

# Documentation

about  
**Ex i ... - 45 °C 8 V DC limit switch boxes**  
 with  
**Pepperl+Fuchs sensors**  
 such as  
**Ex i ... - 40 °C 8 V DC limit switch boxes**  
 with  
**Pepperl+Fuchs-sensors**  
 and  
**stainless steel membrane vent**  
 for  
**pneumatic rotary- and linear actuators**  
 acc. to  
**guideline 2014/34/EU, IExU 04 ATEX 1211**



**II 2G Ex ia/ib IIC/IIB T6 Gb**



**II 2D Ex ia/ib IIIC T 80°C Db**

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## 1. Objectives and practical use

The positions of industrial valves represent an important piece of information for the course of action of a production. These valves are e.g. actuated with pneumatic rotary- and linear actuators at which the end position of the valve like “**open**” or “**closed**” is reported back to a control system. This is done via a mounted limit switch boxes which are placed on / at the actuator.

Use of the above mentioned limit switch boxes (option: with membrane vent, check image 4) can be found in endangered explosive areas as specially for oil and gas industry in extremely cold areas. Equipment group II, category 2G, zones 1, 2 or 2D, zones 21, 22, images 1-4.

For pressure compensation can be use a membrane vent witch is fixed in the ground of the limit switch boxes, check 3.3, page 4.





**Images 1-4:** Aluminium low temperature limit switch box, size.: 125x80x57 mm for rotary- and linear actuators with 2x Pepperl+Fuchs sensors SJ 3,5-SN, **image 4:** stainless steel membrane vent in limit switch box for linear actuator without aluminium plate.

**Ambient temperature range:** - 45 °C ≤ T<sub>a</sub> ≤ +70 °C and  
- 40 °C ≤ T<sub>a</sub> ≤ +70 °C (with membrane vent)

## 2. Technical specification

**Table 1:** Technical specifications as well as conditions of use for the low temperature limit switch boxes equipment group II, category 2G, zone 1, 2 or 2D, zone 21, 22

Term / Identifier:	Technical specifications:
Material and dimensions housing	Aluminium grey, 125x80x57 mm
Connection limit switch box to bracket	4x M6-winding at the bottom hole circle $\varnothing$ 50 mm, F05-slot
Connection limit switch box to bracket for rotary- or linear actuator	- acc. to VDI/VDE 3845, steam hight 20, 30 and 50 mm, hole spacing 80x30 mm and 130x30 mm - mounting set f. linear actuators acc. to IEC 534
Ambient temperature range	- $45\text{ °C} \leq T_a \leq +70\text{ °C}$ such us - $40\text{ °C} \leq T_a \leq +70\text{ °C}$ with stainless steel membrane vent
Protection class	IP 65
ATEX identification	 II 2G Ex ia/ib IIC/IIB T6 Gb  II 2D Ex ia/ib IIIC T 80 °C Db
Temperature class	T6
<ul style="list-style-type: none"> <li>• Nominal voltage</li> <li>• Nominal current</li> <li>• Power</li> </ul>	U <sub>i</sub> = 16 V I <sub>i</sub> = 25 mA P <sub>i</sub> = 34 mW
Cable glands	M20x1,5 mm, $\varnothing$ 14,0-9,0 mm and $\varnothing$ 9,0-5,0 mm, nickel-plated or stainless steel
Membrane vent (option)	M12x1,5 mm, stainless steel
Mini-terminals	2x 2-pole, maximum 2,5 mm <sup>2</sup>
Weight without/with bracket	- 0,47 kg/0,5 kg
Weight without/with mounting set	- 0,5 kg/1,49 kg
Display and switching range	0° - 180°

### 3. Mechanical mounting / Electrical connection

3.1 Mechanical mounting: The low temperature limit switch boxes with the mounted brackets or the mounted aluminium plate (via F05-slot) and the mounting set are placed on / at the rotary- or linear actuator and screwed together.

3.2 Electrical connection: The low temperature limit switch boxes are electrically connected to the 2x 2-pole mini-terminals within the housing through the bush and cable glands tightening torque, see operating instructions cable glands, page 8+9. Data like cable thickness and cable cross section are shown in table 1. You also have to take the attached wiring diagram into consideration which can always be found on the left long surface within the housing or directly on the pcb-see image 5.

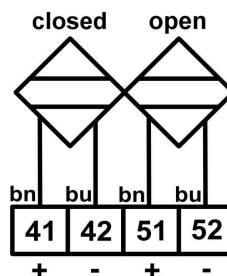
Metal parts have to be grounded or the metal housing has to be connected to the equipotential bonding.

3.3 technical indication of membrane vent: The safety or rather the protection class of the housing is only when the membrane vent resident sealed fixed in the housing ground (between actuator and housing with mounted kid).

At use in the group II outside of the normal temperature range at a minimal ambient temperature up to -40 °C the membrane vent must be installed and operated mechanically protected according to the low risk of mechanical danger according to EN 60079-0: 2004, paragraph 26.4.2.

At the use of the membrane vent in group I the mounting location must be selected in such a way, that it is protected against the risk of mechanical danger during the normal operation based on the requirements of EN 60079-0: 2004, paragraph 9.2.

Damaged membrane vents have to be replaced immediately.



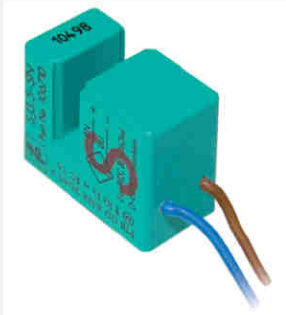
**Image 5:** wiring diagram about connection the 2x Pepperl+Fuchs sensors SJ 3,5-SN at the 2x 2-pole mini-terminals

#### 4. Components and parts list

**Table 2:** Components and parts list of the low temperature limit switch boxes equipment group II, category 2G, zone 1, 2 or 2D, zone 21, 22

Term/Identifier	Article-No.	Material	Comments
Aluminium empty housing: Consisting of a lower part with F05-slot, shaft bushing $\varnothing$ 12mm, tap hole M20x1,5 mm, closed cover as well as 4 pieces of cover screws	SB-AL-L-T	Aluminium-Si 12	125x80x57 mm, grey
Cable cland metal with silicone O-ring	SB-KL-T	Brass nickel-plated	M20x1,5 mm, clamping range for cables $\varnothing$ 14-9 mm and $\varnothing$ 9-5 mm Pflitsch-type: bg 220msHTex -55 °C up to +160 °C
Cable cland metal with silicone O-ring	SB-KL-VA-T	Brass and stainless steel	M20x1,5 mm, clamping range for cables $\varnothing$ 14-9 mm and $\varnothing$ 9-5 mm Pflitsch-type: bg 220VAHTex -55 °C up to +160 °C
Mini-terminals 2x 2-pole with clamp indicators	SB-V	Thermoplastic and copper alloy	Maximum, 2,5 mm <sup>2</sup> , blue, Bartec: 07-9702-0220/2
Shaft for slot sensors	SB-W-schl	Stainless steel	$\varnothing$ 12x64 mm, Drawing-No.: 002
O-Ring for shaft	SB-O-T	Silicone	9x1,5 mm
2x washer for shaf	SB-U	Polyamide or stainless steel	$\varnothing$ 18 / $\varnothing$ 12x1, 2mm
2x washer for shaft	SB-S	Stainless steel	DIN 6799-9
Switching cams	SB-S-s	Aluminium	Drawing-No.: 003
Cable ties	SB-C	Nylon	99x2,5 mm
Wiring diagram/ sensor indication	SB-Sch-S	Polyvinylchlorid self-adhesive	30x32 mm and 8x4 mm
Type label	SB-type	Aluminium foil self-adhesive	70x32 mm
Membrane vent (option)	SB-M	Stainless steel	M12x1,5 mm, RST, Ambient temperature range: -40 °C $\leq$ T <sub>a</sub> $\leq$ +70 °C
Stainless steel brackets standard for rotary actuators	SB-VA-K	Stainless steel	70x130x45/55 mm, for actuators acc.to VDI/VDE 3845
Stainless steel mounting set for linear actuators	SB-VA-A	Stainless steel and plastic	acc. to Namur IEC 534
Aluminium mounting plate for linear actuators with 4x fastening-screws	SB-AB-P	Aluminium	135x80x10 mm, Drawing-No.: 061
Sensors with attachment screws and nut:	SJ 3,5-SN	Plastic PBT	10x15x19 mm

5. Data sheet Pepperl+Fuchs sensor SJ 3,5-SN (Extract from page 1+2)

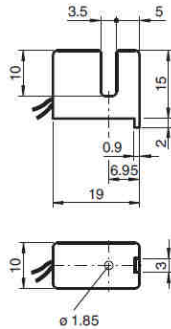


**Inductive slot sensor**  
**SJ3,5-SN**

- 3.5 mm slot width
- Usable up to SIL 3 acc. to IEC 61508
- Extended temperature range



**Dimensions**



**Technical Data**

**General specifications**

Switching function	Normally closed (NC)
Output type	NAMUR with safety function
Slot width	3.5 mm
Depth of immersion (lateral)	5 ... 7 typ. 6 mm
Reference target	10 x 7 x 0.3 mm <sup>3</sup> , Al
Safety Integrity Level (SIL)	up to SIL3 acc. to IEC 61508 <b>Danger!</b> In safety-related applications the sensor must be operated with a qualified fail safe interface from Pepperl+Fuchs, such as KFD2-SH-EX1. Consider the "exida Functional Safety Assessment" document which is available on <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a> as an integral part of this product's documentation.
Output type	2-wire

**Nominal ratings**

Nominal voltage	U <sub>o</sub>	8.2 V (R <sub>i</sub> approx. 1 kΩ)
Switching frequency	f	0 ... 3000 Hz
Hysteresis	H	with NAMUR switch amplifier: 0.045 mm (e. g. Pepperl+Fuchs KCD2-SR-Ex1.LB) with safety switch amplifier 0.025 mm (e. g. Pepperl+Fuchs KFD2-SH-Ex1)
Suitable for 2:1 technology		yes, with reverse polarity protection diode
Rate of current rise		-4.5 mA / mm

Release date: 2020-12-15 Date of issue: 2020-12-15 Filename: 273026\_eng.pdf

Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

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**PEPPERL+FUCHS**

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## Inductive slot sensor

SJ3,5-SN

### Technical Data

Current consumption	
Measuring plate not detected	≥ 3 mA
Measuring plate detected	0.2 ... 1 mA
<b>Functional safety related parameters</b>	
Safety Integrity Level (SIL)	SIL 3
MTTF <sub>d</sub>	11800 a
Mission Time (T <sub>M</sub> )	20 a
Diagnostic Coverage (DC)	0 %
<b>Compliance with standards and directives</b>	
Standard conformity	
NAMUR	EN 60947-5-6:2000 IEC 60947-5-6:1999
Standards	EN 60947-5-2:2007 EN 60947-5-2/A1:2012 IEC 60947-5-2:2007 IEC 60947-5-2 AMD 1:2012
<b>Approvals and certificates</b>	
IECEX approval	
Equipment protection level Ga	IECEX PTB 11.0092X
Equipment protection level Gb	IECEX PTB 11.0092X
Equipment protection level Da	IECEX PTB 11.0092X
Equipment protection level Mb	IECEX PTB 11.0092X
ATEX approval	
Equipment protection level Ga	PTB 00 ATEX 2049 X
Equipment protection level Gb	PTB 00 ATEX 2049 X
Equipment protection level Gc (ic)	PF13CERT2895 X
Equipment protection level Da	PTB 00 ATEX 2049 X
EAC conformity	TR CU 012/2011
FM approval	
Control drawing	116-0165
UL approval	cULus Listed, General Purpose
Ordinary Location	E87056
Hazardous Location	E501628
Control drawing	116-0454
CCC approval	
Hazardous Location	2020322315002308
NEPSI approval	
NEPSI certificate	GYJ16.1392X
<b>Ambient conditions</b>	
Ambient temperature	-50 ... 100 °C (-58 ... 212 °F) Safety application: -40 ... 100°C
<b>Mechanical specifications</b>	
Connection type	flexible leads LIY , 500 mm
Core cross-section	0.14 mm <sup>2</sup>
Housing material	PBT
Degree of protection	IP67
Note	adjustable stop Security relevant only up to -40°C
<b>General information</b>	
Use in the hazardous area	see instruction manuals

Release date: 2020-12-15 Date of Issue: 2020-12-15 Filename: 2779026\_eng.pdf

Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

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 PEPPERL+FUCHS

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## 6. Operating instructions cable glands

Tightening torque **M20x1,5 mm = 10 Nm**

### Betriebsanleitung · Operating instructions



**PTB 11 ATEX 1007X**

**blueglobe HT Ex e**

**Messing vernickelt/blank und  
Edelstahl**

Für Kabel- und Leitungseinführungen (KLE)  
der Zündschutzart „Erhöhte Sicherheit – Ex „e“

**Anwendung:**

Die Kabel- und Leitungseinführungen (KLEs) blueglobe HT Ex e dienen zur Einführung von fest verlegten Kabeln und Leitungen in einen Anschlussraum oder in ein Gehäuse eines explosionsgeschützten elektrischen Betriebsmittels der Gerätegruppe II und der Kategorien 2 G/D und 3 G/D.

Der Anschlussraum oder das Gehäuse muss der Zündschutzart „Erhöhte Sicherheit – Ex „e“ nach den Normen EN 60079-0:2012 + A11:2013, EN 60079-7:2015, EN 60079-31:2014 entsprechen.

Die KLE ist für Betriebsmittel mit dem Grad der mechanischen Gefahr „hoch“ nach EN 60079-0 geeignet. Bei ordnungsgemäßer Montage der KLE kann die Schutzart IP 66/68 nach IEC 529 oder EN 60529 erreicht werden.

**Kennzeichnung:**

Die Kabel- und Leitungseinführungen blueglobe HT Ex e entsprechen den Normen EN 60079-0:2012 + A11:2013, EN 60079-7:2015, EN 60079-31:2014. Sie sind von der Physikalisch-Technischen Bundesanstalt (PTB) einer EG-Baumusterprüfung nach EG-Richtlinie 94/9/EG unterzogen worden.

Sie sind deshalb wie folgt gekennzeichnet:

**Kennzeichnung Zulassungsnummer und Kennzeichen der Prüfstelle:**

PTB 11 ATEX 1007X xx

**Kennzeichnung Gas:**

II 2G Ex e IIC Gb

**Kennzeichnung Staub:**

II 2D Ex tb IIIC Db IP 66/68

**Kennzeichnung extrem kleiner Bauteile:\***

II 2G/II 2D

**Weitere Zertifikate:**

IECEX – IECEX PTB 11.0019X

EAC – RU C-DE.MLU06.B.00119

\*Kennzeichnung auf Kabelverschraubung

**PTB 11 ATEX 1007X**

**blueglobe HT Ex e**

**brass nickel-plated, brass and stain-  
less steel**

For cable glands and cable entry systems (CG/CES) of the  
ignition protective class Ex “e”

**Application:**

The cables glands and cable entry systems (CG/CES) blueglobe HT Ex e are used to insert permanently laid lines and cables into a connection space or housing of an explosion-protected electrical operating material of the appliance group II and categories 2 G/D and 3 G/D. The connection space or housing must conform to the ignition protective class “Increased safety – Ex e” in accordance with the standards EN 60079-0:2012 + A11:2013, EN 60079-7:2015 and EN 60079-31:2014.

The CG/CES is suitable for operating material with the degree of mechanical risk “high” as per EN 60079-0. In selecting the material for the sealing insert, the ambient, surface and operating temperature at the installation point is to be observed. With proper assembly of the KLE, the protective class IP 66/68 according to IEC 529 or EN 60529 can be attained.

**Designation:**

The cable glands and cable entry systems (CG/CES) blueglobe HT Ex e conform with the standards EN 60079-0:2012 + A11:2013, EN 60079-7:2015, EN 60079-31:2014. They were subjected to an EC design test in accordance with EC directive 94/9/EC by the Physical-Technical Federal Institute (PTB).

They are therefore designated as follows:

**ID of approval no. and ID of testing authority:**

PTB 11 ATEX 1007X xx

**Designation gas:**

**Designation dust:**

**Designation of extremely small components:\***

II 2G/II 2D

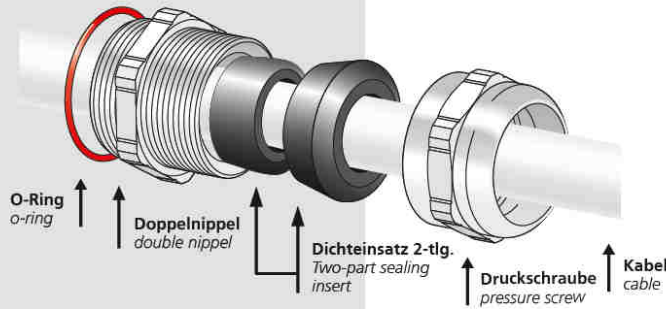
**ID of Approval IECEX:**

IECEX – IECEX PTB 11.0019X

EAC – RU C-DE.MLU06.B.00119

\*Designation on cable gland





**Montage**

Als Montagewerkzeug kann der PFLITSCH Steckschlüssel M28 verwendet werden.

**Einsatztemperaturbereich:**

Temperaturbereich Silikon: -55 °C bis +160 °C

**Mindestwandstärken**

- beim Einbau in Geräten mit Gewindebohrungen:  
s = 5,0 mm (Kunststoff); 3,0 mm (Metall)
- beim Einbau in Geräten mit Durchgangsbohrungen:  
s = 2,0 mm (Kunststoff); 1,0 mm (Metall)

**Hinweis zur Zugentlastung der Kabelverschraubung:**

Die KLE ist nur für fest verlegte Leitungen und Kabel geeignet. Der Betreiber muss in diesem Fall für geeignete Maßnahmen sorgen, um eine Zugentlastung zu gewähren.

**Wichtig:**

Dichtringe dürfen nicht mit dem Messer ausgeschnitten werden!

**Demontage:**

Die Demontage erfolgt in umgekehrter Reihenfolge.

**Instandhaltung:**

Die Blindstopfen sind in die Kontrollen bei der Inspektion und Wartung der elektrischen Betriebsmittel einzubeziehen.

**Assembly**

The PFLITSCH socket spanner M28 can be used as a tool

**Application temperature range:**

Temperature range silicone: -55 °C bis +160 °C

**Minimum wall thicknesses**

- for installation in appliances with threaded holes:  
s = 5.0 mm (plastic); 3.0 mm (metal)
- for installation in appliances with throughholes:  
s = 2.0 mm (plastic); 1.0 mm (metal)

**Pointer for strain relief of the cable gland:**

The CG/CES are only suitable for permanently laid lines and cables. In this case, the operator must adopt appropriate measures to ensure strain relief.

**Important:**

Sealing rings must not be cut out with a knife!

**Disassembly:**

Disassembly is carried out in the reverse order.

**Maintenance:**

The CG/CES are to be included in the inspection and maintenance of the electrical operating material.

**Anschlussmaße für Durchgangsbohrungen:**

Metrisch/metric	M12	M16	M20	M25	M32	M40			
d [mm] 0/+ 0,3	12,0	16,0	20,0	25,0	32,0	40,0			

**Connection dimensions for throughholes:**

**Anzugsmomente:**

Gewinde/Thread	M12	M16	M20	M25	M32	M40			
Nm	5	8	10	15	15	20			

**Tightening torques:**

**Mechanische Festigkeit:**

Gewinde/Thread	M12	M16	M20	M25	M32	M40			
Joule	7	7	7	7	7	7			

**Mechanical strength:**

2 - Betriebsanleitung 1007X bg HT Ex-e/Operating instruction 1007X bg HT Ex-e

## **7. Applicable standards**

### **EN 60079-0: 2018**

Explosive atmospheres - Part 0: Equipment - General requirements

### **EN 60079-11: 2012**

Explosive atmospheres - Part 11: Equipment protection by intrinsic safety “i”