

1604-7

Temperature Controller with mA Output



Issue date
May 2000

 **USER'S MANUAL**

CONTENTS

MOUNTING REQUIREMENTS	1
OUTLINE AND CUT OUT DIMENSIONS	2
CONNECTION DIAGRAMS	3
PRELIMINARY HARDWARE SETTINGS	9
CONFIGURATION PROCEDURE	10
OPERATIVE MODE	18
Display function	18
Indicators	18
Pushbutton function during operating mode	19
Enable/disable the control output	19
SP-SP2 selection	19
Direct access to the set point	20
Manual function	20
Lamp test	20
Serial link	21
SMART function	21
OPERATIVE PARAMETERS	22
ERROR MESSAGES	25
GENERAL INFORMATIONS	27
MAINTENANCE	31
DEFAULT PARAMETERS	A.1

Model identification

Model

1604 1/16 DIN Temperature Controller

Code Output 1 - Heat or Cool

7 20 mA Output

Code Output 2 - Alarm

1 Relay, 2 Amp at 250 VAC (Resistive load)

Code

0 None

1 Out #3, 2 Amps at 250 V AC (Resistive load)

2 Heater Break Down input, Out #3

3 RS 485 Digital communications, Out #3

4 RS 485 Digital comm., Heater Break Down input, Out #3

Code Instrument Power

3 100 - 240 Vac

5 24 Vac/dc

Code

0 Add to complete model number

1601

6

1

0

3

0

Typical Model Number

MOUNTING REQUIREMENTS

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 15 mm thick with a square cutout of 45 x 45 mm. For outline and cutout dimensions refer to Fig. 2. The surface texture of the panel must be better than 6,3 μm .

The instrument is shipped with rubber panel gasket (50 to 60 Sh).

To assure the IP65 and NEMA 4 protection, insert the panel gasket between the instrument and the panel as shown in fig. 1.

While holding the instrument against the panel proceed as follows:

- 1) insert the gasket in the instrument case;
- 2) insert the instrument in the panel cutout;
- 3) pushing the instrument against the panel, insert the mounting bracket;
- 4) with a screwdriver, turn the screws with a torque between 0.3 and 0.4 Nm.

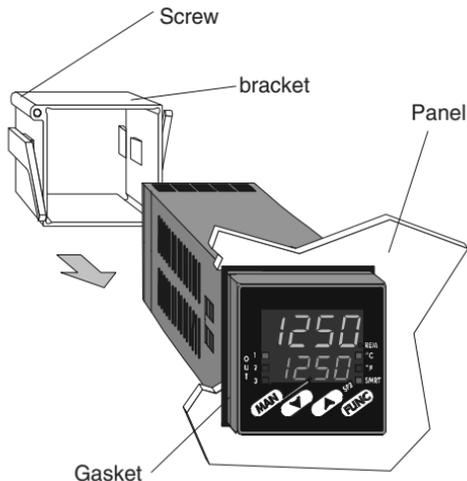


Fig. 1

OUTLINE AND CUT OUT DIMENSIONS

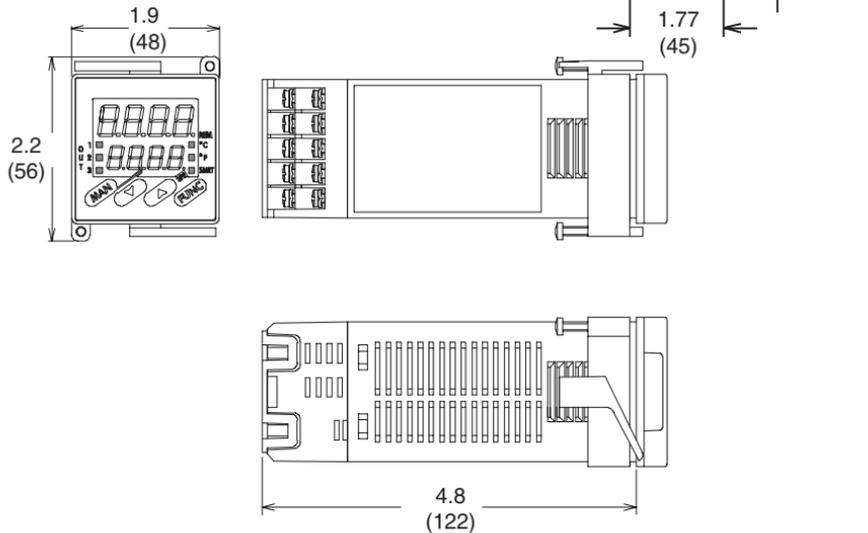


Fig. 2

OUTLINE AND CUT-OUT DIMENSIONS

CONNECTION DIAGRAMS

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

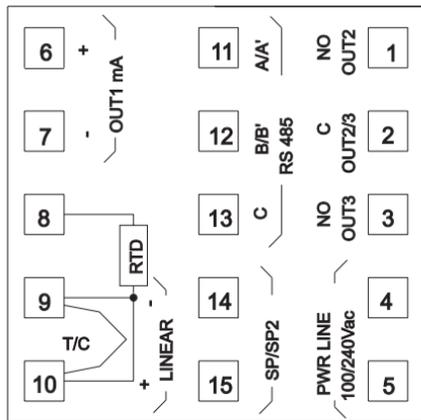


Fig. 3.A REAR TERMINAL BLOCK

A) MEASURING INPUTS

NOTE: 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.

TC INPUT

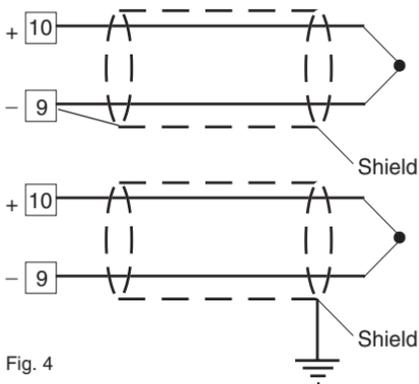


Fig. 4

NOTE:

- 1) Don't run input wires together with power cables.
- 2) For TC wiring use proper compensating cable preferable shielded.
- 3) when a shielded cable is used, it should be connected at one point only.

RTD INPUT

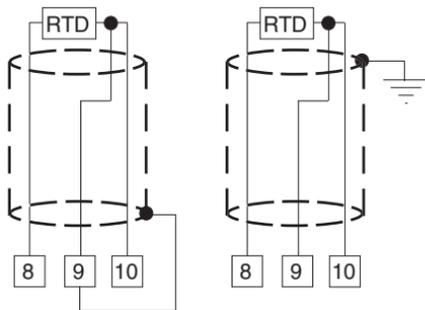


Fig. 5 RTD INPUT WIRING

NOTE:

- 1) Don't run input wires together with power cables.
- 2) Pay attention to the line resistance; a high line resistance may cause measurement errors.
- 3) When shielded cable is used, it should be grounded at one side only to avoid ground loop currents.
- 4) The resistance of the 3 wires must be the same.

LINEAR INPUT

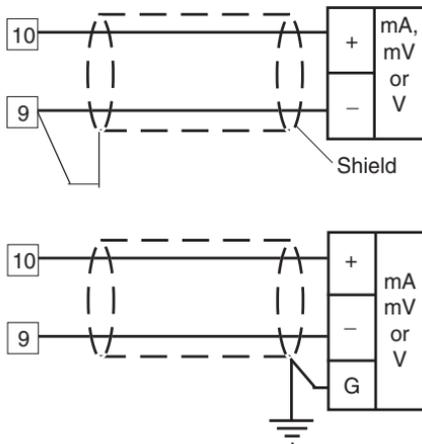


Fig. 6 mA, mV AND V INPUTS WIRING

NOTE:

- 1) Don't run input wires together with power cables.
- 2) Pay attention to the line resistance; a high line resistance may cause measurement errors.
- 3) When shielded cable is used, it should be grounded at one side only to avoid ground loop currents.
- 4) The input impedance is equal to:
 - < 5 Ω for 20 mA input
 - > 1 M Ω for 60 mV input
 - > 200 k Ω for 5 V input
 - > 400 k Ω for 10 V input

B) LOGIC INPUT

Safety note:

- 1) Do not run logic input wiring together with power cables.
- 2) Use an external dry contact capable of switching 0.5 mA, 5 V DC.
- 3) The instrument needs 100 ms to recognize a contact status variation.
- 4) The logic inputs are **NOT** isolated by the measuring input



Fig. 7 - LOGIC INPUT WIRING

This logic input allows to select the operative set point.

logic input	op. set point
open	SP
close	SP2

C) RELAY OUTPUTS

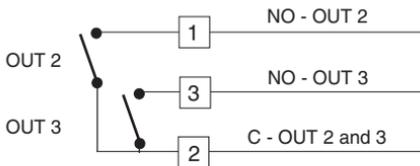


Fig. 8 RELAY OUTPUTS WIRING

The contact rating of the OUT 2, 3 is 2A/250V AC on resistive load.

The number of operations is 1×10^5 at specified rating.

- NOTES**
- 1) To avoid electrical shock, connect power line at the end of the wiring procedure.
 - 2) For power connections use No 16 AWG or larger wires rated for at least 75 °C.
 - 3) Use copper conductors only.
 - 4) Don't run input wires together with power cables.

The relay contacts are protected by varistor against inductive load with inductive component up to 0.5 A.

The following recommendations avoid serious problems which may occur, when using relay output for driving inductive loads.

INDUCTIVE LOADS

High voltage transients may occur switching inductive loads.

Through the internal contacts these transients may introduce disturbances which can affect the performance of the instrument.

For the OUT 2 and OUT 3, the internal protection (varistor) assures a correct protection up to 0.5 A of inductive component.

The same problem may occur when a switch is used in series with the internal contacts as shown in Fig. 9.

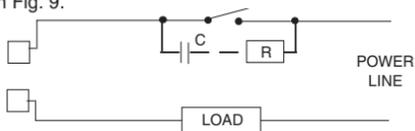


Fig. 9 EXTERNAL SWITCH IN SERIES WITH THE INTERNAL CONTACT

In this case it is recommended to install an additional RC network across the external contact as show in Fig. 9

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

LOAD (mA)	C (μ F)	R (Ω)	P. (W)	OPERATING VOLTAGE
<40 mA	0.047	100	1/2	260 V AC
<150 mA	0.1	22	2	260 V AC
<0.5 A	0.33	47	2	260 V AC

The cable involved in relay output wiring must be as far away as possible from input or communication cables.

LINEAR OUTPUT

This instrument is equipped with one linear output (OUT 1) programmable as:

- main output (heating or cooling)
- secondary output (cooling)
- analog retransmission of the measured value
- analog retransmission of the operative set point.

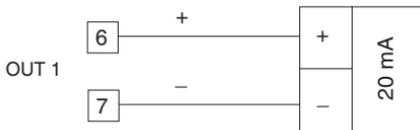


Fig. 10 mA OUTPUT WIRING

It is an isolated analog output.
Maximum load: 500 Ω .

SERIAL INTERFACE

RS-485 interface allows to connect up to 30 devices with one remote master unit.

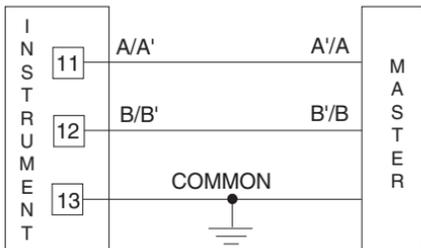


Fig. 11 - RS-485 WIRING

The cable length must not exceed 1.5 km at 9600 BAUD.

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

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

D) POWER LINE WIRING

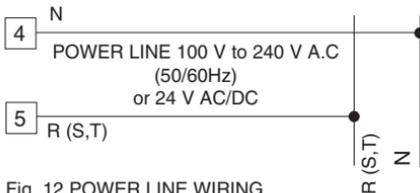


Fig. 12 POWER LINE WIRING

NOTES:

- Before connecting the instrument to the power line, make sure that line voltage corresponds to the description on the identification label.
- To avoid electrical shock, connect power line at the end of the wiring procedure.
- For supply connections use No 16 AWG or larger wires rated for at last 75 °C.
- Use copper conductors only.
- Don't run input wires together with power cables.
- For 24 V DC the polarity is a do not care condition.
- The power supply input is **NOT** fuse protected. Please, provide it externally.

Power supply	Type	Current	Voltage
24 V AC/DC	T	500 mA	250 V
100/240 V AC	T	125 mA	250 V

When fuse is damaged, it is advisable to verify the power supply circuit, so that it is necessary to send back the instrument to your supplier.

- The safety requirements for Permanently Connected Equipment say:
 - a switch or circuit-breaker shall be included in the building installation;
 - It shall be in close proximity to the equipment and within easy reach of the operator;
 - it shall be marked as the disconnecting device for the equipment.

NOTE: a single switch or circuit-breaker can drive more than one instrument.

- 9) When the NEUTRAL line is present, connect it to terminal 4.

PRELIMINARY HARDWARE SETTINGS

- 1) Remove the instrument from its case.
- 2) It is necessary to set J106 according to the desired input type as shown in the following figure.

INPUT TYPE	J106				
	1-2	3-4	5-6	7-8	9-10
TC-RTD	open	close	open	open	open
60 mV	open	close	open	open	open
5 V	close	open	close	open	open
10 V	open	open	close	open	open
20 mA	open	open	open	close	close

NOTE : the not used jumper can be positioned on pin 7-9

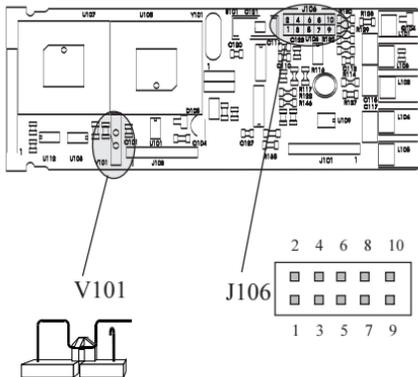


Fig. 13

OPEN INPUT CIRCUIT

This instrument is able to identify the open circuit for TC and RTD inputs.

The open input circuit condition for RTD input is shown by an "overrange" indication. For TC input, it is possible to select overrange indication (standard) or underrange indication setting the CH101 and SH101 according to the following table:

Overrange (STD)	CH101 = close	SH101 = open
Underrange	CH101 = open	SH101 = close

Both pads are located on the soldering side of the CPU card

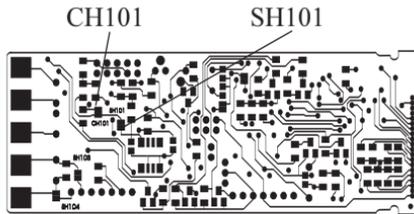


Fig. 14

GENERAL NOTES for configuration.

- FUNC = This will memorize the new value of the selected parameter and go to the next parameter (increasing order).
- MAN = This will scroll back the parameters without memorization of the new value.
- ▲ = This will increase the value of the selected parameter
- ▼ = This will decrease the value of the selected parameter.

CONFIGURATION PROCEDURE

- 1) Remove the instrument from its case.
 - 2) Set the dip switch V101 to the open condition (see fig. 13).
 - 3) Re-insert the instrument.
 - 4) Switch on the instrument.
- The display will show CONf.

NOTE : If "CAL" indication is displayed, press immediately the ▲ pushbutton and return to the configuration procedure.

- 5) Push the FUNC pushbutton.

SEr1 = Serial interface protocol

- OFF = No serial interface
- Ero = Polling/selecting ERO
- nbUS = Modbus
- jbUS = Jbus

SEr2 = Serial link device address

Not available when SEr1 = OFF

From 1 to 95 for ERO protocol.

From 1 to 255 for all the other protocols.

NOTE: the electrical characteristic of the RS 485 serial interface allows you the connection of 31 devices maximum.

SEr3 = Baud rate for serial link

Not available when SEr1 = OFF

From 600 to 19200 baud.

NOTE: 19200 baud is shown on display as 19.2.

SEr4 = Byte format for serial link

Not available when SEr1 = OFF

7E = 7 bits + even parity (For ERO protocol only)

7O = 7 bits + odd parity (For ERO protocol only)

8E = 8 bits + even parity

8O = 8 bits + odd parity

8 = 8 bits no parity

P1 - Input type and standard range

0	= TC type	L	range	0 / +400.0 °C
1	= TC type	L	range	0 / +900 °C
2	= TC type	J	range	-100.0 / +400.0 °C
3	= TC type	J	range	-100 / +1000 °C
4	= TC type	K	range	-100.0 / +400.0 °C
5	= TC type	K	range	-100 / +1370 °C
6	= TC Type	T	range	-199.9 / +400.0 °C
7	= TC type	N	range	-100 / +1400 °C
8	= TC type	R	range	0 / +1760 °C
9	= TC type	S	range	0 / +1760 °C
10	= RTD type	Pt 100	range	-199.9 / +400.0 °C
11	= RTD type	Pt 100	range	-200 / +800 °C
12	= mV	Linear	range	0 / 60 mV
13	= mV	Linear	range	12 / 60 mV
14	= mA	Linear	range	0 / 20 mA
15	= mA	Linear	range	4 / 20 mA
16	= V	Linear	range	0 / 5 V
17	= V	Linear	range	1 / 5 V
18	= V	Linear	range	0 / 10 V
19	= V	Linear	range	2 / 10 V
20	= TC type	L	range	0 / +1650 °F

21 = TC type J	range	-150 / +1830 °F
22 = TC type K	range	-150 / +2500 °F
23 = TC type T	range	-330 / +750 °F
24 = TC type N	range	-150 / +2550 °F
25 = TC type R	range	0 / +3200 °F
26 = TC type S	range	0 / +3200 °F
27 = RTD type Pt 100	range	-199.9 / +400.0 °F
28 = RTD type Pt 100	range	-330 / +1470 °F

NOTE: selecting P1 = 0, 2, 4, 6, 10 or 27, the instrument set automatically P39 = P40 = FLtr. For all the remaining ranges it will set P39 = P40 = nOFL.

If a different selection is desired, P39 and P40 may be modified, after executed P1 configuration.

P2 = Decimal point position

This parameter is available only when a linear input is selected (P1 = 12, 13, 14, 15, 16, 17, 18 or 19).

- . = No decimal figure.
- . = One decimal figure.
- . = Two decimal figures.
- . = Three decimal figures.

P3 = Initial scale value

For linear inputs it is programmable from -1999 to 4000.

For TC and RTD input, it is programmable within the input range.

When this parameter is modified, rL parameter will be re-aligned to it.

P4 = Full scale value

For linear inputs it is programmable from -1999 to 4000.

For TC and RTD input it is programmable within

the input range.

When this parameter is modified, rH parameter will be re-aligned to it.

The initial and full scale values determine the input span which is used by the PID algorithm, the SMART and the alarm functions.

NOTE: the minimum input span (S = P4 - P3), in absolute value, should be set as follows:

For linear inputs, $S \geq 100$ units.

For TC input with °C readout, $S \geq 300$ °C.

For TC input with °F readout, $S \geq 550$ °F.

For RTD input with °C readout, $S \geq 100$ °C.

For RTD input with °F readout, $S \geq 200$ °F.

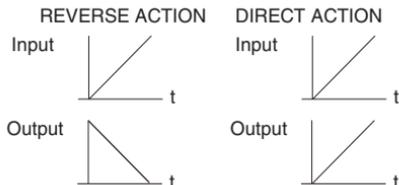
P5 = Output 1 function

rEv = Out 1 is used as control output with reverse action

dir = Out 1 is used as control output with direct action

Pv.rt = Out 1 is used as analog retransmission of the measured value (process variable)

SP.rt = Out 1 is used as analog retransmission of the operative set point.



P6 = Output 1 type.

0-20 = output type 0 - 20 mA.

4-20 = output type 4 - 20 mA.

P7 = analog retransmission - initial scale value.

Available only when P5 = Pv.rt or SP.rt.

It is programmable from -1999 to 4000.

The decimal point will be positioned as selected with P2 parameter.

P8 = analog retransmission - full scale value.

Available only when P5 = Pv.rt or SP.rt.

It is programmable from -1999 to 4000.

The decimal point will be positioned as selected with P2 parameter.

P9 = Output 2 function.

nonE = output not used.

rEv = Out 2 is used as control output with reverse action.

dir = Out 2 is used as control output with direct action.

AL1.P = it is used as Alarm 1 output and the alarm 1 is programmed as process alarm.

AL1.b = it is used as Alarm 1 output and the alarm 1 is programmed as band alarm.

AL1.d = it is used as Alarm 1 output and the alarm 1 is programmed as deviation alarm.

NOTE: If P9 has been changed to "rEv", the cycle time (Cy2) will be forced to 15 seconds.

If P9 has been changed to "dir", the cycle time (Cy2) will be forced to:

10 s when P22 is equal to "Alr"

4 s when P22 is equal to "OIL"

2 s when P22 is equal to "H2O".

P10 = Alarm 1 operating mode

Available only when P9 is equal to "AL1.P", "AL1.b" or "AL1.d".

H.A. = High alarm (outside for band alarm) with automatic reset (latched).

L.A. = Low alarm (inside for band alarm) with automatic reset (latched).

H.L. = High alarm (outside band) with manual reset (latched).

L.L. = Low alarm (inside band) with manual reset (latched).

P11 = Output 3 function

nonE = output not used.

rEv = Out 3 is used as control output with reverse action.

dir = Out 3 is used as control output with direct action.

AL2.P = it is used as Alarm 2 output and the alarm 2 is programmed as process alarm.

AL2.b = it is used as Alarm 2 output and the alarm 2 is programmed as band alarm.

AL2.d = it is used as Alarm 2 output and the alarm 2 is programmed as deviation alarm.

NOTES: 1) If P11 has been changed to "rEv", the cycle time (Cy3) will be forced to 15 seconds.

If P11 has been changed to "dir", the cycle time (Cy3) will be forced to:

10 s when P22 is equal to "Alr"

4 s when P22 is equal to "OIL"

2 s when P22 is equal to "H2O".

2) The relations among P5, P9 and P11 are shown by the following notes:

- one Out only can be configured as "rEv" output.

- one Out only can be configured as "dir" output.

- if no Output is configured as control output the instrument will operate as an indicator.

P12 = Alarm 2 operating mode

Available only when P11 is equal to "AL2.P", "AL2.b" or "AL2.d".

- H.A. = High alarm (outside for band alarm) with automatic reset (latched).
L.A. = Low alarm (inside for band alarm) with automatic reset (latched).
H.L. = High alarm (outside band) with manual reset (latched).
L.L. = low alarm (inside band) with manual reset (latched).

P13 = Programmability of the alarm 2 threshold and hysteresis values

Available only when P11 is equal to "AL2.P", "AL2.b" or "AL2.d".

- OPrt = Alarm 2 threshold and hysteresis are programmable in the operating mode.
COntF = Alarm 2 threshold and hysteresis are programmable in configuration mode.

P14 = Alarm 2 threshold value

Available only when P11 is equal to "AL2.P", "AL2.b" or "AL2.d" and P13 is equal to "COntF".

- Range: For process alarm - within the range limits.
For band alarm - from 0 to 500 units.
For deviation alarm - from -500 to 500 units.

P15 = Alarm 2 hysteresis value

Available only when P11 is equal to "AL2.P", "AL2.b" or "AL2.d" and P13 is equal to "COntF".

- Range: from 0.1% to 10.0% of the range selected with P3 and P4 parameters, or 1 LSD.

P16 = Threshold of the "Soft Start" function.

Threshold value in eng. units to initiate the "Soft start" function (output power limiting) at start up.
Range : within the readout span.

NOTE: This threshold value will not be taken into account when TOL = Inf.

P17 = Safety lock

- 0 = No parameter protection. The device is always in unlock condition and all parameters can be modified.
1 = The device is always in lock condition and no one of the parameters (exception made for set points [SP, SP2] and manual reset of the alarms) can be modified (for SMART status see P30 parameter).
From 2 to 4999 = This combination number is a secret value to be used, in run time (see nnn parameter) to put the device in lock/unlock condition.
For SP, SP2 and manual reset of the alarms, the lock/unlock condition has no effect (for SMART status see P30).
From 5000 to 9999 = This combination number is a secret value to be used, in run time (see nnn parameter) to put the device in lock/unlock condition.
For SP, SP2, manual reset of the alarm, AL1, AL2, the lock/unlock condition has no effect (for SMART status see P30).

NOTE: when safety lock is selected, the secret value can not be displayed again and the display will show 0, 1, SFT.A (when P17 is encompassed between 2 and 4999) or SFT.b (when P17 is encompassed between 5000 and 9999)

The configuration procedure is completed and the instrument shows " - . - . - . - . " on both displays.

If no other setting is necessary, push the FUNC pushbutton, the display returns to show "COnF". Otherwise access to the advanced configuration parameter proceeding as follows:

- 1) using ▲ and ▼ pushbuttons to set the 262 code on the display.
- 2) push the FUNC pushbutton.

P18 = Main control output action

This parameter is skipped if none of the outputs is configured as control output.

nOrL = the power output is equal to the result of PID calculation.

CnPL = the power output is complemented (100 - PID calculation).

P19 = Displayed value of the main power output

This parameter is skipped if none of the outputs is configured as control output.

nOrL = the displayed value is equal to the result of PID calculation.

CnPL = the displayed value is complemented (100 - PID calculation).

P20 = Secondary control output action

This parameter is available only when two control outputs are configured.

nOrL = the power output is equal to the result of PID calculation.

CnPL = the power output is complemented (100 - PID calculation).

P21 = Displayed value of the power output for the secondary control output

This parameter is available only when two control outputs are configured.

nOrL = the displayed value is equal to the result of PID calculation.

CnPL = the displayed value is complemented (100 - PID calculation).

NOTE: when two control outputs are configured, the P18 and P19 selections are applied to the "rEv" control output while P20 and P21 selections are applied to the "dir" control output.

P22 = Cooling media.

Available only when the device is configured with two control outputs.

Air = Air is used as cooling media.

OIL = Oil is used as cooling media.

H2O = Direct water is used as cooling media.

Changing P22 parameter, the instrument forces the cycle time and relative cooling gain parameters to the default value related with the chosen cooling media

When P22 = Air - Cyx = 10 s and rC = 1.00

P22 = OIL - Cyx = 4 s and rC = 0.80

P22 = H2O - Cyx = 2 and rC = 0.40

Where Cyx is the cycle time(Cy2 or Cy3) of the out programmed as "dir" control output.

P23 = Relative cooling gain calculated by SMART function.

Available only when device is configured with two control outputs.

OFF = SMART algorithm does not calculate the rC parameter value

On = SMART algorithm calculates the rC parameter value.

P24 = Alarm 1 action

Available only when P9 = "AL1.P", "AL1.d" or "AL1.b".

dir = direct action (relay energized in alarm condition)

rEV = reverse action (relay de-energized in alarm condition)

P25 = alarm 1 stand-by (mask) function

Available only when P9 = "AL1.P", "AL1.d" or "AL1.b".

OFF = stand-by (mask) function disabled

On = stand-by (mask) function enabled

NOTE: If the alarm is programmed as band or deviation alarm, this function masks the alarm condition after a set point change or at the instrument start-up until the process variable reaches the alarm threshold plus or minus hysteresis. If the alarm is programmed as a process alarm, this function masks the alarm condition at instrument start-up until the process variable reaches the alarm threshold plus or minus hysteresis.

P26 = Alarm 2 action

Available only when P11 = "AL2.P", "AL2.d" or "AL2.b".

dir = direct action (relay energized in alarm condition)

rEV = reverse action (relay de-energized in alarm condition)

P27 = Alarm 2 stand-by (mask) function

Available only when P11 = "AL2.P", "AL2.d" or "AL2.b".

OFF = Stand-by (mask) function disabled

On = Stand-by (mask)function enabled

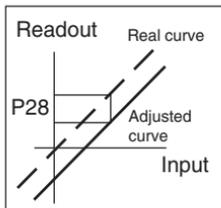
NOTE: for more details to stand-by (mask) function, see P25 parameter.

P28 = OFFSET adjustment added to the measured value

This parameter allows to set a constant OFFSET throughout the readout range.

It is skipped for linear inputs

- For readout ranges with decimal figure, P28 is programmable from -19.9 to 19.9.
- For readout ranges without decimal figure, P28 is programmable from -199 to 199.



P29 = Displayable protected parameters

This parameter is skipped when P17 = 0.

OFF = Protected parameters cannot be displayed.

On = Protected parameter can be displayed.

P30 = SMART function

This parameter is skipped when none of the outputs is programmed as control output.

0 = SMART function disabled.

1 = SMART function is NOT protected by safety lock.

2 = SMART function is under safety lock protection.

P31 = Maximum value of the proportional band calculated by the SMART algorithm.

This parameter is skipped when none of the outputs is programmed as control output or P30=0.

This parameter is programmable from P32 value to 200.0 %.

P32 = Minimum value of the proportional band calculated by the SMART algorithm.

This parameter is skipped when none of the outputs is programmed as control output or P30=0. It is programmable from 1.0% to P31 value.

P33 = Minimum value of the integral time calculated by the SMART algorithm.

This parameter is skipped when none of the outputs is programmed as control output or P30=0.

It is programmable from 00.01[mm.ss] to 02.00 [mm.ss].

P34 = MANUAL function

This parameter is skipped when none of the outputs is programmed as control output.

OFF = manual function is disabled

On = manual function can be enabled/disabled by MAN pushbutton.

P35 = Device status at instrument start up.

This parameter is skipped when none of the outputs is programmed as control output or P34=OFF.

0 = the instrument starts in AUTO mode.

1 = the instrument starts in MANUAL mode with power output set to 0.

2 = the instrument starts in the same way it was left prior to power shut down but if the instrument was in manual mode, it will restart with a power output equal to 0.

3 = the instrument starts in the same way it was left prior to power shut down but if the instrument was in manual mode, it will restart with the same power output it had prior to power shut down.

P36 = Timeout selection

This parameter allows to set the time duration of the timeout for parameter setting used by the instrument during the operating mode.

tn. 10 = 10 seconds

tn. 30 = 30 seconds

P37 = Conditions for output safety value

This parameter is skipped when none of the outputs is programmed as control output.

0 = No safety value (see "Error Messages")

1 = Safety value is applied when overrange or underrange condition is detected.

2 = Safety value is applied when overrange condition is detected.

3 = Safety value is applied when underrange condition is detected.

P38 = Output safety value

This parameter is skipped when none of the outputs is programmed as control output or P37 = 0.

This value can be set

- from 0.0 to 100.0 % when the device is configured with one control output only.

- from -100.0 % to 100.0 % when the device is configured with two control outputs.

NOTE: when the instrument detects an out of range condition, it assigns the P38 value to the PID output but P18 and P20 parameter are still active.

P39 = Digital filter on the displayed value

It is possible to apply to the displayed value a digital filter of the first order with a time constant equal to :

- 4 s for TC and RTD inputs
- 2 s for linear inputs

nOFL. = no filter

FLtr = filter enabled

P40 = Digital filter on the retransmitted value

This parameter is available only if P5 = PV.rt. It is possible to apply to the retransmitted value a digital filter of the first order with a time constant equal to :

- 4 s for TC and RTD inputs
- 2 s for linear inputs

nOFL. = no filter

FLtr = filter enabled

P41 = Control action type

This parameter is skipped when none of the outputs is programmed as control output.

Pid. = The process is controlled by PID action.

PI. = The process is controlled by PI action.

P42 = Extension of the anti-reset-wind up

Range: from -30 to +30 % of the proportional band.

NOTE: a positive value increases the high limit of the anti-reset-wind up (over set point) while a

negative value decreases the low limit of the anti-reset-wind up (under set point).

P43 = Set point indication

Fn.SP = during operative mode, when the instrument performs a ramp, it will show the final set point value.

OP.SP = during operative mode, when the instrument performs a ramp, it will show the operative set point.

P44 = Operative set point alignment at instrument start up

0 = At start up, the operative set point will be aligned to SP or SP2 according to the digital input status.

1 = At start up, the operative set point will be aligned to the measured value, the selected set point value will be reached by the programmed ramp (see Grd1 and Grd2 operative parameters).

NOTE: if the instrument detects an out of range or an error condition on the measured value it will ever operate as described for P44 = 0.

The configuration procedure is terminated and the display returns to show "CO nF".

OPERATIVE MODE

- 1) Remove the instrument from its case.
- 2) Set the internal dip switch V101 in closed condition
- 3) Re-insert the instrument.
- 4) Switch on the instrument.

DISPLAY FUNCTION

The upper display shows the measured value while the lower display shows the programmed set point value (we define the above condition as "normal display mode").

NOTE : When the rate of change (Grd1, Grd2) is utilized, the displayed set point value may be different from the operating set point.

It is possible to change the information on the lower display as follows:

- Push FUNC pushbutton for more than 3 seconds but less than 10 seconds.
The lower display will show " r. " followed by the power value of the OUT programmed as "rEV" control output (from 0.0 to 100.0%*).
- Push FUNC pushbutton again. The lower display will show "d." followed by the power value of the OUT programmed as "dir" control output (from 0.0 to 100.0%*).
- * The graphic symbol " □□.□ " means 100%.
- Push FUNC pushbutton again. The display will return in "Normal Display Mode".

NOTE : The two power outputs are displayed only if the relative function has been previously configured.

When no pushbutton is pressed during the time out (see P36), the display will automatically return in "Normal Display Mode".

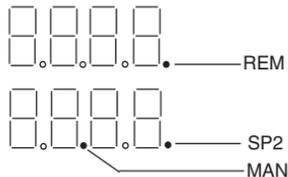
In order to keep the desired information continuously on the lower display, depress ▲ or ▼ push-button to remove the timeout.

When return in "Normal Display Mode" is desired, push FUNC push-button again.

INDICATORS

- °C Lit when the process variable is shown in Celsius degrees.
- °F Lit when the process variable is shown in Fahrenheit degrees.
- SMRT Flashing when the first part of the SMART algorithm is active.
Lit when the second part of the SMART algorithm is active.
- OUT1 It will flash with a duty cycle proportional to the linear output value.
- OUT2 Lit when OUT 2 is ON or alarm 1 is in the alarm state.
- OUT3 Lit when OUT 3 is ON or alarm 2 is in the alarm state

Other functions are shown by decimal points:



REM = Flashing, when the instrument is controlled via serial link.

SP2 = Flashing at slow rate when SP2 is used.
Flashing at fast rate when a set point from serial link is used.

MAN= Flashing at slow rate, when the instrument is in MANUAL mode.

Pushbutton functionality during operating mode.

FUNC = when the instrument is in "normal display mode"

- 1) with a brief pressure (<3s) it starts the parameter modification procedure.
- 2) with a pressure within 3s to 10s it changes the indication on the lower display (see "display function").
- 3) with a pressure longer than 10s it enables the lamp test (see "Lamp Test" paragraph).

During parameter modification, it allows to memorize the new value of the selected parameter and go to the next parameter (increasing order).

MAN = pressed for more than 1 s, it allows to enable or disable the manual function and, during parameter modification, to scroll back the parameters without memorizing the new setting.

▲ = During parameter modification, it allows to increase the value of the selected parameter.

During MANUAL mode, it allows to increase the output value.

▼ = During parameter modification, it allows to decrease the value of the selected parameter.

During MANUAL mode, it allows to decrease the output value.

▲+MAN = During parameter modification they allow to jump to the maximum programmable value.

▼+MAN = During parameter modification they allow to jump to the minimum programmable value.

NOTE: a 10 or 30 seconds time out (see P 36) can be selected for parameter modification during run time mode.

If, during operative parameter modification, no pushbutton is pressed for more than 10 (30) seconds, the instrument goes automatically to the "normal display mode" and the eventual modification of the last parameter will be lost.

ENABLE/DISABLE THE CONTROL OUTPUT

When the instrument is in "normal display mode", by keeping depressed for more than 5 s ▲ and FUNC pushbuttons, it is possible to disable the control outputs. In this open loop mode the device will function as an indicator, the lower display will show the word OFF and all control outputs will also be in the OFF state (the output is also conditioned by P18 and P20 parameters). When the control outputs are disabled the alarms are also in non alarm condition.

The alarms output conditions depend on the alarm action type (see P24-P26).

Depress for more than 5 s ▲ and FUNC pushbuttons to restore the control status.

The alarm stand-by function, if configured, will be activated as if it was at power up.

If a power down occurs when the control output is disabled, at instrument power up the control output will be automatically disabled.

SP - SP2 SELECTION

It is possible to select the operating set point (SP or SP2) only by an external contact (terminals 14 and 15).

By setting P43, it is possible to display the final or the operative set point during a ramp execution.

DIRECT ACCESS TO SET POINT

When the device is in AUTO mode and in "Normal Display Mode", it is possible to access directly to set point modification (SP or SP2).

Pushing ▲ or ▼ for more than 2 s, the set point will begin changing.

The new set point value becomes operative since no pushbutton has been depressed at the end of 2 s timeout.

MANUAL FUNCTION

The MANUAL function can be accessed (only if enabled by P34=On) by depressing the MAN pushbutton for more than 1 sec.

The command is accepted and executed only if the display is in "Normal Display Mode".

When in MANUAL mode the LED's MAN annunciator will light up while the lower display shows the power output values.

The value of "rEV" is shown in the two most significant digit field while the value of "dir" (if present) is shown in the two less significant digit field.

The decimal point between the two values will be flashing to indicate instrument in manual mode.

NOTE :

- A graphic symbol "   " is used for "rEV"= 100
- A graphic symbol "   " is used for "dir"= 100

The power output can be modified by using ▲ and ▼ pushbuttons.

In manual mode the output resolution is equal to 1%.

By depressing, for more than 1 second, MAN pushbutton the device returns in AUTO mode.

The transfer from AUTO to MANUAL and viceversa is bumpless (this function is not provided if integral action is excluded).

If transfer from AUTO to MANUAL is performed during the first part of SMART algorithm (TUNE) when returning in AUTO the device will be forced automatically in the second part of the SMART algorithm (ADAPTIVE).

At power up the device will be in the AUTO mode or as it was left prior to power shut down depending on P35 configuration selection.

NOTE:When start up occurs in Manual mode with power output set to 0, the control outputs will be in accordance with the following formula: "rEV" output - "dir" output = 0

LAMP TEST

When it is desired to verify the display efficiency, push FUNC pushbutton for more than 10 s. The instrument will turn ON, with a 50 % duty cycle, all the LEDs of the display (we define this function "LAMP TEST").

No time out is applied to the LAMP TEST.

When it is desired to come back to the normal display mode, push FUNC pushbutton again. During the LAMP TEST the instrument continues to control the process but no keyboard functions are available (exception made for the FUNC pushbutton).

SERIAL LINK

The device can be connected to a host computer by a serial link.

The host can put the device in LOCAL (functions and parameters are controlled via keyboard) or in REMOTE (functions and parameters are controlled via serial link).

The REMOTE status is signalled by the decimal point (labelled REM) at the right hand of the LSD of the upper display.

This instrument allows to modify the operative and configuration parameters, via serial link. The necessary conditions to implement this function are the following:

- 1) Serial parameters from SEr1 to SEr4 should be properly configured using the standard front keyboard procedure
- 2) Device must be in the OPERATING mode

During the downloading of configuration the device goes in open loop with all output in OFF state.

At the end of configuration procedure, the device performs an automatic reset and then returns to close loop control.

SMART function

It is used to optimize automatically the control action.

To enable the SMART function, push the FUNC pushbutton until "Snrt" parameter is shown. Pushing ▲ or ▼ set the display "On" and push the FUNC pushbutton.

The SMRT LED will turn on or flashing according to the algorithm selected.

When the smart function is enabled, it is possible to display but not to modify the control parameters.

To disable the SMART function, push the FUNC pushbutton again until "Snrt" parameter is shown. Pushing ▲ or ▼ set the display "OFF" and push the FUNC pushbutton. The SMRT LED will turn off.

The instrument maintains the actual set of control parameters and it enables parameter modification.

- NOTES :**
- 1) When ON/OFF control is programmed (Pb=0), the SMART function is disabled.
 - 2) The SMART enabling/disabling can be protected by safety key (see P30).

OPERATIVE PARAMETERS

Push the FUNC pushbutton, the lower display will show the code while the upper display will show the value or the status (On or OFF) of the selected parameter.

By ▲ or ▼ pushbutton it is possible to set the desired value or the desired status.

Pushing the FUNC pushbutton, the instrument memorizes the new value (or the new status) and goes to the next parameter.

Some of the following parameter may be skipped according to the instrument configuration.

Param. DESCRIPTION

SP	Set point (in eng. units). Range: from rL to rH. SP is operative when the logic input is open.
Snrt	SMART status. The On or OFF indication shows the actual status of the SMART function (enabled or disabled respectively). Set On to enable the SMART function. Set OFF to disable the SMART function.
n.rSt	Manual reset of the alarms. This parameter is skipped if none of the alarms has the manual reset function. Set On and push FUNC to reset the alarms.
SP2	Set point 2 (in eng. units). Range: from rL to rH. SP2 is operative when the logic input is closed.
nnn	Software key for parameter protection. This parameter is skipped if P17 = 0 or 1 On = the instrument is in LOCK condition OFF = the instrument is in UNLOCK condition

When it is desired to switch from LOCK to UNLOCK condition, set a value equal to P17 parameter.

When it is desired to switch from UNLOCK to LOCK condition, set a value different from P17 parameter.

AL1

Alarm 1 threshold

This parameter is available only if P 9 is equal to AL1.P, AL1.b or AL1.d.

Ranges:

- Span limits for process alarm.
- From 0 to 500 units for band alarm.
- From -500 to 500 units for deviation alarm.

HSA1

Alarm 1 hysteresis

This parameter is available only if P 9 is equal to AL1.P, AL1.b or AL1.d.

Range: From 0.1% to 10.0% of the input span or 1 LSD.

Note: If the hysteresis of a band alarm is larger than the alarm band, the instrument will use an hysteresis value equal to the programmed band minus 1 digit.

AL2

Alarm 2 threshold

This parameter is available only if P 11 is equal to AL2.P, AL2.b or AL2.d and P13 = OPrt.

For other details see AL1parameter.

HSA2

Alarm 2 hysteresis

This parameter is available only if P 11 is equal to AL2.P, AL2.b or AL2.d and P13 = OPrt.

For other details see HSA1parameter.

Pb

Proportional band

Range: from 1.0% to 200.0% of the input span.

When Pb parameter is set to 0, the control action becomes ON-OFF.

	Note: When device is working with SMART algorithm the Pb value will be limited by P31 and P32 parameters.	Cy3	Output 3 cycle time This parameter is available only if P11 is equal to rEv or dir. Range:From 1 to 200 s.
HyS	Hysteresis for ON/OFF control action This parameter is available only when Pb=0. Range: from 0.1% to 10.0% of the input span.	rC	Relative Cooling gain. This parameter is available only when device is configured with two control outputs and Pb is different from zero or device is in manual mode. Range: from 0.20 to 1.00
ti	Integral time This parameter is skipped if Pb=0 (ON/OFF action). Range: from 00.01 to 20.00 [mm.ss]. Above this value the display blanks and integral action is excluded. Note: When the device is working with SMART algorithm, the minimum value of the integral time will be limited by P33 parameter.		Note: When the device is working with SMART algorithm and P23 is set to On the RCG value is limited in accordance with the selected type of cooling media: - from 0.85 to 1.00 when P22 = Alr - from 0.80 to 0.90 when P22 = OIL - from 0.30 to 0.60 when P22 = H2O
td	Derivative time This parameter is skipped if Pb=0 (ON/OFF action) or P41 = Pi. Range:From 00.00 to 10.00 mm.ss. Notes: When device is working with SMART algorithm the td value will be equal to a quarter of ti value.	OLAP	Dead band/Overlap between H/C outputs. This parameter is available only when device id configured with two control outputs and Pb is different from zero or device is in manual mode. Range: from -20 to 50 % of the proportional band. A negative OLAP value shows a dead band while a positive value shows an overlap.
IP	Integral pre-load Ranges: - from 0.0 to 100.0 % of the output span if device is configured for one control output. - from -100.0 to 100.0 % of the output span if device is configured for two control outputs.	rL	Set point low limit Range: from initial scale value (P3) to rH. Note: When P3 has been modified, rL will be realigned to it.
Cy2	Output 2 cycle time This parameter is available only if P9 is equal to rEv or dir. Range:From 1 to 200 s.	rH	Set point high limit Range:from rL to full scale value (P4). Note: When P4 has been modified, rH will be realigned to it.

- Grd1 **Ramp applied to an increasing set point change**
Range: from 1 to 100 digits per minute.
Above this value the display shows "InF" meaning that the transfer will be done as a step change.
- Grd2 **Ramp applied to a decreasing set point changes**
For other details see Grd1 parameter.
- OLH **Output high limit**
Range:
- From 0.0 to 100.0 % of the output span when device is configured with one control output.
- From -100.0 to 100.0% of the output span when device is configured with two control outputs.
- tOL **Time duration of the output power limiter (soft start)**
Range: from 1 to 540 min. Above this value the display shows "InF" meaning that the limiting action is always on.
Note: The tOL can be modified but the new value will become operative only at the next instrument start up.
- mP **Control output max. rate of rise**
This parameter is available only when Pb is different from zero or one control output is a linear output type.
Range: From 0.1 % to 25.0 % of the output span/second. Above this value the display shows "InF" meaning that no limit is imposed.
Note:the mP parameter is active on a linear control output even if the device is in ON/OFF control mode.

ERROR MESSAGES

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 P37 is equal to 0, the following conditions may occur:

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

When P37 is different from zero and an out of range condition is detected, the instrument operates in accordance with P37 and P38 parameters.

NOTE: in every cases, the P18 and P20 parameters will conditioned the real outputs of the instrument.

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 : For 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)

For RTD input a special test is provided to signal OVERRANGE when input resistance is less than 15 ohm (Short circuit sensor detection).

ERROR MESSAGES

The instrument performs same self-diagnostic algorithm.

When an error is detected, the instrument shows on the lower display the "Err" indication while the upper display shows the code of the detected error.

ERROR LIST

SEr	Serial interface parameter error.
100	Write EEPROM error.
150	CPU error.
200	Tentative to write on protected memory.
201 - 2xx	Configuration parameter error. The two less significant digits shown the number of the wrong parameter (ex. 209 Err shows an Error on P9 parameter)
299	Error on control output selection.
301	Selected input calibration error
307	RJ input calibration error
320	Analog retransmission calibration error.
400	Control parameters error
500	Auto-zero error
502	RJ error
510	Error during calibration procedure.

NOTES

- 1) When a configuration parameter error is detected, it is sufficient to repeat the configuration procedure of the specified parameter.
- 2) If error 400 is detected, push contemporarily the ▼ and ▲ pushbuttons for loading the default parameters then repeat control parameter setting.
- 3) For all the other errors, contact your supplier.

GENERAL INFORMATIONS

GENERAL SPECIFICATIONS

Case: Polycarbonate grey dark color; self-extinguishing degree: V-0 according to UL 94.

Front protection - designed and tested for IP 65 (*) and NEMA 4X (*) for indoor locations (when panel gasket is installed).

(*) Test were performed in accordance with CEI 70-1 and NEMA 250-1991 STD.

Installation: panel mounting.

Rear terminal block: 15 screw terminals (screw M3, for cables from ϕ 0.25 to ϕ 2.5 mm² or from AWG 22 to AWG 14) with connection diagrams and safety rear cover.

Dimensions: DIN 43700 48 x 48 mm, depth 122 mm.

Weight: 250 g.

Power supply:

- 100V to 240V AC 50/60Hz (-15% to + 10% of the nominal value).

- 24 V AC/DC (\pm 10 % of the nominal value).

Power consumption: 6 VA max.

Insulation resistance: > 100 M Ω according to IEC 1010-1.

Dielectric strength: 1500 V rms according to IEC 1010-1.

Display updating time: 500 ms.

Sampling time: 250 ms for linear inputs
500 ms for TC and RTD inputs.

Resolution: 30000 counts.

Accuracy: \pm 0,2% f.s.v.. \pm 1 digit @ 25 °C ambient temperature.

Common mode rejection: 120 dB @ 50/60 Hz.

Normal mode rejection: 60 dB @ 50/60 Hz.

Electromagnetic compatibility and safety

requirements: This instrument is marked CE. Therefore, it is conforming to council directives 89/336/EEC (reference harmonized standard

EN 50081-2 and EN 50082-2) and to council directives 73/23/EEC and 93/68/EEC (reference harmonized standard EN 61010-1).

Installation category: II

Temperature drift: (CJ excluded)

< 200 ppm/°C of span for mV and TC ranges 1, 3, 5, 7, 20, 21, 22, 24.

< 300 ppm/°C of span for mA/V

< 400 ppm/°C of span for RTD range 11, 28 and TC range 0, 2, 4, 6, 23.

< 500 ppm/°C of span for RTD range 10 and TC ranges 8, 9, 25, 26.

< 800 ppm/°C of span for RTD range 27.

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 SWITCH for protection against tampering of configuration and calibration parameters.

INPUTS

A) THERMOCOUPLE

Type : L -J -K -N -R -S -T. °C/°F selectable.

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.

Cold junction: automatic compensation from 0 to 50 °C.

Cold junction accuracy : 0.1 °C/°C

Input impedance: > 1 M Ω

Calibration : according to IEC 584-1 and DIN 43710 - 1977.

STANDARD RANGES TABLE

T/C type	Ranges		
L	0	0 /+ 400.0°C	---
L	1	0 /+ 900 °C	20 0 / + 1650 °F
J	2	-100.0/ + 400.0°C	---
J	3	-100 / + 1000 °C	21 -150 / + 1830 °F
K	4	-100.0/ + 400.0°C	---
K	5	-100 /+ 1370 °C	22 -150 / + 2500 °F
T	6	-199.9/ + 400.0°C	23 -330 / + 750 °F
N	7	-100 /+ 1400 °C	24 -150 / + 2550 °F
R	8	0 /+ 1760 °C	25 0 / + 3200 °F
S	9	0 /+ 1760 °C	26 0 / + 3200 °F

B) RTD (Resistance Temperature Detector)

Input: for RTD Pt 100 Ω, 3-wire connection.

Input circuit: current injection.

°C/°F selection: via front pushbuttons or serial link.

Line resistance: automatic compensation up to 20 Ω/wire with no measurable error.

Calibration: according to DIN 43760

Burnout: up scale. **NOTE:** a special test is provided to signal OVERRANGE when input resistance is less than 15 Ω.

STANDARD RANGES TABLE

Input type	Ranges	
RTD Pt 100 Ω DIN 43760	10	- 199,9 / + 400,0 °C
	11	- 200 / + 800 °C
	27	-199,9 / +400,0 °F
	28	-330 / + 1470 °F

C) LINEAR INPUTS

Read-out: 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, 1-5 V and 2-10 V input types.

It shows the burn out condition as an underrange or an overrange condition (selectable by soldering jumper) for 0-60 mV and 12-60 mV input types. No indication are available for 0-20 mA, 0-5 V and 0-10 V input types.

Input type		impedance	Accuracy
12	0 - 60 mV	> 1 MΩ	0.2 % + 1 digit @ 25°C
13	12 - 60 mV		
14	0 - 20 mA	< 5 Ω	
15	4 - 20 mA		
16	0 - 5 V		
17	1 - 5 V	> 200 kΩ	
18	0 - 10 V	> 400 kΩ	
19	2 - 10 V		

D) LOGIC INPUT

The instrument is equipped with one input from contact (voltage free) for setpoint selection.

Contact open = Main setpoint.

Contact closed = Auxiliary setpoint.

NOTES

- 1) Use an external contact with a contact rating better than 0.5 mA, 5 V DC.
- 2) The instrument needs 100 ms to recognize a contact status variation.
- 3) The logic inputs are **NOT** isolated by the measuring input.

SET POINTS

This instrument allows to use 2 set points: SP and SP2.

The set point selection is possible only by logic input.

Set point transfer:

The transfer between one set point to another (or between two different set point values) may be realized by a step transfer or by a ramp with two different programmable rate of change (ramp up and ramp down).

Slope value: 1 - 100 eng. unit/min or step.

Set points limiter: RLO and RHI parameters, programmable.

CONTROL ACTIONS

Control action: PID + SMART

Type: One (heating or cooling) or two (heating and cooling) control outputs.

Proportional Band (Pb):

Range: - from 1.0 to 100.0 % of the input span for process with one control output.

- from 1.5 to 100.0 % of the input span for process with two control outputs.

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 time (Ti): from 1 s to 20 min. or excluded.

Derivative time (Td): from 1 s to 10 min.

If zero value is selected, the derivative action is excluded.

Integral pre-load:

- from 0.0 to 100.0 % for one control output

- from -100.0 (cooling) to +100.0 % (heating) for two control outputs.

SMART: keyboard enabling/disabling

Auto/Manual: selectable by front pushbutton.

Auto/Manual transfer: bumpless method type

Indicator "MAN" : OFF in auto mode and lit in manual mode.

OUTPUTS

Type: This instrument is equipped with 3 independent outputs programmable as follows:

Out 1 linear (mA)	Out 2 relay	Out 3 relay
Heating	AL1	AL2
Heating	Cooling	AL2
Heating	AL1	Cooling
Cooling	AL1	AL2
Cooling	Heating	AL2
Cooling	AL1	Heating
Retransm.	Heating	AL2
Retransm.	AL1	Heating
Retransm.	Cooling	AL2
Retransm.	AL1	Cooling
Retransm.	Heating	Cooling
Retransm.	Cooling	Heating
Retransm.	AL1	AL2

Control output updating time :

- 250 ms when a linear input is selected

- 500 ms when a TC or RTD input is selected.

Action: direct/reverse programmable by front keyboard.

Output level indication:

The instrument displays separately the output 1 level (heating) and the output 2 level (cooling).

Output status indication: the OUT 1 LED will flash with a duty cycle proportional to the output 1 power. Two indicators (OUT 2 and/or OUT 3) are lit when the respective output is in ON condition.

Output level limiter:

- For one control medium: from 0 to 100 % .
- For two control mediums: from -100 to +100 %.

This function may be operative at instrument start up for a programmable time (To avoid thermal shock and/or preheating the plant) otherwise it can be enabled by an external contact.

OUTPUT 1

Type: optoisolated 0-20 mA or 4-20 mA programmable.

Function: programmable as:

- control output (heating or cooling)
- retransm. of the measured value
- retransm. of the operative set point.

Scaling: programmable from -1999 to 9999.

Maximum load: 500 Ω .

Resolution:

- 0.1 % when used as control output.
- 0.05 % when used as analog retransmission.

Digital filter: it is possible to enable a digital filter, on the output retransmission, with the same time constant chosen for the read-out.

Output level indication (as control output only): from 00.0 to 100.0 %.

Output status indication: the indicator OUT 1 flashes with a duty cycle proportional to the output level.

OUTPUT 2

Type: relay SPST contact (NO or NC selectable by jumper).

Contact rated: 2 A at 250 V AC on resistive load.

Function: programmable as:

- control output (heating or cooling)
- Alarm 1 output

Output cycle time (when used as control output) programmable from 1 s to 99 s.

OUTPUT 3

Type: relay with SPST contact with rated current 2 A at 250 V AC on resistive load.

Function: programmable as:

- control output (heating or cooling)
- Alarm 2 output.

Output cycle time (when used as control output) programmable from 1 s to 200 s.

ALARMS

Actions: Direct or reverse acting.

Alarm functions: each alarm can be configured as process alarm, band alarm or deviation alarm.

Alarm reset: automatic or manual reset programmable on each alarm.

Stand by (mask) alarm: each alarm can be configured with or without stand by (mask) function.

This function allows to delete false indication at instrument start up and/or after a set point change.

Process alarm:

Operative mode : High or low programmable.

Threshold : programmable in engineering unit within the input span.

Hysteresis: programmable from 0.1 % to 10.0 % of the input span (P4 - P3), or 1 LDS.

Band alarm:

Operative mode: Inside or outside programmable.

Threshold : programmable from 0 to 500 units.

Hysteresis : programmable from 0.1 % to 10.0 % of the input span or 1 LDS.

Deviation alarm

Operative mode : High or low programmable.

Threshold : programmable from - 500 to +500 units.

Hysteresis : programmable from 0.1 % to 10.0 % of the input span or 1 LDS.

SERIAL COMMUNICATION INTERFACE

Type: RS-485

Protocol type: MODBUS, JBUS, ERO polling/ selecting.

Baud rate: programmable from 600 to 19200 BAUD.

Byte format: 7 or 8 bit programmable.

Parity: even, odd or none programmable.

Stop bit : one.

Address :

- from 1 to 95 for ERO protocol

- from 1 to 255 for all the other protocols

Output voltage levels: according to EIA standard.

SUPPLY TERMINALS AND FROM RELAY OUTPUT TERMINALS

- 2) Remove the instrument from case.
- 3) Using a vacuum cleaner or a compressed air jet (max. 3 kg/cm²) remove all deposit of dust and dirt which may be present on the louvers and on the internal circuits trying to be careful for not damage the electronic components.
- 4) To clean external plastic or rubber parts use only a cloth moistened with:
 - Ethyl Alcohol (pure or denatured) [C₂H₅OH] or
 - Isopropil Alcohol (pure or denatured) [(CH₃)₂CHOH] or
 - Water (H₂O)
- 5) Verify that there are no loose terminals.
- 6) Before re-inserting the instrument in its case, be sure that it is perfectly dry.
- 7) re-insert the instrument and turn it ON.

MAINTENANCE

- 1) REMOVE POWER FROM THE POWER

APPENDIX A DEFAULT PARAMETERS

DEFAULT OPERATIVE 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:

- The internal switch should be closed.
- The SMART function should be disabled.
- The upper display will show the process variable while the lower display will show the set point value.
- the device must be in "UNLOCK" and "LOCAL" conditions
- Held down ▼ pushbutton and press ▲ pushbutton; the display will show:



A rectangular display box with a black border. The top half contains the word "OFF" in large, bold, black capital letters. The bottom half contains the text "dFLt" in smaller, black capital letters.

- Press ▲ or ▼ pushbutton; the display will show:



A rectangular display box with a black border. The top half contains the word "ON" in large, bold, black capital letters. The bottom half contains the text "dFLt" in smaller, black capital letters.

- Press FUNC pushbutton; the display will show:



A rectangular display box with a black border. The word "LOAD" is displayed in large, bold, black capital letters across the center.

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 operative parameters loaded during the above procedure:

PARAMETER	DEFAULT VALUE
SP	= Minimum range-value
SnrT	= Disabled
n.Srt	= OFF
SP2	= Minimum range value
nnn	= OFF
A1, A2	= Minimum range-value for process alarms 0 for deviation or band alarms
HSA1, HSA2	= 0.1 %
Pb	= 4.0 %
HyS	= 0.5 %
ti	= 4.00 (4 minutes)
td	= 1.00 (1 minute)
IP	= 30.0 for one control output 0.0 for two control outputs
Cy2 - Cy3	= 15 seconds If two control outputs are configured and OUT2 (OUT 3) is configured as "dir", the default value will be equal to: 10 seconds when P22 = Alr 4 seconds when P22 = OIL 2 seconds when P22 = H2O
rC	= 1.00 for P22 = Alr 0.80 for P22 = OIL 0.40 for P22 = H2O
OLAP	= 0
rL	= Initial scale value
rH	= Full scale value
Grd 1	= Infinite (step transfer)
Grd 2	= Infinite (step transfer)
OLH	= 100 %
tOL	= Infinite
mP	= 25.0 % /s.

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:

- The internal switch (V101, see fig. 13) should be open.
- The upper display will show:

C O n F

- Push the ▼ pushbutton; the display will show the firmware version.

**C O n F
A. 0 0**

- Maintaining the pressure on the ▼ pushbutton push the ▲ pushbutton also.
The instrument will show:

**O F F
d F L t**

- Press ▲ pushbutton to select between table 1 (European) or table 2 (American) default set of parameters; the display will show:

**t b. 1
d F L t**

- Press FUNC pushbutton; the display will show:

L O A d

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).

PARA.	TABLE 1	TABLE 2
SEr 1	ErO	ER0
SEr 2	1	1
SEr 3	19200	19200
SEr 4	7E	7E
P1	3	21
P2	----	----
P3	0	0
P4	400	1000
P5	rEV	rEV
P6	0-20	0-20
P7	0	0
P8	400	1000
P9	nonE	nonE
P10	H.A.	H.A.
P11	nonE	nonE
P12	H.A.	H.A.
P13	OPrt.	OPrt
P14	0	0
P15	0.1	0.1
P16	0	0
P17	0	0
P18	norL	norL
P19	norL	norL
P20	norL	norL
P21	norL	norL
P22	Air	Air
P23	OFF	OFF
P24	rEV	rEV
P25	OFF	OFF
P26	rEV	rEV
P27	OFF	OFF
P28	0	0

P29	On	On
P30	2	2
P31	30.0	30.0
P32	1.0	1.0
P33	00.20	00.20
P34	On	On
P35	0	0
P36	10	30
P37	0	0
P38	0.0	0.0
P39	nO.FL	nO.FL
P40	nO.FL	nO.FL
P41	Pid	Pid
P42	10.0	10.0
P43	Fn.Sp	Fn.Sp
P44	0	0

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