92 and 92i Installation and Operating Instructions

EUROTHERM

CONTROLS
PROCESS AUTOMATION
RECORDERS

CE **This controller meets the requirements of the European Directives on Safety and EMC. It is the responsibility of the installer to ensure the safety and EMC compliance of any particular installation.** The installation information contained in this instruction sheet is given to help with this general requirement.

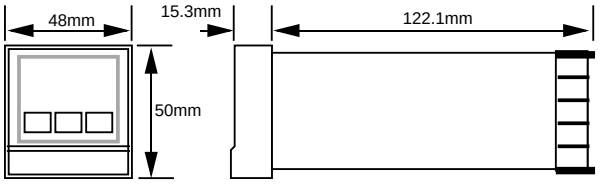
Read Safety notes on the inside page before commencing

MECHANICAL INSTALLATION

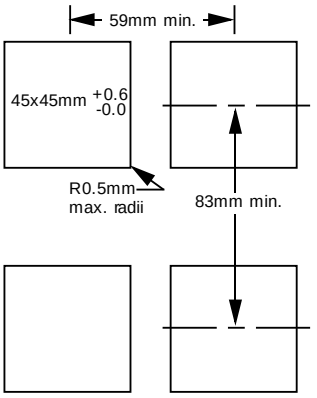
- Prepare panel cutout in sheet metal enclosure. Enclosure temperature must remain within 0-55°C range.
- Install the optional front panel gasket (part no. BO133297) if required. Remove the backing from the gasket and apply it around the panel cutout on the outside of the panel.
- Slide instrument sleeve into the cutout from the front of the panel.
- Position the mounting bracket on the rear of the instrument sleeve with the 2 clips facing the rear.
- While holding the sleeve, slide the mounting bracket towards the panel until the clips engage on the ratchets.
  While still pulling back on the sleeve, press on the upper left and lower right hand corners of the bracket to seat the mounting bracket.
  Another push on the clips with a screwdriver might be necessary to secure the installation.

Panel details

Panel depth: with terminal cover: 126.1mm
with gasket: less 1.5mm
Panel thickness: maximum 13mm



Dimensional details



Panel cutout and minimum spacing

ELECTRICAL CONNECTIONS

Installation Requirements for EMC

To ensure compliance with the European EMC directive certain installation precautions are necessary as follows:

- For general guidance refer to Eurotherm Controls EMC Installation Guide, HA025464.
- When using relay outputs it may be necessary to fit a filter to suppress the emissions. For typical applications we would recommend Schaffner FN321 or FN612, but the filter requirements will depend on the type of load.
- This product complies with the emission requirements of EN 50081-2: 1994, the generic emission standard for the industrial environ ment. If the unit is used in table top equipment powered by a standard power cable, it is likely that compliance is required to EN 50081-1, the generic emission standard for the domestic and light industrial environment. In this case the unit should be mounted in a suitable metallic cabinet to enclose any electromagnetic emissions. All cables passing outside the cabinet, including the mains leads, should pass through suitable RF filtering such as Schaffner FN321 or FN612.

Snubbers

Connect snubbers CZ140398 (22nf + 100Ω) across the appropriate output or alarm relay contacts when driving AC inductive loads (mechanical contactors and solenoids). Do not use snubbers when driving high impedance loads. The snubber passes 1mA in 120Vac circuits, and 2mA in 240Vac circuits; this is sufficient to hold in certain relays with high impedance coils and should not be used in such installations.

Power

Respect the polarity of the AC power supply; line wire must be connected to terminal 12, and the neutral must be connected to terminal 11.

Alarms

The alarm outputs are failsafe: the relays are de-energised during the alarm condition or power down. The attached alarm circuit should be designed for failsafe operation and fused appropriately. A snubber may be required.

WARNING

When an alarm contact is to be implemented as part of a failsafe alarm scheme, it is the user's responsibility to verify that the effect of the snubber does not interfere with the operation of the circuit. Certain high impedance circuits are not able to detect a contact opening when the snubber is placed across the contact. In these cases the snubber should not be installed across the relay contact.

Reset input (latching configurations only)

Connect momentary contact, normally open pushbutton to terminals 6 and 7. Keep wiring run shorter than 1m and well away from any noise generating circuits.

Input

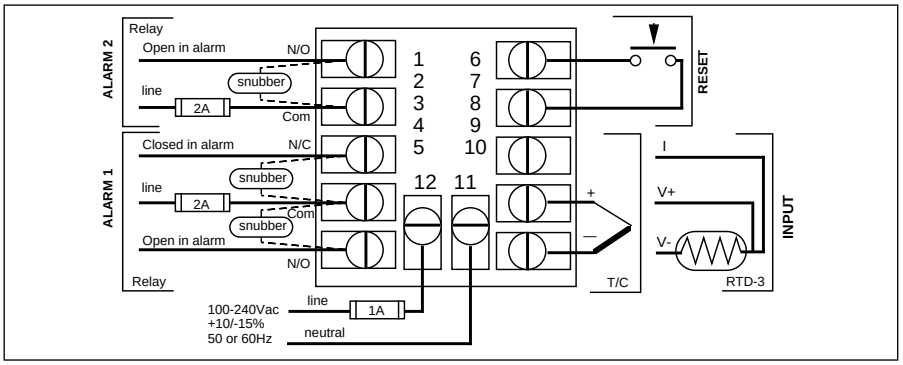
WARNING

This alarm unit must have its own input sensor. Never connect the input terminals 9 and 10 in parallel with the input of any other instrument, e.g. recorder, controller, etc. The parallelled inputs of other instruments interfere with proper operation of the sensor break detection circuitry and may also impair the measurement accuracy.
NOTE: The input circuit is NOT isolated from the reset input (terminals 6 and 7).
Use of shielded, twisted pair is recommended for the input sensor. The shield must be connected to terminal 10 unless grounded elsewhere.

- Thermocouple: Use appropriate compensation cable. Keep loop resistance as low as possible (1kΩ maximum).
- RTD: Use 3 copper wires of same length and diameter. (20Ω/lead maximum resistance.)

Rear terminal cover (optional)

After wiring, attach rear terminal cover BD133125 with screw FY133264U001.



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CONFIGURATION

Procedure

1. Cycle power 'OFF' and 'ON'. Press and hold secret key.
   Self test follows: tESt appears followed by 1111, 8888, then the 4-digit configuration code.
   Hold in secret key until 4-digit configuration code appears and left hand digit flashes.

   NOTE: Touching any other front panel key during the start-up self test could lead to erroneous test results.
2. See configuration code with left digit blinking.
3. Enter new code:
   ▼ = select digit position (1 through 4)
   ▲ = modify digit value.
4. To exit configuration mode do one of these:
   Secret key = accept new configuration; parameter value check follows.
   ↵ = abort; return to previous configuration.

Configuration code

1st (left) and 2nd digit

	alarm 1 and alarm 2 functions
0	Disabled
latching operation	
1	Deviation low alarm
2	Deviation high alarm
3	Deviation band alarm
4	Full scale low alarm
5	Sensor break alarm
6	Full scale high alarm
8	Rate-of-change alarm
non-latching operation	
9	Deviation low alarm
A	Deviation high alarm
B	Deviation band alarm
C	Full scale low alarm
D	Sensor break alarm
E	Full scale high alarm
F	Rate-of-change alarm

3rd digit

	input sensor type	full specified range ℃ min	℃ max
0	"RTD—100Ω Pt, DIN43760"	-100	600
1	B—Pt-30%Rh/Pt/6%Rh	600	1820
2	C—W-5%Re/W-26%Re (Hoskins)	0	2150
3	E—Chromel™/Adams constantan	-260	1000
4	J—Fe/SAMA constantan	-200	1200
5	K—Chromel™/Alumel™	-250	1372
6	L—Fe/Konstantan	-100	900
7	N—NiCroSil/NiSil	0	1300
8	Platinel II™	-250	1395
9	R—Pt-13%Rh/Pt	0	1767
A	S—Pt-10%Rh/Pt	0	1767
B	T—Cu/Adams constantan	-255	400
C	Linear a—2-point entry scaling		
D	Linear b—point-and-span entry scaling		

4th digit

	display	remote ack.	pwr. fail alarm
0	°C	AL1 & 2	no
1	°C	AL1 & 2	yes
2	°C	AL1	no
3	°C	AL1	yes
4	°C	AL2	no
5	°C	AL2	yes
6	°F	AL1 & 2	no
7	°F	AL1 & 2	yes
8	°F	AL1	no
9	°F	AL1	yes
A	°F	AL2	no
B	°F	AL2	yes

Configuration example

6650:

1st digit (6): full scale (absolute) high latching alarm (AL 1).
2nd digit (6): full scale (absolute) high latching alarm (AL 2).
3rd digit (5): type K thermocouple input.
4th digit (0): display units in °C, remote alarm acknowledgement for both alarms, and power fail alarm disabled.

Latching alarms	**Active**	**Cleared**
Before resetting (unacknowledged)	lamp flashing relay de-energised	lamp flashing relay de-energised
After resetting (acknowledged)	lamp steady ON relay de-energised	lamp OFF relay energised
Non-latching Alarms	lamp flashing relay de-energised	lamp OFF relay energised

Table A Alarm conditions

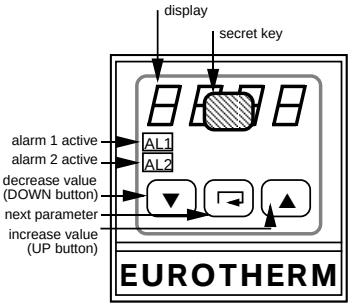
OPERATION

Basic procedures

Open list

Refer to illustration below.

- Measured value is displayed when unit is unattended.
- Depress ↵ once to view display units.
- Depress again to view AL 1 (roc1). Push ▲ or ▼ to view alarm 1 setpoint.
- Depress again to view AL 2 (roc2). Push ▲ or ▼ to view alarm 2 setpoint.
- To acknowledge (or reset) latching alarms (flashing red AL1 or AL2 lamp); use ↵ until AL1 (AL2) appears. Hold ▲ or ▼ for 5 seconds until Clr appears, release , then press the button again.



Front panel pushbuttons, displays and lamps

Protected list

- To enter protected list: use ↵ until units display (°F, °C or Lin), then "**secret key**". Continue with ↵ to view parameters.
- Push ▲ or ▼ to view parameter value. Push▲ or ▼ again to modify parameter value.
- To return to measured value display when in protected list: "**secret key**".

NOTE: Parameters not pertinent to the unit configuration do not appear in the scroll list.

Alarms

Temperature and process alarms

If the measured value enters an alarm condition (defined by the configuration code and the parameter values), then the appropriate red lamp, AL1 or AL2, lights and the corresponding relay de-energizes. The alarm operation is configurable as latching or non latching.

NOTE: Deviation alarm setpoints (d-1and d-2) are in reference to the alarm setpoints (AL 1 and AL 2).
Examples:
deviation low alarm setpoint = AL 2 - d-2,
deviation high alarm setpoint = AL 1 + d-1,
deviation band alarm setpoints = AL 2 ± d-2.

Rate-of-change alarms (configuration codes "8" or "F")

Configured alarm channels go into the alarm condition if the rate of change of the measured value exceeds the alarm setpoint. This applies for both positive and negative changes of the measured value. Modifications to the setpoint take effect after the pushbutton lights extinguish.

Resetting (acknowledging) latching alarms

Latching alarms are acknowledged in the open list (see “Open list procedures”) or by a remote pushbutton.

NOTE: The remote pushbutton can be configured to acknowledge only AL1, only AL2 or both.

Sensor fail alarm

Sensor fail detection is always operative. The unit displays SnSr FAIL upon detecting at least one of these conditions:

- if the input signal is less than -40mV or greater than +90mV,
- if the input is open circuit, or
- if the unit’s temperature is outside of the 0-55°C operating range (thermocouple inputs only).

The behaviour of the relays and the alarm lamps AL1 and AL2 conforms to the Table A on bottom of page 2.

NOTE: Selection of configuration codes “5” or “D” for digits 1 and 2 enables the alarm relay operation only for sensor fail alarm (and power fail alarm if enabled) and not for any process alarm condition.

Power fail alarm (latching alarms only)

- Manual reset after power restoration.
  If the power fail alarm is selected (one of the “yes” selections for configuration code digit 4), the limit switch always places both relays in the alarm state (de-energized) upon powering up. A manual reset by the operator is thus required to re-energize the alarm out put relays. These alarms are acknowledged as all others in the open list or by the remote pushbutton.
- Automatic reset after power restoration.
  If the power fail alarm is not selected (one of the “no” selections for configuration code digit 4), the limit switch automatically re-affirms any alarm existing before the power failure.

Alarm test

To test the operation of the output relays and the connected circuit, scroll to the appropriate alarm (AL1 or AL2) in the protected list and hold ▲ or ▼ until tESt appears. Release, then depress the button again to change the state of the relay: if the relay is energized, then the alarm test de-energizes the relay and vice versa. When the button is released, the relay assumes the previous condition determined by the input.

Adjustable parameters

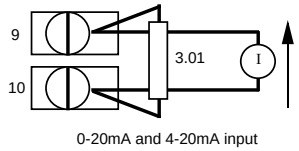
See Adjustable parameter list over the page.

Linear input setup

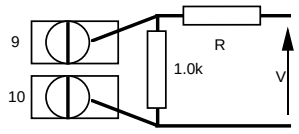
Electrical connections

For all inputs use a shielded twisted pair.

- Millivolt inputs (-10 to 70mV)
  Connect signal leads directly to input terminals 9(+) and 10(-).
- 0-20mA and 4-20mA inputs.
  Connect 3.01Ω shunt (part no. CA 9G3R01) across input terminals 9(+) and 10(-).
- Higher voltage inputs. Voltage divider network is required (standard voltage dividers can be supplied by Eurotherm or made up by the user). Refer to table for suggested values. Resistor specifications:1%, 0.125W minimum, ±100ppm metal or metal oxide film.



0-20mA and 4-20mA input



Voltage inputs

Nominal range	R
-20 to 200mV	2.2k
-0.1 to 1 V	15.0k
-0.5 to 5V	75.0k
-1 to 10V	150k
-2.5 to 25V	392k

Caution

Use of the shunt or voltage divider inhibits operation of the sensor break detection feature.

Scaling procedure

There are two methods of entering and scaling linear inputs:

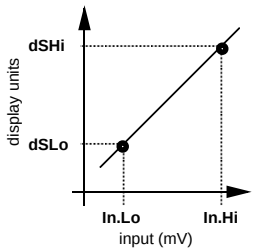
- Linear a: 2-point scaling (configuration code "C").
- Linear b: point and span scaling (configuration code "D").

Linear a and b

1. Set display decimal point position parameter, **dP** to desired value.
2. If reading the input signal directly from the source, connect source (from signal generator or sensor) to input terminals. Apply a signal equal to a known low value for the first setup point.
3. Scroll through the protected list until **In.Lo.** Press and hold on ▼ ▲ until **rEAd** appears, release, then push the button again. [Alternatively, if no input signal is required or the exact value is known, the input value in millivolts can be set in with ▼ or ▲].
4. Scroll to **dSLo**. Then set in corresponding display value with ▼ and ▲.

Linear a only

5. Again, if reading the input signal directly from the source, apply a signal equal to a known high value for the second setup point.
6. Scroll through the protects list until **In.Hi**. Press on ↵ until **rEAd** appears, release, then push the button again. [Alternatively, if no input signal is required or the exact value is known, the input value in millivolts can be set in with ▲ or ▼].
7. Access **dSHi**. Then set in the corressponding display value with ▲ or ▼.

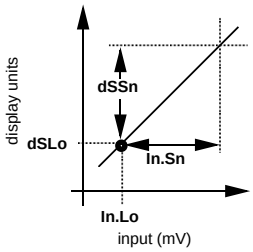


Linear a: 2-point scaling

Linear b: point and span scaling

Linear b only

8. Access **In.Sn.** With ▲ or ▼ set in the input signal span in millivolts.
9. Access **dSSn.** With▲ or ▼ set in the display span.



Linear b: point & span scaling

LINEAR INPUT SCALING (Replaces "OFSt" parameter in protected list)

In.Lo	Input for low setup point	-9.99 to 70.00mV input signal range	Both linear a and b inputs. To read input signal value from rear terminals: Hold UP or DOWN until "rEAd" appears, release, then press the button again.
dSLo	Display value for low setup point	-999 to 9999, -99.9 to 999.9, or -9.99 to 99.99 process units	Both linear a and b inputs.
In.Hi	Input for high setup point	-9.99 to 70.00mV input signal range	Linear a inputs only. To read input signal value from rear terminals: See procedure for "In.Lo", above."
dSHi	Display value for high setup point	-999 to 9999, -99.9 to 999.9, or -9.99 to 99.99 process units	Linear a inputs only.
In.Sn	Input signal span	0.00 to 70.00mv	Linear b inputs only.
dSSn	Display span	-999 to 9999, -99.9 to 999.9, or -9.99 to 99.99 process units	Linear b inputs only.

Adjustable parameter list

Mnemonic	Parameter	Adjustable range	Comments
OPEN LIST			
°C, °F, Lin	Display units	View only.	Display units selected in configuration.
AL 1 (roc1)	Alarm 1 setpoint (rate-of-change setpoint)	View only.	To acknowledge latching alarms: Hold UP or DOWN button until "CLr" appears,release, then press the button again.
Al 2 (roc2)	Alarm 2 setpoint (rate-of-change setpoint)		Value adjustable in protected list, below.
PROTECTED LIST			
ConF	Configuration code	View only.	Can be changed upon power up only.
Id	Instrument model ident.	View only: "92"	
dP	Decimal point position for linear inputs a and b	0 to 2 decimal places. Formats: XXXX, XXX.X or XX.XX"	Appears for linear inputs only. Affects all parameters displayed in process units.
AL 1 (roc1)	Alarm 1 setpoint (rate-of-change setpoint)	Full scale alarm setpoints and deviation alarm reference levels: configured input sensor range. Rate of change alarm: 1 to 3000°C/min.; 1 to 5400°F/min.; 1 to 3000, 0.1 to 300.0, or " 0.01 to 30.00 process units/min.	Alarm function selected in configuration. "AL 1" setting irrelevant for sensor break alarms: configuration codes "5" and "D". To test alarm operation: Hold UP or DOWN button until "tESt" appears, release, then press the button again. Alarm state should toggle.
HY 1	Alarm 1 hysteresis	1°C (or 1°F) to upper range limit Linear inputs: 1 to 9999, 0.1 to 999.9, 0.01 to 99.99	
-d-1	Deviation alarm offset from "AL1"	1°C (or 1°F) to upper range limit Linear inputs: 1 to 9999, 0.1 to 999.9, 0.01 to 99.99	Appears for deviation configurations only. For deviation band alarms, "HY1"" must be less than "-d-1".
AL 2 (roc2)	Alarm 2 setpoint (rate-of-change setpoint)	Same as alarm 1.	Same as alarm 1.
HY 2	Alarm 2 hysteresis		
-d-2	Deviation alarm offset from "AL 2"		
OFSt	Calibration offset	-50.0 to 50.0°C -90.0 to 90.0°F	Appears for temperature inputs only.
LinE	Line frequency	50 Hertz: "50"; 60 Hertz: "60"	Set to line frequency upon installation.

Display messages list

Message	Display condition	User action/comments
INPUT STATUS MESSAGES		
SnSr FAIL	Sensor fail. Input open or reversed; measured value outside of configured range.	Verify input sensor and connections. Message dissapears when input signal is reinstated.
Flashing value	Display overrange or out of specified accuracy range	Unit should not be used in this range.
SELF DIAGNOSTIC MESSAGES		
tESt 1111	Internal self test upon power up.	Replace unit if all four 1's do not light up or fails to go on to "8888" display. Do not touch front panel during self test.
8888	Display test after above self test. Lasts for approximately 3 seconds	User should verify that all digits and lamps light up to prevent erroneous readings.
EE FAIL	Memory corruption.	Cycle power. Verify and correct all parameter and configuration values. If display persists, replace unit.
Id FAIL	Unit failure	Replace unit

SAFETY NOTES

Technical Specification for Safety Purposes

Equipment ratings	
Supply voltage:	85 to 264V a.c. ~.
Supply frequency:	48 to 52, or 58 to 62Hz a.c. ~.
Power consumption:	5 Watts.
Relay output:	Maximum of 264V a.c. ~. Minimum of 10V peak. Maximum current, 2A resistive.
Leakage current:	Snubber components may be fitted externally. The leakage current through these snubber components is less than 2mA at 264V a.c., 50Hz.
Over current protection:	External over current protection devices are required that match the wiring of the installation. A minimum of $0.5mm^2$ or 16/0.2mm wire is recommended. Independent fuses are required for the instrument supply and each relay output. Suitable fuses are T type, (IEC 127; time-lag) as follows: Instrument supply: 85 to 264V a.c. ~ 1A (T). Relay outputs: 2A (T).
Low level I/O:	All other input and output connections are intended for low level signals less than 42V.
Environmental ratings	
Panel sealing:	Instruments are intended to be panel mounted. An optional panel gasket is available to provide panel sealing to IP 54 as defined in EN 60529.
Operating temperature:	0 to 55°C. Ensure the enclosure provides adequate ventilation.
Relative humidity:	5 to 95%, non-condensing.
Atmosphere:	The instrument is not suitable for use above 2000m or in explosive or corrosive atmospheres.
Electrical safety	EN 61010(93), Installation category II, pollution degree 2.
Installation category II:	Voltage transients on any mains power connected to the instrument must not exceed 2.5kV.
Pollution degree 2:	Conductive pollution must be excluded from the cabinet in which the instrument is mounted.
Isolation:	All inputs and outputs, (except digital inputs, logic output on 91e and logic output 2 on 94) have a reinforced isolation which provides protection against electric shock. Digital inputs, logic output on 91e and logic output 2 on 94 are electrically connected to the main process variable input, (thermocouple etc.) but have reinforced isolation to all other connections.

Safety Symbols

Various symbols are used on the instrument, they have the following meaning:


Caution, (refer to the accompanying documents)


Equipment is protected by reinforced insulation

Equipment that is protected with reinforced insulation does not require a protective conductor.

Installation Safety Requirements

For safe operation Eurotherm Controls products must be correctly installed in a suitable environment. The following installation guidelines should be carefully considered before operating the equipment;

- **This unit should be installed inside a suitable grounded metal enclosure.** This must prevent live parts being accessible to human hands and metal tools. It is recommended that rear terminal covers (available as an option) be fitted.
- **Wiring installations should comply with all local wiring regulations.** It is the user's responsibility to calculate the maximum possible current in each power and common wire. Do not exceed the rated current for any particular wire size permitted by the local electrical code. Overheated wires and damaged insulation may result from overloading.
- **The installation must include a power isolating switch or circuit breaker.** This device should be in close proximity to the controller, within easy reach of the operator and marked as the disconnecting device for the equipment. SCRs and triacs are not adequate means of isolating the supply, and should always be backed by a suitable mechanical disconnect switch.
- **The maximum voltage applied to the unit must not exceed 264V ac.** Ensure that the voltage which is applied to the unit power supply, between any two isolated circuits, or between any isolated circuit and ground does not exceed 264Vac.
- **The controller must not be wired to a three phase supply with an unearthed star connection.** This is because under fault conditions the supply voltage can rise above 264Vac with respect to earth. The product will not be safe under these conditions.
- **Any voltage transients that occur on power supply lines must not exceed 2.5kV.** Where occasional voltage transients over 2.5kV are expected or measured, the power installation to both the instrument supply and load circuits should include a transient limiting device. These units will typically include gas discharge tubes and metal oxide varistors that limit and control voltage transients on the supply due to lightening strikes or inductive load switching. Devices are available in a range of energy ratings and should be selected to suit conditions at the installation.
- **Conductive pollution must be excluded from the instrument enclosure.** Carbon dust is a conducting pollution, but even particles that are normally non conducting may become conductive with condensation. To secure a suitable atmosphere in conditions of conductive pollution, fit a filter to the air intake of the cabinet. Where condensation is likely, for example in low temperatures, include a thermostatically controlled heater in the cabinet.
- **This unit is not suitable for use in areas subject to hazardous atmospheres.** No Eurotherm Controls product should be connected to a circuit which passes into or through a hazardous area unless appropriate precautions are taken (even though the instrument itself may be located in a safe area). Such an installation should conform to the requirements of the relevant Authority.
- **Grounding.** This instrument has internal circuits which are isolated or "floating." This is necessary to prevent the occurrence of a "ground loop" in signal circuits. To avoid possible shock hazards in the event of an internal fault causing breakdown of insulation, it is recommended that all equipment connected to this unit be enclosed in a grounded metal enclosure. Sheaths of thermocouples (or other sensors) should be properly grounded by a separate conductor (instead of being dependent on grounding via the machine framework).
- **Out-of-limits alarms.** In applications where excessive deviation of a controlled parameter due to equipment failure could cause damage to machinery or materials, or injury to personnel, it is strongly recommended that an additional separate unit with its own input sensor be used to give alarm indication or to shut down the process or both, as may be appropriate. (Note: The alarm function built into controllers may not give sufficient protection in these circum stances). When the controller alarm function or separate alarm units are used they should be checked for correct operation at regular intervals.
- **Configuration.** Many instrument functions are user selectable from the front panel. It is the user's responsibility to verify that the instrument configuration is correct. Personal injury, property loss and equipment damage could result from an improperly configured instrument.
- **ESD precautions.** This instrument contains static sensitive components. Care should be taken to avoid electrostatic discharge (ESD) and thus reduce incidence of damage to the instrument when removed from its sleeve. Any manipulation of the instrument printed circuit boards should be performed on a conductive surface with the personnel in contact with the surface by means of a grounded, metal or conductive plastic wrist strap with a 1MΩ series resistor.
- **Procedure in the event of trouble.** Before beginning any investigation of a fault, the electrical supplies to all equipment concerned should be switched off and isolated. Units suspected of being faulty should be disconnected and removed to a properly equipped workshop for testing. There are no user-service-able parts inside this unit.

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