

Operation Instruction

“AKKUTEK 2403 DC”

NBUA0523G01***

with battery sensor

MTIA – Q33G3M01

and

battery module

NBBH - Q33G1M01

1/12

Technical modifications possible!



Safety regulations

The assembly, start-up and maintenance may be done by trained personnel only. Mains connection must be realized according to DIN VDE 0100. An equipment for protection and safety to release the power supply must be foreseen. The unit is conform to protection class I and protection system IP20, the operation is only allowed in cabinets or in closed electrical branches! No components to be maintained by the user are integrated in the unit. The unit may only be opened by qualified personnel. In case of failure we recommend to send the unit back to the manufacturer .

The disregard of the safety regulations may cause perilous injuries. In case of exceeding the values given in the technical Data, the risk of damage of the unit occurs.

- ◆ The valid VDE-regulations, especially DIN VDE 0100 and EN 60204 are to be respected!
- ◆ The allowed environmental temperature range must be respected!
- ◆ To prevent overload of the DC-output circuit, the circuit must be protected externally with a fuse. (value s. point 3.1)!
- ◆ Only the battery types specified for the unit are permitted to be used!
- ◆ Battery replacement is only to be made with the unit unpowered! (See Section 10)!
- ◆ On the connection of external backup batteries, battery protection must be provided by the user! In this case the protection components (overload and short circuit protection!) must be installed as close as possible to the set of batteries for safety reasons!
- ◆ On the usage of batteries, sufficient air flow in accordance with VDE 0510, part 2 must be ensured.
- ◆ Never connect together new and used batteries, or batteries of different types, or from different manufacturers!

1. Short Description

The battery backed up DC power supply in the **AKKUTEC** range uses the standby-parallel principle of operation and, in conjunction with a lead accumulator, ensures that the DC power supply is reliably maintained in the case of a mains power failure.

The power supply has the following features:

- battery charger system with I/U charging characteristic
- Microcontroller-based battery management
- Temperature compensation for charging voltage by means of external sensor module (optional module)

1.2 Intended Use

The **AKKUTEC** is designed and developed for industrial applications and system engineering.

The installation of the **AKKUTEC** has only to be made by qualified electricians.

If the **AKKUTEC** is operated outside its intended use, the protection supported by the **AKKUTEC** cannot be guaranteed.

2. Transportation and storage

The transportation of the unit may only be carried out in the original packaging. During transportation and storage the environmental conditions must be observed (see section 4 Technical Data). The units must be protected against humidity and direct sunlight. If lead accumulators are included, they must be recharged at least each half year in case of longer storage.

Equipment designation	Comments	Art. No.	nominal input voltage	nominal output voltage
NBUA0523G01002	IPC function		24 V DC	24 V DC
NBUA0523G01003	standard-unit, single module		24 V DC	24 V DC

3. Norms and regulations

EMC	EN 55011 / 1998 class EN 61000-3-2 und EN 61000-3-3 class A EN 50082-2 1995
Overall unit	EN 50178 / EN 61010-1 / EN 61010-2-201 EN 62368-1

4. Technical Data

4.1 Electrical Data

Input	
Nominal input voltage	24 V DC -10 % +20 % (21,6...28,8 V DC)
Nominal input current	3,7 A @ (U _e = 24 V DC, U _a = 26,4 V DC, I _a = 2,85 A)
Inrush current	≤ 80 A/200 μs
Nominal input power	87 W @ (U _e = 24 V DC, U _a = 26,4 V DC, I _a = 2,85 A)
Output	
Nominal output voltage	24 V DC
Output voltage (without temperature tracking)	19,8...26,8 V DC ±0,4 %
Output voltage (with temperature tracking)	19,8...27,8 V DC ±0,4 %
Final charging voltage with / without temperature tracking	26,8 V DC ±0,4 % / 26,4...27,8 V DC ±0,4 %
Load shedding	19,8 V DC ±0,4 %
Nominal output current	2,85 A
Self-consumption current (in back-up operation)	95 mA
Max. power loss 'worst-case'	13 W @ (U _e = 24 V DC, U _a = 26,4 V DC, I _a = 2,85 A)
efficiency	85 % @ (U _e = 24 V DC, U _a = 26,4 V DC, I _a = 2,85 A)
Charging characteristics	IU-characteristics DIN 41773-1
Fusing	
Internal device protection	4 A (T), 250 V
Fusing battery circuit (external)	3 A (T), 250 V
Fusing output (external)	3 A (T), 250 V
Pre-fusing	5 A (T), 250 V
In general	
Protective system of the housing	IP20
Over voltage category	II
Degree of pollution	2
Battery type	Lead accumulator*
Dimensions (H x W x D) standard device	92,5 mm x 60 mm x 116 mm
Weight standard device (without batteries)	0,6 kg
Operational temperature	0 °C ... +40 °C
Storage temperature	0 °C ... +50 °C
Relative humidity	≤95 % non-condensing
Max. height above sea level (without load reduction)	2000 m

*basic paramterisation for VRLA-lead accumulators (AGM, SLA)

4.2 Display and Messages

mains OK	LED green, illuminates at: • mains operation, this means U _i ok
battery OK	• LED green , goes out at • disconnection of battery circuit • battery voltage < 21,6 V (battery operation) • battery damaged • battery temperature > 45 °C

4.3 Messages In- and output

mains OK	Potential-free relay-contact, change-over, max. contact load 30V DC/ 0,5A
battery OK	Potential-free relay-contact, normally open, max. contact load 30V DC/ 0,5A
Shut-Down	shut down of the UPS-operation switched input referring to earth, switching level: 24V DC (6-45 V DC)

- 1) The signal contacts are coupled to LED's. (s. point 4.2). The illumination of a LED thus results an energizing of the corresponding relay.

4.4 Values for the Messages and Functions.

temperature tracking final charging voltage	active , when the optional module is connected 27,85 V at 0 °C 27 V at 25 °C corresponds to - 2,833 mV per cell and °C 26,3 V at 45°C
battery OK	battery low (battery operation) LED and contact closed $\geq 22,6$ V LED and contact open $\leq 21,6$ V
battery circuit testing	1 x per minute for 1 sec - LED green batt Ok: goes out if negative battery circuit test - contact (Batt OK) : open in case of negative battery circuit test
battery test	1 hour after mains connection, every 24 hours at mains operation for 8 sec - LED green batt Ok: expires if negative battery test - contact (batt OK) : open in case of negative battery test - battery test negative : voltage < 22,3 V DC (voltage for battery test 22 V DC)
battery over temperature	If the temperature sensor is connected Temp. > 45°C - LED green batt Ok: goes out if battery temperature > 45°C - contact (batt OK) : open at battery temperature > 45°C
deep discharge voltage	19,8 V +/- 0,4 V

5. Installation

The battery backed up DC power supply is to be installed such that the necessary cooling is provided. A minimum separation of $\geq 40\text{mm}$ to neighbouring equipment or assemblies in the area of the ventilation openings is to be maintained. The installation is always to be made in such a way that sufficient air circulation through the unit is ensured.

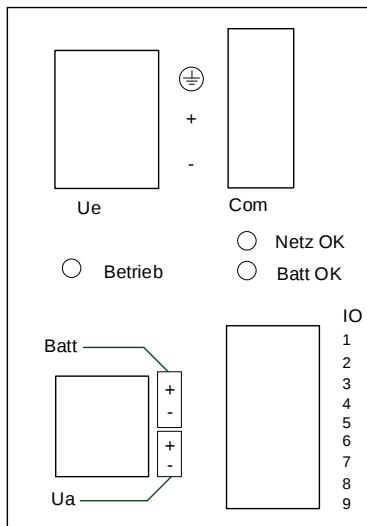
The temperature of the cooling air at the bottom of the unit may not exceed the value given in the technical data. The maximum mounting heights without load reduction is about 1000 m above sea level. During installation, the unit is to be covered in the case that swarf from drilling can fall on or in the unit. **(Risk of short circuit!)**



The unit is a built-in unit and is designed for pollution degree 2. Operation is only permitted in dry rooms and in closed switch cabinets or enclosures

6. Connection

Prior to connection, the values for the mains voltage and frequency as well as the values of the battery are to be checked against the values on the rating plate. Connect in accordance with the labels on the connecting terminals. (See main block diagram and connector assignments). Unused connecting terminal screws are to be tightened.



Terminals			Connection	
Designation	Max. tightening torque/Nm	Min. cable cross section/mm ²		
PE(⊕), +, -	Push-In spring connection	0,75	Input voltage	
Batt+, Batt-	Push-In spring connection	0,5	Batteries	
Ua+, Ua-	Push-In spring connection	0,5	loads	
Com	9-polige D-SUB-Buchse		RS232-interface	
IO-1 (1, 2)	Push-In spring connection	0,2	Temperature sensor	
IO-1 (3, 4)			UPS-Switch-Off	24 V DC/10 mA
IO-1 (5 = NC, 6 = NO, 7 = COM)			Message contact Mains OK (mains present: 6/7 closed mains interruption: 5/7 closed)	30 V DC/0,5 A (potential-free relay contact)
IO-1 (8 = COM, 9 = NO)			Message contact Batt OK	

Dimension the cable cross section off he incoming and outgoing lines according to EN 62368-1 table G.5; also see table above.



In the case of overload, the DC output current comprises the maximum charging rectifier current as well as the current from the battery. To prevent overload of the DC output circuit, the circuit is to be protected externally ! (Value see Section 4.1)



8. Putting into operation

The unit is switched on by the application of the mains supply.



The battery voltage must match the nominal voltage of the AKKUTEC!

Never reverse the poles of the battery!

Never short circuit batteries! Risk of arcing!

Check the connections for correctness prior to switching on for the first time

Only make electrical connections with the unit unpowered

Only use lead batteries. Never use other battery technologies.

When connecting the batteries, make sure that the nominal voltage and polarity match.

Never reverse the polarity of batteries. Never short circuit batteries!

Failure to do so may result in burns from electric arcs or glowing parts.



9. Operation

Approx. 2s after the switch on of the mains, the output voltage is released and the loads which are connected are supplied with power. The back up battery is also charged. This operating mode is indicated by the illumination of the green 'Netzbetrieb' (Mains Operation) LED.

By removing the mains voltage, or if the input voltage drops below the minimum, the **AKKUTEC** switches over to battery mode. The 'Netzbetrieb' (Mains Operation) LED is not illuminated in this case.

The illumination of an LED always results in the energisation of the corresponding signal relay. (See block diagram, point 6)

9.1 Battery circuit control

To check the capability of the UPS to provide back up, the battery circuit is tested cyclically at intervals of 60s; the first test is performed 60s after mains switch on. By means of this test it is possible to identify an open circuit or the high resistivity of the battery circuit. A defective battery circuit is indicated by the expiry of the 'Batt ok' LED

9.2 Battery test

During mains operation, a cyclic battery test loads the battery whilst the voltage is measured. In this way it is possible to evaluate the quality of the battery. A seriously aged battery is indicated by the expiry of the LED "Batt. OK". About one hour of switching on the mains the first battery test is effected, each other after 24 hours.



The battery test is used to detect seriously aged batteries. To evaluate the backup capacity of the batteries with this system, it is imperative that a manual battery check is performed from time to time! (See point 13)

9.3 Shut-Down

To avoid discharging the backup batteries to the deep discharge limit unnecessarily, it is possible to shut down battery operation early. This is performed by applying a +24V DC control voltage to connection 3 (+) and 4 (-) on the 'IO-1' terminal strip.

9.4 Temperature compensation (optional modul)

Lead batteries have a temperature coefficient of approx. $-3\text{mV per } ^\circ\text{C}$ and cell. The **AKKUTECH** final charging voltage is selected such that battery charging is provided over a temperature range of $15\text{--}45^\circ\text{C}$.

In applications with frequent and large temperature variations, the charging voltage should be appropriately compensated to achieve optimal battery life. Also, particularly in the case of very low surrounding air temperature ($T_u < 15^\circ\text{C}$), compensation should be performed to ensure adequate battery charging.

By connecting the external temperature sensor module (option) to terminal strip 'IO-1' connection 1 and 2 (note poles!), temperature compensation is automatically activated. For an surrounding air temperature variation of $0\text{--}45^\circ\text{C}$, the final charging voltage (and thus also the output voltage) varies over a range of $27.85\text{--}26.3\text{ V DC}$

Battery temperatures above 45°C are indicated by the expiry of the LED "Batt ok".



To obtain satisfactory battery life, the operating temperature of the batteries should not exceed 20°C . Higher temperatures lead to a drastic reduction in the life!

10. Taking out of operation

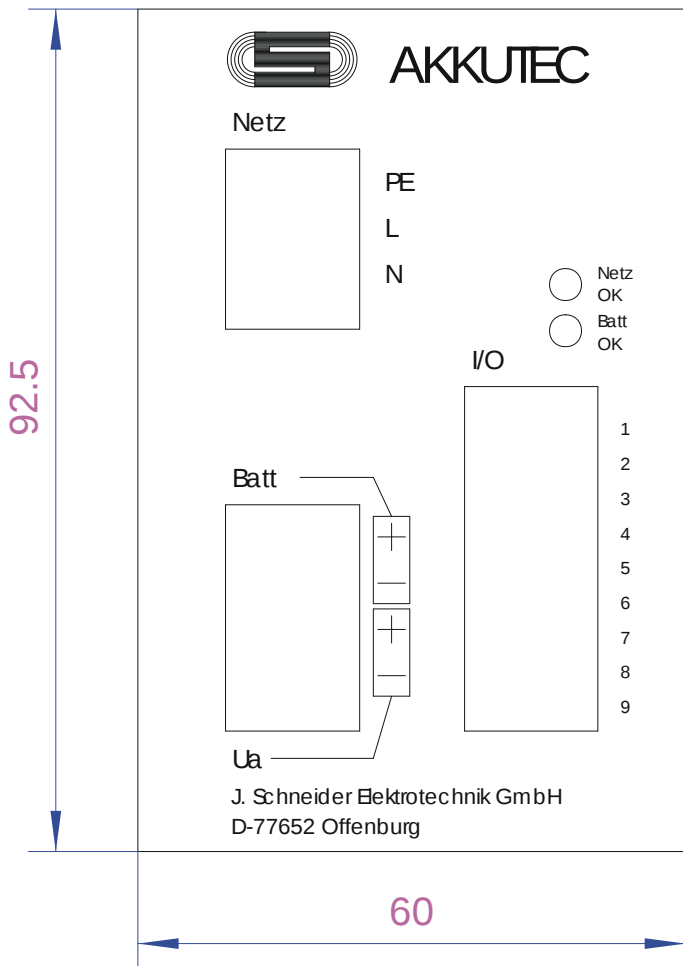
The unit is taken out of operation by removing the mains supply. To prevent subsequent backup from the batteries, the battery circuit must be opened by activating 'Shut-Down'. (See point 9.3) The LED's 'Netz ok' (Mains Operation) and 'Batt ok' must expire.



**Never undo electrical connections whilst the unit is in operation!
It also not permitted to make electrical connections whilst the unit is in operation!**

11. Installation Drawings

snap fixation for 35 mm Norm profil tracks
DIN EN 50022-35 x 15/7,5



Tiefe 116mm inkl. Klemmen
depth 116mm incl. terminal

12. Maintenance

To ensure adequate backup capacity of the power supply, the capacity of the batteries should be checked at regular intervals of 3 to 6 months.

Checking the battery: Force battery operation by switching off the mains. The batteries must achieve the required bridging time under nominal conditions. When the deep discharge limit is reached, the **AKKUTEC** switches off automatically.

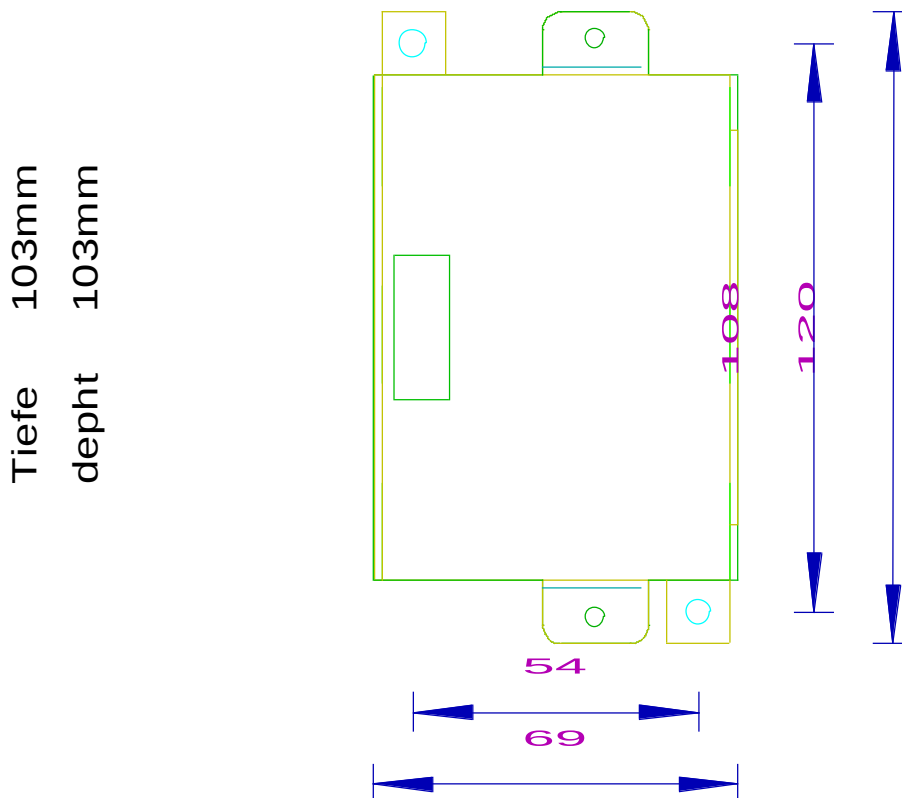
The unit is to be cleaned at least once a year, depending on the degree of soiling.

12.Battery module

Operation mode Battery module

NBBH 2401

Artikel Nr.: NBBHQ33G1M01



battery type:

maintenance-free lead-battery 24V / 1 Ah

battery fusing:

3 A FK2

back-up time:

30 min at 2 A load

dimensions in mm:

(width x height x depth) : 69 x 120 x 103mm

assembly:

on 35 mm norm profile tracks

DIN EN 50022-35 x 15/7,5

assembly:

by fastening lashes look at drawing

12.Optional module

Operation mode temperature sensor AKKUTEC 2402

MTIA – Q33G3M01

The assembly, start-up and maintenance may be done by trained personnel only. The operation mode is to be read carefully before the use and the installation of the unit!

The disregard of the safety regulations may cause the loss of all guaranty and warranty claims.



Safety regulations

- ◆ The sensor is realized according to IP20. The operation is only allowed in dry rooms!
- ◆ The connection or disconnection of electrical connections may only be done when the unit is not under voltage!

General Note concerning the charge of lead batteries

Lead batteries have a temperature coefficient of approx. -3mV per °C and cell. The final charging voltage is selected such that battery charging is provided over a temperature range of 15-45°C.

In applications with frequent and large temperature variations, the charging voltage should be appropriately compensated to avoid a battery over charging (danger of gas). Also, particularly in the case of very low surrounding air temperature ($T_u < 15^\circ\text{C}$), compensation should be performed to ensure adequate battery charging.

By connecting the external temperature sensor module (option) to terminal strip 'IO-1' connection 1 and 2 (note poles!), temperature compensation is automatically activated. For an surrounding air temperature variation of 0-45°C, the final charging voltage (and thus also the output voltage) varies over a range of 27.85 - 26.3 V DC

Battery temperatures above 45°C are indicated by the expiry of the LED "Batt ok".



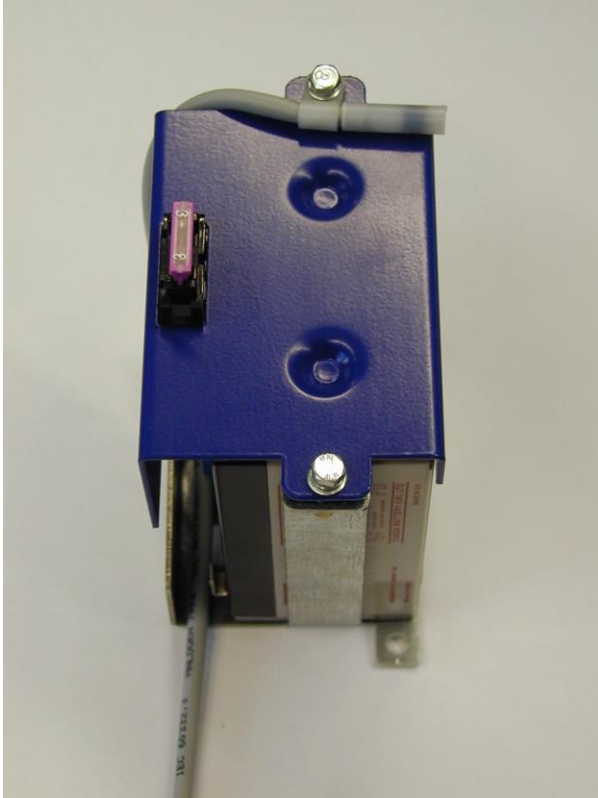
To obtain satisfactory battery life, the operating temperature of the batteries should not exceed 20°C. Higher temperatures lead to a drastic reduction in the life!

Delivery

temperature sensor with 1m connection cable 0,5 mm²

Nylon-cable clamp with 4,3 mm² drill hole

Installation



The battery sensor should be installed near the battery as shown in the example of the battery module NBBH 2402 (see picture). In this way the accurate measurement of the environmental temperature of the battery is granted.

Connection

The temperature sensor is connected at the terminal 'IO-1' connection 1 and 2 of the AKKUTEC 2402. The polarity of the connection cable is free. A maximum length of the cable of 3 m is to be observed. The width of the cable should amount to 0,5 mm².

Start-up operation

The temperature sensor is recognized automatically from the AKKUTEC after the mains is switched on and the charging voltage is compensated depending on the temperature. An additional parameter or the switch on by a separate switch at the unit is not necessary.