

## Battery Power Pack iBA12-14 for intrinsically safe installations

### Ordering Data

Designation	Type	Item no.
Battery power pack 12 V <sub>DC</sub> / 14 Ah	iBA 12-14	375 003 20 AX
Holder for iBA 12-14		375 003 50 AX



- **Battery for non-mains supply of power to firedamp-proof intrinsically safe installations and apparatus with 12 V<sub>DC</sub> voltage**
- **Small dimensions**
- **High capacity (14 Ah)**
- **Plug connection (10-contact jack)**
- **Battery holder for rapid changeover**
- **Charge- / remaining capacity indicator**
- **Monitoring contact**
- **Deep discharge protection**
- **Explosion protection mode I M 2 EEx ib I**

### Use

This intrinsically safe Battery Power Pack iBA12-14 is intended as a non-mains power supply for electrical apparatus in intrinsically safe systems within hazardous areas of coal mines. It comes with explosion protection mode EExb I, corresponding to Category IM2.

The output voltage is 12 V<sub>DC</sub>, the rated current 1.0 A and the capacity 14 Ah. The output current on short-circuit is limited to a maximum of 1.1 A.

Charging of the discharged battery can be carried out within the hazardous area with the aid of one or two approved power supply packs. The use of two power supply packs means that charging is possible within approximately 18 h.

### Design and construction

The intrinsically safe Battery Power Pack iBA12-14 is housed in a sheet stainless steel case. It is provided with protection type IP54. A holder for

accommodation of the battery power pack is available as an accessory.

The charging electronics and accumulator block are situated in separate chambers and are separately sealed. The accumulator block consists of two blocks connected in parallel, each comprising 12 NiCd cells, and with a capacity of 7 Ah each.

All electrical connections for charging inputs, discharging output, activation and monitoring contact are effected via a plug connection (10 contact jack) on the outside. A suitable connection plug which engages with the jack is available as an accessory.

Beneath the steel case cover are also located contacts for de-activation of the end-of-charge cut-off and for measuring the voltage of the accumulator block, as well as the LEDs of the charge indicator, which are visible from the outside through a sight glass pane.

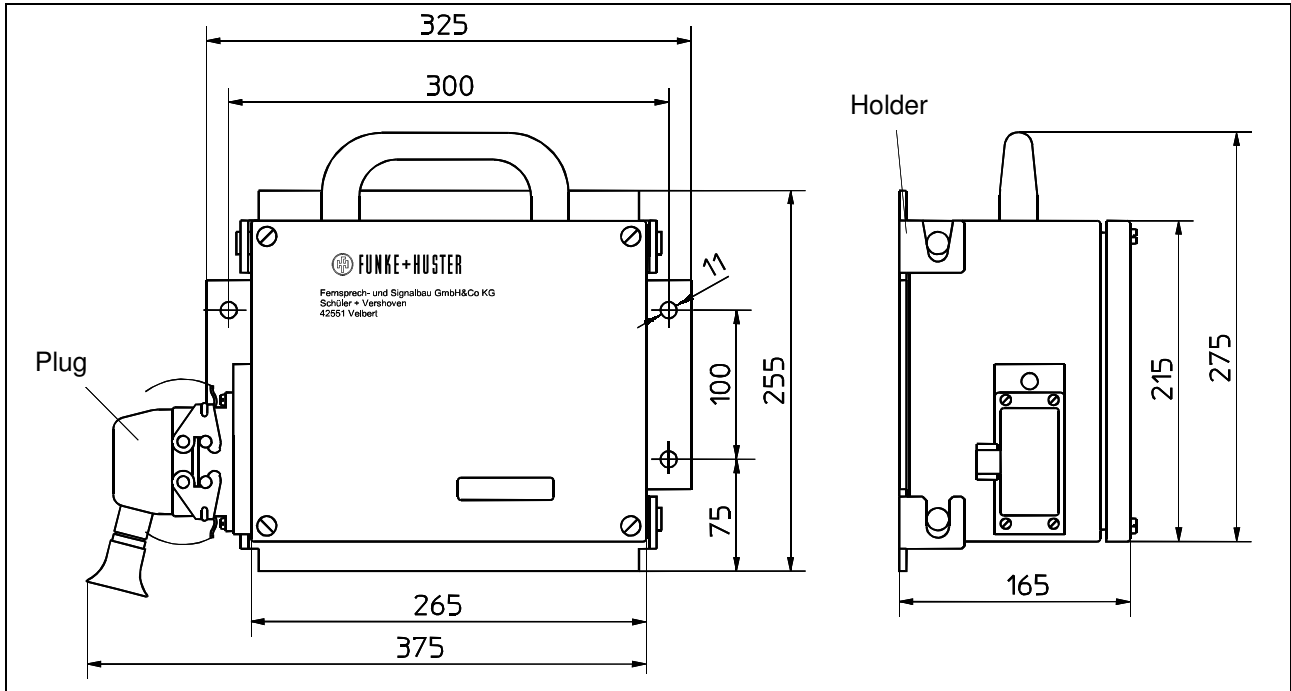
**How it works**

The intrinsically safe iBA12-14 Battery Power Pack has two charging inputs. Via these it can be charged in a hazardous area by the connection of one or two approved power supply packs with intrinsically safe output circuits. When charging is carried out with two such power supply packs the charging process takes approximately 18 h; when only one power supply pack is used it takes approximately 30 h. The inputs are protected by means of diodes against reverse polarity. From the 12V input voltage a DC/DC converter produces the charging current necessary for the accumulator block. A monitoring circuit switches off the DC/DC converter if its output voltage exceeds 19V. This is indicated by the LED "Charging Error". The amount of input and output currents of the accumulator block are counted by the current balance circuitry to determine the charge level,

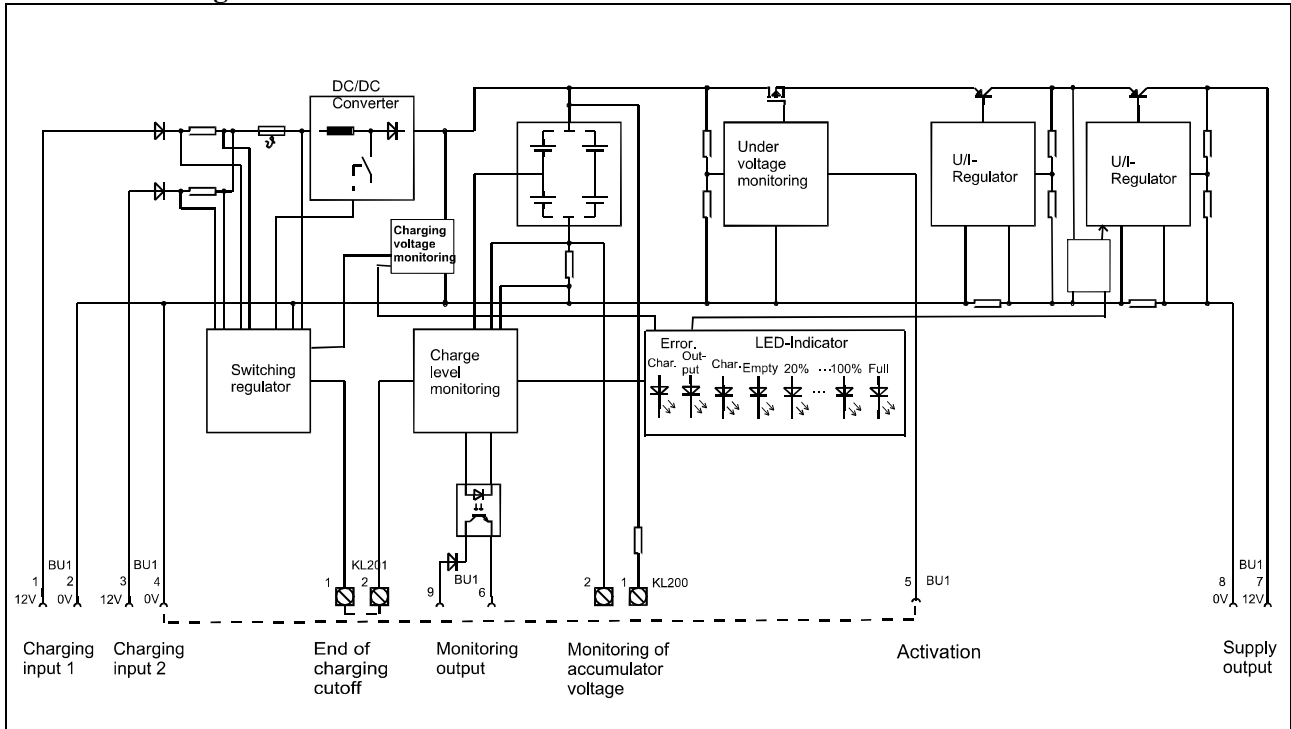
which is indicated on the LED display in steps of 20%. During the charging process the "charging" LED is illuminated. As soon as the charge level of 100% is reached, the DC/DC converter is switched down to trickle charge and the "full" LED lights up. If during the discharging process the charge level falls to "Battery empty", the corresponding LED flashes and the parallel connected optocoupler – monitoring output is switched off (high impedance). The LED display and optocoupler – monitoring output are only active during charging and discharging operations. In standby condition (storage) they are switched off. The changeover from stand-by to discharging operation is effected via an activation input, whereby the accumulator block is connected via a voltage monitoring circuit and two Low-Dropout voltage / current regulating circuits to the supply

output. The activation input is applied to contacts of the plug-in socket, so that for practical purposes activation is automatically effected by contact to the plug of the consumer load. The voltage monitoring circuit serves as a deep discharge protection, and at an under-voltage of around 10% isolates the accumulator block from the supply output. The Low-Dropout voltage / current regulating circuits regulate the output voltage to 12 V and limit the output current to 1.0 A rated current (1.1 A on short circuit). A monitoring circuit monitors the function of the first voltage / current regulating circuit. In the event of a fault the output voltage is switched off and the "Error" LED is illuminated.

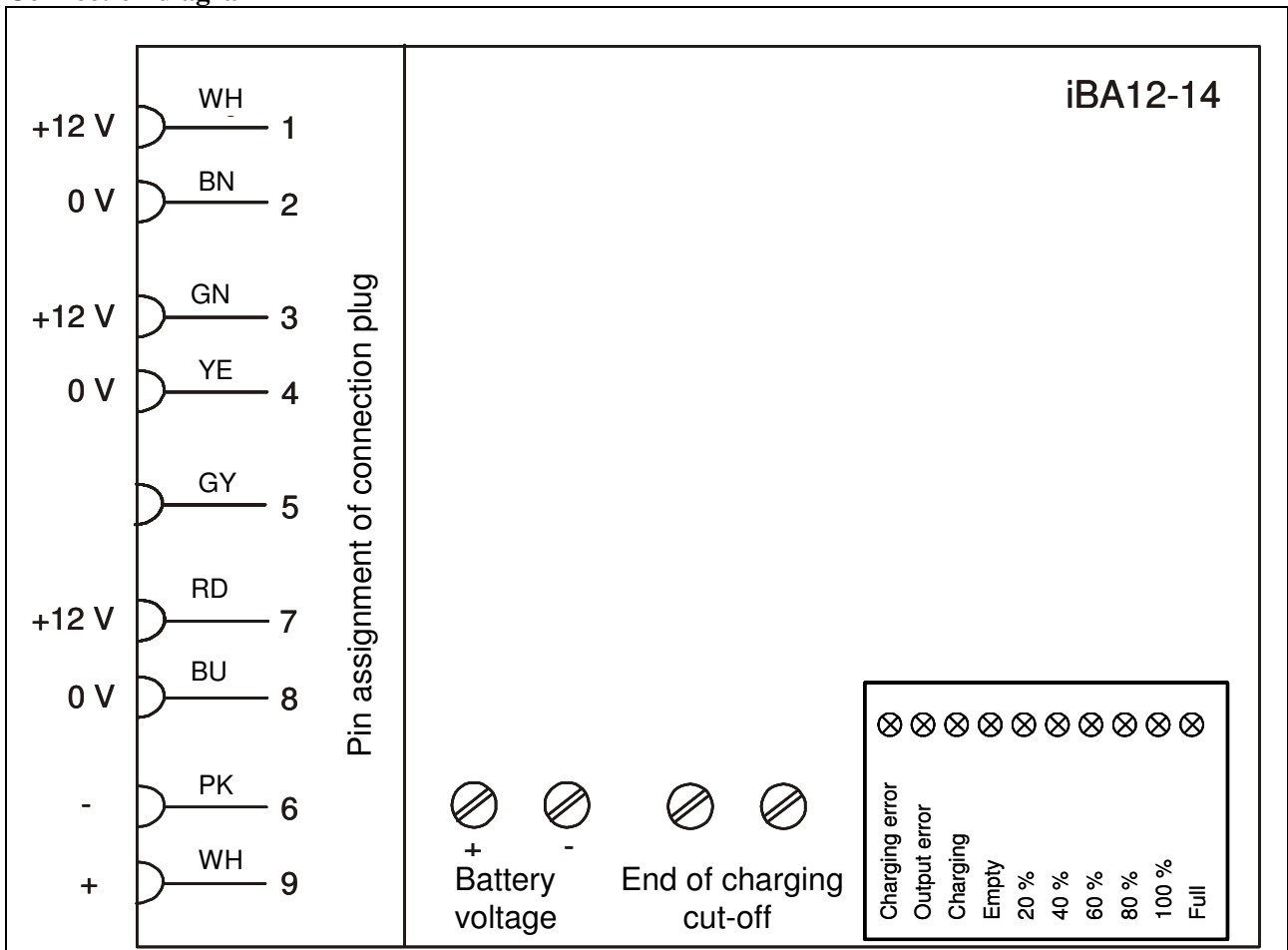
**Dimension sheet iBA12-14**



**Block circuit diagram iBA12-14**



**Connection diagram iBA12-14**




**Technical Data iBA12-14**

<b>Designation</b>	<b>Operating instruction</b>
<b>Type</b>	<b>iBA12-14</b>
Intrinsically safe Input-/ Charging circuit:	BU1.1 (+ 12 V) / BU1.2 (0 V) BU1.3 (+ 12 V) / BU1.4 (0 V)
Charging input 1	Connection jacks No. 1 (+) and No. 2 (-)
Voltage $U_i$	13.5 V <sub>DC</sub>
Current $I_i$	1.3 A
Inductance $L_i$	100 $\mu$ H
Capacitance $C_i$	300 $\mu$ F
Charging input 2	Connection jacks No. 3 (+) and No. 4 (-)
Voltage $U_i$	13.5 V <sub>DC</sub>
Current $I_i$	1.3 A
Inductance $L_i$	100 $\mu$ H
Capacitance $C_i$	300 $\mu$ F
Rated input voltage	12 V <sub>DC</sub>
Rated input current	2 x 1.1 A (normal charging) 2 x 200 mA (trickle charge)
Charging time	c. 18 h (charging with two power supply packs) c. 30 h (charging with 1 power supply pack)
<b>Note:</b>	Charging of the discharged battery may be carried out within hazardous areas be carried out with one or two authorised and approved power supply packs.
Intrinsically safe Output-/(Supply) circuit:	BU1.7 (+12 V) / BU1.8 (0 V)
Characteristic values	Connection jacks No. 7 (+) and No. 8 (-)
Voltage $U_0$	12.5 V <sub>DC</sub>
Current $I_0$	1.1 A
Inductance $L_0$	90 $\mu$ H
Capacitance $C_0$	20 $\mu$ F
Rated output voltage	12 V <sub>DC</sub>
Range of tolerance	10.8 to 12.5 V
Output current	1.0 A (within the rated voltage range)
Short circuit current	1.1 A
Automatic cut-off	Battery voltage 10.5 to 11 V (where battery is discharged)
Current consumption of the internal electronics when the consumer load is connected	$\leq$ 65 mA
Monitoring output	separate-potential optocoupler output BU1.9 (+)/ BU1.6 (-) for the connection of an intrinsically safe circuit
Characteristic values	Connection jacks No. 9 (+) and No. 6 (-)
Voltage $U_i$	15 V <sub>DC</sub>
Current intensity $I_i$	20 mA
Internal inductance $L_i$	negligible
Internal capacitance $C_i$	negligible
Contact closed	Residual capacitance > 5%
Contact open	Residual capacitance < 5% / empty

**Technical Data iBA12-14**

Activation input	
Characteristic values	Connection jacks No. 5 (+) and No. 4 (-)
Voltage $U_0$	18 V <sub>DC</sub>
Current intensity $I_0$	6 mA
Inductance $L_0$	100 mH
Capacitance $C_0$	4 $\mu$ F
Activation	Connection BU1.5 to BU1.4 (to be effected in the connection plug to the consumer load)
Internal Connection terminals in the battery power pack	
Test circuit accumulator block	Connection terminals No. 200.1 and No. 200.2
Voltage $U_0$	18 V <sub>DC</sub>
Current intensity $I_0$	1.8 mA
End of charging signal circuit	
Voltage $U_0$	5 V <sub>DC</sub>
Current intensity $I_0$	1 mA
closed:	switching back to trickle charge
open:	no switching back to trickle charge
NiCd-accumulator	
Structure	Parallel connection of two blocks each with 12 cells at 7 Ah
Rated voltage	1.2 V per cell
Rated capacity	14 Ah
Test output accumulator voltage	Decoupling over 10 k $\Omega$ resistance KL200.1 (+) / KL200.2 (-)
Charge level control	
Principle	Current balance
Indication	
LED "charging	Charging operation
LED " empty "	Battery empty (flashing)
LED "20% ... 100%"	Charge level indication (flashing slowly during charging operation)
LED " full "	End of charging reached
LED " Charging error "	Charging voltage monitoring stage $\geq 19$ V has responded, Charging is cut off
LED " Output error"	Monitoring circuitry of the first current-/voltage regulation stage has responded, output voltage is cut off
Mode of operation	
Operating position when in use	100% ED
Operating conditions	on holder for vertical mounting preferably within hazardous areas of coal mines
Temperature range	
Operation	
- Charging	0° C to + 40° C
- Discharging	-20° C to + 40° C
- Storage	-20° C to + 50° C
Protection type according to IEC 529	
Case	IP 54
Dimensions	stainless steel
Weight	See dimension drawing
	c. 21 kg (without holder)
	c. 24 kg (with holder)

### Technical Data iBA12-14

Approval / Examination	
- Explosion protection type	I M2 EEx ib I
- Examination certificate	BVS 04 ATEX E 043
Marking / Labelling	
The nameplate is marked as follows::	
Company	FHF Bergbautechnik D-42551 Velbert
Type	iBA12-14  I M 2 EEx ib I BVS 04 ATEX E 043 CE 0158
Charging operation	F. No: ... Testing: (Symbol, Month/Year) $0^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$
Discharging operation	$-20^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$

### **Mounting and Installation**

For stationary operation we recommend the use of the suitable holder, on which the battery power pack can be suspended.

The holder is designed for (preferred vertical) wall mounting.

The iBA12-14 battery power pack attaches to this holder by means of its 4 pegs.

Electrical connection to the electrical consumer load or to the power supply pack(s) for charging are subject to the installation regulations in force at any time.

Electrical connection:

Electrical connection between battery power pack iBA12-14 and the electrical consumer or charging device(s) is effected using a connection cable with a 10-contact plug (accessory) connected on the battery power pack side.

Interconnection with separate devices must be separately approved.

### **Setup for operation and settings**

Before setup of the battery power pack into operation, the fixing of the appliance, its installation and the connectors must be checked.

The "End of charging cut-off" is always to be employed when the battery power pack is being operated in hazardous areas. Before the initial operation the pack must be checked.

### **Waste Disposal**

The disposal of the packaging material and of used parts must be realised in compliance with the regulations of the country in which the device is installed.

## Care, maintenance and charging

Ensuring reliable functioning of the battery power pack is dependent upon its charge level. For this, see above under **“Operation”, ‘charging procedure’**. The iBA12-14 battery power pack is maintenance-free, as are the inbuilt accumulator cells. In order to ensure **careful** handling of the cells and a long service life, the following points should in principle be observed:

No long-term storage with activated activation input.

Activation input under-voltage cut-off and deep -discharge protection:

The activation input is applied to contacts in the jack, so that activation can be done automatically by inserting the consumer loads plug. If, at the end of discharging, the under-voltage cut-off monitoring circuit disconnects the accumulator block from the supply output, then within several hours the connection to the load should be separated (deactivation of the activation input). Otherwise the under-voltage cut-off circuit remains active / consumes current from the battery and leads in the long run to further discharging of the accumulator cells.

Batteries with an empty accumulator should be immediately recharged, no long-term storage with an empty accumulator, only fully-charged batteries should be stored long-term.

During long-term storage the battery is to be recharged at regular intervals (3-6 months). The inbuilt accumulator cells are subject to self-discharge, which increases sharply as the temperature rises (after 10 days at 20°C only approximately 75% of the original capacity remains available). The available capacity of the cells also decreases in long-term storage. For these reasons, following a period of long-term storage the accumulator cells of an iBA12-14 battery power pack need around 5 complete charging-discharging cycles until the rated capacity is again fully attained.

Avoid long-term storage at high ambient temperatures.

The ideal operating temperature for the charging and discharging operation lies at 20°C to 25°C. At higher temperatures (>30°C) the charging efficiency of the cells is clearly inferior (at 40°C it is around 75% of that at 20°C).

At low temperatures (<0°C) the available capacity of the cells decreases sharply (at -20°C it is around 75% of that at 20°C). As capacity decreases, reforming of the accumulator is to be effected by a controlled overcharging (30 h charging with 2 power packs with the “End of charging cut-off” bridge (KL2) **removed**) outside the hazardous area.

Charge level indication

It is not possible to determine the charge level and available capacity of an accumulator with any accuracy. One can however approximate the actual values. The process employed here is based upon the principle of current balance, that is to say the inflowing and out-flowing currents are measured and integrated and the charge level of the accumulator is calculated from these. Since charging efficiency and total capacity exhibit a spread of values and also vary with temperature, it may be that, over the course of time, indication fails correspond to the actual charge level. In that case the “end of charging cut-off” bridge can be temporarily removed, thus preventing the battery from being switched down to trickle charge. The iBA12-14 should then be fully and carefully charged over a fixed period (30 h when feeding with two power supply packs). A permanent overcharge must however be avoided at all costs, since otherwise the temperature fuses could be tripped or the accumulator cells could be damaged. If the terminal voltage of the accumulator has fallen below 11 V (measurable on the “battery voltage” terminals) then by switching on the charging device the accumulator with a smaller current than in normal operation is pre-charged. This procedure may, depending upon the existing remaining capacity of the accumulator, take from several minutes up to one hour. Once the battery terminal voltage has reached a value of  $\geq 11$  V there is a changeover to normal charging operation and the LEDs in the charge level indicator begin to flash.

Charging may only occur at ambient temperatures of between 0°C and +40°C. Charging at negative ambient temperatures is not permitted.

Charging within the hazardous areas may only be performed by connecting to authorised and approved power supply packs with an intrinsically safe output. Either 1 or 2 power supply packs may be connected. The maximum output voltage  $U_0$  may amount to  $\leq 13.5$  V, and the maximum output current  $I_0$  may amount to  $\leq 1.3$  A.

On operation within hazardous areas, the “end of charging cut-off” connector must always be inserted. This is to be checked before putting the battery power pack into operation.

Charging outside the firedamp hazard area can likewise be carried out with 1 or 2 power supply packs. These must not be of explosion proved design. It must however be ensured that the maximum output voltage  $U_m$  amounts to  $\leq 13.5$  V, and that the maximum short circuit current  $I_k$  amounts to  $\leq 1.3$  A.



**Warning and Safety Advice**

<p>What is involved here is an appliance designed with explosion protection of appliance group I M2 and intended for operation within methane gas hazardous areas. The following warning and safety instructions are particularly to be observed:</p>
<p>Interconnection to other electrical apparatus must be separately authorised. The appliance may only be connected to, and operated with, approved and authorised power supply packs. Polarity instructions are to be observed.</p>
<p>Where a high methane content is detected the appliance should not be operated.</p>
<p>The appliance should only be operated if undamaged.</p>
<p>On operation of the appliance in commercial facilities the accident prevention regulations of the commercial trade associations for electrical installations and apparatus are to be observed.</p>
<p>The appliance may only operate under the specified ambient conditions. Adverse ambient conditions may lead to damaging of the appliance and thus to a possible risk to the life of the user. Such adverse ambient conditions may include:</p> <p>Increased methane gas level</p> <p>Humidity, dust (observe protection type)</p> <p>Inflammable gases, fumes, solvents, which are not covered by the explosion protection type of the appliance</p> <p>Excessively high ambient temperatures (&gt; +40°C)</p> <p>Excessively low ambient temperatures: (&lt; -20°C) for discharging operation or (&lt; 0°C) for charging operation</p> <p>The ambient operating temperature must not fall below, or exceed, the ambient temperature range specified for the appliance.</p>
<p>Only those connectors prescribed by the manufacturer may be used for cables and wires.</p>
<p>The incorporation or annexing of further parts is forbidden.</p>
<p>The appliance is designed for use within coal mine areas which are subject to firedamp hazard.</p>
<p>Repair works may only be carried out by the manufacturer or by a person appointed by the manufacturer on execution of a renewed routine test on the appliance.</p>
<p>Should these points not be observed, the explosion protection can no longer be guaranteed.</p>
<p><b>Instructions for disposal:</b></p> <p>Faulty or used NiCd accumulator cells are to be taken away for lawful disposal in the prescribed manner.</p>

<p>FHF Bergbautechnik GmbH &amp; Co KG Eintrachtstr. 95 D-42551 Velbert</p>	 <p>FHF Bergbautechnik GmbH &amp; Co. KG</p>	<p>Tel: 0049 (0) 2051 270-0 Fax: 0049 (0) 2051 270-366 Mail: <a href="mailto:info@fhf-bt.de">info@fhf-bt.de</a> URL :<a href="http://www.fhf-bt.de">www.fhf-bt.de</a></p>
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## EC CONFORMITY DECLARATION

We hereby declare that, by virtue of its conception and design (and construction) and of the nature of the model introduced into circulation by us, the product indicated below conforms to the relevant health and safety requirements of the said EC Directive(s).

In the event of a modification to this product which we have not authorised, this Declaration shall no longer remain valid.

Designation of the product: **Battery power pack**

Appliance type or type designation of the individual components: **iBA12-14**

Type test certificate: **BVS 04 ATEX E 043**

Relevant EC Directive(s): 94/9/EC

Related harmonised Standards, in particular: EN 50014: 1997+A1+A2 General Requirements  
EN 50020:2002 Intrinsic safety i

Related National Standards and Technical Specifications; in particular: -/-

Named authority for the Type Test Certificate:  
EXAM BBG Prüf und Zertifizier GmbH  
Fachstelle für Sicherheit elektrischer Betriebsmittel – BVS  
Postfach 10 27 048 D 44727 BOCHUM

Named authority for monitoring: EXAM BBG Prüf und Zertifizier GmbH

Identification Number: 0158

This Declaration is the responsibility of the manufacturer / importer  
FHF Bergbautechnik GmbH & Co. KG  
Eintrachtstrasse 95  
D-42551 Velbert

made through: Dr. Opitz, Hans-Peter  
(Surname, Forename)

Manager  
(Position within the manufacturer's organisation)

Velbert \_\_\_\_\_  
(Place) (Date) (Signature)