Installation and Operation Manual

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1 Devices – an Overview

SAVVY® CargoTrac-ExR-M1 is a latest generation state-of-the-art telematics device. An LTE Cat-M1/NB1 GSM-Cellular Modem is fully integrated, as well as a highest sensitivity GNSS receiver for precision positioning. All antennae are internally included so that no external antenna connections are required.

A primary battery which ensures, depending on freely selectable configuration, an autonomous lifespan of up to 15 years, is also included.

An internal acceleration and compass sensor detects movements, shocks, blows, vibrations and heading.

An internal IEEE802.15.4 radio module enables wireless communication with other devices like SAVVY® SenseGateway-ExR and SenseGateway-ExR-DMS, sensors, remote control and other equipment.

SAVVY® CargoTrac-ExR-M1 has an exceptionally low power usage so it meets both current and possible future environmental regulations.

SAVVY® CargoTrac-ExR-M1 is fully configurable in every function via the Internet software SAVVY® Synergy and can therefore meet all customer and system requirements exactly. All configurations and firmware updates occur wireless.

SAVVY® CargoTrac-ExR-M1 meets the requirements according to IEC60079-0 Ed.7, IEC60079-11 Ed.6, EN60079-0:2012+A11:2013, EN60079-11:2012

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2 Explosion Protection

CargoTrac-ExR-M1 complies with the European Directive 2014/34/EU and the international IECEx requirements. The device may be used in hazardous areas of zones 1 and 2 for gases and in zones 21 and 22 for dust. In zones 1 and 21 there is occasionally the danger of explosive gas and dust mixtures and there is a high requirement for the safety of the device. Typical gases are hydrogen and conductive dusts.

Protection Type and Certification Numbers:

II 2G Ex ib IIC T4 Gb
II 2D Ex ib IIIC T 135°C Db
PTZ 18 ATEX 0033X

Ex ib IIC T4 Gb
Ex ib IIIC T 135°C Db
IECEx PTZ 18.0005X

CargoTrac-ExR-M1 can be operated under the following temperature conditions:

-20°C ≤ t_{amb} ≤ +60°C (inside Ex-Zone)
-40°C ≤ t_{amb} ≤ +85°C (outside Ex-Zone)

Type Label:

The internal battery must not be exchanged in potentially explosive atmospheres!

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3 Functional Overview

3.1 Data Connection

Standard	LTE Cat M1/NB1 Global (3GPP Rel.13)
Fallback	EGPRS
Bands	2,3,4,5,8,12,13,20,28
LTE Tx Power	Class 3 (23dBm)
GSM Tx Power	Class 4 (33dBm)
EGPRS Bands	GSM850,E-GSM900,DCS1800,PCS1900 MHz

3.2 WPAN

Standard	IEEE 802.15.4
Datarate	250kBit/s bis 2Mbit/s
Bandwidth	2415 … 2465 MHz
Link Budget	129dB
Configuration and Firmware-Update	Wireless

3.3 GNSS

Systems	GPS L1C/A, GLONASS L10F, BeiDou B1I, QZSS L1C/A, Galileo E1B/C, SBAS L1 C/A
Sensitivity Tracing and Navigation	-167dBm
Sensitivity Reacquisition	-160dBm
Sensitivity Coldstart	-148dBm
Sensitivity Hotstart	-157dBm
Horizontal Accuracy	2.5m
Horizontal Accuracy SBAS	2.0m
Velocity Accuracy	0.05m/s
Accuracy of the Heading	0.3°
Maximum Altitude Measurement	50‘000m
Maximum Velocity Measurement	500m/s

3.4 Internal Temperature Sensor

Type	Digital
Range	-40°C bis +125°C

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3.5 Internal Reedswitch

Type	Magnetic
Threshold	15-40AT

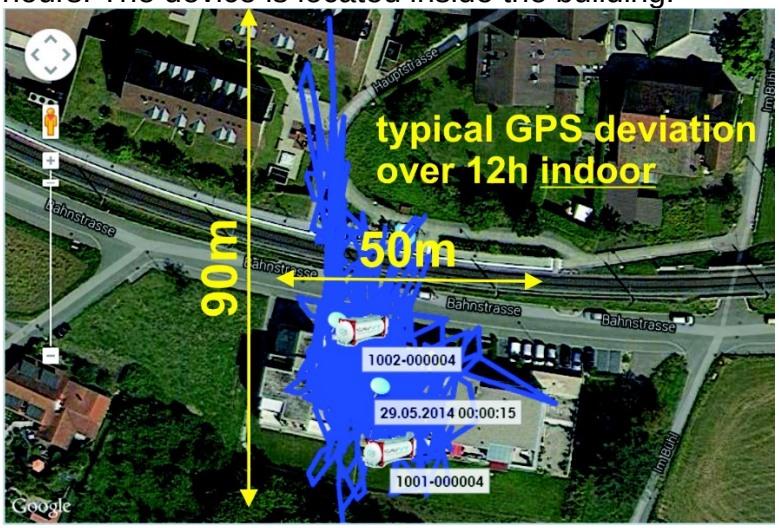
3.6 Acceleration and Motion Sensor

An internal acceleration and motion sensor detects shocks, jolts, vibrations and accelerations. This can be used, for example, for the detection of flat spots, strong impacts or reloading / manoeuvring work.

Feature	
Range	±2g, ±4g, ±8g
Sensitivity	1mg at ±2g, 2mg at ±4g, 4mg at ±8g
Non-Linearity	±0.5%

3.7 GNSS / GPS Accuracy under difficult Conditions

The GNSS / GPS accuracy under difficult reception conditions such as in a hall, urban canyon or indirect view of the sky can vary greatly. The following diagram shows the deviation of the positions of the CargoTrac-ExR-M1 over a period of 12 hours. The device is located inside the building:



3.8 GNSS / GPS Accuracy under very difficult Conditions

If the device is located in a completely shielded building, container or vehicle, an attempt is made to determine the position using Cell-Locate. To do so, CargoTrac-ExR-M1 uses the data connection to the available radio cells.

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4 Ambient Conditions

Operating temperature range	-40°C ≤ T_{amb} ≤ +85°C
Operating temperature range inside Ex-Zone	-20°C ≤ T_{amb} ≤ +60°C
Operating relative humidity	95%
IP-protection class with pressure compensation element IEC/EN60529	67
Vibration and shock ISO 16750-3 and DIN EN61373	≥100g
Case flammability UL94 and IEC/DIN EN 60695-11-10 and -20	UL94 V-0
Case flammability according to EN45545-2	HL1, HL2, HL3 für R22, R23, R24, R26
Salt Spray	>96h
Surface resistance @ 30%rH	$<10^{10}\Omega$
Impact strength according to IEC60079-0	≥1kg aus 0.7m
UV-Stability for Outdoor use	UL746C

5 Electrical Data

Peak power consumption	5.72W
Average power consumption active mode	0.37W
Average power consumption sleep mode	360uW
Energy Source	Internal battery 7.2V

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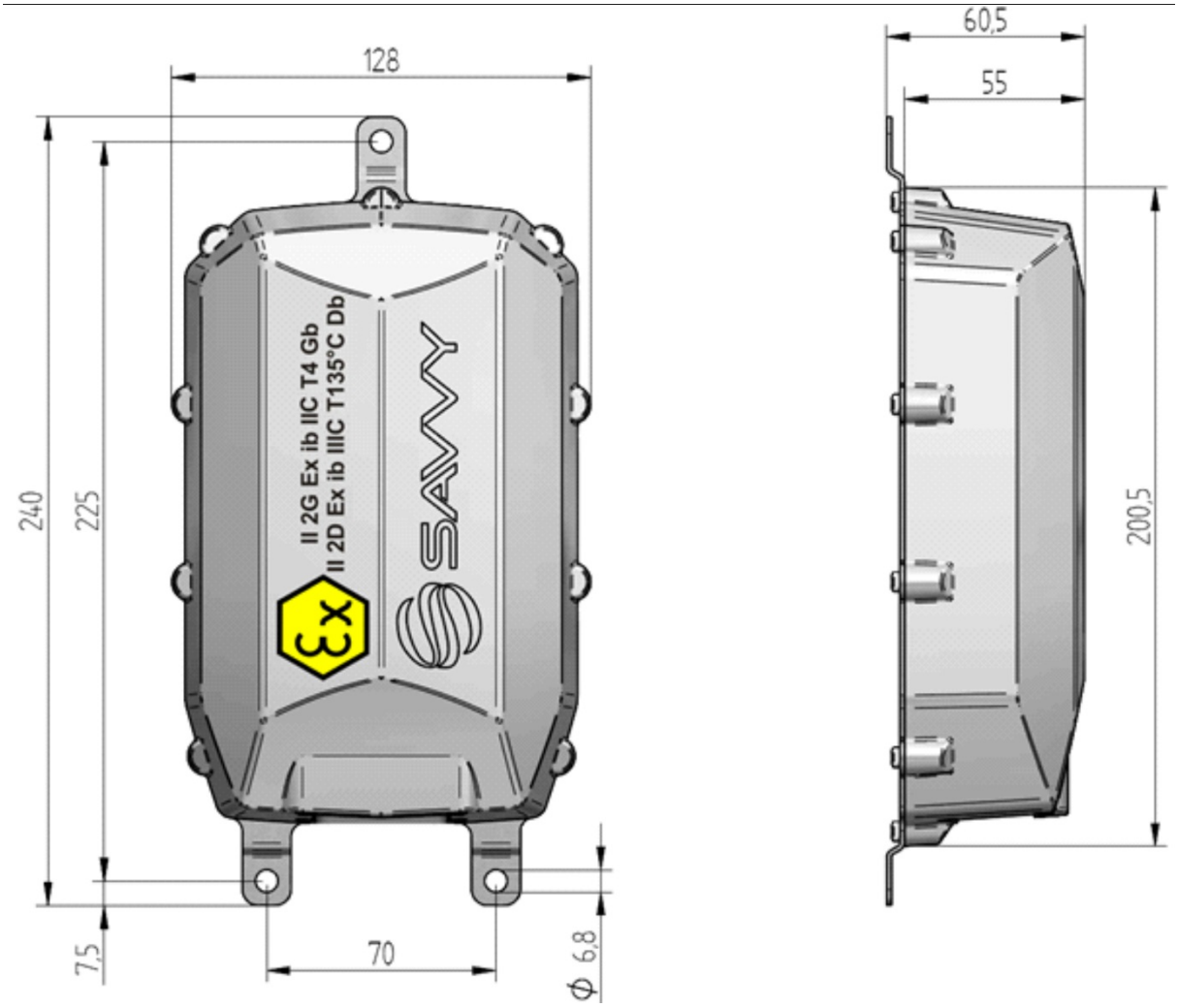
6 Mechanical Dimensions and Materials



Weight	1.5kg
Case material ISO1874	PA 66 + PA6, MFHR, 14-110N, GF 30 FR(40)
Colour	RAL7035
Baseplate	Stainless steel 1.4404 oder 1.4301

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7 Installation and Mounting

7.1 General Information

The installation and commissioning of CargoTrac-ExR-M1 may only be carried out by trained specialist personnel. All regulations and instructions mentioned in this manual must be followed.

Visibly defective devices must not be brought into a danger zone!

In any case, the corresponding directives according to 1999/92/EC (ATEX137), EN60079-14 (project planning, selection and installation of electrical systems) and EN60079-17 (testing and maintenance) must be observed.
As an operator, you are obliged to comply with all legal requirements, test intervals, operating regulations, etc.

Mounting criteria for CargoTrac-ExR-M1:

- The top part of the device (about 1/3 of the entire device) must have an unobstructed view to the sky. This ensures good GNSS, GPS, and LTE/GSM reception.
- Choose a position that is not too exposed, so possible damage through blows from other equipment such as e.g. cranes, loading devices, containers etc. can be avoided.
- Make sure you choose a spot that is far enough away from dirt sources such as brakes, wheels, drains etc.
- Installation must be completely flat, otherwise there is a risk of leakage.

7.2 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 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.

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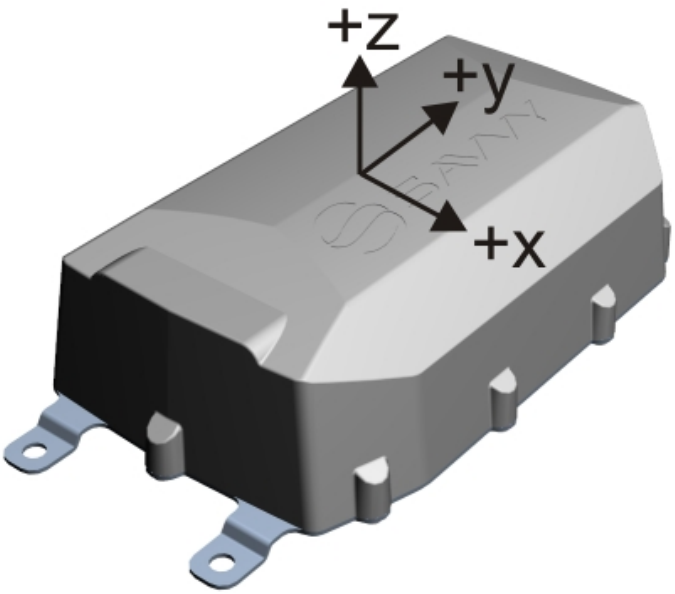
7.3 Pressure Relief Membrane Inspection

CargoTrac-ExR-M1 has a membrane on the back to relieve pressure in the event of temperature fluctuations. This ensures that protection degree IP 67 is maintained during operation. It is however necessary to make sure there is no damage to the membrane before the device is put into operation. It is also necessary to be careful and avoid damaging the membrane while installing the device.

Devices with a damaged pressure relief membrane must not be installed and put into operation.

7.4 X-y-z Axes Alignment During Installation

Before you begin installing or mounting the device, make a note of the mounting position using the designations of the x-y-z axes on the type plate. The mounting position needs to be included later on in the data set on the SAVVY® Synergy Portal. This ensures that vibrations, blows, and accelerations can be attributed to the corresponding axis:



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7.5 Examples of Installation Locations

Always discuss possible installation positions with your project team. Here are a few examples:

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7.6 Mounting Options

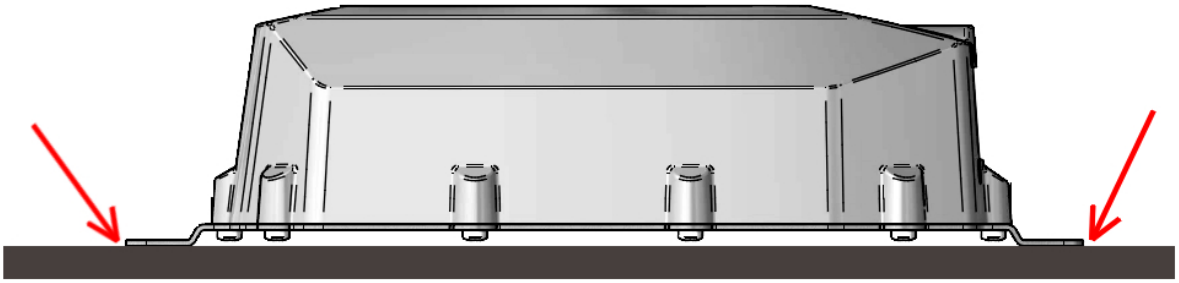
The device can be mounted without adapter or with available welding adapter in various steel versions.

7.6.1 Mounting without an adapter

CargoTrac-ExR-M1 has a sturdy base plate made of stainless steel equipped with three mounting tabs with holes measuring 6.8mm in diameter so the device can be mounted using screws or rivets.

Never weld the device base plate directly onto the installation location!
The heat generated by the welding will destroy the plastic case!

Always take care that mounting the unit will be on a completely flat surface and that it is never any force on the mounting tabs. Twisting or deforming the base plate can cause damage to the housing and leads to water intrusion. Warranty will be lost! This is also safety relevant!



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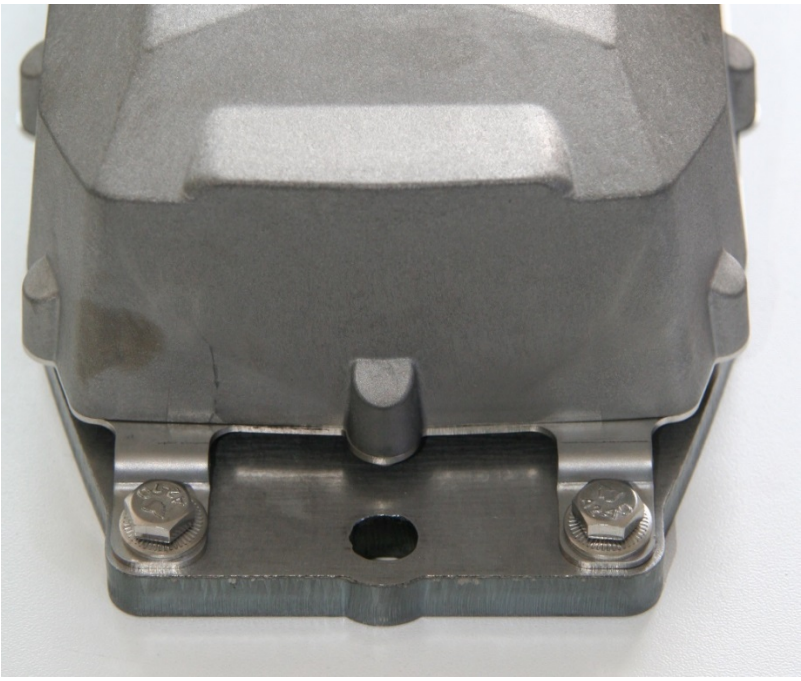
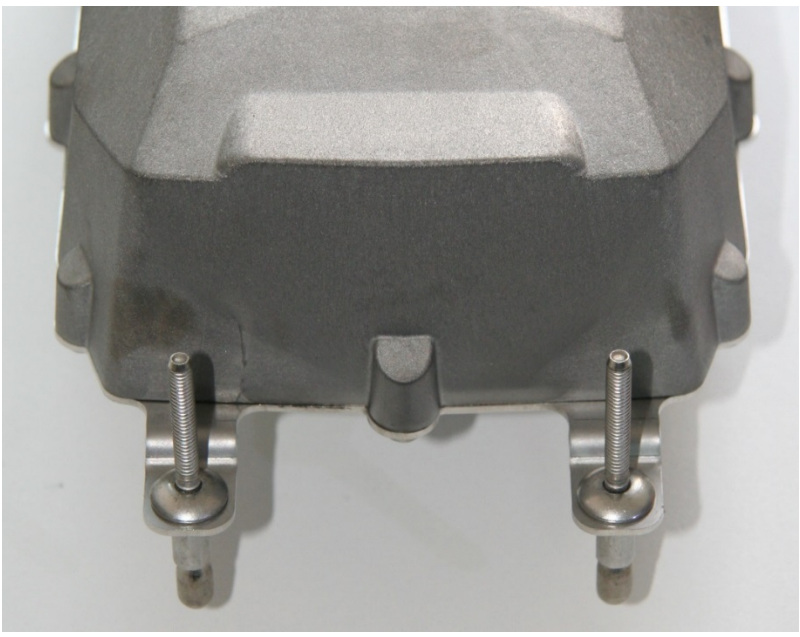
7.6.2 Mounting with screws

Use the following screws: e.g. M6 stainless with a regular or tooth washer as illustrated below:



7.6.3 Mounting with rivets

Use the following rivets: e.g. KVT Magna-Lok 6.4mm MGLP-U8-6 as illustrated below:



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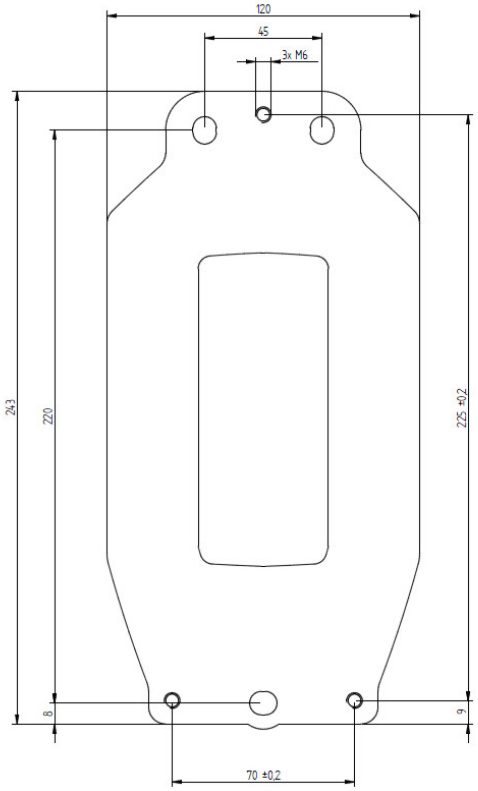
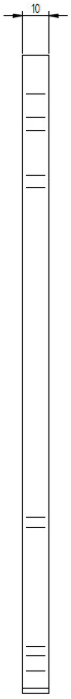
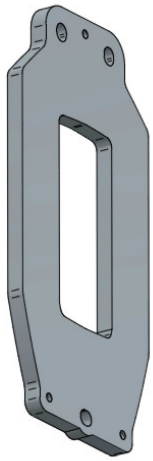
7.6.4 Mounting with a welding adapter

The welding adapter is available in different steel versions. Always weld the plate to the desired installation location first. Then attach the device to the welding plate as desired. If necessary, use corrosion protection.







8 Battery Replacement

CargoTrac-ExR-M1 must not be installed in potentially explosive areas!

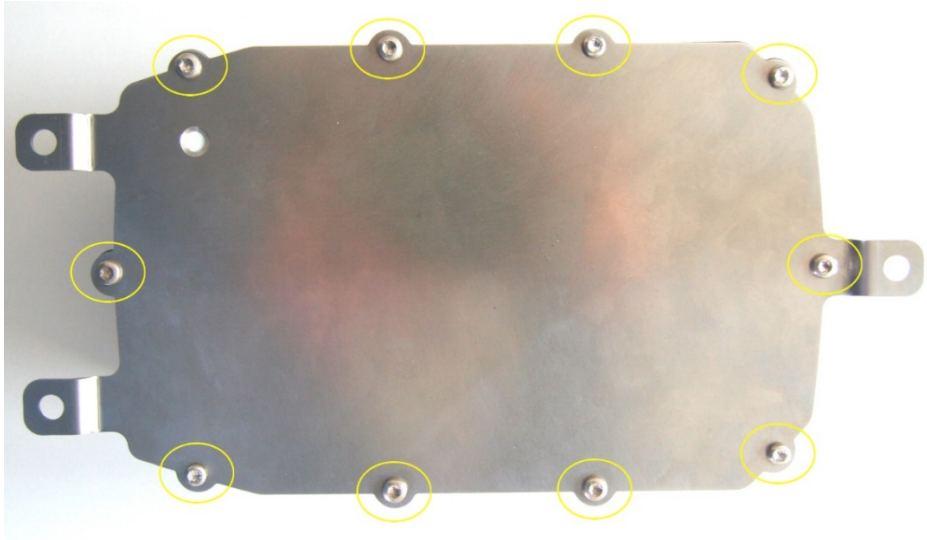
The internal battery must not be replaced in potentially explosive areas!

Use only original parts!

You will rarely need to replace the CargoTrac-ExR-M1 battery. Depending on the desired messaging and position intervals, the internal battery will ensure trouble-free operation for up to 15 years. Should it nevertheless be necessary to change the battery, please proceed as follows:

- Make sure the Asset and the mounted CargoTrac-ExR device are in a place located outside of the potentially explosive area.
- Remove the device from the mounting fixture.
- Place the device in an ESD-protected area and make sure individuals, tools and other devices are ESD-protected before you open the device.

- Use a TORX-T20 screwdriver to remove the 10 screws on the base plate.



- Unplug the battery connector and remove the battery from its compartment. Be sure to unlock the plug!

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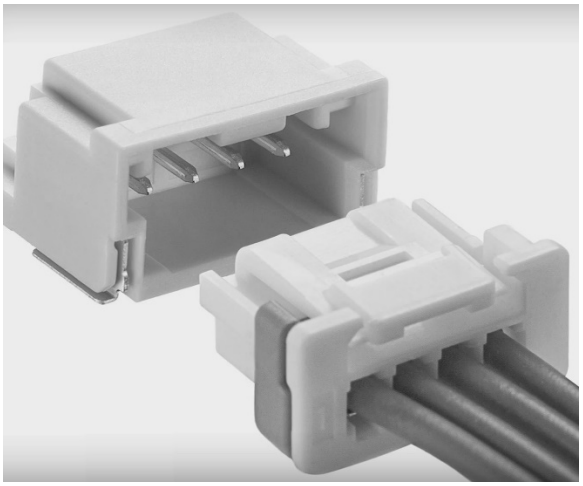

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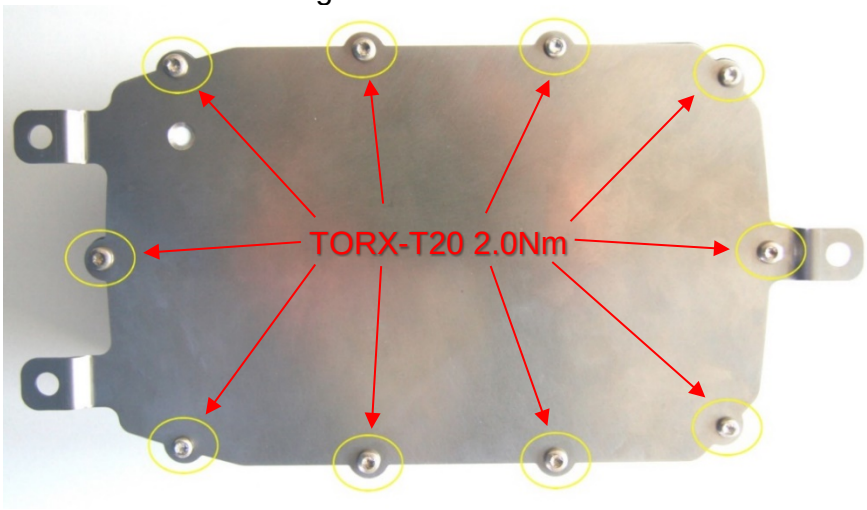
- Fully insert the battery plug belonging to the new battery and place the battery in the case as illustrated.
- Make sure the plug lock is in place when you insert the plug.
- Check to see if the gasket is in the correct position.
- Make sure the gasket is undisturbed by the battery cable and other objects.

- Close the device again with the base plate and tighten each of the ten screws to 2.0Nm.
- Each screw must not overtighten!



- The used battery can be disposed of at any suitable collection point.

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8.1 Internal Battery

Ordering Number	SAVVY 1073
Voltage	7.2VDC
Capacity	57Ah
Length x Width X Height	124mm x 104mm x 35mm
Weight	appx. 0.65kg
Chemistry	LiSOCl2 (lithium thionyl chloride)
Connector	Device-Specific

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9 Declaration of Conformity

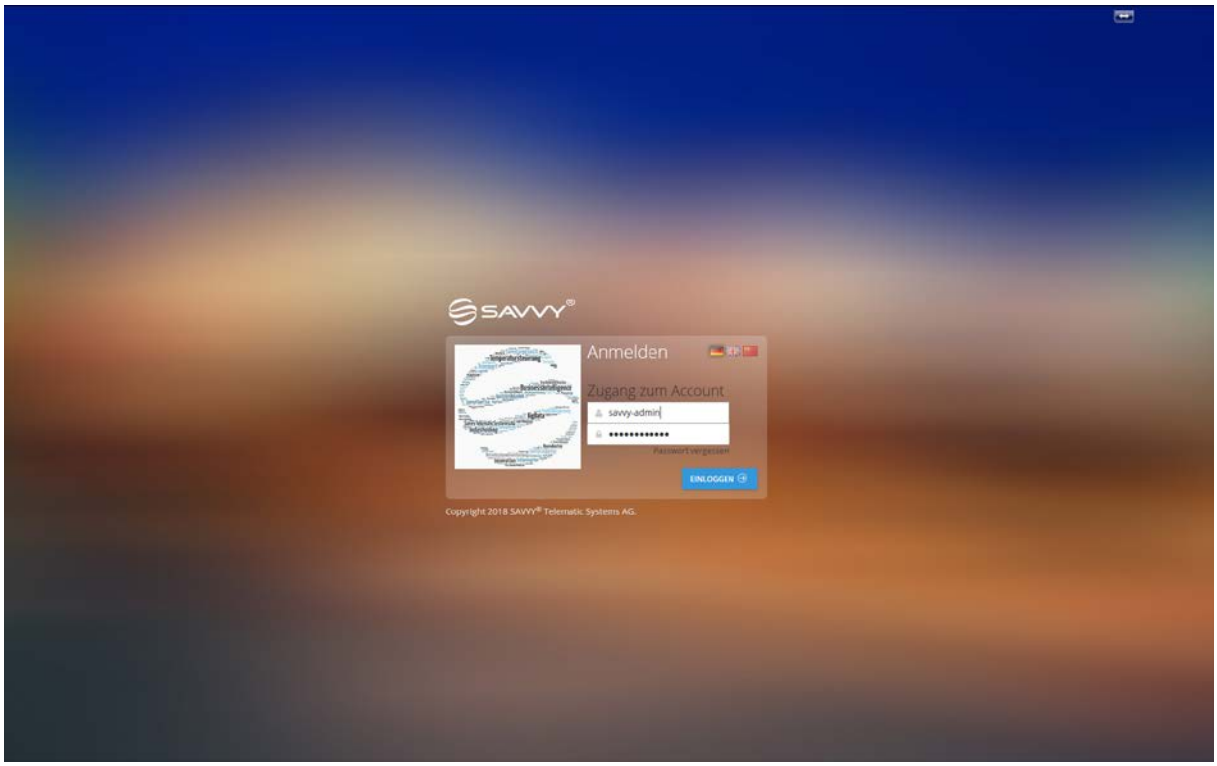
Available from SAVVY® Telematic Systems AG.

10 Proper Usage

CargoTrac-ExR-M1 is designed for use as an autonomous telematics unit and must not be used in any way other than described in this manual, the corresponding data sheet or as instructed by SAVVY® Telematic Systems AG. SAVVY® Telematic Systems AG refuses to accept any responsibility whatsoever for damage due to improper use.

11 Setting Up Operation in SAVVY® Synergy Portal

The SAVVY® Synergy Portal puts the device into operation. No physical action on the device itself at its location is required. More information on putting the device into operation is available at support@Savvy-telematics.com or under Tel +41 52 633 46 00. The login portal is located here: https://www.savvy-synergy.com/customers/SynergyEnterprise/



12 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.

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13 Storage and Shutdown

13.1 Storage

CargoTrac-ExR-M1 is delivered so storage over a longer period of time is unproblematic. The internal battery uses very little energy during storage. Please note that items must be stored at temperatures between +10°C bis +30°C; humidity must not exceed 60%rH.

13.2 Shutdown and Disposal

CargoTrac-ExR-M1 must not be removed from service and shut down in potentially explosive areas!

The internal battery must not be removed in potentially explosive areas!

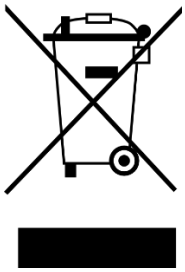
The device and the mounting brackets can be disposed of separately. The mounting brackets are made of steel or stainless steel and can be recycled at a metal recycling site.

The device itself can be taken to a collection site for electronic scrap or sent back to the following address:

For Germany / EU:
SAVVY Telematic Systems AG
c/o LogConnect AG
Zollstrasse 5
DE-78239 Rielasingen

For Switzerland:
SAVVY Telematic Systems AG
Grabenstrasse 9
8200 Schaffhausen

Thank you for contributing to a better environment and making sure your waste is disposed of properly!



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