R.H03 - Automatic Burnoff interval
Upper display: Gr.8
Lower display: bF.tr
Range: from 1.00 to 24.00 hh. mm.
Above this 24.00, the display shows "no.tr" (no time interval is programmed)
When a primary variable different from “O2” is selected.
NOTE: the time setting may be modified any time but it will be performed at the next Burn off, exception made for the changement from/to "no.tr" that it will be immediately activated.

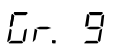
R.H04 - Automatic probe test interval
Upper display: Gr.8
Lower display: Pb.tr
Range: from 1.00 to 24.00 hh. mm.
Above this 24.00, the display shows "no.tr" (no time interval is programmed)
When a primary variable different from “O2” is selected.
NOTE: the time setting may be modified any time but it will be performed at the next Probe test, exception made for the change from/to "no.tr" that it will be immediately activated.

R.H05 - Time remaining to the next automatic Burnoff
This is a reading parameter only and it is available when "bF.tr" is different from "no.tr".
Upper display: Gr.8
Lower display: bF.ñn
Range: from 1.00 to 24.00 hh. mm.
When a primary variable different from “O2” is selected.
NOTE: if a power down occurs, this information will be lost, when power is restored, the countdown will restart from the "bF.tr" [R.H03] value.

R.H06 - Time remaining to the next automatic Probe test
This is a reading parameter only and it is available when "pb.tr" is different from "no.tr".
Upper display: Gr.8
Lower display: Pb.ñn
Range: from 1.00 to 24.00 hh. mm.
When a primary variable different from “O2” is selected.
NOTE: if a power down occurs, this information will be lost, when power is restored, the countdown will restart from the "Pb.tr" [R.H04] value.

R.H07 - Group 8 default data loading.
Upper display: Gr.8
Lower display: dFLt.
Range: OFF = No loading data
On = loading data

Run time group 9 [R.Ixx]
OPTIONAL OUTPUT SETTING



R.I01 - OUT 10 setting
This parameter is available when optional output circuitry is fitted.
Upper display: Gr.9
Lower display: Ou.10
Range: OFF = Relay deenergized
On = Relay energized

For OUT 11 up to OUT 19, the instrument will show on the lower display the related output and it is possible to perform the same setting as above described.

R.I02 - All relays deenergization
This parameter is available when optional output circuitry is fitted.
Upper display: Gr.9
Lower display: dEEn
Range: OFF = No action
On = All relays will be deenergized

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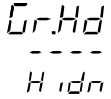
Run time group "dF" [R.Lxx]
DEFAULT RUN TIME PARAMETER LOADING

R.L01 -Default run time parameter loading.
This parameter is not available when SMART function is activated.
Upper display: Gr.dF
Lower display: dFLt.
Range: OFF = No loading data
On = the run time parameters of all groups (exception made for group 9) will be forced to their default values.

Run time group "Hd" [R.Mxx]
HIDDEN PARAMETERS - SMART LIMITS



NOTE: This group is accessible from every group by keeping depressed the "MENU" key for 8 seconds.

R.M01 - Minimum value of proportional band calculated by SMART algorithm.
This parameter is available only when smart function is configured ("Sñ.Fn" [C.G01] = "Enb")
Upper display: Gr.Hd
Lower display: Pb.Lo
Range: From 2.0% to "Pb.Hi" [R.M02].
NOTE: The resolution on "Pb.Lo" value is: 0.1% up to 10.0%; 1% up to 999.0%.

R.M02 - Maximum value of proportional band calculated by SMART algorithm

This parameter is available only when smart function is configured (“Sñ.Fn” [C.G01] = “Enb”)
Upper display: Gr.Hd
Lower display: Pb.Hi
Range: from “Pb.Lo” [R.M01] to 999.0%
NOTE: The resolution on “Pb.Hi” value is: 0.1% up to 10.0%; 1% up to 999.0

R.M03 - Minimum value of integral time calculated by SMART algorithm

This parameter is available only when smart function is configured (“Sñ.Fn” [C.G01] = “Enb”)
Upper display: Gr.Hd
Lower display: ti.Lo
Range: from 00.01 mm.ss to “ti.Hi” [R.M04].

R.M04 - Maximum value of integral time calculated by SMART algorithm.

This parameter is available only when smart function is configured (“Sñ.Fn” [C.G01] = “Enb”)
Upper display: Gr.Hd
Lower display: ti.Hi
Range: from “ti.Lo” [R.M03] to 20.00 mm.ss

R.M05 - Relative gain of the secondary output calculated by SMART algorithm.

This parameter is available only when smart function is configured (“Sñ.Fn” [C.G01] = “Enb”) and a secondary control output is configured.
Upper display: Gr.Hd
Lower display: rG.CL
Range: OFF = Smart algorithm does not calculate “r.Gn” [R.D06] value.
On = Smart algorithm calculates “r.Gn” [R.D06] value.

R.M06 - Hidden group default data loading

Upper display: Gr.Hd
Lower display: dFLt.
Range: OFF = No loading data
On = loading data

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ERROR MESSAGES

OVERRANGE, UNDERRANGE AND TEMPERATURE INPUT LEAD BREAKING DETECTION

The device is capable to detect a fault condition on input variables (OVERRANGE or UNDERRANGE or TEMPERATURE INPUT LEAD BREAKING).
When an error is detected the error code is shown (flashing) on the upper display as follows:

a) Prhi Sensor input out of range (OVERRANGE).
It is detected when:
- mV is the primary controlled variable and its value is greater than 1515 mV;
- CP or DP is the primary controlled variable and its value is greater than 1303 mV.
(Greater than 200 mV if “O2” is configured as primary control variable)

b) PrLo Sensor input out of range (UNDERRANGE).
It is detected when:
- mV or O2 are the primary controlled variable and its value is less than -15 mV.
- CP or DP is the primary controlled variable and its value is less than 997 mV.

c) t.OPn Lead breaking detected on temperature input.
NOTE: if this error is detected, the instrument operates as in presence of a temperature input OVERRANGE.

d) tchi Out of range detected on temperature input.

e) COFt Out of range detected on carbon monoxide input.
NOTE: if this error is detected, the CO value is forced to 20.

NOTES:

1) When "CP" or "DP" is the controlled variable and an error from a) to d) is detected, the device acts as described at "Special output features" (see page 49).
2) When "mV" is the controlled variable and the error a) (OVERRANGE) is detected, the "Main" output is forced to 0 and the "Secondary" (if configured) is forced to 100%.
The alarms and analog retransmissions operate as in presence of the maximum measurable value.
3) When "mV" is the controlled variable and the error b) (UNDERRANGE) is detected, the "Main" output is forced to 100% and the "Secondary" (if configured) is forced to 0.
The alarms and analog retransmissions operate as in presence of the minimum measurable value.
4) When "mV" is the controlled variable the errors from c) to e) are displayed only without affecting the control action.
5) On OVER-RANGE on remote setpoint measurement is

signalled on lower display as “□ □ □ □”
On UNDER-RANGE on remote setpoint measurement is signalled on lower display as “- □ □ □ ”
(indication only when required . See “DISPLAY FUNCTION”)
The sensor leads break can be detected when the range selected has a zero elevation (4-20 mA or 1-5 V or 2-10 V) and signalled as “OPEn”.
The sensor leads break acts as an UNDER-RANGE condition.
For functioning during out of range see also “A.I.Añ – CnF.1”

ERROR MESSAGES
At instrument start up in operative mode all the parameters are checked.

If an error is detected, the display will show the parameter group and the mnemonic code of the group with the wrong parameter setting while “Err” is shown on the central display.
The device reset automatically after a time out of 6 s (20 s if serial link is enabled)

Following the normal procedure reach the group with the wrong parameter setting and correct it (during run time mode, every keystroke restarts the time out. During modify configuration parameters mode, the time out is disabled).
When the error is corrected push “MENU” until the device resets (if in run time mode) or end the modify configuration parameters mode following the normal procedure.
Repeat the above described procedure if another error is shown.

Error list for control action setting:
E.120 Error on control parameter calculated by SMART when the control action type has been changed in the configuration mode.
E.130 Error during the TUNE mode. The algorithm was not able to correctly calculate the control action parameters.

This error can be detected also at start up in ADAPTIVE mode when the values calculated by SMART are wrong.
In both cases, the instrument will be forced to work as a PI controller.

E.140 Error detected when the control action values calculated by ADAPTIVE algorithm are out of range by the limits set of the "Hidden group".

NOTE: push any key in order to remove the E.130 and E.140 error indications if the instrument is in local state.
If the instrument is in remote state refer to the Modbus protocol communication.

The instrument is also capable to detect the following errors:

E.100 Error during data saving in FRAM
E.110 Error in FRAM handling
E.500 Error during auto-zero measurement
E.501 Error during zero integrator measurement
NOTE: when an error E.500 or E.501 is detected, all input measurement are forced to OVERRANGE condition.
E.502 Error during reference junction measurement.
NOTES:
1) If this error is detected, the temperature input is forced to OVERRANGE condition.
2) This error may be generated by an ambient temperature higher than 70 °C (158 °F) or lower than -20 °C (-4 °F).
3) When "mV" is the controlled variable this error is displayed only without affecting the control action.

When one of these errors is detected, contact your supplier.
Two errors, related with the preliminary hardware setting, are detectable:

2. change V101 dip switch or end keyboard/serial link configuration.
8. wrong position of the V101 dip switch.

When one of these error is detected, the display blanks and the error code is shown on most significant digit of the upper display.
Correct the V101 setting.

GENERAL INFORMATION

GENERAL SPECIFICATIONS

Case: Polycarbonate black color; self-extinguishing degree: V-0 according to UL 94.
Front protection: designed for IP 65 (*) and NEMA 4X (*) for indoor locations (when panel gasket is installed).
(*) Test were performed in accordance with IEC 529, CEI 70-1 and NEMA 250-1991 STD.
Installation: panel mounting.
Rear terminal block: 54 screw terminals (screw M3, for cables from ϕ 0.25 to ϕ 2.5 mm^2 or from AWG 22 to AWG 14) with connections diagram and safety rear cover.
Dimensions: according to DIN 43700
3.78" x 3.78" (96 x 96 mm), depth 5" (128 mm).
Weight: 750 g (full option).
Power supply:
- 100 V to 240 V AC 50/60 Hz (-15% to + 10% of the nominal value).
- 24 V AC/DC (+ 10 % of the nominal value).

Power consumption:
- 16 VA max. (without optional I/O)
- 20 VA max. (with optional I/O)

Insulation resistance: > 100 MΩ according to IEC 1010-1.
Dielectric strength: 1500 V rms according to IEC 1010-1.
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 and to council directives 73/23/EEC and 93/68/EEC.
Installation category: II
Operative temperature: from 0 to 50 °C (+32 to 122 °F).
Storage temperature: -20 to +70 °C (-4 to 158 °F)
Humidity: from 20 % to 85% RH, non condensing.
Altitude: This product is not suitable for use above 2000m (6562ft).

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INPUTS

A) MAIN INPUT

Type:
- 0 to 1500 mV (when mV sensor output or oxygen are selected as primary controlled variable).
- 1000 to 1300 mV (when carbon potential or dew point is selected as primary controlled variable).

NOTE: if the probe input value is out of the 1000 to 1300 mV, the range automatically becomes 0 to 1500 mV.

Input type: isolated from others measuring inputs and digital inputs.

Carbon range: 0.00 to 2.00%
Dew point range: -100 to 100 °F or -75 to 40 °C
Oxygen range: 0.0 to 25.0 %
Resolution: 0.1
mV range: 0 to 1500 mV
Cargon resolution: 0.01%
Dew point resolution: 1°F (1°C)
mV resolution: 1 mV
Accuracy:
+ 0.02 digits for 0.40 to 1.60 % of the carbon range.
+ 0.03 digits for the remaining carbon range.

Temperature drift:
- 350 ppm/°C when the range is 1000 to 1300 mV.
- 200 ppm/°C when the range is 0 to 1500 mV.

Input impedance: > 100 MΩ
Sampling time: 125 ms (typical).
Display updating time: 375 ms.
Insulation voltage: 500 VAC
Probe resistance: up to 100 KΩ
Accuracy on probe resistance measurement: 2% f.s.v.

B) TEMPERATURE INPUT

Thermocouple type: K, S, R, B
Input type: not isolated from others measuring inputs and digital inputs.
Sampling time: 1125 ms if carbon monoxide/remote set point input is used.
750 ms otherwise.
Accuracy: + 0.2% f.s.v. + 1 digit @ 25 °C and nominal power supply voltage.
Temperature drift: < 200 ppm/°C of full span
Source impedance: 100 Ω max.
Current for TC open detection: -100 nA.
Cold junction: automatic compensation from 0 to 50 °C.
Cold junction accuracy : 0.1 °C/°C

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Input impedance: > 1 MΩ
Calibration : according to IEC 584-1.

STANDARD RANGES TABLE

T/C type	Ranges			
K	1	-100 / 1370	°C	IEC 584-1: 1995-09
S	2	- 50 / 1760	°C	IEC 584-1: 1995-09
R	3	- 50 / 1760	°C	IEC 584-1: 1995-09
B	4	0 / 1820	°C	IEC 584-1: 1995-09
K	5	-150 / 2500	°F	IEC 584-1: 1995-09
S	6	- 60 / 3200	°F	IEC 584-1: 1995-09
R	7	- 60 / 3200	°F	IEC 584-1: 1995-09
B	8	32 / 3300	°F	IEC 584-1: 1995-09

C) AUXILIARY INPUT (CARBON MONOXIDE)
Input range: 0/4 - 20 mA, 0/1 - 5 V or 0/2 - 10 V.
Input type: not isolated from others measuring inputs and digital inputs.
Sampling time: 1125 ms.
Temperature drift: < 300 ppm/°C of full span.
Input span: from 0 up to 100.
Note: The type of inputs are keyboard and jumper selectable
All type of inputs are factory calibrated

The span is fixed from 0 upto 100 for Carbone Monoxide or as per Main input for Remote Set point
(0.0 to 2.00 for carbon potential)
(0 to 100 °F or -18 to 40 °C for Dew point)
(0 to 1500 for mV))

STANDARD RANGES TABLE

Input type	Impedance	Accuracy
0 - 20mA	< 5 Ω	0.2 % + 1 digit @ 25°C
4 - 20mA		
0 - 5 V		
1 - 5 V	> 200 kΩ	
0 - 10 V		
2 - 10 V	> 400 kΩ	

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D) LOGIC INPUTS

The instrument is equipped with 3 logic inputs.
Input type: Contact closure (voltage free).
Input function:
DIG 1 and DIG 2 can be programmed as:

- Set point selection (SP - SP2)
- Set point selection (SP3 - SP4)
- Auto/manual selection
- Output limiter activation
- Manual reset of the alarms (acknowledge).
- Locale / Remote set point selection

DIG 3 is used to start the Burn off routine.
Active logic level: Close or open programmable.

D1) OPTIONAL LOGIC INPUTS

The instrument may be equipped with 8 optional logic inputs (IN1 to IN8).
Input type: Contact closure (voltage free).
The input status can be read only through serial link.

SET POINTS

This instrument allows to use up to 4 set points: SP, SP2, SP3 and SP4.
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 rates of change (ramp up and ramp down).
Slope value: 1 - 200 eng. unit/min or step.
Set points limiter: rL [r.E10] and rH [r.E11] parameters, programmable.

CONTROL ACTIONS

Algorithm: PID + SMART

Types:

- one control output (digital or analog output)
- two control outputs

NOTE: the outputs can be freely selected between analog and digital outputs.

Digital output types: Relay or SSR.

Digital output action type: Proportional time

Analog output types: 20 mA.

Proportional Band: programmable from 0.5% to 999.0% of the input span.

Setting a PB equal to 0 the control action becomes ON/OFF.

Hysteresis (for ON/OFF control action): programmable from 0.1% to 10.0 % of the input span.

Integral time: programmable from 1 second to 20 minutes or excluded.

Derivative time: programmable from 1 second to 10 minutes or excluded.

Integral pre-load: programmable

- for one control output, from 0 to 100% of the output range.
- for two control outputs, from -100 % to +100 % of the output range.

Anti reset windup: from 10 % to 200 % of the input span.

Main output cycle time: from 1 second to 200 seconds.

Secondary output cycle time: from 1 second to 200 seconds.

Relative secondary output gain: keyboard programmable from 0.20 to 2.00 referred to the proportional band.

Overlap / dead band : keyboard programmable from - 20 % (dead band) to + 50 % (overlap) of the proportional band.

Output limiters.

For the main and/or secondary control outputs it is possible to set:

- output high limits
- output low limits
- output max. rate of rise.

AUTO/MANUAL mode: selectable by front push-button or logic input.

REMOTE SET POINT

The device can be equipped with a remote set point.
This feature must be configured (see “A.In.F / A.In.t / A.I.FL / A.I.Añ / L.r.Oñ “ CnF.1 and “d1.Fn / d2.Fn” CnF.5)
If “A.I.Añ” = norñ the remote set point can be activated **only** by selected external contact (If none digital input is configured to select from Local / Remote set point, the Remote set point will be **always active and** will be **the only SET POINT** present on the device.)
If the auxiliary input is out of range or open the control output is de-activated (see “Control Action Feature”)

If “A.I.Añ” = Cnd.A the remote set point is activated by status of auxiliary input
(Remote set point if auxiliary input is in range, local set point if it is out of range or open)
When remote set point is selected the decimal point at right hand of LSD on middle display is steady lit.(when device is in “Normal display mode”)

The scale for remote set point is fixed and equal to primary control variable; the set point value will be further limited by “rL/ rH”. The sampling rate is 1.125 mS
The value can be filtered.

When transfer from Remote to Locale setpoint is made(by external contact), the local setpoint can be aligned to last remote setpoint value (see L.r.Oñ – CnF.1)
When remote set point value is displayed on lower display (see “DISPLAY FUNCTION”)
the out of range condition are displayed as follow:

OVER-RANGE (“OOOO”), UNDER-RANGE (“-OOO”), leads break (“OPEn”).

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OUTPUTS

Out 1 and 2
Function: singularly programmable as
- Control output
- Alarm output

Type: Relay or SSR

Out 1 - Relay
Relay type: SPDT
Contact rating: 3 A @ 250 V on resistive load.

Out 2 - Relay
Relay type: SPST
Contact rating: 3 A @ 250 V on resistive load.

Out 1 and 2 - SSR
Type: not isolated voltage output
- Logic level 1:
  14V + 20% @ 20 mA max.
  24 V + 20% @ 1 mA.
- Logic level 0:
  < 0.5 V D.C.

Out 3
Function: programmable as:
- Control output
- Alarm output

Type: Relay
Relay type: SPST
Contact rating: 2 A @ 250 V on resistive load.

Out 4
Function: Burn off function
Type: Relay
Relay type: SPST
Contact rating: 2 A @ 250 V on resistive load.

Out 5
Function: Purge function
Type: Relay
Relay type: SPST
Contact rating: 1 A @ 250 V on resistive load.

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ANALOG OUTPUTS

Out 6 and 7
Function: Programmable as
- Linear control output
- Analog retransmission of the measured value
- Analog retransmission of the operative set point.

Output type: Isolated output programmable as
- 0-20 mA
- 4-20 mA.

Scaling: from -1999 to 9999 when used as signal retransmission.
Maximum load: 600 Ω.
Accuracy:
- 0.1 % when it is used as control output
- 0.05 % when it is used as analog retransmission.

Filter: It is possible to apply a first order digital filter on the retransmitted value.
The time constant of the filter may be programmed within 0 and 8 s.

OPTIONAL OUTPUTS

The instrument may be equipped with 10 optional relay outputs.
Type: Relay
Relay type: SPST
Contact rating: 0.5 A @ 250 V on resistive load.
The status of the optional outputs can be set by keys and by serial link.

ALARMS

Alarm action: direct or reverse function programmable.
Alarm functions: each alarm can be configured as process alarm, band alarm, deviation alarm.
Alarm reset/acknowledge: automatic or manual reset programmable on each alarm.
Alarm masking: each alarm can be configured as masked alarm or standard alarm.
This function allows you to delete false indication at instrument start up and after a set point change.

Process alarm:
Operative mode: Minimum or maximum programmable.
Threshold: programmable in engineering unit within the input range.
Hysteresis: programmable in engineering units from 1 to 200 digits.

Band alarm
Operative mode: Inside or outside programmable.
Threshold: two thresholds programmable:
- Low - from 0 to -1000 digits.
- High - from 0 to +1000 digits.
Hysteresis: programmable in engineering units from 1 to 200 digits.

Deviation alarm
Operative mode: high or low programmable.
Threshold: programmable from - 1000 to +1000 digits.
Hysteresis: programmable in engineering units from 1 to 200 digits.

SERIAL INTERFACE
Types: Optoisolated RS 485
Protocol type: MODBUS, JBUS (RTU mode).
Baud rate: programmable from 600 to 19200 BAUD.
Byte format: 8 bit.
Parity: even, odd or none programmable.
Stop bit: one.
Address: from 1 to 255.
Output voltage levels: according to EIA standard.
NOTE: The EIA standard establishes that by RS-485 interface it is possible to connect up to 30 devices with one remote master unit.
The serial interface of these instruments is based on “High input impedance” transceivers; this solution allows you to connect up to 127 devices (based on the same transceiver type) with one remote master unit.

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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 louvres 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.

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DEFAULT PARAMETERS

DEFAULT RUN TIME PARAMETERS

A complete and consistent set of run time parameters is stored in the instrument. These data are the typical values loaded in the instrument prior to shipment from factory.
This instrument allows you to load the default value of a single run time parameter group or to load all the run time parameters

A) When it is desired to load the default parameter of a single group, proceed as follows:
   A.1) By MENU pushbutton, select the desired run time parameter group.
   NOTE: if the selected group is protected by security code, set the assigned value by ▲ and ▼ pushbuttons.
   A.2) By FUNC pushbutton, select the last parameter of the selected group.
   The middle and lower displays will show:

   A.3) By ▲ or ▼ pushbuttons, select the "On" indication on the central display.
   A.4) Push the FUNC pushbutton.

The default parameter loading procedure for the selected group is ended.

B) When it is desired to load the default value of all the run time parameters proceed as follows:
   B.1) By MENU pushbutton, select the "Run time group dF" [R.Lxx].
   NOTE: if all run time parameters are protected by security code, set the assigned value by ▲ and ▼ pushbuttons.
   B.2) Push the FUNC pushbutton.
   The middle and lower displays will show:

   B.3) By ▲ or ▼ pushbuttons, select the "On" indication on the central display.
   B.4) Push the FUNC pushbutton.
   The central display will show:

   The default parameter loading procedure of all run time parameters is ended.

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

Run time group 1 [R.Axx]

PARAMETER	DEFAULT VALUE
SP	= Set point low limit ("rL" [R.E10])
SP2	= Set point low limit ("rL" [R.E10])
SP3	= Set point low limit ("rL" [R.E10])
SP4	= Set point low limit ("rL" [R.E10])
COF	= 200
H2F	= 400

Run time group 3 [R.Cxx]

PARAMETER	DEFAULT VALUE
ñ.rSt	= OFF
AL1	= Initial range value (for process alarm)
	= 0 (for deviation alarm)
bA1.L	= -10
bA1.h	= 10
AL2	= Initial range value (for process alarm)
	= 0 (for deviation alarm)
bA2.L	= -10
bA2.h	= 10
AL3	= Initial range value (for process alarm)
	= 0 (for deviation alarm)
bA3.L	= -10
bA3.h	= 10
HSA1	= 1
HSA2	= 1
HSA3	= 1

Run time group 4 [R.Dxx]

PARAMETER	DEFAULT VALUE
Pb	= 10.0 % (if PID control is configured)
	= 15.0 % (if PI control is configured)
HYS	= 0.5 %
ti	= 1.50 mm.ss (if PID control is configured)
	= 2.45 mm.ss (if PI control is configured)
td	= 1.00 mm.ss
IP	= 50.0 (If only one control output is configured).
	0.0 (If two control outputs are configured).
r.Gn	= 1.00
OLAP	= 0

Run time group 5 [R.Exx]

PARAMETER	DEFAULT VALUE
ArW	= 100%
ñ.OLL	= 0.0%
ñ.OLH	= 100.0%
ñ.rñP	= Inf

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ñC.CY	= 16 s (If relay output) 2 s (If SSR output)
S.OLL	= 0.0%
S.OLH	= 100.0%
S.rñP	= Inf
SC.CY	= 16 s (If relay output) 2 s (If SSR output)
rL	= Initial range value
rH	= Final range value
Grd1	= Inf
Grd2	= Inf
E.Añ	= On

Run time group 6 [R.Fxx]

PARAMETER	DEFAULT VALUE
A1.tP	= Proc
A1.Cn	= H.A.
A1.Ac	= rEV
A1.St	= OFF
A2.tP	= Proc
A2.Cn	= H.A.
A2.Ac	= rEV
A2.St	= OFF
A3.tP	= bAnd
A3.Cn	= H.A.
A3.Ac	= rEV
A3.St	= OFF

Run time group 7 [R.Gxx]

PARAMETER	DEFAULT VALUE
S.L.Pr	= ñbUS
S.L.Ad	= 1
S.L.bd	= 19.20
S.L.bF	= 8

Run time group 8 [R.Hxx]

PARAMETER	DEFAULT VALUE
t.bOF	= 3.00 mm. ss.
t.PrG	= 1.00 mm. ss.
bF.tr	= 12.00 hh.mm
pb.tr	= 24.00 hh.mm

Run time group Hd [r.Lxx]

PARAMETER	DEFAULT VALUE
Pb.Lo	= 2.0%
Pb.Hi	= 999.0%
ti.Lo	= 00.01 mm.ss
ti.Hi	= 20.00 mm.ss
rG.CL	= OFF

DEFAULT CONFIGURATION PARAMETERS

A complete and consistent set of configuration parameters is stored in the instrument. These data are the typical values loaded in the instrument prior to shipment from factory.
When it is desired to load the default value of all the configuration parameters, proceed as follows:

If the instrument starts in configuration mode, push the MENU pushbutton.
If the instrument starts in run time mode, by keeping depressed the MENU push-button for more than 5 seconds the instrument will show:

NOTE: If no push-button is depressed for more than 10 s (or 30 s according to "CnF.6" "t.out" [time out selection" C.I10] parameter setting), the instrument returns automatically to the normal display mode.

By ▲ or ▼ push-button select "ñodF."

NOTES:
1) When modify mode is started, the instrument stops the control and:
   - sets to OFF the control outputs;
   - turns to OFF the bargraph displays;
   - sets analog retransmissions to the retransmitted initial scale value;
   - sets to OFF the alarms;
   - disables the serial link;
   - removes the time out.
2) When the modify mode is disabled by V101 (SW3), the ▲ or ▼ push-button pressure has no effect.

Push MENU pushbutton again and select the "Default configuration group" [C.Cxx].
NOTE: if the configuration parameters are protected by security code, by ▲ or ▼ pushbuttons set the security code assigned and press the FUNC pushbutton.
By ▲ or ▼ push-button select the desired configuration parameter set "tb.1" (european) or "tb.2" (american)
Push MENU pushbutton again
The central display will show:

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and then the display will show:

CnF.1

InPt.

The default parameter loading procedure of all configuration prameters is ended.

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

TABLE 1 (EUROPEAN)

Configuration group 1 [C.Dxx]

PARAM.	VALUE	NOTES
Ln.Fr	50	Hz
PV.SL	CP	
Pb.FL	0	(No filter)
tP.In	1	(Tc K)
OFSt	0	°C
tP.FL	0	(No filter)
A.In.F	-	nonE
A.In.t	-	4-20 (4-20 mA)
A.I.FL	-	0 (No filter)
A.I.Añ	-	norñ
L.r.Oñ	-	n.ALG

Configuration group 2 [C.Exx]

PARAM.	VALUE	NOTES
O1.Fn	ñAin	
O2.Fn	SECn	
O3.Fn	ALr.3	
O6.Fn	PV.rt	
O6.rn	4-20	4-20 mA
O6.Lr	0.00	
O6.Hr	2.00	
O6.FL	0	(No filter)
O7.Fn	nonE	
O7.rn	4-20	4-20 mA
O7.Lr	0.00	
O7.Hr	2.00	
O7.FL	0	(No filter)

Configuration group 3 [C.Fxx]

PARAM.	VALUE	NOTES
ñC.Cn	norñ	
ñ.SCL	nO	
ñC.dP	——.	(No decimal figure)

ñC.E.L	0	
ñC.E.H	100	
ñC.A.C	bEFr	
SC.Cn	norñ	
S.SCL	nO	
SC.dP	——.	(No decimal figure)
SC.E.L	0	
SC.E.H	100	
SC.A.C	bEFr	

Configuration group 4 [C.Gxx]

PARAM.	VALUE	NOTES
Sñ.Fn	Enb	
Cn.tP	PId	
ñAn.F	Enb	
Añ.UL	buñ.	
ñ.A.t.t	buñ.	
St.Fn	Cnd.b	

Configuration group 5 [C.Hxx]

PARAM.	VALUE	NOTES
d1.Fn	nonE	
d1.St	CLSd	
d2.Fn	nonE	
d2.St	CLSd	
d3.St	CLSd	

Configuration group 6 [C.Ixx]

PARAM.	VALUE	NOTES
G.brG	Pr.Ur	
O.brG	OP.SP	
brG.L	0.00	
brG.H	2.00	
brG.d	10	digits
SP.dS	OP.SP	
t.t.Ac	YES	
t.out	tñ.30	

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TABLE 2 (AMERICAN)

Configuration group 1 [C.Dxx]

PARAM.	VALUE	NOTES
Ln.Fr	60	Hz
PV.SL	CP	
Pb.FL	0	(No filter)
tP.In	5	(Tc S)
OFSt	0	°F
tP.FL	0	(No filter)
A.In.F	-	nonE
A.In.t	-	4-20 (4-20 mA)
A.I.FL	-	0 (No filter)
A.I.Añ	-	norñ
L.r.Oñ	-	n.ALG

Configuration group 2 [C.Exx]

PARAM.	VALUE	NOTES
O1.Fn	ñAin	
O2.Fn	SECn	
O3.Fn	ALr.3	
O6.Fn	PV.rt	
O6.rn	4-20	4-20 mA
O6.Lr	0.00	
O6.Hr	2.00	
O6.FL	0	(No filter)
O7.Fn	nonE	
O7.rn	4-20	4-20 mA
O7.Lr	0.00	
O7.Hr	2.00	
O7.FL	0	(No filter)

Configuration group 3 [C.Fxx]

PARAM.	VALUE	NOTES
ñC.Cn	norñ	
ñ.SCL	nO	
ñC.dP	——.	(No decimal figure)
ñC.E.L	0	
ñC.E.H	100	
ñC.A.C	bEFr	
SC.Cn	norñ	
S.SCL	nO	
SC.dP	——.	(No decimal figure)
SC.E.L	0	
SC.E.H	100	
SC.A.C	bEFr	

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Configuration group 4 [C.Gxx]

PARAM.	VALUE	NOTES
Sñ.Fn	Enb	
Cn.tP	PId	
ñAn.F	Enb	
Añ.UL	buñ.	
ñ.A.t.t	buñ.	
St.Fn	Cnd.b	

Configuration group 5 [C.Hxx]

PARAM.	VALUE	NOTES
d1.Fn	nonE	
d1.St	CLSd	
d2.Fn	nonE	
d2.St	CLSd	
d3.St	CLSd	

Configuration group 6 [C.Ixx]

PARAM.	VALUE	NOTES
G.brG	Pr.Ur	
O.brG	OP.SP	
brG.L	0.00	
brG.H	2.00	
brG.d	10	digits
SP.dS	OP.SP	
t.t.Ac	YES	
t.out	tñ.30	

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ALGORITHMS

The following tempirical (derived from experiment) equations are included into the instrument firmware and are applied when the probe sensor voltage is within 1000 and 1300 mV range.

For oxygen potential:

$$\mathbf{O2(\%)} = \frac{\mathbf{20.9}}{\mathbf{\exp\ ((2.3\ *\ E)\ /(\ 0.0496\ *\ Tk))}}$$

For carbon potential:

$$\%C = \frac{3.792 \bullet e^{z}}{\frac{6486000}{CO \bullet COF} + e^{z}}$$

For dew point:

$$D.P.\left(in^{\circ}F\right) = \frac{4238.7}{9.55731 - \log_{10} P_{H2} + \frac{E - 1267.8}{0.05512 \bullet T_R}} - 460$$

Where: $Z = \frac{E - 820.7}{0.0239 \bullet T_R}$

E is the sensor input in mV;

T_R is the absolute value in degrees Rankine (°F+ 459.67);

CO is the carbon monoxide partial pressure, measured on Carbon monoxide input;

COF is the Carbon monoxide factor setting (see [RA02] parameter);

P_{H2} is the partial pressure of hydrogen in atmosphere and it is equal to H2F/1000;

Tk is the temperature in degree Kelvin

NOTE: H2F is the [RA03] parameter.

CALIBRATION PROCEDURE

The calibration procedure is enabled by internal dip switch. V101.2 = Off and V101.4 = On. Perform calibration procedure in accordance with jumpers position, otherwise the stored calibration value may be altered.

All calibration parameters are logically divided in groups of two (initial and final scale), followed by a calibration check in which the input is measured and displayed in counts (30000 at fsv for all inputs).

The upper display shows the calibration step (Table A); the lower display shows the action step (Table B); the middle display shows the selection On/Off, or value for Out6/Out7. Use FUNC key to scroll up calibration steps, MAN key to scroll down. Use ▲/▼ keys to select on/off.

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To enable calibration and go to the next action step, push FUNC when "on" is displayed. For CJ calibration , use ▲/▼ keys to set a temperature value in 1/10°C read, with appropriate instrument, between 1 - 3 rear terminal. No timeout is applied in the calibration mode.

The last step is for loading default calibration data. The display will show: CAL on upper display; OFF/ON on middle display, and dFLt on lower display. Use the ▲/▼ key to select "on" and then push FUNC key to load data. No action otherwise.

Note: The default calibration data allows the verification of device functioning though they should not be taken as final calibration values. After the default calibration data loading, it is necessary to perform the proper input calibration.

Table A. Calibration Steps
Mnemonic code shown in upper display:

Pb.1	=	Main probe input (0 to 1.5 V)
Pb.2	=	Main probe input (0 to 1.3 V)
tP.In	=	Thermocouple input (0 to 60 mV
CJ.In	=	CJ input
A.I.ñA	=	Carbon Monoxide auxiliary input (0 to 20 mA)
A.I.5	=	Carbon Monoxide auxiliary input (0 to 5 V)
A.I.10	=	Carbon Monoxide auxiliary input (0 to 10 V)
O6.ñA	=	Out 6 (0 to 20 mA)
O7.ñA	=	Out 7 (0 to 20 mA)
CAL	=	Default data loading

Table B. Action Steps
Mnemonic code shown on the middle display:

Lr.	=	Low range calibration
Hr.	=	High range calibration
U.	=	Input calibration verify

Note: During CJ input, verify the temperature is displayed in 1/10°C.

For OUT6/OUT7 calibration proceed as follows:

a) Low range calibration ("Lr." action). Set, by using ▲/▼ pushbuttons, a value (from 0 to 5000) to read on rear terminal a 0 µA ± 5µA current.
b) High range calibration ("Hr." action). Set, by using ▲/▼ pushbuttons, a value (from 0 to 5000) to read on rear terminal a 20 mA ± 5µA current.
c) Input calibration verify (U action). Set, by using ▲/▼ pushbuttons, a value (from 0 to 8000) to read on rear terminal a current value corresponding to: Out = displayed value/8000 * 20 mA.

Note: Rear terminals are 16(+)/17(-) for OUT 6 and 18(+)/19(-) for OUT 7.

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