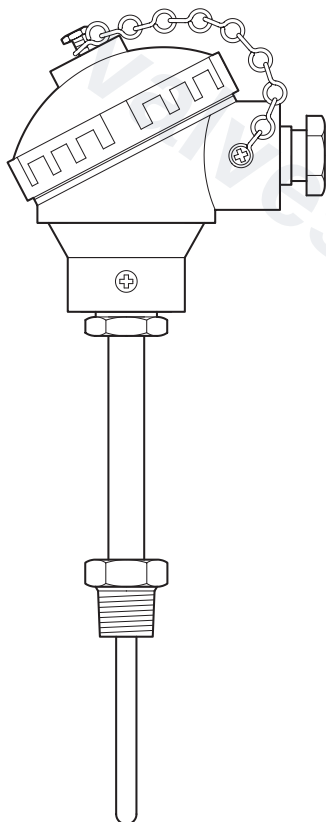


EL2270 Temperature Sensor

EL2271 Temperature Sensor with transmitter

with optional Food+ Thermowell

Installation and Maintenance Instructions



1. Safety information
2. General product information
3. Mechanical installation
4. Electrical installation
5. Maintenance
6. Fault finding
7. Transport, handling and storage

1. Safety information

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use/application. The product listed below complies with the requirements of the EU Pressure Equipment Directive / UK Pressure Equipment (Safety) Regulations and carries the CE mark when so required.

Pressure equipment not bearing the  mark is classified 'Sound Engineering Practice' in accordance with the Pressure Equipment Directive (PED). It is the responsibility of the user to ensure that the product is installed and operated safely.

Note: By law, SEP products cannot be marked with the  symbol.

1.1 Intended use

- i) Check that the product is suitable for use with the intended fluid.
- ii) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.
- iii) Determine the correct installation situation and direction of fluid flow.
- iv) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.
- v) Remove protection covers from all connections before installation and protective film from all name-plates, where appropriate, on steam or other high temperature applications.

Safe operation of these products can only be guaranteed if they are properly installed, commissioned, used and maintained by qualified personnel (see Section 1.11) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.4 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature.

1.5 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk? Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.8 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

1.9 Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

1.10 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high/low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person.

Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety. Post 'warning notices' if necessary.

1.12 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

1.13 Residual hazards

In normal use the external surface of the product may be very hot.

Many products are not self-draining. Take due care when dismantling or removing the product from an installation.

1.14 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.15 Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.16 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

1.17 Directives and standards

Product range	EL2270	EL2271
2014/30/EU Electromagnetic compatibility (EMC)	-	EN61326-1 EN61326-2-3 See Declaration of Conformity for latest version of the standard.
2014/68/EC Pressure Equipment Directive	SEP for thermowell/protection tubes and miniature version only	
2014/34/EU ATEX Directive	WARNING: The equipment must not be used in potentially explosive atmospheres, in accordance with European Directive 2014/34/EU.	
(EC) 1935/2004 Food Contact Materials Regulation	See section 2.2 Thermowells	
NAMUR (Standardization Association for Measurement and Control in Chemical Industries)	-	- NE 21 Electromagnetic compatibility - NE 89 Sensor break signalling - NE 43 Signalling at the analogue output

1.18 Location of operating instructions

The operating instructions are part of the product and must be kept in the immediate vicinity of the instrument and readily accessible to skilled personnel at any time. Pass the operating instructions onto the next operator or owner of the instrument.

1.19 Food+ Thermowells, safety instructions

This product is intended to be connected into a system that can operate an EC1935 compliant process. To minimise the risk of non-intentionally added substances in the system, it is essential that an appropriate CIP (cleaning in place) cycle is carried out by the end user prior to first use in a food contact application.

A list of the materials that could come directly or indirectly into contact with foodstuffs can be found in the Declaration of Compliance available for this product.

2. General product information

2.1 Description and intended use

EL2270

The EL2270 is a Pt100 platinum resistance temperature sensor for general industrial use. It is a single 3 wire device that meets EN 60751: Class A, over a process temperature range of -100 °C to +450 °C. This sensor can be connected directly to any temperature indicator or controller that has a 3 wire Pt100 input.

A single or dual element quick response version (40mm probe length only) is also available for applications such as plate heat exchanger control.

A miniature version may also be ordered, **with an integrated thermowell**, a 1/4 " BSP taper thread, a probe length of 35 mm and a process temperature range of -50 °C to +205 °C

EL2271

The EL2271 is offered in various temperature ranges and probe lengths, see the table below for details. The sensing element is a 3 wire device that meets EN 60751: Class A.

The output is a two wire loop powered 4 - 20 mA transmitter, with a diverse supervisory function.

A comprehensive standard process temperature range is normally available from stock. The 4 - 20 mA output can be connected directly to any temperature indicator, controller or flow computer that has a 4 - 20 mA input.

The EL2271 may be ordered with a 3 point calibration certificate.

EL2270 and EL2271 options

	Process temperature measuring range	Probe length options available Dimension C (mm)	Certification
EL2270	-100 °C to 450 °C	25, 50, 75, 125, 225, 725	Type 2.2, non specific.
EL2270 Quick response	-100 °C to 450 °C	40	
EL2270 Duplex quick response	-100 °C to 450 °C	40	
EL2270 Miniature	-50 °C to 205 °C	35	
EL2271	-50 °C to 50 °C	25, 50, 75, 125	As standard - Type 2.2, non specific.
	0 °C to 100 °C	25, 50, 75, 125	
	0 °C to 150 °C	25, 50, 75, 125	
	100 °C to 250 °C	25, 50, 75, 125	Optional - 3 point calibration certificate.
	-100 °C to 450 °C	75	
	-100 °C to 450 °C	125	

Food+ Thermowells

The thermowell is typically used to separate the EL2270 or EL2271 temperature sensor from the process fluid. It additionally enables replacement of the sensor during operation. The use of a Food+ thermowell pocket is mandatory in any food contact compliant process.

2.2 Food+ Thermowells

General

Three types of Thermowells are available.

Type A 1½" ASME BPE sanitary clamp connection, two piece welded construction.

Type B ½" NPT pipe thread connection, one piece.

Type C ½" NPT pipe thread connection, fabricated and welded construction for non flow applications.

Surface finish of all wetted faces is $R_a < 0.76\mu\text{m}$. The EL2270 Miniature does not require the use of a thermowell and is not suitable for food contact compliant processes.

Certification

The thermowells are available with certification to EN 10204 3.1 at additional cost.

Note: All certification/inspection requirements must be stated at the time of order placement.

Designed, manufactured and approved for steam and condensate applications, all Food+ thermowells comply with:

- (EC)1935:2004 Materials and Articles Intended to come into Contact with Food
- (EC)2023:2006 Good Manufacturing Practice for Materials and Articles Intended to come into Contact with Food
- (EU)10/2011 Plastic Materials and Articles Intended to come into Contact with Food
- FDA Code of Federal Regulations - title 21 - Food and Drugs

This product is intended to be connected into a system that can operate a food contact compliant process. A list of the materials that could come directly or indirectly into contact with foodstuffs can be found in the Declaration of Compliance available for this product.

Material

Type A and Type B 316 / 316L

Type C 316 Ti (1.4571)

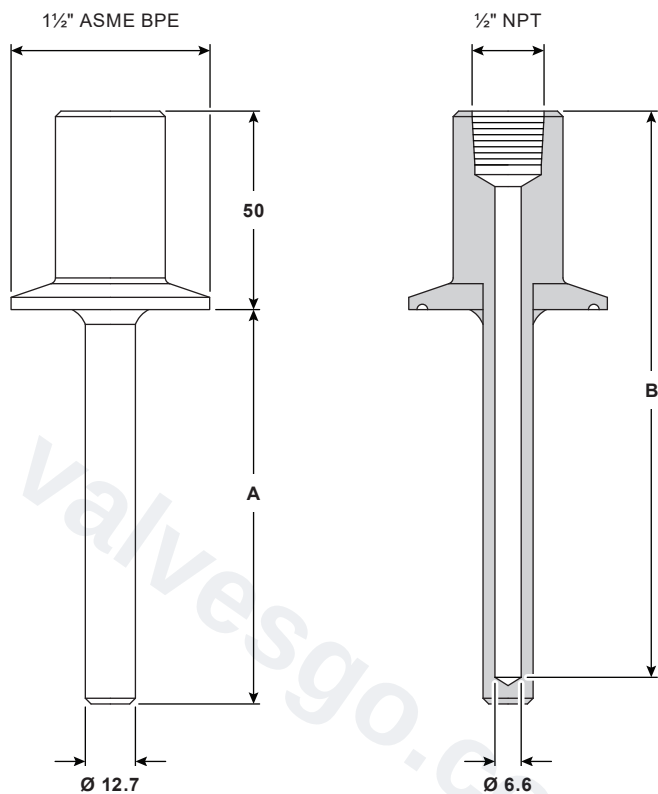


Fig. 1 Type A Thermowell

For dimensions, see page 10

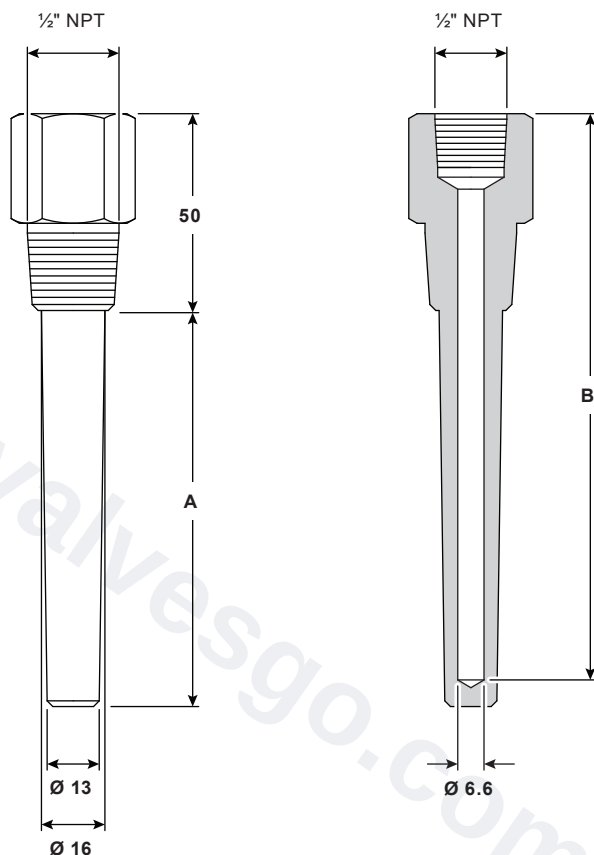


Fig. 2 Type B Thermowell

For dimensions, see page 10

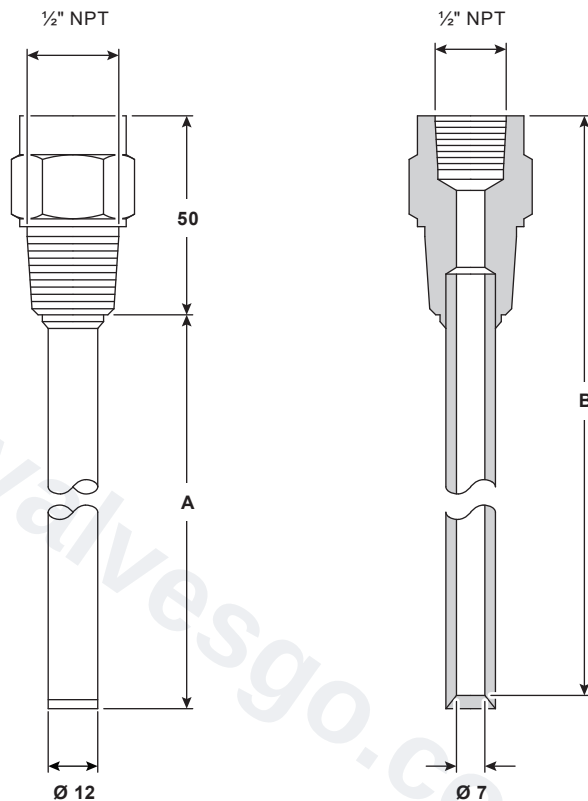


Fig. 3 Type C Thermowell

For dimensions, see page 10

Thermowell Pocket options

Thermowells are sized to suit the probe length, refer to the following table.

	Insertion length	Thermowell depth	For use with probe length	Mass	Pressure rating	Maximum allowable pressure	Maximum allowable temperature
	Dimension A (mm)	Dimension B (mm)	Dimension C (mm)	(kg)			
Type A Sanitary Clamp Thermowell	25	68.5	50	0.27	ASME BPE Table DT-2-1	13.79 bar g	204 °C
	50	93.5	75	0.29			
	100	143.5	125	0.325			
	200	243.5	225	0.4			
Type B Screwed One Piece Thermowell	25	68.5	50	0.2	PN40	40 bar g	450 °C
	50	93.5	75	0.225			
	100	143.5	125	0.27			
*Type C Screwed Fabricated Thermowell	200	243.5	225	0.28	PN40	40 bar g	450 °C
	700	743.5	725	0.57			

* Type C fabricated thermowells are for use in non-flow applications only.

Note: the EL2270 Miniature does not require the use of a thermowell and is not suitable for food contact compliant processes.

2.3 Mechanical data

Product range	EL2270	
Enclosure material	Aluminium (epoxy coated)	
Probe material	316 stainless steel	
Terminals/transmitter material	Single element	Ceramic 45%Al2O3
	Dual element	Plastic PBT, glass fibre reinforced
Process connection	Standard	½" NPT
	Minature	¼" R (BSPT)
Absolute process temperature	Standard	-100 °C to +450 °C (See note 1 and 2)
	Minature	-50 °C to +205 °C (See note 1 and 2)
Weight (Max.)	Standard	0.6 kg (length dependent)
	Minature	0.255 kg (approx)

Product range	EL2271	
Enclosure material	Aluminium (epoxy coated)	
Probe material	316 stainless steel	
Terminals/transmitter material	Plastic PBT, glass-fibre reinforced	
Process connection	½" NPT	
Absolute process temperature	-100 °C to +450 °C (See note 1 and 2)	
Weight (Max.)	0.6 kg (approx)	

Notes :

- Warning:** Risk of damaging the product if upper or lower limits of the absolute process temperature are exceeded.
- Also see the 2.2 Thermowells maximum temperature rating and 2.7 Temperature/pressure limits section.

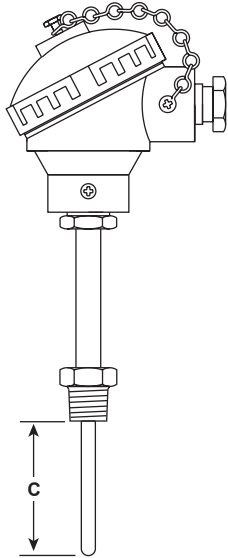


Fig. 4

2.4 Electrical data - EL2270

Output	Pt100 to EN 60751: Class A	
PT100 measuring current	0.1...1mA-	
Electrical Connection	Standard	M20 x 1.5 mm with cable gland
	Miniature	M16 x 1.5 mm with cable gland

2.5 Electrical data - EL2271

Output	Two wire loop powered 4 - 20 mA	
Output on sensor failure (See figure 6)	< 3.6 mA (3.5 mA typically)	
Output over-range (See figure 6)	3.8 mA to 20.5 mA	
Supply (UB)	8 to 35 Vdc	
Maximum loop resistance (RA) (See note 3)	$\leq (UB - 8 \text{ V}) / 0.0215 \text{ A}$ with RA in Ω and UB in V. See Figure 5	
	744 Ω at 24 Vdc	
	1023 Ω at 30 Vdc	
Electrical Connection	M20 x 1.5 mm with cable gland	
Damping	0 seconds (off)	
Switch-on time	3 seconds max	
Warm-up time	4 minutes max The time the instrument will function to the specifications (accuracy).	
Response time	0.6 seconds max transmitter only	
Measuring rate	5 samples per second (approx)	

Note:

- 3 The load must not be too high, as otherwise, in the case of relatively high currents, the terminal voltage at the transmitter will be too low.

2.6 Transmitter accuracy data

Note: Does not include the Pt100 sensor errors

Measuring deviation per DIN EN 60770, NE 145	0.2 K or 0.1 % (greater value applies) MS < 200 K: 0.2 K MS > 200 K: 0.1 % of MS
Mean temperature coefficient (TC) every 10 K ambient temperature deviation from Tref:	$\leq \pm(0.1 \text{ K} + 0.005 \% \text{ MS})$
Influence of power supply every 1 V voltage change from Ui_ref:	$\pm 0.005 \% \text{ of the MS}$
Long-term drift in line with IEC 61298-2 per year:	< 0.1 % of the MS
Reference conditions	Calibration temperature Tref = 23 °C ±3 K Power supply Ui_ref = 24 V Atmospheric pressure = 860 ... 1,060 hPa All accuracy specifications refer to the reference conditions.

Note: MS = Measuring span

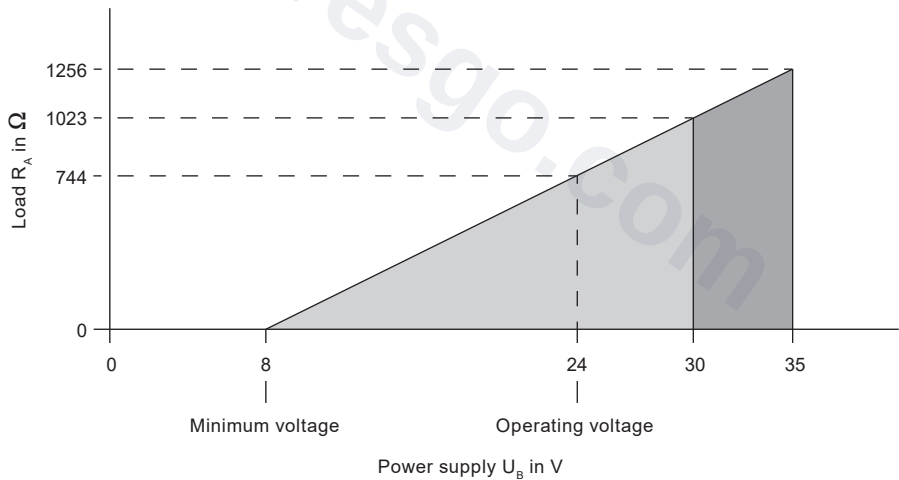


Fig. 5
Load diagram: The permissible load depends on the loop supply voltage (UB)

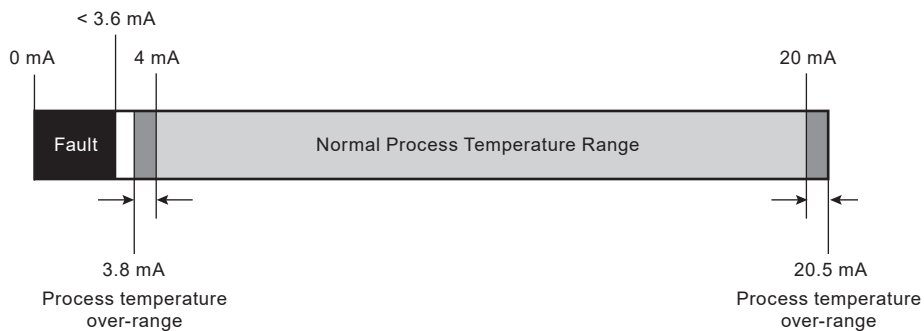


Fig. 6
4 - 20 mA transmitter signalling (standardized on NAMUR NE43)

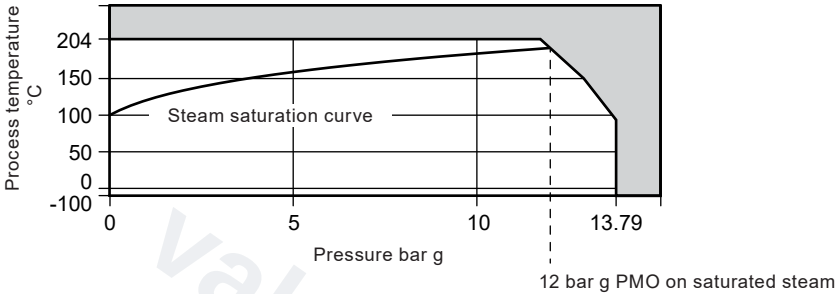
2.7 Pressure/temperature limits

The temperature probes when used in conjunction with associated thermowells, can be used in applications where the pressure/temperature is within the following limits.

For air and steam applications, flow velocities must be below 45 m/s (32 m/s for fabricated Thermowells).

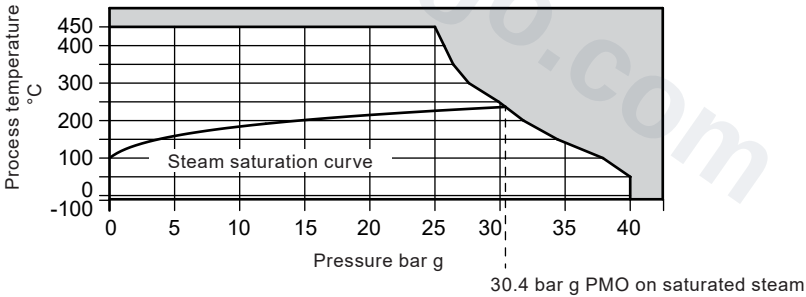
For liquids, a maximum velocity of 5 m/s is recommended. Type C thermowells are for use in non flow applications only.

Type A Thermowell - Sanitary clamp connection



The product **must not** be used in this region.

Type B Thermowell and Type C Protection tube



The product **must not** be used in this region.

3. Mechanical installation

Process connection: ½" NPT (R¾" BSPT for the Miniature version).

Install the probe as shown:-

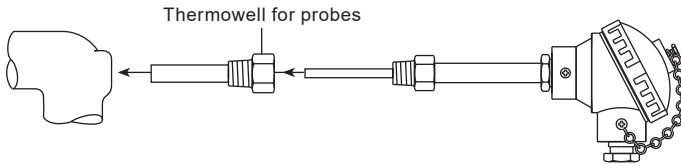


Fig. 7

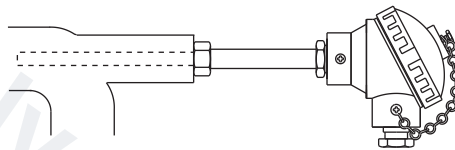


Fig. 8 Correct installation

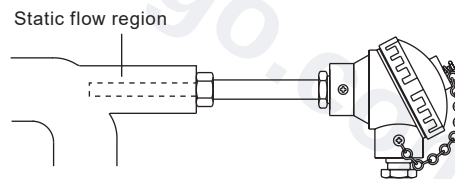


Fig. 9 Incorrect installation

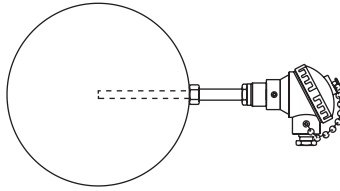


Fig. 10 Preferred installation on steam systems (Miniature shown)

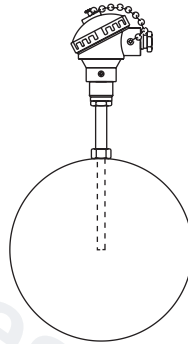


Fig. 11 Acceptable installation (Miniature shown)

Notes:

- Do not install a probe in a static region of the pipeline.
- Use a proprietary heat transfer paste when installing the type B thermowell or type C protection tube.
- On steam systems, preferred probe installation is horizontal if possible. This helps keep the electronics cool. Vertical installation is permissible as long as the ambient temperature limit is not exceeded.

3.1 General ambient data

Product range		EL 2270	EL2271
Ingress protection		IP65	
Ambient temperature	Minimum	-40 °C	-40 °C
	Maximum	+80 °C	+85 °C
Location		For indoor or outside use, except for coastal environments.	

3.2 Transmitter ambient data

Climate class per IEC 654-1:1993	Cx (-40 ... +85 °C, 5 ... 95 % r. h.)
Maximum permissible humidity per IEC 60068-2-38:2009	Test max. temperature variation 65 °C / 10 °C, 93 % ±3 % r. h.
Vibration resistance per IEC 60068-2-6:2008	Test Fc: 10 ... 2,000 Hz; 10 g, amplitude 0.75 mm
Shock resistance per IEC 68-2-27:2009	Acceleration / shock width: 100 g / 6 ms
Salt fog per IEC 68-2-52:1996, IEC 60068-2-52:1996	Severity level 1
Condensation	Acceptable
Free fall in line with IEC 60721-3-2:1997, DIN EN 60721-3-2:1998	Drop height 1.5 m

4. Electrical installation

4.1 Power Supply Specification

See 2.4 and 2.5 Electrical data

Warning

This is protection class 3 equipment for connection at low voltages, which are separated from the power supply or voltages of greater than AC 50 V or DC 120 V. Preferably, a connection to an SELV or PELV circuit is recommended; alternatively protective measures from HD 60346-4-41 (DIN VDE 0100-410).

Alternatively for North America: The connection can be made in line with "Class 2 Circuits" or "Class 2 Power Units" in accordance with CEC (Canadian Electrical Code) or NEC (National Electrical Code). The functional galvanic isolation present in the instrument does not ensure sufficient protection against electrical impulses in the sense of EN 61140. Maximum use altitude: 5,000 m above sea level

4.2 Wiring diagram

Unscrew the enclosure cover for access to electrical connections.

The EL2270 and EL2271 are fitted with cable glands.

These comply with the IP rating of the enclosure

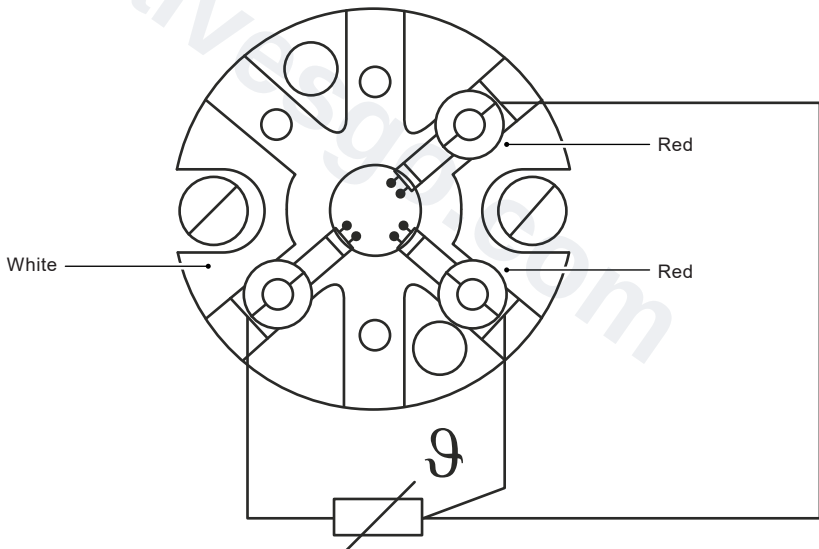


Fig. 12 EL2270 wiring details

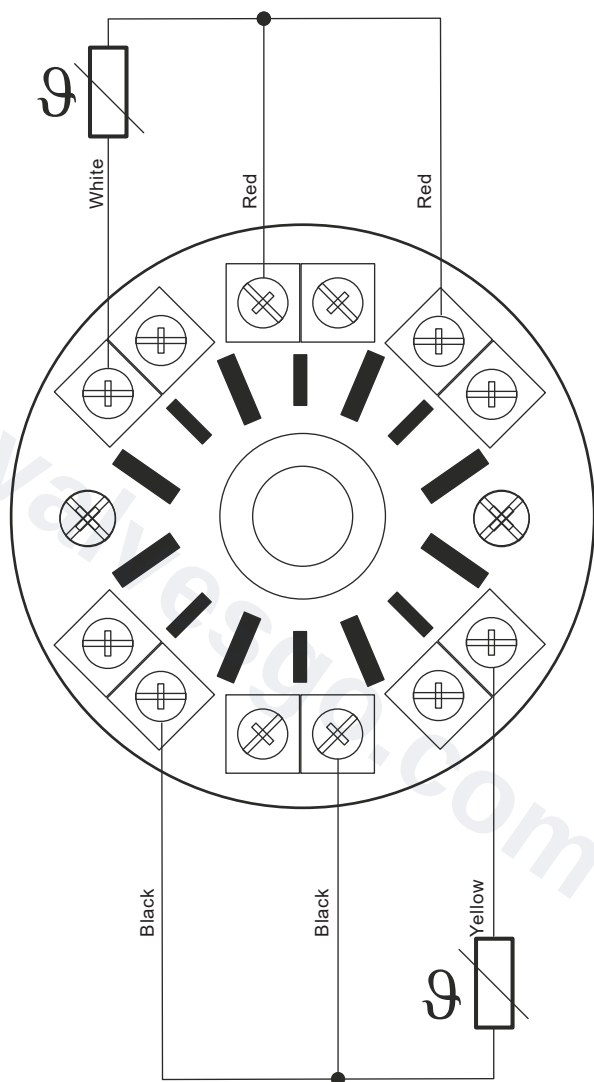


Fig. 13 EL2270 wiring details

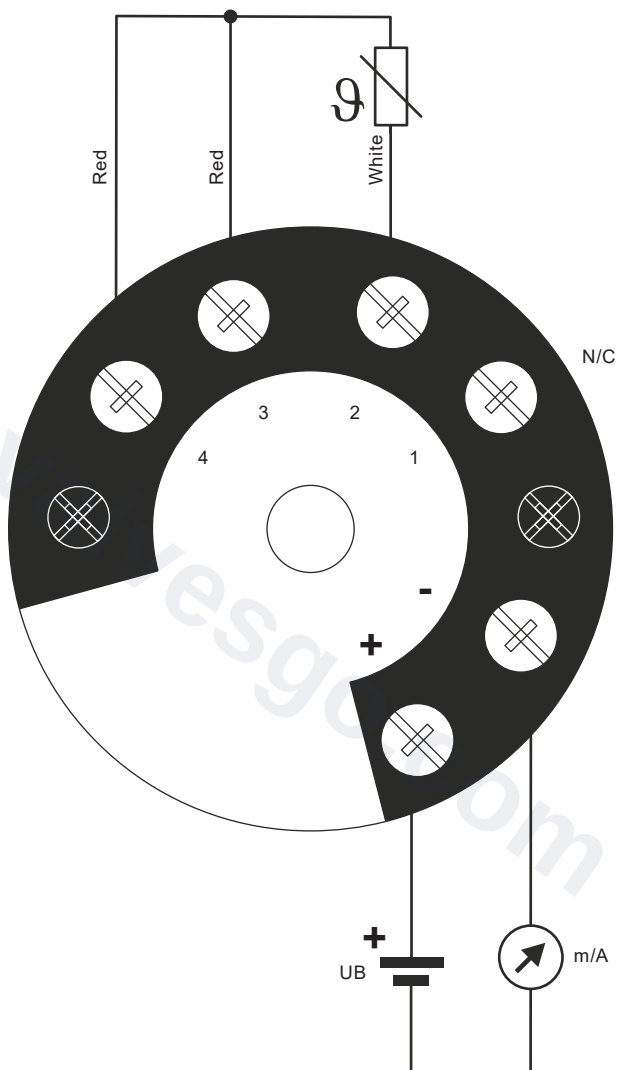


Fig. 14 EL2271 wiring details

Note: The integrated reverse polarity protection (wrong polarity on the terminals + and -) prevents the transmitter from being damaged.

4.3 Cable requirements

Cabling should be installed in accordance with BS 6739 - Instrumentation in Process Control Systems: Installation design and practice or local equivalent. For the US and Canadian installation, the product must be wired in accordance with local and National Electrical Codes (NEC) or Canadian Electrical Code (CEC). Ensure that sufficient cable length is provided to ensure that no strain is placed on the unit.

Install product and cables away from high voltage or switchgear circuits. Cabling must not use the same conduit/wiring trays as power cables.

To protect against signal noise, screened cable is strongly recommended. Ensure that any screen is connected to the local earth / ground at one end only, with a connection resistance of less than 1 Ω . See the cable requirements for the connected instrumentation.

Ensure the sensor head is grounded/earthed.

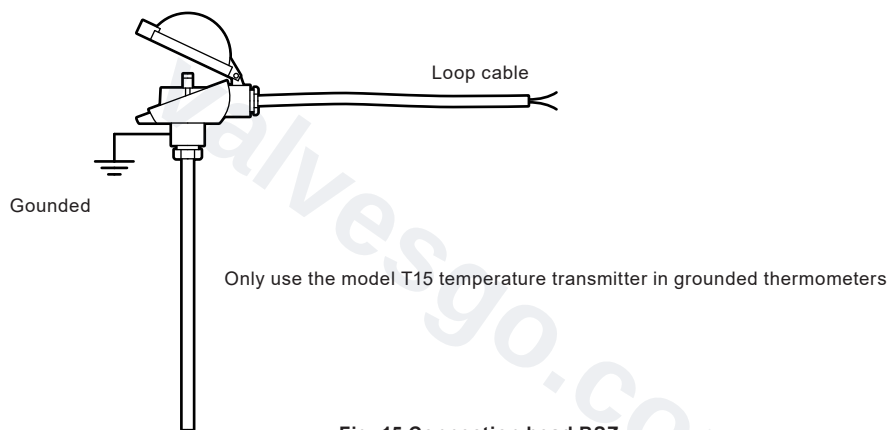


Fig. 15 Connection head BSZ

WARNING:

The product may be exposed to interference above the limits of EMC standards if:

- The product or its wiring is located near a radio transmitter.
- Cellular telephones and mobile radios may cause interference if used within approximately 1 metre (39") of the product or its wiring. The actual separation distance necessary will vary according to the surroundings of the installation and the power of the transmitter.
- In the event of interference caused by high-frequency electromagnetic fields in a frequency range from 80 to 400 MHz, an increased measuring deviation of up to 0.8 % is expected. During transient interference (e.g. burst, surge, ESD) take into account an increased measuring deviation of up to 1.5 %

Static precautions (ESD):

- Static precautions must be observed at all times to avoid damage to the product.

Damage to cables, wires and connection points can lead to the product malfunctioning.

4.4 Wiring and connections data

EL2270

Recommended maximum cable length	10 m (See Note 8, 9 and 10)
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EL2271

Wire size (See note 6)	Solid: 0.14 ... 2.5 mm ² Spliced: 0.14 ... 1.5 mm ²
Recommended maximum cable length	Limited by voltage supply (UB) and wire resistance (see Note 7)
Recommended Screw driver	Cross head (Pozidrive tip), size 2 (ISO 8764)
Electrical terminal torque	0.5 Nm

- Note**
- 6** Fine-stranded leads with bare ends must be finished with end-splices.
 - 7** For distances greater than 200 m, contact Spirax Sarco.
 - 8** Included the probe length.
 - 9** Limited by the receiving instrumentation.
 - 10** Two wire connection could significantly reduced the accuracy of a Class A sensor.

4.5 Cable gland details

In order to meet ingress protection:

- Tighten to a torque of 4.5 Nm using a 24 mm A/F spanner (17 mm A/F spanner for the miniature versions)
- Do not use the lower clamping area with very soft cable types.
- Only use round cables (if necessary, slightly oval in cross-section).
- Do not twist the cable
- Repeated opening/closing is possible; however only if necessary, as it might have a detrimental effect on the ingress protection
- For cable with a pronounced cold-flow behavior the gland must be fully tightened.

5. Maintenance

5.1 Maintenance

The EL2270 and EL2271 are non-serviceable items.

Repairs must only be carried out by Spirax Sarco.

5.2 Cleaning

	CAUTION! Physical injuries and damage to property and the environment Improper cleaning may lead to physical injuries and damage to property and the environment. Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment.
---	--

Carry out the cleaning process as described below;

- When cleaning from outside ("wash down"), observe the permissible temperature and ingress protection.
- Prior to cleaning, properly disconnect the instrument.
- Use the required protective equipment (depending on the application; the thermometer itself is basically not dangerous).
- Clean the instrument with a moist cloth.
- Electrical connections must not come into contact with moisture!

	CAUTION! Damage to the instrument Improper cleaning may lead to damage to the instrument! - Do not use any aggressive cleaning agents. - Do not use any pointed and hard objects for cleaning.
---	---

- Wash or clean the dismantled instrument, in order to protect persons and the environment from exposure to residual media.

5.3 Calibration and recalibration

It is recommended that the measuring insert is recalibrated at regular intervals. This period can reduce, depending on the particular application. The calibration can be carried out by the Spirax Sarco.

6. Fault finding

Fault	Possible cause	Remedial action
No signal/cable break	Mechanical load too high or over-temperature.	Replace probe or measuring insert with one of a suitable design.
Erroneous measured values	Sensor drift caused by over-temperature.	Replace probe or measuring insert with one of a suitable design.
	Sensor drift caused by chemical attack.	Use a suitable thermowell.
Erroneous measured values (too low)	Entry of moisture into cable or measuring insert	Replace probe or measuring insert with one of a suitable design
Erroneous measured values and response times too long	Wrong mounting geometry, for example mounting depth too deep or heat dissipation too high	The temperature-sensitive area of the sensor must be inside the medium.
Display of measured value jumps	Cable break in connecting cable or loose contact caused by mechanical overload	Replace probe or measuring insert with a suitable design, for example equipped with a strain relief or a thicker conductor cross-section
Corrosion	Composition of the medium not as expected or modified or wrong thermowell material selected	Analyse medium and then select a more suitable material or replace thermowell regularly
Signal interference	Stray currents caused by electric fields or earth loops	Use shielded connecting cables, and increase the distance to motors and power cables
	Earth loops	Eliminate potential differences by using galvanically isolated barriers or transmitters

7. Transportation, handling and storage

7.1 Transport

Check the instrument for any damage that may have been caused by transport.

Obvious damage must be reported immediately.



CAUTION!

Damage through improper transport

With improper transport, a high level of damage to property can occur.

- When unloading packed goods upon delivery as well as during internal transport, proceed carefully and observe the symbols on the packaging.
- With internal transport, observe the instructions in chapter 7.2 "Packaging and storage".

If the instrument is transported from a cold into a warm environment, the formation of condensation may result in instrument malfunction. Before putting it back into operation, wait for the instrument temperature and the room temperature to equalise.

7.2 Packaging and storage

Do not remove packaging until just before mounting.

Permissible conditions at the place of storage:

Storage temperature

See section General ambient data - Ambient Temperature

Avoid exposure to the following factors:

- Direct sunlight or proximity to hot objects
- Mechanical vibration, mechanical shock (putting it down hard)
- Soot, vapour, dust and corrosive gases
- Hazardous environments, flammable atmospheres

Store the instrument in its original packaging in a location that fulfils the conditions listed above. If the original packaging is not available, pack and store the instrument as described below:

1. Place the instrument, along with the shock-absorbent material, in the packaging.
2. If stored for a prolonged period of time (more than 30 days), place a bag containing a desiccant inside the packaging.

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