SSi Super Systems

Instruction Manual

31081 (1/8 DIN)
Controller
With mA output.

INDEX GB

OUTLINE AND CUT OUT DIMENSIONS

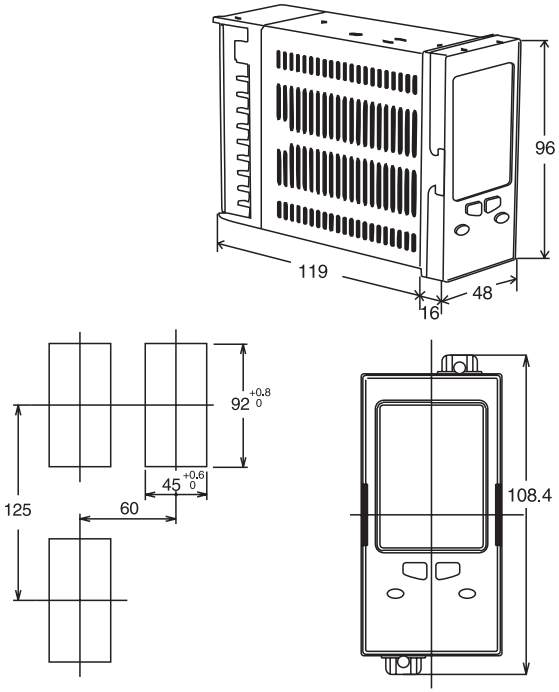


Fig. A1 31081

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

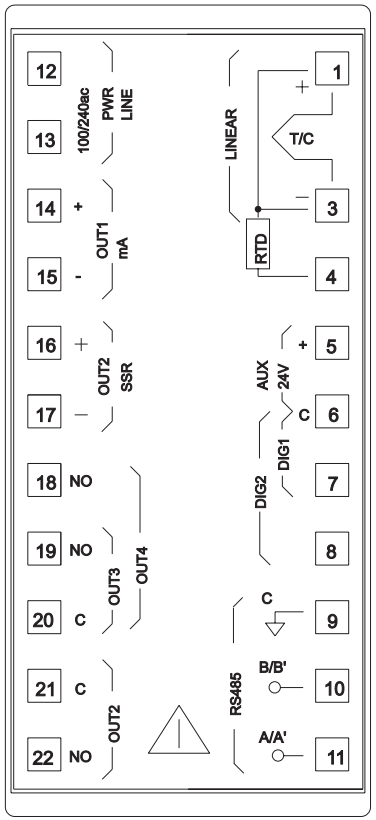


Fig. B 31081

V

MOUNTING REQUIREMENTS

This instrument is intended for permanent installation, for indoor use only, in an electrical panel which encloses the rear housing, exposed terminals and wiring on the back.
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.
For outline and cutout dimensions refer to page IV.
The surface texture of the panel must be better than 6,3 μm.
The instrument is shipped with rubber panel gasket.
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.

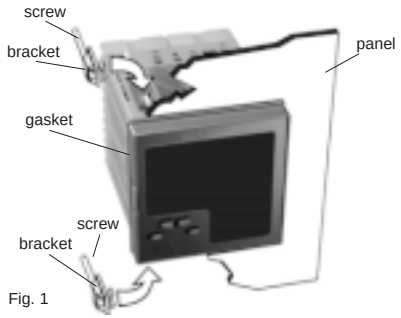


Fig. 1

CONNECTIONS

A) MEASURING INPUTS

NOTE: Any external components (like zener barriers ecc.) 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

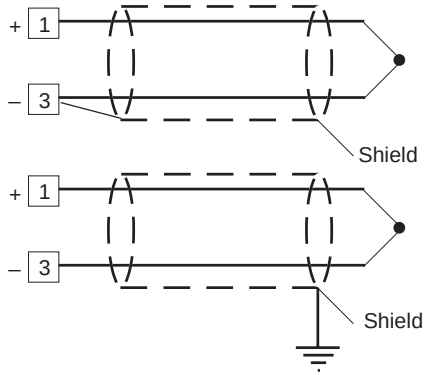


Fig. 2 THERMOCOUPLE INPUT WIRING

External resistance: 100 Ω max, maximum error 0,1% of span.
Cold junction: automatic compensation from 0 to 50 °C.
Cold junction accuracy : 0.1 °C/°C
Input impedance: > 1 MΩ
Calibration : according to IEC 584-1 and DIN 43710 - 1977.

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

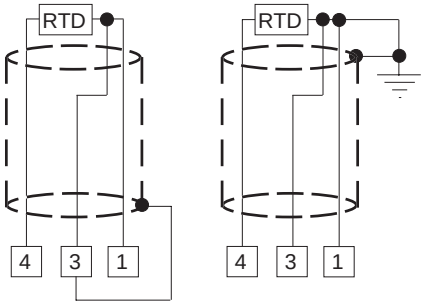


Fig. 3 RTD INPUT WIRING

Input circuit: current injection (135 μA).
Line resistance: automatic compensation up to 20 Ω/wire with no measurable error.
Calibration: according to DIN 43760

NOTES:
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

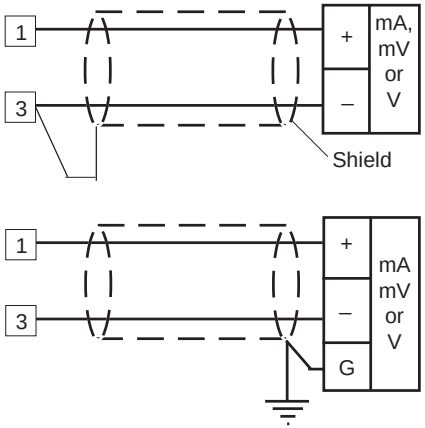


Fig. 4 mA, mV AND V INPUTS WIRING

NOTES:
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.

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

TX INPUT

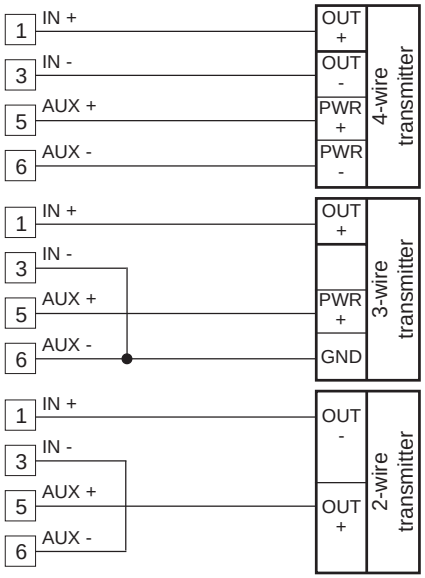


Fig. 5 TX INPUT WIRING

NOTES:

1) Don't run input wires together with power cables.
2) When shielded cable is used, it should be grounded at one side only and possibly to the terminal 6 of the instrument.
3) The impedance of the 20 mA input, is less than 5 Ω.
4) The auxiliary power supply (AUX) is rated: 24 V DC (± 10%), 25 mA maximum.
5) The auxiliary power supply (AUX) is NOT isolated from measuring input. A duble or reinforced isolation between instrument input and power line must be assured by the external transmitter.

B) LOGIC INPUT

Safety note:

1) Do not run logic input wiring together with power cables.
2) Use an external dry contact capable to switch 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. A double or reinforced isolation between logic inputs and power line must be assured by the external elements.

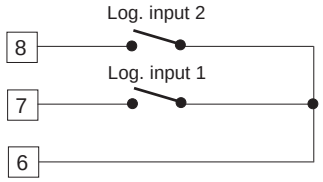


Fig. 6 - LOGIC INPUT WIRING

This instrument is provided with 4 set points (SP, SP2, SP3 and SP4).
The set point selection is possible only by logic inputs 1 and 2 (terminals 6, 7 and 8).

Logic input 1	Logic input 2	Op. Set point
open (6 - 7)	open (6 - 8)	SP
open (6 - 7)	closed (6 - 8)	SP2
closed (6 - 7)	open (6 - 8)	SP3
closed (6 - 7)	closed (6 - 8)	SP4

C) RELAY OUTPUTS

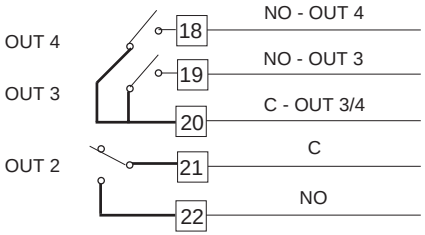


Fig. 7 RELAY OUTPUTS WIRING
All relay outputs are protected by varistor against inductive load with inductive component up to 0.5 A.
The contact rating of the OUT 2 is 3A/250V AC resistive load.
The contact rating of the OUT 3 and 4 is 2A/250V AC resistive load.
The number of operations is 1 x 10^5 at specified rating.
The following recommendations avoid serious problems which may occur, when using relay output for driving inductive loads.

NOTES:
1) To avoid electrical shock, connect power line at last.
2) For supply connections use No 16 AWG or larger wires rated for at last 75 °C.
3) Use copper conductors only.
4) Don't run input wires together with power cables.

INDUCTIVE LOADS

High voltage transients may occur when switching inductive loads.
Through the internal contacts these transients may introduce disturbances which can affect the performance of the instrument.
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. 8.

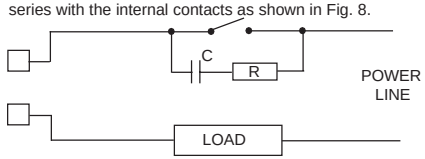


Fig. 8 EXTERNAL SWITCH IN SERIES WITH THE INTERNAL CONTACT

In this case it is recommended to install an additional RC network across the external contact as show in Fig. 10

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

LOAD (mA)	C (μF)	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

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

VOLTAGE OUTPUTS FOR SSR DRIVE

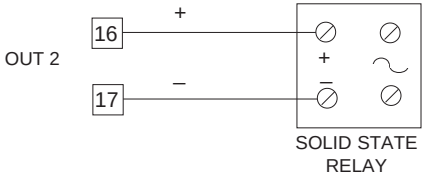


Fig. 9 SSR DRIVE OUTPUT WIRING
It is a time proportioning output.
Logic level 0: Vout < 0.5 V DC.
Logic level 1:
24 V ± 20 % @ 20 mA.
Maximum current = 20 mA.
NOTE: This output is not isolated. A duble or reinforced isolation between instrument output and power supply must be assured by the external solid state relay.

LINEAR OUTPUT
This instrument is equipped with one isolated 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.

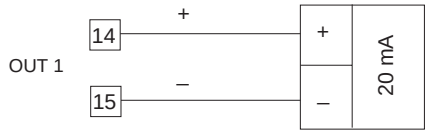


Fig. 10 mA OUTPUT WIRING

Output type: isolated 0 - 20 or 4 - 20 mA programmable.
Maximum load**:** 500 Ω.
Resolution:
- 0.1% when used as control output
- 0.05 % when used as analog retransmission.

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

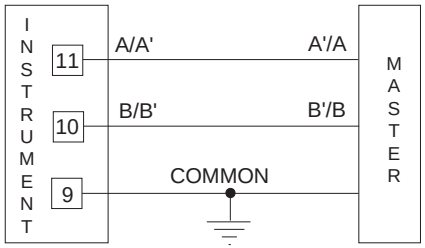


Fig. 11 - RS-485 WIRING

The cable length must not exceed 1.5 km at 9600 BAUD.
It is an isolated RS-485 interface.
Interface type: isolated RS-485
Protocol types: 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.

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).

D) POWER LINE WIRING

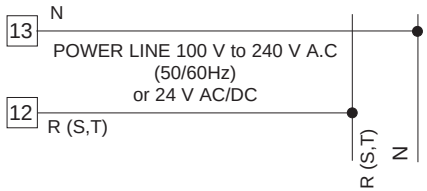


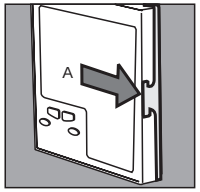
Fig. 12 POWER LINE WIRING

NOTE:
1) Before connecting the instrument to the power line, make sure that line voltage corresponds to the descrtiption on the identification label.
2) To avoid electrical shock, connect power line at the end of the wiring procedure.
3) For supply connections use No 16 AWG or larger wires rated for at last 75 °C.
4) Use copper conductors only.
5) Don't run input wires together with power cables.
6) For 24 V DC the polarity is a do not care condition.
7) The power supply input is fuse protected by a sub miniature fuse rated T, 1A, 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.
8) 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 to 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 a neutral line is present, connect it to terminal 13.

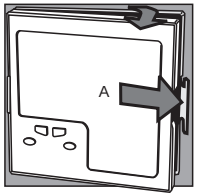
PRELIMINARY HARDWARE SETTINGS

How to remove the instrument from its case

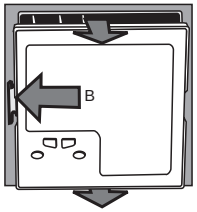
1) Switch off the instrument.
2) Push gently the lock A on the right.



3) While the lock A is maintained out, slide out the right side of the instrument.



4) Push gently the lock B on the left.
5) While the lock B is maintained out, slide out the instrument.



INPUT TYPE SELECTION

1) Remove the instrument from its case.
2) It is necessary to set J1 according to the desired input type as shown in the following figure.

INPUT	J1				
TYPE	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.

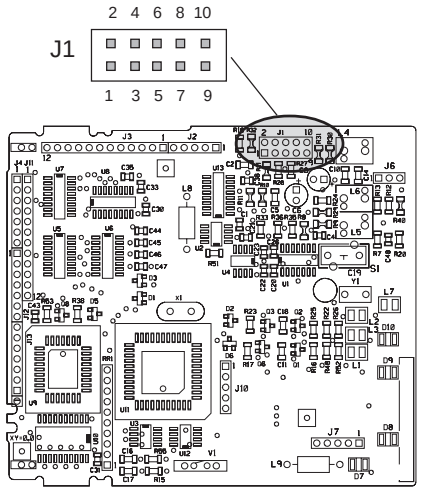


Fig. 13

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 CH102 and SH102 according to the following table:

Overrange (STD)	CH2 = close	SH2 = open
Underrange	CH2 = open	SH2 = close

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

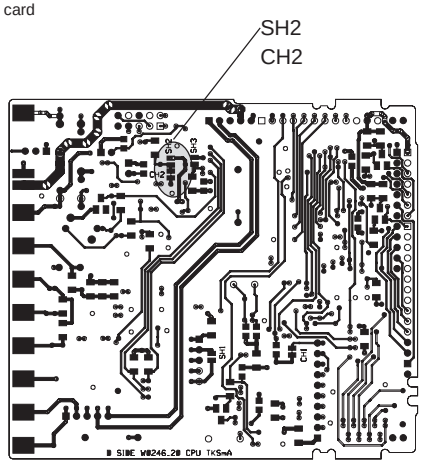


Fig. 14

SELECTION OF THE OUTPUT 2 TYPE

For the output 2 it is possible, by J303, to select the contact used (N.O. = 1-2 (STD) or N.C = 2-3) as shown below:

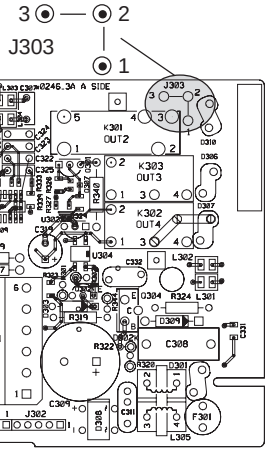


Fig. 15

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.

INSTRUMENT CONFIGURATION

Run time and configuration modes
When the instrument is in run time mode and no modification parameter is in progress, the measured variable is shown on the upper display, while the set point is shown on the lower display (we define this condition "normal display mode").

General note about graphic symbols used for mnemonic code visualization.
The instrument displays some characters with special symbols.
The following table shows the correspondence between the symbols and the characters.

symbol	character
"K"	k
"U"	W
"n"	m
"Z"	Z
"V"	V
"J"	J

CONFIGURATION PROCEDURE

At power up, the instrument starts in the same mode (configuration or run time) it was prior to the power OFF.

When it is desired to go from run-time mode to configuration mode proceed as follows:
a) keep depressed the FUNC pusbutton and push the MAN pushbutton. Maintain the pressure on both pushbuttons for more than 4 seconds, the upper display will show:

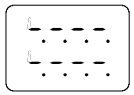
The same indication will be shown when the instrument starts in configuration mode.

b) By the ▲ or ▼ key it is possible to select between:

C.nOn = (monitor) this selection allows to monitor but not to modify the value of all configuration parameters.
C.nOd = (modify) this selection allows to monitor and to modify the value of all configuration parameters.

c) Push the FUNC pushbutton.

NOTES:
1) During monitor mode, the instrument continues to operate as in run time mode and if no push-button is depressed for more than 10 s (or 30 s according to P39 [time out selection"]), the instrument returns automatically to the normal display mode.
2) When modify mode is started, the instrument stops the control and:
   - sets control outputs to OFF;
   - sets alarms in no alarm condition;
   - disables the serial link;
   - the linear output is forced to 0 (also for 4-20 mA output)
3) If the configuration group is protected by security code the display will show:



By ▲ and ▼ keys enter a value equal to the security code set for the configuration mode or the passe-partout code (see appendix A.3).
Note: the master key allows to enter in modify configuration parameters mode either if any other configuration security code is set or if the configuration parameters are always protected (P55 = 1).

When it is desired to exit from configuration modify mode proceed as follows:
a) Push "FUNC" or "MAN" push-button more times until the "C.End" parameter is displayed.
b) Pushing "▲" or "▼" push-button select the "YES" indication.

c) Push “FUNC” push-button. The instrument ends the configuration modify mode, preforms an automatic reset and restarts in the run time mode.

Pushbutton function during configuration mode

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 PARAMETERS

Notes:

1) In the following pages we will describe all the parameters of the instrument but the instrument will show only the parameters related with the specific hardware and in accordance with the specific instrument configuration (i.e. setting OUT 3 (P12) = nonE, (not used), all the parameters related with this output will not be displayed).
2) During configuration mode, the lower display shows the mnemonic code of the selected parameter while the upper display shows the value or the status assigned to the selected parameter.

dF.Cn = Load default configuration data

Not available in monitor mode

OFF = No default data loading
tb.1 = Load table 1 default data loading (european)
tb.2 = Load table 2 default data loading (american)

For more details see appendix A.

SEr1 = Serial interface protocol

OFF = No serial interface
Ero = Polling/selecting ERO
ñbUS = 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 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 19.20.

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 without 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 P44 = P45 = FLtr. For all the remaining ranges it will set P44 = P45 = nOFL.

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.

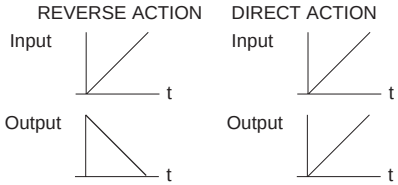
P3 = Initial scale value
For linear inputs it is programmable from -1999 to 4000. For TC and RTD input it is programmable within the input range.
Notes:
1) When this parameter is modified, rL parameter will be re-aligned to it.
2) If a linear input is selected, the value of this parameter can be greater than P4 in order to get a reverse readout.

P4 = Full scale value
For linear inputs it is programmable from -1999 to 4000. For TC and RTD inputs, it is programmable within the input range.
Notes:
1) When this parameter is modified, rH parameter will be re-aligned to it.
2) If a linear input is selected, the value of this parameter can be smaller than P3 in order to get a reverse readout.

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 ≥ 100 units.
- For TC input with °C readout, S ≥ 300 °C.
- For TC input with °F readout, S ≥ 550 °F.
- For RTD input with °C readout, S ≥ 100 °C.
- For RTD input with °F readout, S ≥ 200 °F.

P5 = Output 1 function
rEv = Out 1 used as control output with reverse action (heating).
dIr = Out 1 used as control output with direct action (cooling).
Pv.rt = Out 1 retransmits the process variable.
SP.rt = Out 1 retransmits the operative set point.



P6 = Output 1 type
0-20 = output 1 type 0 - 20 mA
4-20 = output 1 type 4 - 20 mA

P7 = Retransmission - Initial scale value
P7 is available only when P5 = Pv.rt or SP.rt.
Range: from -1999 to 4000.

P8 = Retransmission - Full scale value
P8 is available only when P5 = Pv.rt or SP.rt.
Range: from -1999 to 4000.

P9 = Output 2 function.
nonE = output not used.
rEv = Out 2 is used as control output with reverse action (heating).

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

NOTES:
Setting P9 = rEv, the "out 2cycle time" (Cy2) will be forced to: 15 seconds when P10 = rEL
4 seconds when P10 = SSr
Setting P9 = dir, the "out 2cycle time" (Cy2) will be forced to: 10 seconds when P25 = AIr
4 seconds when P25 = OIL
2 seconds when P25 = H2O

P10 = Output 2 type
This parameter is skipped when P9=nonE.
rEL = Relay SSr = SSR

NOTES:
When P9=rEv and P10 = rEL, the "out 2cycle time" (Cy2) will be forced to 15 seconds
When P9=rEv and P10 = SSr, the "out 2cycle time" (Cy2) will be forced to 4 seconds

P11 = Alarm 1 operating mode
Available only when P9 = AL1.P, AL1,b or AL1.d.
H.A. = High alarm (outside for band alarm) with automatic reset.
L.A. = Low alarm (inside for band alarm) with automatic reset.
H.L. = High alarm (outside for band alarm) with manual reset (latched).
L.L. = Low alarm (inside for band alarm) with manual reset(latched).

P12 = Output 3 function
nonE = output not used.
rEv = Out 3 is used as control output with reverse action (heating).
dir = Out 3 is used as control output with direct action (cooling).
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.

NOTE:
Setting P12 = rEv, the "out 3 cycle time" (Cy3) will be forced to 15 seconds
Setting P12 = dir, the "out 3 cycle time" (Cy3) will be forced to: 10 seconds when P25 = AIr
4 seconds when P25 = OIL
2 seconds when P25 = H2O

NOTES to P5, P9 and P12 relation.
1) Only 1 of the 3 outputs can be configured as "rEv".
2) Only 1 of the 3 outputs can be configured as "dir".
3) When none of the 3 outputs is configured as control output the instrument will operate as a standard indicator.

P13 = Alarm 2 operating mode
Available only when P12 = AL2.P, AL2.b or AL2.d.
H.A. = High alarm (outside for band alarm) with automatic reset.
L.A. = Low alarm (inside for band alarm) with automatic reset.
H.L. = High alarm (outside for band alarm) with manual reset(latched).
L.L. = Low alarm (inside for band alarm) with manual reset(latched).

P14 = Output 4 function
nonE = output not used.
AL3.P = it is used as Alarm 3 output and the alarm 3 is programmed as process alarm.
AL3.b = it is used as Alarm 3 output and the alarm 3 is programmed as band alarm.
AL3.d =it is used as Alarm 3 output and the alarm 3 is programmed as deviation alarm.

NOTE: The alarm 3 and the "Loop break alarm" are in OR condition on the same output (OUT 4).

P15 = Alarm 3 operative mode

Available only when P14 = AL3.P, AL3.b or AL3.d or P51=Enb or EnbO.

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

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

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

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

NOTE: The Loop break alarm assumes the same alarm reset type selected with P15 parameter.

P16 = Programmability of the alarm 3.

Available only when P14 = AL3.P, AL3.b or AL3.d.

OPrt = Alarm 3 threshold and hysteresis are programmable in operating mode.

COnF = Alarm 3 threshold and hysteresis are programmable in configuration mode.

P17 = Alarm 3 threshold value

Available only when P14 = AL3.P, AL3.b or AL3.d and P16 = COnF.

Range: For process alarm - within the range limits (P3 - P4).
For band alarm - from 0 to 500 units.
For deviation alarm - from -500 to 500 units

P18 = Alarm 3 hysteresis value

Available only when P14 = AL3.P, AL3.b or AL3.d and P16 = COnF..

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

P19 = 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.

NOTES:

1) This threshold value will not be taken into account when tOL = InF (power limiting ever active).
2) When it is desired to disable the soft start function, set P19 equal to the lower readout value or set the OLH parameter equal to 100.0% (no power limiting).

P20 = Security code for run time parameters

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, SP3, SP4 and alarm manual reset) can be modified (for SMART status see P35 parameter).

From 2 to 4999 = This combination number is a secret value to be used, in run time (see nnn parameter) to put device in lock/unlock condition.
For the four set points and manual reset of the alarms, the lock/unlock condition has no effect (for SMART status see P35).

From 5000 to 9999 = This combination number is a secret value to be used, in run time (see nnn parameter) to put device in lock/unlock condition.
For the four set points, AL1, AL2, AL3 and manual reset of the alarms, the lock/unlock condition has no effect (for SMART status see P35).

NOTE:when safety lock is selected, the secret value can not be displayed again and the display will show 0, 1, SFt.A (when P20 is encompassed between 2 and 4999) or SFt.b (when P20 is encompassed between 5000 and 9999).

P21 = Power output of the main control output

This parameter is skipped when no one of the output is configured as control output.

norL = the power output assigned to the main control output is the result of the PID algorithm.

cñPL = the power output assigned to the main control output is the complement of the PID result (100 - value calculated by PID algorithm).

P22 = Power output displayed for the main control output.

This parameter is skipped when no one of the output is configured as control output.

norL = the display will show the result of the PID algorithm calculated for the main control output.

cñPL= the display will show the complement to the result of the PID algorithm calculated for the main control output (100 - value calculated by PID algorithm).

P23 = Power output of the secondary control output (cooling)

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

It is applied to the control output with direct action.

norL = the power output assigned to the secondary control output is the result of the PID algorithm.

cñPL = the power output assigned to the secondary control output is the complement of the PID result (100 - value calculated by PID algorithm).

P24 = Power output displayed for the secondary control output (cooling)

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

It is applied to the control output with direct action.

norL = the display will show the result of the PID algorithm calculated for the secondary control output.

cñPL= the display will show the complement to the result of the PID algorithm calculated for the secondary control output
(100 - value calculated by PID algorithm).

P25 = Cooling media.

Available only when two control outputs are programmed.

AIr = Air
OIL = Oil
H2O = Water

Changing P25 parameter, the instrument forces the cycle time and relative cooling gain parameter to the default value related with the chosen cooling media.

When P25 = AIr - CYx = 10 s and rC = 1.00
P25 = OIL - CYx = 4 s and rC = 0.80
P25 = H2O - CYx = 2 s and rC = 0.40

P26 = Relative cooling gain calculated by SMART function.

This parameter is present only when two control outputs are programmed.

OFF = SMART algorithm does not calculate the rC parameter value

On = SMART calculates the rC parameter value.

P27 = Alarm 1 action

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

dir = direct (relay energized in alarm condition)

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

P28 = Alarm 1 stand-by function (mask)

Available only when P9 = AL1.P, AL1.b or AL1.d.
OFF = stand-by function disabled
On = stand-by 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 process variable reaches the alarm threshold plus or minus hysteresis.

P29 = Alarm 2 action

Available only when P12 = AL2.P, AL2.b or AL2.d.

dir = direct (relay energized in alarm condition)

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

P30 = Alarm 2 stand by function (mask)

Available only when P12 = AL2.P, AL2.b or AL2.d.
OFF = Stand by disabled
On = Stand by enabled

P31 = Alarm 3 action

Available only when P14 is different from nonE and P51 is different from diS.

dir = direct (relay energized in alarm condition)

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

P32 = alarm 3 stand by function (mask)

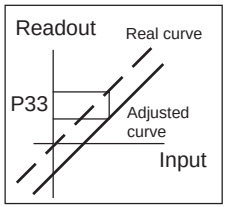
Available only when P14 is different from nonE.
OFF = Stand by disabled
On = Stand by enabled

P33 = OFFSET applied to the measured value

This will set a constant OFFSET throughout the readout range. It is skipped for linear inputs.

- For readout ranges with decimal figure, P33 is programmable from -19.9 to 19.9.

- For readout ranges without decimal figure, P33 is programmable from -199 to 199.



P34 = Displayable protected parameters
This parameter is skipped when P20 = 0.
OFF = Protected parameters cannot be displayed.
On = Protected parameter can be displayed.

P35= SMART function
This parameter is skipped when no one of the output is configured as control output.
0 = SMART function disabled.
1 = The SMART enable/disable is NOT protected by safety lock.
2 = The SMART enable/disable is under safety lock protection.

P36 = Maximum value of the proportional band calculated by the SMART algorithm.
This parameter is skipped when no one of the output is configured as control output or P35 =0.
This parameter is programmable from P37 value to 200.0 %.

P37 = Minimum value of the proportional band calculated by the SMART algorithm.
This parameter is skipped when no one of the output is configured as control output or P35 =0.
It is programmable from 1.0% to P36 value.

P38 = Minimum value of the integral time calculated by the SMART algorithm.
This parameter is skipped when no one of the output is configured as control output or P35 =0.
It is programmable from 00.01[mm.ss] to 02.00 [mm.ss].

P39 = MANUAL function
This parameter is skipped when no one of the output is configured as control output.
OFF = manual function is disabled
On = manual function can be enabled/disabled by MAN pushbutton or serial link.

P40 = Device status at instrument start up.
This parameter is skipped when no one of the output is configured as control output or P39 =OFF.
0 = The instrument starts in AUTO mode.
1 = It starts in manual mode with power output =0
2 = It starts in the same way it was prior to the power shut down (if in manual mode the power output is set to zero).
3 = It starts in the same way it was prior to the power shut down (if in manual mode the power output will be the last value prior to power shut down).

P41 = 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

P42 = Conditions for output safety value
This parameter is skipped when no one of the output is configured as control output.
0 = No safety value (see "Error Messages" chapter)
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.

P43 = Output safety value
This parameter is skipped when no one of the output is configured as control output or P42 = 0.
It can be set
- from 0 to 100 % when one control output is selected
- from -100 % to 100 % when two control outputs are selected

P44 = Digital filter on the measured 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

P45 = Digital filter on the retransmitted value
This parameter is available only when 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

P46 = Control action type.
This parameter is skipped when none of the output is configured as control output.
Pid = The instrument operates with a PID algorithm.
Pi = The instrument operates with a PI algorithm.

P47 - Set point access
0 only SP is accessible.
1 only SP and SP2 are accessible.
2 all 4 set points are accessible.

P48 = 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).

P49 = 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.

P50 = Operative set point alignment at instrument start up
0 = At start up the operative set point will be aligned to the set point selected 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 P50 = 0.

P51 = "Loop break alarm" function.
dIS = Alarm not used
Enb = The alarm condition of the "Loop break alarm" (LBA) will be shown by the OUT 4 LED only.
EnbO = The alarm condition of the "Loop break alarm" (LBA) will be shown by the OUT 4 LED and by the OUT 4 relay status.

NOTES:
1) The alarm 3 and the "Loop break alarm" are in OR condition on the same output (OUT 4).
2) The alarm 3 action type is programmed by P31 parameter.
3) The loop break alarm reset type is programmed by P15 parameter.
4) For more details see "Loop Break Alarm function" at pag 19.

P52 = Loop break alarm deviation
This parameter is available only when P51 is different from "diS".
Range: from 0 to 500 units.

P53 = Loop break alarm time.
This parameter is available only when P51 is different from "dIS".
Programmable from 00.01 to 40.00 mm.ss.

P54 = Loop break alarm hysteresis.
This parameter is available only when P51 is different from "dIS".
Programmable from 1to 50% of the power output.

P55 = Security code for configuration parameters
0 No protection (it is always possible to modify all configuration parameters);
1 Always protected (it is not possible to modify any configuration parameter);
from 2 to 9999 security code for configuration parameter protection.

Notes:
1) If a value from 2 to 9999 has been assigned as security code it cannot be displayed anymore, when returning on this parameter the display will show "On".
2) If the security code is forgotten a master key code is available, by this code it is ever possible to enter in modify configuration mode (S.CnF = 1 or from 2 to 9999).
The master key code is located in Appendix A.
Fill out and cut the part of the Appendix A reserved to the security codes if it is desired to keep them secrets.

C. End = End configuration
This parameter allows to come back to the run time mode.
NO = the instrument remains in configuration mode and comes back to the first display of the configuration mode (dF.Cn).
YES = This selection ends the configuration mode. the instrument performs an automatic reset and restart the run time mode.

OPERATIVE MODE

DISPLAY FUNCTIONS

The upper display shows the measured values 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 setpoint.

By pushing the FUNC key for more than 3 s but less than 10s. it is possible to change the information on the lower display as follows:

- r. followed by the power value of the output configured as "rEv" (from 0.0 to 100.0%).
  Push FUNC key again, the lower display will show:
- d. followed by the power value of the output configured as "dir" (from 0.0 to 100.0%).
  NOTE: the graphic symbol "□.□" means 100.0 %.
  Push FUNC key again, the lower display will show:
- U. followed by the firmware version.
  Push FUNC pushbutton again. The display will return in "Normal Display Mode".

NOTE: The information will be displayed only if the relative function has been previously configured.

When no pushbutton is pressed during the time out (see P41), the display will automatically return in "Normal Display Mode".

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

When is desired to return in "Normal Display Mode" push FUNC pushbutton again.

SET POINTS

This instrument is provided of 4 set points (SP, SP2, SP3 and SP4).

By setting the P47 parameter it is possible to limit the number of the available set points.

The set point selection is possible only by logic inputs 1 and 2 (terminals 6, 7 and 8).

Logic input 1	Logic input 2	Op. Set point
open (6 -7)	open (6 -8)	SP
open (6 -7)	closed (6 -8)	SP2
closed (6 -7)	open (6 -8)	SP3
closed (6 -7)	closed (6 -8)	SP4

INDICATORS

- °C Lit when the process variable is shown in centigrade degree.
- °F Lit when the process variable is shown in Fahrenheit degree.
- SMRT
  - Flashing when the first part of the SMART algorithm is active.
  - Lit when the second part of the SMART algorithm is active.
- OUT1 flashes with a duty cycle proportional to the OUT 1 power.
- 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.
- OUT4
  - Lit when the alarm 3 is in alarm condition.
  - Flashing with slow rate when loop break alarm is in alarm condition
  - Flashing with high rate when alarm 3 and loop break alarm are in alarm condition.
- REM Lit when the instrument is in REMOTE condition (functions and parameters are controlled via serial link).
- SPX Lit when SP2, SP3 or SP4 are used.
  Flashes when a set point from serial link is used.
- MAN Lit 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 run time 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 = 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.

▲+▼ = Are used to start default operative parameter loading procedure.

FUNC + MAN = During operative mode, when depressed together for more than 4 s, they allow to start the configuration mode.

NOTE: a 10 or 30 seconds time out (see P 41) 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 OUTPUTS

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 real output is conditioned by P21 and P23 parameter also).
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 P27-P29-P31).
Depress for more than 5 s ▲ and FUNC pushbuttons to restore the control status.
The alarm standby function, if configured, will be activated.
The enabling/disabling status will not be lost at power down.

MANUAL FUNCTION

The MANUAL mode function can be accessed (only if enabled by P39=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" output is shown in the two most significant digit field while the value of "dir" output 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 simbol " □□ " is used for "rEv" out = 100
A graphic simbol " □□ " is used for "dir" out = 100
When the instrument is in manual mode the output resolution is equal to 1 %.
The power output can be modified by using ▲ and ▼ pushbuttons.
By depressing, for more than 1 seconds, MAN again 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 to the second part of the SMART algorithm (ADAPTIVE).

At power up the device will be in the status defined by P40 parameter.
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

DIRECT ACCESS TO SETPOINT
When the device is in AUTO mode and in “Normal Display Mode”, it is possible to access directly to setpoint modification (SP, SP2, SP3 or SP4).
Pushing ▲ or ▼ for more than 2 s, the setpoint will begin changing.
The new setpoint value becomes operative since no pushbutton has been depressed at the end of a 2 s timeout.

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 a LED labelled REM.
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 configurated 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 "Sñrt" 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 selected algorithm.
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 "Sñrt" parameter is shown.
Pushing ▲ or ▼ set the display "OFF" and push the FUNC pushbutton.
The SMRT LED will turn off.
The instrument will maintain the actual set of control parameter and will enabled parameter modification.
NOTES : 1) The SMART function is disabled when:
a) ON/OFF control is programmed
b) the instrument is in manual mode
c) P35 is equal to zero.
2) The SMART enabling/disabling can be protected by safety key. (see P35)

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 function is available (exception made for the FUNC pushbutton).

"LOOP BREAK ALARM" FUNCTION

The functioning principle of this alarm is based on the concept that, with a steady load and steady power output, the process rate of rise [deviation (P52)/time (P53)] is steady as well.
Thus, analyzing the process rate of rise of the limit conditions it is possible to estimate the two rates of rise which define the correct process behaviour.
The limit conditions are:

- ✓ for one control output: 0% and the value of the "OLH" parameter or
- ✓ for two control outputs: -100% and the value of the "OLH" parameter,

The LBA function is automatically activated when the control algorithm requires the maximum or the minimum power and, if the process response is slower than the estimated rate of rise, the instrument generates an alarm indication in order to show that one or more element of the control loop is in fault condition.
Deviation: from 0 to 500 units.
Timer: from 1 sec. to 40 min.
Hysteresis: from 1% to 50 % of the output span.
NOTES:
1) The LBA does not operate during the soft start.
2) For this special function the hysteresis is related with the power output value and not with its rate of rise.

OPERATIVE PARAMETERS

Push the FUNC pushbutton, the lower display will show the parameter code while the upper display will shows 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	**Main set point (in eng. units)**. SP is operative when logic inputs 1and 2 are open. Range: from rL to rH.
Sñrt	**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.
ñ.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	**Auxiliary set point (in eng. units).** Range: From rL to rH. SP2 is operative when logic input 1 is open, the logic input 2 is closed and P47 is different from 0.
SP3	**Auxiliary set point (in eng. units).** Range: From rL to rH. SP3 is operative when logic input 1 is closed, the logic input 2 is open and P47=2.
SP4	**Auxiliary set point (in eng. units).** Range: From rL to rH. SP4 is operative when logic inputs 1and 2 are closed and P47 = 2.
nnn	**Software key for parameter protection.** This parameter is skipped if P20 = 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 P20 parameter.
When it is desired to switch from UNLOCK to LOCK condition, set a value different from P20 parameter.

AL1 **Alarm 1 threshold (in eng. units).**
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

AL2 **Alarm 2 threshold (in eng. units).**
For other details see AL1parameter.

HSA2 **Alarm 2 hysteresis**
For other details see HSA1parameter.

AL3 **Alarm 3 threshold (in eng. units).**
For other details see AL1parameter.

HSA3 **Alarm 3 hysteresis**
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 zero, the control action becomes ON-OFF.
Note: When device is working with SMART algorithm the Pb value will be limited by P36 and P37 parameters.

HyS **Hysteresis for ON/OFF control action**
Range: from 0.1% to 10.0% of the input span.

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 the integral action is excluded.
Note: When the device is working with SMART algorithm, the minimum value of the integral time will be limited by P38 parameter.

td **Derivative time**
This parameter is skipped if Pb=0 (ON/OFF action).
Range:From 00.00 to 10.00 mm.ss.
Notes:
1)When device is working with SMART algorithm the td value will be equal to a quarter of Ti value.
2)When P46 is equal to "Pi", the derivative action is always excluded.

IP **Integral pre-load**
This parameter is skipped if Pb=0 (ON/OFF action).
Ranges:
- From 0.0 to 100.0 % of the output if device is configured with one control output.
- From -100.0 to 100.0% of the output if device is configured with two control outputs.

Cy2 **Output 2 cycle time**
This parameter is available only if P9 is equal to "rEv" or "dir".
Range:From 1 to 200 s

Cy3 **Output 3 cycle time**
This parameter is available only if P12 is equal to "rEv" or "dir".
Range:From 1 to 200 s

rC **Relative Cooling gain**.
This parameter is skipped if Pb=0 (ON/OFF action) or device is configured with one control output only.
Range: From 0.20 to 1.00
Note: When the device is working with SMART algorithm and P26 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 P25 = AIr
- from 0.80 to 0.90 when P25 = OIL
- from 0.30 to 0.60 when P25 = H2O

OLAP **Dead band/Overlap between H/C outputs**
This parameter is skipped if Pb=0 (ON/OFF action) or device is configured with one control output only.
A negative OLAP value shows a dead band while a positive value shows an overlap.
Range: From -20 to 50% of the proportional band.

rL **Set point low limit (in eng. units)**.
Range: from min. range value (P3) to rH.
Note: When P3 has been modified, rL will be realigned to it

rH **Set point high limit (in eng. units).**
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 changes**
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 when device is configured with one control output.
- From -100.0 to 100.0% of the output when device is configured with two control outputs.

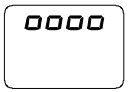
tOL **Time duration of the output power limiter**
Range: from 1 to 540 min.Above this value the display shows “InF” meaning that the limiting action is always on
Note: The tOL can be modified but the new value will become operative only at the next instrument start up.

rñP **Control output max. rate of rise** (in percent per second).
This parameter is available when Pb is different from zero or one control output is linear.
Range: from 0.1%/s to 25.0 %/s.Above 25.0 %/s the display shows “InF” meaning that no ramp limitation is imposed.

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 shown in the following figure:

When P42 is equal to 0, the following conditions may occur:
- The instrument is set for one output only and an OVERRANGE is detected, the OUT turns OFF (if reverse action) or ON (if direct action).
- The instrument is set for heating/cooling action and an OVERRANGE is detected, OUT "rEV" turns OFF and OUT "dir" turns ON.
- The instrument is set for one output only and an UNDERRANGE is detected, the OUT turns ON (if reverse action) or OFF (if direct action).
- The instrument is set for heating/cooling action and an UNDERRANGE is detected, OUT "rEV" turns ON and OUT "dir" turns OFF.

When P42 is different from zero and an out of range condition is detected, the instrument operates in accordance with P42 and P43 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).

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 in control outputs selection
301	Error on calibration of the selected input
307	RJ input calibration error
320	Linear output calibration error
400	Control parameters error
500	Auto-zero error
502	RJ error
510	Error during calibration procedure

NOTE

1) When a configuration parameter error is detected, it is sufficient to repeat the configuration procedure of the specify parameter.
2) If an error 400 is detected, push the ▼ push-button and, maintaining the pressure, push the ▲ push-button and load the default parameters; at this point repeat control parameter setting.
3) For all the other errors, contact your supplier.

GENERAL INFORMATIONS

GENERAL SPECIFICATIONS

Case: PC-ABS black color; self-extinguishing degree: V-0 according to UL 746C.
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.
Rear terminal block: screw terminals (screw M3, for cables from ϕ 0.25 to ϕ 2.5 mm^2 or from AWG 22 to AWG 14) with connection diagrams and safety rear cover.
Weight: 360 g (0.8 lb)
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: 5.5 W max.
Insulation resistance: > 100 MΩ according to IEC 1010-1.
Dielectric strength: 2300 V rms according to EN 61010-1.
Display updating time: 500 ms.
Sampling time: 250 ms for linear inputs
500 ms for TC and RTD inputs.
Control output updating time:
250 ms for linear inputs
500 ms for TC and RTD inputs.
Control output resolution: 0.1% of the span.
Instrument resolution: 30000 counts.
Accuracy: $\pm$ 0,2% f.s.v.. $\pm$ 1 digit @ 25 °C ambient temperature.
Common mode rejection: 120 dB at 50/60 Hz.
Normal mode rejection: 60 dB at 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
Pollution degree: 2

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 ranges 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.

MAINTENANCE

1) REMOVE POWER FROM THE POWER 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/cm^2) 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) [C_2H_5OH] or
   - Isopropil Alcohol (pure or denatured) [$(CH_3)_2CHOH$] or
   - Water (H_2O)
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.

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:

a) The SMART function should be disabled.
b) The instrument is in "UNLOCK" condition.
c) The upper display will show the process variable while the lower display will show the set point value.
d) Held down ▼ pushbutton and press ▲ pushbutton; the display will show:

e) Press ▲ or ▼ pushbutton; the display will show:

f) 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 operative parameters loaded during the above procedure:

PARAMETER	DEFAULT VALUE
SP	= Initial scale value
SñRT	= Disable
ñ.SRt	= OFF
SP2	= Initial scale value
SP3	= Initial scale value
SP4	= Initial scale value
nnn	= OFF
AL1	= Initial scale value for process alarm 0 for deviation or band alarm
HSA1	= 0.1 %
AL2	= Initial scale value for process alarm 0 for deviation or band alarm
HSA2	= 0.1 %
AL3	= Initial scale value for process alarm = 0 for deviation or band alarm
HSA3	= 0.1 %
PB	= 4.0 %
HyS	= 0.5 %
ti	= 4.00 (4 minutes)
td	= 1.00 (1 minute)
IP	= 30 % if one control output is configured = 0 if two control outputs are configured
Cy2	= 15 seconds for relay output 4 seconds for SSR output When two control output are programmed and OUT 2 = "dir" the default value will be: 10 seconds for P25 = AIr 4 seconds for P25 = OIL 2 seconds for P25 = H2O
Cy3	= 15 seconds for relay output When two control output are programmed and OUT 3 = "dir" the default value will be: 10 seconds for P25 = AIr 4 seconds for P25 = OIL 2 seconds for P25 = H2O
rC	= 1.00 for P25 = AIr = 0.80 for P25 = OIL = 0.40 for P25 = 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
rñP	= Infinite

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 instrument must be in modify configuration mode.

b) By ▼ and ▲ pushbuttons select the "dF.Cn" parameter.

c) Press ▲ pushbutton to select between table 1 (european) or table 2 (american) default set of parameters; press FUNC pushbutton the display will show:

This means that the loading procedure has been initiated. After about 3 seconds the loading procedure is ended and the instrument reverts to display the "dF.Cn" parameter.

d) To return to normal display mode, reach the "End" parameter and select the "yES" indication,

e) press the FUNC key

PARAMETER	TABLE 1	TABLE 2
SEr 1	Ero	Ero
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	rEL	rEL
P11	H.A.	H.A.
P12	nonE	nonE
P13	H.A	H.A.
P14	nonE	nonE
P15	H.A	H.A
P16	OPrt.	OPrt
P17	0	0
P18	0.1	0.1
P19	0	0
P20	0	0
P21	norL	norL
P22	norL	norL
P23	norL	norL
P24	norL	norL
P25	Air	Air
P26	OFF	OFF
P27	rEv	rEv
P28	OFF	OFF
P29	rEv	rEv
P30	OFF	OFF
P31	rEv	rEv
P32	OFF	OFF
P33	0	0
P34	ON	ON
P35	2	2
P36	30.0	30.0
P37	1.0	1.0
P38	00.20	00.20
P39	ON	ON
P40	0	0
P41	10	30
P42	0	0
P43	0.0	0.0
P44	nOFL.	nOFL.
P45	nOFL.	nOFL.
P46	Pid	Pid
P47	0	0
P48	10	10
P49	Fn.Sp	Fn.Sp
P50	0	0
P51	diS	diS
P52	50	50
P53	10.00	10.00
P54	10	10
P55	0	0

SECURITY CODES

In this page it is possible to fill out the configuration and the run time security codes of the instrument.

If it is desired to keep the codes secret, cut this page along the dotted line.

Tag name

Run time security code

SSi Super Systems

31081

Tag number

Configuration security code

Passe-partout code

368

Appendix A.3

SSi Super Systems

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