Installation and Operation Instructions

Manufacturer:

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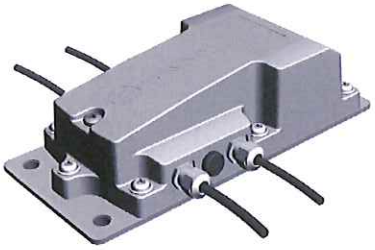
1 Device Overview



The SAVVY SenseGateway-ExR is a sensor gateway which can connect with an Ex pressure sensor and a maximum of three Ex temperature sensors or Ex switches. The gateway communicates wirelessly with the telematics device SAVVY CargoTrac-ExR according to the IEEE802.15.4 standard, which transmits the measurement data to a portal via the Internet.

Integrated into the gateway is a primary battery that ensures an autonomous running time of up to 10 years, depending on the operating profile. Two internal temperature sensors detect the ambient and operating temperature. In addition, a reed switch can detect external changes via a magnet (e.g. opening the door, removing the gateway, triggering, etc.). The SAVVY SenseGateway-ExR impresses with its ultra-low power consumption and meets all current environmental guidelines, today and in the future.

The SAVVY SenseGateway-ExR is fully configurable for any function via the Internet-based software SAVVY Synergy and can therefore exactly replicate all customer and system requirements.

The main areas of use are in rail freight, tank container, and intermodal traffic.

Types of protection:

II 1G Ex ia IIC T4 Ga
II 1D Ex ia IIIC T135°C Da

ATEX Certificate number: KIWA19ATEX0032X

IECEx Certificate number: PTZ17.0003X

Ex ia IIC T4 Ga
Ex ia IIIC T135°C Da

1.1 Optional design for the SenseGateway-ExR-DMS

Instead of a pressure sensor, a passive DMS (strain gauge) SAVVY LoadCell-Ex can be connected to the SenseGateway-ExR DMS. Thus, loading conditions or structural changes can be measured. For this version, it is not possible to connect a pressure sensor.

1.2 Special conditions

1) Extended temperature range -30°C ≤ T_{amb} ≤ +60°C.
2) The housing must not be opened in potentially explosive atmospheres.
3) Integration into the equipotential bonding occurs from the installation.
4) These operating instructions are to be observed.
5) Refer to the operating instructions for electrical and mechanical data.
6) Unused cable glands must be closed by the blind plugs provided by the manufacturer.

2 Internal Functions

2.1 IEEE 802.15.4 radio interface

Feature	
Standard	IEEE 802.15.4
Protocol	SAVVY / TIS ready
Frequency spectrum	2,405 - 2,475 MHz
Transmitted power Tx	Up to 18 dBm
Reception sensitivity Rx	-111 dBm
Network topology	Mesh, star, tree
Number of channels	15
Configuration and FW updates via the air interface	Yes

2.2 Internal temperature sensors

Feature	
Type	PT1000
Class	B (F0.3)
Temperature range	-55°C to 175°C

2.3 Internal reed switch

Feature	
Type	Magnetic reed switch
Operating threshold	15-40AT

2.4 Independent power supply

SenseGateway-ExR has an integrated battery cell, which ensures a long and maintenance-free service life. Data about the battery is shown in Fig 7.1 Internal battery data.

3 External Connections, Explosion-proof Data, and Assembly

As an operator, you are obliged to comply with all legal requirements, test intervals, operating regulations, etc.

The following values are not exceeded by the sum of all external sensors incl. cables:

C_o	≤50 uF
L_o	≤30 uH
U_o	≤3.9 VDC
I_o	≤62.8 mA
P_o	≤245 mW

For application examples and calculations see: 3.5 Circuit diagram of the external sensors.

Note that external sensors may only be used in the intended Ex zones. The SenseGateway-ExR may be used in Zone 0, 1, 2, 20, 21, and 22. The installation does not require any protective barriers because all of the circuits are intrinsically safe.

If external sensors are used that are not approved for Zone 0 or 20, the SenseGateway-ExR may also only be used in the zone where the corresponding sensor has been approved.

Example 1: If a reed switch with protection type II 2GD Ex mb II T6 is connected, the SenseGateway-ExR may be used in zone 1, 2, 21, or 22.

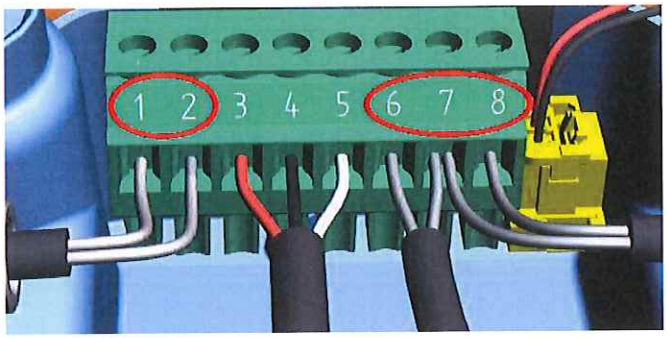
Example 2: If a pressure sensor with protection type II 1G Ex ia IIB T4 Ga is connected, the SenseGateway-ExR may be used in zone 0, 1, or 2.

Example 3: If a temperature sensor with protection type II 1G Ex ia IIC T6 Gb / II 1D Ex ia IIIC T60°C Da is connected, the SenseGateway-ExR may be used in all zones.

3.1 Connection for passive Ex reed switch

E.g. StandexMeder MK08-1A75-500W
Type of protection: II 2GD Ex mb II T6

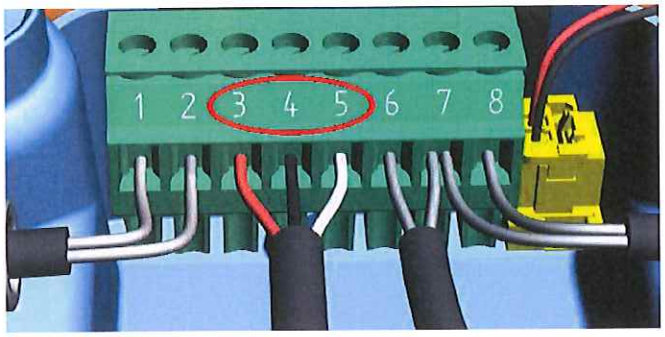
A maximum of three reed switches can be connected. Instead of reed switches, temperature sensors can also be connected; any combination of both types of sensors is also possible.



Feature	
Connection type	Screw terminal PIN1-2 / 6-7 / 7-8
PIN 1,6,8	V+
PIN 2,7	V-
U_o	≤3.9 VDC
P_o	≤15 mW
I_o	≤3.9 mA
R_i	≥1 kΩ
C_o (Sum of all sensors)	≤50 uF
L_o (Sum of all sensors)	≤30 uH
Type	Normal Open
Insulation resistance min. (NO)	3 MΩ
External diameter cable	4.6-5.0 mm

3.2 Connection for Ex pressure sensor

E.g. AST4400
Type of protection: II 1G Ex ia IIB T4 Ga

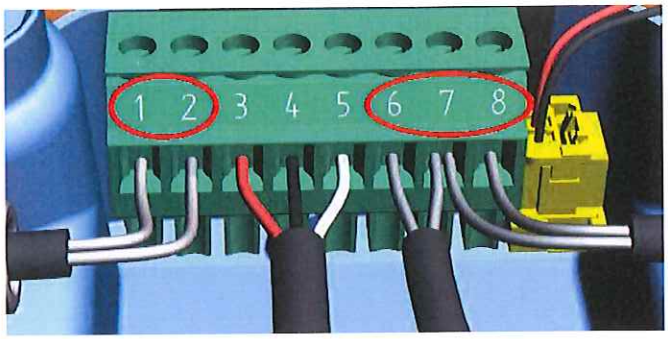


Feature	
Connection type	Screw terminal PIN 3-4-5
PIN 3	V+
PIN 4	V-
Pin 5	Signal
U_o	≤3.9 VDC
P_o	≤154 mW
I_o	≤39.4 mA
C_o (Sum of all sensors)	≤50 uF
L_o (Sum of all sensors)	≤30 uH
R_i (Signal)	≥10 kΩ
R_i(V+)	≥100 Ω
External diameter cable	4.6-5.0 mm

3.3 Connections for Ex temperature sensors

e.g. Jumo 90.2821.8496
Type of protection: II 1G Ex ia IIC T6 Gb / II 1D Ex ia IIIC T60° C Da

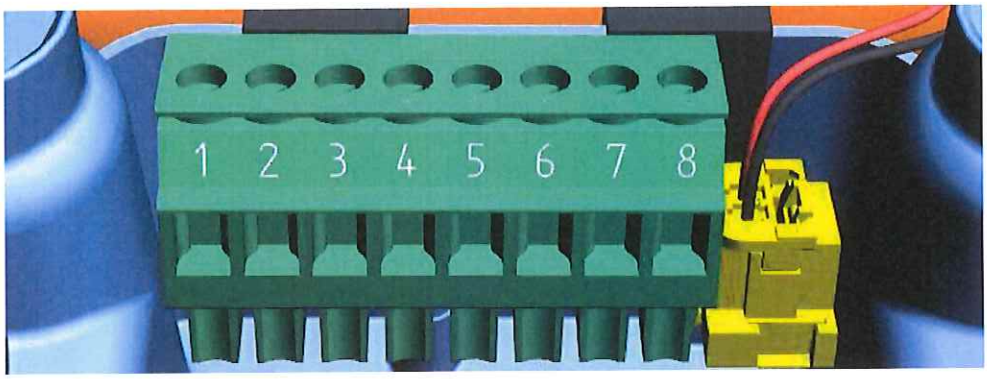
A total of three temperature sensors can be connected. Instead of reed switches, temperature sensors can also be connected. Any combination of both types of sensors is also possible.



Feature	
Connection type	Screw terminal PIN1-2 / 6-7 / 7-8
PIN 1,6,8	V+
PIN 2,7	V-
Type	PT1000
U_o	≤3.9 VDC
P_o	≤15 mW
I_o	≤3.9 mA
R_i	≥1 kΩ
C_o (Sum of all sensors)	≤50 uF
L_o (Sum of all sensors)	≤30 uH
External diameter cable	4.6-5.0 mm

3.4 External connections for optional SenseGateway-ExR-DMS strain gauge SAVVY LoadCell-Ex

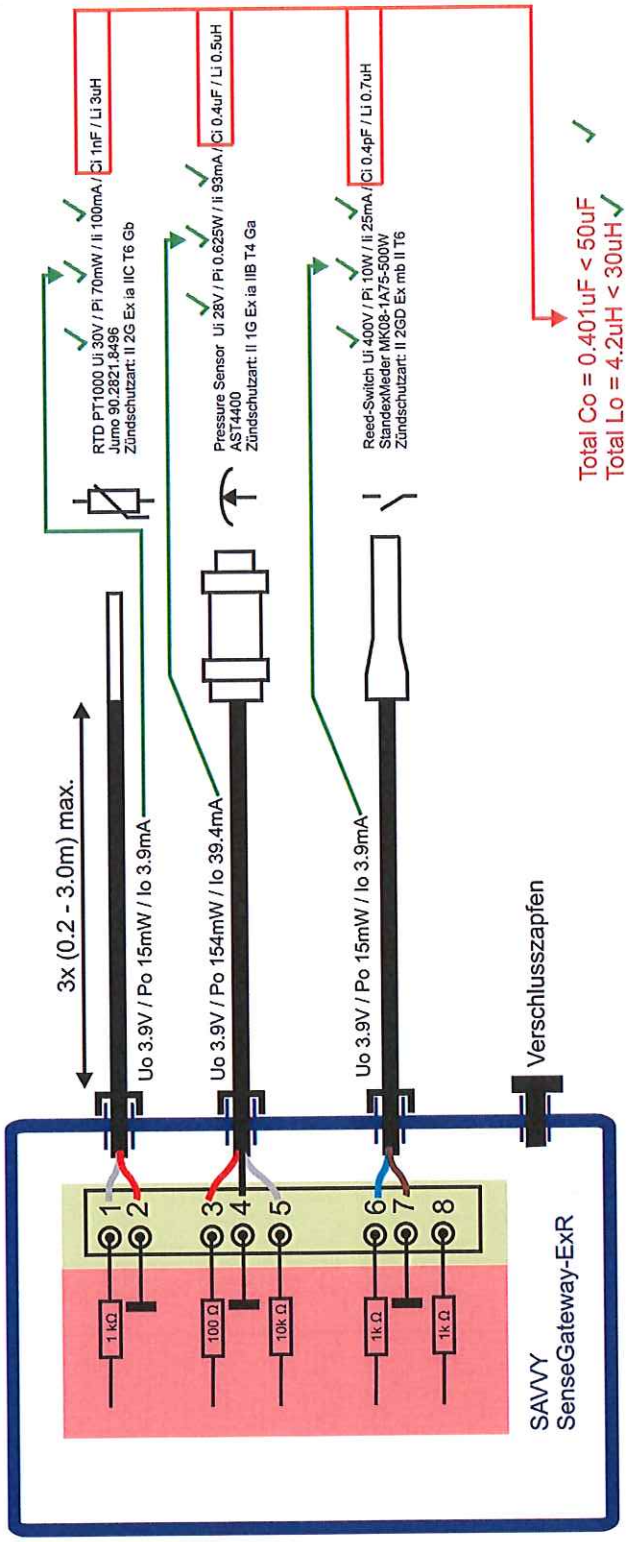
Weighing sensor SAVVY LoadCell-Ex
Type of protection: Ex II 1G ia IIC T6 Ga / Ex II 1D ia IIIC T85°C Da



Terminal	*Color*
PIN 1 (PT1000+)	Green
PIN 2 (V-)	Yellow
PIN 3 (DMS- Signal)	White
PIN 4 (DMS+ Signal)	Grey
PIN 5 (V+)	Brown
PIN 6 (PT1000+)	-
PIN 7 (V-)	-
PIN 8 (PT1000+ / DIN)	-
U_o	≤ 3.9V
P_o	≤ 61mW
I_o	≤ 15.6mA
C_o (Sum of all sensors)	≤ 50uF
L_o (Sum of all sensors)	≤ 30uH
External diameter cable	4.6 – 5.0mm

3.5 System diagram for the external sensors

The system diagram shows, as an example, the connection of a temperature sensor, a reed switch, and a pressure switch, as well as the calculation for compliance with the Ex relevant data:



3.6 Grounding and connection to chassis

The device does not require a fixed connection to the ground. All electrical signals and intrinsic circuits are separated from the ground and insulated. The nature of the housing and the sensor cables ensures that electrostatic charging cannot take place. The bottom plate can be grounded by the construction of the transport container (railway car, intermodal tank, container, etc.) and by the assembly of the device with screwing or welding. Likewise, the metal housing of a sensor can be grounded by its assembly, depending on the construction.

The relevant directives according to 1999/92/EC (ATEX137) and the standard IEC 60079-14 Ed 5.0 (design, selection, and erection of electrical installations) must be observed in all cases.

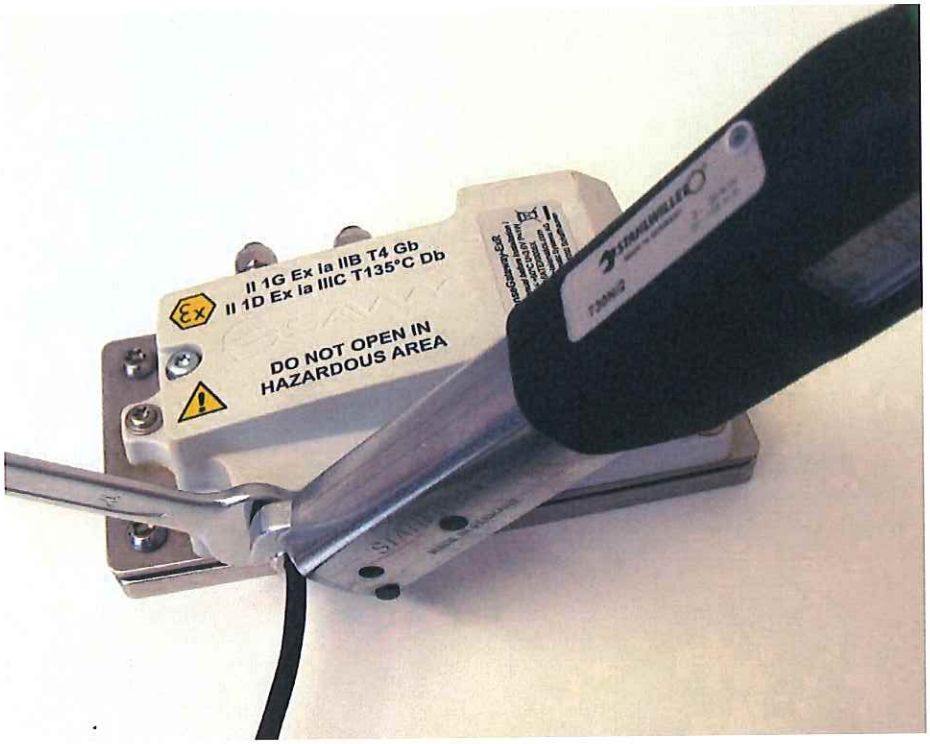
3.7 Assembly and installation

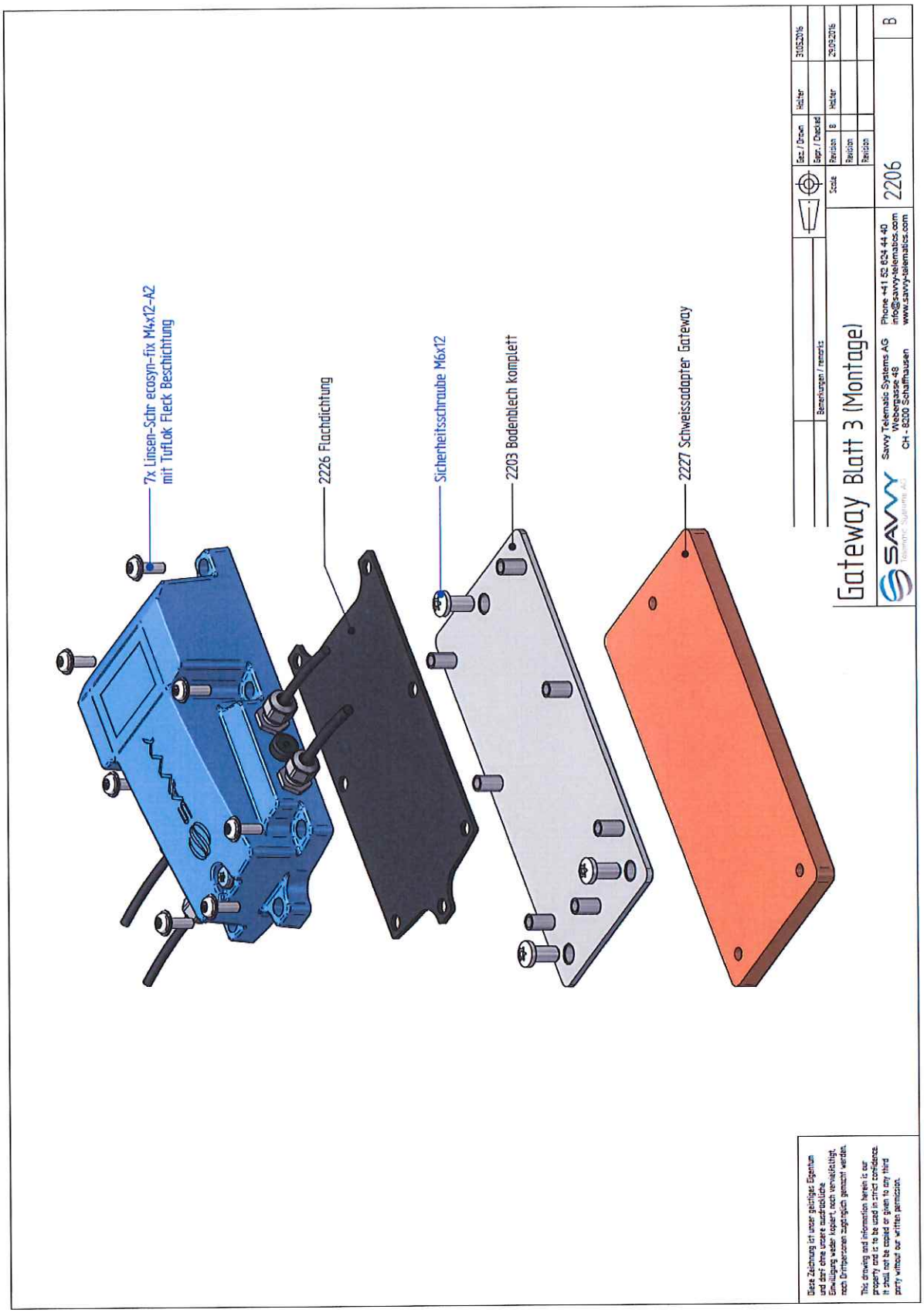
When assembling, ensure that the flat gasket rests completely on the base plate and is aligned by the threaded bolts. In addition, the following shall be ensured:

- The plug with the screw terminals for the external sensors is fully inserted and locked.
- The battery plug is fully inserted and locked.
- Check all cable glands for correct seating and 6Nm tightening torque (see image and description on the next page).
- The outside diameters of the cables may be between 4.6 and 5.0 mm.
- Do not allow single wires to be pinched between the seal and the housing.
- All seven housing screws must be tightened with a torque of 2.5 Nm.
- Unused cable glands must be provided with a plug and sealed (general delivery condition).

In order to achieve a sufficient tightening torque and to prevent the connection cable from being disconnected later, the cable gland is to be attached using a 12 mm wrench, and the screwed connection must be tightened using a torque wrench:

The tightening torque is 6 Nm. You can check this with the help of a suitable torque wrench to be certain:





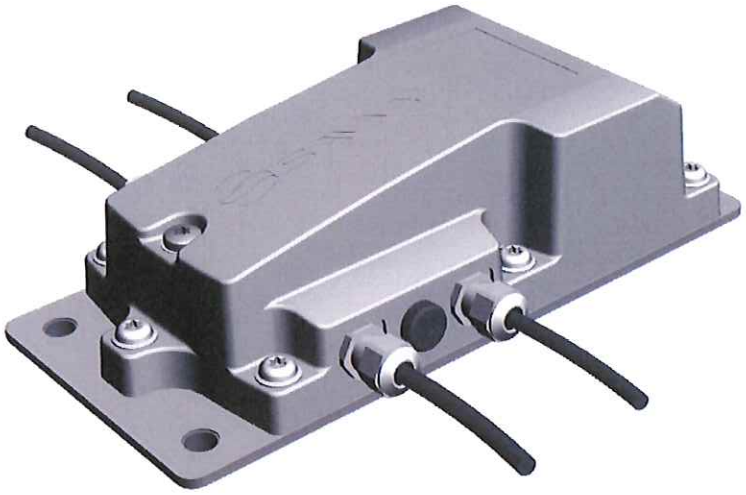
4 Environmental Conditions and Combustibility

Permissible temperature range ATEX / IECEx (without external sensors)	-30°C ≤ T_{amb}≤ +60°C
Range of temperature range for normal operation (without external sensors)	-40°C ≤ T_{amb} ≤ +85°C
Relative humidity operation	95%
IP protection class with pressure equalizing element according to IEC / EN60529	67
Vibration, shock. Service life according to EN60068-2-6 and EN61373	5-200 Hz, 50m/s^2, Cat.1B
Flammability of the housing according to UL94 and IEC/DIN EN 60695-11-10 and -20	UL94 V-0
Flammability of the housing according to EN45545-2	HL1, HL2, HL3 for R22, R23, R24, R26
Salt spray	Min. 96h
Specific surface resistivity	<10^{11} Ω at (30±5)% relative humidity
UV light-fastness for outdoor use	UL746C
Impact strength EN60079-0	≥1 kg from 0.7 m

5 Requirements for Standards

Norm	
IECEx	IEC 60079-0 (Ed.6.0), IEC 60079-11 (Ed.6.0)
ATEX	EN60079-0:2013, EN60079-11:2012
RED (2014/53/EU)	EN 301489-1 V2.1.1:2017-02, EN 301489-17 V3.1.1:2017-02, EN 300328 V2.1.1:2016-11
Protection provided by Enclosure	EN 60529+A1+A2: 2013
Environmental Temperature and Humidity	EN 60068-2-1, EN 60068-2-38, EN 60068-2-2
Sinus, Shock, and Random Vibration Test	EN 61373, EN 60068-2-6
EMC Railway	EN 50155:2007, EN 50121-3-2:2015

6 Mechanical Dimensions



Weight	About 1.2 kg
Dimensions L x W x H	165 x 105 x 46 mm (incl. Cable Glands, excl. Cable)
Housing material per ISO1874	PA 66 + PA6, MFHR, 14-110N, GF 30 FR (40)
Color	RAL7035 light gray
Base plate	Stainless steel 1.4301

6.1 Type label, identification, and warning note

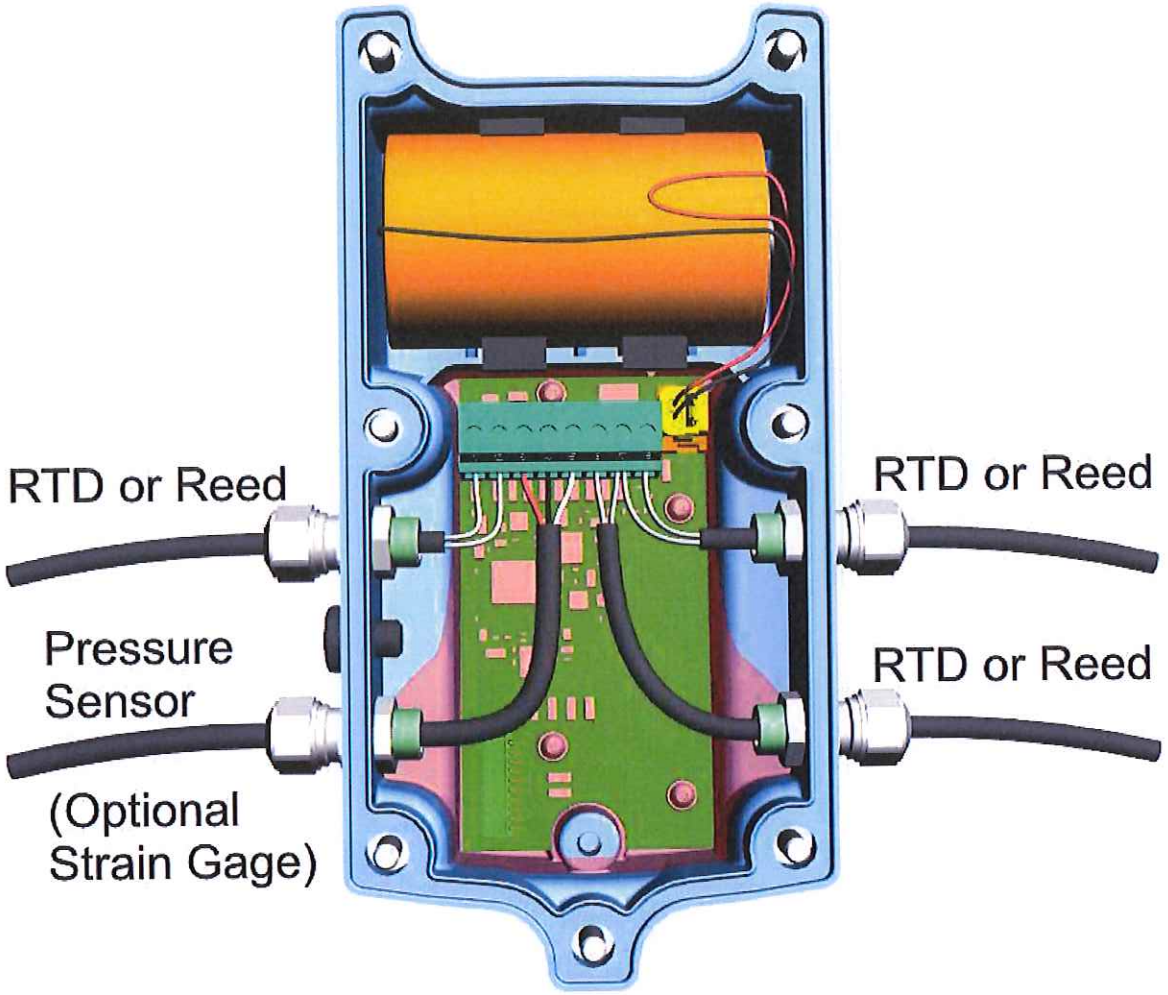
The following important information is provided on the housing:

1) ATEX identification (can deviate from this picture).
2) Serial number and MAC address, readable and as a QR code.

3) The housing must not be opened in potentially explosive atmospheres.
4) Manufacturer's address, temperature range, electrical data, EU type-examination certificate number.

5) IECEx, FCC, ISED Label Location Info

6.2 Construction interior view

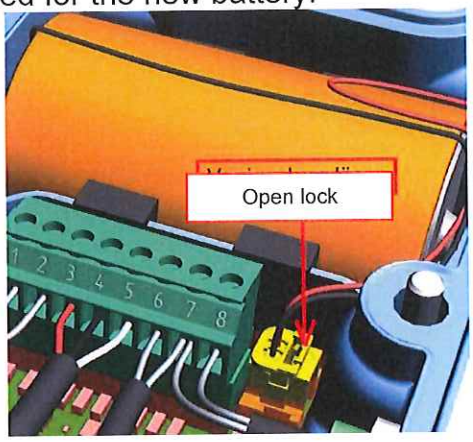


View with removed housing base.

7 Replacing the Battery

The battery may only be replaced by an original battery from the manufacturer. The replacement is never to be carried out in a potentially explosive atmosphere; corresponding warnings can be found on the device and in the operating instructions. The risk of confusion with a third-party battery is excluded since the manufacturer, type, nominal values, and the plug must be clearly identified.

When replacing the battery, note that the switch's lock must be released and re-locked for the new battery:



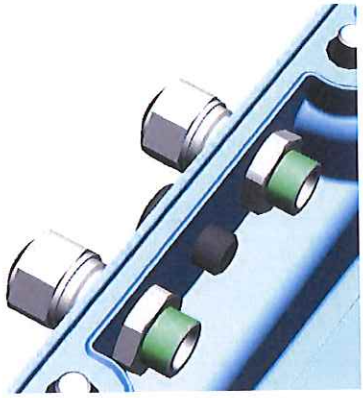
7.1 Internal battery data

Article Number	1060 / 1090
Nominal voltage	3.6 VDC
Maximum open circuit voltage	3.9 VDC
Capacity	19 Ah
Battery housing	D-cell
Diameter max.	33.6 mm
Length max.	60 mm
Weight	97 g
Type	LiSOCl2 (lithium thionyl chloride)
Connector plug	Product-specific

8 Cable Glands and Fasteners

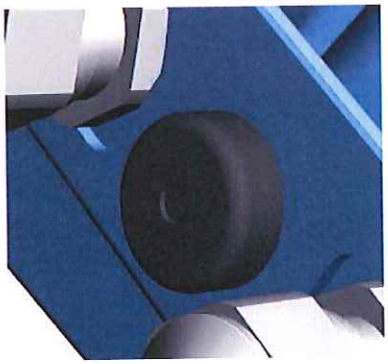
Cable fasteners made of rustproof steel A2 with an IP67 degree of protection and a temperature range of -40°C to +100°C are used for the cable ducts.

Unused ducts are sealed using a plug.



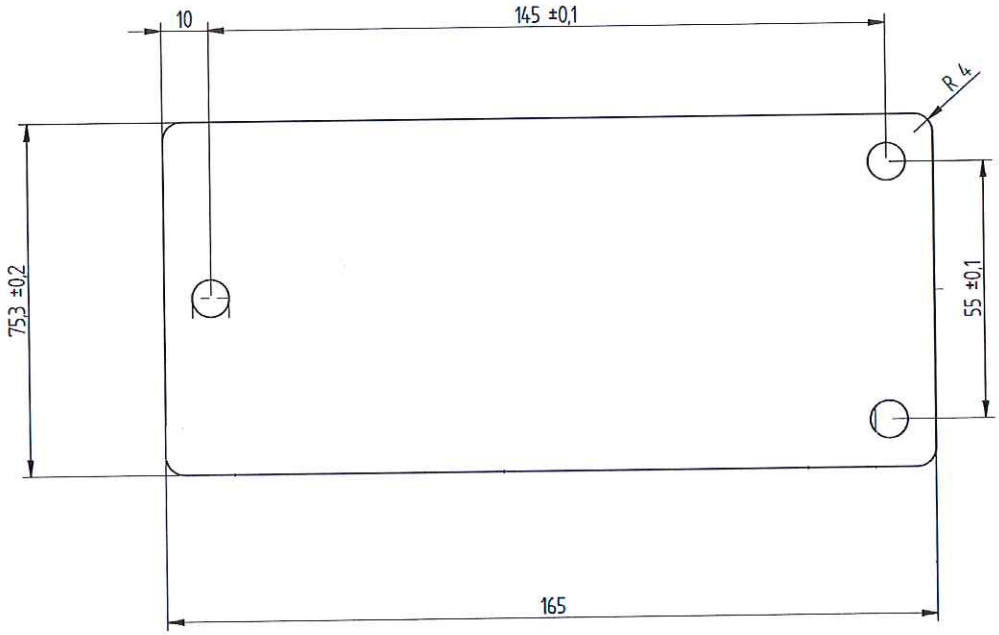
9 Pressure Equalization Membrane

During the device's intended application, large pressure differences can occur due to rapid temperature fluctuations. Therefore, a pressure relief membrane is provided to prevent possible penetration by moisture. In addition, this membrane allows the emission of moisture, which has entered via diffusion, for example. The pressure compensation membrane has an IP68 degree of protection and is designed for a temperature range of -40°C to +150°C.



10 Fastening with Screws

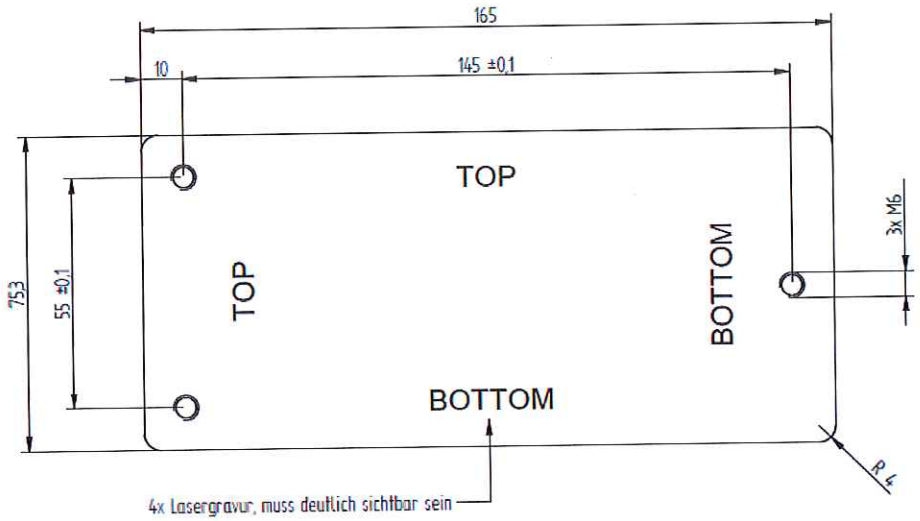
Various types of fastening are available. The bottom plate of the unit can be screwed directly onto a flat surface using three M6 safety screws. Possible small irregularities are compensated for by the spacer bushing in the floor plate. The hole pattern of the SenseGateway-ExR base plate is as follows:

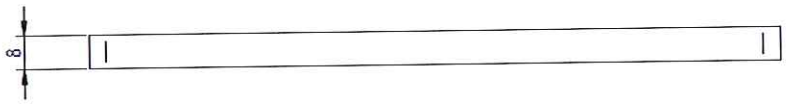


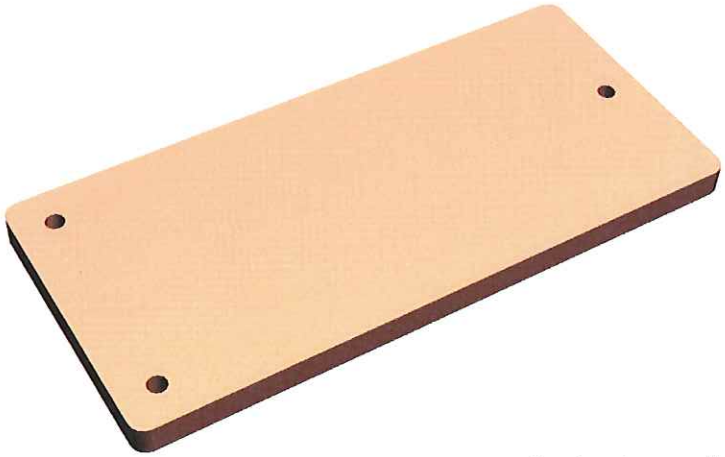
Pay attention to a flat surface and mounting!
Unevenness can have a negative effect on the seal and thus prevent both warranty and use in potentially explosive atmospheres.

10.1 Attachment with a welding adapter

A further possibility is attaching it by means of a welding adapter, which is first welded to the object. Then the device is screwed onto the welding adapter with three M6 safety screws.







Depending on the project requirements, the welding adapter is available in various materials, such as DD11, S235, or 1.4301.

When using the welding adapter, it must be mounted on grounded metal parts.

11 Storage and Decommissioning

11.1 Storage

The SenseGateway-ExR is delivered in such a way that it can be stored easily over a longer period of time. The internal battery consumes very little or no energy during storage. Make sure that storage takes place at an ambient temperature of +10°C to +30°C and that humidity is below 60% rH.

11.2 Decommissioning and disposal

The SenseGateway-ExR may not be dismantled and taken out of operation in potentially explosive atmospheres.

The internal battery must not be removed in potentially explosive atmospheres.

When the unit is taken out of service, the device and the mounting devices can be disposed of separately. The mounting devices are made of steel or stainless steel and can accordingly be recycled as scrap metal.

The whole device can be handed over to an appropriate collection point for electronic waste or returned to the following address:

For Germany/EU:

SAVVY Telematic Systems AG
Goods receiving
c/o LogConnect AG
Zollstrasse 5
DE-78239 Rielasingen

For Switzerland:

SAVVY Telematic Systems AG
Grabenstrasse 9
CH-8200 Schaffhausen

Thank you for ensuring proper disposal.

12 Certificate of Conformity

Contact us or check online at https://www.iecex.com/

13 FCC and ISED related statements

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and any human body.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).
Operation is subject to the following two conditions:
1 . This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and any human body.