



DC-USV

NBPA1630G01***

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1. General

The accumulator buffered DC supply guarantees a safe backup of the DC supply in case of a mains failure. Every other use is strictly excluded.

The operating instructions must be read prior to use or installation; all instructions have to be considered!

Commissioning and maintenance may only be performed by qualified specialist personnel.

All warranty and guarantee claims could be lost in case of non-observance or unauthorised modifications!

1.1 General safety notes



NOTE

The operating instructions must be read prior to installation or use of the unit. The instructions must be observed. All warranty claims could be lost in case of non-observance!



DANGER

Only specialised electricians are authorized to commission and maintain the unit. Improper handling with voltage procedures or lead accumulators can lead to electric shock and severe burns.



DANGER

All work on the unit may only be performed in de-energized state!

The five safety rules must be observed.

Input and output lines must be sufficiently dimensioned and fused!

Never open the housing. Repair may only be done by the manufacturer!

Non-observance can lead to fatal electric shocks.



CAUTION

For use in a controlled environment refer to chapter 11 Technical Data for environmental conditions.



NOTE

In case of malfunction we recommend to send the unit to the manufacturer

The unit has been developed for protection class I and has the degree of protection IP20. Operation is only admissible in dry rooms. The operation is only allowed in closed housings. This device is designed for pollution degree 2.

The admissible ambient temperature range must be observed!

The DC output circuit must be fused externally in order to avoid overload! (See section)

The two energy sources (mains and lead accumulator) must be separated in order to de-energize the unit on the output side!

Only the lead accumulator types specified for the unit must be used! The change of lead accumulators must only be performed when the unit is de-energized! (see section 7.2). If external buffer accumulators are used, accumulator safeguarding must be performed by the user! For safety reasons, the safeguarding element (overload and short circuit protection) must be arranged in close proximity to the accumulator set! If lead accumulators are used, sufficient air flow must be provided according to VDE 0510-485-2.

Never interconnect new and used lead accumulators, or lead accumulators of different types or from different manufacturers.

Used lead accumulators must be disposed carefully

1.2 Short description

The accumulator buffered DC supply works according to the standby parallel principle and guarantees, in connection with a lead accumulator and for a certain time interval, a safe upkeep of the DC supply in case of a mains failure. The overall output current is split up between consumer supply and lead accumulator charge.

The power supply is characterized by the following properties:

- Switching power supply with I/U charging characteristic
- aktiv power factor correction (PFC)
- Micro-controller supported lead accumulator management
- RS232 for monitoring and parameterization
- Temperature adjustment of the charging voltage by an external sensor

1.3 Intended Use

The **AKKUTEK** is designed and developed for the industrial and plant engineering sector. The installation of the **AKKUTEK** is to be carried out exclusively by qualified electricians.

If the **AKKUTEK** is operated outside of its intended use, the protection supported by the **AKKUTEK** 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 11 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.

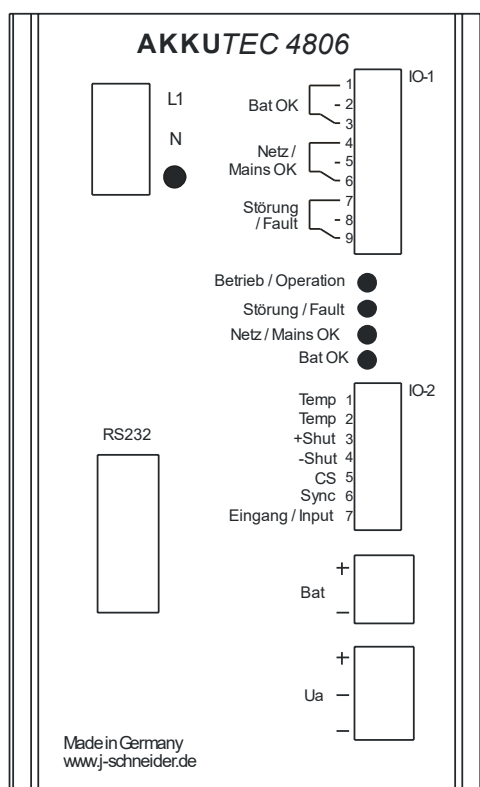
3 Installation and connection

3.1 Installation

The unit must be installed in a way that the necessary cooling is guaranteed. A minimum distance of $\geq 75\text{mm}$ must be kept to neighbouring units or assemblies in the area of the ventilation slots.

The installation must always be performed in a way that sufficient air circulation through the unit is ensured. All fixing points must always be used for fixing the unit.

The specific environmental temperature must not be exceeded. The maximum mounting height without load reduction amounts to 2000 m above sea level.



NOTE

If swarf could fall onto or into the unit, it must be covered during installation. (Danger of **short-circuit!**)



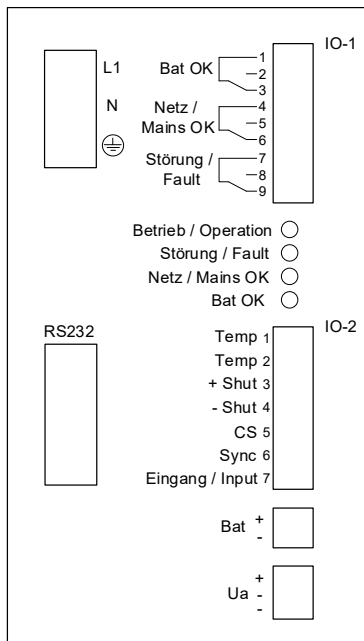
NOTE

The unit is a built-in unit. It may only be operated in closed switch cabinets or enclosures. The unit is designed for pollution degree 2. The switch cabinets or enclosures used must meet the requirements for enclosures according to EN 62368-1. Observe the specifications for ventilation openings in the enclosure in accordance with sections 6.4.8.3.3 and 6.4.8.3.4. A warning notice "Warning of electrical voltage" (ASR A1.3 W012) must be attached to the enclosure.

Mounting height: 155.0mm
 mounting width: 95.0mm
 mounting depth: 183.0mm (without terminals)

3.2 Connection

Before connection, check that the values of the DC supply correspond to the values on the type plate. Make the connection according to the designation of the terminals (see terminal assignment). Tighten unused connection screws.



Terminal	Max. tightening torque/Nm	Min. cable cross section/mm ²	connection	
L1, N, PE(⊕)	0,5	0,5	Mains voltage	
Bat OK (1 = COM, 2 = NO, 3 = NC)	0,25	0,1	Message contact Bat OK	Maximum contact load: 60 V DC/0,25 A (potential-free relay contacts)
Netz/Mains OK (4 = COM, 5 = NO, 6 = NC)			Message contact Netz/Mains OK	
Störung/Fault (7 = COM, 8 = NO, 9 = NC)			Message contact general error	
RS232	9-polige SUB-D-socket		RS232-interface	
Temp(1), Temp(2)	0,25	0,1	Temperature sensor / fuse board	
+Shut(3), -Shut(4)			UPS-Switch-Off	24 V DC/10 mA Ungrounded switch input)
CS (5)			AKKUTECH (Master-Slave-operation)	
Sync(6)			AKKUTECH (Master-Slave-operation)	
Eingang / Input(7)			Fuse board	
Bat+, Bat-	0,5	1,0	Batteries	
Ua+, Ua-	0,5	1,0	load	

Dimension the cable cross section of the supply and output cables according to EN 62368-1 table G.5; see also table above.

If the system is installed in accordance with EN 62368-1 and supply lines leave the room (building wiring), observe section 6.5.3 of EN 62368-1

	REFERENCE The external power supply must be connected to a circuit with its own specially marked fuse (16 A). Before this fuse protection, only one fuse may be used up to the low-voltage side feed point of the electrical network (house junction box). It must be excluded that the circuit for external power supply is interrupted by switching off other equipment.
	REFERENCE In case of overload, the DC output current is composed of the maximum charging rectifier current and the lead battery current. To prevent an overload of the DC output circuit, it must be protected externally!
	REFERENCE Observe the limitation of the output power according to EN 62368-1 section 6.5.3 or Ta-belle Q.1 for cables leaving the room. Protect these cables so that a maximum output power of 100 VA can be transmitted.
	DANGER The unit is prepared for protection type I (protective earthing). The operating earth must be connected. If this is not observed, touchable parts may carry voltage in case of a fault. There is a danger of fatal electric shock.

3.3 Connection lead accumulator

The lead batteries are connected to the external power supply with the battery cables. The lead accumulators are connected to the terminals "+Bat" and "-Bat". For four 12 V lead batteries, connect them in series (positive pole of one lead battery with the negative pole of the other). If there are eight 12 V lead batteries, connect four lead batteries in series and then connect the two battery lines in parallel.

When connecting external buffer batteries, the battery protection must be provided by the user! For safety reasons, the fuse element (overload and short-circuit protection) must be positioned as close as possible to the battery pack. When using lead accumulators, sufficient air flow must be ensured in accordance with VDE 0510-485-2.

	REFERENCE Only use approved lead batteries. Never use different types of lead acid batteries or lead acid batteries from different manufacturers or used and new lead acid batteries together.
	CAUTION Protect or insulate the poles when connecting the lead batteries. When bridging, there is a risk of severe burns from electric arcs or glowing parts.
	CAUTION When lead batteries are charged, hydrogen is produced, which can form a dangerous oxyhydrogen gas. Ensure adequate ventilation. Failure to do so may cause deflagration.
	CAUTION 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.
	REFERENCE Make sure that the lead batteries are properly attached. Never install unmounted lead batteries in the appliance, as there is a risk of short circuit!
	REFERENCE For AKKUTEK parallel connection (master/slave operation), the 48 V battery outputs must be connected together. Under no circumstances should one battery string be connected to the master and the other battery string only to the slave. A connection of plus and minus is absolutely necessary.
	REFERENCE Used lead batteries must be disposed of in an environmentally friendly manner!

3.4 Connection of mains voltage

The input voltage of the external energy supply must correspond to the mains voltage at the distribution. The mains voltage must be disconnected and secured against unintended powering up.

The voltage-free mains cable must be connected to the mains connection terminal provided for this, taking into account the phase. Mains connection must be performed to the terminals "L1", "N" and PE ().

It is obligatory to connect to operational earth.

3.5 Connection load

When connecting the load, the polarity "+" and "-" must be considered.

If the mains voltage is disconnected, and if the minimum input voltage is fallen short of, the external energy supply changes over to buffer operation.



NOTE

In case of overload, the DC output current is composed of the maximum charge rectifier current and the lead accumulator current. The DC output circuit must be fused externally in order to avoid overload!

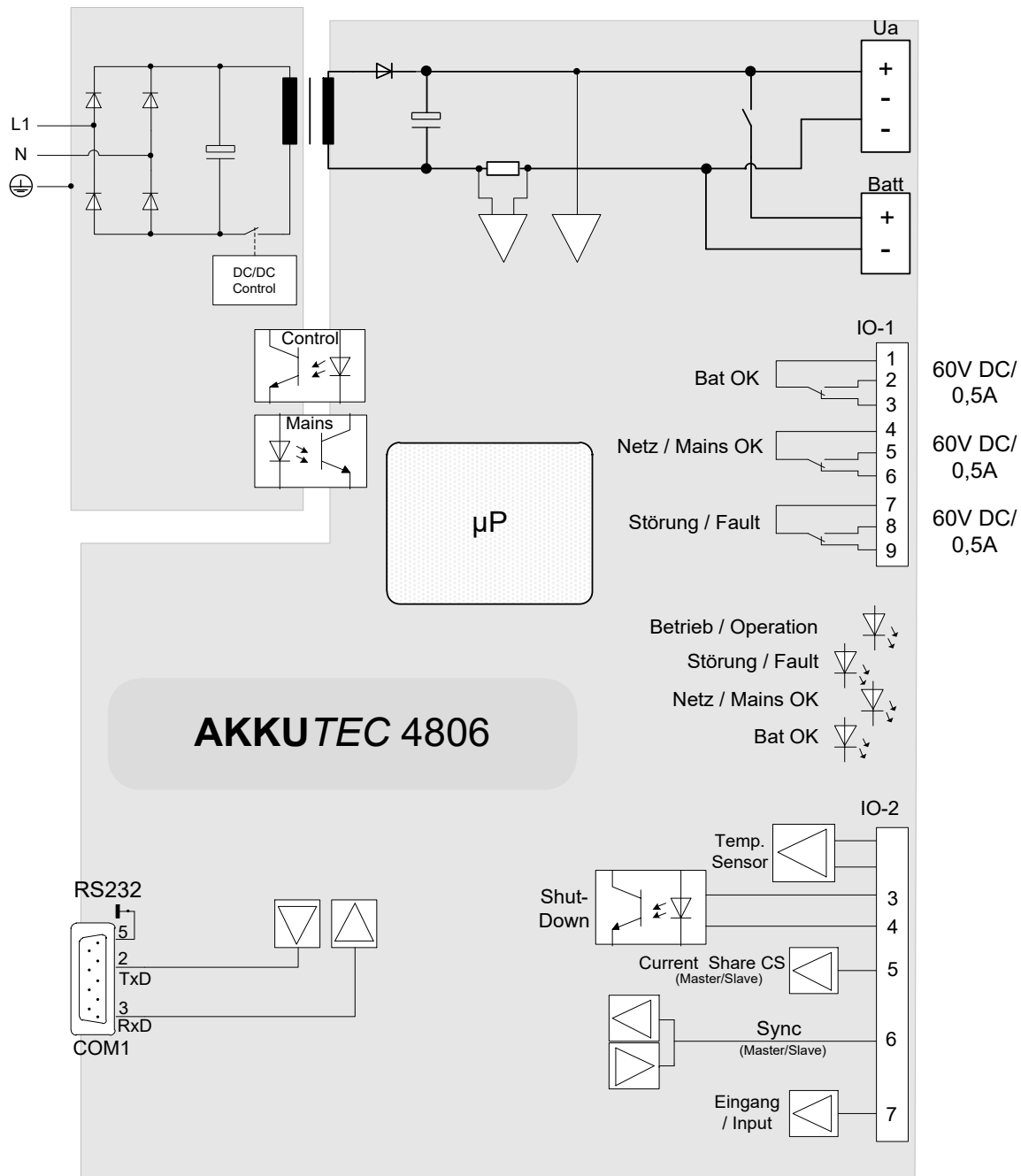
3.6 Circuit diagram

Connection	Terminal	Signal contact	Terminal
Mains connection	L, N, PE	Mains operation	IO-1: COM=4; NO=5; NC=6
DC output (load)	+Ua, -Ua	Bat-OK	IO-1: COM=1; NO=2; NC=3
Lead accumulator	+Bat, -Bat	General fault signal	IO-1: COM=7; NO=8; NC=9
Temperature sensor (Optional)	IO-2: 1,2	Sync (only at parallel connection)	IO-2: 6
Control input Shut-Down	IO-2: 3,4		
Control input safety monitoring	IO-2: 7		
Current-share-bus (only at connection in parallel)	IO-2: 5		

(The LED's are linked to the message contacts with the corresponding names.)

User manual

AKKUTECH 4806



4 Putting into operation

The power supply is switched on by the activation of the mains voltage (230 V AC).



DANGER

Check the correctness of the connections prior to the first activation!

Establish electrical connections only in de-energized status!

In case of non-observance, touching live parts can result in death or serious injury.

Two seconds after connection to the mains the connected consumers are supplied. The charge of the lead accumulators is carried out as well. The charging time is increased if simultaneously to the charging current a high load current is needed, too. The first lead accumulator test is performed after 60 seconds.

4.1 Display and messages

Four LEDs are installed to indicate the status of the unit:

Display	Significance
operation	LED green illuminates: - as long as the output voltage is present.
mains-OK	LED green illuminates: - at mains operation $U_E > U_{Emin}$ - and $T_{int} < T_{intmax}$
Bat-OK	LED green: - illuminates: at $U_{Bat} > 43,2 \text{ V DC}$ - goes out: - at $U_{Bat} < 43,2 \text{ V DC}$ - if the accumulator circuit is interrupted (test interval 1 min) - if the lead accumulators are reverse poled - if the Ri accumulator internal resistance is too high (test interval 10 min.)
Error	LED yellow illuminates: - at back-up operation - if the accumulator circuit is interrupted - if the lead accumulator is reverse poled - if the accumulator internal resistance is too high - if fuse blow on the fuse board (if activated ¹)

(The LED's are coupled to the signal contacts which have the corresponding names.)

5 Operation

5.1 Mains operation

Mains operation is indicated with the illumination of the green LED **Mains-OK** and the green LED **Operation**.

5.2 Back-up operation

By removing the mains voltage respectively by the underrun of the minimum input voltage, the unit switches over to back-up operation. The back-up operation is indicated with the illumination of the LED **Operation**. The LED **Mains-OK** does not illuminate.

5.3 Deep discharge protection

Deeply discharged lead accumulators can cause irreversible damage. The final discharge voltage specified by the manufacturer must never be underrun. In case of a mains failure, the external energy supply continuously monitors the discharge of the lead accumulators. If the final discharge voltage is reached, the consumers are automatically disconnected from the lead accumulators by load rejection.

¹ Can be adjusted with the software **paraTEC VdS**

5.4 Accumulator circuit monitoring

In order to ensure the buffer capacity of the external energy supply, the accumulator circuit is tested in cycles of 60 seconds; the first test is performed 60 seconds after connection to the mains. This test allows the detection of a possible interruption resp. high resistivity of the accumulator circuit.

In mains operation, a defective accumulator circuit is indicated by the LED **Bat-OK** going out, and the illumination of the LED **Error**.

5.5 Accumulator test

A cyclic lead accumulator test which is performed during mains operation each 10 minutes, stresses the battery with simultaneous voltage measurement. This allows to give a statement about the internal resistance of the accumulator.

A severely aged lead accumulator is indicated by the LED **Bat-OK** going out and the illumination of the LED **Error** in mains operation.



NOTE

The lead accumulator test serves to detect severely aged lead accumulators. In order to be able to make a statement about the buffering ability of the lead accumulators in the present system, a manual check of the lead accumulators is necessary in regular intervals! (See section 7)

When the **AKKUTEK 4806** is delivered it is configured for three different accumulator dimensions. Herewith the limiting value for the measurement of the internal resistance is adjusted as follows

- 1: 7 Ah -18 Ah 300 mΩ
- 2: 26 Ah -65 Ah 120 mΩ
- 3: >65 Ah and at Master/Slave operation 60 mΩ



NOTE

The Windows-Software **paraTEC VdS** is available for the configuration of **AKKUTEK** for special requirements.

Special characteristics: Voltage, current, temperature monitoring, adaptation of internal resistance threshold for different lead accumulator sizes, activation/deactivation for external fuse board.

5.6 Temperature tracking (optional)

Lead accumulators have a temperature coefficient of approximately - 3 mV per °C and per cell.

For the usage without temperature sensor the final charging voltage of the external power supply is selected in the way that charging the lead accumulators is ensured in a temperature range of 15 °C to 40 °C.

In applications with frequent and strong temperature variations, the charging voltage should be adjusted in order to obtain maximum life duration of the lead accumulators. A temperature adjustment should be ensured as well in particular in case of very low ambient temperatures ($T_u < 15\text{ °C}$) in order to ensure sufficient lead accumulator charge. The temperature tracking is activated automatically by connecting the external temperature sensor (optional module) to terminal **1** and **2** of the terminal strip **IO-2**. Depending on the ambient temperature variation of -10 to 50 °C, the deep discharge voltage (and thus, also the output voltage) varies in a range of 57,2 V to 52,8 V DC (54,7 V at 25 °C).

A lead accumulator temperature above 45 °C is registered by the power supply and forwarded to the monitoring software **paraTEC**. The power supply however does not monitor this condition.



NOTE

To ensure a satisfying life duration of the lead accumulators, the operating temperature of the lead accumulators should not exceed 20 °C. Higher temperatures lead to a drastic decrease of the life duration resp. service life!



NOTE

Die VdS-regulation instructs a temperature tracking. For VdS conform operation a temperature sensor must be connected to the power supply!

5.7 Shut-Down

Buffer operation can be interrupted early in order to avoid a discharge of the lead accumulator up to the deep discharge limit. This can be done by connecting a +48 V DC control voltage to the terminal **3** (+Shut) and **4** (-Shut) of the terminal strip **IO-2**.

5.8 Acoustic alarm transmitter (optional)

An alarm transmitter with VdS approval is available for emitting an acoustic warning signal if a general error occurs.

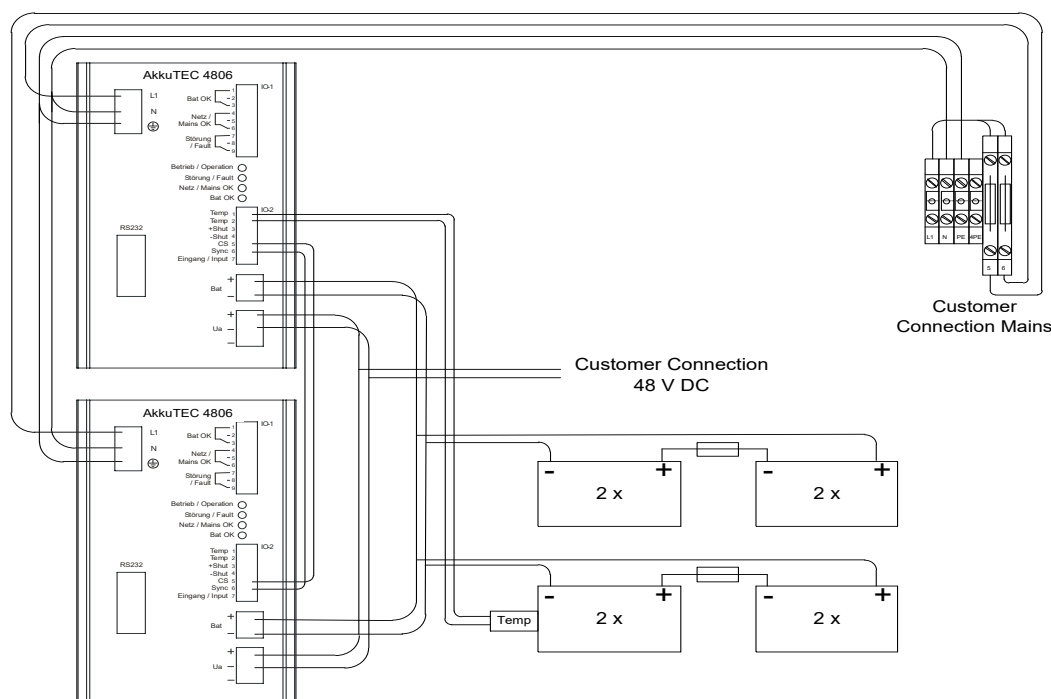
6 Master/Slave-operation at parallel connection

This operational mode is only valid in case of parallel connection of two power supplies to double the total power rating.

6.1 Connection at Master/ Slave-operation

To increase the power rating respectively for redundant operation it is possible to connect two power supplies in parallel.

- The temperature tracking is only carried out by the Master.
Master: IO-2:1,2
- The fuse monitoring is also only carried out by the Master.
Master IO-2:7 to fuse board
- The Sync-connection is necessary for the functions of the accumulator test. A lack of the signal results in a wrong measurement of the internal resistance of the accumulator.
Master IO-2:6 to Slave: IO-2:6
- The CS (Current-Share-Bus) is used to share the load between both power supplies. A lack of this signal results in the overload of the Master unit.
Master IO-2:5 to Slave IO-2:5
- The signal contact mains operation is at both power supplies active. They must be connected in series, to detect a mains failure of both units.
Master IO-1:4,5,6 and Slave IO-1:4,5,6
- The signal contact **Bat-OK** is only active at the Master
Only Master IO-1:1,2,3
- The signal contact General Fault is active at both power supplies. They must be connected in series.
Master IO-1:7,8,9 and Slave IO-1:7,8,9



6.2 Signalisierung at Master/Slave-operation:

The signal contacts for mains failure of the Master and the Slave must be connected in series to detect an error signal from both units.

At the Slave the signal and the signal contact **Bat OK** are not active. (neither on the contact **Fault**, the master takes over this function completely). If one unit switches off because of overvoltage at the output, it is signaled with the signal contact **Mains-OK** (at Master and Slave). Afterwards the mains voltage must be switched off for a short time. (storing protection function).

6.3 Shutdown at Master/Slave-operation

The Shutdown is carried out at the Master as described in section 3.6, the mains voltage must be switched off before.

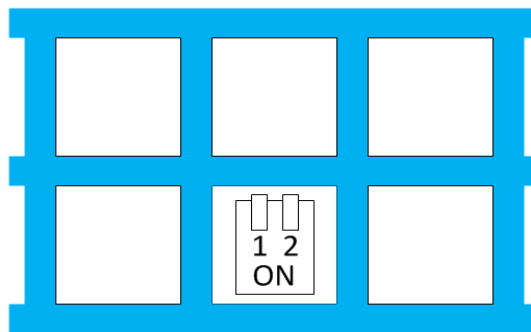
6.4 Configuration Master/Slave

Configuration for Master-operation:

All power supplies also the replacement devices which are delivered from the factory are preset as Master. Complete switch cabinets with Master/Slave configuration are adjusted correctly in the factory. If a Slave must be replaced, the replacement unit must be adjusted as Slave.

Configuration for Slave-operation:

The unit must be completely switched off. On the upper side of the unit a double dip switch can be seen through the grid. Press the dip with the indication **2** in the direction of the board. (ON). Verification for example by the switch on of the unit outside the system. The output voltage amounts to approximately 44 V.



NOTE

During operation Master and Slave must be connected via ground at any time (Ua- or Bat-). A separation of the wiring during operation is not allowed.

A lack of the signal **Sync** results in wrong measurement of the internal resistance of the accumulator, the LED **Fault** illuminates herewith at the Slave.

A lack of the signal **CS** results in the overload of the Master, then the Slave only supplies approximately 44 V.

All load and all accumulator lines must be connected in parallel each with and connected with separate lines at both **AKKUTEK**-units.

7 Servicing

In order to ensure the buffering ability of the power supply, the lead accumulators should be tested for their buffering capability in regular intervals of 3 to 6 months.

The housing must be cleaned at least once per year depending on the degree of contamination.

7.1 Testing the lead accumulators

Start a forced buffer operation by disconnecting the mains. The lead accumulators must keep the required autonomy time under nominal conditions. When the deep charge limit is reached, the external energy supply switches off automatically.

7.2 Exchanging the lead accumulators

If not stated otherwise in the VdS approval certification, the lead accumulators must be exchanged once every four years after the manufacturing date. Removal and installation of the lead accumulators may only be performed by qualified personnel.

It must be performed as follows:

Removal of lead accumulators:

- Perform the putting out of operation as described in section 8.
- Remove electrical connections from the lead accumulators (2-Pol CombiCon, Ubat)
- Loosen the accumulator bracket, retain lead accumulator at the same time.
- Remove lead accumulators

Installation of lead accumulators:

- The installation is performed as described above only in reverse order.
- Take care to ensure correct polarity. In case of a reverse polarity of the lead accumulator, the functions "lead accumulator charge" and "Accumulator release during mains failure" remain blocked, the simultaneous illumination of the LED-**Mains-OK** and the LED-**Error** will indicate the reverse polarity.



CAUTION

Take care to ensure the correct nominal voltage and the correct polarity when installing the lead accumulators.
In case of non-observance there is the danger of severe burns by arcs.



CAUTION

Protect, i. e. insulate the poles when connecting lead accumulators. In case of short-circuits there is the danger of severe burns by arcs or hot parts.



NOTE

Ensure the correct fixing of the lead accumulators after re-installation!



NOTE

Only use VdS approved lead accumulators. Never use different lead accumulator types, nor lead accumulators of different manufacturers, nor old and new accumulators together.

8 Decommissioning

The decommissioning is performed by the removing of the mains voltage. In order to avoid subsequent buffering, the accumulator must be interrupted by activating the **Shut-Down**-signal or by removing the accumulator fuse.

The LED **Mains-OK** and the **Error** must go out in this case.



NOTE

During operation the disconnection or connection of electrical connections is not allowed! In case of non-observance danger of arcs, which may lead to severe burns!

9 Disposal



This symbol indicates, that the product must not be disposed with normal house waste. Please dispose it professionally as electronic scrap. So the materials are separated and recycled according to their characteristics. This is a big contribution to protecting the environment.



NOTE

Used lead accumulators must be disposed of properly!

10 Norms and Regulations

EMC	EN 55011 limit value class B EN 62040-2, limit value class C1 EN 61000-6-2 EN 61000-6-4
Total unit	2014/30/EU+A1+A2 EN 50178 EN 62368-1 EN 61010-1/ EN 61010-2-201
Optocoupler to ensure safe isolation primary/sec- ondary	EN 60747-5-1, complies with SELV / PELV
Power HF transformer to ensure safe separation of primary and secondary	EN 61558 2-16, complies with SELV / PELV

11 Technical Data

INPUT	
Nominal input voltage	230 V AC $\pm 15\%$ (196 V AC...265 V AC)
Nominal frequency	47 Hz ... 63 Hz
Nominal input current	1,6 A @ ($U_e = 230$ V AC, $U_a = 52,8$ V DC, $I_a = 6$ A)
Inrush current	≤ 35 A / 2 ms
Nominal input power	356 W @ ($U_e = 230$ V AC, $U_a = 52,8$ V DC, $I_a = 6$ A)
OUTPUT	
Nominal output voltage	48 V DC
Output voltage range (with temperature tracking)	43,2 V ... 57,2 V DC $\pm 0,4\%$
Output voltage range (without temperature tracking)	43,2 V ... 52,8 V DC $\pm 0,4\%$
Charging end voltage (with / without tem)	52,8 V DC $\pm 0,4\%$ / 52,8 V DC...57,2 V DC $\pm 0,4\%$
Load shedding	40,8 V DC $\pm 0,4\%$
Residual ripple	< 150 mV eff.
nominal output current	6 A
Self current consumption	35 mA @ 48 VDC oder 6,4W @ 230 VAC
Max power loss ,worst-case'	41 W @ ($U_e = 230$ V AC, $U_a = 52,8$ V DC, $I_a = 6$ A)
efficiency	88,5 % @ ($U_e = 230$ V AC, $U_a = 52,8$ V DC, $I_a = 6$ A)
Charging characteristics	I/U DIN41773
FUSING	
Internal device protection	2,5 A (T), 250 V
fuse DC-output circuit (external)	7,5 A (T), 250 V
Fuse DC-Battery circuit (external)	7,5 A (T), 250 V
Pre-fusing	5 A (T), 250 V
IN GENERAL	
Protective system	IP20
Overvoltage category	II
Degree of pollution	2
Accumulator type	VRLA lead battery*
Dimensions (HxWxD)	155 mm, 95 mm, 183 mm
Weight	1.6 Kg
Operating temperature / storage temperature	-10 °C ... 50 °C
Rel. Humidity	$\leq 95\%$ no condensation
Max. installation altitude without load reduction	2000 m above sea level

*.basic parameterization for VRLA-Batteries (AGM, SLA)

12 Accessories

In application cases with frequent and strong temperature variations, the charging voltage should be adjusted in order to avoid accumulator overload (danger of gassing!). In the same way, a temperature adjustment should be ensured in particular in case of very low ambient temperatures ($T_u < 15\text{ °C}$) in order to ensure sufficient accumulator charge.

- Temperature sensor MTIAQ33G3M01
- Temperature sensor MTIAQ33G3M04
- Temperature sensor MTIAQ33G3M05

Software for PC-aided monitoring and parametrization functions

- Windows .NET Framework Software **paraTEC** VdS