Continental
Industries International

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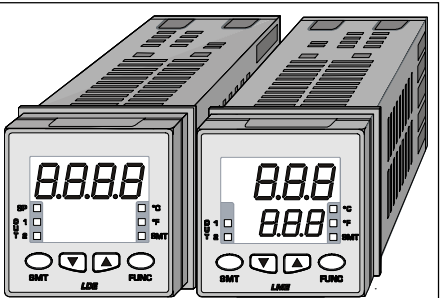
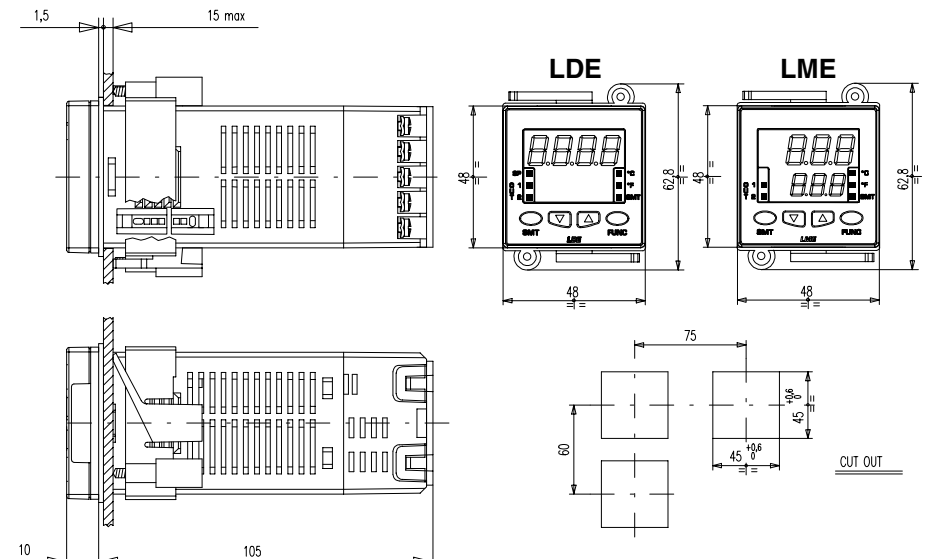


❒ USER MANUAL

LDE
LME

INDEX USA

A. OUTLINE AND CUT OUT DIMENSIONS



1. MOUNTING

Select a mounting location where there is minimum vibration and the ambient temperature ranges between 0 and 50°C (32 and 122°F).
The instrument can be mounted on a panel up to 15 mm thick with a square cutout of 45 x 45 mm.
For outline and cutout dimensions refer to page A.4.
The surface texture of the panel must be better than 6.3 μm.
The instrument is fitted with a rubber panel gasket.
To assure 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.

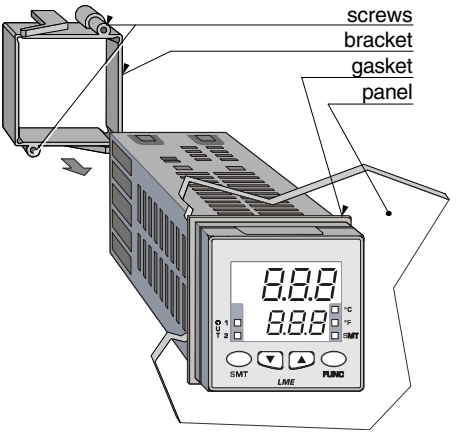


Fig. 1 PANEL MOUNTING

2. ELECTRICAL CONNECTIONS

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

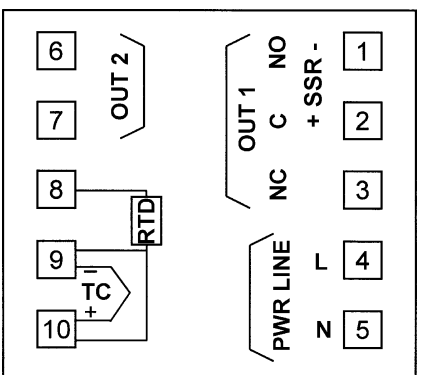


Fig. 2 REAR TERMINAL BLOCK

MEASURING INPUTS

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

TC INPUT

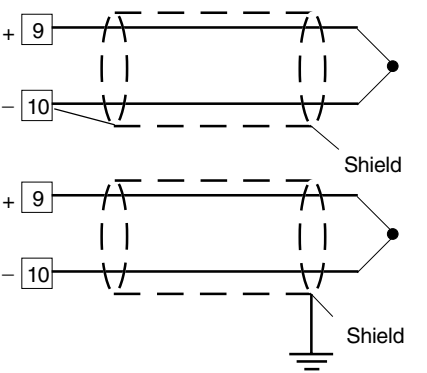


Fig. 3 THERMOCOUPLE CONNECTION

NOTES:

1) Do not run input wires together with power line cables.
2) For TC wiring use proper compensating cable preferably shielded.
3) When a shielded cable is used, it should be connected at one point only.

RTD INPUT

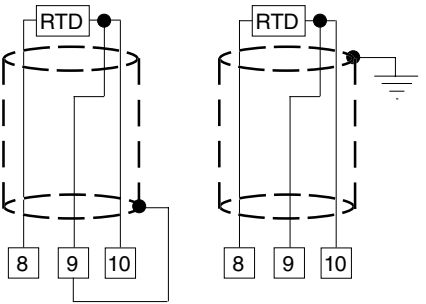


Fig. 4 RESISTANCE TEMPERATURE DETECTOR CONNECTION

NOTES:
1) Do not run input wires together with power line cables.
2) Pay attention to the line resistance; a resistance higher than 20 Ω/wire 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 impedence of the 3 wires must be the same.

RELAY OUTS

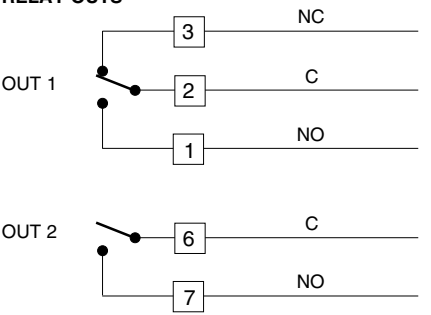


Fig. 5 RELAY OUTS

The OUT 1 NO contact and the OUT 2 contact are protected by varistors against inductive load with inductive component up to 0.5 A.
The OUT 1 contact rating is 3A/250V AC on resistive load.
The OUT 2 contact rating is 2A/250V AC on resistive load.
The number of operations is 1 x 10^5 at specified rating.

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

The following recommendations avoid serious problems which may occur it when using relay output to drive inductive loads.

INDUCTIVE LOADS

High voltage transients may occur when switching inductive loads.
These transients may introduce disturbances through the internal contacts which can affect the performance of the instrument.
The internal protection (varistors) assures correct protection up to 0.5 A of inductive component but the OUT 1 NC contact is not protected.
The same problem may occur when a switch is used in series with the internal contacts.

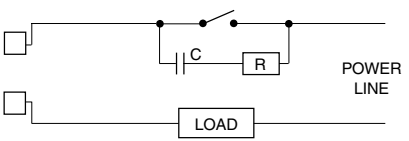


Fig. 6 EXTERNAL SWITCH IN SERIES WITH THE INTERNAL CONTACT

In these cases an additional RC network should be installed across the external contact as shown in Fig. 6
The value of the capacitor (C) and resistor (R) are shown in the following table.

LOAD (mA)	C (mF)	R (W)	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

In every case the cable connected to the relay outs must be routed as far away as possible from input or communication cables.

VOLTAGE OUTS FOR SSR DRIVE

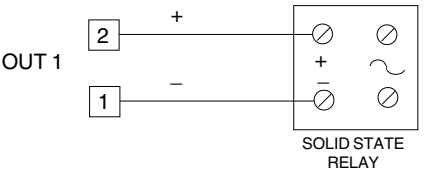


Fig. 7 SSR DRIVE OUT WIRING

It is a time proportioning out.
Logic level 0: Vout < 0.5 V DC.
Logic level 1: Maximum current = 20 mA.
- 14 V + 20 % @ 20 mA
- 24 V + 20 % @ 1 mA.

NOTE: This out is NOT isolated.
A double or reinforced Isolation between instrument output and power supply must be assured by the external solid state relay.

POWER LINE WIRING

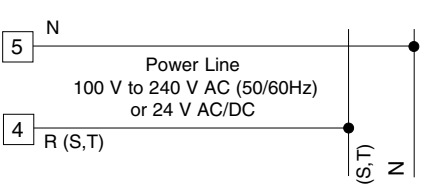


Fig. 8 POWER LINE WIRING

NOTES:

1) Before connecting the instrument to the supply, make sure that the line voltage corresponds to that indicated on the rating plate.
2) To avoid electric shock, connect the power line at the end of the wiring procedure.
3) For supply connections use No 16 AWG or larger wires rated for at least 75°C.
4) Use copper conductors only.
5) Do not run input wires together with power line cables.
6) For 24 V AC/DC the polarity does not matter.
7) The power supply input has NO fuse protection. Please, provide a T type 1A, 250 V fuse externally.
8) The safety regulations for equipment permanently connected to the mains require that there is a switch or circuit breaker in the building electrical system and that this:
   - is near the device and can easily be reached by the operator;
   - is marked as the device ON/OFF device.

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

3. PRELIMINARY HARDWARE SETTINGS

These instruments can detect the opening of the input circuit (TC or RTD). This failure is displayed as an overrange condition.
For the thermocouples only one can select, by means of jumpers SH1 and CH1 indicated in Fig. 9, the type of indication to be obtained when the thermocouple is open (see table at the bottom of the page).
To gain access to the jumpers the instrument must be taken out of its case.

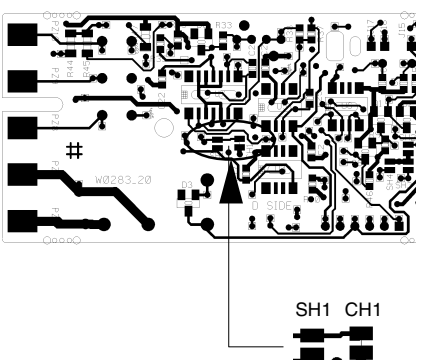


Fig. 9 SH1 and CH1 JUMPERS

SH1	CH1	Indication
open	close	overrange (standard)
close	open	underrange

4. CONFIGURATION

4.1 PUSHBUTTON FUNCTION

FUNC This saves the new value of the selected parameter and goes to the next parameter (increasing order).

SMT This scrolls back the parameters without saving the new value.

▲ This increases the value of the selected parameter.

▼ This decreases the value of the selected parameter.

4.2 POSSIBLE PROTECTION OF THE PARAMETERS

Access to the configuration, and the display and modification of the operative parameters, can be protected by a secret code. The code is entered in configuration, by means of parameters P11 and P14.

P11 = 0 All the operative parameters can be displayed and modified. Access to the configuration is free.
P11 = 1 and P14 = On All the operative parameters can be displayed but not modified, apart from SP (Set Point). Access to the configuration is only possible by entering code 408 when requested.
P11 = 1 and P14 = OFF No operative parameter can be displayed and modified, apart from SP. Access to the configuration is only possible by entering code 408 when requested.
P11 = 2/499 In this case the value programmed in P11 represents a numerical key which can be used to protect access to the configuration and, in operative mode, the modification of the parameters (SP can always be modified).
To set P11 see section 4.4.

If the modification of the parameters has been enabled, the passage in configuration is free.
If not it will be allowed by entering, when requested, the numerical value programmed in P11, or code 408.
P11 = 500/999 As for the previous point, with the difference that AL (alarm threshold) can be modified as well as SP.

In the two previous cases, with P14 = On the parameters set as not modifiable can however be displayed. With P14 = OFF they are not.

4.3 ACCESS TO THE CONFIGURATION PROCEDURE

To access the configuration, press SMT and FUNC simultaneously (press first SMT and immediately afterwards FUNC) keeping both the pushbuttons pressed for three seconds.
In the model LME the lower display will show CnF, the upper OFF. In model LDE OFF and CnF will appear alternatively.
Press ▲ or ▼ within 10 seconds to set On, then confirm with FUNC.
If the device is in the protected condition (see previous section), the lower display (LME) shows CnF, the upper a dashed line (instead of OFF). In model LDE the two wordings appear alternately.
By means ▲ or ▼ enter the value entered in P11, or value 408. Press FUNC to confirm.
The instrument is now in configuration mode, and the display shows CnF steadily for both models.
Via FUNC we advance to the first parameters.

In configuration, the lower display shows the code of the parameter (P1-P21), the upper the numerical value or the selection code. In the model LDE, the display shows the parameter code and the numerical value alternatively.

To alter the value set press ▲ or ▼ and confirm with FUNC.
The parameter for loading the default parameters is shown in section B at the end of the manual.

4.4 CONFIGURATION PARAMETERS

P1 - Type of input and standard range

	Type of input		Range	
0	TC type	L	0 / +900 °C	
1	TC type	J	0 / +999 °C	(LME)
			0 / +1000 °C	(LDE)
2	TC type	K	0 / +999 °C	(LME)
			0 / +1370	(LDE)
3	TC type	N	0 / +999 °C	(LME)
			0 / +1400 °C	(LDE)
4	RTD type	Pt 100	-199 / +800 °C	(LME)
			-200 / +800 °C	(LDE)
5	RTD type	Pt 100	-19.9 / +99.9 °C	(LME)
			-199.9 / +400.0 °C	(LDE)
6	TC type	T	0 / +400 °C	
8	TC type	L	0 / 999 °F	(LME)
			0 / 1652 °F	(LDE)
9	TC type	J	0 / 999 °F	(LME)
			0 / 1832 °F	(LDE)
10	TC type	K	0 / 999 °F	(LME)
			0 / 2498 °F	(LDE)
11	TC type	N	0 / 999 °F	(LME)
			0 / 2552 °F	(LDE)
12	RTD type	Pt 100	-199 / 999 °F	(LME)
			-328 / 1472 °F	(LDE)
13	TC type	T	0 / 752 °F	

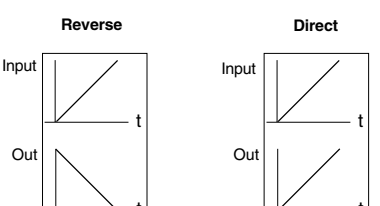
NOTE: On the instrument front panel two leds indicate the setting of the temperature in °C or °F, depending on the configuration.

P2 = Initial range value
Initial range value for input from thermocouple/ Resistance Temperature Detector.

P3 = Full range value
Full range value for input from thermocouple/ Resistance Temperature Detector.

NOTES: The minimum input span (P3 - P2) is 300°C or 600°F for TC input and 100°C or 200°F for RTD input.
On every parameter change P1, P2 is forced to the minimum value, P3 to the maximum value.
If the value of P2 and/or P3 is modified the parameter rL is automatically aligned to the new value (of P2 and/or P3).
If P5 = 1, parameter AL is checked and automatically aligned if it is out of range.

P4 = Out 1 action
This parameter is not modifiable when P5 = 5
rEU = reverse action (Heating)
dir = direct action (Cooling)



P5 = Function of Out 2
0 = Not provided
1 = Process alarm
2 = Band alarm
3 = Deviation alarm
4 = Instrument failure alarm
5 = Cooling out

NOTE: When P5 = 1, 2, 3, 4: if parameter OLH is less than 0, it is set to 100; if parameter iP is less than 0 it is set to 30;
when P5 = 0, 1, 2, 3: parameter AL is checked and if it is out of range it is set to the lowest value.
When P5 = 5: parameter P4 automatically assumes the value "rEU"; parameter P16 is checked and if it is out of range it is set to the lowest value; if parameter Pb is not 0 and is lower than 1.5, it is set to 1.5.

P6 = Configuration Out 2
P6 is skipped when P5 = 0.
If P5 = 1, 3 or 4;
HA. = High alarm with automatic reset
LA. = Low alarm with automatic reset
HL. = High alarm with manual reset
LL. = Low alarm with manual reset
When P5 = 4, the "high" or "low" selection has no effect.

If P5 = 2:
HA. = out of band with automatic reset
LA. = in band with automatic reset
HL. = out of band with manual reset
LL. = in band with manual reset

When P5 = 5 this parameter selects the cooling medium.
AIr = air OIL = oil H2O = water

NOTE: Modifying parameter P6 automatically updates the values of the cooling cycle time and the cooling gain.

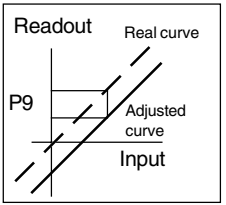
P6	C2	RC
Air	10 (s)	1
OIL	4 (s)	0.8
H2O	2 (s)	0.4

P7 = Alarm action
Only available when P5 is different from 0 or 5.
rEU = reverse (relay de-energized in alarm condition)
dir = direct (relay energized in alarm condition)

P8 = Stand-by of the alarm
Only available when P5 is 1, 2 or 3.
OFF = stand-by disabled
On = stand-by enabled

NOTE: The alarm stand-by function disables the alarm indication at instrument start up and after a set point modification until the process variable reaches the alarm threshold.

P9 = OFFSET applied to the measured value
This OFFSET is applied along the whole span.
When P1= 5 P9 is programmable from -19.9 to 19.9°C.
When P1 ≠ 5 P9 is programmable from -199 to 199°C or °F.



P10 = Threshold of the "Soft Start" function
The "Soft start" function limits the maximum out power (see OLH operative parameter) for a programmable time (see tOL operative parameter) at the instrument start up when the measured value is lower then the programmed threshold.
P10 is the threshold value, in engineering units.
If tOL = InF, P10 value is not considered.

Every time parameter P1 is changed it is forced to the minimum value.

P11 = Safety lock
0 = device unlocked. All the parameters can be modified
1 = device locked. None of the parameters can be modified except the SP.
2 to 499 = SP can be always modified.
Select the secret code (to be remembered) and during the "operative mode" and scrolling the "software key" parameter, the display will show one of the following figures:

A) 

The device is "Unlocked" and all parameters can be modified.

To make the device "Locked" enter a number different from the "secret code".

B) 

The key is enabled: no parameter can be modified apart from SP.
To "Unlock" the device, insert the "secret code".

500 to 999: Selecting a secret code between these two numbers, everything will occur as explained above except that when the device is "Locked" the parameters that can be modified are the set point and the alarm threshold.

NOTE: The instrument shows on the display the value **2** for any value of P11 between 2 and 999.

P12 = Out maximum rate of rise
This parameter is only available if Pb is not 0.
Programmable from 1 to 25% of the out signal per second.
Over 25%/s the instrument displays " InF" to indicate the exclusion of the limitation.

P13 = Not used

P14 = Protected parameters display
This parameter is only available if P11 is not 0.
This parameter enables/disables the display of the protected parameter during "operative mode".

OFF = the protected parameters are not displayed
On = the protected parameters are displayed

P15 - SMART function enabling/disabling
0 = The SMART function is disabled
1 = SMART function enabling/disabling is **NOT** protected by the safety code.
2 = SMART function enabling/disabling is protected by the safety code.

P16 - Maximum value of the proportional band automatically settable by the SMART function
This parameter is available if P15 is not 0. It can assume the following values:
model LME: between P17 or P18 and 99.9%
model LDE: between P17 or P18 and 100.0%

P17 - Proportional minimum band value automatically settable by the SMART function (one control out only)
This parameter is only displayed if P5 is not 5 or P15 is not 0.
It may be programmed from 1.0% to the value of P16.

P18 - Proportional minimum band value automatically settable by the SMART function (two control outs, heating/ cooling)
This parameter is only present if P5 is 5 and P15 is not 0.
This parameter may be programmed from 1.5% to the value of P16.

P19 = Automatic calculation of "relative cooling gain"
This parameter is only present if P5 is 5 and P15 is not 0.
OFF = the SMART function does **NOT** calculates the "relative cooling gain".
On = the SMART function calculates the "relative cooling gain".

P20 = Minimum integral time value calculated by the SMART function
This parameter is only present if P15 is not 0.
It can assume the following values:
model LME: between 0.1 (1 tenth of a second) and 2.0 (2 minutes)
model LDE: between 00.01 (1 second) and 2.00 (2 minutes).

P21 = Extension of the anti-reset-wind up
Span: 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).

The advanced configuration procedure is completed and the instrument shows "EnF" on the display.

To quit the configuration, press SMT and FUNC simultaneously (press first SMT and immediately afterwards FUNC) keeping both the pushbuttons pressed for three seconds.

5. OPERATIVE MODE

The display and modification of the operative parameters can be protected by a secret code. For more information see section 4.2.

5.1 PRELIMINARY COMMENTS

It is assumed, at this point, that the instrument has been correctly configured as indicated in Section 4.

- Model LME displays the value measured on the upper display: the lower display is normally used to display the operating set point (below this condition is defined as “Normal display”).
- Model LDE displays the value measured (below this condition is defined as “Normal display”) or, alternatively, the operating set point (in this case the SP led lights up). To change from the display of the set point to that of the value measured, or vice versa, press pushbutton ▲.

All the parameters can be displayed sequentially by pressing the FUNC pushbutton.

- Model LME displays the abbreviated name of the parameter selected on the lower display, on the upper display the value set.
- Model LDE displays alternatively the name of the parameter and its value: during the modification it displays only the value.

To modify the setting of a parameter proceed as follows:

1) By means of the FUNC pushbutton select the parameter to be modified.
2) Using the ▲ and ▼ keys set the value required.
3) Press the FUNC pushbutton to save the new value and go to the next parameter.
4) Press SMT to return to the previous parameter without saving.

NOTES:

1) If, during parameter modification, no pushbutton is pressed for more than 10 seconds, the instrument automatically reverts to the “normal display mode” and the new setting of the last parameter will be lost.
2) In the “normal display”, on pressing pushbutton ▲ or ▼ and keeping it pressed for more than two seconds, one can directly access the set point value, which can be modified by pressing ▲ or ▼ again (see section 5.7).
3) The instrument does not display all the possible parameters, but only those which are in agreement with:
   a) The instrument configuration (see section 4).
   b) The setting of parameter P14 (see section 4).
   c) The setting of the proportional band (see section 5.5).

5.2 INDICATORS

SMT Flashes when the first part of the SMART algorithm is active.
Lit when the second part of the SMART algorithm is active.
OUT1 Lit up when out 1 is ON.
OUT2 Lit up when out 2 is ON.
°C Lit up if the temperature is displayed in °C.
°F Lit up if the temperature is displayed in °F.
SP (LDE only) Lit when the display shows the operative set point.

5.3 FUNCTION OF THE PUSHBUTTONS

FUNC Saves the new value of the selected parameter and goes to the next parameter (increasing order).

SMT Enables or disables the SMART function and scrolls back all the parameters without saving them.

▲ Increases the value of the selected parameter or (LDE only) displays the set point value or the measured value.

▼ Decreases the value of the selected parameter.

▼ + FUNC Enables/disables the "LAMP TEST".

NOTE: The operative parameters must be modified within 10 seconds. If, during operative parameter modification, no pushbutton is pressed during this time, the instrument automatically reverts to the “normal display mode”. Saving only the parameter modifications which were followed by pressing the FUNC pushbutton.

5.4 MANUAL RESET OF THE ALARM

If the alarm has been configured as a latched alarm, the alarm status persists even after the alarm condition disappears.
To reset the alarm, press the FUNC pushbutton to select the parameter “rS” (the display will show “rS” and “OFF”. Use the ▲ and ▼ pushbuttons to select “On” and press the FUNC pushbutton.
The alarm reset action will only be successful if the alarm condition has disappeared only.

5.5 SMART ALGORITHM

This function gives best process control.
To enable the SMART function, press the SMT pushbutton for more than 1.5 s, when the instrument is in normal display mode. The SMT LED will be lit continuously or flash according to the algorithm automatically selected.
When the SMART function is enabled, the traditional control parameters (Pb, t I, td and rC) can be displayed but not modified.
When the traditional control (PID) is desired, press the SMT pushbutton again (for more than 1.5 s) to turn the "SMART" OFF. The instrument maintains the actual control parameters setting and allows parameter modification.

NOTES:

1) During operation of the SMART function, the relative cooling gain (if controlled by SMART) is limited within the following ranges:

Cooling medium	Span
Air	0.85 to 1.00
OIL	0.80 to 0.90
H_2O	0.30 to 0.60

2) The SMART function uses a derivative time equal to 1/4 of the integral time.
3) The limits of the proportional band settable by the SMART function are programmed by parameters P16, P17 and P18 .
4) The lower limit of the integral time settable by the SMART function is programmed by parameter P20 .
5) When ON/OFF control is programmed (Pb=0), the SMART function is disabled.
6) SMART enabling/disabling can be protected by the safety lock (see parameter P15).

5.6 INHIBITION OF THE OUT SIGNAL

These products allow to turn the out signal OFF manually to stop the control.
To turn the out signal OFF, press the ▲ pushbutton first and then press the FUNC pushbutton.
Keeping them both pressed for more than 3 seconds, the instrument will show "OFF" instead of the set point value.
The instrument will display "OFF" instead of indicating the set point; the out signal will switch OFF and the instrument will work as a simple indicator.
When the control outs are disabled, the alarms are also disabled and forced to the no-alarm condition. The modification of the control parameters is still enabled.
To return to normal control, press the ▲ pushbutton first and then press the FUNC pushbutton.
Keeping them both pressed for more than 3 seconds, the instrument returns to normal display mode.

NOTES :

1) If the out is turned OFF when the SMART function is performing the first part of the SMT algorithm (LED SMT flashing), the SMART function will be aborted and when the instrument comes back to the normal control, the SMART function will be disabled.
   If the out is turned OFF when the SMART function was performing the second part of the SMT algorithm (LED SMT lit), the SMART function will be stopped and, when the instrument comes back to the normal control, the smart function will also be activated.
2) If the instrument is turned OFF with the out power off function enabled, at the next start up this function will automatically be enabled again.

5.7 DIRECT MODIFICATION OF THE SET POINT

The instrument modifies the set point value without using the FUNC pushbutton.
When direct access to set point modification is required, proceed as follow:

1) Press pushbutton ▲ or ▼ for more than 2 seconds; the set point value will be displayed and it will start to change.
2) Using the ▲ and ▼ pushbuttons, set the desired value.
3) When the desired value is reached, DO NOT press any pushbutton, the new set point will become operative after 2 seconds after the pushbuttons were last pressed and the instrument will return to the "normal display".

If during this procedure the modification is not to be saved, press the FUNC pushbutton immediately (within 2 seconds); the instrument automatically returns to the normal display without saving the new set point.

5.8 DISPLAYING THE SET POINT SET (model LDE)

To display the set point set, press the ▼ pushbutton. The SP led lights up.
The set point value will appear on the display.

To return to the display of the value measured press pushbutton ▼ again.

5.9 LAMP TEST

To check the display efficiency, press pushbuttons ▼ + FUNC. The instrument will turn ON, with a 50% duty cycle, all the LEDs of the display (this state is called LAMP TEST).

No time out is applied to the LAMP TEST.
To return to the normal display mode, press pushbuttons ▼ + FUNC again.
No other keyboard functions are available during the LAMP TEST.

5.10 OPERATIVE PARAMETERS

The following is a list of all the available control parameters.
Note that some parameters may not be displayed depending on the specific instrument configuration.

Press the FUNC pushbutton. In model LME, the lower display will display the abbreviated name while the upper display will display the value of the parameter selected. In model LDE the display will show the values alternatively.
The value or state required can be set by means of pushbuttons ▲ and ▼.
On pressing pushbutton FUNC, the instrument saves the new value (or the new state) and goes to the next parameter.

Param. Description

SP — Set point (in eng. units).
Span: from rL to rH.

oPS — Manual reset of the alarms.
This parameter is displayed if one alarm has been programmed with manual reset.
Set ON and press the FUNC pusbutton to reset the alarms.

PPP — Software key for parameter protection.
This parameter is skipped if P11 = 0 or 1.
ON = the instrument is in LOCK condition
OFF = the instrument is in UNLOCK condition.
To switch from LOCK to UNLOCK, set a value equal to the value of parameter P11.
To switch from UNLOCK to LOCK, set a value different from the value of parameter P11.
Span: 2/999

AL — Alarm threshold (in eng. units).
Parameter AL is only displayed if P5 = 1, 2 or 3.
Spans:
- From P2 to P3 for process alarm (P5 = 1)
- From 0 to 500 units for band alarm (P5 = 2).
- From -199 to 500 units for deviation alarm (P5 = 3).

HSA — Alarm hysteresis (in % of P3 - P2 span).
This parameter is only displayed if the alarm is configured.
Span: From 0.1% to 10.0% of the input span or 1 LSD.
Note: If the hysteresis of a band alarm is larger than the alarm band, the instrument will use an hysteresis value equal to the alarm band minus 1 digit.

Pb — Proportional band (in % of P3 - P2 span).
Span:
from 1.0% to 99.9% (from 1.0% to 100% for model LDE) of the input span with one control out.
From 1.5% to 99.9% (from 1.5% to 100% for model LDE) of the input span with two control outs.
When the the SMART is ON (see section 5.5) the value of Pb is limited to that set in P16-P17 (one control action)

and to that set on P16-P18 (two control actions).
When Pb parameter is set to 0, the instrument performs an ON-OFF control; the ti, td, IP, C, C2, rC, OLP, OLH and tOL parameters are skipped and SMART function is disabled.

HS Hysteresis for ON/OFF control action (in % of P3 - P2 span).
This parameter is only available when Pb = 0.
Span: from 0.1% to 10.0% of the input span.

t i Integral time. Is skipped when Pb = 0 (ON/OFF action).
Span model LME: from 0.1 to 20.0 mm.s (minutes and tens of seconds).
Span model LDE: from 00.01 to 20.00 mm.ss (minutes and seconds)
Above this value the display becomes dark and the integral action is excluded.

td Derivative time. This parameter is skipped if Pb = 0 (ON/OFF action).
Span model LME: from 0.00 to 9.59 mm.ss (minutes and seconds)
Span model LDE: from 0.00 to 10.00 mm.ss (minutes and seconds).
If 0 is set, the derivative action is excluded.

IP Integral pre-load. This parameter is only available when Pb is not 0.
Span:
- from 0 to 100% for one control action
- from -100 to 100% for two control actions.

C Out 1 cycle time (in seconds).
This parameter is only available when Pb is not 0.
Span: from 1 to 200 s.

C2 Out 2 cycle time (in seconds).
C2 is only available if Pb is not 0 and P5 is 5.
Span: from 1 to 200 s.

rC Relative Cooling gain.
This is skipped if Pb = 0 (ON/OFF action) or P5 is not 5.
Span: from 0.20 to 1.00

OLP Dead band/Overlap between H/C outs (in % of the proportional band).
"OLP" is skipped if Pb = 0 (ON/OFF action) or P5 is not 5.
A negative value shows a dead band while a positive value shows an overlap.
Span: from -20 to 50%.

rL Set point low limit (in eng. units).
Span: from min. range value (P2) to rH.
Note: When P2 has been modified, rL will be realigned to it.

rH Set point high limit (in eng. units).
Range:from rL to full scale value (P3).
Note: When P3 has been modified, rH will be automatically realigned to it.

OLH Out maximum limit (in % of the out).
Available only if Pb is not 0.
Span:
- From 0 to 100 when the instrument is configured with one control out.
- From -100 to 100 when the instrument is configured for two control outs.

tOL Duration of the out power limiter (in minutes).
The tOL is a programmable time in which the out level is limited to OLH value.
The count of this time starts when the

instrument is switched on if the measured variable is less than the threshold value programmed (P10 parameter of section 4).
This parameter is only present if parameter PB is not 0.
Span: from 1 to 540 min. Above this limit, the display shows " inF" and the limitation is always entered.
Note: Parameter tOL can be modified but the new value will only become operative at the next instrument start up unless the new value is inF.

6. ERROR MESSAGES

6.1 MEASUREMENT ANOMALY SIGNAL

The instrument display (the upper display for model LME) shows the OVERRANGE and UNDERRANGE conditions with the following indications:

Overrange

Underrange

The example shows the display of model LME. Model LDE displays 4 digits.

The sensor break can be signalled as:
- for TC/mV input : OVERRANGE or UNDERRANGE selected by a solder jumper
- for RTD input : OVERRANGE

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

NOTE:
When:
- The instrument is set for one control out only and an OVERRANGE is detected, the OUT 1 turns OFF (if reverse action) or ON (if direct action).
- The instrument is set to use two control outs and an OVERRANGE is detected, OUT 1 turns OFF and OUT 2 turns ON.

- The instrument is set for one control out only and an UNDERRANGE is detected, the OUT 1 turns ON (if reverse action) or OFF (if direct action).
- The instrument is set to use two control outs and an UNDERRANGE is detected, OUT 1 turns ON and OUT 2 turns OFF.

For inputs from thermocouple the underrange indication can be selected as shown in section 7.2 of this manual.

NOTE: When an overrange or an underrange is detected, the alarms operate as if the instrument had detected the maximum or the minimum measurable value respectively.

To eliminate the out of span condition, proceed as follows:

1) Check the input signal source and the connecting line.
2) Make sure that the input signal is in accordance with the instrument configuration. Otherwise, modify the input configuration (see section 4).
3) If no error is detected, send the instrument to your supplier to be checked.

6.2 ERROR MESSAGES

Diagnostics are made on switching on and during normal operation.
If the instrument detects an error condition the display will show:
LME: "Err" in the lower display and the code which identifies the type of error in the upper display.
LDE: "E" and the error code.

The complete list of all the possible errors follows in numerical order.
Some errors automatically reset the instrument: if the error persists, send the instrument to your supplier to be checked.

6.3 LIST OF POSSIBLE ERRORS

100 EEPROM writing error.
Consult your supplier.

150 Generic CPU error.
Consult your supplier.

2xx Error in the configuration parameters.
The two less significant figures indicate the number of the incorrect parameter (e.g. 209 Err indicates error of parameter P9).
Press SMT and FUNC, then set the parameter correctly.
See section 4.

301 RTD input calibration error.
Contact your supplier.

305 TC input calibration error.
Contact your supplier.

307 RJ input calibration error.
Contact your supplier.

400 **Error in the operative parameters.**
To deal with the problem, enter the predefined parameters ("Default Parameters", see section B), pressing pushbuttons ▼ and ▲ at the same time.
Then set the operative parameters.

500 Auto-zero error
Contact your supplier.

502 RJ error
Contact your supplier.

510 Error during calibration.
Contact your supplier.

7. TECHNICAL CHARACTERISTICS

7.1 TECHNICAL SPECIFICATIONS

Case: ABS grey (RAL 7043); self-extinguishing degree: V-0 according to UL 94.
Front protection - designed and tested for IP 65(*) and NEMA 4X for indoor locations (when panel gasket is installed).
(*) Tests were performed in accordance with CEI 70-1 and NEMA 250-1991.
Installation: panel mounting
Rear terminal block:10 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 terminal block cover.
Dimensions: according to DIN43700 48 x 48 mm, depth 105 mm.
Weight: 200 g max.
Power supply:
- 100V to 240V AC 50/60Hz (-15% to + 10% of the nominal value).
- 24 V AC/DC (+ 10 % of the nominal value).

Power consumption: 9 VA max / 4 W.
I**nsulation voltage**: 2300 V rms according to EN 61010-1.
Display updating time: 500 ms.
Sampling time: 500 ms.
Resolution: 30000 counts.
Precision: + 0.3% v.f.s. + 1 digit @ 25°C of room 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.
It therefore conforms to directives 89/336/EEC (reference harmonized standard CEI EN-61326-1:1998 and CEI EN-61326/A1:1999 emission requirements: residential environment - class B – for 100/240V AC and industrial environment - class A – for 24V AC/DC) and to directives 73/23/EEC and 93/68/EEC (reference harmonized standard EN 61010-1).

Installation category: II
Temperature drift: < 200 ppm/°C (RJ excluded)
< 400 ppm/°C for RTD input and input from thermocouple T.
< 800 ppm/°C for RTD input with 1/10°C resolution (model LME).
< 500 ppm/°C for RTD input with 1/10°C resolution (model LDE).
Operating temperature: from 0 to 50°C (from 32 to 122°F).
Storage temperature: -30 to +70°C (-22 to 158°F)
Humidity: from 20 % to 85% RH, non condensing.
Protections:
1) WATCH DOG (hardware/software) for the automatic restart.

7.2 INPUTS

A) THERMOCOUPLES

Type: L, J, K, N, T programmable from the keypad.
Line resistance: max. 100 Ω with error <+0.1% of the input span.
Engineering units: °C or °F programmable.
Reference junction: automatic compensation from 0 to +50°C (from 32 to122°F).
Reference junction drift : 0.1°C/°C.
Burn-out: Up or down range selectable.
Calibration: according to IEC 584-1 and DIN 43710 - 1977 (TC L).

TABLE OF STANDARD RANGES

Type of TC	Measuring spans	
	In brackets the data of model LDE	
L	0 / +999 (1652) °F	0 / +900°C
J	0 / +999 (1832) °F	0 / +999 (1000) °C
K	0 / +999 (2498) °F	0 / +999 (1370) °C
N	0 / +999 (2552) °F	0 / +999 (1400) °C
T	0 / +752 °F	0 / +400 °C

B) RTD (**R**esistance **T**emperature **D**etector)
Type: Pt 100 3 wire connection.
Current: 135 μA.
Line resistance: automatic compensation up to 20 Ω/wire with :
- error <+1% of the input span when P1 = 5.
- not measurable error for the other spans.
Engineering units: °C or °F programmable.
Burn-out: up range.
NOTE: A special test is provided to signal OVERRANGE when input resistance is less than 15 Ω.
Calibration: according to DIN 43760.

TABLE OF STANDARD RANGES

RTD type	Measuring span In brackets the data of model LDE	
RTD Pt 100	-199 / +800 °C (-200 / +800°C)	-199 / +999 °F (-328 / +1472°F)
RTD Pt 100	-19.9 / +99.9 °C (-199.9 / +400.0°C)	- -

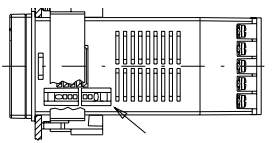
7.3 CONTROL ACTIONS
Control actions: PID or SMART
Proportional band: from 1.0 % (if just one control out is used) or 1.5 % (if two control outs are used) to 99.9% (LME) 100% (LDE) of the input span.
On setting Pb = 0 an ON/OFF control is performed.
Hysteresis (for ON/OFF control): from 0.1% to 10.0% of the input span.
Integral time: from 0.1" to 20' (LME): from 1" to 20' (LDE). If a value of more than 20 minutes is set the integral action is excluded.
Derivative time: from 0 to 9'59" (LME): from 0 to 10'00" (LDE).
Integral preload:
- from 0 to 100% for one control out.
- from -100 to 100% for two control outs.
Main out (out 1) cycle time: from 1 to 200 s.
Cooling out (out 2) cycle time: from 1 to 200 s.
Cooling action gain: from 0.20 to 1.00
NOTE: Parameters PB, TI, TD and RCG may be limited when the SMART function is enabled.
Overlap/dead band: from - 20 % to 50%.

7.4 OUTS
OUT 1 (Heating):
Relay out with SPDT contact;
a) Out contact 3A / 250 V AC on resistive load.
b) Logic voltage for solid state relay command.
Logic state 1: 24 Vdc +20% @ 1mA,
14V +20% @20 mA
Logic state 0: <0.5V

OUT 2 (Cooling or alarm 1)
Relay out with SPST contact;
Out contact 2A/250V AC on resistive load.

7.5 CPI – CONFIGURATION PORT INTERFACE

The instrument has a lateral socket into which a special five-pin connector can be inserted. This connector, supplied as an option together with its interface, can connect to the RS232 port of a normal PC on which the management software must be installed.



CPI connection socket

By means of the software the configuration can be managed directly from the PC. In this case the instrument display and keypad are not operative.

8. MAINTENANCE

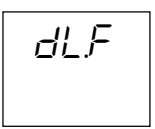
1) SWITCH THE EQUIPMENT OFF (power supply, relay out, etc.).
2) Take the instrument out of it case.
3) Using a vacuum cleaner or a compressed air jet (max. 3 kg/cm^2) remove all deposits of dust and dirt which may be present on the louvers and on the internal circuits being careful not to damage the 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
   - Isopropyl Alcohol (pure or denatured) [$(CH_3)_2CHOH$] or
   - Water (H_2O).
5) Make sure that there are no loose terminals.
6) Before putting the instrument back in its case, make sure that it is perfectly dry.
7) Put the instrument back and turn it ON.

B. DEFAULT PARAMETERS

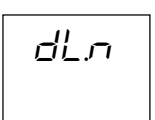
DEFAULT OPERATIVE PARAMETERS

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:

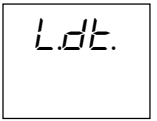
a) The SMART function should be disabled.
b) The safety lock must be OFF.
c) The upper display will show the processe variable while the lower display will show the set point value or the current measure (LME type).
d) In normal display mode, held down ▼ pushbutton and press ▲ pushbutton; the display will show:



e) Within 10 seconds press ▲ 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:

PARAM.	DEFAULT VALUE
SP	= minimum range-value
nrS	= OFF
AL	= minimum range-value for process alarms; 0 for deviation or band alarms
HSA	= 0.1 %
Pb	= 4.0 %
HS	= 0.5 %
t i	= LME: 04.0 LDE: 04.00 (4 minutes)
td	= LME: 1.00 LDE: 01.00 (1 minute)
IP	= 30 % for one control output 0 % for two control outputs
C	= 20 seconds
C2	= 10 seconds for P6 = Air 4 seconds for P6 = OIL 2 seconds for P6 = H2O
rC	= 1.00 for P6 = Air 0.80 for P6 = OIL 0.40 for P6 = H2O
OLP	= 0
rL	= initial scale value (P2)
rH	= full scale value (P3)
OLH	= 100 %
tOL	= infinite

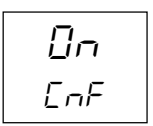
DEFAULT CONFIGURATION PARAMETERS

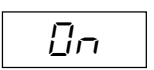
The configuration parameters can be loaded with predetermined default values. These data are the typical values loaded in the instrument prior to shipment from factory. To load the default values proceed as follows:

a) In "normal display mode", press SMT and FUNC pushbutton for more than 3 secs.

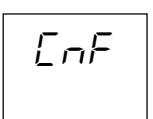
LME **LDE** (alternatively):

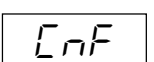
b) Push the ▼ or ▲ pushbutton; display will show:



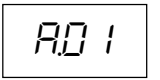


c) Press FUNC to confirm.

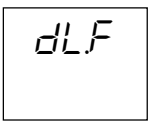




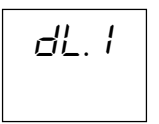
d) Press the ▼ pushbutton; display will show the firmware version.



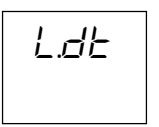
e) Mantaining the pressure on the ▼ pushbutton, push the ▲ pushbutton too. The instrument will show:



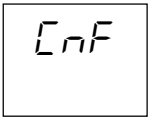
f) Press ▲ pushbutton to select between table 1 (european) or table 2 (american) default parameter set. The display will show:

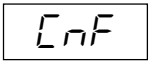


g) Press FUNC pushbutton; the display will show:



This means that the loading procedure starts. After about 3 seconds the loading procedure is terminated.





h) Press SMT and FUNC pushbutton for more than 3 secs.

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

PRODUCT	**LDE**		**LME**	
PARAMETER	TABLE 1	TABLE 2	TABLE 1	TABLE 2
P1	1	9	1	9
P2	0 °C	0 °F	0 °C	0 °F
P3	400 °C	1000 °F	400 °C	999 °F
P4	r	r	r	r
P5	0	0	5	5
P6	H.A	H.A	Air	Air
P7	r	r	r	r
P8	OFF	OFF	OFF	OFF
P9	0	0	0	0
P10	0	0	0	0
P11	0	0	0	0
P12	25	25	25	25
P13	--	--	--	--
P14	ON	ON	ON	ON
P15	2	2	2	2
P16	30.0	30.0	30.0	30.0
P17	1.0	1.0	1.0	1.0
P18	--	--	1.5	1.5
P19	--	--	OFF	OFF
P20	00.30	00.30	00.3	00.3
P21	10	10	10	10

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