UPS Operating manual BAX 3261 – 200/250/300 kVA

JOVYSTAR-M

Fachbereich USV-Anlagen

Index	Datum	Name	Zustand / Änderung
0	24.07.2006	Christian Fechteler	
1	27.10.2006	Harms	
2	21.10.2006	Harms	Last version
3	22.11.2007	B. Olm	07/179
4	08.02.2008	B. Olm	08/024
5	19.05.2008	B. Olm	08/109
6	25.06.2008	B. Olm	08/158
7	05.08.2008	B. Olm	08/219
8	09.11.2009	A.Doyen	09/554

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TECHNICAL DATA

Designation	Values: 200KVA | 250KVA | 300KVA
Input voltage	3 x 400/230V ±10%
Mains frequency	50/60Hz ±5%
Nominal input current	250A with charged battery | 310 | 375
Maximum input current at charging battery	280A at nominal input voltage | 350 | 400
Number of battery cells	300
Battery charge voltage	681V (2,27V/cell)
Ripple of DC-voltage	Max. ±1% RMS (disconnected battery)
Battery charge current (max. adjustable)	40A | 40A | 30A
Output voltage	3 x 400/230V (setting range: ±5% of nominal value)
Tolerance of output voltage	±1% static (symmetrical load) ±2% static (unsymmetrical load) ±5% dynamic (load step 10%→90%→10%)
Tolerance of phase angle	±1% static (symmetrical load) ±2% static (100% unsymmetrical load)
Settling time of output voltage	20ms within ±1% of nominal value
Total harmonic distortion	Max. 2% (linear load) Max. 5% (crest-factor 3:1, @75% of nom. power, linear load)
Output frequency	50Hz (adjustable to 60Hz) ±0.25% → ±3% (selectable in 0.25%-steps) with mains synchronization ±0.001% at free running mode
Output power (cos. φ 0.8)	200kVA | 250KVA | 300KVA
Nominal output current (cos. φ 0.8)	290A | 361KVA | 430KVA
Short circuit current (500ms)	462A | 578KVA | 693KVA
Short circuit current (4,5s, afterwards switching off)	290A | 361KVA | 430KVA
Overload capability inverter	125% for 10min, 150% for 1min, 200% for 100ms
Overload capability static switch	200% for 1min, 1000% for one cycle
Efficiency (nominal load)	> 93%
Power loss (100% load)	11,2KW | 14KW | 16,8KW
Radio interference level	Acc. EN 62040 – 2: 2007 Class C3
Acoustic noise level	< 68 dB(A)
Protection degree	IP 20 according to DIN 40050
Protection class	1 according to VDE 0106/Teil 1
UPS ambient temperature	0°C → +40°C
UPS storage temperature	-10°C → +70°C
Battery ambient temperature	0°C → +20°C (Battery lifetime will be reduced at storing temperatures >20°C)
Dimensions: Width Height Depth	1200mm 1900mm 860mm
Weight (approx., without batteries)	870kg | 1020kg | 1200kg
Colour	RAL 5026 / RAL 9006
Humidity	95% max. (without condensation)
Maximum altitude	1000m above sea level
Degradation of power at altitudes >1000m	0,03% / metre

AUTONOMY TIME

200KVA UPS

Autonomy time [min]	**6**	**13**	**20**	**27**	**40**	**60**
Battery typ (Jovyatlas)	50 x J1006000	100 x J1005900	100 x J1006000	100 x J1006200	150 x J1006200	200 x J1006200
Battery cabinet	B14	2 x B14	2 x B14	2 x B14	3 x B14	4 x B14
Weight of the Battery cabinet incl. Batteries [kg]	Ca. 1295	Ca. 2750	Ca. 3930	Ca. 4290	Ca. 6430	Ca. 8570

250KVA UPS

Überbrückungszeiten [min]	**6**	**14**	**25**	**50**	**70**
Erforderlicher Batterietyp	50 x J1006200	100 x J1006000	150 x J1006000	200 x J1006200	250 x J1006200
Batterieschrank	B14	2 x B14	3 x B14	4 x B14	5 x B14
Gewicht Batterieschrank inkl. Batterien [kg]	Ca. 2050	Ca. 3930	Ca. 5890	Ca. 8570	Ca. 10710

300KVA UPS

Überbrückungszeiten [min]	**6**	**11**	**15**	**27**	**40**	**55**
Erforderlicher Batterietyp	100 x J1005900	100 x J1006000	100 x J1006200	150 x J1006200	200 x J1006200	250 x J1006200
Batterieschrank	B14	2 x B14	2 x B14	3 x B14	4 x B14	5 x B14
Gewicht Batterieschrank inkl. Batterien [kg]	Ca. 2420	Ca. 3930	Ca. 4290	Ca. 6430	Ca. 8570	Ca. 10710

All Batteries are valve regulated and low maintenance types. (Design life 6-9 Years)

UPS OPERATING MANUAL

TABLE OF CONTENTS

WARNING: This is a Class A-UPS Product. In a domestic environment, this product may cause radio interference, in wich case, the user may be required to take additional measures.

1. UPS GENERAL DESCRIPTION AND INSTALLATION

Index **Page**

Index of pictures

1. INTRODUCTION

Thank you for having chosen a JOVYATLAS product for the safety of your equipment. In order to fully take advantage of the performance of your UPS JOVYSTAR - M (uninterruptible power supply), we suggest that you dedicate some time to reading the following manual.

The purpose of this manual is to briefly describe the parts that constitute the UPS and to guide the installer or user to a correct installation of the equipment.

The installer or user should read and correctly carry-out the instructions provided, with particular attention to the information regarding security, according to the CEI 64-8 and DPR 46-90 standards.

The manufacturer declines all responsibility of damages towards persons or things due to the non-compliance of the above.

2. GENERAL UPS DESCRIPTION

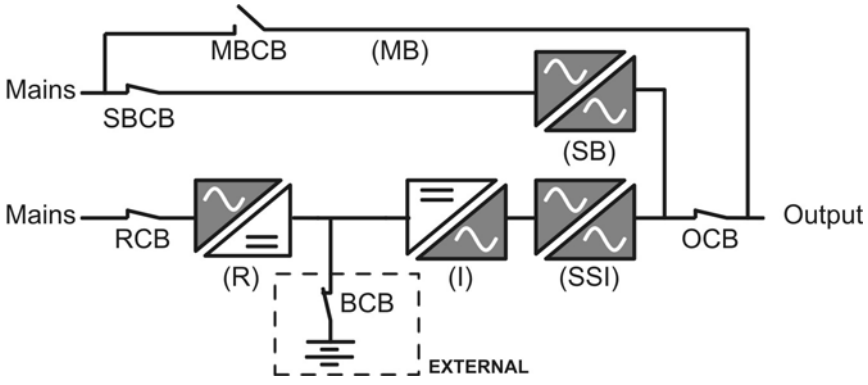
2.1 TYPOLOGY

The JOVYSTAR - M UPS are double conversion on-line ; the inverter constantly supplies energy to the load, whether mains is available or not (according to the battery autonomy time).

WARNING

The UPS output is energized even during mains failure, therefore in compliance with the prescriptions of EN 50091-1, the installer will have to identify the line or the plugs supplied by the UPS making the User aware of this fact.

This configuration guarantees the best service to the User, as it supplies clean continuously regulated power and guarantees the voltage and frequency will be stabilised at nominal value independently from mains status. Thanks to the double conversion, it makes the load completely immune from micro-interruptions due to excessive mains variation, and prevents damage to the critical load (Computer - Instrumentation - Scientific equipment etc.).



Picture 1 – Block diagram

2.2 DESCRIPTION OF THE SYSTEM

2.2.1 Rectifier

It converts the three phase voltage of the mains into continuous DC voltage.

The UPS has got a total-controlled IGBT three-phase bridge to reach a low harmonic distortion.

This configuration is used in order to reduce the distortion of the mains' absorbed power (THD) to a value inferior to 5%. This guarantees, with respect to other loads, that the rectifier does not distort the mains voltage and avoids the overheating of the cable due to the circulation of the harmonic currents.

The rectifier is designed to supply the inverter at full load and the battery at the maximum recharge current.

2.2.2 Inverter

Required to convert the continuous voltage coming from the rectifier or from the battery, into alternating voltage, stabilized in amplitude and frequency.

The inverter uses IGBT technology with a frequency commutation of approximately 10 KHz.

The control electronics is completely digital and uses a 16 Bit μP, that, thanks to its processing capability, generates an excellent output sine-wave, which has a very low distortion even in presence of loads having high crest factor currents.

2.2.3 Battery and charger

The battery is located in an external cabinet.

The battery charger control logic is completely integrated inside the total-controlled rectifier control board; the battery is charged, according to the DIN 41773 Standard, every time it has been partially or completely discharged and it is kept floating, even when it's charged, to compensate for any autodischarge.

2.2.4 Static bypass

It's designed to transfer the load between INVERTER and MAINS, and vice-versa, without break, and uses SCR's as power commutation elements.

2.2.5 Manual bypass

It's used to by-pass the UPS, supplying the load directly to the mains in case of maintenance or serious failure.

WARNING

The sequence of bypass switching must be carried out with respect to the procedure in the UPS Operating Manual in the chapter "Start-up, shut-down and manual bypass". The manufacturer cannot accept responsibility for damages arising from incorrect operation.

2.2.6 Front Panel

The front panel of the UPS, consisting of a double row alphanumeric displays plus 5 function keys, allows the complete monitoring of the UPS status.

The mimic diagram helps to understand the operating status of the UPS.

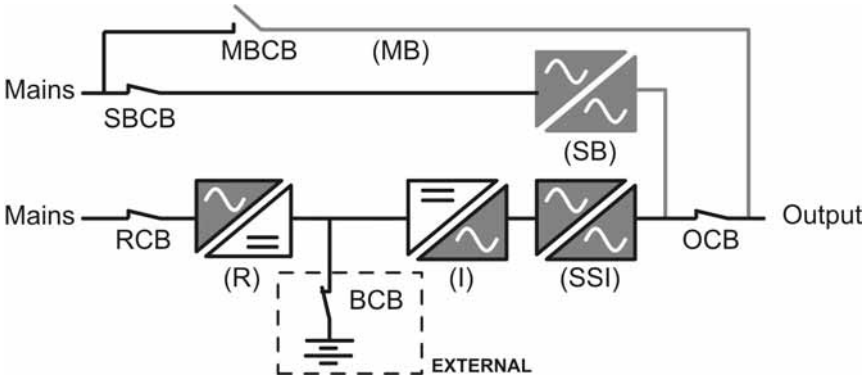
For more information see the chapter “FRONT PANEL”.

2.3 OPERATING STATUS

The following paragraphs show all the possible operating status of the UPS.

2.3.1 Normal Operation

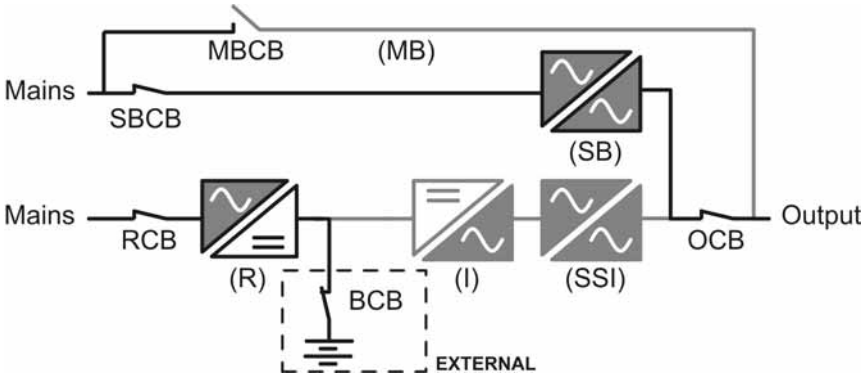
The inverter is supplied by the rectifier; the load, through the static switch, is supplied directly by the inverter output.



Picture 2 – Normal operation

2.3.2 Load supplied by bypass due to inverter fault

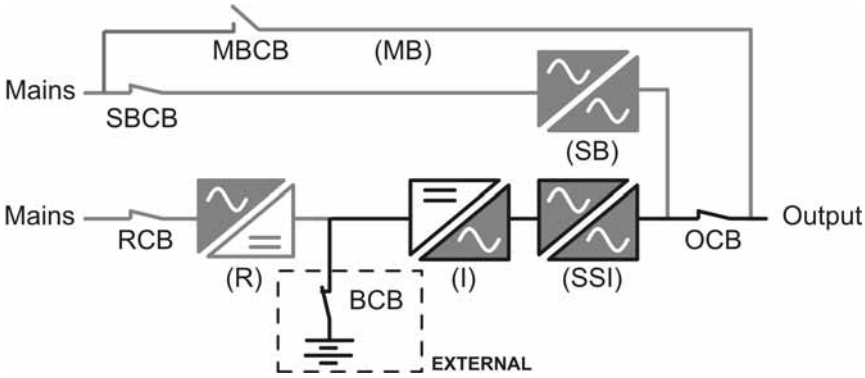
The load is transferred to bypass through the static switch; the transfer is carried out without interruption.



Picture 3 – Load supplied by bypass

2.3.3 Rectifier failure or mains failure

The inverter is supplied by the battery for the required autonomy time; the load, through the static switch, is supplied directly by the inverter output.



Picture 4 – Rectifier failure or mains failure

2.3.4 Manual bypass

The load is supplied by the mains through the manual bypass; the operator can work in safety on the UPS to carry out maintenance or repairing operations.

3. INSTALLATION

3.1 RECEIPT OF UPS

When the UPS is received, please attend immediately to its unpacking and carry-out an accurate visual check to be sure that the equipment has not been damaged during transport.

IMPORTANT

In case of objections relating to damage incurred during transport these must be immediately notified to the transportation company after receipt of the equipment.

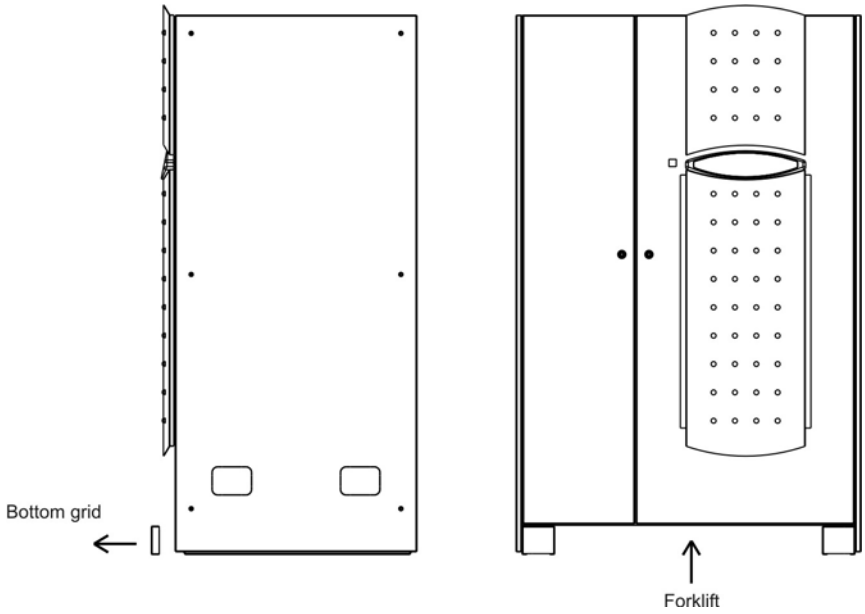
When the UPS is not installed immediately it must be stored carefully in vertical position, as indicated on the packing and conserved in a dry and sheltered room in its box so that it is protected from dust.

3.2 HANDLING OF THE UPS

Before positioning the UPS, in order to avoid risks of turnover, it's recommended to move the system on the wood pallet on which the UPS is fixed.

Before the positioning in the final location, remove the UPS from the pallet.

The UPS can be lifted and handled using a pallet truck or a forklift; It can be handled only after having taken-off (manually) the lower front panel, so that a pallet truck or a forklift can be inserted (see picture 6). The UPS technical data are shown on a label fixed on the internal side of the front door.

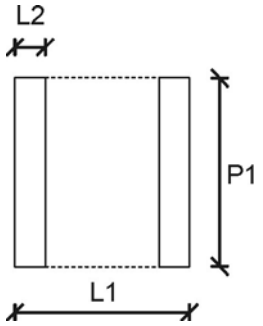


Picture 6 – Handling JOVYSTAR - M 200-300kVA

3.3 POSITIONING AND INSTALLATION

The UPS must be installed in a clean and dry room, preferably not dusty. The User must ensure that there is enough air exchange in the room so that the equipment can be adequately cooled; if this is not guaranteed, the room must be adequately aired.

3.3.1 Base plan, static load and weights

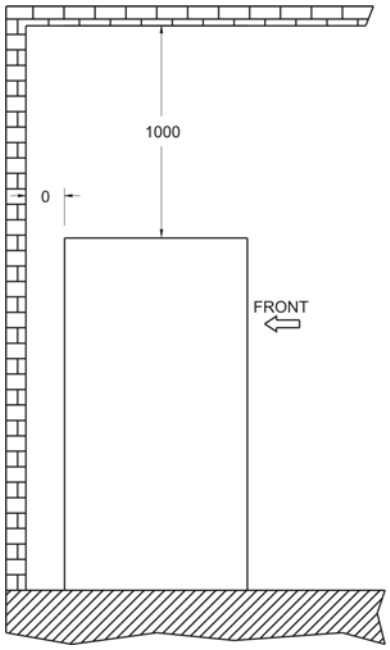


Picture 7 – Base plan

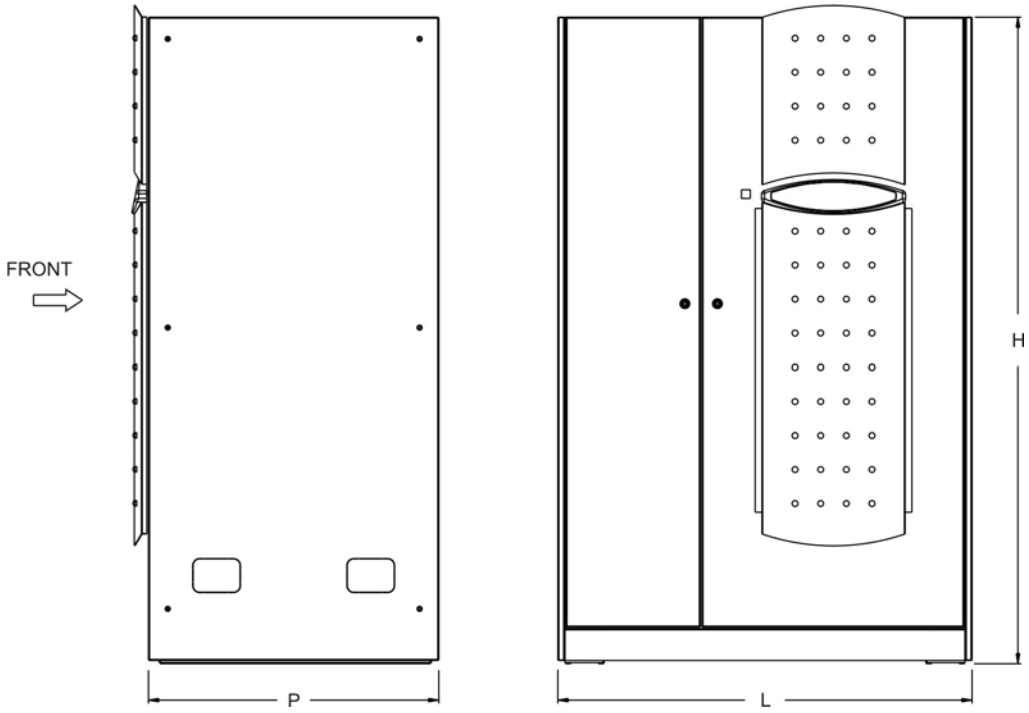
UPS (kVA)	**200**	**250**	**300**
	3F		
L1 – mm	1175		
P1 – mm	800		
L2 – mm	115		

UPS 3Ph (kVA)	**200**	**250**	**300**
Weight without battery – kg	870	1020	1200
Weight with battery – kg	-	-	-
Static load – kg/m^2	925	1085	1277

3.3.2 Dimensions and distances



Picture 8 – Distance from the walls



Picture 9 – Layout JOVYSTAR - M 200-300kVA

UPS 3F (kVA)	200	250	300
L – mm	1200		
P – mm	860		
H – mm	1900		

3.4 ELECTRICAL CONNECTION

The electrical connection is part of the work which is normally provided by the supplier that carries out the electrical installation and not by the UPS manufacturer. For this reason, the following recommendations are only an indication, as the UPS manufacturer is not responsible for the electrical installation.

In any case we recommend to carry-out the installation and the electrical connections of the input and output in compliance with the local standards.

During the electrical installation take particular care to check the phase rotation with a suitable instrument.

For improving the quality of connection of the UPS flexible cables are recommended. A cable clamp must be provided by the end-user directly at the structure of the frame or right below the UPS cabinet.

The terminal boards are positioned at the front of the UPS, under the breakers. To access the terminals remove the protection, extracting the fixing bolts.

WARNING

The connection to the mains must be carried out with protection fuses between the mains and the UPS.

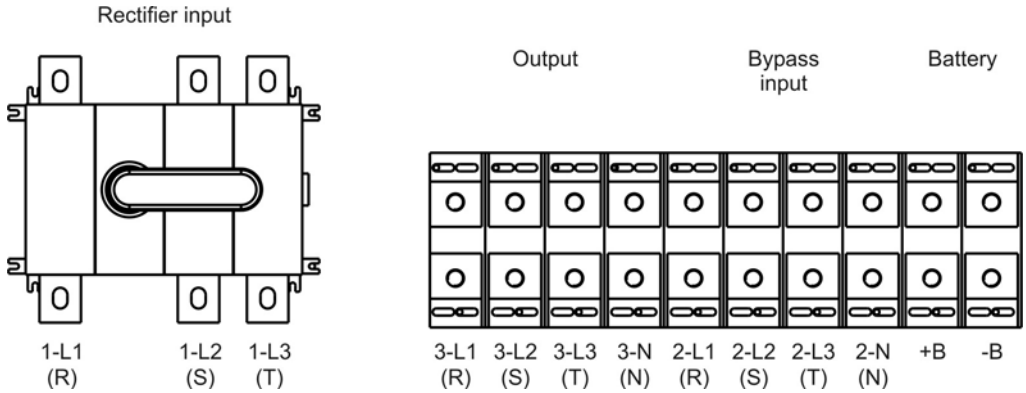
The use of residual current devices in the line supplying the UPS is unadvisable. The leakage current due to the RFI filters is rather high and it can cause spurious tripping of the protection device.

According to the EN/IEC 62040-1 /2 /3 standard, in order to take into account the UPS' leakage current, residual current devices having adjustable threshold can be used.

The connection cables section is shown in the following tables:

UPS 3Ph (kVA)		**200**	**250**	**300**
Input fuses (A)	Rectifier	3x315	3x400	3x500
	Bypass	3x315	3x400	3x500
Input cables (mm^2)	Rectifier	3x185	3x240	3x 2x150
	Bypass	4x185	4x240	4x 2x150
Ground cable (mm^2)		120	120	150
Output cables (mm^2)		4x185	4x240	4x240
Battery cables (mm^2)		2x240	2x240	2x2x185

3.4.1 Terminal Board



Picture 10 – Terminal Board

3.5 BATTERY POSITIONING AND CONNECTION

IMPORTANT

For battery installation please respect the prescriptions of the EN62040-1 standard, paragraph 4.5.

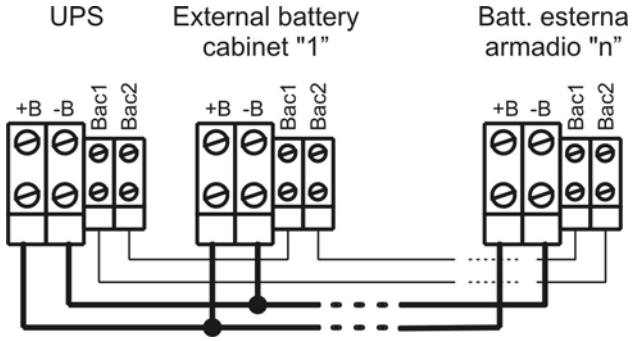
To obtain the battery life indicated by the battery manufacturer, the operating temperature must remain between 0 and 25 °C. However, although the battery can operate up to 40 °C , there will be a significant reduction of the battery life.

To avoid the formation of any kind of potentially explosive hydrogen and oxygen mixture, suitable ventilation must be provided where the battery are installed (see EN62040-1 annex N).

The batteries are external for all the series, however, it is recommended to install them when the UPS is capable of charging them. Please remember that, if the battery is not charged for periods over 2-3 months they can be subject to irreparable damage.

3.5.1 Connections

The following picture shows the electrical connection between the UPS and the external battery cabinet.



Picture 11 – Battery cabinet link

The connection cables are two power cables, with section that varies according to the UPS size (see table at page 11) and with length ranging from 2 to 50 meters.

Longer cables are subject to excessive voltage drop, so their section must be increased accordingly.

2. FRONT PANEL

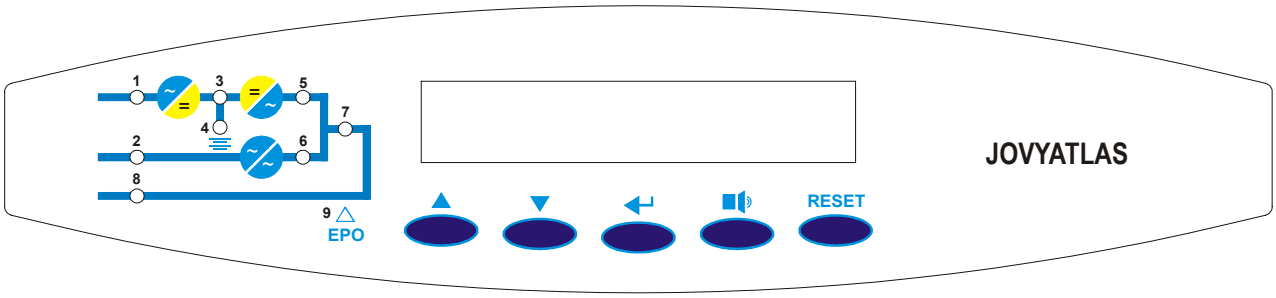
Index

Index of pictures

1. INTRODUCTION

front panel of the UPS, consisting of a double row alphanumeric display plus 5 function keys, allows the complete monitoring of the UPS status.

The mimic flow helps to understand the operating status of the UPS.



Picture 1 – JOVYSTAR - m front panel

2. DESCRIPTION

2.1 MIMIC DESCRIPTION

Picture1 shows the mimic present on the display, with the names of the circuit breakers/isolator switches of the UPS. Also the led's and blocks that comprise the UPS are clearly identified.

LED 1 ⇒ Lit-up green = Mains present at the rectifier input.
Otherwise off.

LED 2 ⇒ Lit-up green = Emergency line present and phase sequence correct. Otherwise off.

LED 3 ⇒ Lit-up green = Rectifier feeding correctly.
Red light = Rectifier output voltage out of tolerance.

LED 4 ⇒ Lit-up green = Battery OK.
Green flashing = Battery discharging or battery in test.
Orange flashing = BCB open.
Lit-up red = Battery test aborted.

LED 5 ⇒ Lit-up green = Inverter static switch closed.
Otherwise off.

LED 6 ⇒ Lit-up orange = Emergency line static switch closed.
Otherwise off.

LED 7 ⇒ Lit-up green = Voltage present on the load.
Lit-up orange = OCB circuit breaker open.

LED 8 ⇒ Orange light = Manual by-pass closed. Otherwise off.

LED 9 ⇒ Red light = EPO button pressed.

2.2 ALARMS AND OPERATING STATUS

The alpha-numeric display offers a complete diagnostic of the system, through the visualization of 25 alarms and six operating status conditions.
Each alarm is associated with a code which allows it to be stored in the events' history.

A1 MAINS FAULT = Rectifier input mains failure

Possible causes:
1) Central system black-out (mains failure)
2) Distribution problems upstream of the UPS
3) RCB open

A2 CHARGER FAULT = Battery charger failure

A3 RECT FUSE = One or more rectifier fuses are blown

A4 THER IMAGE = Load transferred to mains due to overload. After 30' the load is transferred back to inverter

A5 AC/DC FAULT = Rectifier output voltage out of tolerance

Possible causes:
1) Mains input voltage too high/low
2) Distribution problems upstream of the UPS
3) RCB open
4) Rectifier bridge failure

A6 INPUT WR SEQ = Input phase rotation not correct

A7 BCB OPEN = Battery circuit breaker open

A8 BATT DISCH = The battery is discharging

Possible causes:
1) Rectifier input mains failure (alarm A1 present)
2) Rectifier failure

A9 BATT AUT END = Battery autonomy (calculated) has expired

A10 BATT FAULT = Battery test failed

Possible causes:
1) The test has been carried out with the battery not perfectly charged
2) One or more battery cells are damaged

A11 BATT IN TEST = Battery test in progress

A12 PLL FAULT = Problems with the digital synchronisation system

Possible causes:
1) Emergency mains excessively disturbed or intermittent
2) Mains variation speed not acceptable for the UPS

A13 INV OUT TOL = Inverter output voltage out of tolerance

Possible causes:
1) Intervention of the inverter current limitation for excessive load (more than 200%)
2) Inverter failure

A14 OVERLOAD = Inverter overload (load exceeding 100%). The thermal image protection is started

A15 BYP FAULT = Emergency mains not available

Possible causes:
1) Emergency mains failure
2) Distribution problems upstream of the UPS
3) SBCB open
4) Wrong input phase rotation

A16 BYP FEED LOAD = Load fed by bypass

Possible causes:
1) Inverter overload
2) Thermal image intervention
3) Forced commutation due to the bypass switch operation
4) Inverter failure

A17 RETR BLOCK = Re-transfer between bypass and inverter blocked, load on bypass

Possible causes:
1) Excessive repeated overloads on inverter

It is possible, after having verified that the load is correct, to reset the UPS, and switch back the load to the inverter (see menu SPECIAL).

A18 MBYP CLOSE = Manual bypass breaker closed (the inverter is shutdown)

A19 OCB OPEN = UPS output breaker open

A20 FANS FAILURE = Optional

A21 HIGH TEMP = High temperature on the inverter and/or rectifier bridge

Possible causes:
1) Excessive load
2) Failure or malfunctioning of the cooling system
3) Wrong positioning of the UPS (distance from walls, altitude)

A22 BYP SWITCH = Closure of the commutation switch which forces the load to bypass (maintenance)

A23 EPO BUS = Intervention of the emergency shut down switch in accordance to EN62040-1

A24 CURR STOP = Inverter bridge stop for max current

Possible causes:
1) Repeated short circuits at the UPS output
2) Inverter bridge malfunctioning

It is possible to reset this state using a button on the μP card.

A25 SHORT CIRCUIT = Short-circuit protection intervention (current exceeding 200%)

Possible causes:
1) Problems on load
2) Distribution problems downstream of the UPS

WARNING:

After switching off the UPS, please remove the Battery Fuses. In other case, the power supply consume a little current from the Battery. After a couple of hour, the battery is damaged.

Please contact our Service department after a failure. Jovyatlas does not take over any liability for late error reports.

3. LCD DISPLAY MANAGEMENT

3.1 DEFAULT

3Ph UPS

The default screen appears on the LCD panel when the UPS is operating normally (with no alarm present); it shows the name of the UPS (for example, JOVYSTAR - M), the nominal power and the value of the output voltage.

Pressing a key the main menu, with all the functions and parameters, is accessed

After 5' during which no key is pushed, if there isn't any alarm and the battery is not in discharge mode the Default screen is shown again.

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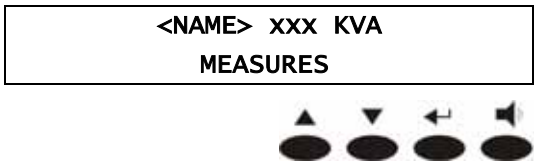
3.2 MAIN MENU

The screens of the main menu appears as follows: Pressing a key the main menu, with all the functions and parameters, is accessed

SPECIAL MENU. To access press the ↵ key (see 3.5); to scroll the other menus, press the ▲ or ▼ key.

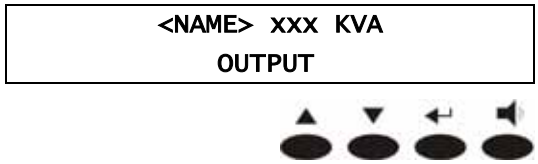


MEASURES MENU. To access press the ↵ key (see 3.3); to scroll the other menus, press the ▲ or ▼ key.

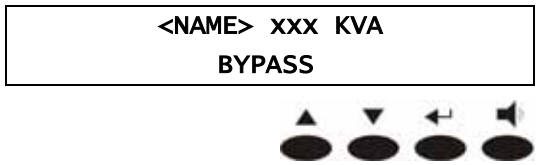
ALARM MENU. To access press the ↵ key (see 3.4); to scroll the other menus, press the ▲ or ▼ key.

3.3 MEASURES

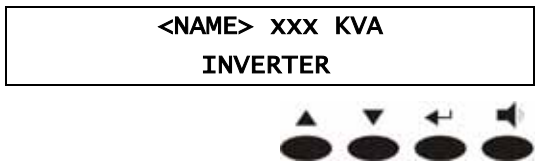
The following pictures show the structure of the MEASURES menu.



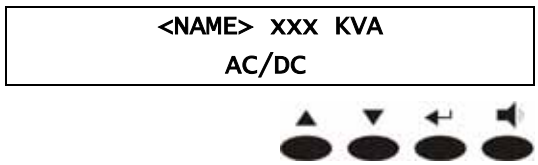
OUTPUT measures. To access press the ↵ key (see 3.3.1); to scroll the other sub-menus press the ▲ or ▼ key.



BYPASS measures. To access press the ↵ key (see 3.3.2); to scroll the other sub-menus press the ▲ or ▼ key.



INVERTER measures. To access press the ↵ key (see 3.3.3); to scroll the other sub-menus press the ▲ or ▼ key.



DC meaures. To access press the ↵ key (see 3.3.4); to scroll the other sub-menus press the ▲ or ▼ key.

BATTERY measures. To access press the↵ key (see 3.3.5); to scroll the other sub-menus press the ▲ or ▼ key.

By pressing the ↵ key the main menu screen returns; to scroll the other sub-menus press the ▲ or ▼ key.

PLEASE NOTE

The voltage measures are always referred to the phase-to-neutral value.

3.3.1 Output

OUTPUT VOLTAGE XXX YYY ZZZ Volt	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.
OUTPUT FREQUENCY XX Hertz	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.
OUTPUT CURRENT XXX YYY ZZZ Ampere	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.
LOAD % XXX YYY ZZZ	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.
<NAME> XXX KVA EXIT	Pressing the key ↵ leads to the MEASURES menu screen (see 3.3), pressing the keys ▲ or ▼ the measures are shown again.

3.3.2 Bypass

BYPASS VOLTAGE XXX YYY ZZZ Volt	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.
BYPASS FREQUENCY XX Hertz	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.
<NAME> XXX KVA EXIT	Pressing the key ↵ leads to the MEASURES menu screen (see 3.3), pressing the keys ▲ or ▼ the measures are shown again.

3.3.3 Inverter

INVERTER VOLTAGE XXX YYY ZZZ Volt

Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.

INVERTER FREQUENCY XX Hertz

Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.

<NAME> XXX KVA EXIT

Pressing the key ↵ leads to the MEASURES menu screen (see 3.3), pressing the keys ▲ or ▼ the measures are shown again.

3.3.4 AC/DC

This menu is active only when the battery is not discharging. If the battery is in discharge mode, the BATTERY menu is automatically shown.

AC/DC VOLTAGE XXX Vdc

Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.

<NAME> XXX KVA EXIT

Pressing the key ↵ leads to the MEASURES menu screen (see 3.3), pressing the keys ▲ or ▼ the measures are shown again.

3.3.5 Battery

BATTERY VOLTAGE XXX Vdc

Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.

BATTERY TYPE XXX Ah

Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.

BATTERY CURRENT XXX Ampere	This measure is active only when the battery is discharging.
	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen
AUTONOMY XXX min	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.
	
AUTONOMY % XXX %	Pressing the key ▼ the following parameter is shown, while the key ▲ leads to the previous screen.
	
<NAME> XXX KVA EXIT	Pressing the key ↵ leads to the MEASURES menu screen (see 3.3), pressing the key ▲ or ▼ the measures are shown again.
	

3.4 ALARMS

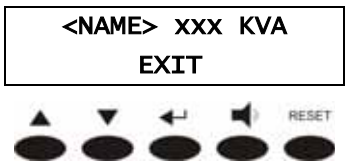
This menu, when selected, shows the status of the equipment and the current alarms are shown (see list below).

Each time an alarm occurs, the display goes to this menu to indicate the alarms present; the audible alarm can be silenced pressing the key 🔇. The exit is disabled if the alarm is not silenced.

The following pictures shows the structure of the ALARMS menu.

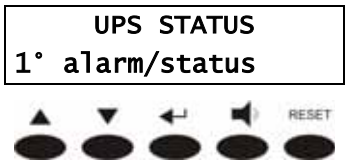
Alarms and UPS status. Press the ↵ key to access (see 3.4.1), pressing the ▲ or ▼ keys scrolls the other sub-menus.

Alarm's history. To access press the ↵ key (see 3.4.2); to scroll the sub-menus press the ▲ or ▼ keys.

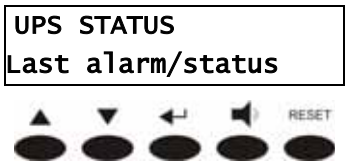


Pressing the ↵ key the main menu is shown; to scroll the sub-menus press the ▲ or ▼ key.

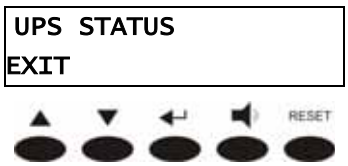
3.4.1 UPS Status



Pressing the ▼ key scrolls all the other UPS status' and/or successive alarms; with the ▲ key the previous screen is accessed.



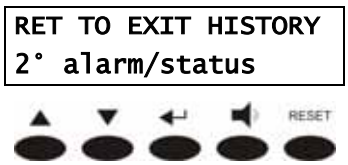
Pressing the ▲ key accesses the previous alarm; pressing the ▼ key the EXIT screen is accessed.



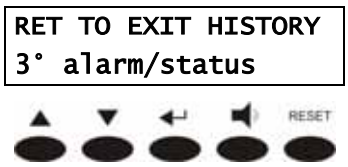
Pressing the ↵ key the ALARM menu screen is accessed (see 3.4), with the ▲ or ▼ key the alarms and status are shown again.

3.4.2 History

Pressing the key ▼ the following alarm is shown; pressing the key ↵ exit the history, leading to the ALARMS menu screen (see 3.4).



Pressing the key ▼ the following alarm is shown; pressing the key ↵ exit the history, leading to the ALARMS menu screen (see 3.4).

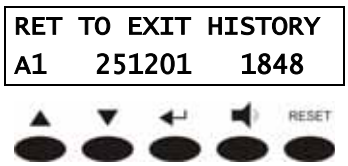


Pressing the key ▼ the following alarm is shown; pressing the key ↵ exit the history, leading to the ALARMS menu screen (see 3.4).

Pressing the key ▼ the first alarm is shown again; pressing the key ↵ exit the history, leading to the ALARMS menu screen (see 3.4).

The first alarm shown is the most recent in order of time; a new alarm makes all the alarms shift one position, clearing the oldest event.

For each event is shown the alarm code, the date and time; an asterisk next to the code indicates that the alarm has cleared at the date and time indicated. The following example shows two possible screens.



Alarm A1 (MAINS FAULT) at 18:48 on 25/12/01.

A1 alarm reset at 20:12 on 25/12/01.

3.4.3 List of alarms and status

List of alarms		List of status	
A1	MAINS FAULT	S1	AC/DC OK
A2	CHARGER FAULT		
A3	RECT FUSE		
A5	AC/DC FAULT		
A6	INP WR SEQ		
A7	BCB OPEN	S2	BATT OK
A8	BATT DISCH		
A9	BATT AUT END		
A10	BATT FAULT		
A11	BATT IN TEST		
A12	PLL FAULT	S5	INV SYNC
A13	INV OUT TOL	S3	INV OK
A14	OVERLOAD	S4	INV FEED OK
A4	THERM IMAGE		
A15	BYP FAULT	S6	BYP OK
A16	BYP FEED LO		
A17	RETR BLOCK		
A18	MBYP CLOSE		
A19	OCB OPEN		
A20	FANS FAILURE (OPTION)		
A21	HIGH TEMP		
A22	BYP SWITCH		
A23	EPO BUS		
A24	CURR STOP		
A25	SHORT CIRC		

The status shown in this list are always displayed in ascending order when the STATUS menu is entered, the alarms are shown when they are present and must be silenced with the buzzer. The alarms remain displayed whilst they are present and they are automatically stored in the event history memory with date and time.

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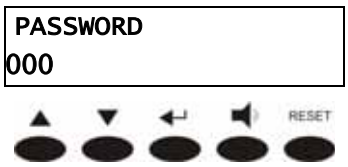
3.5 SPECIAL

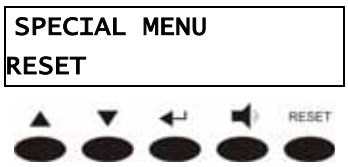
IMPORTANT

When entering the SPECIAL menu a password is required, as the operations which are allowed needs to be carried out by competent personnel. For each operation a confirmation is required.

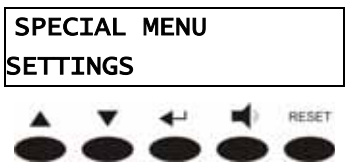
.



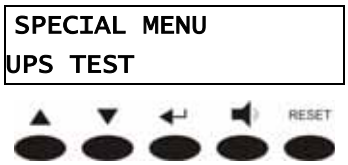
Password entering; if wrong the main menu screen is shown.



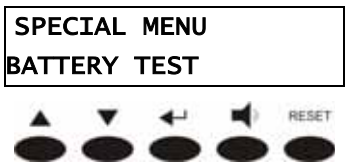
RESET UPS. To access press the ↵ key (see 3.5.1); to scroll the sub-menus press the ▲ or ▼ key.



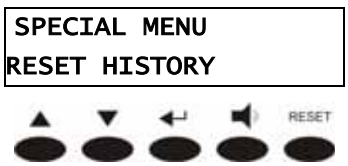
SETTINGS. Pressing the ↵ key (see 3.5.2) accesses the settings; to scroll the sub-menus press the ▲ or ▼ keys.



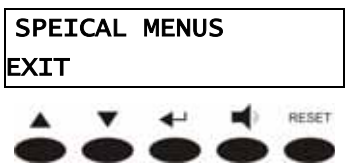
UPS TEST. To access press the ↵ key (see 3.5.3); to scroll the sub-menus press the ▲ or ▼ key.



BATTERY TEST. To access press the ↵ key (see 3.5.4); to scroll the sub-menus press the ▲ or ▼ key.

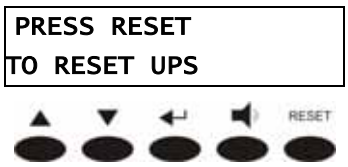


RESET HISTORY. To access press the ↵ key (see 3.5.5); to scroll the sub-menus press the ▲ or ▼ key.



Pressing the ↵ key the main menu screen appears; to scroll the sub-menus press the ▲ or ▼ key.

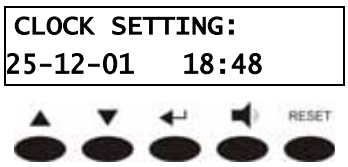
3.5.1 Reset



This menus provides a general reset of the UPS status pressing the key RESET. Pressing another key exit the menu

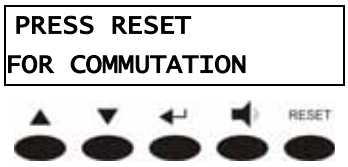
3.5.2 Settings

This menu allows to update the date and time settings for the history of alarms.



The numbers can be modified with the key ▲ or ▼ and they are confirmed by pressing ↵. Pressing the key RESET leads to the special menu (see 3.5).

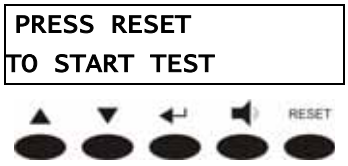
3.5.3 Test Ups



Pressing the key RESET causes the commutation to bypass. Pressing the key ↵ leads to the special menu (see 3.5).

3.5.4 Battery test

The BATTERY TEST cannot be started if the dip-switch on the μP is in the OFF position.



Pressing the key RESET the battery test is started. Pressing the key ↵ leads to the special menu (see 3.5).

WARNING

This test may affect the continuity of power supply to the loads if the battery is not fully charged.

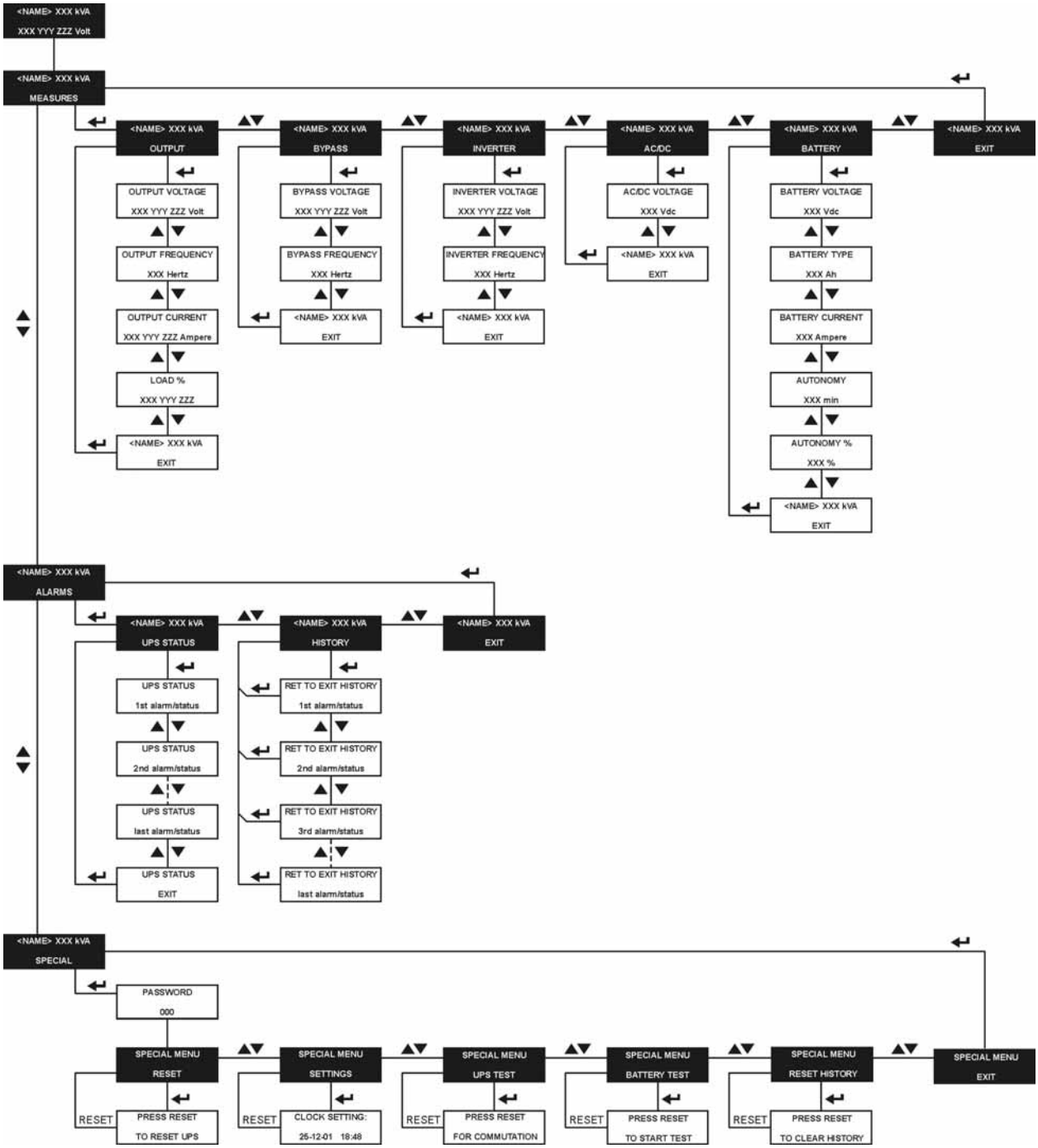
3.5.5 Reset history

Pressing the key RESET the alarms history is cleared. Pressing the key ↵ leads to the special menu (see 3.5).

WARNING

The above operation causes the cancellation of the events' history memory.

3.6 MENU STRUCTURE



Picture 2 – Menu structure

3. START-UP, SHUTDOWN & MANUAL BYPASS

Index

1. INTRODUCTION

Before performing any of the procedures described in this chapter, read carefully the instructions, to avoid possible damages to persons or things deriving from incorrect manoeuvres.

2. START UP PROCEDURE

WARNING

Before switching on the UPS, make sure:

1) the emergency power off "EPO" push-button, placed near the front panel, is in the release position; if not, press it and proceed with the start-up procedure;
2) the input and output phase rotation is correct.

NOTE

The BCB battery switch is found on the outside of the UPS system.

WARNING

Do not close the battery breaker BCB before it's required by the front panel. Serious damages to UPS internal parts and battery may occur if the breaker is closed before the rectifier is started-up.

Nr.	LCD DISPLAY	ACTION	UPS OPERATION
1	BLAND	**Close RCB**	
2	UPS START UP PLEASE WAIT		The rectifier is supplied and the DC voltage increases up to the nominal value. All LED's in the front panel are lit green. The microprocessor checks all the start-up conditions are ok. LED's #1 and #3 are lit green.
3	BOOSTER START UP PLEASE WAIT		The IGBT rectifier bridge starts to modulate and the inverter input voltage reaches the nominal value. LED #3 green light on.
4	INVERTER START UP PLEASE WAIT		The inverter bridge starts to modulate and the AC voltage reaches the nominal value. After a few seconds the static inverter switch closes. LED #5 green light on.
5	BYPASS START UP CLOSE SBCB	**Close SBCB**	
6	BYPASS START UP PLEASE WAIT		The microprocessor checks that all the bypass parameters (voltage, phase sequence, frequency) are within the tolerance limits. LED #2 green light on.

7	BATTERY START UP CLOSE BCB	**Close BCB**	
8	BATTERY START UP PLEASE WAIT		The microprocessor checks that all the conditions for the following steps are ok. LED #4 green light on.
9	START UP END CLOSE OCB	**Close OCB**	
10	START UP END PLEASE WAIT		The microprocessor checks that all the output parameters (voltage, current, frequency) are within the tolerance limits. LED #7 green light on.
End	UPS MODEL VOLTAGE OUTPUT		After a short time the default screen is displayed.

2.1 START-UP TROUBLESHOOTING

This paragraph provides the basic information if any alarms occur during the start-up procedure. In case the problem cannot be solved contact the service department.

1) *After having closed the RCB the LCD display is still blank*
   - Check the input phase rotation.
   - Check the rectifier protection fuses; these are installed inside the UPS.
2) *After Step #2 the UPS does not go on to Step #3 and displays the alarm A1 – Network failure*
   - Make sure alarm A2 is functioning. Check the input phase rotation.
   - Check the rectifier protection fuses F1-F2-F3.
3) *After Step #3 the UPS displays alarm messages*
   - Open RCB and check the connections.
   - Close RCB and try to restart the UPS.
4) *After Step #4 the UPS displays alarm messages*
   - Check that the EPO button, if provided on the outside of the UPS, is in the release position
   - Open RCB and control the connections.
   - Close RCB and try restarting the UPS.
5) *After Step #5 the display does not go to Step #6 and displays the alarm A15 – BYP NOT AVLB*
   - Check the protection fuses of the Bypass static switch; they are installed inside the UPS.
   - Control the phase rotation voltage.
   - Check that the voltage and frequency are within the tolerance limits.
6) *After Step #7 the display does not go on to Step #8 and the alarm A7 – BCB OPEN is displayed.*
7) Check the battery fuses.
   - Control the inter-connection between the auxiliary contact of the battery switch (in the external cabinet) and the clamps Bac1-Bac2 of the UPS.

WARNING:

Please contact our Service department after a failure. Jovyatlas does not take over any liability for late error reports.

3. SHUT DOWN PROCEDURE

Nr.	ACTION	LCD DISPLAY	UPS OPERATION
1	**Open OCB**	A19 OCB OPEN	The supply to the load is interrupted. LED #7 lit orange
2	**Open BCB**	A7 BCB OPEN	The battery is disconnected from the rectifier. LED #4 flashing red light.
3	**Open SBCB**	A7 BCB OPEN	The bypass line is disconnected. LED #2 off.
4	**Open RCB**	A1 NETWORK FAILURE	Booster and Inverter are switched off.
5		OFF	End of shut down procedure.

4. MANUAL BYPASS PROCEDURE

WARNING

During manual bypass operation the load is supplied directly by the mains, therefore continuous supply is not guaranteed.

Nr.	ACTION	LCD DISPLAY	UPS OPERATION
1	**Move the "NORMAL-BY-PASS" selector to "BY-PASS"**	A16 BYP→LOAD	The load is transferred to the by-pass line. LED #5 off, LED #6 orange light.
2	**Close MBCB**	A16 BYP→LOAD	The load is supplied from the mains through the manual by-pass switch. The by-pass static switch is still off.
3	**Open BCB**	A1 MAINS FAULT	Rectifier is switched off; the inverter is still on and supplied by the batteries. LED #1 off, LED #4 flashing green.
4	**Open RCB**	A1 MAINS FAULT	The batteries are disconnected and the inverter is switched of. The load is still supplied by the by-pass static switch. LED #4 flashing orange.
5	**Open SBCB**	OFF	The by-pass line is disconnected.
6	**Open OCB**	OFF	The load is supplied directly by the mains through the manual by-pass switch. The UPS is isolated.

5. START-UP FROM MANUAL BYPASS

Before the start-up from manual by-pass (after a maintenance or repairing) check that the "NORMAL-BYPASS" switch is in *BYPASS* position.

Nr.	LCD DISPLAY	ACTION	UPS OPERATION
1	BLAND	**Close RCB**	
2	UPS START UP PLEASE WAIT		The rectifier is supplied and DC voltage increases to the nominal value. All the LEDs on the front panel are lit. The microprocessor checks that all the start up conditions are o.k. LED #1 and #3 green lights on. LED #8 orange light on.
3	BYPASS START UP CLOSE SBCB	**Close SBCB**	
4	BYPASS START UP PLEASE WAIT		The microprocessor checks that all the bypass parameters (voltage, phase sequence, frequency) are within the tolerance limits. LED #2 green light on. The by-pass static switch is turned off, LED #6 orange light on.
5	CLOSE BCB PLEASE WAIT	**Close BCB**	The microprocessor checks that all the conditions for the following steps are ok. LED #4 green light on.
6	CLOSE OCB PLEASE WAIT	**Close OCB**	The load is supplied by the bypass static switch. The MBCB switch is still off. LED #7 green light on.
7	OPEN MBCB PLEASE WAIT	**Open MBCB**	The load is supplied by the bypass static switch only and the inverter can be started up. LED #8 off.
8	INVERTER START UP PLEASE WAIT		The inverter bridge starts to modulate and the AC voltage reaches the nominal value. The microprocessor checks the synchronisation with the by-pass line.
9	MOVE BYP SWITCH PLEASE WAIT	**Move the "NORMAL-BYPASS" switch to *NORMAL***	The load is transferred to the inverter static switch. LED #5 green light on.
10	START UP END PLEASE WAIT		The microprocessor checks that all the output parameters (voltage, current, frequency) are within the tolerance limits.
11	UPS MODEL OUTPUT VOLTAGE		

SPARE PARTS LIST

DESCRIPTION	Suggested Quantity	Type / Value	UPS SIZES		
			200 kVA	250 kVA	300 kVA
LEVEL 1					
AUXILIARY FUSES	2	FB1-FB2 PB108	X	X	X
FANS FUSE	2	10,3x38 4A Gg F7	X	X	X
INPUT CAPACITORS FUSE	2	32AX38 GG	X	X	X
RECTIFIER POWER FUSES	3	400A URD F1-F2-F3	X		
RECTIFIER POWER FUSES	3	630A URD F1-F2-F3		X	X
STATIC SWITCH BYPASS FUSES	3	500A URD F4-F5-F6	X		
STATIC SWITCH BYPASS FUSES	3	800A URZ F4-F5-F6		X	X
BATTERY FUSES	1	900A URD	X	X	X
INVERTER BRIDGE FUSES	1	315A URB (F10-F12)	X		
INVERTER BRIDGE FUSES	1	315A URB (F10-F11-F12)		X	X
LEVEL 2					
INVERTER STATIC SWITCH CONTROL LOGIC 3/F	1	2A5 (2A5A1+2A5A2+2A5A3+2A5A4)	X	X	X
INVERTER ACTUAL VALUE 3/F	1	INV-AV 3F	X	X	X
VOLTAGE REFERENCE 3/F	1	2A4A2 VOLT REF 3F	X	X	X
IGBT DRIVE RECTIFIER	1	ID 1-ID2-ID3	X	X	X
2SCR FIRING	2	2SCR-FIR 1-2-3-4-5-6	X	X	X
RECTIFIER THYRISTORS FIRING	1	RTF	X	X	X
FREE CONTACT INTERFACE	1	2A5 FCI	X	X	X
POWER SUPPLY HV	1	2A7A1 PS-SAT	X	X	X
IGBT DRIVE INVERTER	2	DR-SAT 1-2-3-4-5-6	X	X	X
CONTROL LOGIC TO IGBT DRIVER INTERFACE	1	2A8 PWM-SAT	X	X	X
SYSTEM CONTROL PANEL /E	1	2A6 SCP-E	X	X	X
RECTFIER POWER SUPPLY	1	INT-R	X	X	X
THYRISTOR INTERFACE CARD	1	INT-R2	X	X	X
DC VOLTAGE MEASURED	1	PS-MIS	X	X	X
IGBT SEMIX INTERFACE CARD	2	INT-SEMIX900	X	X	X
RECTIFIER CONTROL LOGIC	1	CPU-1 D-CPU-RC	X	X	X
SSI-BL IVERTER BOARD	1		X	X	X
NPE -FIL	1		X	X	X

LEVEL 3					
RECTIFIER POWER MODULE	1	323 A 1200V PS 7- PS 9	X	X	X
INVERTER STATIC SWITCH THYRISTORS	1	323 A 1200V PS 1- PS 3	X	X	X
BYPASS STAT.SWITCH THYRISTORS	1	323 A 1200V PS 4- PS 6	X	X	X
IGBT RECTIFIER	2	300A 1200V PS 1- PS 6	X		
IGBT RECTIFIER	2	400A 1200V PS1- PS 6		X	X
IGBT INVERTER POWER BRIDGE	2	700A 1200V PS1- PS6	X		
IGBT INVERTER POWER BRIDGE	2	910A 1200V PS1- PS6		X	X
FAN	2	230 VAC E1- E4	X	X	X
DC CAPACITORS 3900 MF 500 V	3	3900 uF 500Vdc C1-N	X		
DC CAPACITORS 3900 MF 500 V	3	3900 uF 500Vdc C1-N		X	
DC CAPACITORS 3900 MF 500 V	4	3900 uF 500Vdc C1-N			X
AC FILTER CAPACITORS 400 MF-250 V	3	400uF 400VAC CR-CS-CT	X	X	
AC FILTER CAPACITORS 400 MF-250 V	4	400uF 400VAC CR-CS-CT			X
INPUT AC FILTER CAPACITORS 200 MF-250 V	1	200uF 250 VAC CAC1-CAC3	X	X	X
DC CAPACITORS 2 MF 1000 V	2	2uF1000V	X	X	X
DIODE SINGLE 140A 1500V	1	140A 1500V D1-D2-D3	X		
DIODE SINGLE 140A 1500V	1	140A 1500V D1-D2-D3		X	X
ADDITIONAL SPARES					
INPUT RFI FILTER	1		X		
INPUT RFI FILTER	1			X	
INPUT RFI FILTER	1				X
BYPASS-OUTPUT RFI FILTER	1	EMIF-3F_DER	X	X	X
BATTERY RFI FILTER	1	EMIF-B_DER	X	X	X
HALL EFFECT CURRENT TRANSFORMER	1	300A TA1- TA3	X		
HALL EFFECT CURRENT TRANSFORMER	1	500A TA4-TA6	X		
HALL EFFECT CURRENT TRANSFORMER	2	500A TA1-TA7		X	X
OUTPUT CURRENT TRANSFORMERS	1	200-400-600/0,1A TA2-TA4	X	X	X
SERIAL INTERFACE	1	SLOT SERIAL	X	X	X
PB RPI BUSCAN					
RELAY CARD					

APPENDIX

DRAWINGS

Contents	Drawing-no.
Dimensional Drawing Battery Cabinet B10…B14 series	Y89 010 00 . MZ3
Charging Circuit and Battery Symmetry Monitoring	X00 074 01 . AS3
Parallel-redundant connection	X00 200 00 . VP3

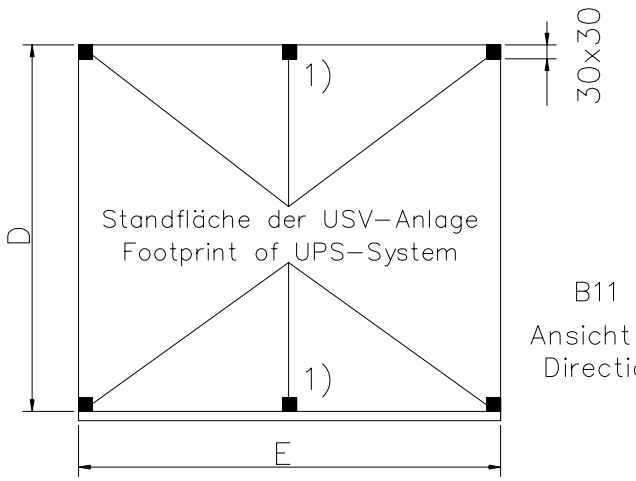
DATA SHEETS

Contents	Drawing-no.
Battery instruction guide	Types JOVYATLAS J / JL *)

**) When using a different battery instead of the above mentioned type “J” or “JL”, the applicable operating instructions must be followed. Either the battery manufacturer or our service department shall be consulted in this case.

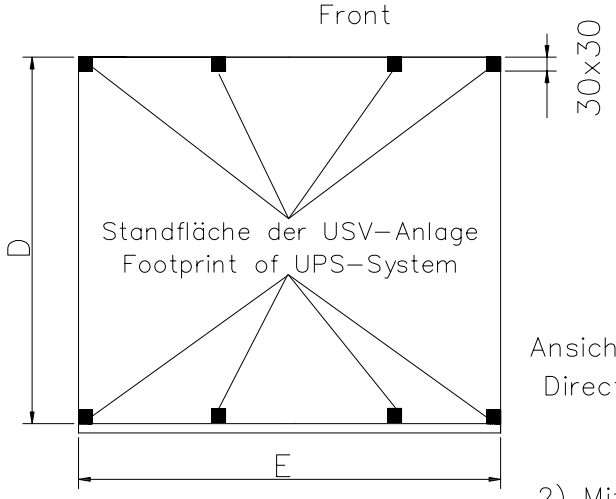
Batterieschrank Typ Battery cabinet type	Abmessungen Dimensions ca. / approx. (mm)					Gewicht ohne Batterie Weight without battery ca./approx. (kg)
	A	B	C	D	E	
B10	470	800	1200	780	470	70
B11	470	800	1340	780	470	80
B12	910	810	1620	790	910	125
B13	910	810	1820	790	910	140
B14	1072	936	1898	910	1069	198
B15	1354	790	1670	770	1354	202

1) Mittlere Füße nur bei B12 / B13 / B14
Middle footprints only for B12/B13/B14



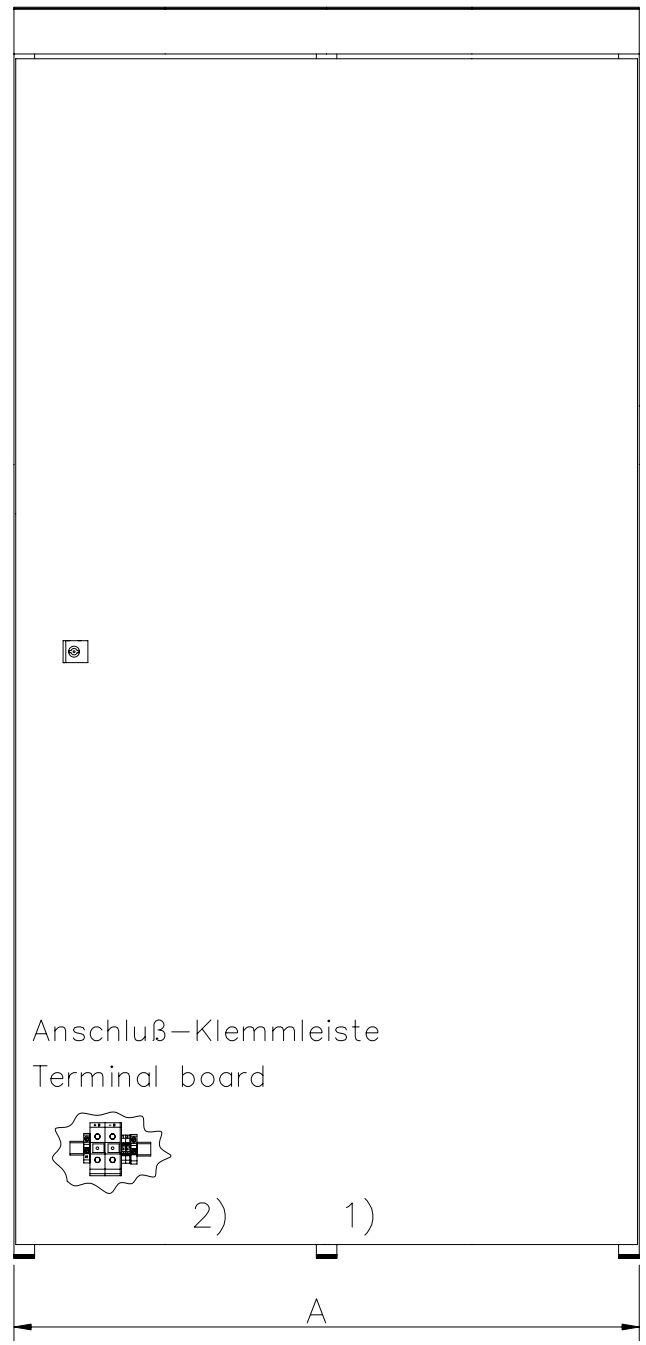
B11 – B14
Ansicht von oben
Direction above

Vorne
Front

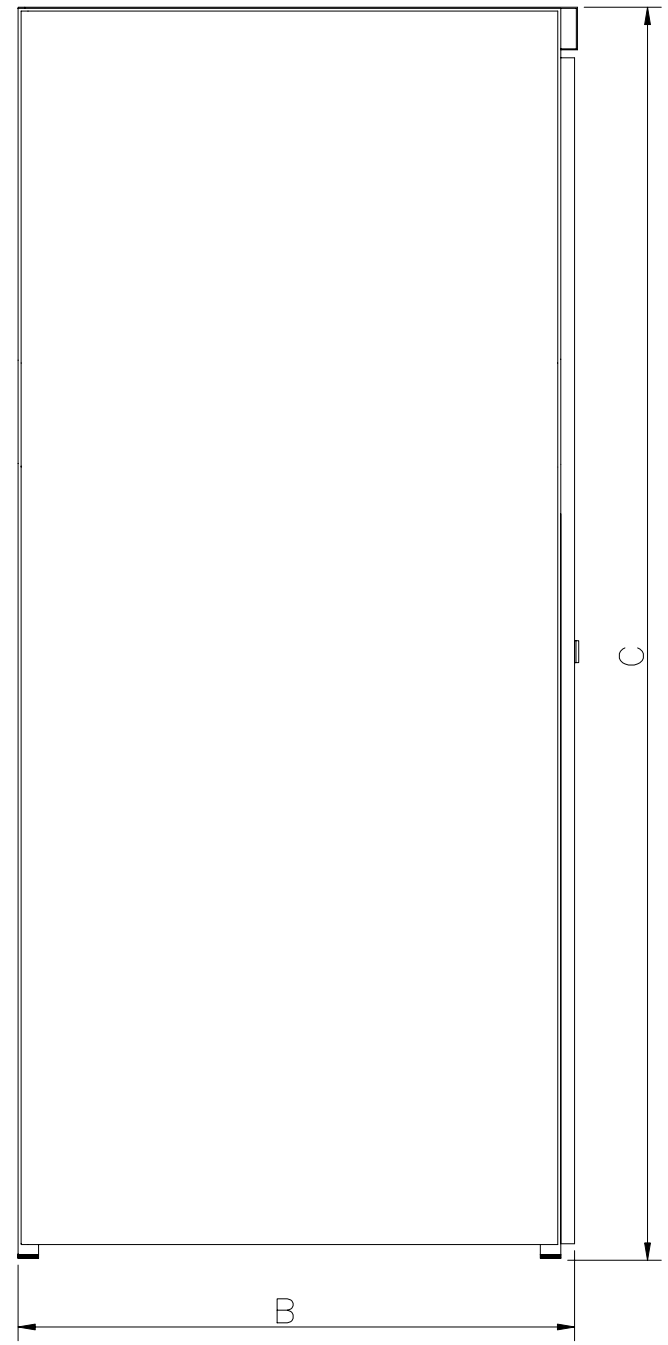


B15
Ansicht von oben
Direction above

Vorne
Front



Vorderansicht
Front view



Seitenansicht von links
Left side view

2) Mittlere Füsse für B15 siehe Draufsicht
2) Middle Footprints only for B15 see the front drawing

07/143	01.10.07	Harms	Datum: Date:	22.02.2002	Batterieschränke Battery cabinets		Unterbrechungsfreie Stromversorgung Uninterruptible Power System JOVYSTAR	Zeichnungs–Nr.: / Drawing–No.: Y 89 010 00 . MZ 3
06/168	25.07.06	FECHTELER	Name: Name:	O. Böke				
06/053	16.01.06	FECHTELER	Geprüft: Checked:	H. Beek				Auftrags–Nr.: / Order–No.:
Zustand: Rev.	Datum: Date:	Name: Name:	Norm: Norm:		Dateiname: File name: Y890100B.DWG	Maßstab: Scale:		Benennung: / Drawing description: Maßzeichnung / Dimensional drawing

communications JOVYATLAS

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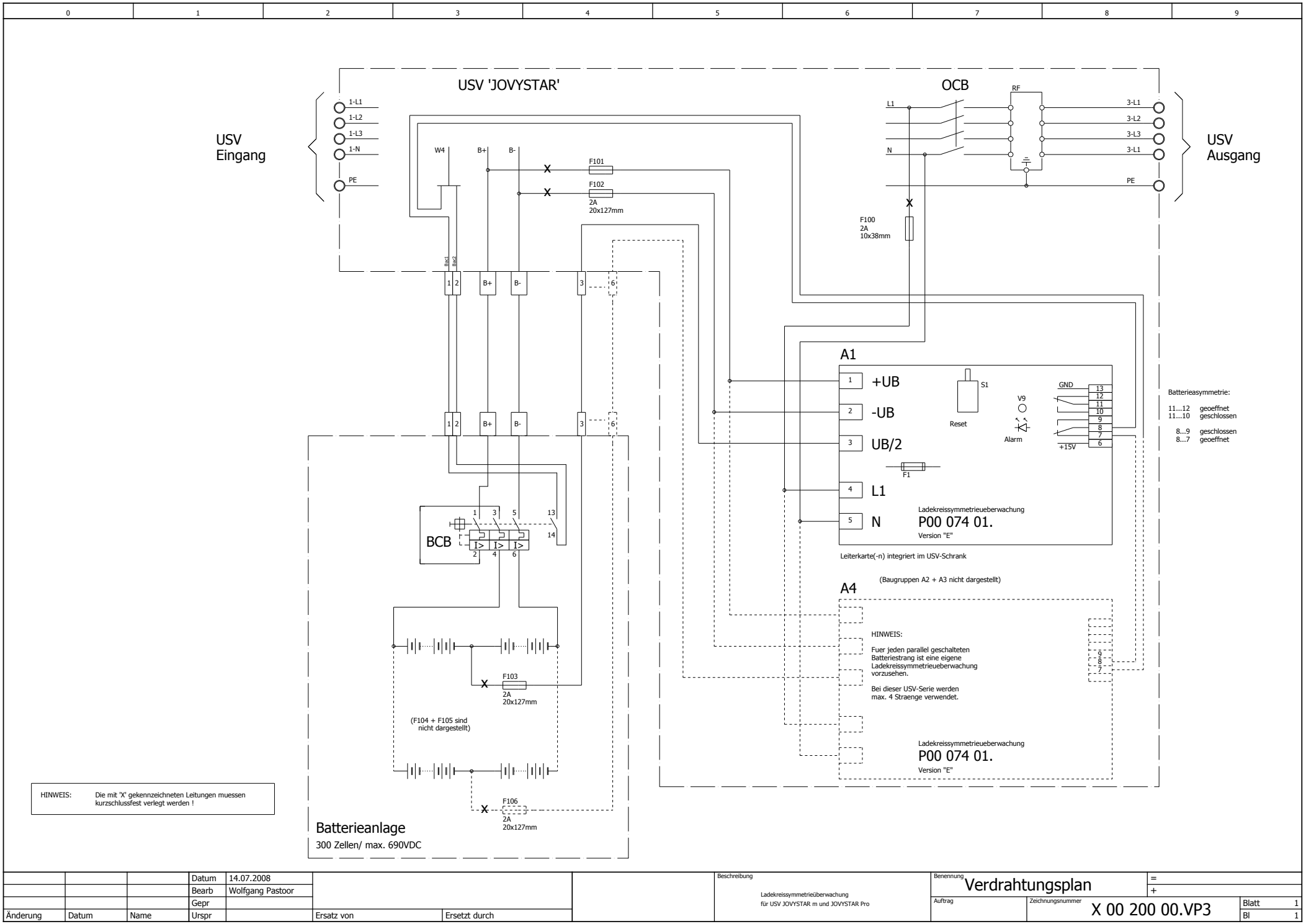
von of 1 Blatt Page(s)



			Datum	14.07.2008		
			Bearb	Wolfgang Pastoor		
			Gepr			
Änderung	Datum	Name	Urspr		Ersatz von	Ersetzt durch

Beschreibung
Ladekreissymmetrieüberwachung
für USV JOVYSTAR m und JOVYSTAR Pro

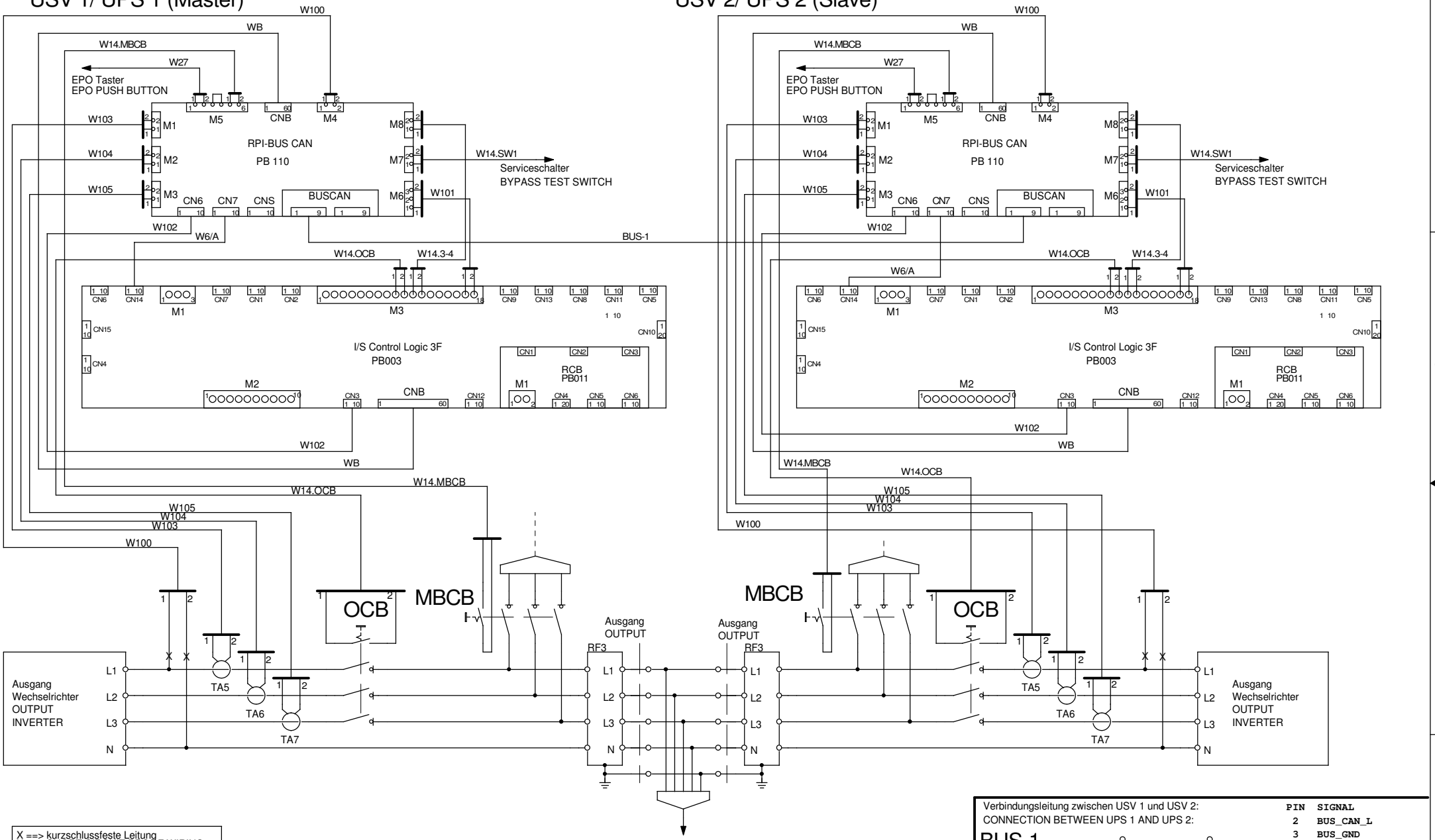
Benennung: Verdrahtungsplan

=
+

Auftrag

Zeichnungsnummer: X 00 200 00.VP3

Blatt 1
Bl 1



X ==> kurzschlussfeste Leitung
X ==> SHORT CIRCUIT PROOF WIRING

Verbindungsleitung zwischen USV 1 und USV 2:
CONNECTION BETWEEN UPS 1 AND UPS 2:

BUS-1

Sub-D-9 Stift /Male — Sub-D-9 Stift /Male

PIN	SIGNAL
2	BUS_CAN_L
3	BUS_GND
4	INT_SYNC_BUS
5	MAINS_SYNC_BUS
7	BUS_CAN_H
9	BUS_POWER

			Datum Date	30.10.2002		
			Name Name	W. Pastoor		
03/125	25.11.2003	Fechteler	Geprüft Chkd.			
Zustand Revision	Datum Date	Name Name	Norm Norm		Dateiname File name X0012900.DSN	Maßstab Scale

USV - JOVYSTAR (Parallel-Redundant-Verschaltung)
UPS - JOVYSTAR (Parallel-Redundant-Connection)

Zeichnungsnr./DRAWING NO. X0012900.VP3

Auftragsnr./ORDER No.

Benennung/DESCRIPTION: Verdrahtungsplan 3-ph./ Wiring Diagram 3-ph.

Blatt Page 1 von of 1 Blatt No. of pages

JOVYATLAS GmbH

Operating instructions for valve regulated lead-acid batteries in AGM - Technology

Type GiV: J/JL

Index	Date	Name	Status
0	21.05.2007	A. Heller	First Edition

Nominal data:

• Nominal voltage UN:	2,0 V x number of cells (1 2 V/ 6V)
• Nominal capacity C20	20h discharge
• Nominal temperture TN:	20°C
• Factors of reduction:	For ventilation (draft DIN/VDE 051 Opart1) Factor fl = 0,5 f2 = 0,5
• Nominal discharge curr.: h= 1»	CV20h

Battery type:	
Assembly by:	Date:
Commissioned by:	Date:

	• Observe these instructions and keep them located nearby the battery for future reference! Work on the battery should only be carried out by quilified personnel!
	• Do not smoke! Do not use any naked flame or other sources of ignition. Explosion and fire hazard are present!
	• While working on batteries wear protective eye-glasses and clothing! Observe the accident prevention rules as well as DIN VDE 0510, VDE 0105 part I!
	• Any acid splashes on the skin or the eyes must be flushed with plenty of water immediately. Then seek medical assistance. Spillages on clothing should be rinsed out with water!
	• Explosion and fire hazard, avoid short circuits! Caution! Metal parts of the battery are always alive, therefore do not place items or tools on the battery!
	• Electrolyte is strongly corrosive and acidic. In normal working conditions the contact with electrolyte is nearly impossible; electrolyte may leak from the vent valves in case of over charging the battery or in case of mechanical damage to the container. In case of any contact with electrolyte please flush water abundantly and get in touch with a physician.
	• Batteries/cells are heavy! Ensure adequate mounting security and always use suitable handling equipment for transportation!
	Non-compliance with operation instructions, repairs made with other than original parts, or repairs made without authorization (e.g. opening valves) render the warranty void.
	**Disposal of batteries:** **Batteries marked with the recycling symbol should be processed via a recognised recycling agency. By agreement, they might be returned to the manufacturer. Batteries must not be mixed with domestic or industrial waste.**

Valve-regulated lead acid batteries consist of cells which do not require water topping during the operation.

1. Start up

Check all cells/blocks for mechanical damage, correct polarity and firmly seated connectors. The following torques apply for screw connectors:

M5	M6	M8	M 10
2 - 3 Nm	4 - 5,5 Nm	5 - 6 Nm	14-22 Nm

Connect the battery with the correct polarity to the charger. The charger should not be switched on during this process. The load should not be connected (pos. pole to pos. terminal).
Switch on charger and start charging following instruction no. 2.2.

.

2. Operation

For the installation and operation of the batteries DIN VDE 0510 is mandatory. Battery installation should be made such

that temperature difference between individual units does not exceed 3 degrees Celsius/Kelvin.

2.1 Discharge

Discharge must not be continued beyond the level specified for the specific discharge current. Deeper discharges must not occur unless specifically agreed with the manufacturer. Recharge immediately following complete or partial discharge.

2.2 Charge

Applicable are all charging procedures with their limit values according to DIN 41773 (IU-characteristic). According to the charging equipment specification and characteristics, alternating currents (< 0.1 C(A)) flow through the battery superimposing into the direct current during charging operation. These alternating current and the reaction from the loads lead to an additional temperature increase of the battery and strain the electrodes with possible damages (2.5)

Depending on the installation, charging (acc. to DIN VDE 0510 Part I draft) may be carried out in the following operations.

a) Standby Parallel Operation and Buffer Operation

Here the load, direct current source and battery are continuously in parallel. Thereby the charging voltage is the operation-voltage and, at the same time, the battery-installation voltage. With the standby parallel operation, the direct current source is at any time capable of supplying the maximum load current and the battery charging current. The battery only supplies current when the direct current source fails. The charging voltage should be set at 2,275V ± 0,005V (at 20°C) x number of cells in series measured at the terminals of the battery. With buffer operation the direct current source is not able to supply the maximum load-current at all times. The load-current intermittently exceeds the nominal current of the direct source. During this period the battery supplies power. The battery is not fully charged at all times but the float-charge voltage of 2.275 V/cell ± 0.005 V (at 20° C) x number of cells in series provides a reasonable recharge duration under normal conditions. Dependent on load and number of cells in series, it is recommended to consult the battery manufacturer in any doubtful case.

b) Switch-mode Operation

When charging, the battery is separated from the load. To reduce the charging time, a three phase boost charge mode can be applied by charging the battery at 2,45 – 2,5 V/cell until the charging current drops to 0,07 C(A) (trip point for the first phase of charging t1). The duration of charging of the first phase is measured by a timer so that the second phase should be half of the first phase (t2 = 0,5 x t1) when the batteries are kept on charge at 2,45 – 2,5 V /cell.
After the total charging of t=t1 +0.5t1 has elapsed, the charger reduces the voltage to a normal float-charge level of 2,275 V/cell (± 0,005V) at 20° C.

c) Battery Operation (Charge / Discharge Operation)

The load is only supplied by the battery. The charging process depends on the application and must be carried out in accordance with the recommendations of the battery manufacturer.

2.3 Maintaining the full charge (Float charge)

Devices complying with the stipulations under DIN 41773 must be used. They are to be set so that the average cell voltage is 2.275 V ± 0.005V

.

2.4 Supplementary and Equalizing charge

To ensure maximum service life, a supplementary charge may be required prior to installation on condition that the batteries have been in storage for more than 6 months or more, latest after 9 months age from the date of production and that the open circuit voltage is less than 2,1 Volts per cell.

A supplementary charge should be applied in accordance with figures shown in the table:

Storage period	Charge voltage/ cell at 20° C	Charge time
Less than 9 Months	2,275 V/cell	More than 72 hours
Up to 1 year	2,35 V/cell	48 - 144 hours
1 - 2 years	2,35 V/cell	72 - 144 hours

Batteries kept at normal float charge level within a string do not require any equalizing charge in case of partial replacement, in order to narrow the bandwidth of open-circuit voltages.

2.5 Alternating currents

On recharging up to 2,4 V/cell under operation modes 2.2 the actual value of the alternating current is for a very short time permitted to reach 0,1 C(A) nominal capacity. In a fully charged state during float charge or standby parallel operation the actual value of the alternating current must not exceed 5A / l00Ah nominal capacity.

2.6 Charging currents

During float charge or standby parallel-operation without recharging state the charging currents are not limited. The charging current should range between 10 A to 20 A / l00 Ah nominal capacity.

2.7 Temperature

The nominal operation temperature range for lead-batteries is 10°C to 30°C (best 20°C ±5 K). Higher temperatures will seriously reduce service life. All technical data are produced for a nominal temperature of 20°C. Lower temperatures reduce the available capacity. The absolute maximum temperature is 50°C and should not permanently exceed 40°C in service.

2.8 Temperature related float charge voltage and boost charge voltage

The float charge voltage of 2,275V /cell ± 0,005V/cell refers to a battery temperature of 20°C. Temperature compensated charging is required in order to avoid overcharge at high temperatures and undercharge at low temperatures. The recommended temperature compensation factor is -3m V/cell/°C for float charge operation. In order to avoid thermal runaway, it is mandatory to temperature-compensate the float-charge voltage for temperatures above 40°C.

The boost charge mode can be applied if a quick recharge is required on condition that the charging current does not exceed 0,25C(A) and constantly drops to 0,01C from where normal float charge voltage should be applied.

Temperature (°C	Boost charging voltage (V/cell)	Maintenance charge voltage(V/cell)
- 10	2,58	2,36
0	2,53	2,33
10	2,48	2,30
20	2,45	2,275
30	2,4	2,24
40	2,34	2,21

2.9 Electrolyte

The electrolyte is diluted sulphuric acid and is absorbed in glass-matt separator.

3. Battery maintenance and control

Keep the battery clean and dry to avoid leakage currents.

Plastic parts of the battery, especially containers, must be cleaned with pure water without additives, any organic solvents are prohibited.

At least every 6 months measure and record:

- battery voltage
- voltage of several cells/blocks
- surface-temperature of several cells/blocks
- battery-room temperature

If the difference of the average float-charge-voltage/cell is exceeding ± 0,1V/cell within a string or if the surface temperature-difference between cells/blocks is exceeding 5 K, the service-agent should be contacted.

Annual measurement and recording:

- voltage of all cells/blocks
- surface temperature of all cells/blocks
- battery-room temperature
- insulation-resistance according to

DIN 43539 part 1

Annual visual check:

- screw-connections, any screw-connections without locking devices have to be checked for tightness
- battery installation and arrangement
- ventilation

4. Tests

Tests have to be carried out according to IEC 896-2, DIN 43539 part 1 and 100(draft) Special instructions like DIN VDE 0107 and DIN VDE 0108 have to be observed.

5. Faults

Call the service agents immediately in case of faults in the battery or the charging unit. The availability of the recorded data described in point 3, will be very helpful to find the cause of failure. A service-contract simplifies trouble- shooting.

6. Storage and taking out of operation

To store or decommission cells/batteries for a longer period of time, they should be fully charged and stored in a dry frost-free room.

Ta avoid damage, batteries should be regularly subjected to supplementary charge cycles in accordance with 2.4.

7. Transport

VRLA batteries, which by no means show any kind of damage, are classified as non-dangerous goods for transportation via rail, lorry or air (according to GGVS, GGVE and IATA Regulations) if they are safeguarded during transportation against short-circuiting, tossing about, slipping or any damage.

Batteries to be classified under afore-mentioned paragraph must mandatory not display any traces of electrolyte on the exterior of the battery container.

As for VRLA batteries being damaged, assumed to be leaking of electrolyte and to be transported under warranty, or assumed not to be tight in any aspect anymore, they are to be handled in accordance with exception regulations of dangerous goods transportation rules concerned.

8. Technical data

Capacities (Cn) at different discharge times (tn) until the final discharge voltage (US) at battery temperature 20°C

Type	**20h** C20 (Ah) to 1,85V/cell	**10h** C10 (Ah) to 1,80V/cell	**5h** C5 (Ah) to 1,79V/cell	**3h** C3 (Ah) to 1,78V/cell	**1h** C1 (Ah) to 1,74V/cell	**30Min.** C1/2 (Ah) to 1,720V/cell	**10Min.** C1/6 (Ah) to 1,70V/cell
J - series 6 – 9 years							
J1005000	5	4,8	4,3	4,03	3,45	3,07	2,93
J1005100	7	6,5	5,5	5,3	4,2	3,45	3,24
J1005200	12	11,2	9,5	9	7,1	5,9	5,56
J1005300	17	15,5	13,5	13	10	8,36	7,9
J1005400	24	22,8	19,9	19,5	16	15,1	13
J1005500	32	28,3	25	23,2	21,5	19,25	13,9
J1005600	38,9	35,9	31,9	31	28,1	25,6	19
J1005700	52,7	45,8	41,2	38,8	34,5	29,9	22,8
J1005800	62,9	56	50,9	49,2	45	39,3	31,5
J1005900	61	54,4	49,5	47,3	42,7	36	26,5
J1006000	97	91	80	72,5	58	55	40,9
J1006100	97	89,5	78,5	73,5	62,5	54,7	38,8
J1006200	125	118	106	96	78	67,5	47,5
J1006300	160	150	136	129	100	89	60,5
J1006400	210	200	185	162	136	109	66,8
Type	C20 (Ah) to 1,85V/cell	C10 (Ah) to 1,80V/cell	C5 (Ah) to 1,75V/cell	C3 (Ah) to 1,75V/cell	C1 (Ah) to 1,74V/cell	C1/2 (Ah) to 1,70V/cell	C1/6 (Ah) to 1,70V/cell
JL - series 10 – 12 years							
JL205500	17,2	15,3	14,3	13,5	11	9,6	6,9
JL205510	26	23,4	21,3	19,6	18,1	17,35	11,3
JL205520	28	25,3	23	20,7	19,5	18,7	12,2
JL205530	32	28,3	25	23,2	21,5	19,25	13,9
JL205540	38,9	35,9	32,2	31	28,7	25,5	19
JL205550	50,9	45,8	41,6	39,1	35,5	30,2	23,66
JL205560	64,2	57,2	52,5	50,9	47,8	41,1	29,66
JL205570	73,1	65,9	61,2	58	55,6	46,5	31,66
JL205580	91,9	85,1	75,8	72,5	65	56	40,5
JL205590	102	93,1	83,3	78,7	69,8	62,5	43,66
JL205600	112	104	93	90	80,7	68,5	46,8
JL205610	123	115	105	103	100	84	53,8
JL205620	139	128	115	110	104	90	56,3
JL205630	186	172	158	151	140	110,5	63

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