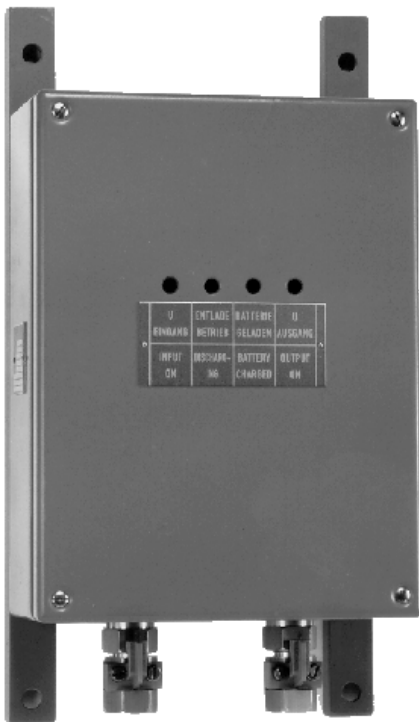


Emergency power supply NV2.1-12iaE

Ordering Data

Designation	Type	Item no.
Emergency power supply	NV2.1-12iaE	372 100 04 AX

- Supply of consumers even in case of failure or shutdown of the input / charging current circuit
- NiCd battery as energy store
- Intrinsically safe input voltage
- Two intrinsically safe output voltages of category ia (5 V_{DC} / 12 V_{DC})
- Protection type: I M 1 EEx ia I



Application

The NV2.1-12iaE emergency power supply ensures the power supply of intrinsically safe equipment or installations in firedamp areas.

The emergency power supply allows uninterrupted operation of the connected devices, which the integrated accumulator battery also ensures in case of a failure of the intrinsically safe power supply.

The intrinsically safe input / charging current circuit supplies the emergency power supply NV2.1-12iaE and simultaneously buffers / charges the internal battery.

On the output side, the emergency power supply NV2.1-12iaE provides two intrinsically safe supply voltages (5 VDC and/or 12 VDC).

These output / supply circuits conform to protection type EEx ia I.

LEDs indicate the input / output voltages, the discharging mode as well as the discharge degree of the internal battery.

A potential-free optocoupler output allows connection to an external discharge degree indication for signalling purposes.

The emergency power supply NV2.1-12iaE is installed in a robust steel sheet enclosure and provides protection as per IP54.

Configuration

The emergency power supply NV2.1-12iaE consists of a steel sheet housing. A sealed NC-accumulator block of 10 cylindrical 5Ah NiCd cells (type D), and the related control electronics are installed in its bottom part and embedded in casting resin.

Outside of the compound, the indicator LEDs and the input and output terminals are located on a separate printed board.

The housing cover of 3 mm steel sheet is fixed onto the housing bottom by means of 4 screws. Four acrylic glass lenses which are fixed to the housing by gluing and sealed allow to observe the LED indications within the housing.

The connecting cable is led into the housing of the NV2.1-12iaE through two PG16 (or their metric equivalent) entries (for line diameters of 9-14 mm incl. strain relief, anti-kink protection and twist lock). In addition, the housing features a PG21 bore (or its metric

equivalent) which is closed by a blind plug.

Functioning

In order to protect the battery cells against exhaustive discharge during storage, the short-circuiting link between terminals KL 8 and KL 9 has to be removed and to re-inserted before commissioning of the emergency power supply NV2.1-12iaE. A potential-free, intrinsically safe contact maker can also be connected to these terminals, if the activation of the emergency power supply is to be ensured externally.

If in the case of normal operation, the short-circuiting link has not been inserted, a switch over to "emergency mode" or discharging is not possible, the battery block, however, will be (re-) charged.

In normal operation, the following applies to the switching over between mains operation and (battery) discharging mode (with the short-

circuiting link between terminals KL 8 and KL 9 inserted):

If the voltage of the intrinsically safe supply circuit (terminals KL 12 (+12 V) and KL13 (0 V)) drops below 9.5 V (or if the intrinsically safe supply circuit is shut off completely), and if the voltage of the battery exceeds 12.6 V, the operation mode is switched to (battery) discharging.

If the voltage of the intrinsically safe supply circuit exceeds 10.5 V, the operation mode returns to normal operation, i.e. the charging of the battery and supply of the output is realised through the intrinsically safe input circuit.

The output voltages are completely shut off if the battery voltage drops below 10.6 V.

The power supply of the internal control logics is switched off at 10.4 V to avoid an exhaustive discharge of the battery. When planning the project, it has to be considered that the capacity

available at the output terminals is ca. 2.7 Ah, as only a part of the internal battery capacity of 5 Ah is used to operate the internal circuits and current-limiting stages.

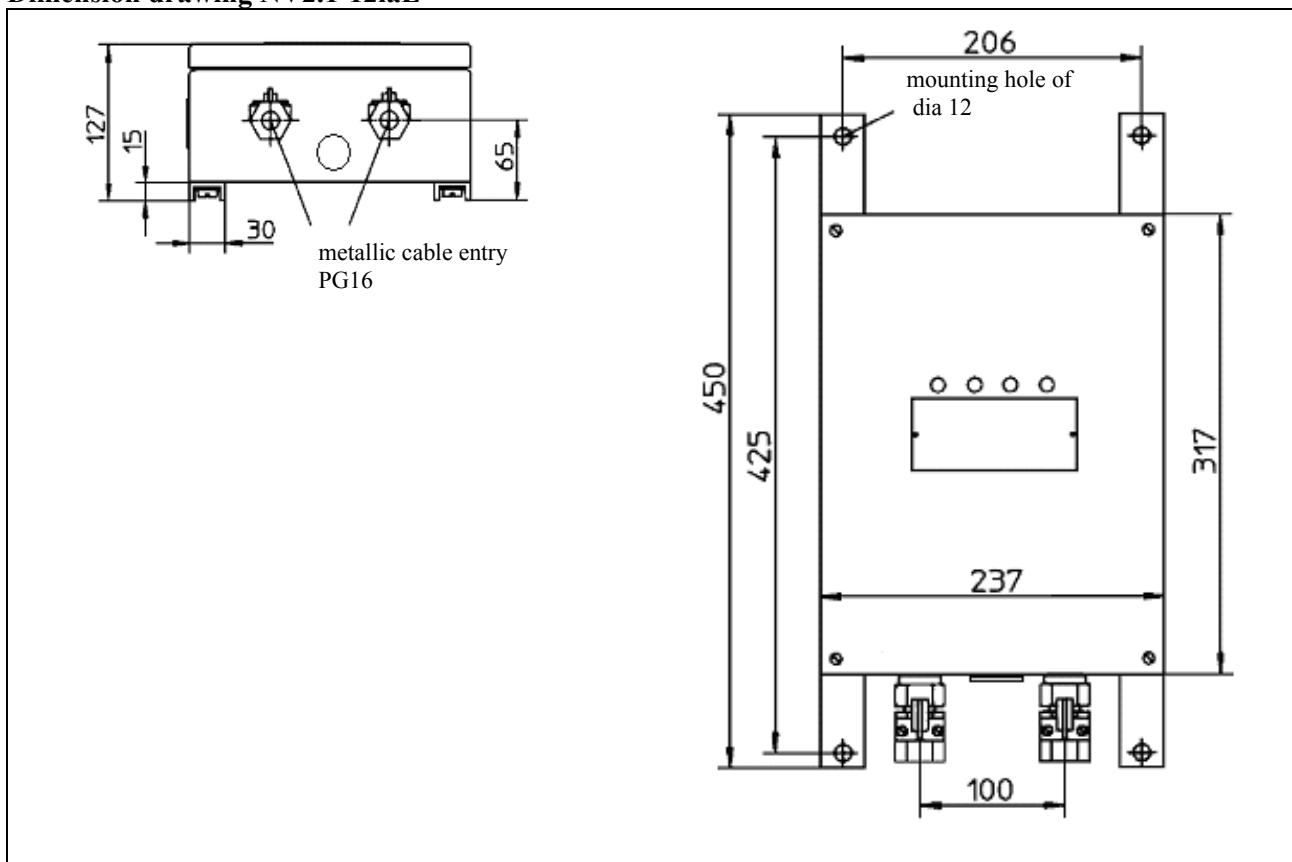
Due consideration is to be given to the fact that after the battery has been discharged completely, 36 hrs are required to recharge it in active standby parallel operation.

The isolated optocoupler output with its terminals KL 6 (+) and KL 7 (-) allows to connect an intrinsically safe circuit for external monitoring of the discharge degree.

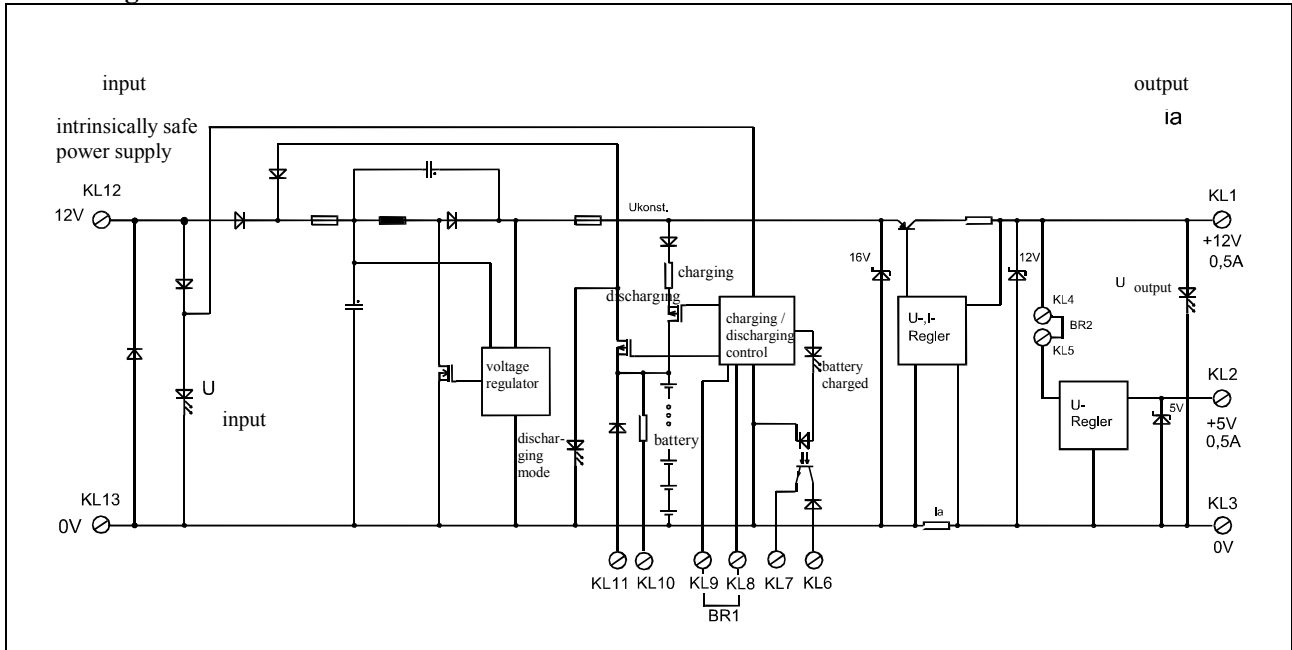
The optocoupler output is switched on at an battery charging state of $U \geq 12.8 \text{ V}$ and switched off at

$U \leq 12.2 \text{ V}$ and serves as a timely early warning before a complete discharge of the battery occurs (final switch off at 10.6 V).

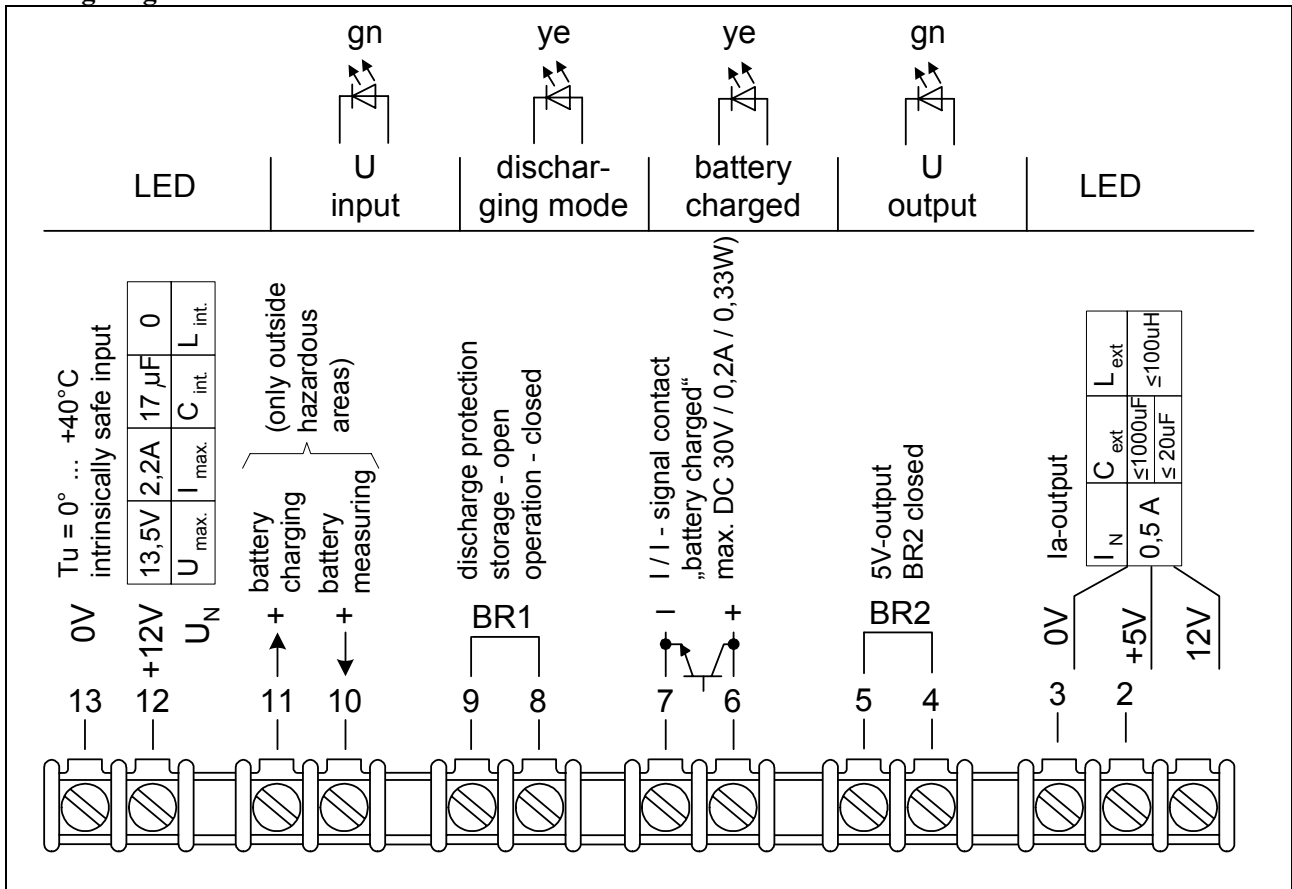
Dimension drawing NV2.1-12iaE



Block diagram NV2.1-12iaE



Wiring diagram NV2.1-12iaE



Technical Data NV2.1-12iaE

Designation	Emergency power supply
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Type	NV2.1-12iaE
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Intrinsically safe input / charging circuit terminals KL 12 (+12 V) and KL13 (0 V)

Nominal input voltage U_n	$10 V_{DC} - 12 V_{DC}$
Max input voltage U_i	$13,5 V_{DC}$
Input current I_n	$1.1 A_{DC}$
Max. input current I_i	2.2 A
Internal capacitance C_i	$1.7 \mu F$
Internal inductance L_i	negligible

**Only use approved and certified power supplies to feed the intrinsically safe input /charging circuit!
The interconnection has to be separately inspected and certified.**

Intrinsically safe 12V output supply circuit, terminals KL 1 (+12 V), KL 3 (0 V)

Nominal output voltage	$12 V_{DC}$, constant ($\pm 2.5\%$)
Nominal output current	0.5 A
U_o	$13.0 V_{DC}$
I_o	2.2 A
C_o	$20 \mu F$,
L_o	$100 \mu H$

Intrinsically safe 5V output supply circuit, terminals KL 2 (+5V), KL 3 (0V)

Nominal output voltage	$5 V_{DC}$, constant ($\pm 5\%$)
Nominal output current	0.5 A
U_o	$6.4 V_{DC}$
I_o	2.2 A
C_o	$1000 \mu F$,
L_o	$100 \mu H$

Note:

The sum of the output currents of the 12V and the 5V circuit is 0.5A, as the 5V circuit is supplied through the 12V circuit.

Battery

Configuration	10 NiCd cells (D type) connected in series
Nominal voltage	1.2 V per cell
Nominal capacity	5 Ah
Available capacity	2.7 Ah

**Signalling output terminal KL 6 (+) and terminal KL7 (-)
isolated optocoupler output for intrinsically safe circuits**

Contact made:	(battery) charge of $U \geq 12.8 V$
Contact open:	(battery) charge of $U \leq 12.2 V$
Voltage U_i	$30 V_{DC}$
Current I_i	200 mA
Power P_i	330 mW
C_i	negligible
L_i	negligible
Residual voltage when switched through	$\leq 2 V$

Technical Data NV2.1-12iaE**Activation input terminals KL 8, KL 9**

U_o	17.0 V
I_o	10 mA
C_o	4 μ F
L_o	100 μ H

**External charging circuit, terminals KL 11 (+U) and KL 13 (0 V)
only for charging outside of firedamp areas**

Charging method	constant current
Charging current	500 mA
Charging time	14 h


**External battery measuring circuit terminals KL 10 (+U_{bat}) and KL 13 (0 V)
only for measuring processes outside of firedamp areas**

Measuring instrument	every circuit analyser
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Optical indications of discharge degree

LED "U Input"	Input voltage 12 V _{DC} applied
LED "Discharging mode"	Battery in discharging mode (emergency mode)
LED "Battery charged"	Battery ready for discharge
LED "U output"	12 V _{DC} (5 V _{DC}) output voltage applied

General

Cable entry:	2 x PG16 or its metric equivalent (line diameter: 9-14 mm) bore with blind plug PG21 or metric equivalent
Enclosure	steel sheet, colour: blue
Enclosure protection degree	IP 54 as per IEC 529
Operating mode	100 % ED / continuous operation
Operating conditions	preferably in environments susceptible to firedamp
Operating position	at choice, preferably in vertical position, with the cable entries facing downwards
Temperature range	
- operation	- 20 to + 40°C
- storage	- 20 to + 60°C
- transport	- 20 to + 60°C
Dimensions	see dimension sheet
Weight	ca. 17 kg
Test and approval	
- type of protection	I M 1 EEx ia I
- approval no.	DMT 03 ATEX E 067 X
Marking	
The nameplate is marked as follows:	
Company	FHF Bergbautechnik GmbH D-42551 Velbert
Type	NV2.1-12iaE ib  I M 1 EEx ia I DMT 03 ATEX E 067 X CE 0158 F. No.... test....(initials, month/year) 0°C ≤ T _a ≤ +40°C

Assembly / Installation

The emergency power supply is to be installed on a support of adequate rigidity and stability with regard to the weight of the unit.

The preferred operating position is vertical, with the cable entries facing downwards.
The interconnection with other devices must be separately certified.

Special care is to be taken with regard to the sealing when the emergency power supply is open as to avoid damaging the sealing and the sealing faces. During installation, proper fit and clean condition of the sealing are to be ensured. When closing the housing, tighten the cover screws firmly and uniformly.

Commissioning and settings

If the complete buffer capacity is required during commissioning, the battery has to be charged beforehand. Prior to commissioning, verify the proper fixing and installation as well as the correct connecting method and equipment.

To activate the battery, a connection between terminals KL 8 and KL 9 must be realised.

If, in a properly approved intrinsically safe installation, the device is supplied through a supply circuit of category I M 2, protection type EEx ib I, the user will be responsible for this power supply circuit to be shut down in the event of an explosive atmosphere (increased methane content) and thus for the input circuit (terminals KL12, KL13) to be de-energized. The circuits supplied by the internal battery within the device are of category I M 1, protection type EEx ia I. If the device is charged through a circuit of category ia, the charging can stay operable in case of an explosive atmosphere.

Charging outside hazardous areas

Two additional terminals allow to "quick-charge" the battery (terminals KL11 und KL 13) outside the fire-damp area and to monitor the discharging degree. The charging has to be realised by means of a charging device featuring a constant current output of 500 mA / 14 h. The charging device has to ensure a voltage of at least 17 V. The charging input is provided with an internal fuse; charging with currents >500mA is not possible and not permitted.

Output current circuits

The terminals KL 1 (+12 V) and KL 3 (0 V) allow to pick up an intrinsically safe, regulated 12 V output voltage. If an additional 5 V DC is required, this can be picked up after insertion of a further short-circuiting link between terminals KL 4 and KL 5 at the terminals KL 2 (+5 V) and KL 3 (0 V). A series connection of both output voltage sources is prevented by the common 0 V connection.

The nominal output current (sum of the currents supplied by the +5 V and the +12 V branch) is ca. 500 mA. The safety relevant output voltages and the output currents are limited through corresponding safety relevant suppressor circuits and details are given in the "Technical Data".

Indications

Integrated LEDs which are visible from the outside, indicate the most important NV2.1-12iaE functions. The LED "battery charged" indicates an adequate (battery) discharge degree of $U \geq 12.8$ V and is switched off at $U \leq 12.2$ V. The LED "U output" is on, if the +12 V output voltage is applied. The LED "discharge mode" is activated when the mode is switched over to activate (battery) discharging mode. The LED "U input" is on, if an adequate supply voltage is applied.

Maintenance

The emergency power supply NV2.1-12iaE is maintenance-free and does not contain any parts requiring maintenance.

The integrated battery is subject to self-discharge. After extended storage, especially at higher temperatures (>+25°C), the battery should be recharged in regular intervals of 3 - 6 months.

Note on storage

The integrated battery is subject to self-discharge. The degree of the self-discharge depends on the storage temperature. Long storage periods without recharging, however, do not damage the cells.

Prior to start-up, it is recommended to re-charge the battery for 14 h after a longer storage period.

Note on waste disposal

After use, the integrated NiCd battery cells are to be discarded as specified.

Warning and Safety Advice

The apparatus is a flameproof device designed for the operation within explosive atmospheres. It complies with safety class group I M 1.

Please pay particular attention to the following warning and safety advice:

The interconnection with other electric equipment must be separately certified.

If the device is operated in a correspondingly approved, intrinsically safe installation and supplied through a power supply circuit of category I M 2, protection type EEx ib I, the user will be responsible for this power supply circuit to be shut down in the event of an explosive atmosphere (increased methane content), and thus for the input circuit (terminals KL12, KL13) of the device to be de-energized. The circuits still operable are supplied with power by the internal battery of the device conform to category I M 1, protection type EEx ia I.

If the device is charged in an explosive atmosphere, this charging may only be realised through a circuit of category "ia" as per paragraph 4.10.2 of DIN EN 50303.

The device may only be connected and operated with the specified voltage. The polarity specifications are to be observed.

The apparatus is to be connected and installed in accordance with the specified installation instructions by qualified personnel, taking into account the protection type indicated.

Make sure the housing is not damaged. Do not operate faulty devices, shut them off immediately.

If the device is operated in an industrial installation, the rules for the prevention of accidents for electrical installations and equipment of the association of the industrial employer's social insurance against occupational accidents shall be observed.

The device may only be operated under the specified ambient conditions. Unfavourable ambient conditions may damage the appliance, possibly jeopardising the user's life as a result. Unfavourable ambient conditions may be:

- moisture, dust (observe type of protection)
- air humidity too high (> 75% rel., condensing)
- inflammable gases, vapours, solvents not covered by the protection class of the device.
- ambient temperatures too high (>+40°C)
- ambient temperatures too low (<-20°C).

The ambient temperature specified for the device may not be exceeded or failed to be reached during operation (-20°C up to +40°C), storage and transport (-20°C up to +60°C).

The extension and the installation of further parts is not permitted.

Replace faulty components only by the appropriate genuine spare parts.

Only use the cable glands/entries specified by the manufacturer.

Repair work may only be realised by the manufacturer or by a person authorized by the manufacturer. Subsequently, a new routine test for the device must be carried out.

Preferably, the device is mounted vertically, with the cable glands and plug connectors facing downwards at the bottom side. When mounting the device, it is to be ensured that the device will not be used as climbing aid and thus be damaged. If required, additional measures must be taken to protect the device against falling objects.

Any faulty connection lines on the devices shall be replaced.

It must be ensured during the mounting that the substructure features an adequate carrying capacity.

Make sure the device is protected against damage during transport, storage and when not in use.

Warning and Safety Advice

The terminals KL 10 and KL 11 may only be used outside the hazardous area. If the device is charged outside the hazardous area through terminals KL 11 and KL 13, a suitable charging device is to be used that provides a constant current of $\leq 500\text{mA}$, at a charging time of 14 h. The charging input is equipped with an internal fuse; charging with currents $> 500\text{mA}$ is not possible and not permitted.

Attention:

Disregarding the above points will nullify the explosion protection. The device then represents a danger to the life of the operator and may cause a hazardous atmosphere to explode.

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