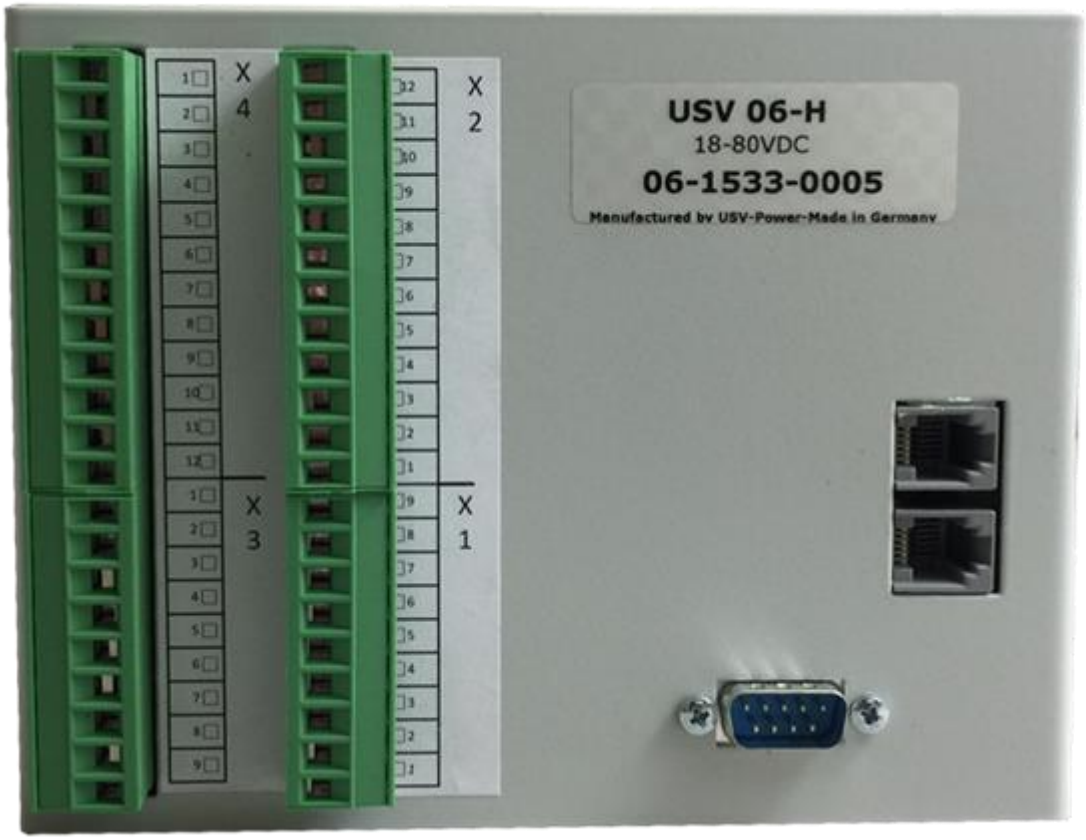
USV6-H
DC-CONTROLLER

USER MANUAL

(Firmware version: V2.08)



Notes to this manual

ATTENTION! Read this manual carefully before installing and commissioning the specified unit. This manual is a part of the delivered unit. Familiarity with the contents of this manual is required for installing and operating the specified unit. The rules for prevention of accidents for the specific country and the general safety rules in accordance with IEC 364 must be observed.

The function description in this manual corresponds to the date of publishing. Technical changes and changes in form and content can be made at any time by the manufacturer without notice. There are no obligations to update the manual continually.

The unit is manufactured in accordance with applicable DIN and VDE standards such as VDE 0106 (part 100) and VDE 0100 (part 410). The CE marking on the unit confirms compliance with EU standards 2006-95-EG (low voltage) and 2004-108-EG (electromagnetic compatibility) if the installation and operation instructions are followed.

Changes and errors expected.

Revision history

Revision: 3.1

Date: 2013-09-06

Revision	Description	Author	Date
00	Preliminary version (translation of the German version …R02)	PS	2008-08-04
1.0	Section 4.6 "Temperature Compensation" completed; translation reworked; pinning of connector X2:5 corrected; new revision numbering (X.X) introduced.	RTH	2011-01-31
2.0	Pinning of the relay contacts corrected.	RTH	2011-04-06
3.0	Section "Optional: Relayboard USV6-I/O" omitted	RTH	2013-06-10
3.1	Section 2.1 "Options" reworked	RTH	2013-09-06

Contents

1. Applications & functioning

The Signalling and Monitoring unit USV6-H is used as a central monitoring and signalling unit in DC power supply systems. These plants can be battery powered or operate as direct supply for DC-bus bars.

They are used in all the places, where plant information is collected (such as voltages and current at different intersections of the system), where parameters have to be monitored and errors signalled or if boost charge function or discharge test is required in a battery system.
The monitoring unit can be mounted in different ways. Thus it is possible to mount it in 19" full insertion units with a minimum height of 3 HU, and 19" partial insertion units (1/3-19" width), or door mounted as well.

The individual signal parameters such as voltages and current are connected using secured lines directly to the USV6-H by plug (DIN41612, R48).
The USV6-H receives these values, indicates them on the display, compares the values with adjusted monitoring thresholds, gives disturbance signals (LED + relay) and operates in the boost charge operation as well as discharge test operation as a controlling device of the connected rectifiers.
Additionally the output values of rectifier REC and inverter INV can be read out if a CAN bus is connected.

The user language can be selected by menu. All the necessary monitoring parameters can be read by the end-user directly at the site of application and can be adjusted by code-protected service menu. Special software adaptations are not necessary for this.

The USV6-H can be obtained for two different voltage ranges and can be directly connected to the corresponding DC potential without any further measures.
The software as well as the default values for the plant parameters for the USV6-H is programmed in an EPROM. The current values (adaptations on site etc) as well as the error data are stored in an EEPROM.

If there is cancellation in the EEPROM (e.g. due to a defect of the USV6-H), a reprogramming starts using the default values of the plant which are stored in the EEPROM. During reprogramming all the functions which include a control function for external devices (boost charge option, discharge test) are deactivated in order to prevent damage due to false values in the plant. These functions must be manually enabled again in the service menu.

2. Type list

USV6-H versions as listed in the table below are available.

Type designation	Article code	Supply voltage (V DC)
USV6-H-LV Language	300-110-660.00	24 to 80 (Low Voltage Version)
USV6-H-HV Language	300-110-770.00	80 to 300 (High Voltage Version)

2.1 Options and additional available articles

- 3-phase mains monitoring board: USV3
- Battery monitoring board: USV8
- 8 digital inputs: signalling board USV5
- 6 relay outputs: relay board USV4
- Profibus-accessibility by unigate gateway CL
- Modbus-accessibility by unigate gateway CL-RS
- Front plate 1/3-19" x 6 HU for mounting one USV6-H; printed
- Front plate 19" x 3 HU for mounting one USV6-H; printed

3. Features

The USV6-H has the following standard features:

- Real time clock (RTC) with date and Event History
- Measurement, indication and monitoring of three DC voltages in the system
- Measurement, indication and monitoring of three DC currents in the system
- Isolation fault monitoring
- Boost charge automatic (dependent on current, voltage and time) boost charge switchable by digital input
- Battery test (dependent on time) and switchable by digital input
- Drop diode control
- Monitoring of battery voltage imbalance
- Control of LVD
- RS232 interface for parameterization using PC configuration software
- 4 potential free relay outputs (K1-K4)
- 8 digital measuring inputs
- CAN bus interface to control connected power supply modules
- Multilingual facility, seven languages (three at the same time): English and German as well (always), French, Italian, Russian (Cyrillic), Swedish, Czech
- LED signals to indicate errors
- Free programming of indication and error texts as well
- Free allocation of individual errors to urgent and not urgent alarms as well as to the signalling relays
- BootLoader, i.e. firmware-update via CAN or RS232 alternatively

The following options and upgrades as well are available:

- Temperature compensation of the charge voltage (using a temperature sensor LM335)
- Measurement, indication, and control of current and voltage of 3-phase mains (using a mains monitoring board DCC-MMB)
- 8 additional digital inputs (using a signalling board DCC-DI8)
- 6 additional potential free relay contacts (using a relay board DCC-RB)
- Remote data retrieval via modem
- Programming software for the parameterization of the unit via RS232
- Connection to Profibus (using an external gateway Unigate CL)
- Connection to Modbus (using an external gateway Unigate CL-RS)

4. Description of the individual functions

4.1 Measuring inputs V_{dc1}, V_{dc2}, V_{dc3}

- Voltage version 1 (LV): Measurement and indication voltage range 0 V to 100 VDC
- Voltage version 2 (HV): Measurement and indication voltage range 0 V to 300 VDC

The supply lines have to be externally fused. If V_{dc3} is used for monitoring the battery symmetry, pay attention to use the same reference connection point of the minus connections for V_{dc1} and V_{dc3}!

The plain text of display indication of the measuring inputs V_{dc1} to V_{dc3} can be freely programmed (max. five signs) via software (not included in this version) in the user menu.

The indication accuracy of the values corresponds to class 1 measuring device.

Clear text terms:

- V_{dc1}: free programmable; designation in this version: Vbatt
- V_{dc2}: not connected
- V_{dc3}: not connected

4.2 Measuring inputs I_{dc1}, I_{dc2}, I_{dc3}

The assignment of the nominal shunt values is done in the Service menu. The shunt magnitudes can be assigned to the individual measuring inputs as follows:

- I_{dc1}(±)0 A to 50 A (1 A steps), 50 A to 1000 A (5 A steps); 0 A means "no shunt installed"
- I_{dc2}: 0 A to 50 A (1 A steps), 50 A to 1000 A (5 A steps); 0 A means "no shunt installed"
- I_{dc3}: 0 A to 50 A (1 A steps), 50 A to 1000 A (5 A steps); 0 A means "no shunt installed"

The assigned maximum current of the shunt corresponds to a potential drop of 60 mV.
Because exclusively measuring input I_{dc1} is able to measure negative current values it should be used to meter the battery charging and discharging current as well.

The indication accuracy of the values corresponds to class 1 measuring device.

ATTENTION!
All shunts have to be referenced to the same DC-bar. Potential differences in the current path of the shunts may destroy the measuring inputs.
For the correct indication of the measured current value it is necessary to connect digital GND to the positive measurement line connection point at the shunt (in the direction of current flow). If more than one shunt is used in the system, the connection to one shunt is sufficient.

4.3 Insulation error monitoring

The connection of the measuring and supply voltage Vdc1 as well as of the protective conductor is the minimum necessity for monitoring insulation errors of the DC-system for. While measuring the insulation error, it can be seen whether there is an insulation error between plus pole and earth, or minus pole and earth.

Insulation errors are only recognised if they appear between plus potential /minus potential and earth, not between the potentials. The threshold value of the insulation resistance can be adjusted using the user menu. The prefix indicates whether there is an earth-leakage against plus or minus.

Earth fault R = +(-)xxx kOhm

Factory setting: The error signal does not enter collective failure relay.

4.4 Signalling of "DC voltage low"

A monitoring threshold V<Vmin can be set for each measuring voltage (V_{dc1} to V_{dc3}). The LED indication at the front side $V>V_{min}$ and the relay K4 are fixedly connected to the monitoring of V_{dc1}. The green LED $V>V_{min}$ is OFF, and the signalling relay K4 switches over in the case of error.

External signalling of monitoring V_{dc2} and V_{dc3} is possible by an assignment of the signal to the reserve relay K1 or LED-signal S1 or S2.

A time delay can be adjusted in the user-menu for these signals.

Indication: $V_{dc1}<V_{min}$
$V_{dc2}<V_{min}$
$V_{dc3}<V_{min}$

4.5 Signalling of "DC voltage high"

A monitoring threshold V>Vmax can be set for each measuring voltage (V_{dc1} to V_{dc3}). The LED indication at the front side $V>V_{max}$ and the relay K3 are fixedly connected to the monitoring of V_{dc2}. The red LED $V>V_{max}$ is ON and the signalling relay K3 pulls up in the case of error.

External signalling of monitoring V_{dc2} and V_{dc3} is possible by an assignment of the signal to the reserve relay K1 or LED-signals S1 or S2.

A time-delay can be adjusted in the user-menu for these signals.

Indication: $V_{dc1}>V_{max}$
$V_{dc2}>V_{max}$
$V_{dc3}>V_{max}$

4.6 Temperature control and temperature compensation of the charge voltage

If an active temperature sensor (LM335) is connected to the monitoring unit, the temperature of the devices (cabinet), or the battery can be monitored. The signal can be set as collective failure (selectable by the user) or signalled by the re-serve relay K1 (programmable).

Indication: Temperature high "T>"

Thus the relay contact can be used e.g. for fan control. Temperature monitoring can be enabled in the service menu. The temperature threshold and hysteresis can be adjusted in the service menu as well.

If the option "temperature compensation" is enabled, the output voltage of the CAN bus connected rectifiers is controlled dependent on temperature.
The temperature coefficient as well as the start temperature and final temperature of the charge voltage control are settable.
The reference temperature value is 20 °C. The relevant parameters of the regulator (U_{batt}) are related to this value. If the temperature deviates from the reference value, the charge voltage is controlled accordingly.

4.7 Monitoring of mains voltage

Using a Mains Monitoring Board (DCC-MMB) the unit monitors and displays mains voltages. The monitoring threshold is settable in the service menu.

Indication:

VR	VS	VT	f
xxxV	xxxV	xxxV	50.0

and

IR	IS	IT
xxxA	xxxA	xxxA

Fault Indication: MM1 fault, mains fault V< or mains fault V>

If the set threshold values are deviated, an error signal is generated by the USV6-H. The error signal is stored in the event memory and can be assigned to a signalling LED (S1 or S2) and a signalling relay as well.

The indicated frequency is measured at phase L1.

4.8 Digital inputs

In total eight digital inputs are available for different monitoring functions. External relay contacts such as fuse monitoring are connectable to monitor and signal error signals via USV6-H.

4.9 Signalling relays K1 & K2 (K11-K16)

By configuration at the service menu signals can be assigned to the internal signalling relay K1 and K2 (using an optional relay board DCC-RB in addition to the relays K11 to K16). The signals are linked if more than one signal is assigned to one relay. If one or more signals occur, the relay is deactivated. A time delay of 0 sec. up to 300 sec. can be set to each relay. Deactivation of the relay is delayed if an error occurs but if the error disappears, the relay operates without de-lay.
If "boost charge" is assigned to one relay, it is deactivated without delay if boost charge is enabled. The relay keeps deactivated for a settable follow-up time of 0 min. up to 300 min. This feature can be used e.g. for a period of continued venti-lation (battery room).

4.10 Monitoring: Battery voltage imbalance

By setting the threshold dV_{batt} and battery center tap voltage $V_{batt}/2$ as well in the service menu, defective battery cells can be detected at deviation of the battery center tap voltage. Simply the voltage imbalance is detected not the position of the defective battery cell(s). To be able to use this monitoring feature the connection of the measurement voltage U_{dc3} between minus potential and battery center tap is essential.

Error indication: "Battery unsymmetrical"

The setting effects in "%" of the nominal battery voltage value (=number of cells x 2.0 V).

4.11 Boost charge/hand operation charge/system test

The **boost charge mode** can be switched ON in different ways.

-Manual switch ON. If "boost charge" is enabled in the main menu, you are able to switch ON (and OFF as well) the boost charge mode in the main menu by clicking "ENTER".

-Automatic switch ON. E.g if the battery voltage drops below a set threshold val-ue,

or

if I_{batt} (I_{lade}) > 200 A.

-Boost charge can also be released via digital input (USV6-H or I/O or DI8).

-Boost charge can be automatically started after a battery test.

A running boost charge is indicated in the main menu of the USV6-H.

A timer can be set (one hour up to 24 hours) in order to switch OFF the boost charge after the set period is lapsed.

By digital input boost charge can be disabled, or blocked in order to prevent starting.

Furthermore **hand operation charge** can be enabled. In this case the charge voltage value (rectifier output voltage) can manually be set.

Also **system test** is possible. In this case the charge voltage value (rectifier out-put voltage) also can manually be set e.g. to test the threshold values of the sys-tem.

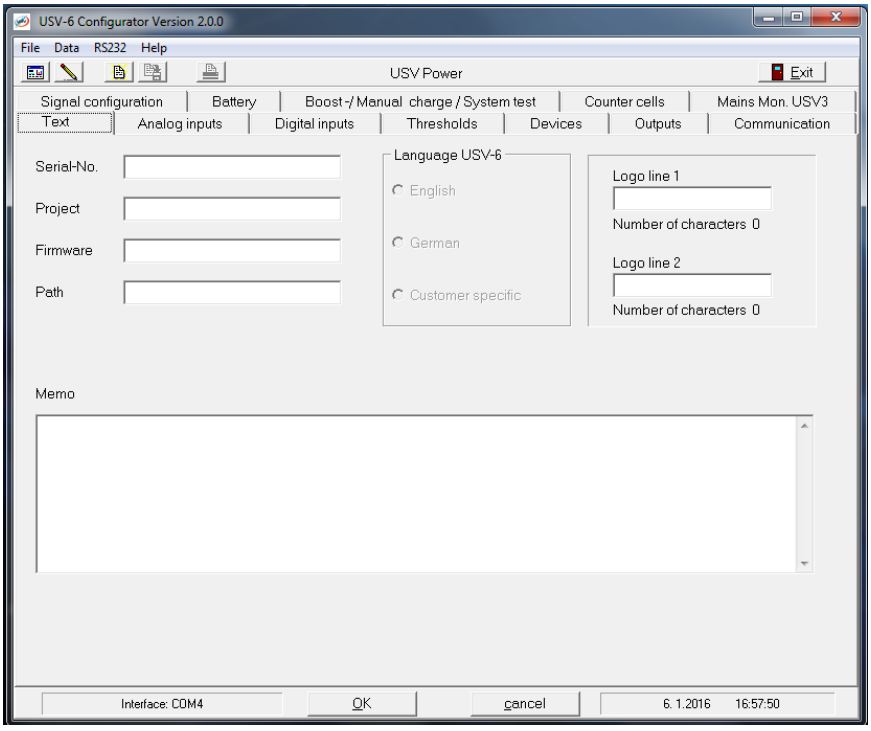
4.12 Bootloader

From the firmware version MU 2.0 a "Bootloader" is integrated. This enables you to carry out a firmware update via CAN bus (using an USB-CAN-Dongle), or via RS232 interface as well.

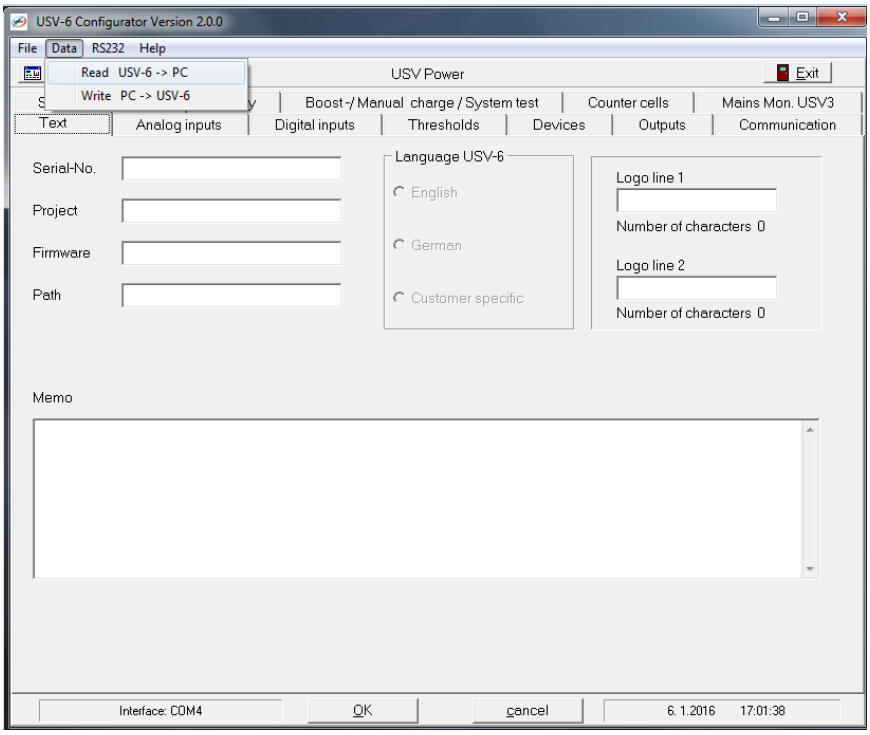
5. Configurator- and display structure

The USV6-H can be utilised with or without the USDV14 LCD display. When the USV14 is not present, the USV6-H must be controlled with the USV6 configurator software.

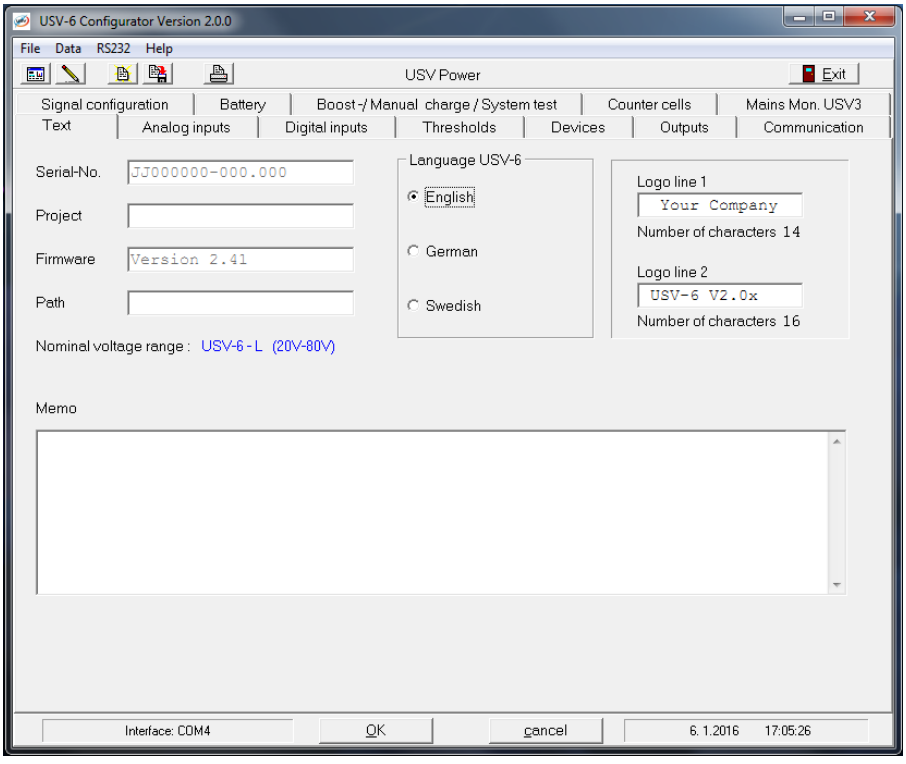
The USV6-H can be connected to a PC via the RS232 connection located on the front-plate. Once connected, the USV6-H will be recognised by the configurator. The screen below will be displayed.



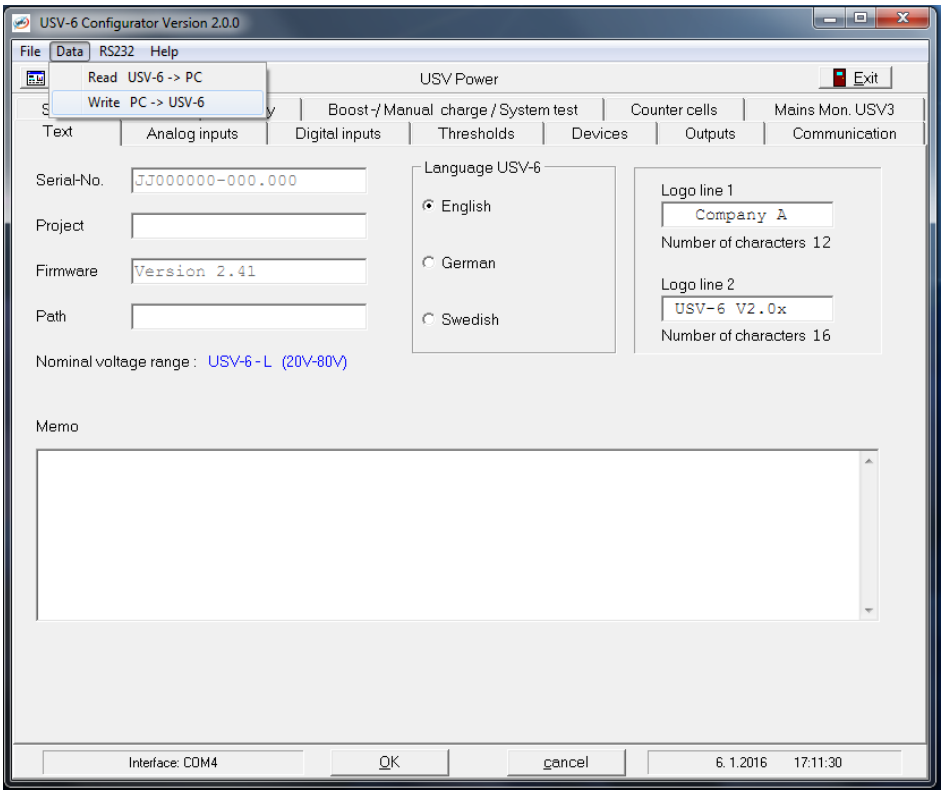
To begin, use the read feature in the configurator to import all the current settings in to the configurator.

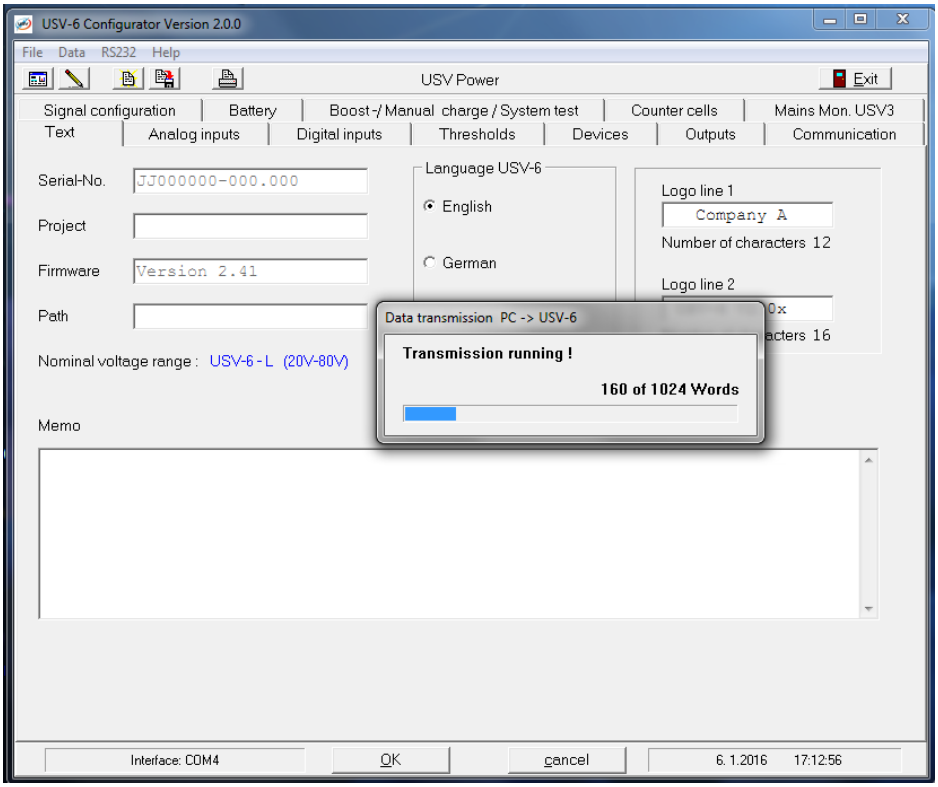


Once the data has been received, all the information from the USV-6 will be displayed. Changes can now be made in the configurator whilst using the current settings as a start point.



To save any changes to the USV6-H, press the “Write PC –> USV-6 button”.

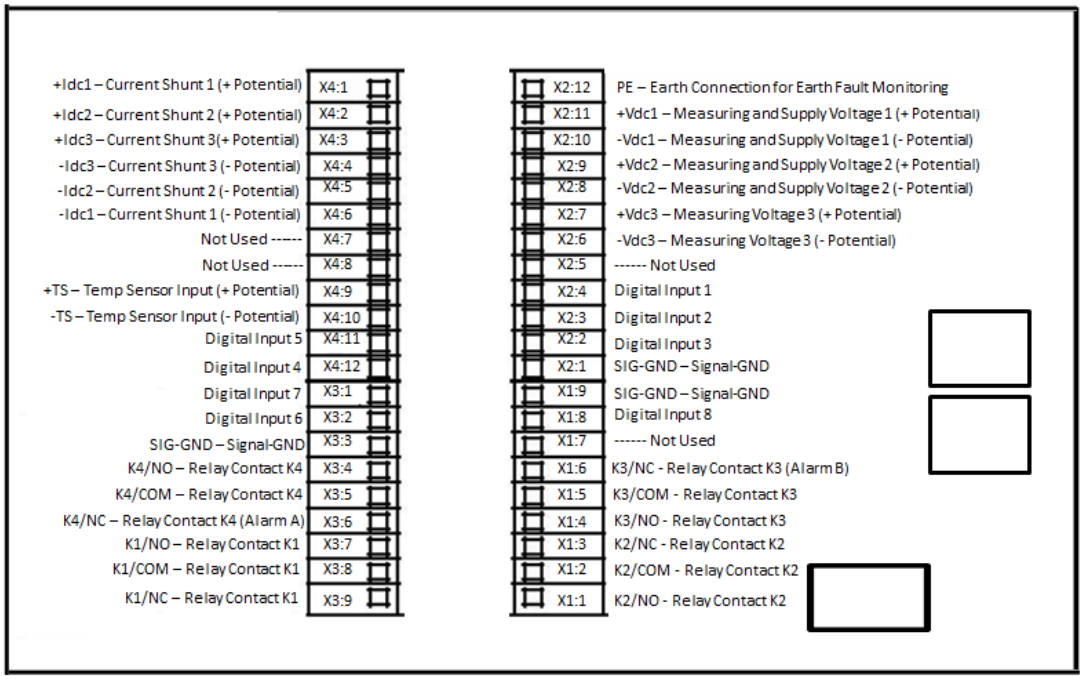




6. Electrical connectors

The connections to the USV6-H are made using a 42 -pole plug. The matching plug is included in delivery of the unit. The delivery of the MSTB plug (screw connection) is optional.

The following picture shows the layout of the connectors X1 to X4 (MSTB plugs):



Connections:

Pin-No. MSTB-Plug	Name	Remark
- X2:12	PE	Earth connection for earth fault monitoring
- X2:11	$+V_{dc1}$	Measuring and supply volt. 1 (Plus potential) [1)]
- X2:10	$-V_{dc1}$	Measuring and supply volt. 1 (Minus potential)
- X2:9	$+V_{dc2}$	Measuring and supply volt. 2 (Plus potential) [1)]
- X2:8	$-V_{dc2}$	Measuring and supply volt. 2 (Minus potential)
- X2:7	$+V_{dc3}$	Measuring voltage 3 (Plus potential) [2)]
- X2:6	$-V_{dc3}$	Measuring voltage 3 (Minus potential)
- X4:1	$+I_{dc1}$	Current shunt 1 (Plus potential) [3)]
- X4:2	$+I_{dc2}$	Current shunt 2 (Plus potential) [3)]
- X4:3	$+I_{dc3}$	Current shunt 3 (Plus potential) [3)]
- X4:6	$-I_{dc1}$	Current shunt 1 (Minus potential)
- X4:5	$-I_{dc2}$	Current shunt 2 (Minus potential)
- X4:4	$-I_{dc3}$	Current shunt 3 (Minus potential)
- X4:7	---	Not used
- X4:8	---	Not used
- X4:10	-TS	Temperature sensor input for LM335 (Minus potential)
- X4:9	+TS	Temperature sensor input for LM335 (Plus potential)
- X2:5	---	Not used
- X2:4		Digital input 1
- X2:3		Digital input 2
- X2:2		Digital input 3
- X2:1	SIG - GND	Signal – GND
- X4:12		Digital input 4
- X4:11		Digital input 5
- X3:3	SIG - GND	Signal – GND
- X3:2		Digital input 6
- X3:1		Digital input 7
- X1:9	SIG - GND	Signal – GND
- X1:8		Digital input 8
- X1:7	---	Not used
- X3:6	K4 / NC	Relay contact K4 (Alarm A, urgent alarm)
- X3:5	K4 / COM	Relay contact K4
- X3:4	K4 / NO	Relay contact K4
- X1:6	K3 / NC	Relay contact K3 (Alarm B)
- X1:5	K3 / COM	Relay contact K3
- X1:4	K3 / NO	Relay contact K3
- X1:3	K2 / NC	Relay contact K2 (free programmable)
- X1:2	K2 / COM	Relay contact K2
- X1:1	K2 / NO	Relay contact K2
- X3:9	K1 / NC	Relay contact K1 (free programmable)
- X3:8	K1 / COM	Relay contact K1
- X3:7	K1 / NO	Relay contact K1

1)

Both of the supply voltages V_{dc1} and V_{dc2} should connected (redundancy) whereby the decoupling is done via diodes on the USV6-H board. The measurement voltage is additionally required for the evaluation $V<V_{min}$ and insulation error and the measuring voltage V_{dc2} is used for V>. The connection of a protective conductor is necessary for detection of insulation error.

2)

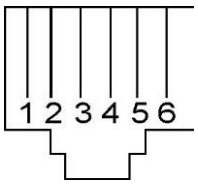
In case of monitoring the battery voltage imbalance make sure that this circuit is connected with the correct polarity between minus potential of the battery and $V_{batt}/2$. It should thereby be noted that the minus wire is connected at the same point as the minus wire of the measurement voltage Vdc1. If the voltage imbalance monitoring is not necessary, then another voltage metering point can be measured in the system.

3)

The potential drop (max. 60 mV) to be measured via shunt, measured with the correct potential, should be connected in the direction of the current, otherwise the USV6-H don't indicate any current value. With the exception of Idc1, the unit only processes positive voltage values. The measuring voltage for Idc1 could be negative. It is intended for shunts, which are in the battery connection (charging and discharging current). Thus only I_{dc1} can be used as "I_{batt}". In order to correctly indicate all the currents, the SIG- GND should be connected to the shunt potential.

6.1 CAN bus connector

(Modular plug RJ45, 6-pole)



Pin-No. CAN-BUS	Allocation
1	+8 to 15V
2	+8 to 15V
3	CAN_High
4	CAN_LOW
5	GND
6	GND

7. Optional: Relay board DCC-RB

This extension board provides additional six potential free relay contacts. The allocation of individual signals and signal groups are freely programmable. It can be installed at any place in the system and is simply connected to the CAN bus.

Further information is evident in the data sheet.

8. Optional: Digital input board DCC-DI8

The board provides eight digital inputs.

Enabling/disabling as well as the naming of each individual input is freely programmable.

It is also connected via CAN bus.

9. Technical Data USV6-H

Type	USV6H-LV Language	USV6H-HV Language
Supply voltage range	18 to 80 VDC	80 to 300 VDC
Voltage measuring range	0 to 100 VDC	0 to 300 VDC
Input power consumption	approx. 3 W	
Voltage measuring inputs	3, accuracy 1%; 3 x mains voltage and frequency (by using an optional mains monitoring board)	
Current measuring inputs	3 (1 x ± 60 mV for battery charge / discharge current measurement; (2 x + 60 mV) 3 x mains current (option: Battery monitoring board DCC-BM)	
Temperature measuring input	1 (for optional temperature sensor)	
PE–connector	1 (isolation fault)	
Digital measuring inputs	8 (free programmable)	
LED indications	Operating, information and alert, only when used with USV14. Indication is SET using the USV6H.	
Relay outputs	4 relay contacts (Alarm A, Alarm B, and 2 x reserve); free programmable; max. contact switching capacity= 1 A at 24 V to 125 VDC; 2 A at 250 VAC; extension to 10 free programmable relays (using an optional relay board)	
Configuration/interfaces	RS232 interface, CAN interface	
Communication	CAN-bus interface for communication with PSS/PSR-rectifier modules, UNV-inverter modules and UNB modules; RS232 interface for external modem control (optional) and programming of all functions and parameters via PC	
Fieldbus	Profibus or Modbus as option, via RS232 using a gateway	
Functions	Boost charge control (current-, voltage- and time dependent); battery test (voltage- and time dependent); controlling of voltage drop-down diodes; battery low protection; battery midpoint voltage monitoring; isolation fault monitoring	
Microprocessor controlling	Programmable monitoring functions with history function, real time clock, device parameters via front keys and alphanumeric display (only with USV14)	
Languages	German, English, Swedish, Italian, Russian, Czech, French	
Ambient temperature	Operation: -20 °C to +55 °C, storage: -40 °C to +85 °C	
Climatic conditions	IEC 721-3-3 class 3K3/3Z1/3B1/3C2/3S2/3M2	
Max. installation altitude	1500 m	
Audible noise	≤ 30 dB (A) in 1m distance	
Construction	Built-in module for front panel mounting, rear side connectors	
Dimensions (W/H/D)	155/120/66 mm	
Weight	approx. 1.2 kg	
Type of enclosure / Protection class	IP20 (mech.); 1 acc. to EN 60950 (electr.)	
Colour (front panel)	RAL 7035	
CE conformity	yes	
Compliance to safety standards	EN 60950-1; VDE 0100 part 410; VDE 0110, EN 50178, EN 60146	
Compliance to EMC standards	EN 55022 class „B“, EN 61000-4 part 2-5	

10. Dimensions USV6-H