ERO ELECTRONIC

PMW

Serial Interface

MICROPROCESSOR
BASED CONTROLLER

INSTRUCTION MANUAL

170.MAN.PMW.E10 1.4 - 97 / 5B

BEFORE PROCEEDING WITH INSTALLATION OF THE INSTRUMENT READ CAREFULLY **SECTION 2** AND PARTICULARLY CHAPTER D2 CONCERNING THE EXTERNAL LOADS.

CONTENTS

SECTION 1 GENERAL INFORMATION

1.1 INTRODUCTION

The PMW controller has been carried out to an up-to-date technology, accurate engineering and design.
These products are a highly flexible, field or laboratory reconfigurable controller.
The following is a summary of the features of these products:

- 1/8 DIN size (48 x 96 mm).
- IP 54 front protection.
- Self-tuning of control parameters: TUNE and ADAPTIVE.
- Three color custom display.
- High efficiency back lighted display.
- 150 milli seconds sampling time.
- Dual set point with transfer from SP to SP2 and vice versa by external contact or internal timer, programmable.
- Programmable transfer ramp between the set points.
- Start of a timer function by external contact.
- Output power limiter with programmable time duration.
- Two independent alarms programmable as process, band or deviation alarms.
- Three logic inputs.
- RS-485 interface for host computer or EROlink system.
- Control outputs: time proportioning, linear, open loop valve motor drive, heating and cooling.

1.2 PRODUCT SPECIFICATIONS

1.2.1 GENERAL SPECIFICATIONS

Case: PC black color; self-extinguishing degree: V-2 according to UL 94.
Front panel: IP 54 protection according to IEC 549 and CEI 70-1.
Installation: panel mounting by means of tie rods. The instrument is a plug in type and it is kept captive by a front safety screw.
Plug in construction: PCB's are assembled by snap in action for easy inspection and replacement of all boards.
Rear terminal block: with 21 screw terminals with identification labels, connection diagrams and safety rear cover.
Dimensions: DIN 43700 48 x 96 mm, depth 165 mm.
Cut-out: 45 mm (+0.6 mm, -0.0 mm) x 92 mm (+0.8 mm, -0.0 mm).
Weight: 500 g max.
Displays: LCD back lighted display
Upper display: 4 digits, 7 segments with decimal point. Figure height 11.5 mm .
Lower display: 4 digits, 14 segments with decimal point, figure height 9 mm.
Front indicators: 6 indicators for alarm and instrument status indication.
Power supply:
- 100V to 240V A.C. 50/60Hz (-15 % to + 10% of the nominal value)
- 24 V AC/DC ($\pm$ 10% of the nominal value).
Power consumption : 8 VA max.

I**nsulation resistance**: > 100 MΩ according to IEC 348.
Dielectric strength: 1500 V rms according to IEC 348.
A/D Conversion: dual slope integration type.
Resolution: 30000 counts equal to:
2 μV for TC inputs
0.01 Ω for RTD inputs
0.66 μA for mA inputs
2 μV for 60 mV inputs
166 μV for 5 V inputs
333 μV for 10 V inputs
Sampling time: 150 ms typical.
Accuracy: ± 0,2% fsv ± 1 digit @ 25 °C ambient temperature.
Common mode rejection: 120 dB at 50/60 Hz.
Normal mode rejection: 60 dB at 50/60 Hz.
Noise immunity : according to IEC 804-1 level 3
Temperature drift:
< 200ppm of the span/°C for TC nominal ranges (CJ excluded).
< 250 ppm of the span/°C for linear inputs
< 500 ppm of the span/°C for RTD inputs
Operative temperature: from 0 to 50 °C.
Storage temperature : -20 to +70 °C
Humidity: from 20 % to 85% RH, non condensing.
Protections: 1) WATCH DOG circuit for automatic restart.
2) DIP SWITCHES for protection against tampering of configuration and calibration parameters.
3) Programmable output safety value when an out of range condition is detected (available from status 00 AB)

1.2.2 INPUTS

A) THERMOCOUPLE
Type :B -J -K -L-N -R -S -T. °C/°F selection via front pushbuttons.
External resistance: 100 Ω max, maximum error 0,1% of span.
Burn out: It is shown as an overrange condition (standard). It is possible to obtain an underrange indication by cut and short actions.
Cold junction: automatic compensation from 0 to 50 °C.
CJ accuracy: 0.1°C/°C
Input impedance: > 1 MΩ
Calibration: according to IEC 584-1
STANDARD RANGES TABLE

Thermocouple type	Ranges	
B	+32 / + 3272 °F	0 / + 1800 °C
J	- 328 / + 1832 °F	- 200 / + 1000 °C
J (*)	+ 32/ + 932 °F	+ 0 / + 500 °C
K	+ 32 / + 2498 °F	0 / + 1370 °C
L (*)	+32 / +932 °F	+ 0 / + 500 °C
N	+ 32 / + 2552 °F	0 / + 1400 °C
R	+ 32 / + 3200 °F	0 / + 1760 °C
S	+ 32 / + 3200 °F	0 / + 1760 °C
T	- 328 / + 752 °F	- 200 / + 400 °C

(*) Available from status 00 AB

B) CURRENT OR VOLTAGE INPUT
Input impedances: see table below.
Readout : keyboard programmable between -1999 and +4000.
Decimal point : programmable in any position
Burn out : the instrument shows the burn out condition as an underrange condition for 4-20 mA, 12-60 mV, 1-5 V and 2-10 V input types. No indication are available for the other linear input types.

STANDARD RANGE TABLE

Input type	Input impedance	Accuracy
0 - 20 mA	< 10 Ω	0.2 % + 1 digit @ 25°C
4 - 20 mA		
0 - 60 mV	= 500 kΩ	
12 - 60 mV		
0 - 5 V	= 80 kΩ	
1 - 5 V		
0 - 10 V	= 150 kΩ	
2 - 10 V		

NOTE : the instrument is shipped with the mA input calibrated as standard from the factory. If a different linear input is desired, it is necessary to make cut and short procedure and to re-do the linear input calibration.

C) RTD (**R**esistance **T**emperature **D**etector)
Input: for RTD Pt100 Ω, 3 wire connection.
Input circuit: current injection.
RTD measuring current : 100 μA
°C/°F selection: via front pushbuttons.
Line resistance: automatic compensation up to 20 Ω/wire with no measurable error.
Calibration: according to DIN 43760
Burn out : The instrument detect the open condition of one or more wires (shone as an overrange condition).
It is able to detect also the short circuit of the sensor (shown as an overrange condition).
Standard ranges: see table

STANDARD RANGES TABLE

Input type	Ranges	
RTD Pt 100 Ω DIN 43760	- 328 / + 1562 °F	- 200 / + 850 °C
	---	- 99.9 / + 400.0 °C
	---	- 50.0 / + 200.0 °C (*)
	---	- 50.0 / + 100.0 °C (*)

(*) Available from status 00 AB.

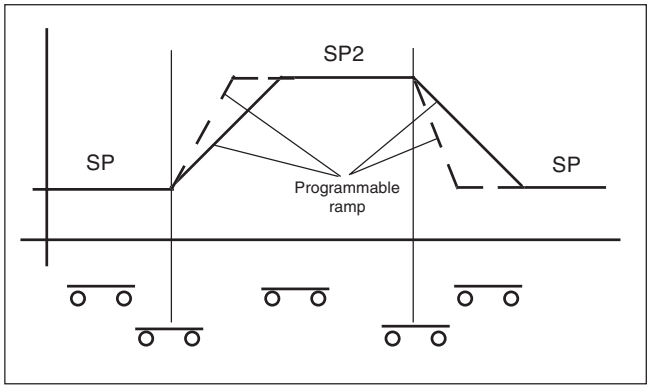
D) LOGIC INPUTS

the instrument is equipped with three logic inputs (contact closure) for the following functions:
1st - to enable the remote control from central unit via serial link
2nd - configurable for one of the following functions:
a) to start transfer from SP and SP2 and vice versa following a pre-assigned ramp.
b) To select AUTO or MANUAL mode.
c) To switch ON or OFF the output level limiter
3rd - to start the timer function (not available for valve motor drive version)

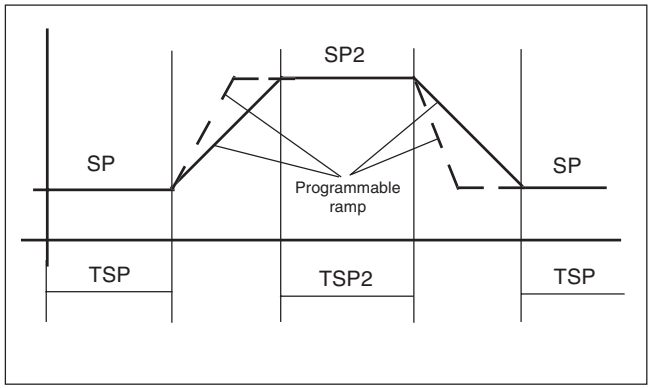
1.2.3 SET POINTS

Two set points are programmable
A) Main set point: Front pushbutton programmable. The transfer between one value and another may be realized with a programmable slope.
Slope value: 1 - 100 eng. unit/min. Above the max value, the display blanks and the transfer is a step change.
B) Auxiliary set point: front pushbuttons programmable.

Main set point/auxiliary set point selection: by external contact or after a programmed time.
The transfer between main set point and auxiliary set point may be realized with a programmable slope (GRAD parameter).
Slope value: 1 - 100 Eng. unit/min.
Above the max value, the display blanks and the transfer is a step change.
Set points limiter: RLO and RHI parameters, programmable.



Set point transfer by means of external event, transfer ramp with programmable rate of change.



Set point transfer with programmable soaking on SP and SP2.
Transfer ramp with programmable rate of change.

1.2.4 CONTROL ACTIONS

Control action: PID + ARW + TUNE + ADAPTIVE
Proportional Band (Pb): from 0.2 to 500.0 % of the input span.
When Pb=0, the control action becomes ON/OFF.
Hysteresis (for ON/OFF control action) : from 0.1% to 10.0% of the input span.
Integral (Ti): from 1 s to 99 min 59 s.
Above 99 min 59 s the integral action is excluded.
Derivative time (TD): from 1 s to 99 min 59 s. Resolution 1 s.
If zero value is selected, the derivative action is excluded.
Antireset (ARW): A from 1 to 100 % of Pb value.
Integral pre-load: IP function,
- from 0 to 100 % for one control output
- from -100 (cooling) to +100 % (heating) for two control output.

TUNE : keyboard enabling/disabling
ADAPTIVE : keyboard enabling/disabling
Auto/Manual: selectable by front pushbutton or by external contact
Choice between bumpless balance or bumpless balanceless transfer.
Indicator "MAN" : OFF in auto mode and lit in manual mode.

1.2.5 CONTROL OUTPUTS

A) TIME PROPORTIONING

Cycle time: from 1 to 99 s (CY parameter) programmable.
Output: 1) Relay, SPDT.Contact rating: 4 A - 250 V AC resistive load.
2) Voltage for solid state relay drive.
"ON" status for Vout between 17 V and 20 V, maximum current 17 mA.
"OFF" status for Vout < 0.1 V DC.
Indication: "OUT 1" indicator lit to show output "ON" status.
Output action: direct/reverse programmable
Output Maximum ratio of change : programmable (available from status 00 AB).
Output level indication: Output level is shown in percent on lower display from 0 to 100%.

B) LINEAR

Output: 0-20 mA or 4-20 mA selectable by front pushbuttons, galvanically isolated.
Load resistance: 500 Ω max.
Output Maximum ratio of change : programmable.
Output level indication: Output level is shown in percent on lower display from 0 to 100%.

C) VALVE MOTOR DRIVE

Type : open loop version: with feedback potentiometer used for valve position indication only.
Feedback potentiometer range: from 100 Ω to 10 kΩ.
Valve motor stroke time : programmable from 6 seconds to 3 minutes.
Servomotor dead band: Programmable from 1 to 50 % of the stroke time.
Output: Two relays Increase/Decrease interlocked on the rear terminal block.
Contact rating 2 A - 250V AC on resistive load.
Output Maximum ratio of change : programmable (available from status 00 AB).
Output level indication: valve position shown in percent of potentiometer span on lower display.
Two front LED.s indicate opening or closing of the valve motor drive.

NOTE: When the instrument is equipped with valve motor drive output, the alarm 2, the out 2 and timer function are not available.

D) TWO CONTROL OUTPUT (HEATING/COOLING)

OUTPUT: 1) Heating, selectable as relay, SSR drive or mA.
2) Cooling, relay contact rating 2A, 250 V AC on resistive load
Relative cooling gain: programmable from 0.02 to 1 of the value of the out 1 proportional band.
Overlap/dead band: programmable within ± 20% of the proportional band
Cycle times: For out 1 it is programmable from 1 to 99 s.
For out 2 it is programmable from 1 to 99 s.
Output Maximum ratio of change : programmable (available from status 00 AB).
Indication: Two front LED.s for the model with relay/relay output.
Output level indication: from -100% to +100 %.

NOTE: the out 2 may be programmed to perform the second control output or the alarm 2 output.

1.3 ALARMS / TIMER

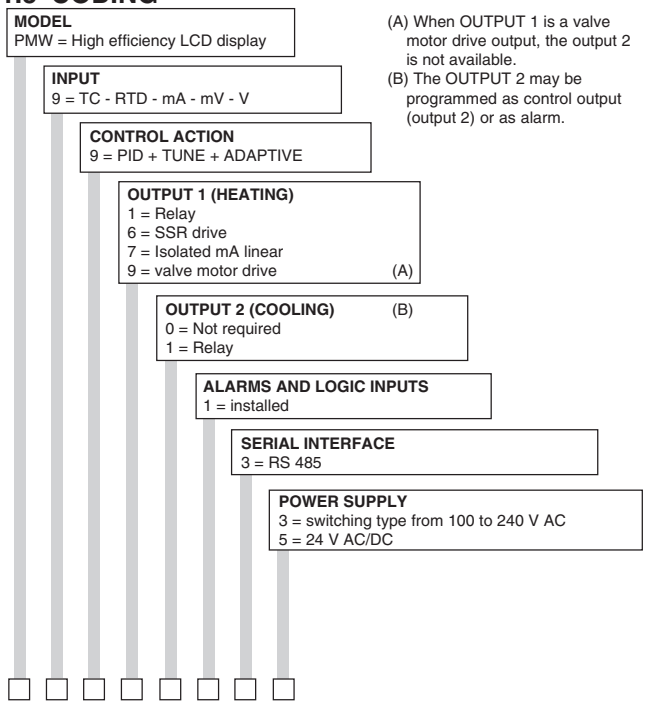
Two independent alarms are available and each one of them can be configured in three modes as follows:
- process alarm
- band alarm
- deviation high or deviation low.
- timer "on event" (alarm 1 only)
- timer "timed event" (alarm 1 only)

Actions: Direct or reverse acting.
Threshold resolution : 1 digit.
Alarm hysteresis : programmable between 0.1 % and 10.0 % of the input span.
Alarm outputs: two relays, SPST contacts free of voltage.
Contact rating: 2A - 250V AC on resistive load
Alarms indication: Two LED.s (AL1 - AL2) lit for alarm ON.

1.4 COMMUNICATION INTERFACE

Type: RS 485 optoisolated.
Communication: bi-directional half duplex.
Baud rate: selectable from 150 to 19200 baud.
Format: 7 bit + parity, 8 bit no parity or 8 bit + parity
Parity: odd or even programmable
Instrument address: from 1 to 31.
The serial link can be used by a remote terminal for setting all the control parameters, and for monitoring the process variable, plant status and instrument configuration.
Safety: external safety switch, driven by remote unit, shows when the remote terminal is out of service.

1.5 CODING



(A) When OUTPUT 1 is a valve motor drive output, the output 2 is not available.
(B) The OUTPUT 2 may be programmed as control output (output 2) or as alarm.

1.6 LABELS

1.5.1 IDENTIFICATION LABEL

The instrument identification label , see Fig. 1.1, is located externally on the left of the housing.
It contains the following information:

a) The instrument Model Number on the left side column.
The model number includes the instrument code which allows the instrument functions to be decoded. Each item is followed by a brief description. A complete description of all the codes can be found in chapter 1.4.

b) The instrument Serial Number on the bottom line.

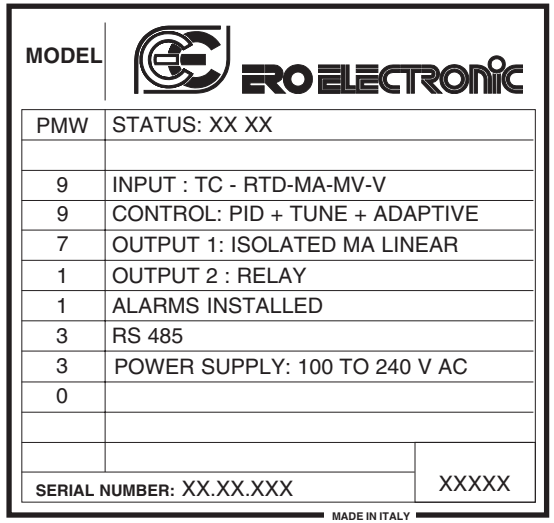


Fig. 1.1 INSTRUMENT IDENTIFICATION LABEL

1.6.2 CONDENSED LABELS

Two condensed labels are provided to allow the instrument parts to be identified.
They are located : (a) on the bottom side of the display plastic support; (b) internally on the bottom front end of the housing.
The condensed labels contain the Model Number and the Serial Number of the instrument.

SECTION 2 INSTALLATION

2.1 MOUNTING

Select a mounting location where there is minimum vibration and the ambient temperature range between 0 and 50 °C.
The instrument can be mounted on a panel up to 5 mm thick with a square cutout of 92 x 45 mm (+0.8 mm - 0 mm).
For outline and cut-out dimensions refer to Fig. 2.2.
Remove the mounting brackets from both sides of the instrument, and insert the instrument through the panel cut-out.
While holding the instrument against the panel, insert the mounting brackets and with a screwdriver turn the screw until the instrument is held tightly against the panel.

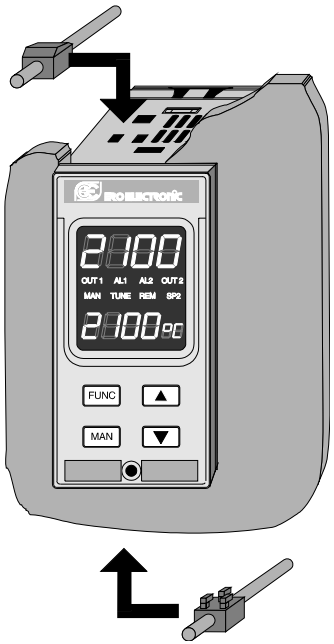


Fig. 2.1 HOW TO INSERT THE INSTRUMENT

2.1.2 OUTLINE AND PANEL CUT-OUT

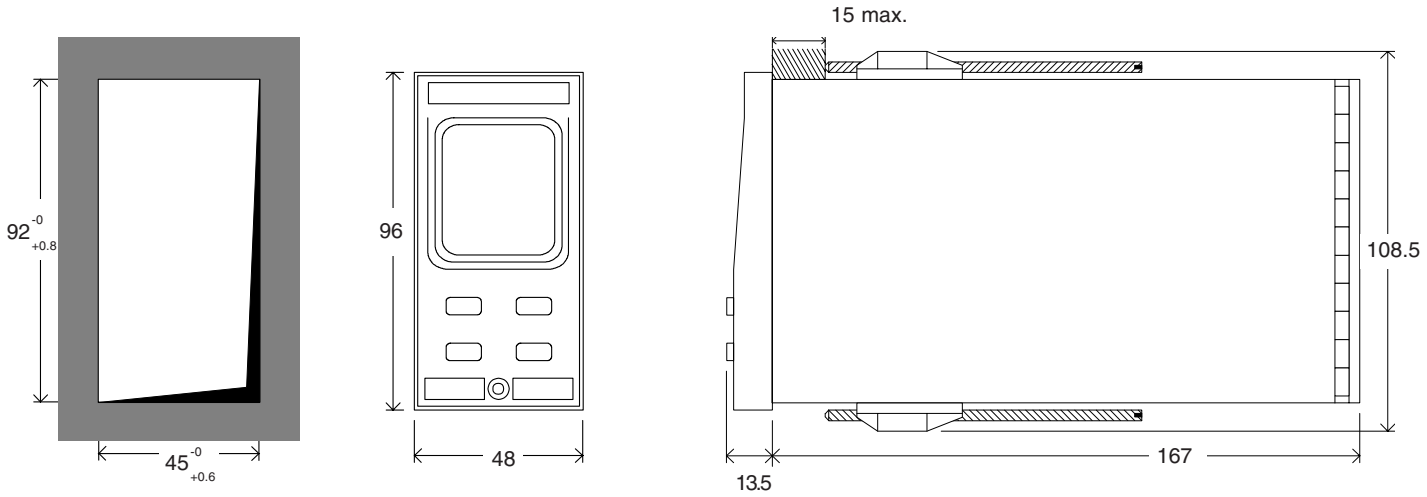


Fig. 2.2 OUTLINE AND CUT-OUT DIMENSIONS

VERTICAL PACKING: Minimum distance between cut outs : 20 mm
PACKING FOR MORE INSTRUMENT IN A SINGLE CUT OUT (max. 10 instruments) : the total dimensions of the cut out is the addition of the front dimensions minus 3 mm. Horizontal dimension of the cut out = (n x 48) - 3 mm, where n is the number of instruments to be packed.

2.2 WIRING GUIDE LINES

Connections are to be made with the instrument housing installed in its proper location.

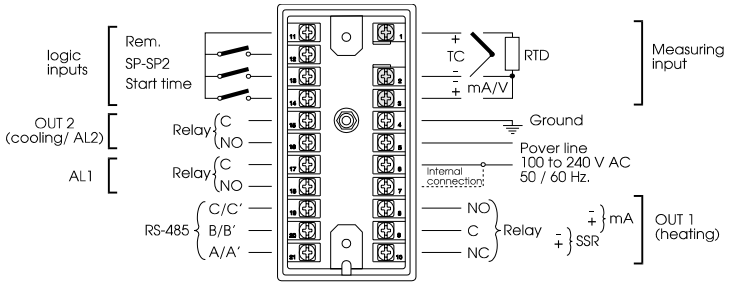


Fig. 2.3 REAR TERMINAL BLOCK WITH HEATING OR HEATING AND COOLING OUTPUT

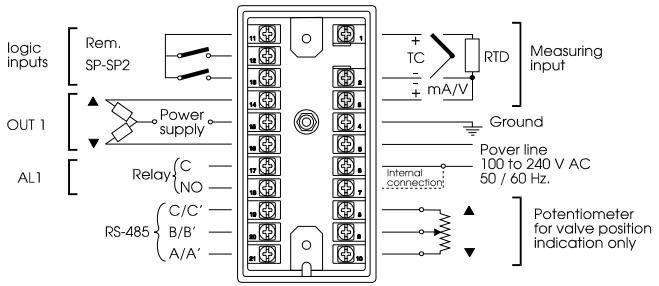


Fig 2.4 REAR TERMINAL BLOCK WITH VALVE MOTOR DRIVE OUTPUT.

A) POWER LINE AND EARTH WIRING

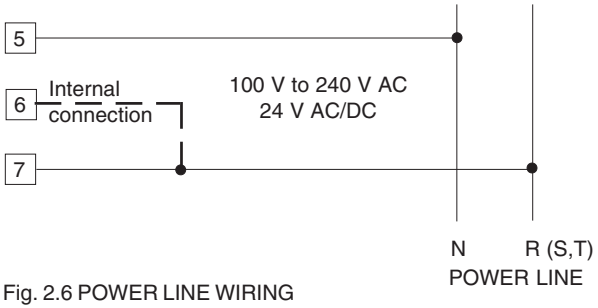
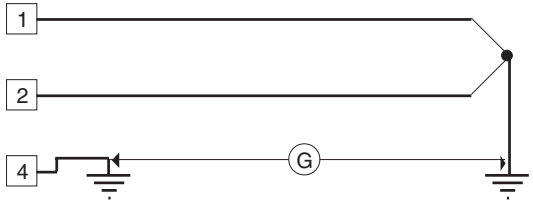


Fig. 2.6 POWER LINE WIRING

NOTE: 1) When line NEUTRAL is present, be sure that it is connected to terminal 5.
2) Before connecting the instrument to the power line, make sure that line voltage corresponds to the description on the identification label (see Paragraph 1.5).
3) Terminal 4 must be connected to earth ground.
4) To avoid electric shock, connect power line at the end of the wiring procedure.

Fig. 2.7 EARTH WIRING

SAFETY NOTE: when one side of the signal wiring is connected to remote earth ground, the maximum common mode voltage (CMV) between the remote earth ground and the earth ground of the control panel cannot exceed 220 Vrms or 630 V DC see figure below.



B) INPUTS

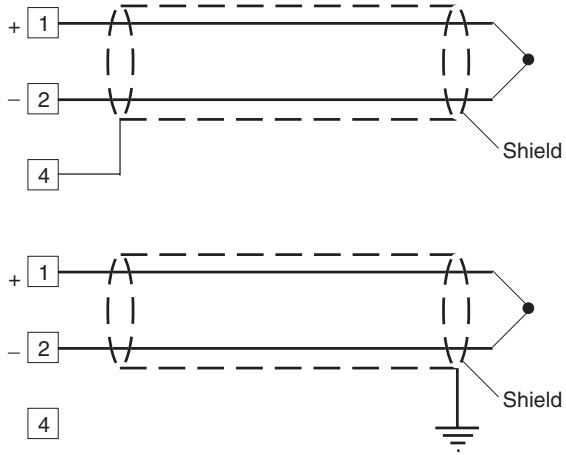


Fig. 2.8 THERMOCOUPLE INPUT WIRING

NOTE: Don't run input wires together with power cables.
For TC wiring use proper compensating cable preferably shielded (see Table 1).
If shielded cable is used, it should be grounded at one point only.

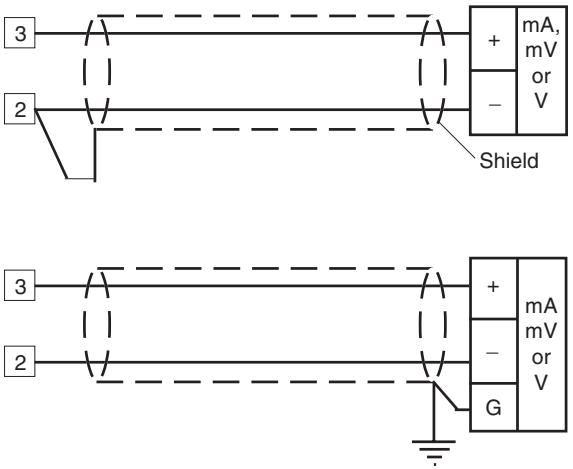


Fig. 2.9 mA, mV AND V INPUTS WIRING

Pay attention to the line resistance; a high line resistance may cause measurement errors (see PRODUCT SPECIFICATIONS).
When shielded cable is used, it should be grounded at one side only to avoid ground loop currents.

TABLE 1: THERMOCOUPLE COMPENSATING CABLE COLOUR CODES.

Thermocouple Material		British BS 1843	American ANSI MC 96.1	German DIN 43710	French NFE 18-001
	Copper	+ White	+ Blue	+ Red	+ Yellow
T	Constantan	- Blue	- Red	- Brown	- Blue
		Blue	Blue	Brown	Blue
	Iron	+ Yellow	+ White	+ Red	+ Yellow
J	Constantan	- Blue	- Red	- Blue	- Black
		Black	Black	Blue	Black
	Nichel Chromium	+ Brown	+ Yellow	+ Red	+ Yellow
K	Nichel Aluminium	- Blue	- red	- Green	- Purple
		Red	Yellow	Green	Yellow
	Platinum/ Platinum	+ Wite	+ Black	+ Red	+ White
R	13% Rhodium	- Blue	- Red	- White	- Green
		Green	Green	White	Green
	Platinum/ Platinum	+ White	+ Black	+ Red	+ White
S	10% Rhodium	- Blue	- red	- White	- Green
		Green	Green	White	Green
	Chromel	+ Brown	+ Violet	-	-
E	Constantan	- blue	- Red	-	-
		Brown	Violet	-	-
	Platinum 30% Rh	-	+ Grey	-	-
B	Platinum 6 % Rh	-	- Red	-	-
			Grey		
N	Nicrosil / Nisil	-	-	-	-

NOTE: Last color of each grup is refered to the overal sheat.

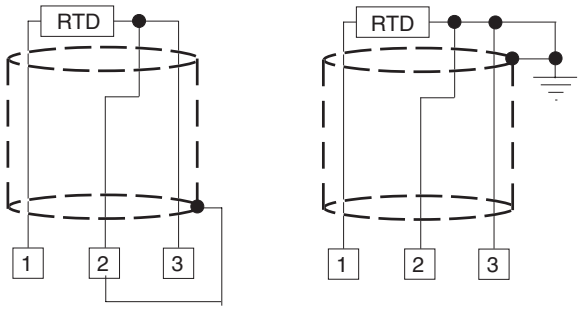


Fig. 2.10 RTD INPUT WIRING

NOTE: Don't run RTD wires together with power cables.
If shielded cable is used, it should be grounded at one point only.
Use copper wires with appropriate size (see "PRODUCT SPECIFICATIONS").
The resistance of the 3 wires must be the same.

Any external components (like zener barriers etc..) connected between sensor and input terminals may cause errors in measurement due to excessive and/or not balanced line resistance or possible leakage currents.

C) LOGIC INPUTS

Safety note:
- Do not run logic inputs wiring together with AC power cables.
- Use an external contact with a contact rating better than 0.5 mA, 5 V DC.
- The instrument needs 100 ms to recognize a contact status variation.

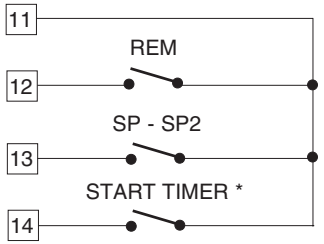


Fig. 2.11 - LOGIC INPUTS WIRING

* Not available with valve motor drive output

Logic input function:

* The REM contact is available to enable the remote control from central unit via serial link when the controller is fitted with RS-485 interface.
* The SP - SP2 contact is available for the three different functions which can be selected in configuration mode:
  a) To enable the transfer from SP to SP2 according to a programmed ramp.
     When the contact is open the operative set point is SP
     When the contact is closed the operative set point is SP2
  b) To select between AUTO and MANUAL mode.
     When the contact is open the instrument is in AUTO mode
     When the contact is closed the instrument is in MANUAL mode
  c) To switch ON and OFF the maximum output limit
     When the contact is open the maximum output limit is disabled.
     When the contact is closed the maximum output limit is enabled.
* The start time contact is available to start the timer function.
  The time count will start when the external contact go from an open to a closed condition.

D) OUTPUTS

D.1 RELAY OUTPUTS

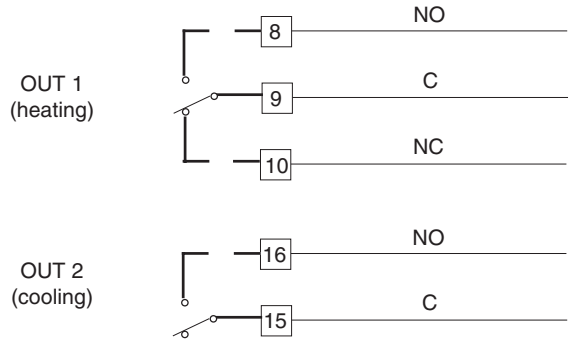


Fig. 2.12 RELAY OUTPUTS WIRING

The relay output is not protected with snubber network.
The contact rating is 4A/250V AC resistive load.
The number of operations is 2×10^5 at specified rating.
The following recommendations avoid serious problems which may occur, when using relay output for driving inductive loads.

D.2 INDUCTIVE LOADS

Switching inductive loads, high voltage transients may occur. Through the internal contact these transients may introduce disturbances which can affect the performance of the instrument.
When an inductive load is switched by instrument contacts an additional external network should be connected across the terminals as near as possible to the terminals (see Fig. 2.13).

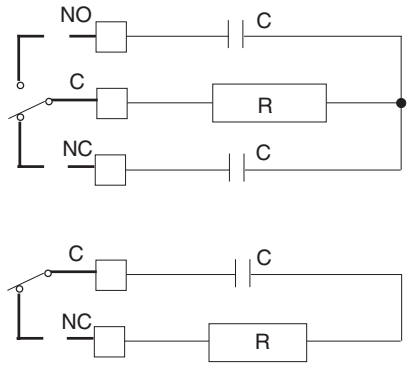


Fig. 2.13 EXTERNAL PROTECTION FOR INDUCTIVE LOAD GREATER THAN 40 mA

The value of capacitor (C) and resistor (R) are shown in the following table.

LOAD CURRENT	C (µF)	R (Ω)	RESISTANCE POWER (W)	RESIST. AND CAPAC. VOLTAGE
< 40 mA	0.047	100	1/2	260
< 150 mA	0.1	22	2	260
< 0.5 A	0.33	47	2	260

The same problem may occur when a switch is used in series with the internal contacts as shown in Fig. 2.14.

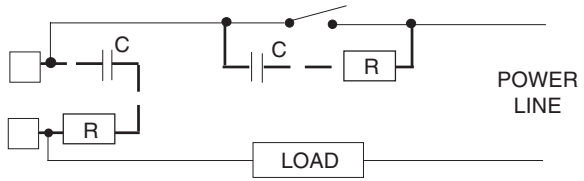


Fig. 2.14 EXTERNAL SWITCH IN SERIES WITH THE INTERNAL CONTACT

In this case it is recommended to install an additional RC network across the external contact as show in Fig. 2.14
Anyway the cable involved in relay output wiring must be as far away as possible from input or communication cables.

D.3 VOLTAGE OUTPUTS FOR SSR DRIVE

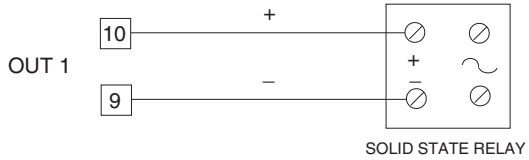


Fig. 2.15 SSR DRIVE OUTPUT WIRING

They are a time proportioning outputs.
The output level (ON condition) is about 20 V DC with load from 0 to 10 mA.
Increasing the load current the output level will decrease.
The maximum possible load is 17 mA. At this current the voltage level is about 17 V DC.
NOTE : These outputs are not isolated.
Isolation between instrument outputs and power supply must be assured by the external solid state relay.

D.4 LINEAR OUTPUTS

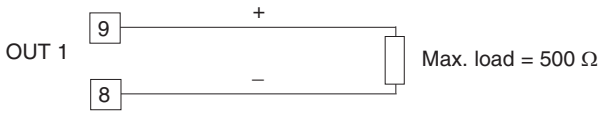


Fig. 2.16 LINEAR OUTPUT WIRING

D.5 VALVE MOTOR DRIVE OUTPUT

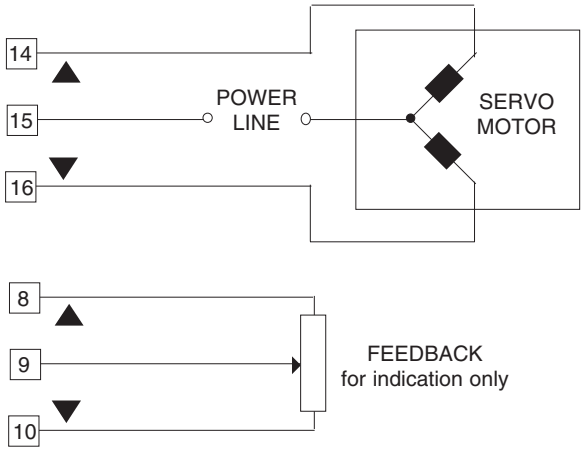


Fig. 2.17 VALVE MOTOR DRIVE OUTPUT WIRING

The output has two relays electrically interlocked and properly filtered with a snubber network. Contact rating is 2A-250V AC resistive load, $2x10^5$ operations. For problems caused by high inductive loads see "RELAY OUTPUT".
The feedback circuit is not isolated and filtered for high frequency noise. Avoid to run feedback wires together with power cables.

D.6 ALARMS OUTPUTS

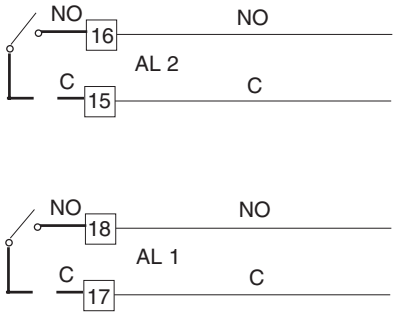


Fig. 2.18 ALARMS WIRING

The alarm output is an SPST relay.
The contact rating is 4A-250V AC resistive load, for 2 x 10^5 operations.
Internal snubber network is provided.
For problems with inductive loads, see "RELAY OUTPUT".

D.7 SERIAL INTERFACE

The RS-485 interface allow up to 31 slave device on a party line to be connected to a master unit.

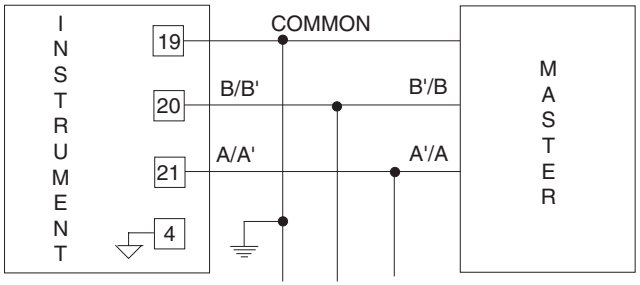


Fig. 2.19 - RS-485 INTERFACE WIRING

NOTE: The following report describes the signal sense of the voltage appearing across the interconnection cable as defined by EIA for RS-485.

a) The " A " terminal of the generator shall be negative with respect to the " B " terminal for a binary 1 (MARK or OFF) state.
b) The " A " terminal of the generator shall be positive with respect to the " B " terminal for a binary 0 (SPACE or ON) state.

NOTES a) The cable length must not exceed 1.5 km at 9600 BAUD.
b) Use a 24 AWG cable (0.205 mm^2) as medium.
c) The maximum resistance of the cable should not exceed 750 Ω.
d) If a shielded cable is used, the shield should be connected to the lead terminal 19 (wire "C"). When using a shield cable the shield shall be connected only to earth ground at one of the two end points depending on the application.
e) The interconnection between master unit and slave units should be done with three wires in accordance to the standard specifications.
If the third wire is not used, the common of the interface circuit must be connected to terminal 19 and the earth ground of the instrument provides that the DC common mode voltage between any I/O of the bus does not exceed the range from -5V to 5 V DC.
f) Don't run interface wires together with power cables or noise sources.

The interface output is optoisolated from the main common.

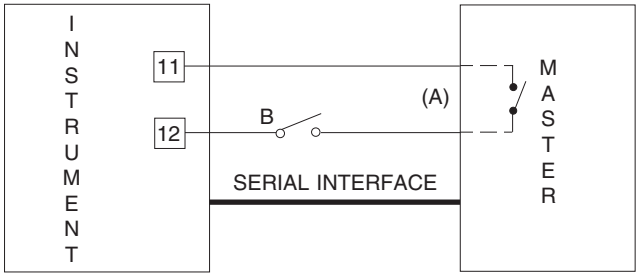


Fig. 2.20 - LOCAL/REMOTE CONTACT WIRING

A contact on the rear terminal block (terminals 11 and 12) is used to switch the instrument control from a master device to local mode or viceversa.
In case of emergency, the operator must regain control on the instrument by a keyswitch (B) connected to (A) signal and positioned near the instrument.
The switch should have a minimum rating of 0.5 mA - 12 V DC.

SECTION 3 INSTRUMENT CONFIGURATION

3.1 FRONT PANEL DESCRIPTION

3.1.1 DESCRIPTION OF THE INDICATORS

OUT 1
Indicator "OFF" = output 1 is "OFF" or it is a mA output.
Indicator lit = output 1 is ”ON” or it's opening the valve.

OUT 2
Indicator "OFF" = output 2 is "OFF".
Indicator lit = output 2 is "ON" or it's closing the valve.

AL1 / AL 2
Indicator ”OFF" = no alarm condition.
Indicator lit = alarm condition.

MAN
Indicator "OFF" = the instrument is in automatic mode.
Indicator lit = the instrument is in manual mode.

°C / °F
Show the engineering unit selected for thermocouple or RTD input.
It is always off for linear inputs.

TUNE
Indicator "OFF" = TUNE and ADAPTIVE are disabled.
Indicator flashing = when TUNE function is working.
Indicator "ON" = when ADAPTIVE function is working.

REM
Indicator "OFF" = keyboard enabled.
Indicator lit = serial communication link enabled.

SP2
Indicator "OFF" = The main set point is operative.
Indicator lit = the second set point is operative.

3.1.2 DISPLAYS DESCRIPTION

UPPER DISPLAY

The upper display shows continuously the process variable in eng. units.
During the programming procedure this display shows the numerical value of the selected parameters or functions.

LOWER DISPLAY

The lower display shows continuously the up-to-date set point value, when the instrument is in AUTO mode.
Pushing ▲ pushbutton it shows the value in percent of the output level (0-100 %).
When the instrument operates with two control outputs, the value will be from -100 % to +100 %.
If the instrument is equipped with valve motor drive output, the lower display shows the valve position in percent of potentiometer span (0-100 %).
Pushing ▲ pushbutton another time, the set point value will be shown again.
When the instrument is in manual mode, the lower display shows the output level in percent or the valve position.
During configuration, calibration and parameters set up, the lower display will show the code of the selected parameter.

3.1.3 KEYBOARD DESCRIPTION

To select all the parameters .
Pushing the FUNC pushbutton the parameters will be shown sequentially on the upper and lower displays and at the same time the value of the previous parameter will be stored.

In control mode, it selects the operative mode from automatic to manual or viceversa.
In configuration and calibration mode it is used to scroll backward the configuration and calibration parameters without storing the modified parameters

To decrease the parameter value.
When the instrument is in manual mode, it decreases the output level or the valve position.

To increase the parameter value.
When the instrument is in manual mode, it increases the output level or the valve position.

3.2 INSTRUMENT CONFIGURATION

3.2.1 PRELIMINARY

Before configuration, proceed as follows:

1) Select between RTD input or linear/TC input.
   NOTE : the instrument is shipped (▭ standard) with the linear/ TC input selection.
   1) If the RTD input is desired, it is sufficient to set J6 dip switch as show below without to modify cut and short setting or to redo calibration.
   2) If a linear input different from mA is required, it is necessary to set J6, to modify CH2, CH3, SH3, SH4 setting and to re-do the linear input calibration.

	mA/TC	RTD	60 mV	5 V	10 V
J6 - SW1	OFF	ON	OFF	OFF	OFF
J6 - SW2	OFF	ON	OFF	OFF	OFF
J6 - SW3	ON	OFF	ON	ON	ON
J6 - SW4	OFF	ON	OFF	OFF	OFF
CH2	CLOSE	CLOSE	OPEN	OPEN	OPEN
CH3	CLOSE	CLOSE	CLOSE	OPEN	OPEN
SH3	OPEN	OPEN	OPEN	CLOSE	CLOSE
SH4	OPEN	OPEN	OPEN	CLOSE	OPEN

2) The RTD burn-out protection sets the instrument to full scale.
3) The standard TC burn-out protection sets the instrument to full scale (▭ standard). If you desire the down scale protection, close SH 1 locate on the component side and open CH1 located on the soldering side of the input card as shown in Fig. 3.1.

TC burn out	SH1	CH1
Overrange	OPEN	CLOSE
Underrange	CLOSE	OPEN

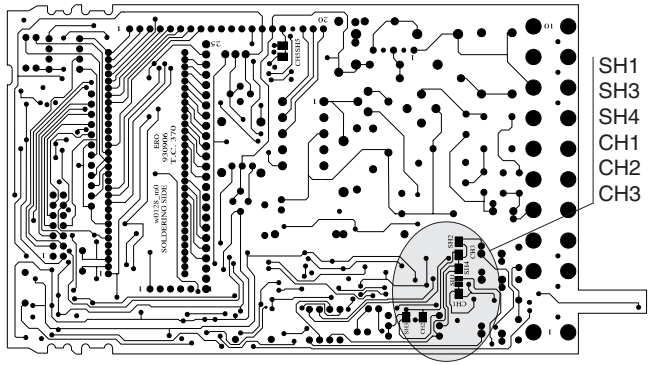


Fig. 3.1 CPU CARD (SOLDERING SIDE)

3) For configuration procedure, the internal DIP SWITCHES, mounted on CPU card, must be positioned as follows:

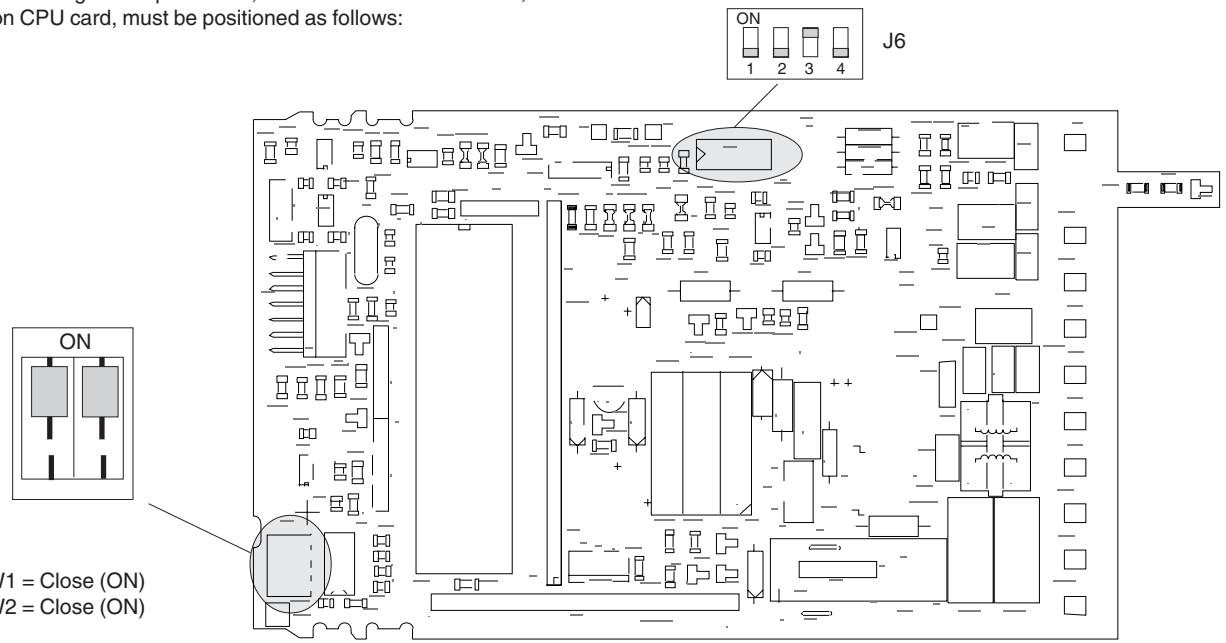
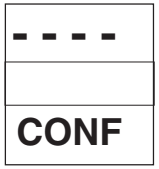


Fig. 3.2

3.2.2 CONFIGURATION PROCEDURE

Once the internal dip switches have been positioned as described in Fig. 3.2 proceed as follows:

1. Switch the instrument on. The display will show:



2. Push FUNC pushbutton to start the configuration procedure.
3. The lower display will show the parameters code (P 1 - P 2 etc.) and the upper display will show the value previously stored.
4. To modify this value, push ▲ or ▼ to obtain the desired setting.
5. When the upper display shows the new desired setting, push FUNC pushbutton to store the value and go to the next parameter. (The storage is done only when the FUNC pushbutton is depressed).
   The MAN pushbutton can be used to scroll backward the configuration parameters without memorization of the previously modified value.

When the lower display shows "CONF" pushing ▲ pushbutton the display will show, for about 2 seconds, the program code and the revision number.

3.2.3 PARAMETERS LIST

The following is a complete list of configuration parameters. Some of these parameters may be skipped according to the previous setting.

P 1 - INPUT TYPE
This parameter is present only when the input card is configured (hardware setting) for linear/TC input.

0 = Thermocouple
1 = Linear input (mA or V in accordance to the hardware setting)

NOTE: It is possible to change the linear input type (from mA to mV or V) by a hardware setting (see par 3.2.1) but input calibration must be re-made.

P 2 - °C/°F SELECTION
This parameter is present if the thermocouple or RTD input has been chosen only

0 = °C
1 = °F

P 3 - INPUT LINEARIZATION
This parameter is present if linear input has not been chosen only.

P3 value	SENSOR TYPE	°C	°F
0	J TC	- 200 / + 1000	- 328 / + 1832
1	K TC	0 / + 1370	+ 32 / + 2498
2	T TC	- 200 / + 400	- 328 / + 752
3	R TC	0 / + 1760	+ 32 / + 3200
4	S TC	0 / + 1760	+ 32 / + 3200
5	N TC	0 / + 1400	+ 32 / + 2552
6	B TC	0 / + 1800	+ 32 / + 3272
7 (*)	J TC	0 / + 500	+ 32 / + 932
8 (*)	L TC	0 / + 500	+ 32 / + 932
9	Pt 100 Ω RTD	- 200 / + 850	- 328 / + 1562
10	Pt 100 Ω RTD	-99.9 / +400.0	---
11 (*)	Pt 100 Ω RTD	-50.0 / +200.0	---
12 (*)	Pt 100 Ω RTD	-50.0 / +100.0	---

(*) Available from 00 AB status.

P4 - 20 % SUPPRESSION ON LINEAR INPUT
This parameter is present if the linear input has been configured only.

0 = Input 0 - 100 % (0 - 20 mA, 0 - 60 mV, 0 - 5 V, 0 - 10 V)
1 = Input 20 - 100 % (4 - 20 mA, 12 - 60 mV, 1 - 5 V, 2 - 10 V)

P 5 - DECIMAL POINT POSITION FOR LINEAR INPUT
This parameter is present if the linear input has been configured only.

0 = not provided
1 = 1 decimal figure
2 = 2 decimal figures
3 = 3 decimal figures

P 6 - INITIAL READ-OUT VALUE FOR LINEAR INPUT
This parameter is present only when the linear input has been configured.

Lowest read-out value for min. range value: - 1999
Highest read-out value for min. range value: + 3900 (P7 - 100)

P 7 - FINAL READ-OUT VALUE FOR LINEAR INPUT
This parameter is present only when the linear input has been configured.

Lowest read-out value for max. range value: - 1899 (P6 - 100)
Highest read-out value for max. range value: + 4000

Note: The min span limit in eng. units between P 6 and P 7 is 100 units.

P8 - MAIN OUTPUT (HEATING) SELECTION

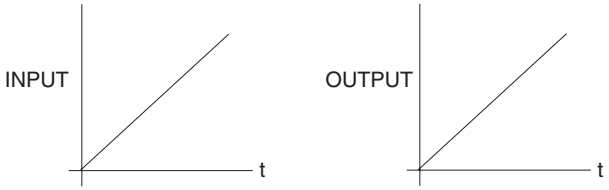
0 = Relay or SSR output
1 = Open loop valve motor drive
2 = 0 - 20 mA current output
3 = 4 - 20 mA current output

P9 - MAIN OUTPUT ACTION

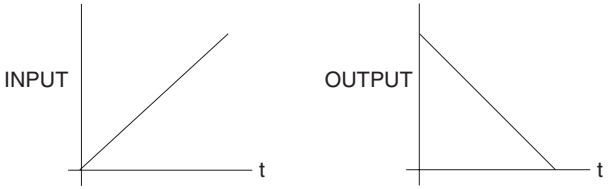
0 = REVERSE action
1 = DIRECT action

Reverse action means that the control output decreases while the process variable increases.

DIRECT ACTION



REVERSE ACTION



NOTE: The indicator OUT 1 light to show that the relay is energized independently from direct or reverse output action.

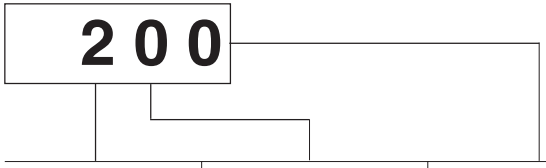
P10 - CONTROL OUTPUT 2 (COOLING) SELECTION
This parameter is present if P8 is different from 1 only.
0 = output 2 not provided
1 = Relay

P11 - CONTROL OUTPUT 2 (COOLING) ACTION
This parameter is present if P10 is different from 0 only.
0 = DIRECT action
1 = REVERSE action

Reverse action means that the cooling output decreases while the process variable increases.

P 12 - ALARM 1 OR TIMER CONFIGURATION
Three digits of the upper display are used for this configuration.

- If all of them are 0, the alarm or timer is not provided
- If they are different from 0, see the following table:



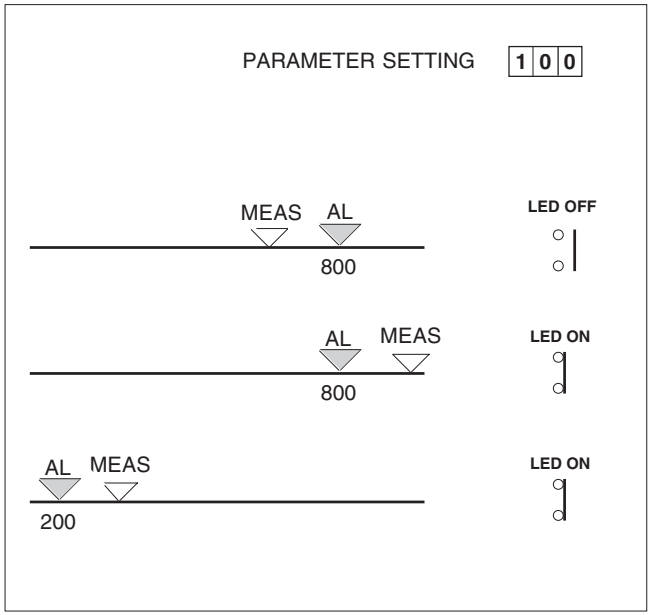
FIRST DIGIT FUNCTION	SECOND DIGIT OPERATIVE MODE	THIRD DIGIT RELAY ACTION
0 = Not provided	0	0
1= Process alarm	0 = max. 1= min.	0 = direct 1 = reverse
2= Band alarm	0 = out 1 = in	0 = direct 1 = reverse
3= Deviation alarm	0 = max. 1 = min.	0 = direct 1 = reverse
4= Timer "on delay"*	0 = direct 1 = reverse	0 = direct 1 = reverse
5= Timed event *	0 = direct 1 = reverse	0 = direct 1 = reverse

* Available only when P8 is different from 1.

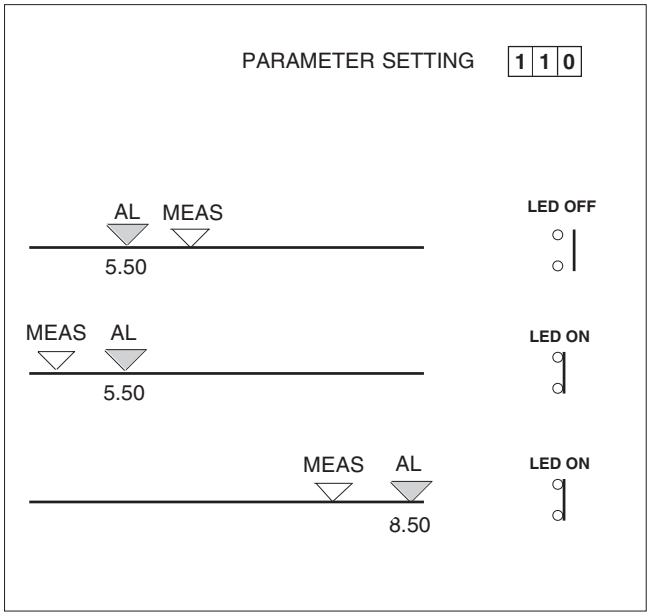
NOTE : THE THIRD DIGIT ALLOWS TO SET THE RELAY ACTION.
This setting will not influence either the relative alarm annunciator or the alarm device status.

DIRECT ACTION : Indicator ON - relay energized
Indicator OFF - relay de-energized
REVERSE ACTION : Indicator ON - relay de-energized
Indicator OFF - relay energized

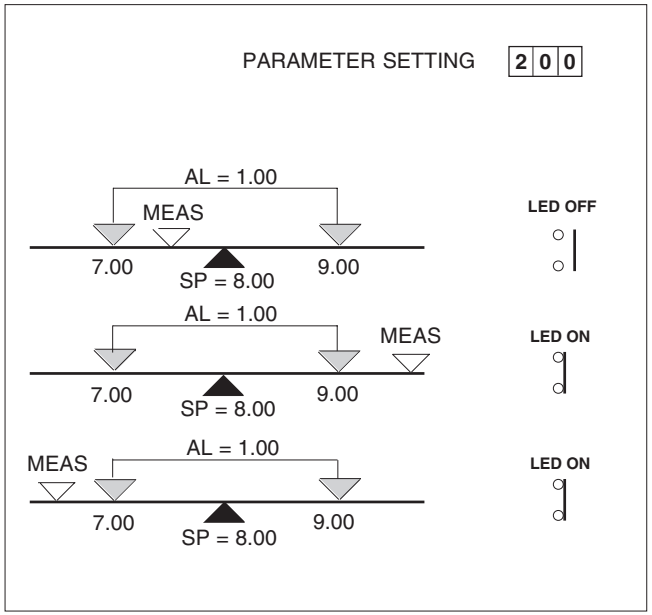
HIGH ALARM ON THE VARIABLE.
DIRECT ACTION



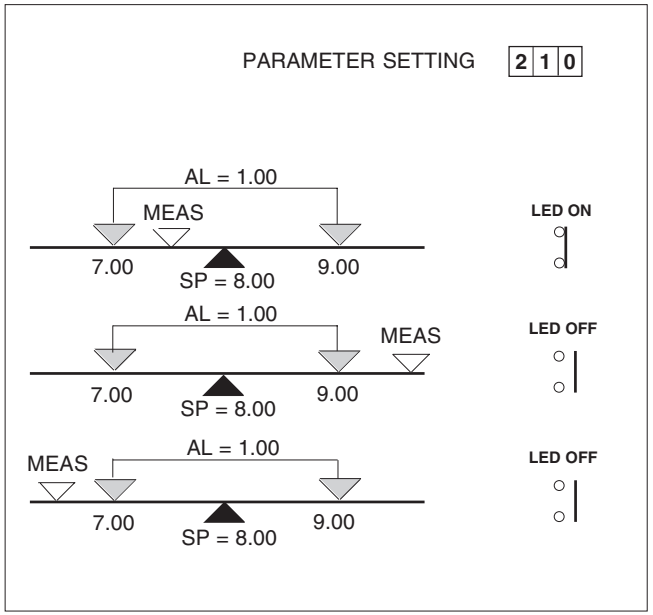
LOW ALARM ON THE VARIABLE.
DIRECT ACTION



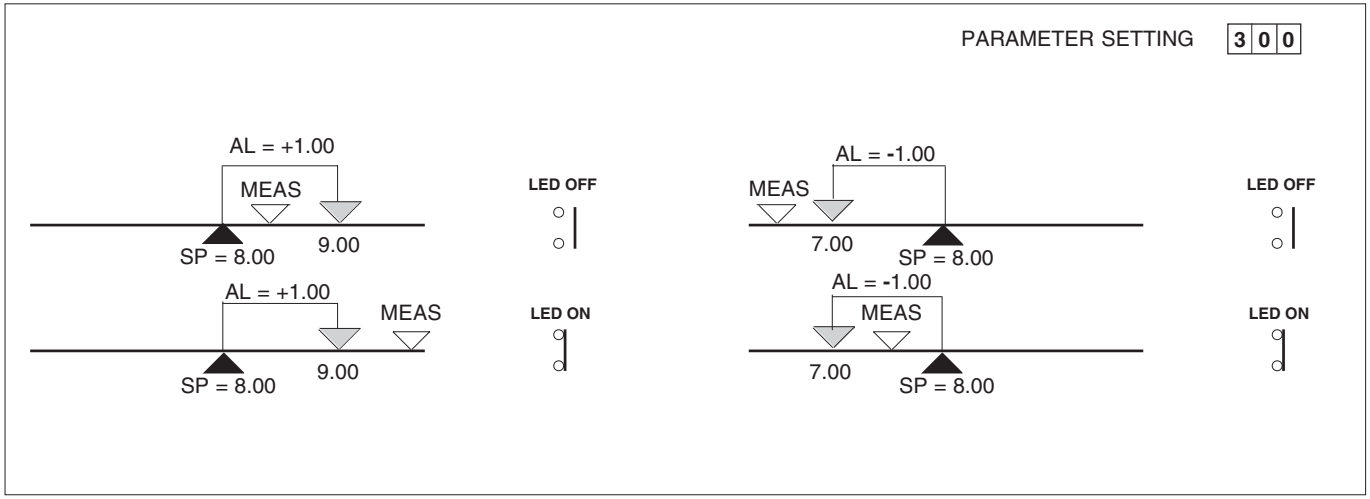
BAND ALARM WITH NEUTRAL ZONE OFF WITH RESPECT TO THE SET POINT. DIRECT ACTION.
THRESHOLD IS EXPRESSED AS DEVIATION.
(MEASURE - SET POINT = DEVIATION)



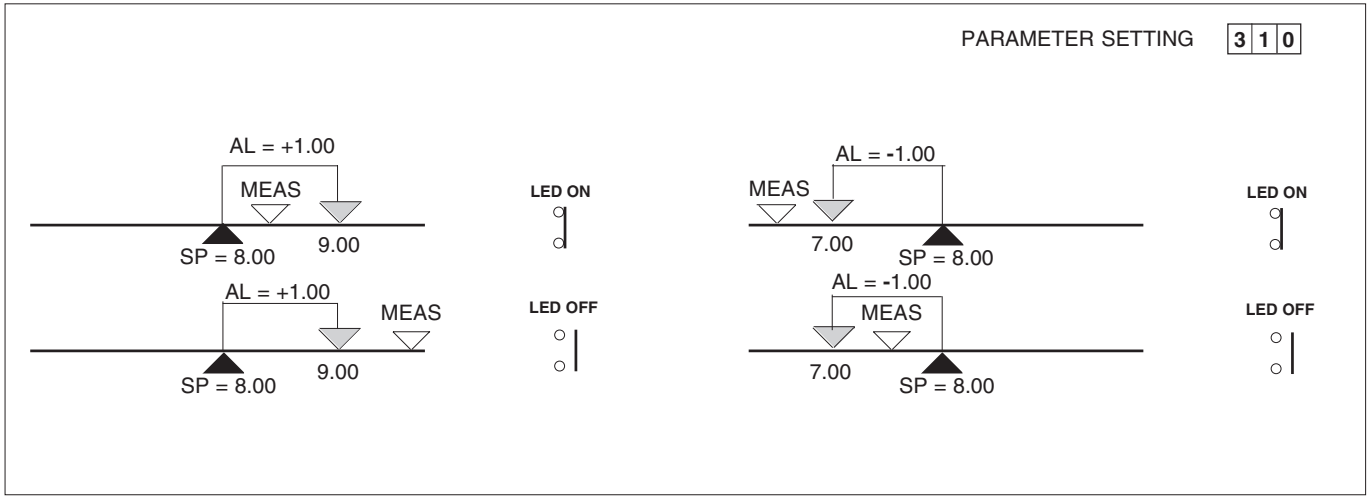
BAND ALARM WITH NEUTRAL ZONE ON WITH RESPECT TO THE SET POINT. DIRECT ACTION.
THRESHOLD IS EXPRESSED AS DEVIATION.
(MEASURE - SET POINT = DEVIATION)



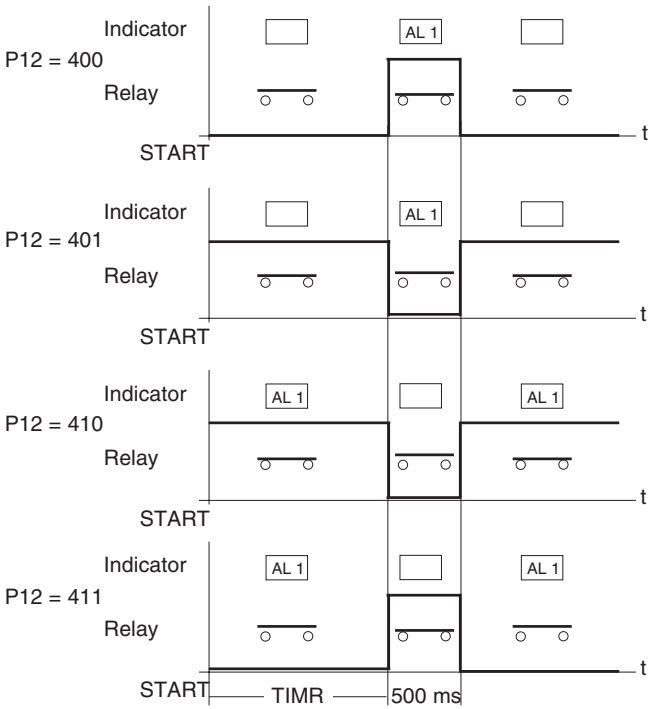
HIGH DEVIATION ALARM. DIRECT ACTION.
THRESHOLD IS EXPRESSED AS DEVIATION.
(MEASURE - SET POINT = DEVIATION)



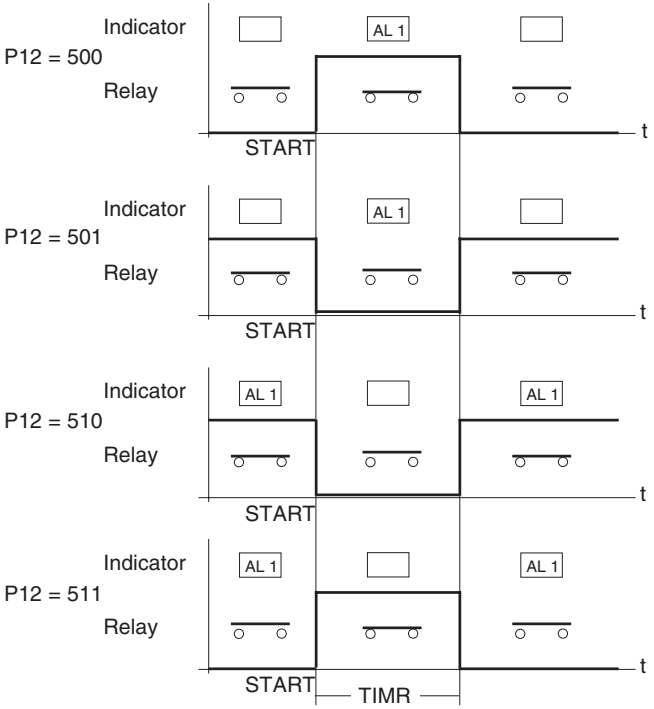
LOW DEVIATION ALARM. DIRECT ACTION
THRESHOLD IS EXPRESSED AS DEVIATION.
(MEASURE - SET POINT = DEVIATION)



TIMER "ON DELAY" DIAGRAMS

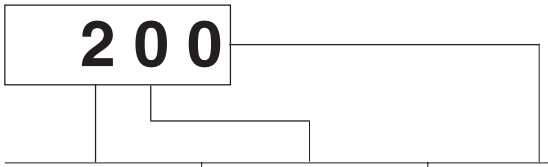


TIMED EVENT DIAGRAMS



P 13 - TIMER TIME CONFIGURATION
This parameter is present only when P12 = 4xx or 5xx.
0 = Hours and minutes
1 = Minutes and seconds
2 = Seconds and 1/100 of seconds

P 14 - ALARM 2 CONFIGURATION
This parameter is present only if P8 is different from 1 and P10 is equal to 0.
Three digits of the upper display are used for this configuration.
- If all of them are 0, the alarm is not provided
- If they are different from 0, see the following table:



FIRST DIGIT FUNCTION	SECOND DIGIT OPERATIVE MODE	THIRD DIGIT RELAY ACTION
0 = Not provided	0	0
1 = Process alarm	0 = max. 1= min.	0 = direct 1 = reverse
2 = Band alarm	0 = out 1 = in	0 = direct 1 = reverse
3 = Deviation alarm	0 = max. 1 = min.	0 = direct 1 = reverse

NOTE : For alarm details see P12 parameter.

P 15 - SP / SP2 TRANSFER CONFIGURATION
This parameter is used to configure the transfer modes from main set point (SP) to auxiliary set point (second set point SP2) and viceversa or the manual transfer between two different values of the main set point.
0 = Not required
1 = Transfer from SP to SP2 and viceversa by programmable soak times and with programmable ramp.
2 = Manual transfer between two different value of the main set point with programmable ramp.
3 = Transfer from SP to SP2 and viceversa by means of an external contact and with programmable ramp.

P 16 - AUTO/MAN START UP AND CHOICE OF TRANSFER ALGORITHM
0 = Start in auto mode
Auto/man transfer with "Bumpless balance" algorithm
1 = Start in manual mode
Auto/man transfer with "Bumpless balance" algorithm
NOTE: the instrument start with a power output equal to PMN parameter.
2 = Start in auto mode
Auto/man transfer with "Bumpless balanceless" algorithm
3 = Start in manual mode
Auto/man transfer with "Bumpless balanceless" algorithm
NOTE: the instrument start with a power output equal to PMN parameter.
4 = Manual function disabled

BUMPLESS BALANCE transfer: switching from manual to auto mode, the controlled variable will reach the set point by using the integral action.

BUMPLESS BALANCELESS transfer: switching from manual to auto mode the set point follows istantaneously the controlled variable.

P 17 - LOGIC INPUT 2 CONFIGURATION

This parameter is available only when P15 is different from 3.

0 = To select auto or manual mode
1 = To switch ON and OFF the max. output limit.
2 = Not required.

P 18 - ADDRESS FOR SERIAL INTERFACE COMMUNICATION

0 = no serial link
1 - 31 = serial communication address

NOTE: Two or more instruments with the same address can't coexist on the same serial line.

P 19 - COMMUNICATION BAUD RATE

This parameter is present only when P18 is different from 0.

0 = 150 BAUD
1 = 300 BAUD
2 = 600 BAUD
3 = 1200 BAUD
4 = 2400 BAUD
5 = 4800 BAUD
6 = 9600 BAUD
7 = 19200 BAUD

P 20 - WORD LENGTH

This parameter is present only when P18 is different from 0.
The choice of communication mode depends on the master unit.

0 = 7 bit
1 = 8 bit

P 21 - PARITY ENABLING / DISABLING

This parameter is present only when P18 is different from 0 and P20 is equal to 1.
When P20 is equal to 0 the parity is enabled and P21 is skipped.

0 = parity disabled
1 = parity enabled

P22 - TYPE OF PARITY
It is present if P18 is different from 0 and P21 is equal to 1 only.
0 = even
1 = odd

P 23 - POWER LINE FREQUENCY
0 = 50 Hz
1 = 60 Hz
NOTE: When a DC supply is used, it is suggest to set a P23 value equal to the local line frequency.

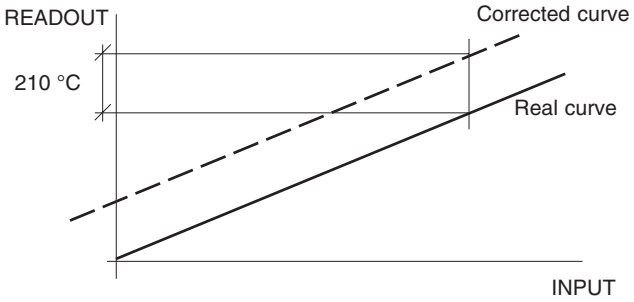
P 24 - OFFSET TYPE AND APPLICATION POINT

0 =	The OFFSET will be constant on the whole range.
- 1999 to 4000 =	It is the point (in counts) where the offset value (P25) will be applied. The offset will be proportional along the scale and it will be equal to zero in correspondence with the zero in unit of the real curve.

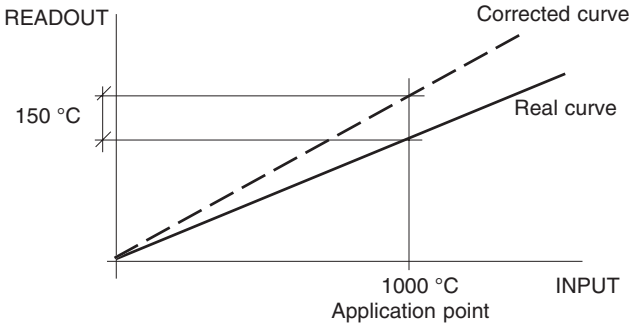
P 25 - OFFSET VALUE
This parameter shows, in engineering unitsthe offset applied to the measured value.
When P25 = 0 the offset will be disabled
When P24 is equal to 0, P25 is the constant offset applied allover the range.
When P24 is different from 0, P25 is the offset applied to the P24 point.
P25 range: -20 to +20 % of the input span.

EXAMPLES:

P 24 = 0 **Span = 1400 °C** **P 25 = 210 °C**



P 24 = 1000 **P 25 = 150 °C**



P 26 - INPUT THRESHOLD FOR ACTIVATION/DEACTIVATION OF THE TIMED OUTPUT LEVEL LIMITER

This parameter is present only if P8 and P17 are different from 1.
This parameter is in percent of the input span and allows to define a input threshold to be set below the set point value and it is calculated with the following procedure:

$$\text{Treshold} = SP - \left(\frac{\text{span} \times P26}{100} \right)$$

At instrument switching on, if the measured value is lower than the threshold value, the timed maximum output level limiter will be enabled otherwise it will be disabled.

0 = Timed output level limiters ever active (when present)
0.1 to 100.0 = Percent of the input span for the timed maximum output level limiter enabling

P27 - ANTI-RESET WIND UP

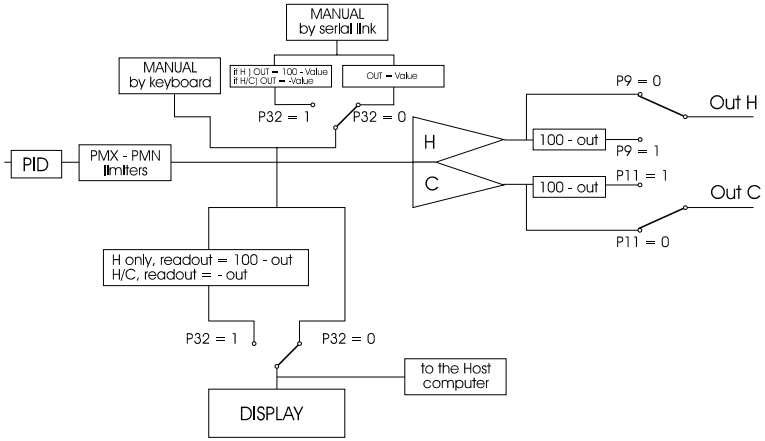
Programmable from 1 % to 100 % of the proportional band.
NOTE : When an integral pre-load different from 50 is programmed, the proportional band will be shifted with respect to the set point but also the action area of the ARW will be shifted with the same ratio.

P28 - CONTROL ACTION TYPE

0 = PID control action
1 = PI control action

P 32 - DIRECT OR REVERSE OUTPUT LEVEL INDICATION

This parameter allows to show the output level with or without a reverse scaling.
0 = DIRECT
1 = REVERSE



P35 = Conditions for output safety value
This parameter is available from 00 AB status only
P35 is skipped when the instrument is programmed with open loop valve motor drive output.
0 = No safety value ("Standard" effect)
1 = Safety value applied when overrange or underrange condition is detected.
2 = Safety value applied when overrange condition is detected.
3 = Safety value applied when underrange condition is detected.

P36 = Output safety value
This parameter is available from 00 AB status only
This parameter is skipped when P35 ie equal to 0
This value can be set
- from 0 to 100 % when P10 is equal to 0
- from -100 % to 100 % when P10 is equal to 1.

P37 = Enable/disable the TUNE and ADAPTIVE functions
This parameter is available from 00 AB status only
0 = it is not possible to enable the TUNE and ADAPTIVE functions.
1 = It is not possible to enable the ADAPTIVE function
2 = It is not possible to enable the TUNE function
3 = It is EVER possible to enable TUNE and ADAPTIVE functions

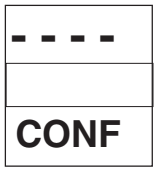
P38 = Enable/disable of the relative cooling gain calculation by ADAPTIVE function.
This parameter is available from 00 AB status only
0 = the ADAPTIVE function does NOT modify the RCG parameter.
1= the ADAPTIVE function calculates and modifies the RCG parameter.

3.3 DEFAULT CONFIGURATION PARAMETERS

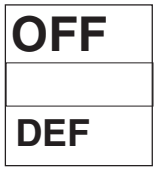
The configuration parameters can be loaded with predetermined default values. These data are the typical values loaded in the instrument prior to shipment from factory. To load the default values proceed as follows:

a) The internal dip switches, located on the input card should be :
   SW1 - 1 = ON.
   SW1 - 2 = don't care condition

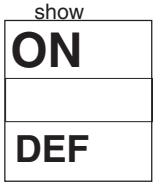
b) the display will show:



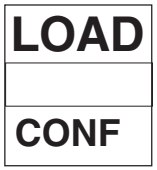
f) Press ▲ and ▼ pushbutton; the display will show:



g) Within 10 seconds, press ▲ or ▼ pushbutton; the display will show



h) Press FUNC pushbutton; the display will show:



This means that the loading procedure has been initiated. After about 3 seconds the loading procedure is terminated and the instrument reverts to visualization as in point b).

The following is a list of the default parameters loaded during the above procedure:

PARAMETER	VALUE	DEFAULT VALUE
P1	0	Thermocouple input
P2	0	°C
P3	0	J type thermocouple or
	9	Pt 100 RTD (-200 to +850)
P4	1	Linear input with 20% soppression
P5	0	No decimal figure
P6	0	Minimum scale value of the linear input
P7	1000	maximum scale value of the linear input
P8	0	Relay output
P9	0	Reverse action
P10	0	No cooling output
P11	0	Direct action
P12	000	No alarm 1 or timer
P13	2	Timer time in seconds and centiseconds
P14	000	No alarm 2
P15	0	No second set point
P16	0	Start in auto mode
P17	2	Logic input 2 not configured
P18	1	Serial link interface
P19	7	Baud rate : 19200 baud
P20	0	Word length = 7 bit
P21	1	Parity enabled
P22	0	Even parity
P23	0	Line frequency 50 Hz
P24	0	No offset
P25	0	Offset value = 0
P26	0	Threshold value = 0
P27	100	Antireset wind-up
P28	0	PID control action
P32	0	Direct
P35 (*)	0	Standard condition
P36 (*)	100	Output safety value
P37 (*)	3	TUNE and ADAPTIVE functions are enabled
P38 (*)	1	The ADAPTIVE function calculates and modifies the RCG parameter.

(*) These parameters are available from 00 AB status only

SECTION 4 - OPERATING INSTRUCTIONS

4.1 PRELIMINARY

To make the instrument operative as controller the internal dip switch SW 1-1 located on the input card (see Fig. 3.3) should be set OFF.
It is assumed at this point that the instrument has been correctly configured as detailed in Section 3. In most applications as controller the instrument will be operated in the NORMAL DISPLAY mode, where the upper display shows the measured variable while the lower display shows the set point or the output signal, if selected by the ▲ pushbutton.

Pressing the FUNC pushbutton makes the parameters to scroll and their abbreviated names will be shown on the lower display while their value is shown on the upper display. To modify a parameter, first select the desired parameter by the FUNC pushbutton, then set the new value by ▲ or ▼ pushbuttons. Press FUNC pushbutton to memorize the new value and step to the next parameter. The access time to parameter scrolling is limited to 10 seconds; therefore if no pushbutton is pressed within this time, the instrument will automatically revert to the NORMAL DISPLAY mode.
In the controller mode SW1-1 is OFF while the SW1-2 is used to disable (OFF) or enable (ON) the control parameter modification with exception of the set point.
All function are ever selectable.

NOTE: 1) If, during parameter modification, no pushbutton is pressed for more than 10 seconds, the instrument reverts automatically to the “normal display mode” and the new setting of the last parameter will be lost.
2) The instrument doesn't displays all the parameters. It select the parameters in accordance with the instrument configuration.

4.2 CONTROL PARAMETERS

4.2.1 CONTROL PARAMETERS

The following is a list of all the available control parameters. Note that some parameters may be not visualized according to the specific instrument configuration.

SET POINT
Lower display: SP
Upper display: set point value.
Range: from RLO parameter value to RHI parameter value.

TUNE
Lower display: TUNE
Upper display: ON or OFF according to the actual status of the TUNE function.
This parameter enables or disables the TUNE function.

When the tuning procedure has been completed the controller returns automatically to the normal operation or it enables the adaptive function if this function has been previously inserted.

ADAPTIVE
Lower display: ADPT
Upper display: ON or OFF according to the actual status of the ADAPTIVE function.
This parameter enables or disables the ADAPTIVE function.
During the adaptive operation, the Pb, Ti, Td and RCG parameters are continuously calculated in order to obtain the best process control.
When the ADAPTIVE function is enabled, the Pb, Ti, Td and RCG parameters cannot be manually modified.

SECOND SET POINT
This parameter is present only when P15 parameter (see chapter 3.4) is equal to 1 or 3.
Lower display: SP2
Upper display: value of the second set point
This set point is selectable and becomes operative by an external contact or by an internal timer.
Range: From RLO to RHI.

ALARM THRESHOLD (AL1, AL2)
These parameters are present if the relative alarm is configured only.
Lower display: ALM1, ALM2
Upper display: alarm threshold value
Process alarm range: from minimum range value to maximum range value of the input span.
Band alarm range: from 0 to 200 units.
Deviation alarm range: from - 200 to 200 units.

ALARMS HYSTERESIS (HYS1, HYS2)
Lower display: HYS1, HYS2.
Upper display: value of alarm 1 and alarm 2 hysteresis.
Range : from 0.1 % to 10.0 % of the input span.

PROPORTIONAL BAND
Lower display: PB
Upper display: value of proportional band.
Range: from 0.2 % to 500.0 % of the input span.
When PB parameter is set to 0, the control action becomes ON-OFF and TI, TD and IP parameters are skipped.

INTEGRAL TIME
This parameter is present only if PB parameter is different from 0.
Lower display: TI
Upper display: integral time defined in minutes and seconds.
Range: from 1 s to 99 min. 59 s; above the upper value the display blanks out and the integral action is excluded.

DERIVATIVE TIME
This parameter is present if PB parameter is different from 0 and P28 is equal to 0 only.
Lower display: TD
Upper display: derivative time defined in minutes and seconds.
Range: from 1 s to 99 min. 59 s; if 0 is set, the derivative action is excluded.

HYSTERESIS (for NO-OFF control)
This parameter is present if the Proportional Band is equal to 0.
Lower display: HYST
Upper display: hysteresis for ON-OFF control action.
Range: from 0.1% to 10.0% of input span.

OUTPUT 1 (HEATING) CYCLE TIME
This parameter is present with relay contact or SSR drive voltage output only .
Lower display: CY
Upper display: cycle time value for output 1.
Range: from 1 to 99 seconds.

SET POINT LOW LIMIT
Lower display: RLO
Upper display: value of set point low limit.
Range: from the minimum range value to RHI value.

SET POINT HIGH LIMIT
Lower display: RHI
Upper display: value of set point high limit.
Range: from RLO value to the maximum range value.

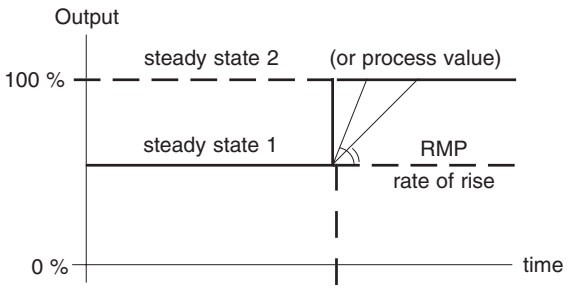
INTEGRAL PRE-LOAD
This parameter is skipped if PB=0
Lower display: IP
Upper display: the control value which is algebraically added to the output value as calculated by the PID algorithm. The control action will be improved if this parameter is set close to the average control output required by the process.
Range: from 0 % (-100 % for instruments with two control output) to 100 %.

CONTROL OUTPUT LOW LIMITER
This parameter is skipped when output 1 is a valve motor drive output.
Lower display: PMN
Upper display: value of control output minimum limit.
Range: from 0 % (-100 % for instruments with two control output) to PMX value.

CONTROL OUTPUT HIGH LIMITER
This parameter is skipped when output 1 is a valve motor drive output.
Lower display: PMX
Upper display: value of control output maximum limit.
Range: from PMN value to 100 %.

TIME FOR THE OUTPUT LEVEL LIMITER
The PMXT is a programmable time where the output level is limited to PMX value.
The count of this time starts at instrument switching on if the measured variable is less than the threshold value calculated as shown at section 3 (P26 parameter).
This parameter is skipped when :
1) the instrument is equipped with valve motor drive output
2) PMX parameter is equal to 100 %
3) the PMX is controlled by an external contact (P17 = 1).
Lower display: PMXT
Upper display: value of control output limiter time duration.
Range: from 1 minute to 99 hours and 59 minutes. Above this limit, the upper display blanks out and the limiter will be ever operative.

CONTROL OUTPUT MAX RATE OF CHANGE
This parameter allows to choose the maximum desired rate of change applied to the process when a change of control output is required.
This parameter is present when at least one linear output is present.
NOTE: from 00 AB status, this parameter is available for all output types.
Lower display: RMP
Upper display: value of control output max rate of change.
Range: from 1% to 10% of control output per second. If set above 10% the upper display blanks out and no limit is imposed to control output rate of change.



RATE OF CHANGE FOR SET POINT VARIATIONS

Lower display: GRAD (skipped if P15 = 0)

Upper display: value of the rate of change imposed to set point transfer from SP to SP2 and vice versa. If SP2 is not selected, the GRAD value will be applied to the main set point variations.

Range: from 1 to 100 units per minutes. Above the max. value the display blanks so that the transfer is a step transfer.

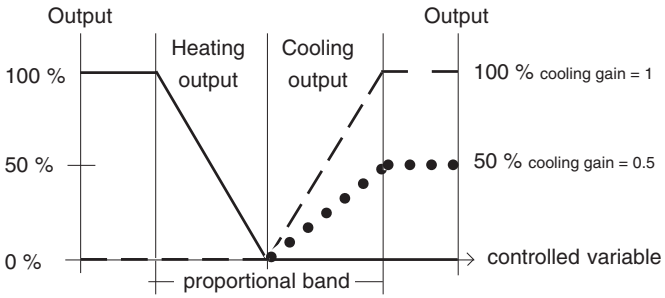
RELATIVE OUTPUT 2 (COOLING) GAIN

This parameter is present only when the output 2 (cooling) is configured (P10 parameter set to 1,2 or 3).

Lower display: RCG

Upper display: gain of cooling proportional band.

Range: from 0.02 to 1.00 of heating proportional band.



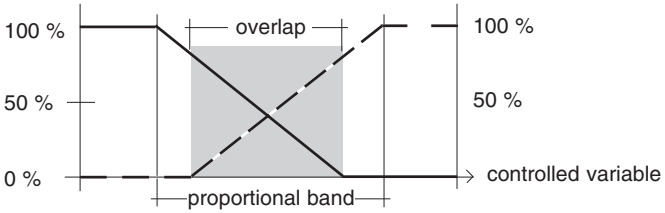
OVERLAP/DEAD BAND BETWEEN HEATING AND COOLING OUTPUTS

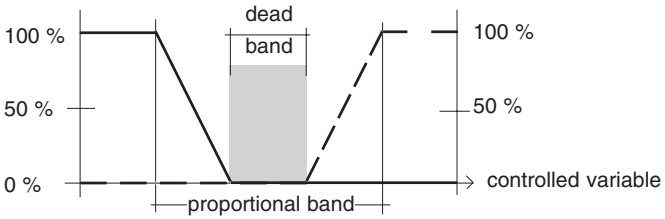
This parameter is only present with output 2 (cooling) (P10 parameter set to 1,2 or 3).

Lower display: OLAP

Upper display: a positive value means overlap between heating and cooling outputs; a negative value means dead band between the two outputs.

Range: from -20% to 20% of the proportional band.





OUTPUT 2 (COOLING) CYCLE TIME
This parameter is present only when the instrument is configured for two control outputs.
Lower display: CY2
Upper display: cycle time value for output 2.
Range: from 1 to 99 seconds.

VALVE MOTOR STROKE TIME
This parameter is present only with the open loop valve motor drive output type.
Lower display: TSVM
Upper display: it is the travel time that the servomotor needs to move from closed valve position to open valve position.
Range: from 6 seconds to 3 minutes.

VALVE MOTOR DRIVE DEAD BAND
This parameter is present only with a valve motor drive output type.
Lower display: DBSM
Upper display: servomotor dead band, defined as a percent of servomotor stroke time.
Range: from 1% to 50%.

MAIN SET POINT SOAK TIME
This parameter is present if P15 is equal to 1 only.
Lower display: TSP
Upper display: set point insertion time
Range: from 1 minute to 99 hours and 59 minutes.
At the end of the programmed time the instrument will switch from SP to SP2 according to a programmed ramp set with GRAD parameter.

NOTE: If this parameter is modified during TSP count, the new value will be immediately stored and the time count will be restarted.

SECOND SET POINT SOAK TIME
This parameter is present if P15 is equal to 1 only.
Lower display: TSP2
Upper display: second set point insertion time
Range: from 1 minute to 99 hours and 59 minutes.
Above the maximum value the display blanks and the time will be infinity.
At the end of the programmed time the instrument transfer from SP2 to SP according to a programmed ramp set with GRAD parameter.

NOTE: If this parameter is modified during TSP2 count, the new value will be immediately stored and the time count will be restarted.
TIMER FUNCTION
This parameter is present if the alarm output 1 has been configured as a timer output only.
Lower display: TIMR

Upper display: time of this function
Ranges : according to P13 setting.
from 0.0 to 99 hours and 59 minutes
from 0.0 to 99 minutes and 59 seconds
from 0.0 to 99 seconds and 99/100 seconds.
The timer starts by external contact closure on the rear terminal block.
SAFETY NOTE: During counting time, even if the external contact changes status, the internal count will not be influenced.
When TIMR is set to zero, the timer function is disabled.

AUTO / MANUAL FUNCTION
This parameter is present only when the logic input 2 is configured as auto/ man transfer (P17 = 0).
Lower display: EXAM
Upper display: OFF = The AUTO/ MAN transfer is controlled by keyboard or serial link.
ON = The AUTO / MAN transfer is controlled by an external contact on logic input 2.

4.2.2 VALVE MOTOR DRIVE CALIBRATION

VALVE MOTOR DRIVE LOW LIMIT
This parameter will appear when the open loop valve motor drive output has been configured and the controller is in manual mode.
Lower display: LSM
Upper display: OFF or ON

Proceed as follows :

1) With the controller in manual mode push the ▼ pushbutton and reach the valve motor drive minimum position.

2) Push FUNC pushbutton until LSM appears on the lower display, while OFF message will be shown on the upper one.

3) Push ▲ or ▼ pushbutton, the ON message will appear on the upper display.

4) Press FUNC pushbutton, the new value will be stored.

SAFETY NOTE: if the ON message does not appear on the upper display, it means that the reached position is not correct, i.e. it is higher than the high limit.

VALVE MOTOR DRIVE HIGH LIMIT
This parameter will appear when the open loop valve motor drive output has been configured and the controller is in manual mode.
Lower display: HSM
Upper display: OFF or ON

Proceed as follows :

1) With the controller in manual mode push the ▲ pushbutton and reach the valve motor drive maximum position.

2) Push FUNC pushbutton until HSM appears on the lower display, while OFF message will be shown on the upper one.

3) Push ▲ or ▼ pushbutton, the ON message will appear on the upper display.

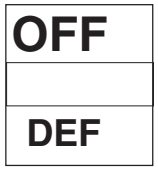
4) Press FUNC pushbutton, the new value will be stored.

SAFETY NOTE: if the ON message does not appear on the upper display, it means that the reached position is not correct, i.e. it is lower than the low limit.

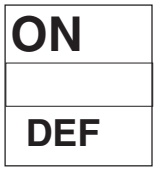
4.3. DEFAULT PARAMETERS

The control parameters can be loaded with predetermined default values. These data are the typical values loaded in the instrument prior to shipment from factory. To load the default values proceed as follows:

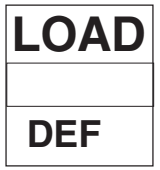
a) The internal dip switches, located on the input card should be :
   SW1 - 1 = OFF.
   SW1 - 2 = ON
b) The instrument should be set as controller in AUTO mode and it should not be in remote control.
c) The ADAPTIVE function should be disabled.
d) The upper display will show the process variable while the lower display will show the set point value or the output value.
e) Held down ▼ pushbutton and press ▲ pushbutton; the display will show:



f) Within 10 seconds press ▲ or ▼ pushbutton; the display will show:



g) Press FUNC pushbutton; the display will show:



This means that the loading procedure has been initiated. After about 3 seconds the loading procedure is terminated and the instrument reverts to NORMAL DISPLAY mode.

The following is a list of the default parameters loaded during the above procedure:

PARAMETER	DEFAULT VALUE
SP and SP2	= minimum range-value
TUNE	= Positioned at OFF
ADAPTIVE	= Last condition as before default parameters loading.
ALARMS THRESHOLD	= minimum range-value for process alarms 0 for deviation or band alarms
HYS1, HYS2	= 0.1 %
PB	= 10.0%
TI	= 5.00 (5 minutes)
TD	= 0.30 (30 seconds)
HYST	= 0.5 %
CY	= 15 seconds
RLO	= minimum range-value
RHI	= maximum range-value
IP	= 50 for one control output 0 for two control output
PMN	= 0 for one control output -100 for two control output
PMX	= 100.0 %
PMXT	= INFINITY
RMP	= OFF
GRAD	= OFF

PARAMETER	DEFAULT VALUE
RCG	= 1.00
OLAP	= 0
CY2	= 15 seconds
TSVM	= 1 minute
DBSM	= 5 %
TSP	= 99 hours and 59 minutes
TSP2	= Infinity
TIMR	= disabled
EXAM	= OFF

SAFETY NOTE: When the operator loads the default parameters and if TSP and TSP2 parameters have been programmed and are operative, the controller will come back to operate with the main set point (SP) with the new default value of TSP.

4.4 LOCAL/REMOTE CONTROL

When a serial communication interface is fitted the instrument can be operated in the following two conditions:

LOCAL CONTROL
The REM indicator on the front panel is OFF. The communication is limited to data transfer from the instrument to the remote MASTER, but the latter can make no modification to instrument parameters and states. The instrument keyboard is enabled to visualize and modify all parameters and states.

REMOTE CONTROL
The REM indicator on the front panel is light. The remote MASTER has the control of the instrument. The MASTER can acquire and modify all parameters and states. The instrument keyboard is only enabled to visualize the parameters and states.
The instrument logic input 1 is used to enable/disable the instrument control through the serial link.

When switched on, the instrument is in LOCAL CONTROL. Then the instrument condition will depend on logic input 1 state.

4.5 TUNE ALGORITHM

The TUNE algorithm is a standard self-tuning function of the instrument. It is used during system start-up to calculate and set the control parameters automatically.
To be operative, the TUNE algorithm needs that the difference (error) between the measured variable and the set point is higher than 5% of the input span. The controller should be in auto mode and the timed output limiter function disabled.
To start "TUNE", depress the FUNC pushbutton to recall the tune parameter. Push ▲ or ▼ pushbutton, the upper display will show the ON message. Now depress FUNC pushbutton, the TUNE indicator will start blinking.
The control output will reach its maximum value (if the set point is higher than the process variable) or its minimum value (if the set point is lower than the process variable). When the error is reduced to one half of the initial error, the output is inverted until the process variable starts coming back.
The size and duration of the oscillation are used to calculate the PID parameters.
When the TUNE procedure is completed, the calculated PID parameters are loaded and the instrument returns to normal operation or, if ADAPTIVE was previously selected, to ADAPTIVE.

SAFETY NOTE: If you desire to abort TUNE procedure, put the tune parameter in OFF position and depress the FUNC pushbutton.

4.6 ADAPTIVE FUNCTION

ADAPTIVE is indicated by TUNE indicator in the continuous ”ON” condition.
In this mode the PID parameters and relative cooling gain cannot be set by the operator.
When ADAPTIVE function is desired, proceed as follows:

1) select the AdPT parameter by the FUNC pushbutton;
2) push the ▲ pushbutton and select the ON indication;
3) Push the FUNC pushbutton.

ADAPTIVE can be switched IN or OUT by means of the relative parameter if TUNE function is not active or the instrument is not in manual mode.
The ADAPTIVE function will use present PID parameters; either previously set manually or set by the TUNE function.
Otherwise it will use the default parameters set.
ADAPTIVE modify the PID parameter whenever there is a change in the set point or in the presence of a load disturbance and so on.
The parameters found by this automatic process are stored and used in a dynamic mode for future adjustments required by the process.
If the ADAPTIVE function was enabled at instrument switching off, the controller will start or restart to operate in ADAPTIVE mode at instrument switching on.
SAFETY NOTE:
If the controller is forced from automatic to manual mode while the adaptive function is operating, the adaptive function will remain pending as long as the instrument remains in manual mode.
When the instrument will be switched to automatic mode the adaptive function will be enabled again.

4.7 MANUAL CONTROL

Pressing the MAN pushbutton changes the instrument operation from AUTO to MANUAL control. The MAN indicator is lit. The upper display shows the measured variable while the lower display shows the output level in percent or the valve position indication in percent.

When switching from AUTO to MANUAL control, the output in manual is forced to match the existing output in auto, so that the transfer is bumpless, i.e. it is made without disturbing the final control element position. Then it is possible to adjust the control output by using the ▲ and ▼ pushbuttons, until the desired value is achieved. In MANUAL mode the access is allowed to all control parameters (see paragraph 4.2.1) which can be visualized and modified.

Pressing the MAN pushbutton again changes the instrument operation from MANUAL back to AUTOMATIC control. In the transfer, the control output remains unchanged (bumpless transfer) and the working set point remains at the original value if P16 (see chapter 3.2.3) is set to 0 or 1, otherwise it matches the actual measured variable value, if P16 parameter is set to 2 or 3.

Note that the bumpless transfer from MANUAL to AUTO control is only possible if the integral action is not excluded.

4.8 DIRECT ACCESS TO THE SET POINT MODIFICATION

From 00 AB status it is allowed to modified the set point value without to use the FUNC pushbutton.
When a direct access to set point modification is required, proceed as follow:

1) Push, for more than 2 seconds, the ▲ or ▼ pushbutton; the set point value, will be displayed and it will start to change.
2) Using the ▲ and ▼ pushbuttons, it is possible to set the desired value.
3) When the desired value is reached, do not push any pushbutton for more than 2 second, the new set point will become operative after 2 second from the last pushbutton pressure.

If, during this procedure, there is no interest in memorizing the new value, push the FUNC pushbutton; the instrument returns automatically to the normal display mode without having memorized the new set point.

4.9 NOTE ON THE OPERATIVITY OF THE OUTPUT POWER LIMITING

At the end of the output limiting (at the end of the programmed time duration or when the instrument detect a new condition on the logic input) if the PID algorithm required an output power higher than the PMX value, the transfer from PMX to the PID requirement is bumpless.

SECTION 5 INSTRUMENT CALIBRATION PROCEDURES

5.1 DIP SWITCHES LOCATION

To start with the calibration procedure, the DIP SWITCHES SW1, mounted on CPU card, must be positioned as follows.
The switches J6 must be position according to the desired input type.
NOTE: during calibration procedure the serial comunication interface will be disabled.

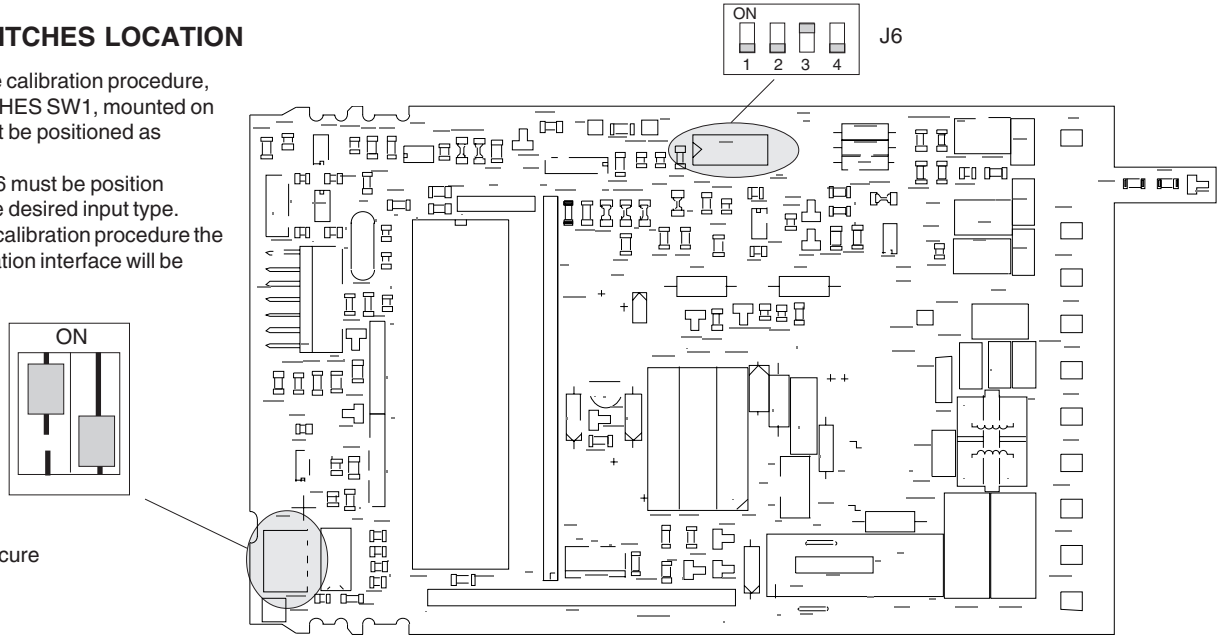


Fig. 5.1

5.2 GENERAL GUIDE LINES FOR CALIBRATION

For a good calibration it is necessary to proceed as follows:
a) - The instrument under calibration should be mounted in its case in order to keep the internal temperature constant.
b) - The ambient temperature should be stable. Avoid any drift due to air-conditioning or others.
c) - The relative humidity should not exceed 70%.
d) - Minimum warm-up time must be 20 minutes.
e) - Operate possibly in a noise free environment.
f) - During calibration, connect one input at a time to the rear terminal block.
For this calibration procedure it is necessary to use calibrators with the following accuracy and resolution:

ACCURACY
1) For current input: ± 0.025% output ± 0.0025% range ± 0.01 μA
2) For voltage input : + 0.005% output + 0.001% range + 5 μV
3) For TC input: + 0.005% output + 0.001% range + 5 μV
4) For RTD input: ± 0.02 % ± 0.0025 Ω/decade.
5) For could junction compensation: better then 0.1 °C

RESOLUTION
2) For current input: 0.5 μA
2) For voltage input: 100 μV
1) For TC input: 1 μV
3) For RTD input: 10 mΩ
4) For could junction compensation: better then 0.1 °C

5.3 CALIBRATION PROCEDURE

5.3.1 FOREWORD

Calibration parameters are logically divided in groups of two parameters each (initial and final scale value).
After each group the calibration check is provided but it is also possible to do it without a new calibration is made. When calibration check is required only, press twice the FUNC pushbutton when "OFF" is shown on the display. The instrument goes directly to the specific group check.
The lower display will show the parameter code (C1 - C10) while the upper display will show "ON" or "OFF".
Using ▲ and ▼ pushbuttons it is possible to select between "ON" or "OFF".
To go to the next parameter without modify the calibration, push FUNC pushbutton when the display is showing "OFF" .
To set parameter calibration, push FUNC pushbutton when the display shows "ON".
NOTE: Pushing MAN pushbutton it is possible to go back to the previous parameter without modifying the calibration.

5.3.2 CALIBRATION PROCEDURE

All the instruments are factory calibrated by means of calibrators with high accuracy and resolution (see para. 5.2).
During calibration procdure the instrument shows the parameters used by the actual configuration only.
The following is a complete list of calibration symbols:

Code	Parameter
C 1	- RTD input minimum range value
C 2	- RTD input maximum range value
C 3	- Linear input minimum range value
C 4	- Linear input maximum range value
C 5	- TC input minimum range value
C 6	- TC input maximum range value
C7	- Cold junction compensation
C 8	- Linear output minimum scale value
C 9	- Linear output maximum scale value

HOW TO PROCEED

Switch on the instrument, the lower display will show CONF.
Push FUNC and MAN pushbutton at the same time, the lower display will show CAL.
Push the FUNC pushbutton to visualize the first calibration code on the lower display. Depress FUNC pushbutton in sequence until the desired calibration code is reached.

C 1 - RTD INPUT MINIMUM RANGE VALUE

a) Connect a resistor box as shown in Fig. 5.1.
b) Set 100.00 Ω on the resistor box.
c) Push ▲ pushbutton, then the instrument will show "ON" and "C 1".
e) After few seconds, start calibration routine by pushing FUNC pushbutton.
The lower display will show "CAL" temporarily to indicate that the instrument is performing the calibration rutin.
The displays will show "OFF" and "C 2".

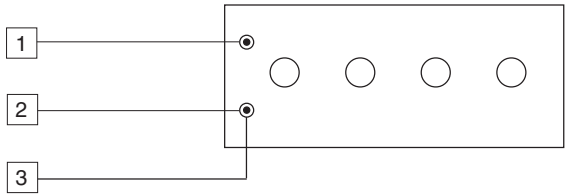


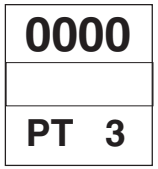
Fig. 5.1

C 2 - RTD INPUT MAXIMUM RANGE VALUE

a) Set the resistance box to 400.00 Ω (see Fig. 5.1).
b) Push ▲ pushbutton, the displays will show "ON" and "C 2".
c) Wait few seconds then push FUNC pushbutton.

RTD INPUT CHECK

a) The display should show "Pt 3" and "0000 " ±10 counts as shown below:



If a different value is displayed, set the resistance box to 400.00 Ω (see Fig. 5.1)
The C2 calibration is correct if the indication is "Pt 3 0000" ± 10 counts.
b) Check the zero calibration by setting 100.00 Ω on the resistance box; the readout should be "Pt 0 0000 " ±10 counts.
To check the half scale linearity, set the resistance box to 250.00Ω and the readout should be "Pt 1 5000" ±10 counts.
c) Push FUNC pushbutton to proceed to next calibration step.

C 3 - LINEAR INPUT (mA, mV or V) MINIMUM RANGE VALUE

a) Connect the instrument to the calibrator as shown in Fig. 5.2.
b) Set 0.000 mA, 0.00 mV or 0.000 V on the calibrator (even if the minimum range value is 4 mA or 1 V).
The upper display will show "OFF".
Depress ▲ pushbutton to enable the calibration; then the upper display will switch to "ON".
c) Wait few seconds, until the measurement has stabilized.
d) Push the FUNC pushbutton. When the calibration is completed the instrument will go automatically to the next parameter.

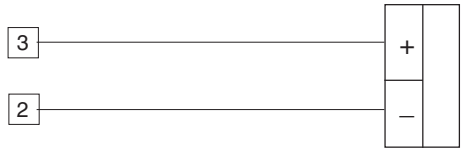


Fig. 5.2

C 4 - LINEAR INPUT (mA, mV, V) MAXIMUM RANGE VALUE.

a) Set 20 mA, 60 mV, 5 V or 10 V on the calibrator (see Fig. 5.2).
b) Push ▲ pushbutton, the displays will show "ON" and "C 4".
c) Wait few seconds then push FUNC pushbutton.
d) The lower displays will show "CAL" temporarily to show that the instrument is performing the calibration routine.

LINEAR INPUT (mA, mV, V) CHECK

a) The instrument will show "mA" followed by a number showing the measured value in counts.
Set 20.00 mA, 60 mV, 5 V or 10 V on the calibrator, if C 4 calibration is correct the indication will be "mA 3 0000" ±10 counts.
b) Check linear input calibration by resetting the calibrator to 0.000 mA, 0 mV or 0 V.
The resulting indication should give "mA 0 0000" ±10 counts.
Check the linearity by setting the calibrator to 10.000 mA30 mV, 2.5 V or 5 V; the readout must be "mA 1 5000" ±10 counts.
c) Push FUNC for the next calibration

C 5 - TC INPUT MINIMUM RANGE VALUE

a) Provide connections between calibrator and instrument under test as shown in Fig. 5.3.
b) The upper display will show "OFF", while "C 5" will appear on the lower display.
c) Set calibrator to 0.000 mV. Push ▲ pushbutton, the display will change to "ON".
d) After few seconds, start calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next parameter.

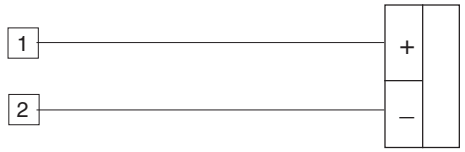


Fig. 5.3

C 6 -TC INPUT - MAXIMUM RANGE VALUE

a) Set the calibrator to 60.000 mV for TC inputs (see Fig. 5.3).
b) Push ▲ pushbutton, the displays will show "ON" and "C 6".
c) Wait few seconds then push FUNC pushbutton.
d) The lower display will show "CAL" temporarily to indicate that the instrument is performing the calibration routine.

TC INPUT CHECK

Then the display will show "TC" followed by a number showing the measured value in counts.
C6 calibration is correct if the indication is "TC 3 0000" $\pm$ 10 counts.
a) Check the zero calibration, by setting the calibrator to 0.000 mV, the readout must be "TC 0 0000" $\pm$10 counts.
b) Check linearity at half scale by setting the proper value on the calibrator. The readout must be "TC 1 5000" $\pm$10 counts.
c) Push FUNC pushbutton, "OFF" and "RJ" will appear on the displays.

C7 COLD JUNCTION COMPENSATION

NOTE: make sure that C5 and C6 parameters are correctly calibrated before C7 calibration.
a) Measure the temperature close to terminals 1 and 2 using an appropriate instrument, for instance, a MEMOCAL (see Fig. 5.4).
b) Wait a few minutes to allow the temperature stabilisation of the entire system (compensation cable, sensor, calibrator and instrument).
c) The displays will show "C7" and "25.0".
Using ▲ or ▼ pushbuttons, make the readout value equal to the temperature measured by the measuring device in tenth of °C.
d) Initiate the calibration routine by pushing FUNC pushbutton.

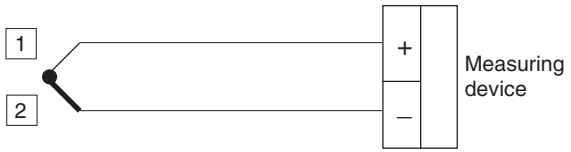


Fig. 5.4

COLD JUNCTION COMPENSATION CHECK
The display will show "RJ" and the cold junction temperature in tenths of °C.
Make sure that the display readout is equal to the value read on the measuring device (MEMOCAL).

C 8 - LINEAR OUTPUT MINIMUM SCALE VALUE

a) Connect a milliammeter to the instrument as shown in Fig. 5.5.

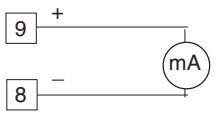


Fig. 5.5 main output

b) The lower display shows "C 8" and the upper display shows a number of counts.
c) Using ▲ or ▼ pushbuttons, adjust the instrument output until 0.000mA ±0.08 mA is shown by the measuring device.
d) Depress FUNC pushbutton. The instrument memorizes the above value as zero.
The display will show now "C 9" which means that the instrument is ready for next calibration step.

SAFETY NOTE: for C8 calibration the output signal must be 0 mA also for controller with 4 - 20 mA linear output. The 4 mA offset is a software setting.

C9 - LINEAR OUTPUT MAXIMUM SCALE VALUE

b) The lower display shows "C 9" and the upper display shows a number of counts.
c) Using ▲ or ▼ pushbuttons, adjust the instrument output until 20.000 mA ±0.08 mA is shown by the measuring device.
d) Depress FUNC pushbutton. The instrument memorizes the above value as full scale.

With this last operation the instrument returns at the beginning of the calibration routine.
If you depress FUNC and MAN pushbutton at the same time, the lower display will show "CONF" to indicate that the instrument is in configuration procedure.
Switch the instrument OFF and set the dip switches according to para. 4.1.

SECTION 6 ERROR MESSAGES

6.1 OVERRANGE, UNDERRANGE AND SENSOR LEADS BREAK INDICATIONS

The device is capable to detect a fault on the process variable (OVERRANGE or UNDERRANGE or SENSOR LEADS BREAK). When the process variable exceeds the span limits established by configuration parameter P 1 an OVERRANGE condition will be shown on display as show in the following figure:

An UNDERRANGE condition will be shown on display as show in the following figure:

When P35 is equal to 0, the following conditions may occur:

- The instrument is set for one output only and if an OVERRANGE is detected, the OUT 1 turns OFF (if reverse action) or ON (if direct action).
- The instrument is set for heating/cooling action and an OVERRANGE is detected, OUT 1 turns OFF and OUT 2 turns ON.
- The instrument is set for one output only and if an UNDERRANGE is detected, the OUT 1 turns ON (if reverse action) or OFF (if direct action).
- The instrument is set for heating/cooling action and an UNDERRANGE is detected, OUT 1 turns ON and OUT 2 turns OFF.

When P35 is different from zero and an out of range condition is detected, the instrument operates in accordance with P35 and P36 parameters.

The sensor leads break can be signalled as:

- for TC/mV input: OVERRANGE or UNDERRANGE selected by a solder jumper
- for RTD input : OVERRANGE
- for mA/V input : UNDERRANGE

Note: On the mA/V input the leads break can be detected only when the range selected has a zero elevation (4/20 mA or 1/5 V or 2/10 V) On RTD input a special test is provided to signal OVERRANGE when input resistance is less than 15 ohm (Short circuit sensor detection).

6.2 ERRORS

Diagnostics are made at instrument switch-on and during normal mode of operation.
If a fault condition (error) is detected, the display will show the message "Err" while the upper display shows the relative error code.
The following is a list of possible errors in numerical order.
Also causes, instrument output conditions and possible remedies are briefly described.
Some errors reset the instrument; if the error persists, send back the instrument to your supplier

6.3 ERROR DESCRIPTIONS

ERR 100
EEPROM memory writing error.
After 2 seconds the instrument restarts automatically.
Send back the instrument to your supplier.

ERR 101
Damaged RAM memory.
The instrument remakes this check every 2 seconds.
If this error persists, send back the instrument to your supplier.

ERR 110
The instrument detects the incorrect access to a protected memory area (this error may be generated by a big noise only).
After 2 seconds the instrument restarts automatically.

ERR 199
CPU error
The instrument remakes this check every 2 seconds.
If this error persists, send back the instrument to your supplier.

ERR 203
Non-existent input linearization.
Return in configuration procedure and check the P3 value.

ERR 206
Wrong range for linear input
Return in configuration procedure and check the P6 and P7 values.

ERR 212
Wrong configuration of the heating output.
Return in configuration procedure and check the P8 and P12 values.

ERR 213
Wrong time in timer programming.
Return in configuration procedure and check the P13 value.

ERR 214
Wrong configuration of the cooling output.
Return in configuration procedure and check the P8, P10 and P14 values.

ERR 216
Wrong configuration of the auto / manual transfer.
Return in configuration procedure and check the P16 value.

ERR 217
Wrong configuration of the logic input 2.
Return in configuration procedure and check the P17 value.

ERR 218
Wrong configuration of the serial communication interface address.
Return in configuration procedure and check the P18 value.

ERR 220
Parity disabled with 7 bit transmission.
Return in configuration procedure and check the P20 value.

ERR 224
Wrong configuration of the offset type.
Return in configuration procedure and check the P24 value.

ERR 225
Wrong configuration of the offset value.
Return in configuration procedure and check the P25 value.

ERR 226
De-activation threshold for timed output level limiter out of range.
Return in configuration procedure and check the P26 value.

ERR 227
Wrong ARW value.
Return in configuration procedure and check the P27 value.

ERR 229
Wrong configuration of the analog retransmission or configuration of the analog retransmission and of the serial interface contemporarily.
Return in configuration procedure and check the P29 and P18 values.

ERR 230
Wrong value of the read-out for the min. retransmission output.
Return in configuration procedure and check the P30 value.

ERR 231
Wrong value of the read-out for the max. retransmission output.
Return in configuration procedure and check the P31 value.

ERR 301
RTD calibration error.
Return in calibration procedure and check the C1 and C2 calibrations.

ERR 303
Linear input calibration error.
Return in calibration procedure and check the C3 and C4 calibrations.

ERR 305
Thermocouple input calibration error.
Return in calibration procedure and check the C5 and C6 calibrations.

ERR 307
Reference junction calibration error.
Return in calibration procedure and check the C7 calibration.

ERR 308
Linear output calibration error.
Return in calibration procedure and check the C8 and C9 calibrations.

ERR 400
One or more control parameters are out of range with respect to the allowed values.
It may appear at instrument switching on.
Push contemporarily ▲ and ▼ pushbutton and load all the default parameters.
Remade parameter setting.

ERR 450
Wrong potentiometer calibration for valve motor drive output.
It may appear at instrument switching on.
Push contemporarily ▲ and ▼ pushbuttons and load the specific default parameters. Remake feedback potentiometer calibration only.

ERR 470
When ADAPTIVE option is present, it means the loss of the data in RAM.
Push contemporarily ▲ and ▼ pushbuttons and load all the default parameters. Remake parameter setting.

ERR 500
Autozero error.
The instrument measure an internal autozero value too negative or too positive.
The instrument remakes this check every 20 seconds.
If this error persists, send back the instrument to your supplier.

ERR 502
Could junction measurement errors.
The instrument can't make the could junction compensation.
It may appear during the operative mode.
Check the ambient temperature and, if necessary, remake the calibration procedure.
If this error persists, send back the instrument to your supplier.

ERR 510
Wrong measured value during calibration procedure.
It may appear during the calibration procedure.
Check the input value and, if necessary, remake the calibration procedure.
If this error persists, send back the instrument to your supplier.

ERR 520
Not possible bumpless balanceless transfer.
It may appear during the operative mode when the variable is out of the set point limiter and a bumpless balanceless transfer is required.
This error disappears in few seconds but the transfer will be bumpless balance.

PMW

Serial No..... Tag No.....

CONFIGURATION PARAMETERS

Param.	Value	Description
P 1		Input type
P 2		°C/°F selection
P 3		Input linearization
P 4		20% suppression on linear inputs
P 5		Decimal point position
P 6		Minimum scale value for linear input
P 7		Maximum scale value for linear input
P 8		Main output (heating) selection
P 9		Main output action
P10		Control output 2 (cooling) selection

Param.	Value	Description
P11		Control output 2 (cooling) action
P12		Alarm or timer configuration
P13		Timer time configuration
P14		Alarm 2 configuration
P15		SP / SP2 transfer configuration
P16		AUTO / MAN start up and choice of transfer algorithm
P17		Logic input 2 configuration
P18		Address for serial interface communication
P19		Communication baud rate
P20		Word length
P21		Parity enabling / disabling
P22		Type of parity
P23		Power line frequency
P24		Offset type and application point

Param.	Value	Description
P25		Offset value
P26		Input threshold for activation/de-activation of the timed output level limiter
P27		Antireset wind-up
P28		Control action type
P32		Selection of the direct/revers output level indication
P35		Condition for output safety value
P36		Output safety value
P37		Enable/disable the TUNE and ADAPTIVE functions
P38		Enable/disable the RCG calculation by ADAPTIVE function

NOTES

PMW Serial No..... Tag No.....

CONTROL PARAMETERS

Param.	Value	Description
SP		Set point
TUNE		TUNE
ADPT		ADAPTIVE
SP2		Second set point
ALM1		Alarm 1 threshold
ALM2		Alarm 2 threshold
HYS1		Alarm 1 hysteresis
HYS2		Alarm 2 hysteresis
PB		Proportional band
TI		Integral time

Param.	Value	Description
TD		Derivative time
HYST		Hysteresis
CY		Output 1 (heating) cycle time
RLO		Set point low limit
RHI		Set point high limit
IP		Integral pre-load
PMN		Control output low limit
PMX		Control output high limit
PMXT		Time for output limiter enabling
RMP		Control output max rate of change
GRAD		Max. rate of change for set point variations
RCG		Relative cooling gain
OLAP		Overlap / dead band between heating and cooling outputs
CY2		Output 2 (cooling) cycle time

Param.	Value	Description
TSVM		Valve motor stroke time
DBSM		Valve motor dead band
TSP		Set point soak time
TSP2		Second set point soak time
TIMR		Timer function
EXAM		Auto / Man function

NOTES

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