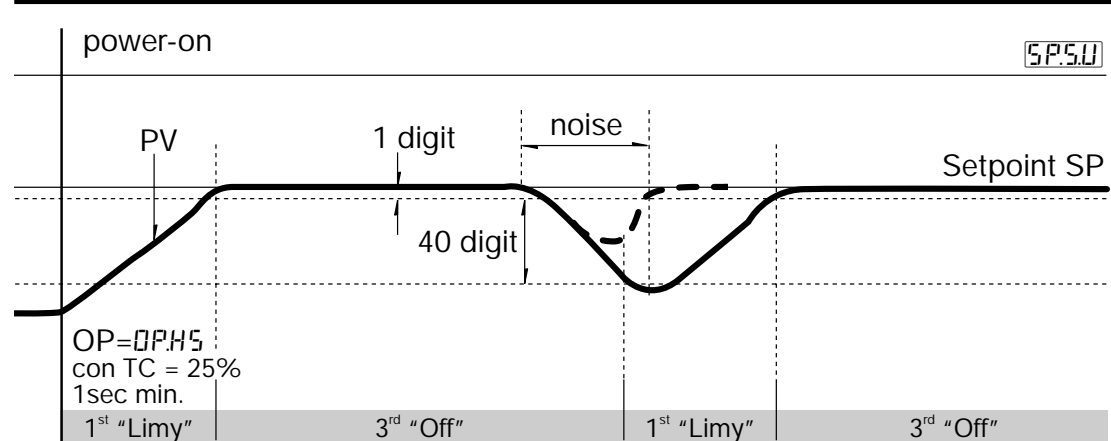
6.2   TIMER FUNCTION

To use AL3 in addition to this function, set the parameter $\boxed{Con2}$ (AL3 configuration code) to $\boxed{0.}$

⚠ **The Timer can't be enabled with Heat/Cool control.**

The two following parameters (see page 37) must be set to select one of the six possible types of Timer.

$\boxed{t.\Pi od}$ **Timer/Start-up operating mode**

By this parameter can be defined:
- the counting start time
- the control output status at the end of the counting

Table 1

Timer counting mode		Value
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

$\boxed{t.\overline{R}ct}$ **Timer Action**

By this parameter can be defined:
- the time units
- the starting mode
- the 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
Seconds	Manual by keypad	Off	0
		On	1
	Auto at the power on [2]	Off	2
		On	3
Minutes	Manual by keypad	Off	4
		On	5
	Auto at the power on [2]	Off	6
		On	7

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

After the Timer configuration the following parameters will be shown on the second parameters group. (see page 26)

$\boxed{t\,\overline{i}\,\overline{\Pi}e}$ **Timer setting** (1…9999 sec/min.)

$\boxed{S.P.\ \ 2}$ **Stand-by Setpoint** (only for $t.\Pi od$ = 7) ($SP.\ L\ ...SP.\ H$)

6.2.1. DISPLAY

```
      850
RUN   850
  ▭  ⬦  ▭
```
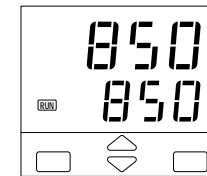
When the Timer is running, the led $\boxed{RUN}$ is on.

```
      850
      End
  ▭  ⬦  ▭
```
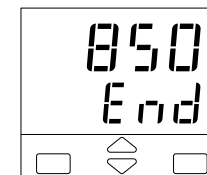
When the Timer ends, the Setpoint display shows alternatively the message $\boxed{End}$ and the Setpoint

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

Operator mode
and Timer running

Press until

Remaining time.

Counting stop.

Remaining time value

Value change

If set to ⬚ 0
the timer ends
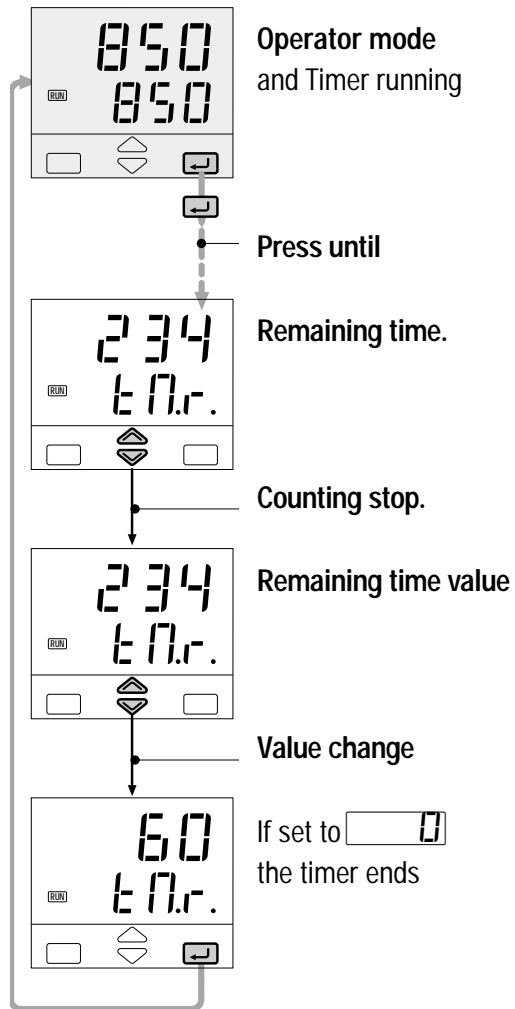
6.2.2 TIMER STARTING

Depending on the Timer action $\boxed{t.\Box ct}$ selection, there can be two different starting ways:
- Automatic at the power on
- Manual by keypad or serial communications.

To start/stop the Timer:

Operator mode

Press until

To start
select $5t \, r t$

To stop
select $5t \, o P$

Press the key ⤶ to confirm
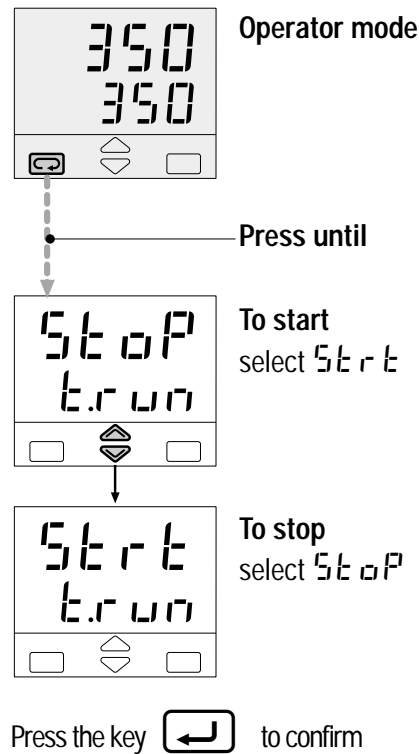
6.2.3 POWER FAILURE

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

Depending on Timer action $\boxed{t.\Box ct}$ selection, when the controller restarts you can have two different situations:

- with automatic mode
  ($\boxed{t.\Box ct}$ = $2,3,6,7$), the Timer function starts again and the counting time is reinitialised.
- with manual mode
  ($\boxed{t.\Box ct}$ = $0,1,4,5$), the control output is forced to ⬚ 0
  if $\boxed{t\Box od}$ = 3 e 5; otherwise the control action restarts using the working Setpoint

6.2.4 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.

Timer launch · $t.Mod$ = 2

Setpoint

±1 digit band

Process variable PV

Output OP

OP3
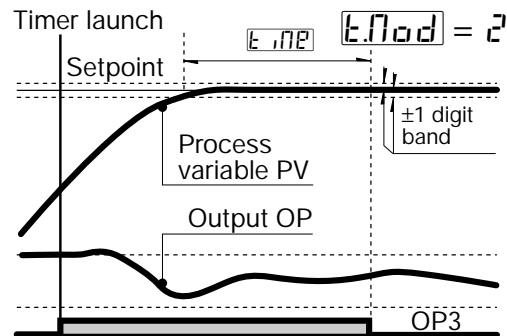
B Counting start time inside the band, end with control output forced to zero.

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]

Timer launch · $t.Mod$ = 3

Setpoint

±1digit band

Process variable PV

Output OP

OP3

C Counting start time = timer launch time, end in control mode.
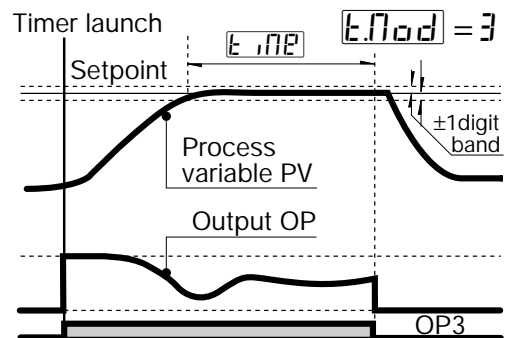
The time counting starts when the timer is launched. The control action is not affected by the Timer function.

Timer launch · $t.Mod$ = 4

Setpoint

Process variable PV

Output OP

OP3
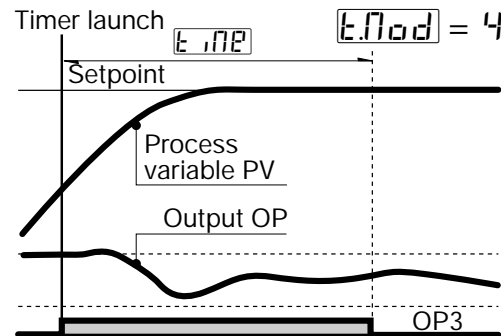
D Counting start time = timer launch time, end with control output forced to zero.

The time counting starts when the timer is launched. At the end, the control output is forced to zero. [1]

Timer launch · $t.Mod$ = 5

Setpoint

Process variable PV

Output OP

OP3
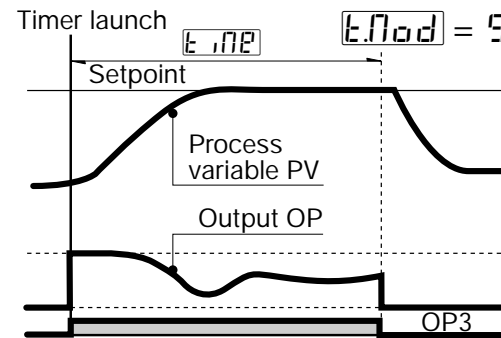
E No control action during the counting time.

The time counting starts when the timer is launched and the control output is forced to zero. At the end, the control action starts.

Timer launch · $t.Mod$ = 6

Setpoint

Process variable PV

Output OP

OP3
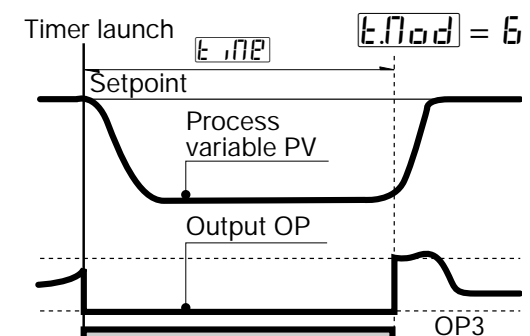
F Control action with stand-by Setpoint during the counting time

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.

Timer launch · $t.Mod$ = 7

Setpoint

Process variable PV

$S.P. 2$

Output OP

OP3
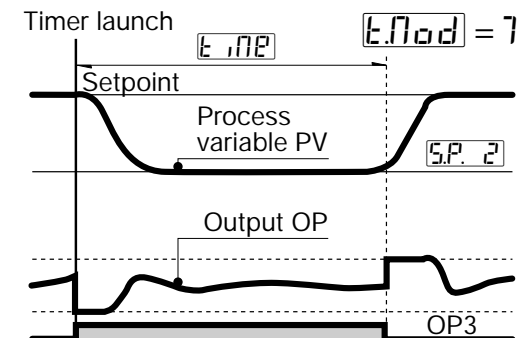
[1] When the Timer is not running the control output is forced to zero, also before the Timer launch

7 ▪ TECHNICAL SPECIFICATIONS

Features (at 25°C environmental temp.)	Description			
Total configurability (see par. 3.2 page 18 par. 4.6 page 35	From keypad or serial communication the user selects: - the type of input - the associated functions and the corresponding outputs - the type of control algorithm - the type of output and the safe conditions - the type and functionality of the alarms - the values of all the control parameters.			
PV Input (see page11,12 and page 18)	Common characteristics	A/D converter with resolution of 50.000 points Update measurement time: 0.2 seconds Sampling time: 0.5 seconds Input bias: - 60…+ 60 digit Input filter with enable/disable: 1…30 seconds		
	Accuracy	0.25% ± 1 digits for temperature sensors 0.1% ± 1 digits (for mV and mA)		Between 100…240V∿ the error is minimal
	Resistance thermometer (for ΔT: R1+R2 must be <320Ω)	Pt100Ω at 0°C (IEC 751) °C/°F selectable	2 or 3 wires connection Burnout (with any combination)	Max. wire Res: 20Ω max (3 wires) Sensitivity: 0.35°C/10° E. T. <0.35°C / 10Ω Wire Res.
	Thermocouple	L,J,T,K,S (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.Env. Temp <5μV / 10Ω Wire Res.
	DC input (current)	4…20mA,0-20mA with external shunt 2.5Ω Rj >10MΩ	Engineering units Conf. decimal point position Init. Sc -999…9999 Full Sc. -999…9999 (min. range of 100 digits)	Input drift: <0.1% / 20°C Env. Temp.
	DC input (voltage)	10…50mV, 0-50mV Rj >10MΩ		

Features (at 25°C environmental temp.)	Description			
CT auxiliary input (option)	Current transformer (see page 12)	50 or 100 mA input hardware selectable	Current visualisation 10 … 200A With 1A resolution and Heater Break Alarm	
Operating mode and Outputs	1 double action PID loop or On/Off with 1 or 2 alarms	Single action	**Control output**	**AL2 alarm**	**AL3 alarm**
			OP1-Relay /Triac	OP2-Relay or SSR drive	OP3-Relay/Triac
			OP2 SSR drive	OP1-Relay /Triac	OP3-Relay/Triac
		Double action Heat/cool	OP1-Relay /Triac · OP3-Relay /Triac	OP2-Relay or SSR drive	
			OP1-Relay /Triac · OP2 SSR drive		OP3-Relay/Triac
			OP2 SSR drive · OP3-Relay /Triac	OP1-Relay /Triac	

Features	Description		
Control mode	Algorithm	PID with overshoot control or ON OFF	
	Proportional band (P)	0.5…999.9%	PID algorithm
	Integral time (I)	0.1…100.0 min	
	Derivative time (D)	0.01…10.00 min (OFF = 0)	
	Error band	0.1…10.0 digit	
	Cycle time	1…200 sec	
	Dead band	-10.0…10.0%	Heat / cool control action
	Cool relative gain	0.1…10.0	
	Cool cycle time	1…200 sec	
	Overshoot control	0.01…1.00	PID algorithm
	High limit	100.0…10.0% (heat) -100.0…-10.0%(cool)	
	Hysteresis	0.1…10.0%	On-Off algorithm
OP1 output	SPST Relay N.O., 2A/250V~ for resistive load Triac, 1A/250V~ for resistive load		Protection by varistor for 220V ~ and capacitor
OP2 output	SSR drive not isolated: 5V–, ± 10%, 30mA max SPST Relay N.O., 2A/250V~ for resistive load	Jumper selectable (page 13)	
OP3 output	SPST Relay N.O., 2A/250V~ for resistive load Triac, 1A/250V~ for resistive load		

Features (at 25°C environmental temp.)	Description				
AL2 - AL3 alarms	Hysteresis 0.1…10.0% c.s.				
	Action	Active high	Action type	Deviation threshold	±range
				Band threshold	0…range
		Active low		Absolute threshold	whole range
		Special function	Sensor break, heater break alarm,Latching/Blocking, Loop Break Alarm		
Setpoint	Ramp up and down. User inhibited		0.1…999.9 digit/min		
	Low limit		from low range to high limit		
	High limit		from low limit to high range		
OP4 PV or SP retransmission (option)	Galvanic isolation: 500 V∼/1 min Resolution 12bit (0.025%) Accuracy: 0.1 %		In current: 0/4…20mA 750Ω/15V max		
One shot Fuzzy-Tuning with automatic selection	The controller selects automatically the best method according to the process conditions		Step response		
			Natural frequency		
Serial comm. (option)	RS485 isolated, Modbus/Jbus protocol, 1200, 2400, 4800, 9600 bit/sec, two wires				
Auxiliary Supply	+18V– ±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 value: -100%…100%			
	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, keypad lock, output lock			
General characteristics	Power supply (fuse protected)	100 - 240V∼ (- 15% + 10%) 50/60 Hz or 24V∼ (- 25% + 12%), 50/60 Hz and 24V– (-15% + 25%) Power consumption 2.6W max			
	Safety	Compliance to EN61010-1 (IEC 1010 – 1), installation class 2 (2500V) pollution class 2, **instrument class II**			

Features (at 25°C environmental temp.)	Description	
General characteristics	Electromagnetic compatibility	Compliance to the CE standards (see page 2)
	Protection EN60529 (IEC 529)	IP65 front panel
	UL and cUL Omologation	File 176452
	Dimensions	$^1/_{16}$ DIN - 48 x 48, depth 120 mm, weight 130 gr. apx.

▇ WARRANTY

We warrant that the products will be free from defects in material and workmanship for 3 years from the date of delivery.
The warranty above shall not apply for any failure caused by the use of the product not in line with the instructions reported on this manual.

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