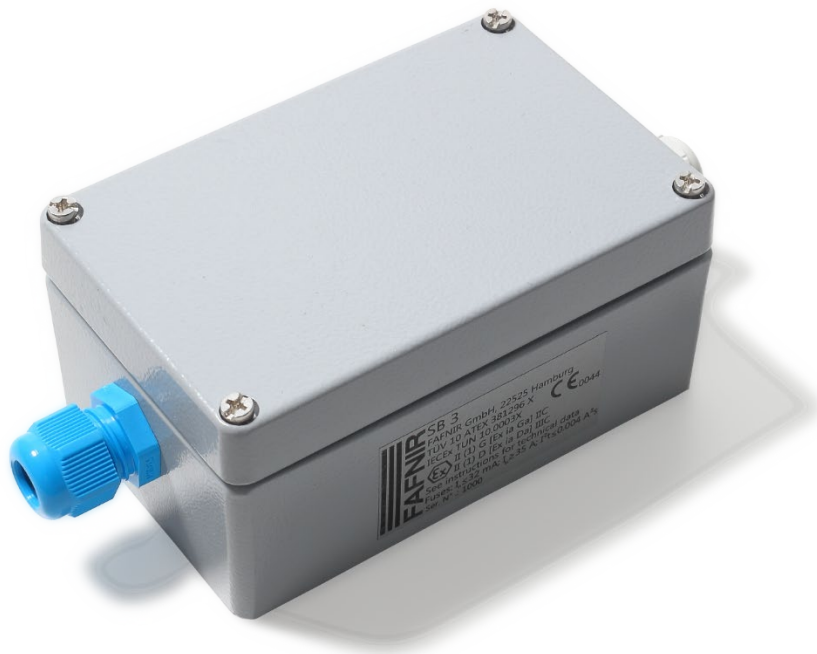


## Safety Barrier SB 3



Edition: 2021-06  
Version: 1  
Art. no.: 350327

## Table of contents

<b>1</b>	<b>Characteristics</b> .....	<b>1</b>
<b>2</b>	<b>Safety instructions</b> .....	<b>1</b>
<b>3</b>	<b>Design</b> .....	<b>2</b>
<b>4</b>	<b>Installation</b> .....	<b>3</b>
4.1	Assembly and electrical connection.....	3
4.2	Connection Diagram.....	4
<b>5</b>	<b>Maintenance</b> .....	<b>5</b>
5.1	Return shipment.....	5
<b>6</b>	<b>Technical Data</b> .....	<b>5</b>
<b>7</b>	<b>List of figures</b> .....	<b>6</b>
<b>8</b>	<b>Annex</b> .....	<b>7</b>
8.1	EU Declaration of Conformity SB .....	7
8.2	EU-Type Examination Certificate SB .....	8
8.3	Instructions SB .....	12

## 1 Characteristics

The Safety barrier SB 3 is designed to supply intrinsically safe RS-485 sensors with non-intrinsically safe supply devices.

## 2 Safety instructions

Only use the SB 3 for this purpose. The manufacturer accepts no liability for any form of damage resulting from improper use.

The device has been developed, manufactured and tested in accordance with the latest good engineering practices and generally accepted safety standards. Nevertheless, hazards may still arise. For this reason, the following safety instructions must be observed:

Do not change or modify the device or add any equipment without the prior consent of the manufacturer.

The device should only be installed, operated and maintained by specialised personnel. Specialised knowledge must be acquired by regular training.

Operators, installers and service technicians must comply with all applicable safety regulations. This also applies to any local safety and accident prevention regulations which are not stated in this user guide.

The safety instructions in this user guide are marked as follows:



*If these safety instructions are not observed, it may result in the risk of accident or damages to the device.*

### 3 Design



Figure 1: SB 3 closed

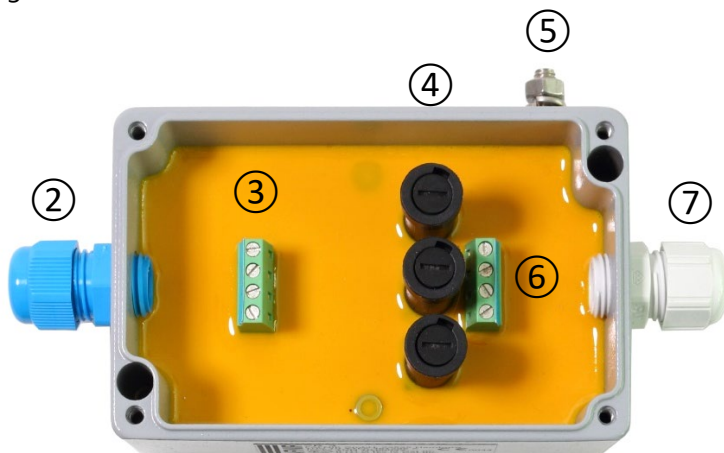


Figure 2: SB 3 open

- ① Housing cover
- ② Cable gland M16 x 1.5 for probe cable (blue)
- ③ Terminal RS-485 (+, A, B, -) for probe connection
- ④ Fuses
- ⑤ Potential equalization terminal
- ⑥ Terminal RS-485 for power supply connection (higher-level system)
- ⑦ Cable gland M16 x 1.5 for power supply connection (higher-level system)

## 4 Installation

### 4.1 Assembly and electrical connection



*When installing and operating the Safety barrier SB 3 in potentially explosive areas, the requirements of the Explosion Protection Regulations, the Industrial Health and Safety Regulations and the Equipment Safety Regulations as well as generally accepted rules of engineering and these operating instructions must be observed. The special conditions of the EU-Type Examination Certificate must be observed.*



*Observe also the local safety and accident prevention regulations, which are not stated in these operating instructions.*



*The existing M16 x 1.5 cable glands are to be used for installing the SB 3.*

The housing cover must be unscrewed to connect the SB 3:

- (1) Loosen the screws of the cover ① (see Figure 1)
- (2) Lift off the cover ①
- (3) Connect the probe (intrinsically safe) according to the connection diagram (see Figure 3) and pay attention to the polarity
- (4) The outer potential equalization terminal must be connected to the equipotential bonding

The Safety barrier SB 3 has a voltage drop of max. 16 V.

The plugged in fuses ④ are used for functioning the Safety barrier SB 3.

## 4.2 Connection Diagram

### Safety Barrier SB 3

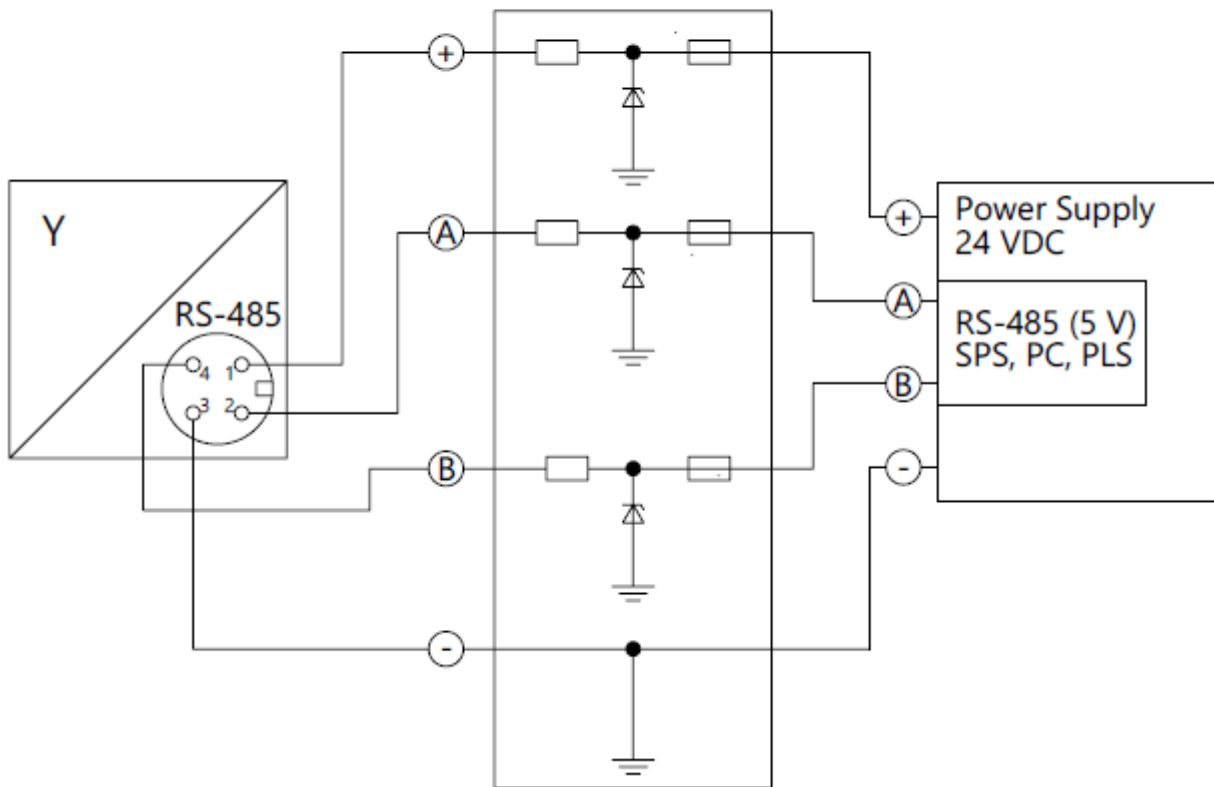


Figure 3: Wiring diagram SB 3

## 5 Maintenance

### 5.1 Return shipment

Before returning any FAFNIR equipment, the Return Material Authorization (RMA) from FAFNIR customer service is required. Please contact your account manager or the customer service to receive the instructions on how to return goods.



*The return of FAFNIR equipment is possible only with authorization by the FAFNIR customer service.*

## 6 Technical Data

Dimensions	[57 x 125 x 80] mm
Ambient temperature	-40 °C ... +70 °C
Protection class	IP67
Power supply	24 V $\pm$ 5 % at + and – 5 V $\pm$ 20 % for channels A and B
Voltage drop	$\leq$ 16 V



## 7 List of figures

Figure 1: SB 3 closed.....	2
Figure 2: SB 3 open.....	2
Figure 3: Wiring diagram SB 3.....	4





**EU-Konformitätserklärung  
EU Declaration of Conformity  
Déclaration UE de Conformité  
Dichiarazione di Conformità UE**

**FAFNIR GmbH  
Schnackenburgallee 149 c  
22525 Hamburg  
Deutschland / Germany / Allemagne / Germania**

erklärt als Hersteller in alleiniger Verantwortung, dass das Produkt  
declares as manufacturer under sole responsibility that the product  
déclare sous sa seule responsabilité en qualité de fabricant que le produit  
dichiara sotto la sola responsabilità del produttore, che il prodotto

**Sicherheitsbarriere / Safety Barrier / Barrière de sécurité / Barriera di sicurezza**

**SB ...**

den Vorschriften der europäischen Richtlinien  
complies with the regulations of the European directives  
est conforme aux réglementations des directives européennes suivantes  
è conforme ai regolamenti delle direttive europee

2011/65/EU	Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten	RoHS
2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment	RoHS
2011/65/UE	Limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques	RoHS
2011/65/UE	Restrizione dell'uso di determinate sostanze pericolose nelle apparecchiature elettriche ed elettroniche	RoHS
2014/34/EU	Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen	ATEX
2014/34/EU	Equipment and protective systems intended for use in potentially explosive atmospheres	ATEX
2014/34/UE	Appareils et systèmes de protection destinés à être utilisés en atmosphères explosibles	ATEX
2014/34/UE	Apparecchi e sistemi di protezione destinati a essere utilizzati in atmosfera potenzialmente esplosiva	ATEX

durch die Anwendung folgender harmonisierter Normen entspricht  
by applying the harmonised standards  
par l'application des normes  
applicando le norme armonizzate

**RoHS / RoHS / RoHS / RoHS  
ATEX / ATEX / ATEX / ATEX**

**EN 50581:2012  
EN 60079-0:2012 + A11:2013  
EN 60079-1:2014  
EN 60079-11:2012  
EN 60079-31:2014**

Das Produkt ist bestimmt als Elektro- und Elektronikgerät der RoHS-  
The product is determined as electrical and electronic equipment of RoHS  
Le produit est déterminé comme des équipements électriques et électroniques de RoHS  
Il prodotto è determinato come apparecchiatura elettrica ed elettronica di RoHS

**Kategorie / Category / Catégorie / Categoria**

**Überwachungs- und Kontrollinstrumenten in der Industrie /  
Industrial Monitoring and Control Instruments /  
Instruments de contrôle et de surveillance industriels /  
Strumenti di monitoraggio e controllo industriali**

Die notifizierte Stelle TÜV NORD CERT GmbH, 0044 hat eine EU-Baumusterprüfung durchgeführt und folgende Bescheinigung ausgestellt  
The notified body TÜV NORD CERT GmbH, 0044 performed a EU-type examination and issued the certificate  
L'organisme notifié TÜV NORD CERT GmbH, 0044 a effectué examen UE de type et a établi l'attestation  
L'organismo notificato TÜV NORD CERT GmbH, 0044 ha effettuato esame UE del tipo e rilasciato il certificato

**SB ...**

**TÜV 10 ATEX 381296 X**

Hamburg, 28.08.2019

Ort, Datum / Place, Date / Lieu, Date / Luogo, data

Geschäftsführer / Managing Director / Gérant / Direttore Generale: René Albrecht

Translation

(1) **EU-Type Examination Certificate**

(2) Equipment and protective systems intended for use in potentially explosive atmospheres, **Directive 2014/34/EU**



(3) **Certificate Number** TÜV 10 ATEX 381296 X **issue:** 00

(4) for the product: Safety Barrier type SB ...

(5) of the manufacturer: **FAFNIR GmbH**

(6) Address: Schnackenburgallee 149 c, 22525 Hamburg, Germany

Order number: 8003002010

Date of issue: 2019-05-23

(7) The design of this product and any acceptable variation thereto are specified in the schedule to this EU-Type Examination Certificate and the documents therein referred to.

(8) The TÜV NORD CERT GmbH, Notified Body No. 0044, in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and the Council of 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential ATEX Assessment Report No. 19 203 237353.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

**EN 60079-0:2012 + A11:2013 EN 60079-1:2014 EN 60079-11:2012 EN 60079-31:2014**

except in respect of those requirements listed at item 18 of the schedule.

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions for Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design, and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the product shall include the following:

 **See item 15 of the schedule**

TÜV NORD CERT GmbH, Langemarckstraße 20, 45141 Essen, notified by the central office of the countries for safety engineering (ZLS), Ident. Nr. 0044, legal successor of the TÜV NORD CERT GmbH & Co. KG Ident. Nr. 0032

The head of the notified body

  
Roder

Hanover office, Am TÜV 1, 30519 Hannover, Tel. +49 511 998-61455, Fax +49 511 998-61590

This certificate may only be reproduced without any change, schedule included.  
Excerpts or changes shall be allowed by the TÜV NORD CERT GmbH



(13) **SCHEDULE**

(14) **EU-Type Examination Certificate No. TÜV 10 ATEX 381296 X issue 00**

(15) Description of product

The safety barrier type SB 1 is preferably used in conjunction with a certified flameproof enclosure, e. g. HPH Ex d ..., for connecting intrinsically safe sensors (two-wire) to non-intrinsically safe circuits. The safety barrier type SB 3 is used to connect intrinsically safe sensors (four-wire) to non-intrinsically safe circuits.


In the future, the safety barriers may also be manufactured in accordance with the test documents listed in the ATEX test report. The changes affect the addition of a new type and the dust explosion protection. Furthermore, the equipment was assessed according to the latest standards.

The marking is as follows:

Type SB 1

 II 2(1) G Ex db [ia Ga] IIC T6... T4 Gb resp.  
 II 1(1) D Ex ta [ia Da] IIIC T115 °C Da

Type SB 3

 II (1) G [Ex ia Ga] IIC resp.  
 II (1) D [Ex ia Da] IIIC

Type designation:

SB 1 Single-channel safety barrier potted in a bushing  
 SB 3 Three-channel safety barrier in the wall housing

Technical data:

Type SB 1

Supply circuit  $U = 24 V_{DC}$   
 $U_m = 253 V$

Output circuit in type of protection "Intrinsic Safety" Ex ia IIC/IIB/IIIC  
 Maximum values:  $U_o = 28.4 V$   
 $I_o = 100 mA$   
 $P_i = 705 mW$

Characteristic line: linear

Maximum permissible outer capacitance and inductance:

	Ex ia IIC		Ex ia IIB/IIIC	
$L_o$	500 $\mu H$	560 $\mu H$	5 mH	2 mH
$C_o$	71 nF	68 nF	330 nF	400 nF

**Schedule to EU-Type Examination Certificate No. TÜV 10 ATEX 381296 X issue 00**

Type SB 3

Supply circuit

U = 24 V<sub>DC</sub> for channel 1  
 U = 5 V<sub>DC</sub> for channel 2 and 3  
 U<sub>m</sub> = 253 V

Output circuit

in type of protection "Intrinsic Safety" Ex ia IIC/IIB/IIIC

Maximum values: U<sub>o</sub> = 28.4 V  
 I<sub>o</sub> = 95 mA  
 P<sub>i</sub> = 507 mW

Characteristic line: linear

Maximum permissible outer capacitance and inductance:

	Ex ia IIC		Ex ia IIB/IIIC	
L <sub>o</sub>	500 μH	200 μH	5 mH	2 mH
C <sub>o</sub>	72 nF	79 nF	340 nF	410 nF

Permissible ambient temperature range:

The ambient temperature range for SB 3 is -40 °C to +70 °C.

The ambient temperature range for SB 1 is

**Used as Category 2G equipment**

Temperature class	Ambient temperature
T6	-40 °C to +40 °C
T5	-40 °C to +55 °C
T4	-40 °C to +85 °C
T3	-40 °C to +85 °C
T2	-40 °C to +85 °C
T1	-40 °C to +85 °C

**Used as Category 1D equipment**

Maximum surface temperature		Ambient temperature
dust layer ≤ 5 mm	Immersed in dust	
+115 °C	+115 °C	-40 °C to +85 °C

All further data are valid unchanged.

(16) Drawings and documents are listed in the ATEX Assessment Report No. 19 203 237353



**Schedule to EU-Type Examination Certificate No. TÜV 10 ATEX 381296 X issue 00**

**(17) Specific Conditions for Use**

1. The side of the safety barrier SB 1, where the encapsulation can be seen, must be operated protected against UV light.
2. The safety barrier SB 1 has no terminal compartment. It must be installed in an enclosure that corresponds to a suitable type of protection. In addition, it can only be installed in zone 1 in conjunction with a flameproof enclosure (such as HPH Ex d ...).
3. Repair of flameproof joints of SB 1 is not planned.
4. The equipotential bonding connection must be connected to the equipotential bonding of the potentially explosive area (an equipotential bonding must exist for the entire intrinsically safe area). Therefore, the safety barriers do not meet the dielectric strength requirements. When carrying out an insulation test on the intrinsically safe circuit, the device must therefore be disconnected from equipotential bonding.
5. The maximum permissible pressure of SB 1 is 30 bar.

**(18) Essential Health and Safety Requirements**

no additional ones

- End of Certificate -



## Instructions in accordance with directive 2014/34/EU

TÜV 10 ATEX 381296 X

### Safety Barrier type SB ...

Edition: 05.2019

#### I Range of application

The safety barrier type SB 1 is preferably used in conjunction with a certified flameproof enclosure, e.g. HPH Ex d ..., for the connection of intrinsically safe sensors (two-wire) to non-intrinsically safe circuits.

The safety barrier type SB 3 is used to connect intrinsically safe sensors (four-wire) to non-intrinsically safe circuits.

#### II Standards

The safety barriers are designed according to the following European standards

EN 60079-0:2012 + A11:2013	Equipment – General requirements
EN 60079-1:2014	Equipment protection by flameproof enclosures "d"
EN 60079-11:2012	Equipment protection by intrinsic safety "i"
EN 60079-31:2014	Equipment dust ignition protection by enclosure "t"

#### III Instructions for safe ...

##### III.a ... use

The safety barrier type SB 1 serves as flameproof encapsulated intrinsically safe equipment and is suitable for use in hazardous areas. The safety barrier type SB 3 serves as associated equipment and is not suitable for use in hazardous areas. The intrinsically safe sensor circuits may be routed into Zone 0 or Zone 20 and can be used for all gas groups or dust groups.

The approval applies to the following device versions

SB 1	Single channel safety barrier potted in a bushing
SB 3	Three-channel safety barrier in a wall enclosure

##### III.b ... assembling and dismantling

The assembly or disassembly may only be carried out without voltage!

Only the dismantling of the wall enclosure is intended so that the safety barrier type SB 3 can be installed. After installation, the enclosure must be closed again.

##### III.c ... installation

The wiring may only be done de-energized. Special regulations e.g. EN 60079-14 or the local installation regulations must be observed.

When wiring from intrinsically safe equipment to a safety barrier (preferably blue cable), the inductance and capacitance permitted under point V must not be exceeded.

##### SB 1

The external thread M24 × 1.5 on the input side is preferably intended for screwing into an approved flameproof enclosure. The connection of an intrinsically safe sensor (output) takes place via an external thread M28 × 1.5. The safety barrier can be installed in approved flameproof enclosures. When installing in an enclosure, make sure that there is a clearance and creepage distance of > 50 mm between the input and output terminals.

Three individual cables are provided for the connection of the non-intrinsically safe auxiliary energy. The green-yellow cable must be securely connected to the equipotential bonding (PA). The supply voltage is connected to the blue (-) and red (+) cable.

The intrinsically safe output has two cables (blue and red) to which an intrinsically safe sensor is connected.



The enclosure of the safety barrier is not connected to the circuit. It must therefore be installed in a metallic enclosure which is integrated in the equipotential bonding system.

The side of the safety barrier SB 1 on which the potting can be seen must be operated protected from light (e.g. daylight, artificial lighting).

#### SB 3

The safety barrier is suitable for wall mounting and must be installed outside the hazardous area.

The safety barrier is provided with connection terminals at the input and output. The non-intrinsically safe input side is provided with a non-blue cable gland and the intrinsically safe output side with a light blue cable gland. The safety barrier must be integrated into the equipotential bonding system. A connection terminal is provided on the outside of the enclosure for this purpose.

### III.d ... adjustment

No Ex-relevant adjustments are required to operate the safety barriers.

### III.e ... putting into service

Before putting into service, all devices must be checked for correct connection and installation. The electrical supply, including the connected devices, must be checked.

### III.f ... maintenance (servicing and emergency repair)

The apparatus is generally maintenance-free. In the case of a defect, this must be returned to the manufacturer or one of its representatives.

There is non-compliance with the dielectric strength requirements according to EN 60079-11, Clause 6.3.13 of the safety barriers.

#### SB 1

The repair of the flameproof joints (M24 external thread) is not intended.

#### SB 3

If a fuse is defective, it may be replaced. It must be ensured that the following fuse values are adhered to (values are also on the type plate):

Nominal current	$I_n \leq 32 \text{ mA}$
Breaking Capacity	$I_{BC} \geq 35 \text{ A}$
Melting Integral	$I^2t \leq 0,004 \text{ A}^2\text{s}$

## IV Equipment marking

1	Manufacturer:	FAFNIR GmbH, 22525 Hamburg						
2	Type designation:	SB ...						
3	Certificate number:	TÜV 10 ATEX 381296 X						
4	Ex marking:	<table><tr><td>SB 1</td><td></td><td>II 2(1) G Ex db [ia Ga] IIC T6...T4 Gb II 1(1) D Ex ta [ia Da] IIIC T115 °C Da</td></tr><tr><td>SB 3</td><td></td><td>II (1) G [Ex ia Ga] IIC II (1) D [Ex ia Da] IIIC</td></tr></table>	SB 1		II 2(1) G Ex db [ia Ga] IIC T6...T4 Gb II 1(1) D Ex ta [ia Da] IIIC T115 °C Da	SB 3		II (1) G [Ex ia Ga] IIC II (1) D [Ex ia Da] IIIC
SB 1		II 2(1) G Ex db [ia Ga] IIC T6...T4 Gb II 1(1) D Ex ta [ia Da] IIIC T115 °C Da						
SB 3		II (1) G [Ex ia Ga] IIC II (1) D [Ex ia Da] IIIC						
5	CE marking:	0044						
6	Technical data:	See instructions for technical data						
7	Thread size and type (only SB 1):	M24						



## V Technical data

The nominal voltage for SB 1 and SB 3, channel 1 is:

$$U = 24 V_{DC}$$

The nominal voltage for SB 3, channel 2 (A) and channel 3 (B) is:

$$U = 5 V_{DC}$$

The maximum safety voltage is:

$$U_m = 253 V$$

The sensor circuits are designed in the ignition protection type "intrinsic safety" (ia) with a linear output characteristic. The output values per circuit are as follows

		<b>SB 1</b>	<b>SB 3</b>
Output voltage	$U_o \leq$		28.4 V
Output current	$I_o \leq$	99.5 mA	95.5 mA
Output power	$P_o \leq$	705 mW	507 mW
Inner inductance	$L_i$		negligible small
Inner capacitance	$C_i$		negligible small

The permissible external inductance and capacitance are as follows:

	<b>IIC</b>	<b>SB 1</b>	<b>SB 3</b>	
$L_o \leq$	500 $\mu$ H	560 $\mu$ H	500 $\mu$ H	200 $\mu$ H
$C_o \leq$	71 nF	68 nF	72 nF	79 nF
	<b>IIB/IIIC</b>			
$L_o \leq$	5 mH	2 mH	5 mH	2 mH
$C_o \leq$	330 nF	400 nF	340 nF	410 nF

The maximum values of the value pairs may be used simultaneously as concentrated capacitance and concentrated inductance.

The data of the Ex d connection thread of the SB 1 on the input side are as follows:

Thread size:	M24
Thread pitch:	1,5
Tolerance:	6g
Turns:	8
Screw-in depth:	16 mm

The maximum permissible explosion pressure which may act on the SB 1 safety barrier is as follows:

$$p_{max}(SB 1) = 30 \text{ bar}$$





The safety barriers may be used in the following ambient temperature range:

**Type SB 1**

Temperature Class	Ambient Temperature T <sub>a</sub>
<b>Category 2G resp. Equipment Protection Level Gb</b>	
T6	-40 °C ... +40 °C
T5	-40 °C ... +55 °C
T4, T3, T2, T1	-40 °C ... +85 °C

Table 1: Service temperatures for potential explosive gas atmospheres

Maximum Surface Temperature		Ambient Temperature T <sub>a</sub>
dust layer ≤ 5 mm	immersed in dust	
<b>Category 1D resp. Equipment Protection Level Da</b>		
+115 °C	+115 °C	-40 °C ... +85 °C

Table 2: Service temperatures for potential explosive dust atmospheres

**Type SB 3**

T<sub>a</sub>(SB 3) = -40 °C ... +70 °C

The safety barriers achieve a degree of protection of the housing of:

- SB 1: IP68
- SB 3: IP67

**VI Special conditions of use**

1. The side of the safety barrier SB 1, where the encapsulation can be seen, must be operated protected against UV light.
2. The safety barrier SB 1 has no terminal compartment. It must be installed in an enclosure that corresponds to a suitable type of protection. In addition, it can only be installed in zone 1 in conjunction with a flameproof enclosure (such as HPH Ex d ...).
3. Repair of flameproof joints of SB 1 is not planned.
4. The equipotential bonding connection must be connected to the equipotential bonding of the potentially explosive area (an equipotential bonding must exist for the entire intrinsically safe area). Therefore, the safety barriers do not meet the dielectric strength requirements. When carrying out an insulation test on the intrinsically safe circuit, the device must therefore be disconnected from equipotential bonding.
5. The maximum permissible pressure of SB 1 is 30 bar.

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