1. INTRODUCTION:

This instruction manual contains important information regarding the safety instructions, installation, operation, maintenance and storage of the ñGuardboxò limit switch boxes.
The limit switch boxes may only be mounted, wired and installed by qualified and trained personnel, according to International standards requirements for hazardous areas. If you require any additional information or assistance, please contact the manufacturer or its representative. All contacts are listed in the footnote together with the QR code for an easy access to the complete product documentation. Please read these instructions carefully before proceeding with the limit switch box installation and save them for future reference.

2. PRODUCT DESCRIPTION:

Guardbox Limit switch boxes are electromechanical devices ideal for monitoring the remote operation of industrial valves in plants, designed and manufactured for demanding applications in extreme environments and where there are requested high standards for safety and reliability products. The Guardbox devices are used to control the position of the valve and provide high accuracy electrical feedback signal of valve status to plant control systems. Guardbox devices are equipped in standard configuration with a 3D high visibility position indicator that represent a true indication of valve position. The indicator is visible on all 4 sides and is fully adjustable on 360° without disassembly. Guardbox limit switch boxes are built to be installed on valves or actuators which drive the process valves from closed to open position (Normal acting) or from open to closed position (Reverse acting) . *Normal acting* is considered full CW when the process valve is closed and CCW when the process valve is open. *Reverse acting* is full CW when the process valve is open and CCW when the process valve is closed.

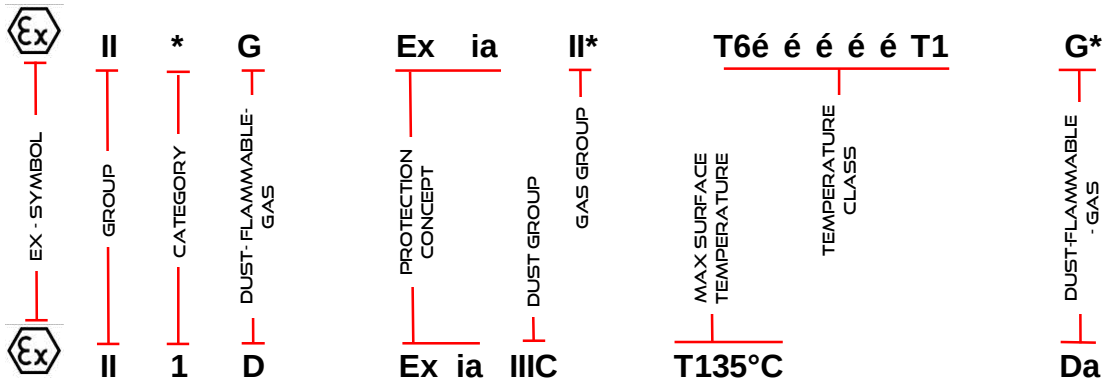
3. SAFETY INSTRUCTIONS:

Guardbox Limit switch boxes are electromechanical devices ideal for monitoring the remote operation of industrial valves in plants, designed and manufactured for demanding applications in extreme environments and where there are requested high standards for safety and reliability products. The Guardbox devices are used to control the position of the valve and provide high accuracy electrical feedback signal of valve status to plant control systems. GI Guardbox intrinsic safety Exi series limit switch box are specially projected and built to withstand the most extreme weather conditions and be installed into hazardous areas with flammable gases, vapours and mist, according with the relevant Union harmonization legislation of ATEX Directive 2014/34/EU, and to IECEx Scheme and applicable standards. Reference standards are the IEC60079-0:2011 (Ed6.0), IEC60079-11:2011+Corr1:2012 (Ed6.0), and the applied marking of Group, category and applied Ex protection is:

Ex ï Equipment marking **II*G Ex ia II* T6é é T1 G* (Tamb. - *°C/+*°C)**
II1D Ex ia IIIC T135°C Da

In case of simple apparatus **II1G Ex ia IIB/IIC T6é T1 Ga or II2G Ex ia IIB/IIC T6é T1 Gb (Tamb. - 60°C +105°C)**
II1D Ex ia IIIC T135°C Da

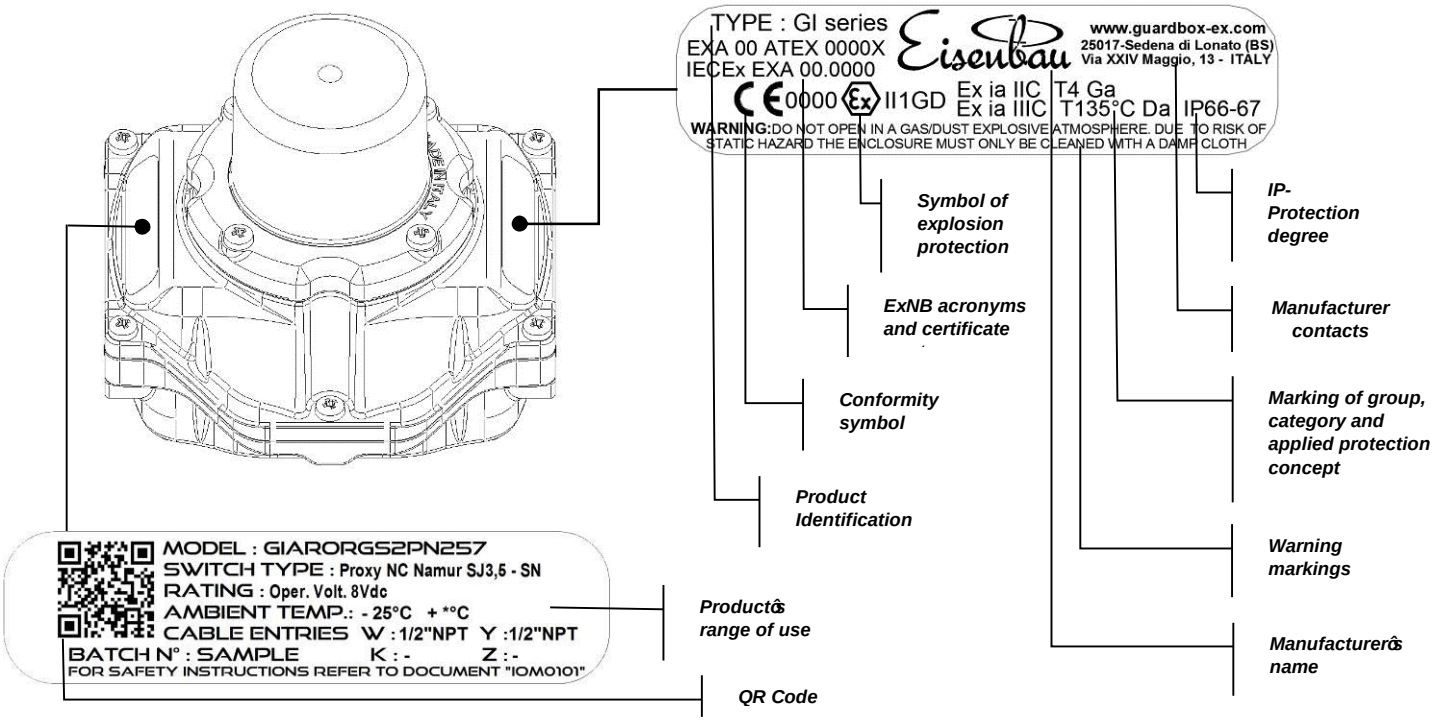
Ex ï Marks



On the outside of the Exi box cover there are two adhesive labels on which are marked the Ex-marking and all the information and references about the manufacturer, electrical and ambient range of use of the specific product, together with a QR code for a quick link and easy access to the product documentation including wiring diagram, drawings, datasheet and certificates:

IOM (Installation, Operating & Maintenance Manual) 0101-ENG rev.6

Ex ï Equipment Marking



The certification relies upon the following materials used in its construction: Box housing made up of body and cover is in Stainless Steel AISI316L, or Aluminium Alloy EN AB ed AC 44300 Al Si 12 (Fe) (a). In order to comply with the requirements for the equipment protection level (EPL), the material of the enclosure must be chosen as follow:

Table 1 ï Relation between EPL and type of material of the enclosure

EPL (EXPLOSION PROTECTION LEVEL)	ENCLOSURE MATERIAL
Ga	Stainless steel 316L (CF3M)
Gb / Gc	Aluminium Alloy EN AB ed AC 44300 Al Si 12 (Fe) (a) or Stainless steel 316L (CF3M)

Box gasket is in silicone rubber. It is the responsibility of the user to ensure that all the following safety instructions, essential health and safety requirements and warnings ⚠ are observed during installation, operation and maintenance of the product:

3.1 These instructions must carefully read before proceeding with the limit switch box installation and saved for future reference.

3.2 Installation should be carried out by suitably trained personnel to an applicable Code of Practice (eg IEC/EN60079-14 & IEC/EN61241-14).

3.3 If the box is integrated in a system or in a plant, the customer shall ensure that the local safety regulations are observed.

3.4 Before proceeding with the wiring, make sure that the characteristics of the electrical connection are compatible with electrical operation parameters of operation of the box.

3.5 Do not exceed the limit switch box performance limitation. Exceeding the limitation may cause damage to the limit switch, actuator and valve.

3.6 Use wiring suitable for temperature higher than maximum GI-series device declared ambient temperature +9°C.

3.7 Connection for limit switch box shall be provide with cable of thermal stability not less than maximum ambient temperature of particular configuration + 9°C and minimum cross sectional area of 0,14mm^2.

3.8 Operating the box over temperature limits will damage internal and external components.

3.9 ⚠ RISK OF SEVERE INJURIES!: Do not open the box when energized or in presence of explosive atmospheres

3.10 Guardbox products are supplied with plastic caps fitted on the customer requested cable entries. Task of these caps is to protect the internal circuits of the products in the time between manufacturing and commissioning. It is responsibility of the installing personnel to replace the protective caps with suitably certified and temperature rated cable glands and blanking plugs permitted for use with ATEX/IECEx intrinsic safety enclosures.

3.11 Product IP rating is ensured only by the use of suitable IP rated cable glands and plugs.

3.12 All cable entry devices shall be certified in type of explosion protection ïî and suitable for the area classification in accordance with the National Electrical Code.

3.13 Any unused cable entries must be sealed with suitably certified stopping plugs.

3.14 The box is provided with two grounding connection facilities, one inside and one outside the housing. The facilities allow for the effective connection of at least one conductor with a cross-sectional area given below in table (2):

Table 2 – minimum cross-sectional area of protective conductors

CROSS-SECTIONAL AREA OF PHASE CONDUCTOR, S [mm²]	MINIMUM CROSS-SECTIONAL AREA OF THE CORRESPONDING PROTECTIVE CONDUCTOR, S_p [mm²]
S ≤16 16 < S ≤35 S >35	S 16 0,5S

3.15 For Ex installations, the internal ground connection shall be used. The external ground connection, is an additional wiring allowed where local authorities permit, or is required. Use a ground wire of proper cross section.

3.16 Both internal and external grounding connections are clearly identified and permanently marked on the box housing and are projected to facilitate the installation of the ground cable preventing it from rotating.

3.17 A grounding connection kit composed by n°2 phillips head screws plus n°2 toothed washers, is provided in a sealed bag, available inside the box. The two anti-vibration washers help to ensure the securing of the cable.

3.18 ⚠ **WARNING!** : Risk of electrostatic charges accumulation of static charge on non-conductive parts of the box (eg. Plastic indicator dome). The external surfaces of the box must be preserved by the accumulation of dust through periodic cleaning. Clean Only with a Damp Cloth.

3.19 ⚠ **CAUTION!**: The metallic alloy used for the housing material may be at the accessible surface of this equipment; in the event of rare accidents, ignition sources due to impact and friction sparks could occur.

3.20 ⚠ **CAUTION!**: The box can work in plants in presence of extreme environments and in contact with highly aggressive and corrosive substances that may affect the integrity of the product and its protection mode. To operate in such conditions the box is projected to be realized in different materials that ensure durability and reliability in operation. For the right choice of the available options, please contact Eisenbau.

3.21 A single intrinsically safe circuit may be connected to the provided extra terminal block (labelled +,- / +,-). This circuit has not to exceed the following parameters: Ui:30V, Ii: 250mA and shall be powered by a barrier with output suitable for use in gas group IIC.

3.22 For the maximum values of the circuits according to Type of protection intrinsically safe for sensors, simple apparatus or other devices, please refer to type certificate of components installed into the box and listed into table shown in the following section of the manual. The certificates are subjected to periodic reviews, for the latest release please visit the manufacturer's website. The certificates for Pepperl & Fuchs sensors are available at this link http://www.pepperl-fuchs.com/great_britain/en/index.htm, for IFM sensors are available on https://www.ifm.com/ifmuk/web/home.htm. For transmitters, encoders or other devices certificates, please contact the device manufacturer or Eisenbau.

4. CE Ex DECLARATION OF CONFORMITY IN ACCORDANCE WITH THE RELEVANT UNION HARMONIZATION LEGISLATION ATEX DIRECTIVE 2014/34/EU

The manufacturer Eisenbau s.r.l. herewith declare under his sole responsibility, that the limit switch boxes GI-series complies, when installed in accordance with the installation and safety instruction, with all the following applicable EU directives, Regulations and all the essential Health and Safety requirements:

Ex – Equipment marking (for certified switches and components) Ex **II*G Ex ia II* T6… T1 G* ($T_{amb.}$ -*°C/+*°C)**
II1D Ex ia IIIC T135°C Da

Table 3 – List of installed certified components

Switch series	Manufacturer	ATEX gas certificate	IECEx gas certificate
Cylindrical inductive proximity sensors of types NC..and NJ...	Pepperl&Fuchs	PTB 00 ATEX 2048X	IECEx PTB 11.0037X
SN-type proximity sensors series NJ..and SJ...	Pepperl&Fuchs	PTB 00 ATEX 2049X	IECEx PTB 11.0092X
Slot-type proximity sensors series SJ..and SC...	Pepperl&Fuchs	PTB 99 ATEX 2219X	IECEx PTB 11.0091X
Cuboidal inductive proximity sensors series FJ..and NB...	Pepperl&Fuchs	PTB 00 ATEX 2032X	IECEx PTB 11.0021X
Cuboidal inductive proximity sensors series NC..and NJ...	Pepperl&Fuchs	PTB 00 ATEX 2032X	IECEx PTB 11.0021X
Valve position sensors type NCN.., N4..., PL.F25.-.N4..,NC..F31.-N5..	Pepperl&Fuchs	TUV 99 ATEX 1479X	IECEx TUN 04.0014X
Inductive proximity switch series N*50*A	IFM electronics GmbH	BVS 04 ATEX E091X	IECEx BVS 06.0003X

Transmitter/encoder type	Manufacturer	Description	Approvals ATEX	Approvals IECEx
5333D	PR electronics	2-wire programmable transmitter	KEMA 03ATEX1535X	DEK 13.0036X
5335D, 5337D	PR electronics	2-wire transmitter with Hart protocol	KEMA 03ATEX1537	KEM 10.0083X
5350B	PR electronics	Profibus PA/ Foundation Fieldbus transmitter	KEMA 02ATEX1318	BVS 12.0035X

Ex ï Equipment marking (in case of simple apparatus) **II1G Ex ia IIB/IIC T6é T1 Ga or II2G Ex ia IIB/IIC T6é T1 Gb**
II1D Ex ia IIIC T135°C Da

Table 4 ï List of installed simple apparatus

Micromechanical switch SPDT/ DPDT gold plated	As applicable	Simple apparatus	Simple apparatus	Simple apparatus
Micromechanical switch SPDT/ DPDT gold plated and sealed	As applicable	Simple apparatus	Simple apparatus	Simple apparatus
Reed switches SPDT/DPDT	As applicable	Simple apparatus	Simple apparatus	Simple apparatus
Reed switches SPDT/DPDT	Eisenbau	Simple apparatus	Simple apparatus	Simple apparatus

IEC60079-0:2011 (Ed6.0); IEC60079-11:2011 (Ed6.0)
EN 60079-0:2012/ A11:2013; EN 60079-11:2012

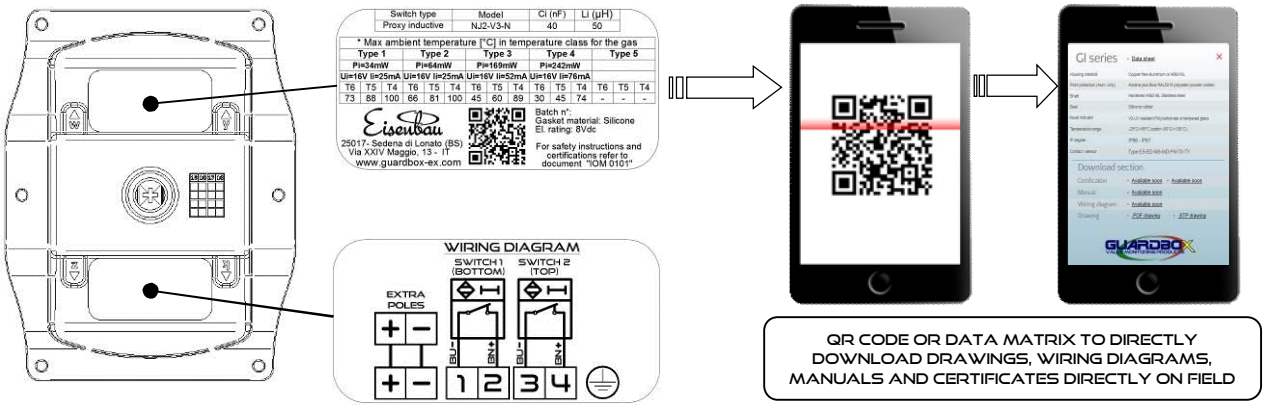
ATEX EC ï Type examination certificate**: EXA 15 ATEX 0040X**
IECEx ï Certificate of Conformity**: IECEx EXA 15.0007X**

ATEX - Production Quality Assurance Notification**: EXA 15 ATEX Q051**
IECEx - Product Quality Assessment Report **: HR/EXA/QAR15.0001/00**

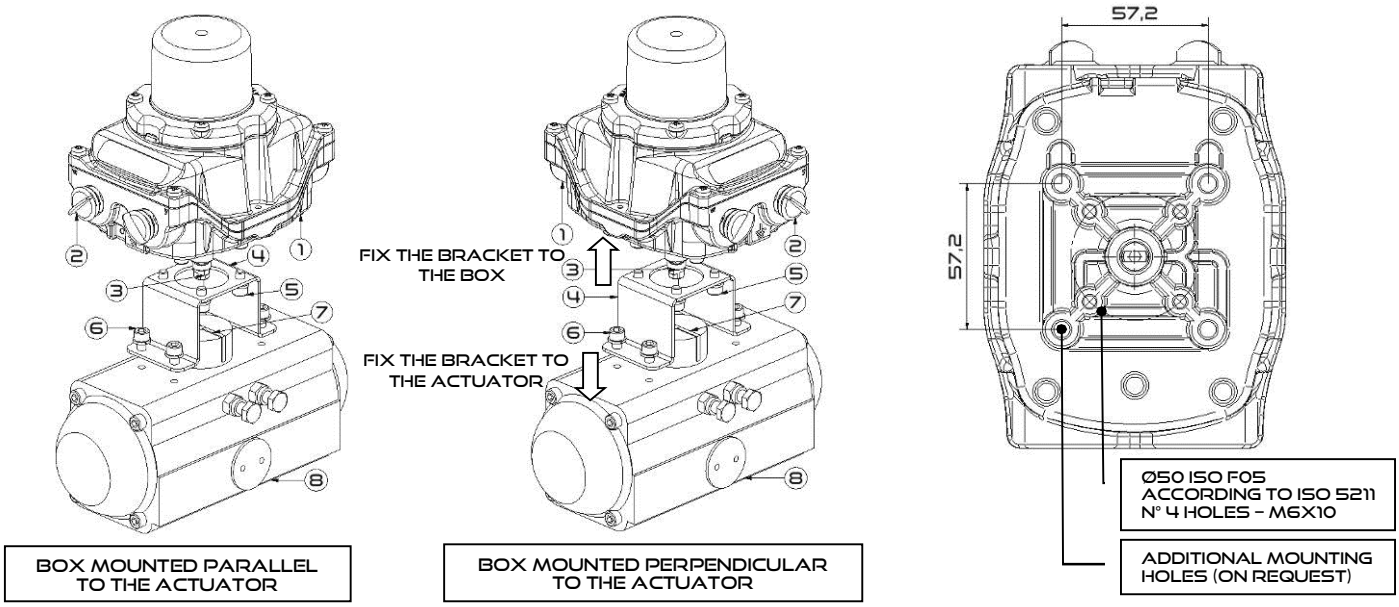
Guardbox GI-series Limit switch boxes are also available, on request, with the following certification:

EAC - Customs union certificate of conformity : N° TC **RU C-IT.BH02.B.00123** Series RU **N° 0325960**

5. INSTALLATION



6. MOUNTING



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⚠ **ATTENTION! :** Consider the rotation direction of the actuator. The box is factory presetted to be installed parallel to CCW rotating actuators (Normal acting). For installation on reverse acting actuator or perpendicular to the actuator, the cams inside the box need to be reset before operating the system to avoid damages to the cams or to the sensors.

6.1 The box has on the bottom surface a drilling according to ISO 5211, as shown in the image. Fix the proper mounting bracket (supplied in option by Eisenbau) to the box using M6 screws (6).

6.2 Move the actuator to a completely ñOpenò or ñCloseò position, then align the box shaft (3) to actuator slot (7) ensuring of their correct coupling.

6.3 The box is designed, assembled and controlled to ensure a maximum operating torque, at the shaft, lower than 0,5Nm. An excessive misalignment of the two shafts during coupling, may result in the increase of this torque value until reaching the complete seizure of the shaft in the worst cases. Eccentricity between the two shafts must not exceed 0.2 mm.

6.4 The motion transmission from the actuator or valve to the box GI is attained by a mechanical coupling. Before installation on a valve or an actuator, make sure that the orientation of the position indicator is correct.

6.5 Operate the actuator before making the electrical wiring to ensure proper alignment between box and actuator . If it should be necessary, re-align box by loosening mounting bolts (6) and retighten bolts to the actuator (8) according to the required direction of rotation when satisfied with alignment.

6.6 Replace the protective caps with suitably certified and temperature rated cable glands and blanking plugs permitted for use with ATEX/IECEx intrinsic safety enclosures.

7. INPUT PARAMETERS AND LIST OF POSSIBLE CONFIGURATIONS:

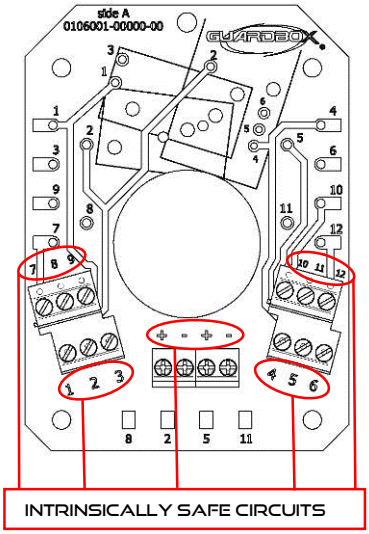
Ex ï Equipment marking
(for certified switches and components)

II*G Ex ia II* T6é é T1 G* (Tamb. - *°C/+*°C)
II1D Ex ia IIIC T135°C Da

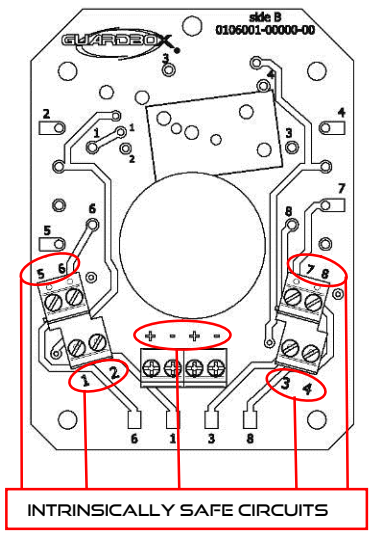
⚠ **ATTENTION! :** Category, gas group and the EPL depends on type of certified sensor installed inside the box. The asterisk option on the outside label refer to the values listed on the label inside the box according to sensor or component intrinsically safe parameters. For gas the upper ambient temperature range of the equipment shall be not greater than the upper ambient temperature of the individual Ex sensor (according to Type, Category and temperature class of use) reduced by a value of qT rise (see table 5) related to the box heating calculated in the worst operating case. The max ambient temperature must be determined by crossing the sensor/components values with the max ambient temperature of the limit switch box indicated in the external label not exceeding this value in any case. In most cases the switch installed belong to the same series, however can be installed a combination of switch plus a certified position transmitter or encoder and in rare cases a combination of switch of different series as shown in following table (5). In these cases the internal label will report all input parameters of the different switch series or components connected to the intrinsically safe circuits and the max ambient temperature must be determined by crossing all the values of single different sensors and components choosing the lowest values according to the type, temperature class and category of use.

7.1 The sensors or the other components can be provided installed on a PCB circuit board or wired directly into terminals fixed on a metallic board. The PCB board option can have up to 4 independent intrinsically safe circuits reserved to the installation of sensors and components plus an extra terminal block (marked +,- / +,-) reserved to the customer for connection of an single intrinsically safe circuit (e.g. an external solenoid) not exceeding the following parameters: Ui:30V, Ii:250mA powered by a barrier with output suitable for use in gas group IIC. Side A of the PCB allow to install 3-wire sensors, while side B is suitable for 2-wire sensors. The metallic board version allow to have more flexibility on configurations due to direct wiring on terminal blocks and allow to install up to 4 sensors plus a position transmitter. Extra terminal blocks for customer connection are installed also on the metallic board when there is enough available space.

PCB side A (For 3-wire sensors)



PCB side B (For 2-wire sensors)



Metallic board for all sensors and components

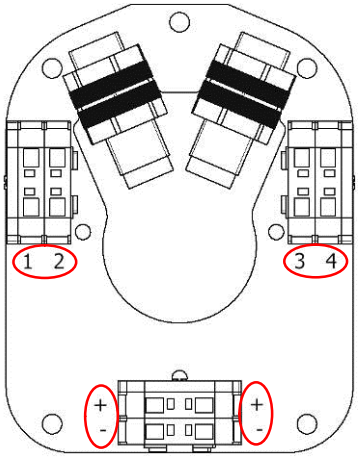


Table 5 – Possible circuit configurations

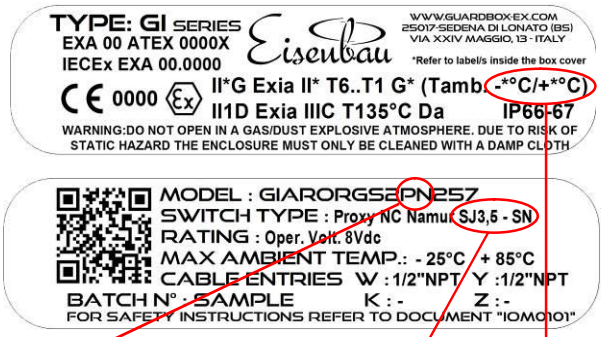
Configuration	Switch type and max qty	Encoder/Transmitter type and max qty	Switch quantity	* Temperature rise ΔT [°C]
1	Max n°2 - Electromechanical SPDT	0	For every combination	/
2	Max n°4 - Electromechanical SPDT or Max n°3 Electromechanical DPDT	0		
3	Max n°4 - Reed switches SPDT or Max n°3 Reed switches DPDT	0		
4	Max n°4 - Cuboidal inductive proximity	0	1	2°C
5	Max n°4 - Cylindrical inductive proximity	0	2	3°C
6	Max n°4 - Slot-type inductive proximity	0	3	4°C
			4	5°C
7	0	Max n°1 - 2 wire transmitter PR electronics 5333D, 5335D, 5337D or 5350B + Max n°1 - Honeywell 640 series or Contelec WAL305 series	/	5°C
8	Max n°2 - Slot-type or cylindrical inductive proximity	Max n°1 - 2 wire transmitter PR electronics 5333D, 5335D, 5337D or 5350B + Max n°1 - Honeywell 640 series or Contelec WAL305 series	1	6°C
			2	7°C
9	Max n°4 - Cuboidal inductive proximity	Max n°1 - 2 wire transmitter PR electronics 5333D, 5335D, 5337D or 5350B + Max n°1 - Honeywell 640 series or Contelec WAL305 series	1	6°C
			2	7°C
			3	8°C
			4	9°C
10	Max n°4 - Electromechanical SPDT or Max n°2 Electromechanical DPDT	Max n°1 - 2 wire transmitter PR electronics 5333D, 5335D, 5337D or 5350B + Max n°1 - Honeywell 640 series or Contelec WAL305 series	For every combination	5°C
11	Max n°3 - Reed switches SPDT or Max n°3 Reed switches DPDT	Max n°1 - 2 wire transmitter PR electronics 5333D, 5335D, 5337D or 5350B + Max n°1 - Honeywell 640 series or Contelec WAL305 series		

* ΔT is the internal temperature rise of the GI box in Celsius degrees, depending on installed components, that must be taken into consideration in the calculation of max ambient operating temperature of the box. The certified housing temperature coefficient used to calculate ΔT rise is 4,97°C/W, while the component power dissipation considered to calculate the ΔT is:

- Simple apparatus → 0W (Does not to be considerate because switches don't produce heat)
- Encoder/transmitter → 0,84W (according to device certificates)
- Inductive sensors → 0,242W (according to type 4 intrinsic safety barrier)

For gas, when simple apparatus or a configuration containing simple apparatus is installed, the max ambient temperature of the limit switch box is decreased by manufacturer by a ΔT of 45°C, according to IEC60079-11. When certified components and sensors are installed, the max ambient temperature of the limit switch box is equal to max ambient temperature of the certified components and sensors installed, indicated into their corresponding certificates, reduced by manufacturer by a ΔT according to specific configuration as listed in the table above. The max ambient temperature of the limit switch box, has already been calculated according to temperature class by the manufacturer and printed on the label stuck inside the box cover, so the customer must refer to this internal label. When Pepperl & Fuchs certified sensors are installed, more than one max ambient temperature values are printed on label, divided by temperature class according to different types of intrinsic safe barriers. The customer must select the correct value depending on type of intrinsic safe barrier used. It is possible in same cases to have a combination of different certified sensor series installed into the same box. In these cases on the label are printed only the final reference values for customer already calculated by the manufacturer by crossing all the different max ambient temperature of the installed sensors.

EXTERNAL LABELS



INTERNAL LABEL

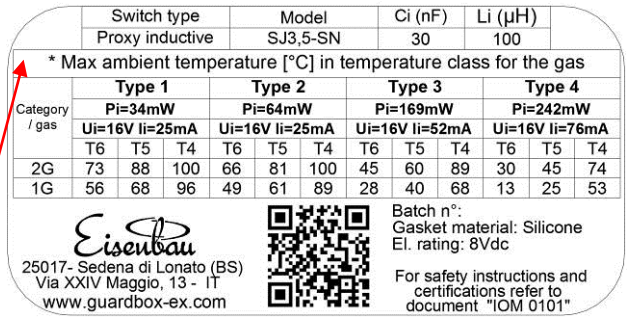


Table 6 ï Intrinsically safe parameters for certified sensors and components

Switch type	Switch series	Manufacturer	Equipment Group/Category Environment	Ci (nF)	Li (µH)	Type 1 Pi=34mW Ui : 16V Ii: 25mA			Type 2 Pi=64mW Ui : 16V Ii: 25mA			Type 3 Pi=169mW Ui : 16V Ii: 52mA			Type 4 Pi=242mW Ui : 16V Ii: 76mA		
						T6	T5	T4	T6	T5	T4	T6	T5	T4	T6	T5	T4
PN	Cilindrical inductive proximity sensors of type NC...and NJ...	Pepperl & Fuchs	IIC 1G or 2G	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	SN-type proximity sensors series NJ..and SJ..		IIC 1G or 2G	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Slot-type proximity sensors series SJ..and SC..		IIC 1G or 2G	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Cuboidal inductive proximity sensors series FJ..and NB...		IIC 1G or 2G	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Cuboidal inductive proximity sensors series NC..and NJ...		IIC 1G or 2G	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Valve position sensors type NCN..., N4...,PL.F25.-.N4..,NC..F31.-N5	Pepperl & Fuchs	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Inductive proximity switch series N*50*A	IFM electronics GmbH	IIC 1G or 2G	*	*	Ui : 15V			Ii : 50mA			Pi : 120mW					

Switch type / transmitter type	Transmitter / encoder / potentiometer	Manufacturer	Equipment Group/Category Environment	Ci (n F)	Li (µH)	Intrinsically safe input parameters	Min Ambient temperature [°C]	Max Ambient temperature for temperature class [°C]	
								T6	T4
TX	2-wire transmitter 5333D, 5335D, 5337D or 5350B	PR Electronics	IIC 1G or 2G	1	10	Ui : 30V Ii: 120mA Pi : 0,84W	-40	60	85
	Potentiometer 640 Series	Honeywell	/	/	/	Works with 2-wire transmitter PR electronics	-40	66	116
	Potentiometer WAL 305 Series	Contelec	/	/	/		-25	66	75

Ex ï Equipment marking (in case of simple apparatus) **II1G Ex ia IIB/IIC T6é T1 Ga or II2G Ex ia IIB/IIC T6é T1 Gb**
II1D Ex ia IIIC T135°C Da

Table 7 ï Intrinsically safe parameters for simple apparatus

Switch type	Switch series & Contact type		Max nominal operating Ambient temp. **	Max nominal switching voltage/current ***	Manufacturer	Max ambient temperature for temperature class [°C]				Equipment Group - Category Environment	Intrinsically safe input parameters for dry contact simple apparatus
	Micromechanical switch SPDT/DPDT gold plated	Reed switch SPDT or DPDT				T6	T5	T4	T3		
ES (SPDT)	D41 series		-40 + 85/125°C	0,1A-250Vac	Cherry	40	55	90	105	IIC 2G	Ui : 16V Ii: 76mA Pi: 242mW
	DC3 series (sealed)		-40 + 85/120°C								
	V3D series		-50 + 85/125°C	0,1A-250Vac 0,1A-30Vdc	Crouzet						
	V3 series		-60 + 85/125°C								
	V15W series (sealed IP67)		-40 + 85°C	0,1A-250Vac 0,1A-30Vdc	Honeywell	40	55	85	85		
	SM series		-54 + 121°C			40	55	90	105		
ED (DPDT)	DB3 series		-40 + 85/120°C	0,1A-250Vac	Cherry						
MS (SPDT)		MS series	-60 +125°C	0,1A-250Vac 1A-24Vdc	As applicable or Eisenbau	40	55	90	105	IIC 1G or 2G	
MD (DPDT)		MD series									

NOTE:

* For the maximum values of the circuits according to Type of protection intrinsically safe for sensors, simple apparatus or other devices, please refer to type certificate of components installed into the box. The certificates are subjected to periodic reviews, for the latest release please visit the manufacturerôs website. The certificates for Pepperl & Fuchs sensors are available at this link http://www.pepperl-fuchs.com/great_britain/en/index.htm, for IFM sensors are available on https://www.ifm.com/ifmuk/web/home.htm. For transmitters, encoders or other devices certificates, please contact the device manufacturer or Eisenbau

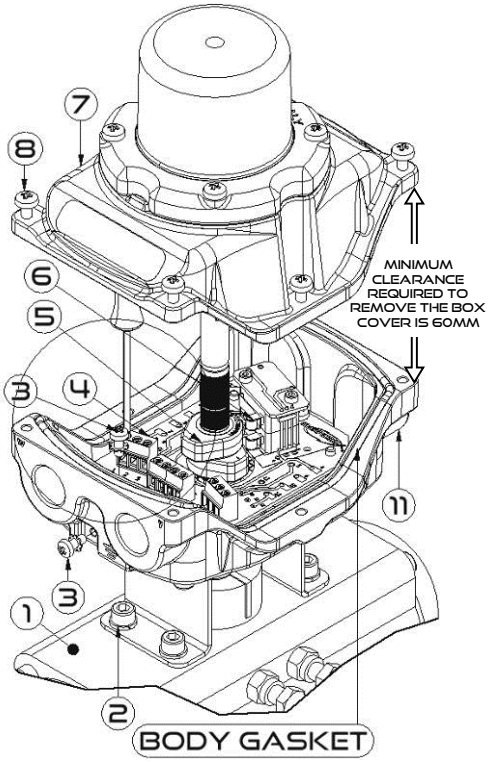
** Max operating temperature for simple apparatus must be reduced, according to the type, temperature class and category of use as shown in the last column of the table

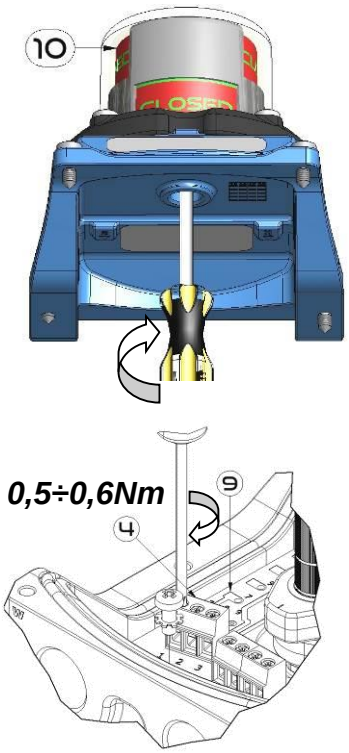
*** Do not exceed the intrinsically safe input parameters shown in the table.

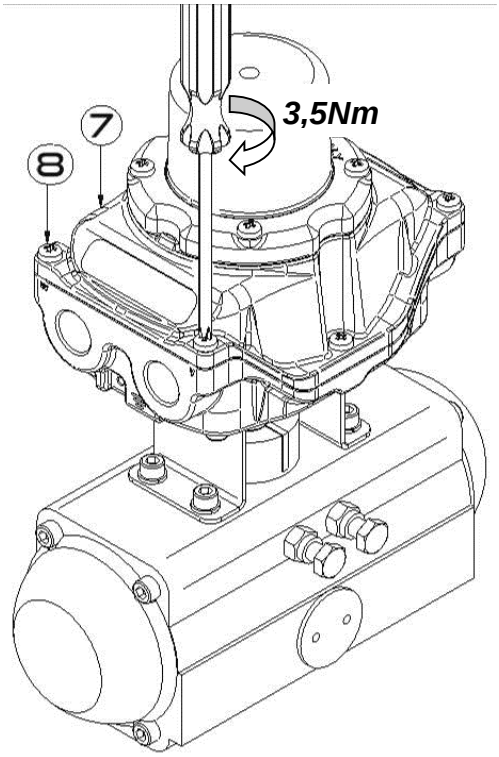
8. ELECTRICAL WIRING:

⚠ CAUTION! : The electric components inside the box may carry dangerous voltage. The box must not be electrically connected during installation.
Follow switch adjustment, wiring instructions (if present) and indicator setting before servicing the limit switch box
Make sure that the characteristics of the electrical connection are compatible with electrical parameters of operation of the Limit switch box. Do not exceed the limit switch performance limitation. Exceeding the limitation may cause damage to the limit switch, actuator and valve. Connect earth conductor.

⚠ ATTENTION! : the minimum clearance required to remove the box cover is 60mm.







8.1 Replace the protective caps with suitably certified and temperature rated cable glands and blanking plugs permitted for use with ATEX/IECEx intrinsic safety enclosures.

8.2 Product IP rating is ensured only by the use of suitable IP rated cable glands and plugs

8.3 Make sure that the cable glands are steadily tightened so that the sealing ring reaches the proper compression to avoid the transmission of mechanical stresses to the terminals (4).

8.4 Number, position and size of the provided cable entries are specified in the adhesive label outside the box cover. Number and type of cable entries can also be determined by reference to the 4th digit of limit switch box model marked on both internal and external labels. The certified cable entry options in the following table (8):

Table 8 – Cable entry options

ENTRY SIZE (Ex)				MAX QUANTITY *
M20x1,5	*M25x1,5*	*1/2"NPT*	*3/4"NPT*	*N°4*
Metric thread conform to UNI 5870:1971 NPT thread conform to ANSI/ASME B1.20.1:1983				

* Every box housing can be customized with a various combination , in quantity and size, of cable entries up to a maximum of 4 , depending on customer request

8.5 Unscrew the six box cover captive screws (8), then remove the box cover (7).

8.6 Connect field wiring to the terminals (4) within the circuit board (9) according to the wiring diagram and terminal labelling available inside the box.

8.7 Make sure that the electrical wires are steadily tightened and totally inserted into the terminals (4) and that there isn't non-insulated conductor material.

8.8 For box with circuit board (9) installed, the terminals (4) must be tightened using a torque value between 0,5÷0,6Nm

8.9 Make sure that the box is connected to the ground with the proper screw (3) using a ground cable with a suitable section

8.10 For switch adjustment and cams (5) setting, please refer to following section (9. SWITCH AND CAM SETTING).

8.11 Check the cams (5) position before replacing the box cover (7).

8.12 ⚠ ATTENTION! : During the steps of removal and adjustment it is possible that the body gasket moves from its operating position. Verify that it is in the seat during assembly because the incorrect positioning of the gasket may cause malfunctions in the box.

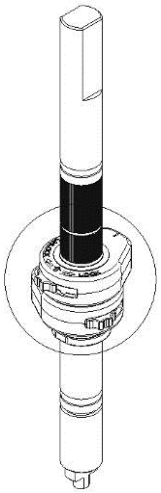
8.13 Replace the cover (7) making sure that the orientation of the position indicator (10) is correct. If the cover (7) is hard to engage on the box shaft, the indicator (10) could have moved during box cover's opening. Use a phillips screwdriver to match the 3D indicator slot with the box shaft, than reassemble the cover (7).

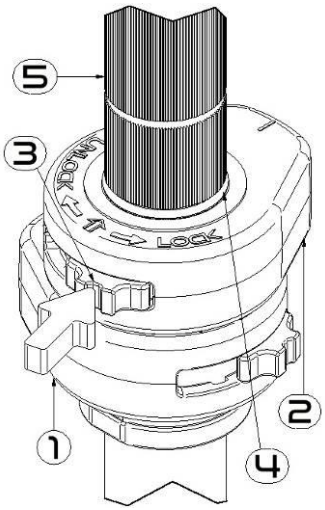
8.14 Fasten the six captive screws (8) using a torque of 3,5Nm.

9. SWITCH AND CAM SETTING:

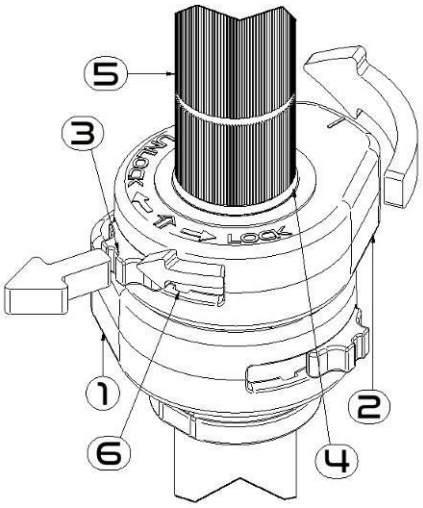
⚠ NOTE !: Cams are factory presetted in order to operate in a box installed parallel (See section 6. MOUNTING) to CCW rotating actuators (Normal acting). The lower cam (1) is regulated to operate the switch in the full CW position, when the process valve is CLOSED. The cam above (2) is regulated to operate the switch in the full CCW position, when the process valve is OPEN. All installation are suitably accompanied by dedicated instructions, due to the size of the installed sensor, cams may have the opposite regulation. Some applications moreover require the use of additional or special cams. These cams, placed above the cam (2), can be set for signaling intermediate positions or as a redundant signaling of valve OPEN or CLOSED. Where necessary, will be provided dedicated additional instructions for the proper setting of the special cams or electrical components. Following table represents the main cam configurations divided by specific type of switch, for applications not represented below, please refer to additional instructions provided inside the box packaging:

CAM EASY ADJUSTABLE REGULATING SYSTEM





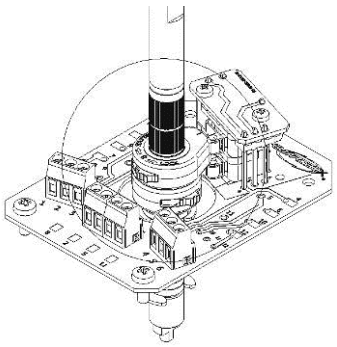
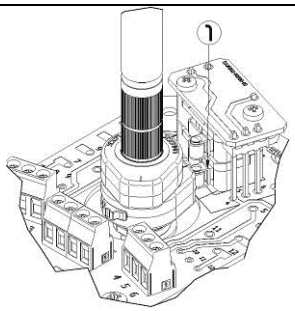
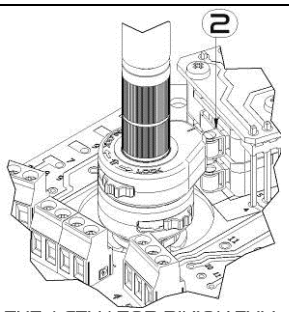
ENGAGED CAMS

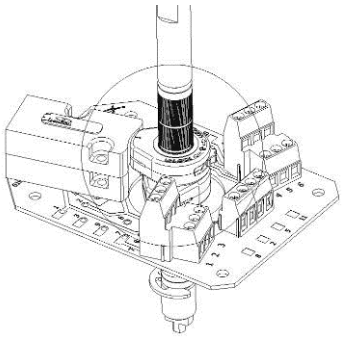
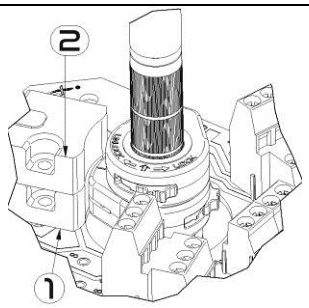
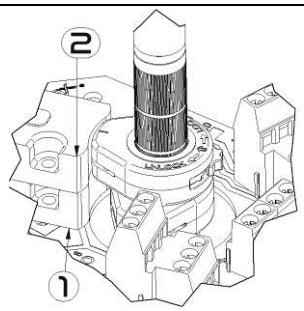
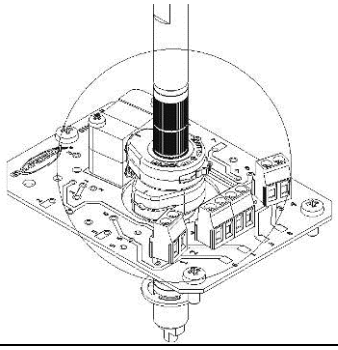
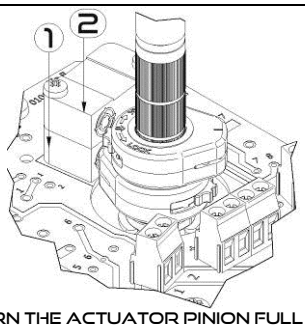
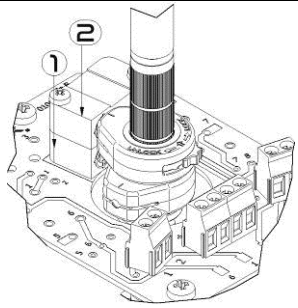
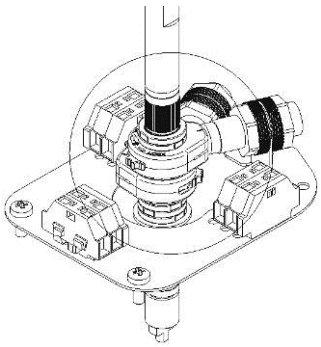
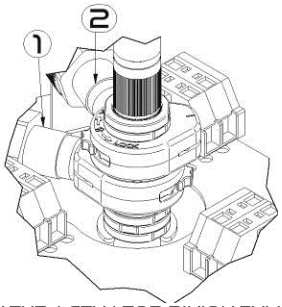
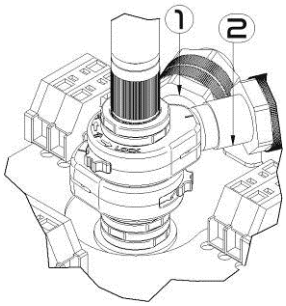
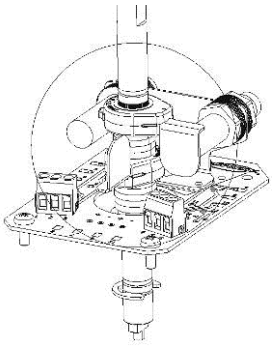
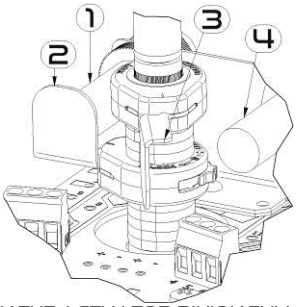
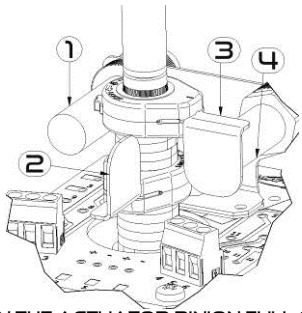
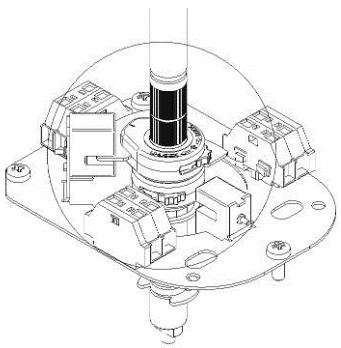
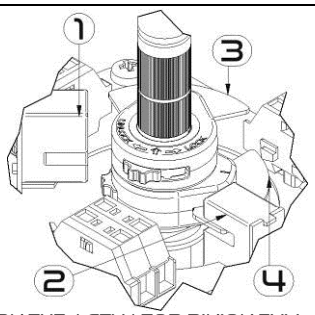
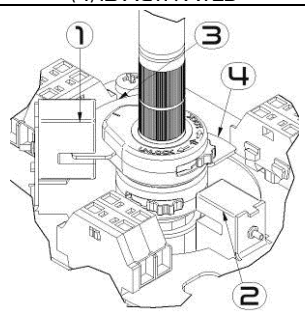


RELEASED CAMS

NO TOOL IS REQUIRED FOR THE REGULATION OF THE CAMS.

a) Push the button (3) with the finger up to disengage the cam from its retaining seat (6), rotate CW the button until it stops, then release. Now the cam is free to rotate on the shaft (5). Retaining spring (4) prevent the cams to lift up during regulation.
b) Rotate the cam till reaching the correct operating point
c) Push the button (3) with the finger up to disengage the cam from its retaining seat (6), rotate CCW the button until it stops, then release. Now the cam is set and locked on the shaft (5).

	BOARD ASSEMBLY		
ES / ED (ELECTROMECHANICAL SPDT/DPDT)		 TURN THE ACTUATOR PINION FULL CW AND REGULATE THE CAM TILL THE SWITCH (1) IS ACTIVATED	 TURN THE ACTUATOR PINION FULL CCW AND REGULATE THE CAM TILL THE SWITCH (2) IS ACTIVATED

MS / MD (MAGNETIC PROXIMITY SPDT/DPDT)	BOARD ASSEMBLY 	 TURN THE ACTUATOR PINION FULL CW AND REGULATE THE CAM TILL THE SWITCH (1) IS ACTIVATED	 TURN THE ACTUATOR PINION FULL CCW AND REGULATE THE CAM TILL THE SWITCH (2) IS ACTIVATED
PI / PN (INDUCTIVE PROXIMITY) / (INDUCTIVE PROXIMITY NAMUR)	BOARD ASSEMBLY 	 TURN THE ACTUATOR PINION FULL CW AND REGULATE THE CAM TILL THE SWITCH (1) IS ACTIVATED	 TURN THE ACTUATOR PINION FULL CCW AND REGULATE THE CAM TILL THE SWITCH (2) IS ACTIVATED
		 TURN THE ACTUATOR PINION FULL CW AND REGULATE THE CAM TILL THE SWITCH (1) IS ACTIVATED	 TURN THE ACTUATOR PINION FULL CCW AND REGULATE THE CAM TILL THE SWITCH (2) IS ACTIVATED
		 TURN THE ACTUATOR PINION FULL CW AND REGULATE THE CAM TILL THE SWITCH (1) IS ACTIVATED	 TURN THE ACTUATOR PINION FULL CCW AND REGULATE THE CAM TILL THE SWITCH (4) IS ACTIVATED
		 TURN THE ACTUATOR PINION FULL CW AND REGULATE THE CAM TILL THE SWITCH (1) IS ACTIVATED	 TURN THE ACTUATOR PINION FULL CCW AND REGULATE THE CAM TILL THE SWITCH (2) IS ACTIVATED

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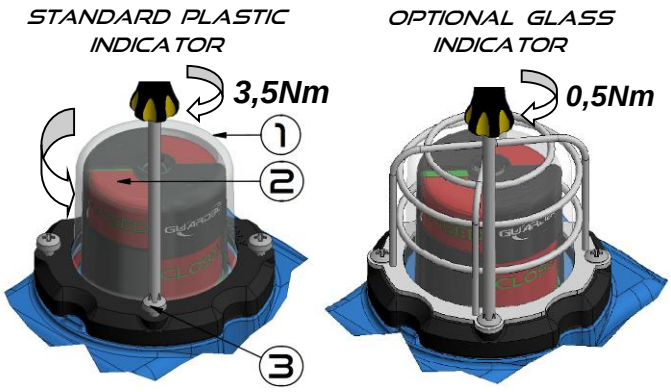
10. INDICATOR SETTING:

10.1 The 3D indicator (2) is visible on all 4 sides and is fully adjustable on 360° without disassembly.

10.2 Loosen indicator M5 captive screws and rotate transparent indicator dome (1) to desired viewing angle according to valve position. (OPEN or CLOSED appearing through indicator window).

10.3 Retighten the four captive M5 screws (3) using a torque of max ***3,5Nm*** for standard plastic dome while, for glass dome version, do not exceed the max torque of ***0,5Nm.***



11. STORAGE AND MAINTENANCE:

11.1 Store the boxes away from UV rays and atmospheric agents, in an environment with temperature between 0°C and 40°C.

11.2 The Guardbox devices require no servicing during normal working life if properly installed, except the normal inspection of mounting screws/bolts, O-rings and terminal wiring for signs of loosening or corrosion as part of the routine plant maintenance.

11.3 Guardbox boxes have been projected to withstand the most severe mechanical fatigue test (more than 1000000 cycles) and accelerated corrosion test (up to 500 hours according to UNI EN ISO9227). However for long-time outdoor usage expecially in aggressive environments or if subjected to an elevate number of operations, is recommended to periodically check the correct functionality and integrity of the box. If some parts are damaged, please contact the manufacturer or the local distributor for certified replacement parts.

11.4 Maintenance should be carried out by suitably trained personnel to an applicable Code of Practice (eg. IEC/EN60079-14 & IEC/EN61241-14).

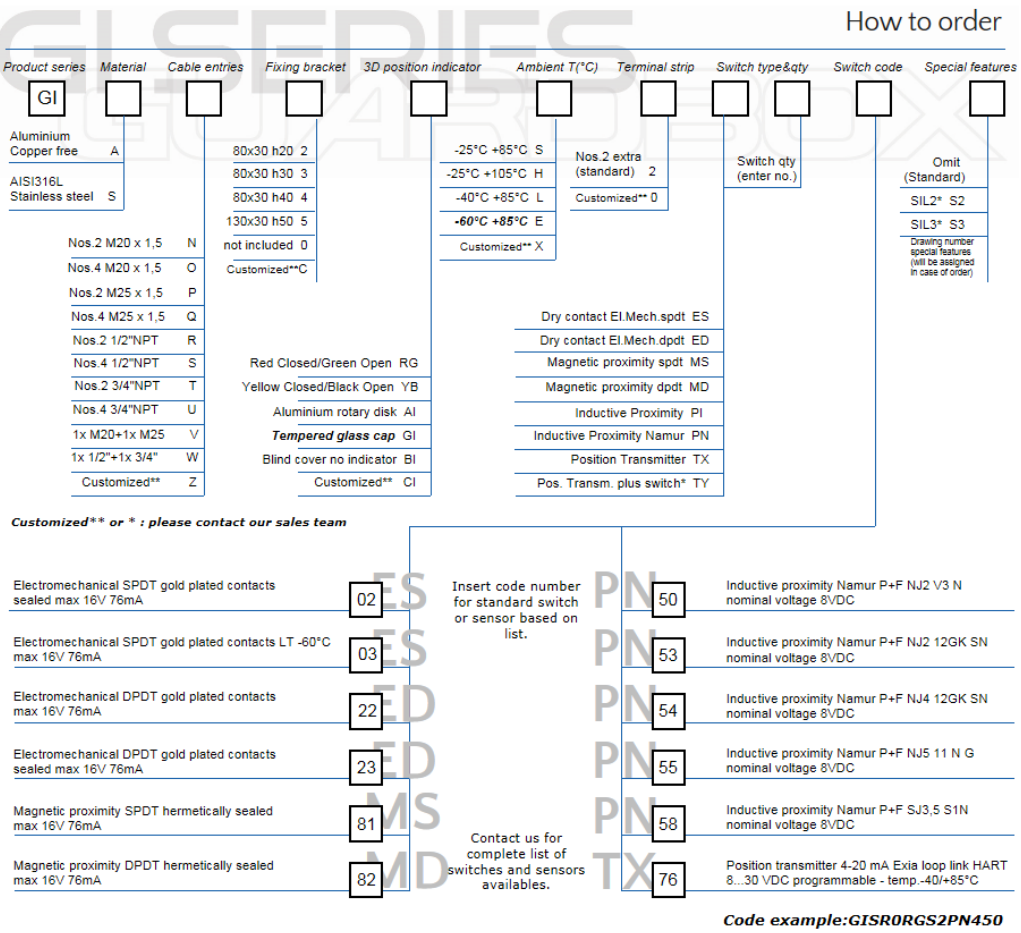
11.5 Ensure safety warnings ⚠ are observed during maintenance.

11.6 Eisenbau reserves the right to change or modify products without prior notice or without incurring any obligation to make some changes on products previously or subsequently sold.

11.7 All trademarks are property of their respective owners.

12. WARRANTY:

For warranty conditions, please refers to section 7 of document ñGeneral terms and condition of saleò



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