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Technical Documentation



VPS

Pressure Sensor



Art. No.	Version	Edition
350204	6	2023-04

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1 Overview

The pressure sensor VPS-L with connection to the VISY-Command... measurement evaluation system is used for continuous and high-resolution monitoring of gas pressures in LPG tanks.

In combination with the **VISY-Stick LPG sensor** and the **VISY-Density module**, the VPS-L pressure sensor is used to determine the product mass in LPG tanks.

In the following sections you will be guided by means through the installation and commissioning of the VPS-L pressure sensor.

2 Safety Instructions

The VPS-L pressure sensor is used to for measure and monitor the gas pressures in storage tanks. The measuring sensor sensor must be used exclusively for this purpose. The manufacturer accepts no liability for any damage from improper use.

The pressure sensor VPS-L has been developed, manufactured and tested in accordance with the latest good engineering practices and generally accepted safety standards. Nevertheless, hazards may arise from their use. For this reason, the following safety instructions must be observed:

- Opening or removing the pressure sensor cover may expose you to the risk of electric shock.
- Do not change or modify the system or add any equipment without the prior consent of the manufacturer.
- Only use original spare parts. These comply with the technical requirements specified by the manufacturer.
- The installation, operation and maintenance of the level sensor may only be carried out by expert 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 manual.
- The Pressure sensor must be supplied only with the permitted power.

The safety instructions in this guide are marked as follows:



If you do not observe these safety instructions, there is a risk of accident or the system can be damaged.



Useful information in this guide you should observe, appear in italics and are identified by this symbol.

3 VPS-L Pressure Sensor

3.1 Design and Function

The pressure sensor VPS-L is a capacitive-ceramic sensor that measures the absolute pressure.

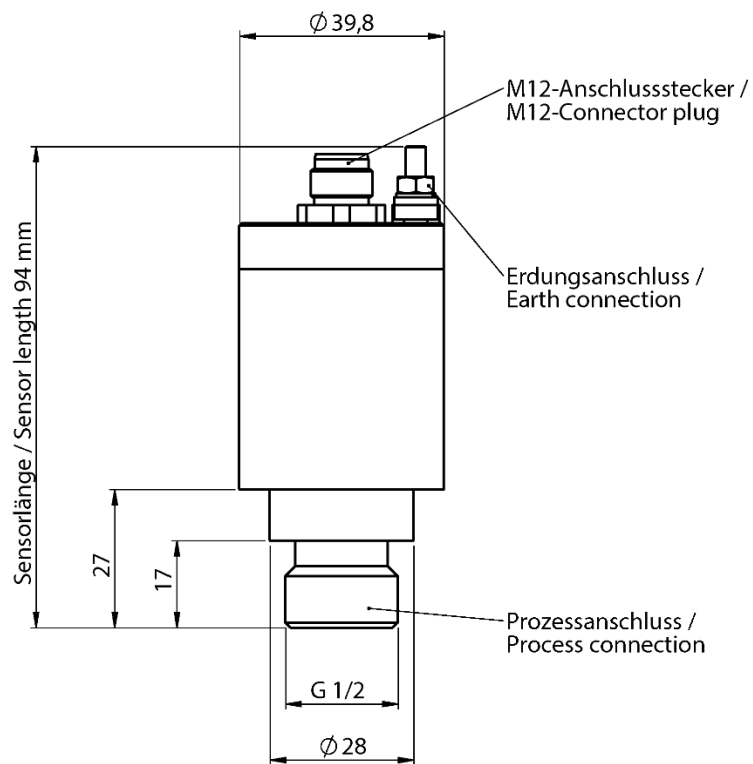


Figure 1: Dimensions of VPS-L pressure sensor

3.2 Description

The VPS-L pressure sensor measures the vapour pressure in LPG tanks, which only depends on the temperature and gas composition.

In combination with the level sensor VISY-Stick LPG and the VISY-Density module, the level and the product density of the liquid phase are determined.

From this, the product mass (mass of the liquid phase plus the mass of the vapour phase) and the volume of the liquid phase are determined.

The product mass of the vapour phase is determined from the volume of gas (total volume minus liquid volume) and the vapour pressure.

The VPS-L pressure sensor is connected directly to the VISY-Command evaluation unit.

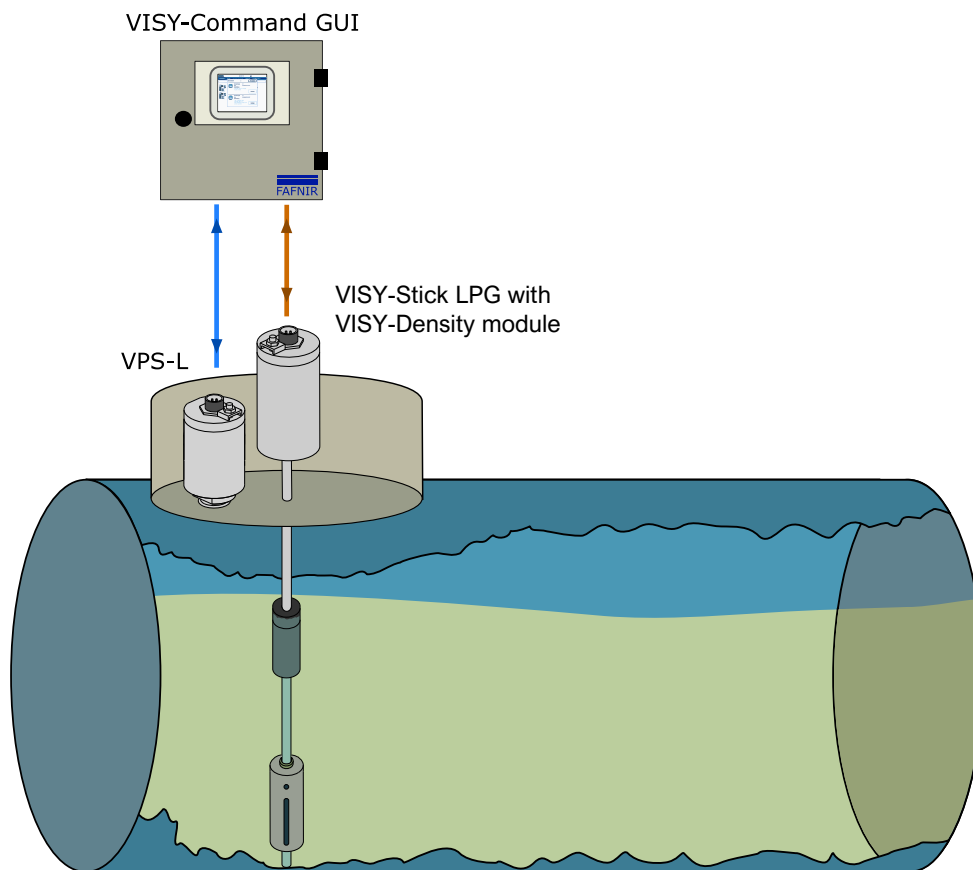


Figure 2: VPS-L pressure sensor for monitoring the vapour pressure in LPG tanks

4 Installation



For installation and maintenance of the VPS-L pressure sensor, the requirements of Explosion Protection Regulations, of Industrial Health and Safety Regulations and Equipment Safety Regulations as well as the generally accepted rules of engineering and these instructions must be observed.



This also applies to any local safety and accident prevention regulations which are not stated in this manual.



When working with the VPS-L pressure sensor, the national safety and accident prevention regulations and safety instructions in this manual must be observed.

4.1 Requirements for operation

- Free connection to the gas space of the tanks via G $\frac{1}{2}$ " thread
- Available evaluation unit (VISY-Command...)
- If required, extension cable (specifications see chapter 9.3)
- VISY-Stick LPG with VISY-Density module



The VPS-L pressure sensor must only be connected to measuring transducers that have been certified by a recognized inspection authority.

4.2 Scope of Delivery

- VPS-L Pressure Sensor
- FAFNIR connection cable with M12 coupling plug
- Technical Documentation



A cable connector for extension cable connection can be ordered separately.

4.3 Mounting

A free process connection in the tank lid is suitable as installation point for the gas pressure monitoring. The pressure sensor is screwed in via a G $\frac{1}{2}$ " thread. The connection must be made gas-tight with the use of a sealing ring. Since the housing of VPS-L pressure sensor is designed water-tight, the pressure sensor is not affected by water entering the manhole.

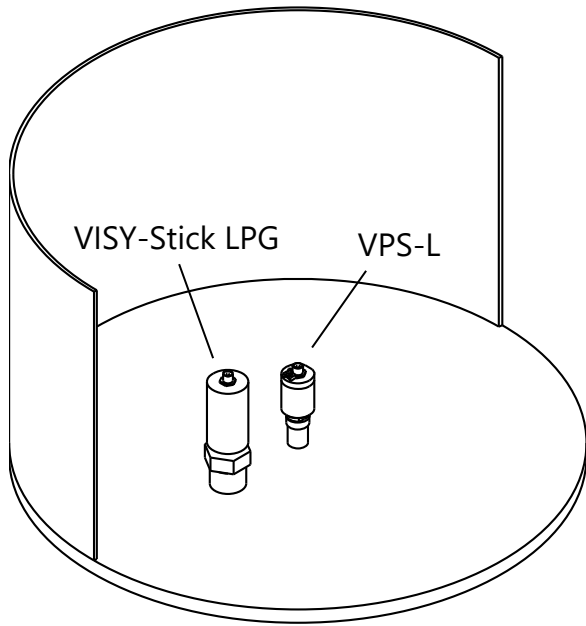


Figure 3: Installation in the tank lid

4.4 Electrical connection

For the wiring of VPS-L pressure sensor, proceed as follows:

- (1) Connect the M12 coupling plug of the FAFNIR connection cable with the pressure sensor. Extending the cable is possible if the specifications of the FAFNIR connection cable listed in chapter "Technical data" are met.
- (2) Open the casing cover of the VISY-Command
- (3) Insert the free wires of FAFNIR connection cable in a free cable gland of the VISY-Command.
- (4) Connect the free wires (brown, white, black, blue) of the FAFNIR connection cable with the screw terminals (+ A B -) of the connection strip of the VP measuring transducer according to the connection diagram (see Figure 4).



The VPS-L pressure sensor must be connected to the same sensor screw terminal as the associated VISY-Stick... level sensor to be able to assign it to the associated level sensor and to be able to calculate the correct mass. VISY-Stick and VPS-L can be connected to one line either in the manhole or in the VISY-Command.



At each single probe terminal, it is possible to connect up to three different types of FAFNIR probes (e. g. one VISY-Stick, one VPS-L, and one VISY-Stick Sump Manhole, see the following figure).

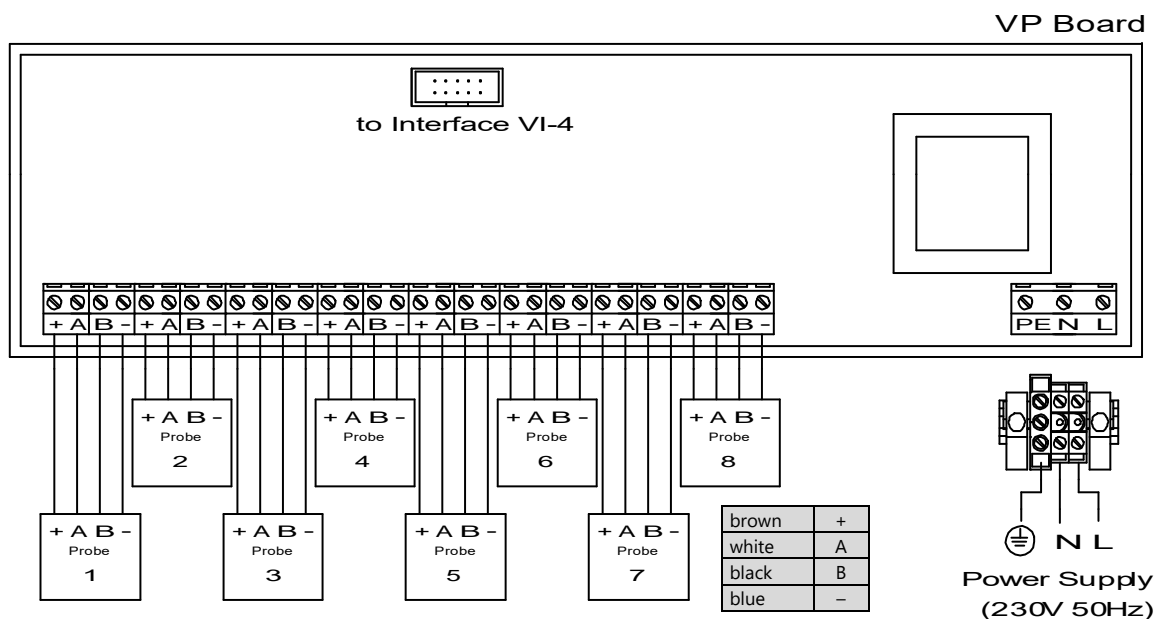


Figure 4: VPS-L pressure sensor connection to the VP board in the VISY-Command

- (5) The equipotential terminal on the pressure sensor is provided for potential equalization. The potential equalization (min. 4 mm² cable) must be carried out by the installer in accordance with the nationally applicable installation regulations.



Please comply with general installation regulations concerning equipotential bonding.

4.5 Configuration



After installation, or replacement of the pressure sensor, a configuration of the evaluation unit VISY-Command... is required.

The configuration of the VISY-Command... is done with a PC/laptop and the software VISY-Setup, see:



Technical documentation VISY-Setup V4, art. - no. 207158

5 Operation



The safety valve of the storage tank opens if the pressure exceeds the maximum of 16 bar.

6 Maintenance

6.1 Servicing

The VPS-L pressure sensor is maintenance-free when operated according to the manufacturer's specifications.

6.2 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 products is only possible after approval by the FAFNIR customer service.

7 Technical Data



Details on the technical data can be found in the approvals and instructions.

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**EU-Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de Conformité**

**FAFNIR GmbH
Bahrenfelder Straße 19
22765 Hamburg / Germany**

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

**Drucksensor
Pressure Sensor
Capteur de pression
VPS-...**

den Vorschriften der europäischen Richtlinien
complies with the regulations of the European directives
est conforme aux réglementations des directives européennes suivantes

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
2014/30/EU	Elektromagnetische Verträglichkeit	EMV
2014/30/EU	Electromagnetic compatibility	EMC
2014/30/UE	Compatibilité électromagnétique	CEM
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

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

**RoHS / RoHS / RoHS
EMV / EMC / CEM
ATEX / ATEX / ATEX**

**EN 50581:2012
EN 61326-1:2013
EN 60079-0:2009
EN 60079-11:2012
EN 60079-26:2007**

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

Kategorie / Category / Catégorie

**Überwachungs- und Kontrollinstrumenten in der Industrie /
Industrial Monitoring and Control Instruments /
Instruments de contrôle et de surveillance industriels**

Das Produkt entspricht den EMV-Anforderungen
The product complies with the EMC requirements
Le produit est conforme aux exigences CEM

**Störaussendung / Emission / Émission
Störfestigkeit / Immunity / D'immunité**

**Klasse B / Class B / Classe B
Industrielle elektromagnetische Umgebung /
Industrial electromagnetic environment /
Environnement électromagnétique industriel**

Die notifizierte Stelle TÜV NORD CERT GmbH, 0044 hat eine EG-Baumusterprüfung durchgeführt und folgende Bescheinigung ausgestellt
The notified body TÜV NORD CERT GmbH, 0044 performed a EC-type examination and issued the certificate
L'organisme notifié TÜV NORD CERT GmbH, 0044 a effectué examen CE de type et a établi l'attestation

VPS-...

TÜV 12 ATEX 111601

Hamburg, 20.04.2016

Ort, Datum / Place, Date / Lieu, Date

Geschäftsführer / Managing Director / Gérant: René Albrecht

Translation

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

- (2) Equipment and protective systems intended for use in potentially explosive atmospheres, **Directive 94/9/EC**

(3) **Certificate Number** TÜV 12 ATEX 111601

(4) for the equipment: Pressure Sensor VPS-...

(5) of the manufacturer: FAFNIR GmbH

(6) Address: Bahrenfelder Straße 19
22765 Hamburg
Germany

Order number: 8000414822

Date of issue: 2013-02-05

- (7) This equipment or protective system and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.
- (8) The TÜV NORD CERT GmbH, notified body No. 0044 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive. The examination and test results are recorded in the confidential report No. 12 203 111601.
- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2009

EN 60079-11:2012

EN 60079-26:2007

- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. 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 equipment or protective system must include the following:

Ex II 1 G Ex ia IIC T6 Ga resp. II 1/2 G Ex ia IIC T6 Ga/Gb resp. II 2 G Ex ia IIC T6 Gb

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



Schwedt

Hanover office, Am TÜV 1, 30519 Hannover, Fon +49 (0)511 986 1455, Fax +49 (0)511 986 1590

(13) **SCHEDULE**

(14) **EC-Type Examination Certificate No. TÜV 12 ATEX 111601**

(15) Description of equipment

The Pressure Sensor VPS-... is used for the detection of inner tank pressures in explosive hazardous areas.

The permissible ambient temperature ranges as well as the medium temperature ranges in dependence of the temperature class have to be taken from the following tables:

Use as Category 1 (EPL Ga) and Category 1/2 (EPL Ga/Gb) apparatus

Temperature class	Ambient and medium temperature range
T6	-20 °C to +45 °C
T1 to T5	-20 °C to +60 °C

The process pressure of the media has to be from 0.8 bar to 1.1 bar when potentially explosive mist air mixtures exist. If no potential explosive mixtures exist, the device may also be operated outside of this stated range according to the specification of the manufacturer.

Use as Category 2 (EPL Gb) apparatus

Temperature class	Ambient and medium temperature range
T6	-20 °C to +45 °C
T5	-20 °C to +60 °C
T1 to T4	-20 °C to +70 °C

Electrical data

Signal- and power circuit
(terminals +, -, A, B)

in type of protection "Intrinsic Safety" Ex ia IIC

only for the connection to a certified intrinsically safe circuit

Maximum values: $U_i = 15 \text{ V}$
 $I_i = 100 \text{ mA}$
 $P_i = 100 \text{ mW}$
 $L_i = 50 \text{ } \mu\text{H}$
 $C_i = 10 \text{ nF}$

(16) Test documents are listed in the test report No. 12 203 111601.

(17) Special conditions for safe use

none

(18) Essential Health and Safety Requirements

no additional ones

Instructions

Edition: 12.2012

Pressure Sensor VPS-...

TÜV 12 ATEX 111601

I Range of application

The pressure sensor VPS- ... is used to measure tank internal pressures, absolute or differential pressure.

II Standards

The intrinsically safe apparatus is designed in accordance with the following European standards

EN 60079-0:2009	Equipment - General requirements
EN 60079-11:2012	Equipment protection by intrinsic safety "i"
EN 60079-26:2007	Equipment with equipment protection level (EPL) Ga

III Instructions for safe ...

III.a ... use

The pressure sensor is designed as intrinsically safe apparatus and is approved for use in potentially explosive areas. The pressure sensor may be used for all gas groups (IIA, IIB and IIC).

The approval applies to the device versions

VPS-L	for absolute pressure measurement (0 bar ... 25 bar)
VPS-V	for differential pressure measurement (± 30 mbar)

III.b ... assembly or disassembly

To operate the pressure sensor disassembly is not provided. Disassembly may damage the pressure sensor and expire its approval.

III.c ... installation

All wiring operations must solely be carried out with the power disconnected. Special rules and regulations, including EN 60079-14 respectively local installation regulations, must be observed.

The pressure sensor can be screwed directly into the tank. The sensor is supplied with a G 1/2 inch thread.

General information (see also EN 60079-26, clause 4.6):

Attention must be paid, if the sensor is built into the boundary wall between Zone 0 and Zone 1, that a protection class of at least IP67 is achieved after installation.

When wiring the sensor to the evaluation unit (preferably blue coloured cable), the approved inductance and capacitance of the associated equipment must not be exceeded.

The electrical connection is made using the M12 plug. The cable coding is:

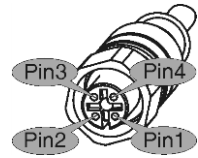
Pin		VPS-L	VPS-V	
1	+	brown		
2	A	white		
4	B	black		
3	-	blue		

Table 1: Pin assignment of the pressure sensor

For integration of the pressure sensor in the potential equalization, a PA terminal at the sensor housing is present.

III.d ... adjustment

To operate the device security settings are not necessary.

III.e ... putting into service

Before putting into service, all equipment must be checked to ensure it is properly connected and installed. The power supply, as well of connected equipment, must be checked.

III.f ... maintenance, overhaul and repair

Generally the device is maintenance-free. In case of a defect it must be send back to FAFNIR or one of his representations.

When performing an isolation test with 500 V under well-controlled conditions, it is not necessary to disconnect the pressure sensor, since there is conformity in accordance with EN 60079-11, clause 6.3.13.

IV Equipment marking

- | | | |
|---|---------------------|--|
| 1 | Manufacturer: | FAFNIR GmbH, Hamburg |
| 2 | Type designation: | VPS-... |
| 3 | Serial number: | Ser. N°: ... |
| 4 | Certificate Number: | TÜV 12 ATEX 111601 |
| 5 | Ex marking: | 
II 1 G Ex ia IIC T6 Ga
II 1/2 G Ex ia IIC T6 Ga/Gb
II 2 G Ex ia IIC T6 Gb |
| 6 | CE marking: |  0044 |
| 7 | Technical data: | See instruction manual for technical data |

V Technical data

The following safety-related values are defined with:

Input voltage:	$U_i \leq 15 \text{ V}$
Input current:	$I_i \leq 100 \text{ mA}$
Input power:	$P_i \leq 100 \text{ mW}$

The externally effective capacitance and inductance are:

Internal capacitance:	$C_i < 10 \text{ nF}$
Internal inductance:	$L_i < 50 \text{ }\mu\text{H}$

When used in potentially explosive atmospheres, the maximum temperatures depending on the temperature classes and categories can be found in the table 2.

Temperature class	Range of ambient and media temperature T_a
Category 1 resp. equipment protection level Ga (pressure sensor completely installed in Zone 0)	
T6	-20 °C ... +45 °C
T5, T4, T3, T2, T1	-20 °C ... +60 °C
Category 1/2 resp. equipment protection level Ga/Gb (pressure sensor installed into the boundary wall)	
T6	-20 °C ... +45 °C
T5, T4, T3, T2, T1	-20 °C ... +60 °C
Category 2 resp. equipment protection level Gb (pressure sensor completely installed in Zone 1)	
T6	-20 °C ... +45 °C
T5	-20 °C ... +60 °C
T4, T3, T2, T1	-20 °C ... +70 °C

Table 2: Service temperatures

For use in Category 1 and Category 1/2 applies:

The process pressure for the media must be between 0.8 bar and 1.1 bar where explosive vapour-air mixtures are present. If no explosive mixtures are present, the equipment may also be operated outside this area according to the manufacturer's specification.

General information (see also EN 60079-0, clause 1):

Zone 0 exists only under atmospheric conditions:

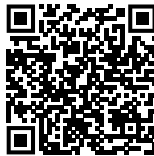
Temperature range:	-20 °C ... +60 °C
Pressure range:	0.8 bar ... 1.1 bar
Oxidants:	Air (oxygen content approx. 21 %)

VI Specific conditions

None.

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