

EP500

Advanced

ATEX Electropneumatic Positioner

Installation and Maintenance Instructions



1. Safety information
2. Technical Information
3. Installation
4. Commissioning
5. Maintenance
6. Spare parts
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1. Safety information

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.



WARNING: The maximum process fluid temperature must be suitable for use if the unit is to be used in any potential explosive atmosphere. For the device maintenance in a potentially explosive atmosphere, we recommend the usage of tools which do not produce and/or propagate sparks.

1.1 Intended use

Referring to the Installation and Maintenance Instructions, product markings and Technical Information Sheet, check that the product is suitable for the intended use/application. These products comply with the requirements of the Directive ATEX 94/9/CE.

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.

X 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. The positioner suitable for installation in Zone 1 or Zone 2 (Gas) Zone 21 or Zone 22 (Dust) according to the Atex rating reported in the following. The positioner shall not be used in zone 0.

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 opened and closed progressively 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 the 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. If used at the maximum permitted operating conditions the surface temperature may reach temperatures in excess of 90°C (194°F).

Many products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance instructions').

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.

2. General product information

2.1 Introduction

The EP500 is a 2 wire loop powered positioner requiring a 4-20 mA control signal, and is designed for use with linear pneumatic valve actuators. The positioner compares the electrical signal from a controller with the actual valve position and varies a pneumatic output signal to the actuator accordingly. A mounting kit is supplied to suit all pneumatic actuators compliant with the NAMUR standard.

2.2 Operating principle

The current signal (1) flows in the coil (2) and generates a magnetic field which attracts the flapper (3) tapping the nozzle (4). As a consequence of this the pressure inside the actuator increases and the valve moves. When the valve stem (5) moves it generates through the feedback lever (6) and the feedback spring (7) a negative feedback which moves the flapper away from the nozzle and stops the valve movement.

Changes in the current signal will induce changes in the valve positioning.

This mechanism will build a linear correspondence between the current signal and the valve position expressed in percentage of the valve stroke. The valve opening at 4 mA and at 20 mA can be adjusted manually as illustrated in Figure 1.

Key:

- | | |
|--------------------|------------------------|
| 1 = Current signal | 6 = Feedback lever |
| 2 = Coil | 7 = Feedback spring |
| 3 = Flapper | 8 = Pneumatic relay |
| 4 = Nozzle | 9 = Pneumatic actuator |
| 5 = Valve stem | 10 = Span lever |

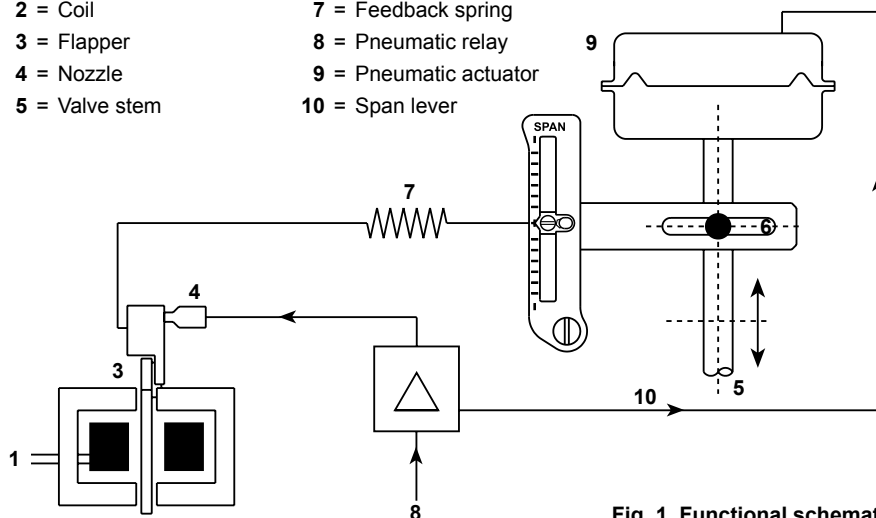


Fig. 1 Functional schematic

2.3 Applications

The EP500 can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

- PN1000 and PN2000 series
- PNS3000 and PNS4000 series
- PN9000 series
- TN2000 series

2.4 Materials

Part	Material	Finish
Case and cover	Die cast aluminium	Anti-corrosive paint to RAL9006

2.5 Technical data

Input signal range	4-20 mA (split range minimum amplitude 4 mA)
Input resistance	292 Ω
Air supply	1.4 to 6.0 bar (regulate 5 to 10 psi above actuator spring range)
Air quality	Air must be free of water, oil and dust
Output pressure	0 to 100% supply pressure
Actuator stroke	10 mm to 100 mm
Action	Single acting / fail vent
Operating temperature	-20°C to +75°C
Air flow	3.20 Nm ³ /h @ 1.4 bar
Steady state air consumption	0.17 Nm ³ /h @ 1.4 bar
Air connections	1/4" NPT female
Sensitivity	$\leq 0.2\%$ F.S. (Full Scale)
Histerisis	$\leq 0.4\%$ F.S.
Linearity	$\leq 1.0\%$ F.S.
Repeatability	$\leq 0.5\%$ F.S.
Electrical connections	Cable gland M20 internal terminals for conductors from 0.5 to 2.5 mm ² wire
Degree of protection	IP65
Characteristic	Linear
Shipping weight	2.35 kg
Mateial (housing and cover)	Die-cast aluminium anti-corrosion paint RAL 9016
Atex rating	II 2G Ex d mb IIC T6 Gb II 2D Ex tb mb IIIC T76°C Db II 2G Ex ia IIC T6 Gb II 2D Ex ia IIIC T76°C Db
Ex ia circuits parameters	Ui=30V Ii=110mA Pi=0.82W Li=0 Ci=0

3. Installation

Note: Before starting any installation observe the 'Safety information' in Section 1.

This document is provided as a guide and it is recommended that it is read thoroughly prior to installation. Also refer to the separate Installation and Maintenance Instructions for the control valve and actuator.

3.1 Location

The positioner should be mounted in sufficient space to allow opening of the cover and provide access to connections. When fitting to an actuator, ensure the positioner will not be exposed to an ambient temperature outside the range -20°C to +75°C. The positioner enclosure is rated to IP65. Connection of air supply pressure (1.4 to 6 bar g) and control signal (4 - 20 mA) should be considered prior to choice of location.

3.2 Connecting up

3.2.1 Pneumatic connections

Warning: Air supply must be dry, oil and dust free. Dirty air supply may damage the product and invalidate warranty.

For best performance, set the air supply pressure to about 0.5 bar g above the pressure required to fully travel the actuator.

Check all connections for leaks. Please note however that the EP500 bleeds air in normal operation at a rate of approximately 0.17 Nm³ / hour at 1.4 bar supply pressure.

Pneumatic connections are located at the right hand side of the positioner and are identified as follows 'SUPPLY' and 'OUT':

SUPPLY - Air supply - 1.4 bar g to 6 bar g, depending upon required actuator spring range.

OUT - Output signal to the actuator.

Connections are 1/4" NPT female. Interconnection between the positioner and the actuator should be at least 6 mm OD tube.

3.2.2 Electrical connections

The EP500 only requires a 4-20 mA signal. Remove the front.

Note: Ensure resistance from earth post to local earth (e.g. pipework) is less than 1 Ohm.

Connection to the unit is through the M20 cable gland (as supplied), which when used with suitable cable will ensure the IP65 protection rating. Appropriate conduit connections may be used instead.

Connect conductors (0.5 to 2.5 mm²) to the terminal blocks and earth noting the polarity +/- .

Refer to the table below for the suitable connection:

Action	4 - 20 mA polarity	EP500 terminal block
Direct	+	Red
	-	Black
Reverse	+	Black
	-	Red

Direct action - the air pressure increases when current signal increases and vice versa.

Reverse action - the air pressure decreases when the current signal increases and vice versa.

X 3.2.3 Electrical connection for ATEX equipment

When the positioner is installed in hazardous areas special precautions must be taken.
In case the explosion proof protection system is used: a fuse of 100 mA should be inserted in the circuit to provide protection against overcurrent as indicated in the drawing here below:

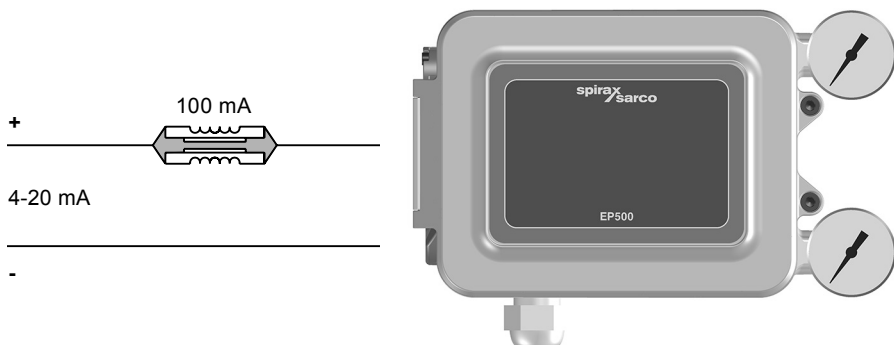


Fig. 2

In case the intrinsically safe protection system is used, voltage and current should be limited using a suitable barrier as indicated in the drawing here below:

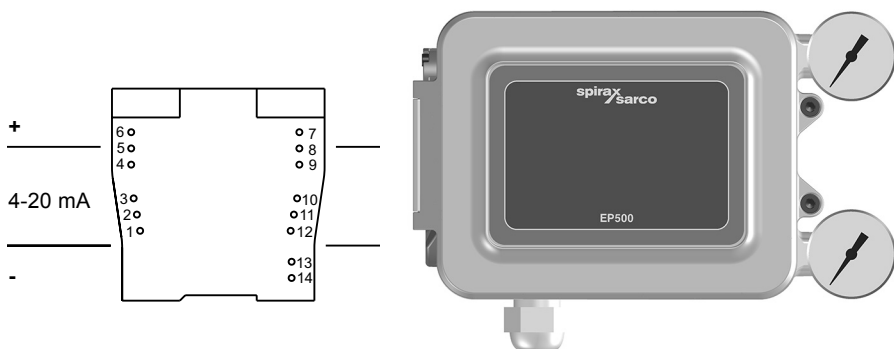


Fig. 3

The barrier shall be chosen in accordance with intrinsic safety parameters declared for the EP500 positioner. Please refer to the technical sheet.

3.3 Mounting the positioner onto the actuator

The EP500 can be attached onto any type of valve and actuator conforming to NAMUR standards. The unit can be attached in the traditional centered position (Figures 4 and 5) in line with the actuator central axis or side mounted (Figures 6 and 7) to enable the operator to view frontally the stem of the valve.

Step 1

Attach the mounting bracket on one of the two positions shown below with the two M8 x 14 screws and washers.

Centre mounting

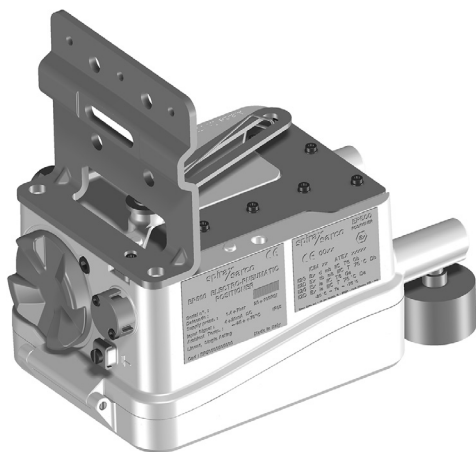


Fig. 4

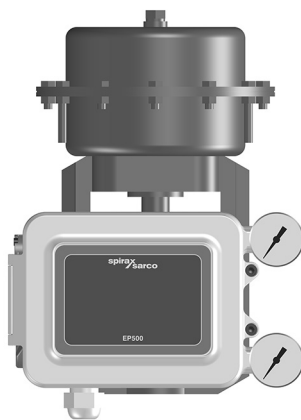


Fig. 5

Side mounting

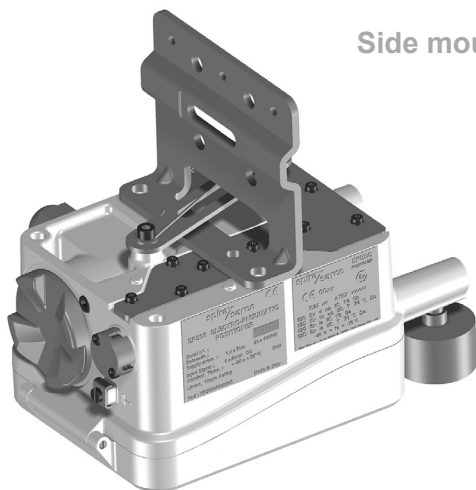


Fig. 6



Fig. 7

Step 2

Using the 2 off M6 pan head screws, securely attach the 'T' shaped sliding pin holder to the valve actuator coupling block (Figure 8).

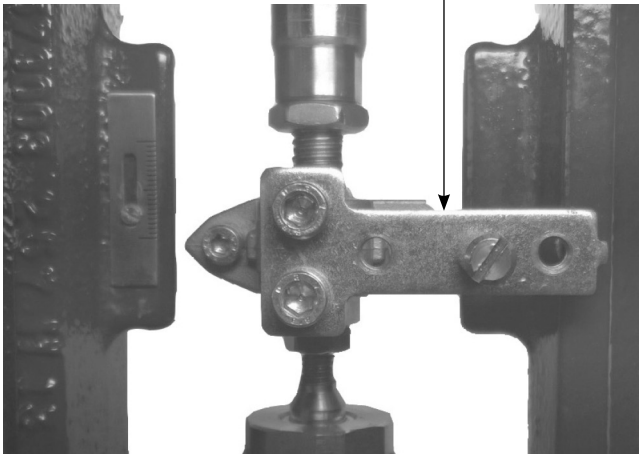


Fig. 8

Depending on the travel of the valve actuator and depending on the actuator yoke, apply a medium strength thread locker to the sliding pin and screw into the correct hole on the sliding pin holder and tighten. Use Figure 9 and Table 1 to determine the correct hole to use.

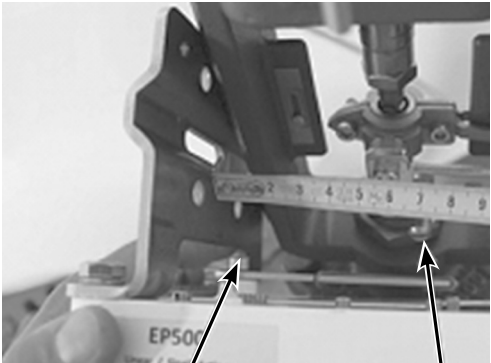


Fig. 9

Feedback lever fulcrum

Pin

Table 1

The 'T' bracket can be moved towards the right or towards the left. This allows the adjustment as displayed below between the lever fulcrum and the pin:

Actuator stroke (mm)	Distance between feedback lever fulcrum and pin	Feedback lever
20	70	
30	70	
50	80	
70	80	
75	115	
100	115	

Step 3

Attach the bracket to the actuator with the screw M8 x 20 with washers (Figure 10). Take care to insert the feedback pin in the slot of the feedback lever while you attach the positioner (Figure 11)

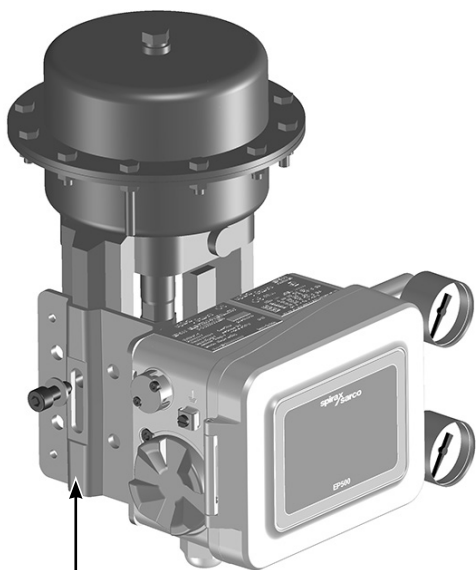


Fig. 10

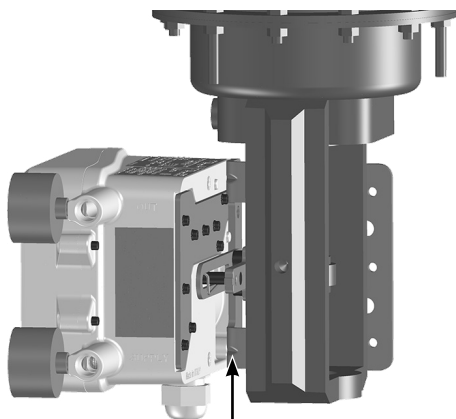


Fig. 11

Step 4

Air connections and electrical connections.

Fig. 12

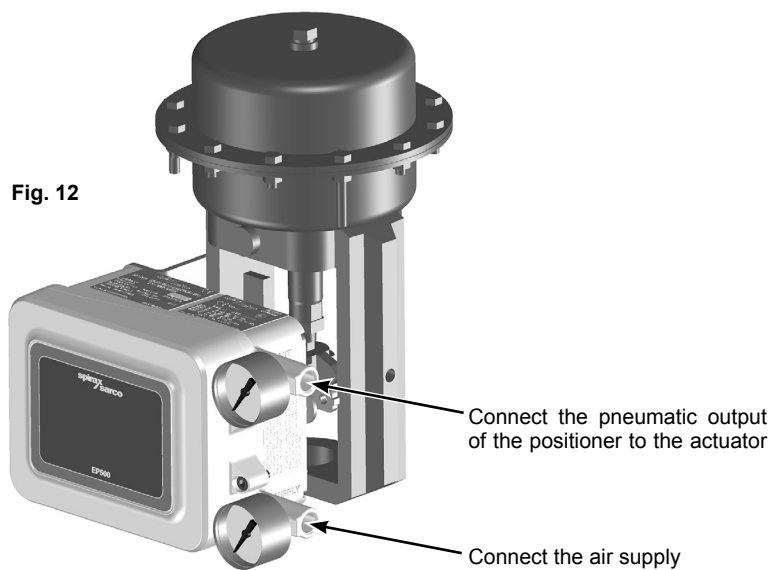
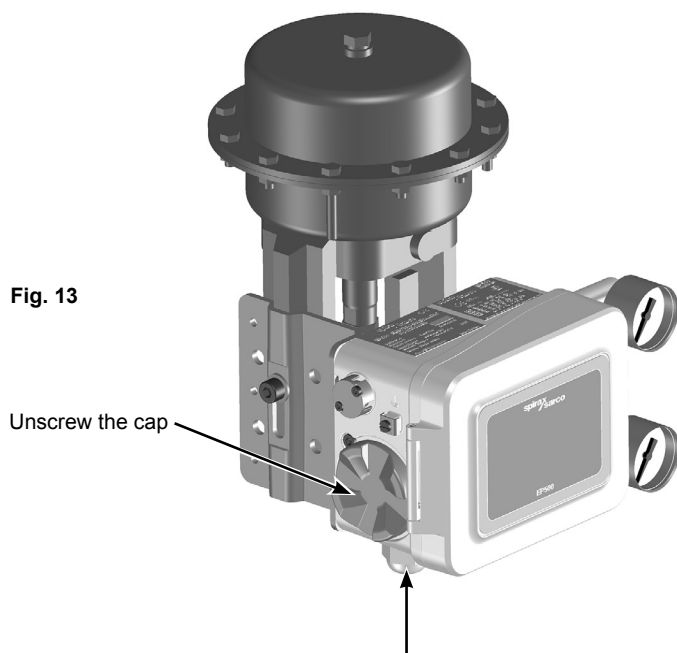


Fig. 13



Insert the electric cable (4 to 20 mA), connect to the appropriate terminals and screw the cap.

X Step 5

Fig. 14

After properly completing the wiring and before retightening the M50 Ex d cap, make sure that the M5 x 10 screw - Ex d locking cap is fully tightened, using a 4 mm allen key.

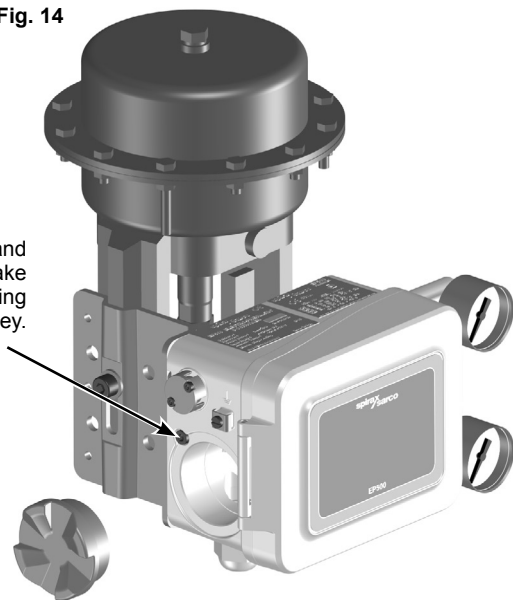
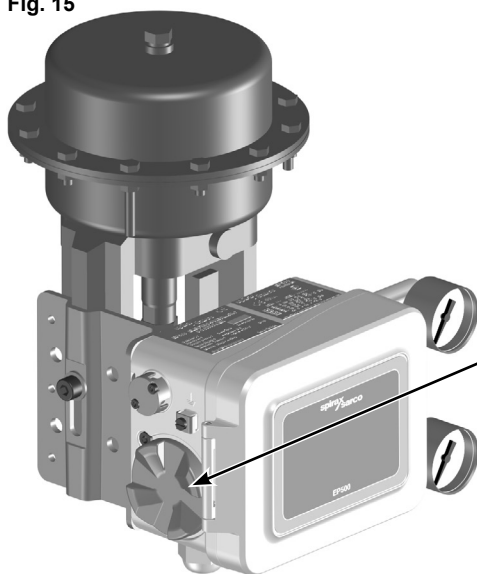


Fig. 15



After manually screwing the cap Ex d M50 cap, loosen the Ex d locking cap M5 x 10 screw, using a 4 mm allen key, by exerting a slight pressure between the screw head and EX d cap. This operation is to prevent accidental unscrewing of the Ex d cap.

Step 6

Open the lid of the positioner.

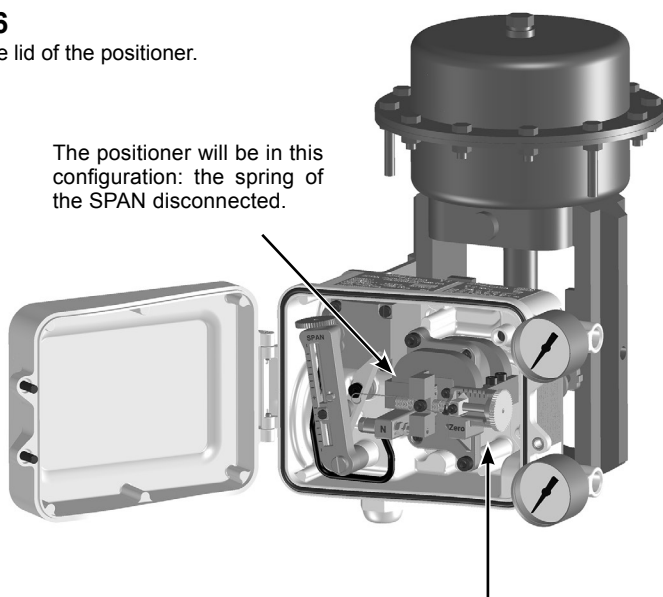


Fig. 16

Turn the ZERO dial (the green one), until the valve is opened at 50%

Slightly loosen the M8 x 14 screw that is connecting the mounting bracket on to the actuator yoke. Move the positioner and bracket upwards or downwards, so that the feedback lever is horizontal, then tighten the M8 x 14 screw to the required position.

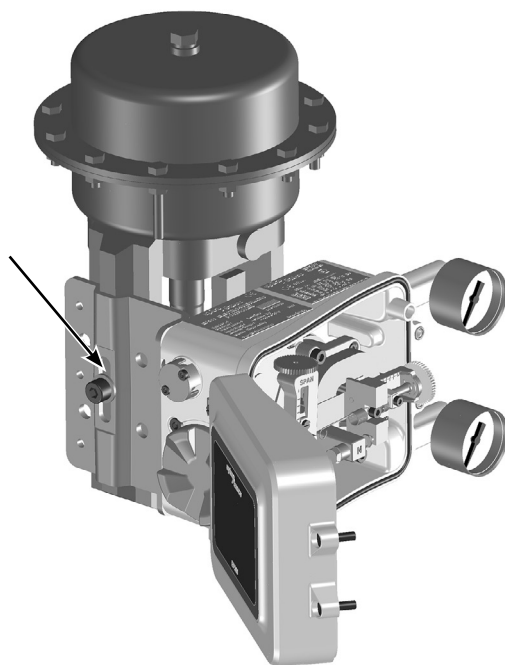


Fig. 17

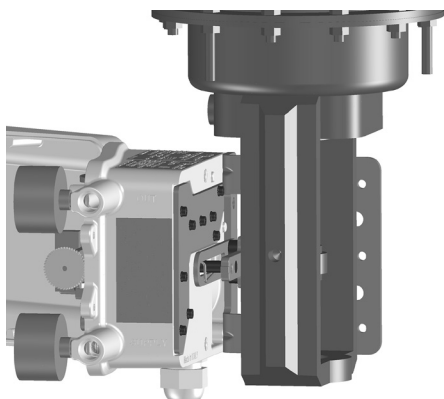


Fig. 18 Correct placement

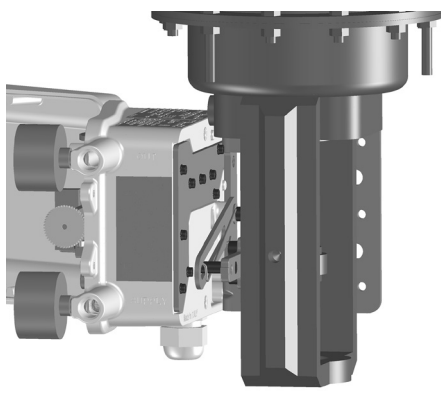


Fig. 19 Incorrect placement

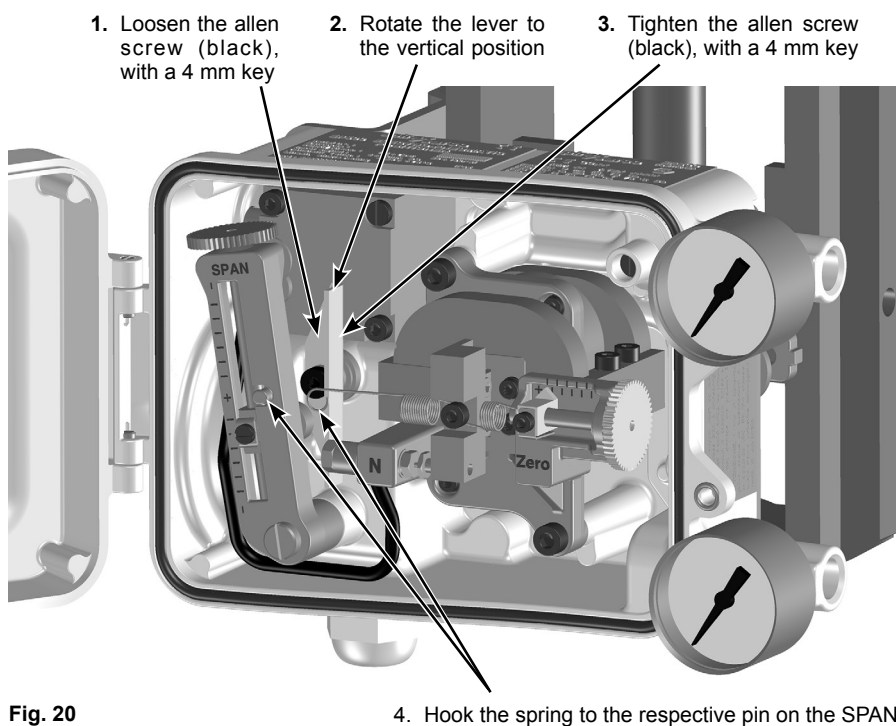


Fig. 20

4. Commissioning

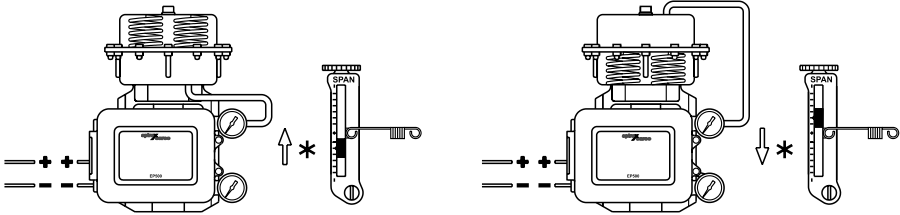
4.1 Set the valve action

Firstly, with reference to Figure 21, determine the action that is relevant to your application.

To change the slider turn the red gear until the slider is positioned into the correct half of the span arm.

* **Please note** that the arrow illustrates the stem movement direction when the input control signal increases.

Direct action



Reverse action (inverse polarity input signal)

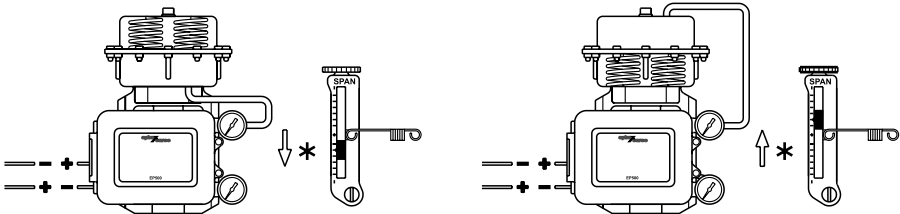


Fig. 21

4.2 Set sensitivity

Xp regulation

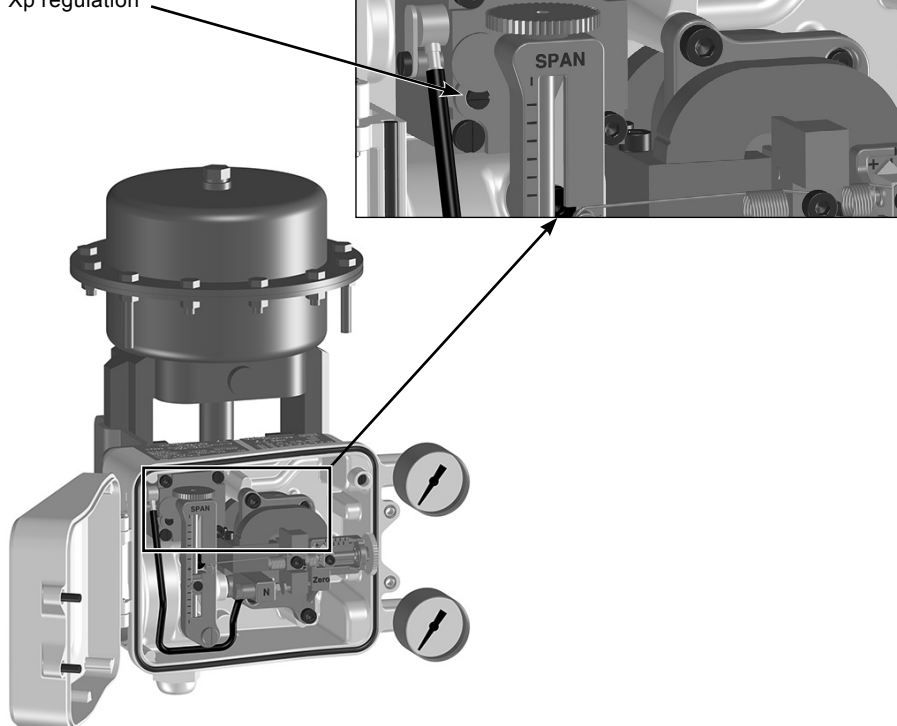


Fig. 22

We recommend not to change the Xp regulation until you familiarise with the product and with this regulation.

To increase positioner sensitivity close the adjusting screw, to decrease sensitivity open the screw. **Do not** open the screw beyond the mechanical lock.

Xp closed means the positioner is very reactive and consuming a small amount of air. However on small valves this could result in valve hunting. In this case, unscrew slightly (in steps of 1/8 turns) the Xp screw, until the oscillation disappears.

Xp opened means that the unit is less reactive wastes more air, but is more stable.

Note: Adjustment of the Xp % screw causes a change of positioner 'zero' point, and it is therefore important to repeat the zeroing and travel setting procedures after any changes.

Once the positioner has been mounted and connected up, proceed as follows:

4.3 Calibration

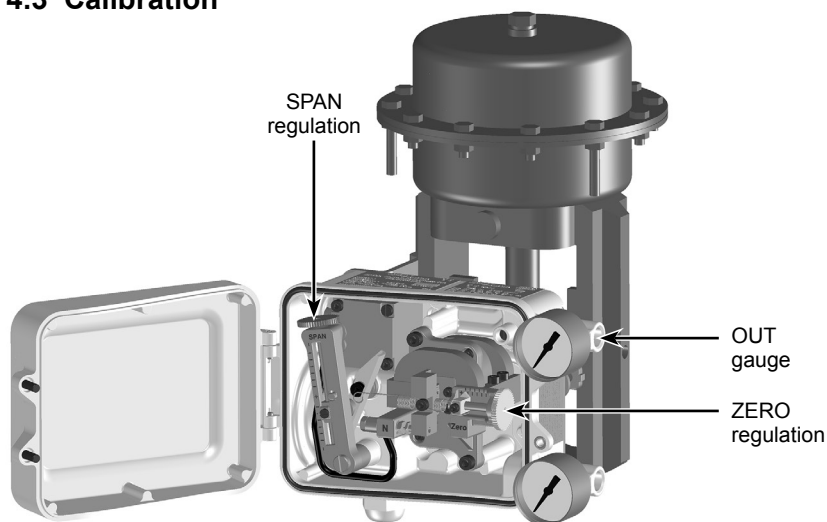


Fig. 23

Feed the EP500 with a current input of 4 mA, turn the ZERO (green knob), till it reaches the value of the desired pressure and the valve opening reaches the starting position.

Feed the EP500 with an input current of 20 mA, turn the SPAN (red knob), until it reaches the desired pressure and the valve is fully opened or reaches the desired opening percentage according to the application requirements.

In order to refine the values of ZERO and SPAN repeat the operation more times till the required configuration is achieved.

Split range operation

EP500 may be split ranged to sequentially actuate two valves from one control signal e.g.:

Valve 1 Set 4 - 12 mA,

Valve 2 Set 12 - 20 mA.

Split ranging is achieved by adjustment of the zero and travel settings as described above.

4.3 Damping screw

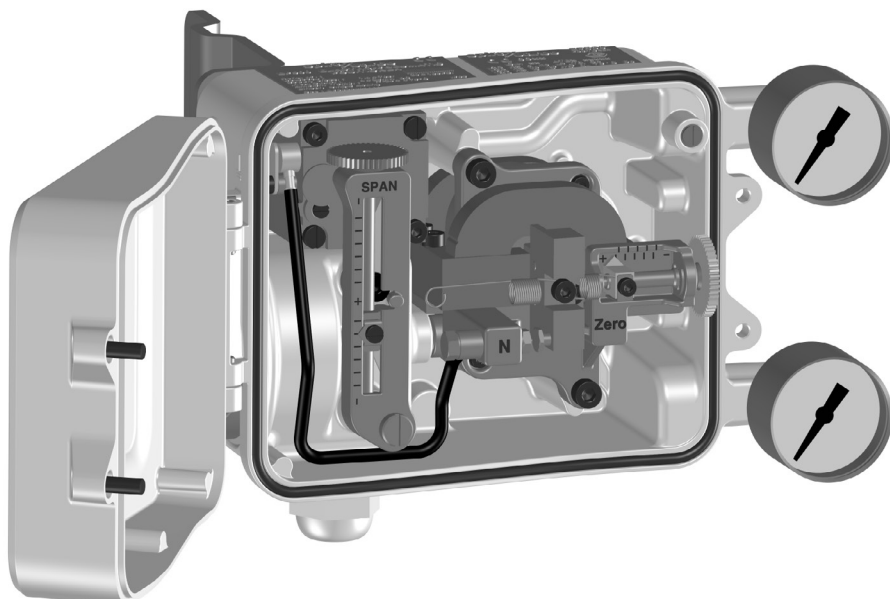
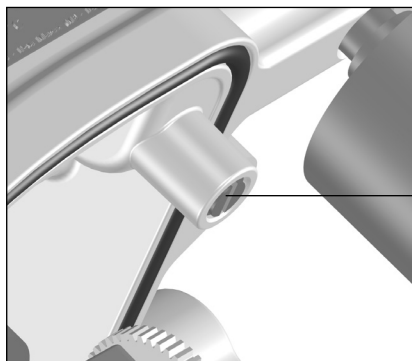


Fig. 24

The calibration of damping screw will be carried out during plant operation, it has the purpose of limiting, if necessary, the speed of the pneumatically operated valve: the reduction of the air flow to the servo motor may introduce delays in the positioning of the valve for which it is recommended for use only in the case of servomotors of small capacity and when there is a major tendency to cyclical swings.



Attention

Do not unscrew behind this limits. The air pressure in the piping might push out the screw.

Fig. 25

5. Maintenance

5.1 Regular maintenance

1. Drain any build-up within the air supply filter set as impurities such as oil, water and dirt will cause inconsistent operation.
2. Ensure air supply is at the correct pressure (see Section 3.3.2 and refer to the actuator TI).
3. Make visual checks to ensure that the valve is operating correctly.
- X** 4. Wipe the unit with a damp cloth or antistatic products

5.2 Corrective maintenance

5.2.1 Removal and cleaning of sensitivity adjuster (see Figure 26):

- Loosen and remove the lock.
- Note setting then remove the sensitivity screw.
- Wash the adjuster with solvent, checking the condition of the cone and ensuring that the 0.35 mm side hole is clear.
- Dry with clean compressed air to ensure that there is no remaining contaminants.
- Refit the the cleaned adjuster and unscrew it 1 turn from its stop.

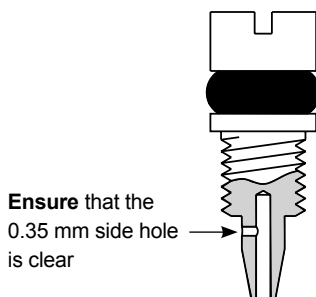


Fig. 26

- Refit the lock to touch the adjuster top and secure it with the lock-nut.
- Set the sensitivity see Step 2, Section 4, Commissioning.
- Reset zero and span if required.

6. Spare parts

The spare parts available are detailed below. No other parts are available as spares.

Available spares

Gauges	Full scale 0 - 2 bar	1
	Full scale 0 - 4 bar	2
	Full scale 0 - 7 bar	3
Back plate and gasket		4
Amplifying relay set		5
Gasket set	Note: Spare parts 5, 6 and 7 are not visible in Figure 24.	6
Mounting kit		7

How to order spares and accessories

Always order spares by using the description in the column headed 'Available spares' and a description of the product.

Example:

1 off Gauge 0-2 bar for a Spirax Sarco EP500 electropneumatic positioner.

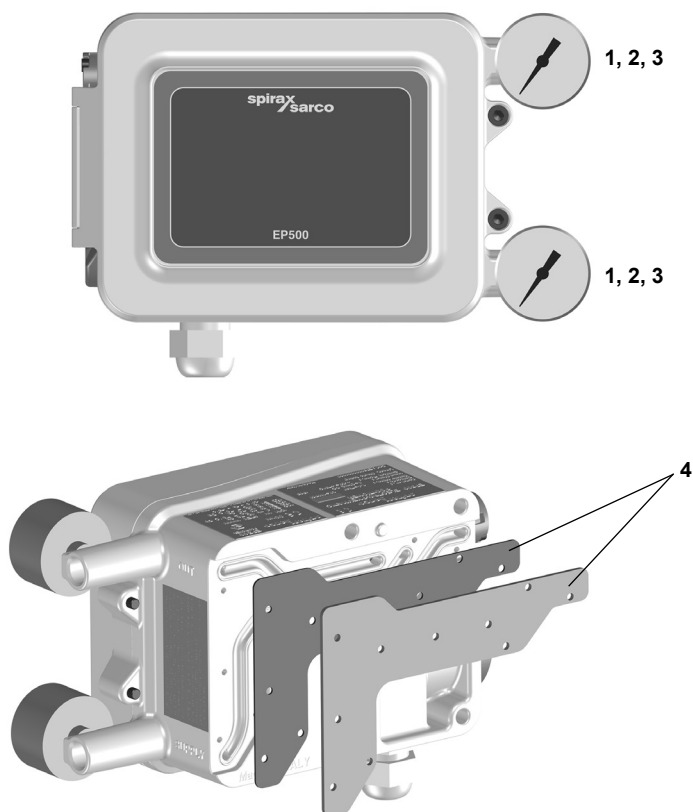


Fig. 27

Product return procedure

Please provide the following information with any equipment being returned:

1. Your name, Company name, address and telephone number, order number and invoice and return delivery address.
2. Description of equipment being returned.
3. Description of the fault.
4. If the equipment is being returned under warranty, please indicate:
 - i. Date of purchase
 - ii. Original order number

Please return all items to your local Spirax Sarco branch.

Please ensure all items are suitably packed for transit (preferably in the original cartons).

7. Fault finding

Output pressure too low or zero

Cause	Remedy
a. No control signal	a. Restore mA signal
b. Low air supply pressure	b. Verify actuator air pressure requirement
c. Clogged or dirty sensitivity adjuster	c. Clean adjuster see Section 5.2.1
d. Incorrect set-up	e. Recalibrate
e. Damaged pneumatic actuator or piping	f. Verify replace as necessary

Output pressure too high

Cause	Remedy
a. Sensitivity adjuster open too far	a. Recalibrate

Actuator movement too slow

Cause	Remedy
a. Low air supply capacity	a. Check supply capacity and pipe sizes

Actuator failing to close

Cause	Remedy
a. Output pressure too low	a. Refer to previous fault
b. Incorrect zero point	b. Recalibrate
c. Valve/actuator coupling incorrect	d. Reset (refer to valve/actuator IMI's)
d. Actuator too small	e. Fit correct actuator

Actuator failing to fully open valve

Cause	Remedy
a. Output pressure too low	a. Refer to previous fault
b. Incorrect travel adjustment	b. Recalibrate see
c. Valve/actuator coupling incorrect	d. Reset (refer to valve/actuator IMI's)
d. Actuator too small	e. Fit correct actuator

Hunting

Cause	Remedy
a. Incorrect controller set up (P, I, and D)	a. Verify and adjust according to process requirement
b. Sensitivity orifice closed too far	b. Adjust by opening sensitivity screw
c. Excessive valve friction	c. Verify and maintain as valve IMI
d. Control valve over-sizing	d. Verify operating conditions against valve capacity

Note: The effects of hunting caused by valve over-sizing or unstable process conditions can be reduced by adjustment of damping.

8. Approvals

Spirax-Sarco s.r.l.

Capitale Sociale € 2.582.300 i.v.

Sede e Stabilimento

Via per Cinisello, 18 - 20834 Nova Milanese - (MB) Ita-

Tel: 0362 - 49 17. 1 - Fax: 0362 - 49 17.310

DICHIARAZIONE CE DI CONFORMITA' EC DECLARATION OF CONFORMITY

Spirax-Sarco S.r.l. Via per Cinisello 18,
20834 - Nova Milanese (MB) Italia,

Con la presente dichiara che il prodotto sotto descritto, è stato sottoposto alla procedura di controllo di fabbricazione interno (di cui all'Allegato VIII) ed è conforme alle disposizioni della Direttiva 94/9/CE (ATEX) applicabili al gruppo di apparecchi:

Hereby declares that the product below is approved with an internal made check (Annex VIII) in accordance with the standards stipulated by 94/9/CE Directive (ATEX) for products:

II2G Ex d mb IIC T6 Gb
II2D Ex tb mb IIIC T 81°C Db
II2G Ex ia IIC T6 Gb
II2D Ex ia IIIC T6 Gb T 81°C Db

POSIZIONATORE ELETTROPNEUMATICO EP500 ELECTRO PNEUMATIC POSITIONER EP500

*Lo strumento è destinato ad essere impiegato in atmosfere potenzialmente esplosive
È stato progettato, costruito ed ispezionato secondo le seguenti normative*

*The instrument is designed for use in potentially explosive atmospheres
have been designed, manufactured and inspected according to the followings standards*

EN 60079-0 : 2009 , EN 60079-18 : 2009 , EN 60079-1 : 2007 , 2004/108/CE
EN 60079-31 : 2009 , EN 60079-11 : 2012

che ottemperano ai requisiti richiesti dalla
which comply with the requirements requested by

Direttiva 94/9/CE (ATEX) EMC 2004/108/CE

Fascicolo tecnico n° Technical Dossier n°	Numero dell'attestato CE di tipo EC type certificate number	NB (Ente notificato) NB (Notified Body)
RDS002	0425 ATEX 002822-00 X	ICIM S.p.a. Via Don Enrico Mapelli 75 20099 Sesto San Giovanni Milano n° notifica 425

Nova Milanese, 15-12-2014

Il Direttore di Stabilimento
Plant Manager
Giuseppe Villa

spirax
/sarco

Sede legale: Via per Cinisello, 18-20054 Nova Milanese (MI)
Iscrizione Reg.Imprese e Cod.Fisc. 06527950585 - Iscrizione R.E.A. Milano 1172330 - Partita Iva 11339630151

spirax
/sarco

EP500
POSITIONER

CE 0425



0425 ATEX 002822-00 X

II2G Ex d mb IIC T6 Gb

II2D Ex tb mb IIIC T 76 °C Db

II2G Ex ia IIC T6 Gb

II2D Ex ia IIIC T 76 °C Db

-20 °C ≤ Ta ≤ -75 °C

Ui=30V Ii=110mA Pi=0.82W Li=0 Ci=0

Spirax Sarco srl - via per Cinisello 18 - 20834 - Nova Milanese (MB) - Italy

