

INSTRUCTION MANUAL

PSM system monitor and PBUS components



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Introduction

The PSM system monitor is designed for the supervision and control of all philippi components that are connected to the PBUS system. It is the main display and operational interface, and a vessel's system is supervised, operated and controlled using the PSM system monitor. Additional PSM system monitors can be added to show different information simultaneously at the same location, such as a navigation area, or at various different locations on the vessel to enable monitoring and control from multiple stations. These monitors will allow all information to be shown independent of each other.

The PSM system monitor operates as a central monitor, and the system can be easily expanded from a simple battery monitor comprising of a PBUS system monitor plus a battery Shunt SHC, up to a multi-system monitor and control panel in a digitally switched CAN-bus system.

1 Safety references

Unauthorised change to the equipment will invalidate the CE sign.

The installation of the PSM should be made only by electrical specialists.

Before connection of the PSM, the battery terminals must be disconnected.

Important - pay attention to the correct polarity of the batteries!

The inlet of the power supply must be protected by a fuse of a suitable rating. The power supply wire of the shunt has to be protected by a 1 amps fuse.

The assembly and operating instruction is a component of the PSM package. It must be kept (for reference). Importantly: - for later maintenance work - and for the use of subsequent owners of the equipment.

1.1 Exclusion of liability

Both adherence to the operating instruction, and the conditions and methods used during installation, use, and maintenance of the PSM cannot be supervised by philippi elektrische systeme gmbh. Therefore we do not take any responsibility for loss, damage or costs, which develop due to incorrect installation and/or inappropriate use or operation.

1.2 Warranty

philippi elektrische systeme gmbh grants a two year limited warranty due to our „terms of sale and delivery - passage 7“ for our devices. This “terms of sale and delivery” are the basis of all our sales and deliveries. They are printed in our catalogues and part of all quotations and delivery confirmations.

1.3 CE-sign

philippi elektrische systeme gmbh certifies herewith, that the PSM system monitor fulfills the requirements of the European Regulation:

2004/108/EG “Electromagnetic compatibility”

The compatibility of the device is certified by the CE-sign.

2 Content

2.1 PSM system monitor

PSM system monitor
Instruction manual
Pluggable 3-pole terminal for the connection of the power supply
1 terminator resistor CBT
1 terminator resistor M12
1 adapter cable RJ45 – M12 (5m)

2.2 Battery management Shunt SHC and Load Charging device SHL

Battery management shunt SHC, and Load/Charging Device Shunt SHL
Pluggable 4-pole terminal
Fuse holder ASH 1 and fuse FSS 1A

2.3 Tank interface CMT

Tank interface CMT
T-adapter cable M12 - PBUS
Pluggable 10-pole terminal

2.4 AC interface CMW

AC interface CMW
T-adapter cable M12 - PBUS
Pluggable 5-pole terminal incl. 1m cable to ACW 3

3 Technical Data

3.1 PSM system monitor

Nominal voltage	DC 8-60 V
Power consumption	100 mA @ 12 V operating at 100% illumination. 5 mA @ 12 V at stand-by mode (illumination 0%).
Dimensions:	105 x 105 x 40 mm
Cut out:	85 x 85 mm

3.2 Battery management shunt SHC

Operation voltage	DC 8-60 V
Power consumption	5 mA @ 12 V, 3 mA @ 24 V

3.3 Interface CMT / CMW

Operation voltage	DC 8-32 V
Power consumption	5 mA @ 12 V

4. Installation

4.1 Necessary equipment

Following parts are needed for the installation of the PSM:

- 2 terminator resistors CBT/M12 (content of the PSM package)
- 1 network cable 5m M12 for the connection of the PSM system monitor to another component such as shunt SHC, tank interface CMT (the cable is supplied in the PSM package).
- When connecting further components you need also another M12 (NMEA2000) cable or RJ45 network cable CAT5 per component.

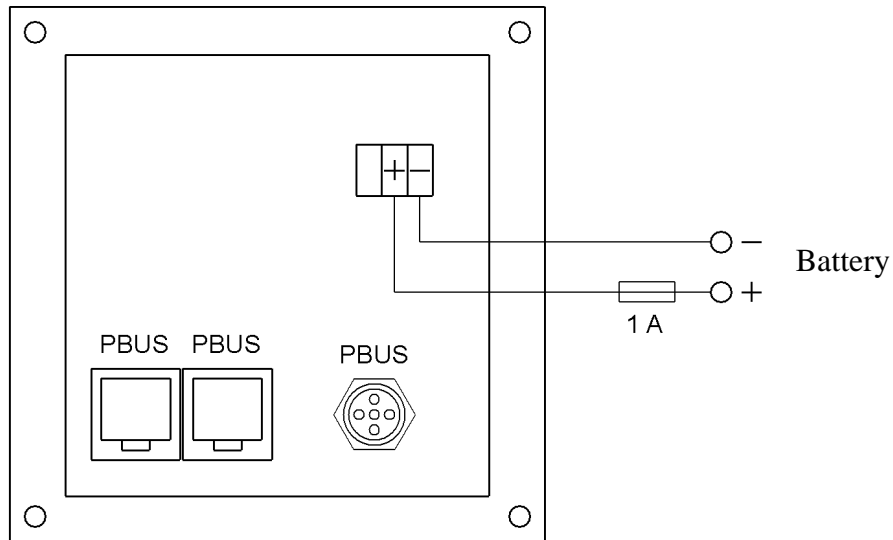
4.2 Installation and connection of the PSM

Install the PSM in a dry and visible place, so that it can be read off at any time.

The necessary installation cut out is 85 x 85mm (3.5" x 3.5"), the necessary minimum depth is 40mm (1.6").

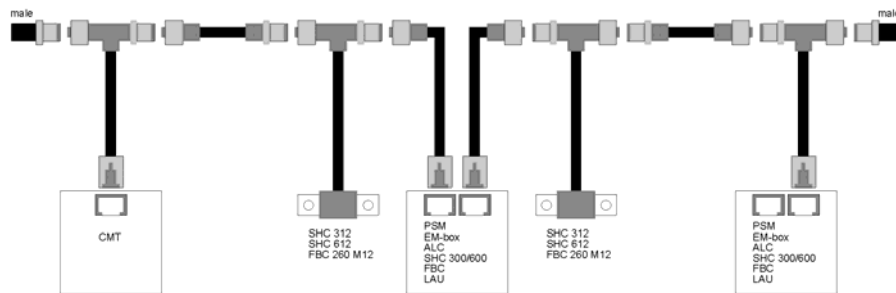
Starting with model year 2014 the PSM has an additional M12 network socket to connect the M12 (NMEA2000) cables alternatively to the RJ45 network cables.

We recommend the use of the M12-wiring.



4.3 System arrangement PBUS

All PBUS components are connected via a PBUS network cable. The components can be in any order or sequence.



Ensure that a Terminator Resistor M12 or CBT is installed at each end of the network. Without these Terminator Resistors the PBUS will not function.

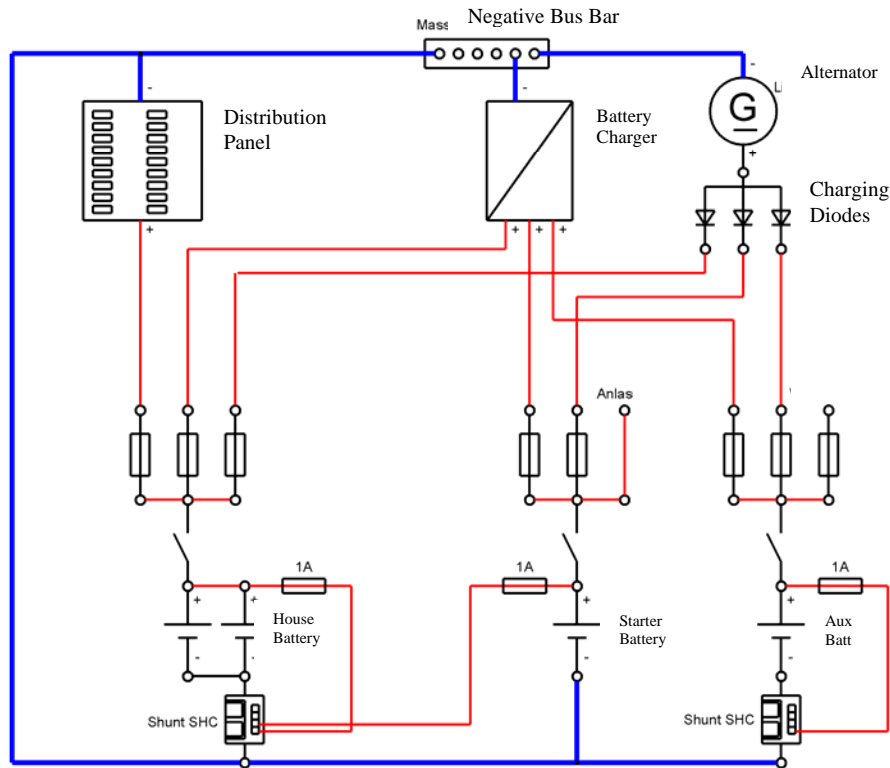
An overview over the different connection possibilities you can get on our web site under PBUS components.

4.4 Installation and connection of the Shunts SHC and SHL

The Battery Management Shunt SHC must be installed in a dry and sheltered location and as close to the battery as possible. The Shunt must be installed in the **negative** line of the battery.

The Load/Charge Device Shunt SHL must be installed in a dry and sheltered location and as close to the device as possible. The Shunt must be installed in the **negative** line of the load or charging device.

The drawing below shows the principal installation of a battery arrangement of 3 battery banks with the use of 2 Shunts SHC for complete supervision.

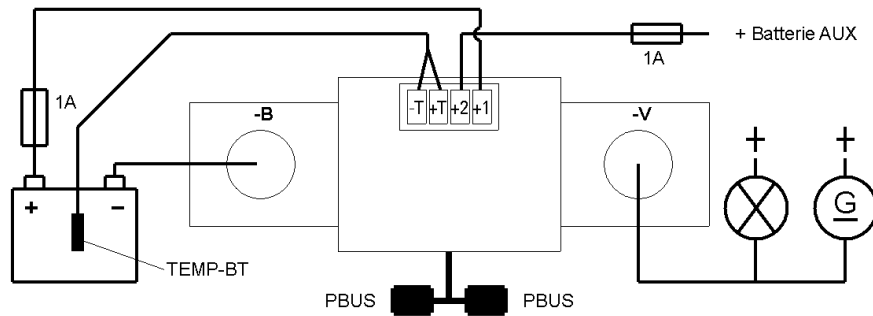


The Shunt SHC is powered by a feed from the battery positive via a 1 amp fuse to terminal "+1". This supply serves as both the voltage measuring point, and as the power supply for the Shunt. This connection should only be separated during winter storage in order to ensure accurate measurement of the battery capacity without interruption.

An optional Temperature Sensor can be connected to the Shunt to "T1" and "T2" to show the temperature of the battery, battery compartment, engine room, or some other location where the sensor is installed.

There is also an optional connection "+2" for the measurement and supervision of the voltage of a second battery bank (e.g. starter battery) Alternatively, this connection can be used to monitor the mid-bank voltage of a serially connected 24V or 48V battery group.

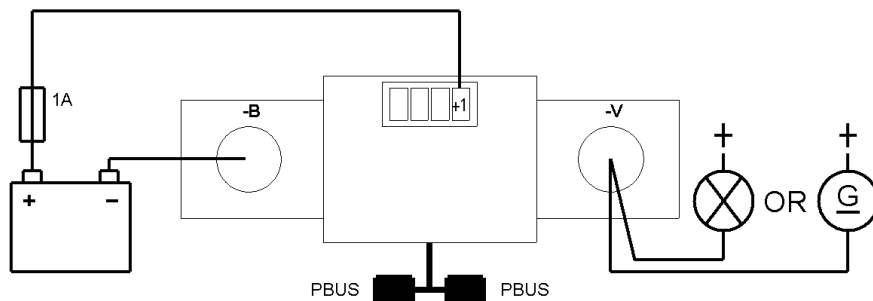
Shunt SHC – For Batteries



At the green 4 pole plug, the wiring is connected as follows:

- 1: T-: minus temperature sensor (blue line)
- 2: T+: plus temperature sensor (black line)
- 3: +2: voltage of a second (aux) battery or part voltage of a 24V / 48V battery
- 4: +1: battery measuring line and power supply from main battery

Shunt SHL – For Loads and Charging Sources



Shunt SHL for Loads and Charging devices

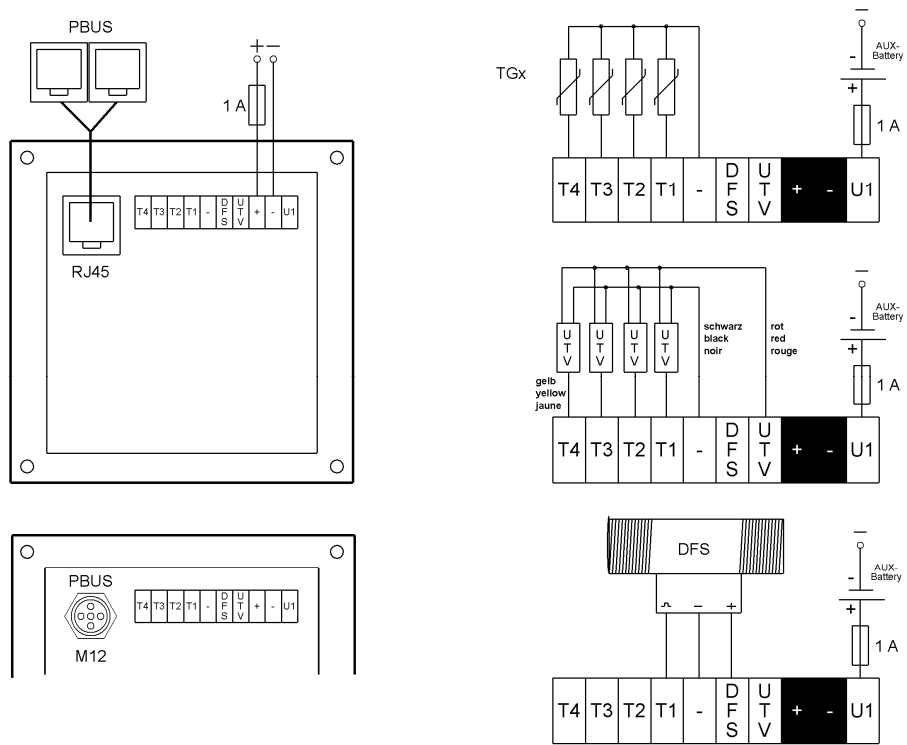
The Shunt SHL, used to measure and record the current draw and charging current of various devices in the Energy menu, is installed in a similar way to the Shunt SHC except that there is no provision for a Temperature Sensor or second (aux) battery input. The Shunt SHC requires only a positive battery supply to terminal "+1" via a 1 amp fuse.

4.5 Installation and connection of the tank interface CMT

Please install the tank interface CMT in a dry and sheltered place and connect the power supply wire by using a fuse 1A. Up to 4 tank sensors can be connected accordingly to the drawing below. The tank sensors (TGx and UTV) can be connected without special sequence at any input terminal.

Attention: flow sensors DFS can only be connected to the inputs T1 and T2. At the inputs T3 and T4 this functionality isn't possible.

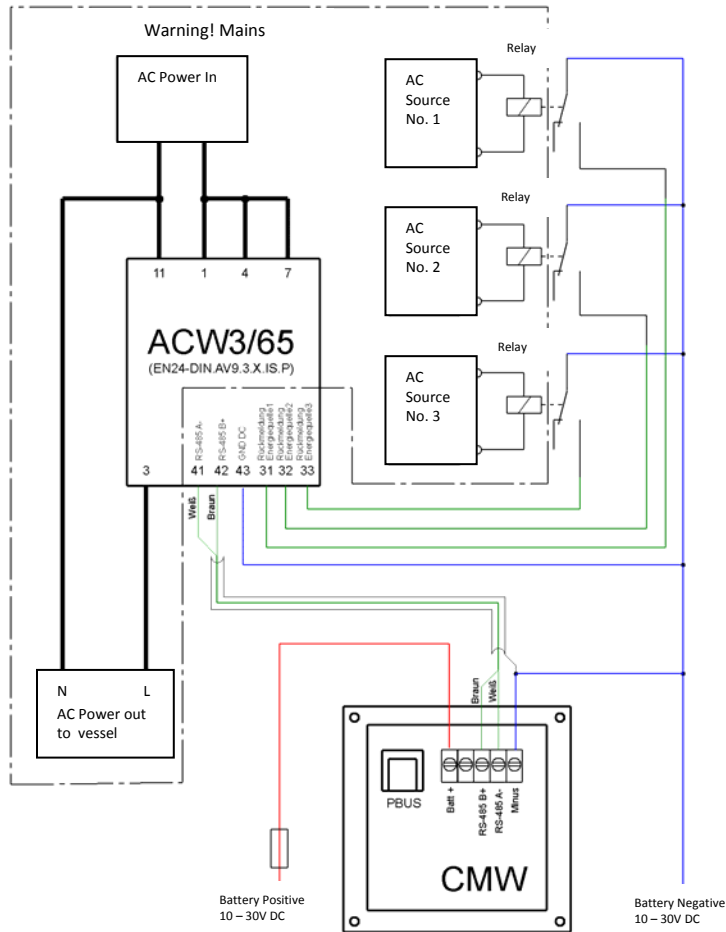
For the measuring of tank sensors with a current output e.g. UTA (4..20mA) a hardware modification is needed (124 ohms from sensor input (Tx) to minus).



4.6 Installation and connection CMW

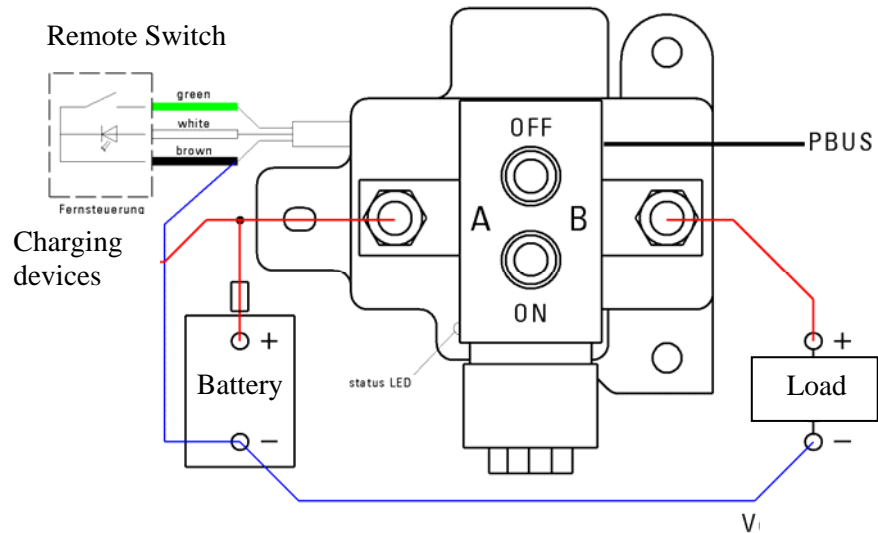
Pay attention to regulations and standards for the installation of AC (Alternating Current) systems and consult or employ a marine electrical professional before installation. Install the CMW Module in a dry and sheltered place and connect the 10-30v DC power supply wires, with a 1 amp fuse in the positive lead. The drawing below shows the connection of the CMW AC Module to the ACW AC Transducer which is required for this installation.

A relay with AC voltage coil and normally open contacts is required across the output of each AC source in order to show the active source in the display.



4.7 Installation and connection FBC

Install the remote battery main switch FBC in a dry and sheltered place and connect it according to the following drawing.



The power supply for the FBC requires the black (brown) control wire to be connected to battery minus, and terminal stud A to be connected to battery plus 12V or 24V. With the switch is off, the status-LED shows operational readiness by flashing. When the switch is on, the LED will glow continuously.

By using a remote momentary switch or push button to bridge the green and brown wires, the FBC can be switched on or off independently of the network. An LED without pre-resistor can be connected as shown in order to indicate the status of the switch. In an emergency the switch can be operated manually by pressing the buttons OFF and ON located on the top of the switch. Due to technical reasons, the status of manual operation of the switch cannot be detected and displayed on the PSM. To synchronize the display, operate the switch from the PSM Display first, followed by the remote switch.

4.8 Installation and connection EM-box

Install the EM-box according to the EM-box manual and connect it to the PBUS by using network cables. After initialising the submenus battery, energy and main switch are available. The configuration is the same as with the single devices. The EM-box provides 3 battery shunts, 10 energy sources/consumers and 3 main switches.

5 Quick operation Start-Up of the PSM

Before using the PSM System Monitor for the first time it is necessary to connect all components to the PBUS network and ensure that they are all powered up. When this is accomplished, the PSM System Monitor will recognise all the devices connected to the network and will add them to its memory.

5.1 Password protection (PIN) of the Setup menu

The Setup menu is password protected. When you choose “Setup” from the main menu you will be asked for a PIN, which is factory set to 1234. Once the password is entered and “OK” is pressed, the screen will change to the Setup menu page.

NOTE: If the language on the main menu appears to be German, press the button “Einstellungen”, enter the PIN “1234” and press OK. On the next screen press the button “Anzeige”, then the button “Sprache” and then you can choose the language.



5.2 Identification of all devices connected to the PBUS

In the Setup menu, press “Display”, and on the next page press the arrow in the top right-hand of the screen to go to page 2. On page 2, pressing “Connected Devices” initiates a scan of all devices connected and shows them on the “Logged Devices” list. If new devices are added they are logged on automatically. If changes are made to the connected devices (e.g. new devices, devices omitted or not ready-to-operate) these changes will be recognised automatically and only the connected devices will be listed.

ATTENTION: This function is only available on the PSM Monitor with the ID “0”. If additional Displays are added, they must have different addresses; i.e. “1”, “2”, etc.



5.3 Adjustment of the operational parameters

After identification of all devices you can adjust the individual parameters of the tanks, batteries etc. Please have a look at the explanations of the parameters of each component at chapter 6.

6 PSM Setup



All settings of the PSM Display and the devices connected to the network are made in the Setup menu. Settings for the connected devices are saved on the devices themselves, and can be accessed and adjusted from any PSM System Monitor on the network.

6.1 Display Menu



6.1.1 Language

Please choose your language.

6.1.2 Display off

In order to save energy and reduce glare, the PSM display will enter a standby mode of reduced brightness after an adjustable delay. The delay is adjustable from 20 to 250 seconds after the last operation. If you choose any value under 20 the PSM will not enter standby mode.

6.1.3 Brightness operation

You can adjust the brightness of the display illumination while in operation from 20 to 100 %.

6.1.4 Brightness Standby

You can adjust the brightness of the display illumination in the standby mode from 0 to 20 %.

6.1.5 Start page

You can set the page that the PSM System Monitor displays when powered up as either the main menu or one of the available submenus.

6.1.6 PSM Address

Each PSM System Monitor connected to the PBUS network requires a different address in order to avoid conflicts. If more than one PSM system Monitor is connected to the network, each one must have a unique address, from between 0 and 15.
NOTE: If only one PSM System Monitor is connected, it must have the address "0".

6.1.7 Touch screen calibration

The sensitivity of the touch screen can be calibrated to an individual's preference. Follow the on-screen instructions. If at any time the touch screen is not responsive, the factory default setting can be recalled by touching the screen anywhere for at least 15 seconds.

6.1.8 Change PIN

Access to the Setup menu is protected by a 4-digit PIN. You can change this PIN at any time from the factory setting of "1234". If the PIN is lost or cannot be recalled, the factory default setting of 1234 can re-set by pressing "PIN" on the first page of the Setup menu for at least 15 seconds.

6.2 Special setting

Pressing the arrow in the top right-hand corner of page 1 of the Setup menu will display page 2. These system and network settings should only be accessed by the system administrator, as incorrect operation could delete the entire system configuration.



6.2.1 Logged devices

This shows the devices which are or were connected to the PBUS network at the time of the last scan of connected devices.

6.2.2 Connected devices

Pressing this button will initiate a scan of all connected active devices. They are identified and shown on a list. If new devices are connected into the network, they will be added automatically at the time of their connection. If there were changes in the connected devices (e.g. new devices, devices omitted or not ready-to-operate) these changes will be recognised automatically, and only connected devices will be listed.

6.2.3 Renew devices addresses

By pressing this button all sub-addresses of the connected and active PBUS network components are reset. This will only be required if new components are added which have been used on other PBUS networks, and where the possibility of duplicate addresses may exist. NOTE: This function should only be used in the case noted above, otherwise the allocation and display order of connected devices may be altered or otherwise affected.

6.2.4 Protocol

With a SD-card inserted this function is available. Thereby all measured data of the batteries and energy sources can be recorded and analyzed later on a PC. For each given battery and energy source a data file will be created. The saving of the data will be done in the .CSV-format and can be analyzed via a spreadsheet program.

6.2.5 Interval

If the protocol function is activated, the time span between two logs can be determined until max. 200 seconds.

6.2.6 EM-box Reset

A software-reset of every EM-box connected to the PBUS will be carried out. The successful operation will be acknowledged by 2 buzzer sounds.

6.2.7 EM-box Firmware - Update

This function is only available if a SD-card is inserted. Only a single EM-box must be connected to carry out it's update.

The PSM is checking if a firmware file with the ending *.aes is available on the SD-card. If so, the update procedure is initiated immediately.

6.3 Setup Battery

It will be necessary to enter the correct settings of the existing battery system. There is one Setup menu for each connected Shunt SHC.



Selecting a battery from the menu will bring up page 1 of that battery's set-up menu (left picture).



6.3.1 Description

The name of the selected battery is shown and can be changed if desired to one from a list that is displayed when the button is pressed. The selected name is displayed in the corresponding battery symbol on the Battery page for ease of identification.

6.3.2 Identification

The type of device (e.g. shunt SHC312) is shown together with the software version and the serial number.

6.3.3 Battery capacity

The nominal capacity of the battery (1-9999Ah) must be entered here. This is required in order for the PSM to be able to calculate an accurate assessment of the time-to-alarm function, battery charge percentage, and remaining amp/hour capacity.

NOTE: The capacity of the batteries should only be adjusted while the battery is charged 100% . When this value is adjusted, the capacity display on the Battery page will be set to 100% and all internal counters are set to 0.

If this value is adjusted while the battery is less than fully charged, the battery will need to be charged as soon as possible in order to synchronise the display and show an accurate state of charge.

6.3.4 Nominal voltage

The nominal voltage [12, 24,36,48V] of the battery bank that is connected to the Shunt must be entered here.

6.3.5 Alarm capacity

The PSM Systems Monitor shows an alarm (the battery symbol on the Battery page goes red), if the battery capacity falls below an adjustable capacity threshold.

The capacity alarm is preset to 50% of the overall capacity of the battery. For a typical application this value is adequate, but the threshold can be adjusted according to the requirements of the application.

6.3.6 Battery Type

This should be set according to the type of battery connected. Select either GEL, OPEN-LEAD, AGM, or Userdef.

6.3.7 Generator on

Adjustable capacity threshold for a generator start (active on PSM-G only)

6.3.8 Generator off

Adjustable capacity threshold for a generator stop (active on PSM-G only)

6.3.9 Charge efficiency factor (CEF)

Each battery has an efficiency factor. This reflects the fact that more ampere-hours need to be charged into a battery than can be used. The efficiencies of most lead-acid batteries lies between 80% and 99%. When the CEF drops below 70%, this indicates that the battery may have reached the end of its life span. If the battery is charged only with a trickle charge (for example with solar panels), the CEF will fall also, but once the battery is cycled again, this factor should rise. The factory-installed setting is 95%. The CEF is adapted automatically by the PSM while in operation on a sliding average over the 4 last cycles.

6.3.10 Peukert exponent

Most lead –acid batteries are rated at the 20 hour rate, e.g. a 100 amp/hr battery would last 20 hours at a discharge of 5 amps before the battery reaches 10.5 volts. If the discharge current is higher, for example 10 amps, then the battery is not able to supply the full 100 amp/hrs, as the effective capacity is reduced. In this case the battery voltage will reach 10.5v, before the battery has supplied its nominal 100 amp/hrs. This anomaly can be adjusted for mathematically with the Peukert equation, and it is used with the “Remaining Time to Alarm” feature. Under normal use the Peukert exponent does not need to be changed as it results in only minor changes. The factory setting is 1,27. Consult your battery manufacturer for the Peukert Exponent value for their battery.

6.3.11 Cycle depth

The cycle depth is the depth of discharge required to be reached for one cycle to be counted. For a starter battery this value should be adjusted to 10-20% and for cycling batteries a value of 50% is recommended.

6.3.12 Charging cycles

This shows the number of times a battery has been discharged by at least the amount entered in the Cycle Depth menu above, and then recharged to 100%. The number of cycles gives an indication of the expected life span of a battery. Modern batteries, particularly AGM batteries, are considered to be dual-purpose, i.e. used for either house supply or starting, and can have life expectancies in excess of 500 cycles. However, these values can be obtained only with normal care and worsen rapidly if the battery is damaged or misused.

6.3.13 Number of deep discharges

If a battery is discharged for 4 min under 11.0V (for a 12V battery) then this is considered to be a deep discharge. Deep discharges should be absolutely avoided, since they damage the battery and a premature loss of capacity is to be expected. If a deep discharge should accidentally occur, then the battery must be charged immediately again in order to avoid further damage.

6.3.14 Reset of the counter of cycles, number of deep discharges and average cycle depth

If a new set of batteries is installed, the number of Charging Cycles and Deep Discharges must be reset to zero. By pressing the appropriate buttons and then entering the PIN (default 1234), the counters are reset.

6.3.15 Average Discharge Rate

The Average Discharge Rate indicates the average state of charge that the main battery has been discharged to. With this value you can see how intensively the main battery has been used. The smaller this value is, the deeper the main battery has been discharged on average, and regular deep discharges will reduce the life-span of a battery.

6.3.16 Alarm U (only for voltage measuring of the second battery)

If the voltage of a second battery is detected at the "+2" terminal of the Shunt SHC, this voltage will be displayed as a secondary or auxiliary battery, and a low voltage alarm threshold (alarm U) can be set for this battery. The naming of these batteries and the setting of the low voltage alarm thresholds are set by selecting the appropriate battery on the first page of the Battery Setup page.



The factory default setting of this alarm threshold is 11,5 V and the PSM produces a time delayed alarm. If the battery is subjected to high loadings, (start, windlass, thrusters, etc.) we recommend that the alarm threshold be set to a lower value (e.g. 10,8V) If groups of batteries with a higher nominal voltage (24 V/36V/48V) are connected, the thresholds should be set accordingly.

6.4 Tanks setup

There is a setup menu for each tank sensor connected, with the following options. In order to get a correct reading/function it is necessary to adjust the parameters to each tank and tank sensor/flow meter.



6.4.1 Description

The description of the tank is shown on the Tanks page, below the symbol of the tank. The colour of liquid displayed in the graphic is dependent on the description.

6.4.2 Location

The location of the tank is shown below the name of the tank on the Tanks page.

6.4.3 Identification

The type of hardware device, i.e. CMT, is shown, and also the software version, the serial number, and the terminal name of the sensor input, i.e.TG1.

6.4.4 Type of sensor

The type of tank sensor must be entered as one from the list below:

Not Active	No sensor connected
philippi TRG	6 steps (6..190 Ohm)
philippi TGx	TGT / TGW (10..180 Ohm)
philippi UTV/UTA	0,5..2,5V, for UTA (4...20mA, Hardware adjustment at CMT necessary!)
philippi UTV40/80	0,5..2,5V
0...10 V	Hardware adjustment at CMT necessary!
240...33 Ohm	UTR not possible!
Indiv. R	Free adjustment of the resistance range
DFS down (Emptying of the tank)	Flow sensor counting downwards
DFS up (Filling of the tank / e.g. watermaker)	Flow sensor counting upwards

6.4.4.1 Custom adjustment of the resistance sensors (indiv. R)



If you have an existing tank sensor that measures resistance but does not match any of the listed sensor types, you can enter it as a custom item under "Indiv.R". The resistance values at 3 levels, 0%, 50%, and 100% need to be entered on the second page of the Indiv.R menu. This is possible only for sensors that read 0 ohms when the tank is empty and maximum ohms when the tank is full.

6.4.4.2 UTV 40 / UTV 80

If the ultrasonic tank sensors UTV 40 or UTV 80 are installed, the tank depth can be entered to the nearest centimetre. The tank depth can be adjusted on the second page of the menu for the tank concerned, as shown below, and, if one is installed, the size of the Distance Ring can be entered.



6.4.5 Volume [1-9999]

Enter the volume of the tank, in litres.

Note: Highest accuracy will be achieved by using DFS flow sensors, as these items measure the actual liquid flow.

Please have in mind, that tank sensors TGT/TGW are not measuring continuously every millimetre – internally there are “steps” every 16 mm!

6.4.6 Compensation [20-80%]

If a tank is not uniform in length and/or width, the liquid volume at various heights in the tank will not be directionally proportional to the volume of a full tank. By entering a compensation value for the tank at half-height, the PSM Display will show more accurate results.

The compensation value is entered on page 1 of the menu for the selected tank. The default value is 50%, which represents a symmetrical tank. The following examples show how to calculate compensation values for tanks with asymmetrical geometries.

The compensation value is calculated by taking the liquid capacity at the half-height level divided by the capacity of the tank when full, and then multiplied by 100.

$$\text{Compensation value} \quad K = \frac{\text{Capacity of tank at half height}}{\text{Capacity of tank when full}} \times 100$$

Example: A tank when full has a capacity of 150 Litres, and a height of 50 cm. In order to determine the compensation value, the tank is filled to half-height, ie.25 cm, and it is found to take 65L of liquid to reach this level.

When inserted into the formula, this results in a compensation value of:
 $K = 65L/150L \times 100 = 43$. The compensation value of 43% is then entered on page 1 of the menu for the tank concerned.

6.4.7 Alarm duration

Each active tank has a level alarm that can be set. The activation and duration of the alarm is adjusted on page 1 of the menu for the tank concerned.

0 s	Alarm off
1... 600 s	Alarm duration 1 to 600 seconds
601 s	Continuous alarm. Cancelled by tapping the tank graphic, or if the measured value changes, i.e. tank is filled or emptied.

6.4.8 Alarm level [0-100%]

Once an alarm level is entered, a horizontal line will be seen on the graphic for that tank on the Tanks page. There are two types of alarm; an Empty Alarm (water, fuel, etc.), and a Full Alarm (holding tank, grey water, etc.).

If the alarm level is set between 0% and 50% it is considered an Empty Alarm. When this alarm is seen it indicates that the tank should be re-filled.
If the alarm level is set between 50% and 100% it is considered a Full Alarm. When this alarm is seen it indicates that the tank should be emptied.

With both types of alarms, the activation is delayed by 15s.

With both types of alarms, when activated the liquid is shown as red in colour.

6.5 Setup Energy



All devices displayed on the Energy page, i.e. SHL Shunts, Chargers, ...) can be set up in this menu.

6.5.1 Setup shunt SHL

SHL Shunts and the Shunts incorporated in the EM-box can be adjusted in this menu.



6.5.1.1 Description

The description entered will determine the symbol to be shown on the Energy page, as well as allocating the Shunt as either a load or a charging source. Charging sources like solar, wind, hydro generator, fuel cell etc. are shown in the upper part of the display, while loads are shown on the lower part together with a symbol representing the combined battery banks. A “Combi” inverter/charger will appear on the bottom row. If the description “not active” is chosen, that Shunt will not be displayed.

6.5.1.2 Identification

The type of hardware (e.g. shunt SHL312) is displayed together with the software version (V002) and the serial no. of the device.

6.5.1.3 Reset Capacity counter

The accumulative charged or discharged amp-hours (Ah) Capacity Counter for any Shunt can be reset. To activate the reset, press the “Reset Capacity Counter” button, and after entering the PIN (PIN default 1234), the reset is initiated and the Capacity Counter will start again from 0 Ah.

6.5.2 Setup Charger ALC

The Series ALC Chargers are set up in this menu.



6.5.2.1 Identification

The type of hardware (e.g. ALC 12/50) is displayed incl. the software version (V007) and the serial no. of the device.

6.5.2.2 Limit

In order to reduce the power consumption from the AC source, the inrush current can be adjusted. After pressing the “Limit” button, the power consumption of the charger can be reduced in steps of 10% (40-100%).

6.5.2.3 Silent mode (sleep)

In order to reduce noise while sleeping, the cooling fan can be deactivated by pressing the “Sleep” button. The cooling fan will be switched off, and the output power will be reduced accordingly.

6.5.2.4 Output 1,2,3

The following settings are required to be adjusted for each output individually:

Name:

This will be the name of the battery bank that is displayed on the PSM system monitor and on the charger itself.

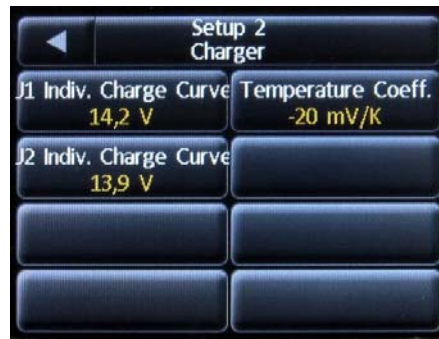
Type of battery:

Select from; Gel, Open-lead, AGM and Userdef. The adjustments of the parameters of the individual mode settings is described in chapter 4.6.1.

Charge current :

In order to reduce the wire size for outputs 2 and 3, the charging current can be reduced. Minimum wire cross section is 4 mm² (10 AWG). This setting is not available for output 1.

6.5.2.5 Individual characteristic

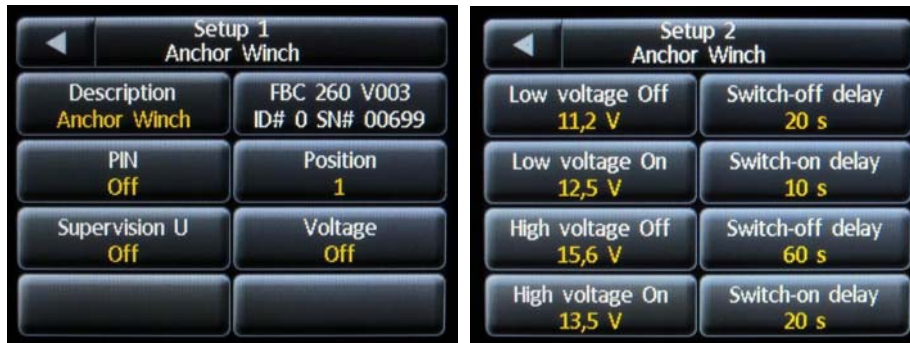


In this submenu the settings of the individual charging characteristic can be adjusted:

- 1) U1 charging voltage
- 2) U2 trickle charging voltage
- 3) Temperature coefficient.

6.6 Setup Main Switch

Up to 12 Main Switches can be connected to the PSM network. If an EM-box is connected, it has 3 integrated Main Switches. A PIN can be entered for security, and high and low voltage protection thresholds can be set (FBC 260 only).



6.6.1 Description

The name of the Main switch is shown in the corresponding symbol on the Main Switch page and serves for ease of identification. In the EM-box the names are fixed.

6.6.2 Identification

The type of hardware (e.g. FBC 260) is shown as well as the software version (Vxx) and the serial no. of the device.

6.6.3 PIN-entry

If desired, the Main Switch operation can be protected from accidental or malicious operation by pressing the PIN button. Once activated, the Main Switch cannot be operated without entering a PIN. The PIN is the same as that used for the Setup menu.

6.6.4 Position

The position of each Main Switch on the Main Switch page can be defined individually. Up to 6 Main Switches can be shown per page (page1 - positions 1 to 6, page 2 - 7 to12). If more than one PSM system monitor is installed, adjustments must be made at each PSM monitor.

6.6.5 Deep discharge and over-voltage protection (FBC only)

In this menu you can activate or deactivate the deep discharge and overvoltage protection, and set voltage thresholds and delay times.

The value of "Low Voltage On" must be under the value of "Low Voltage Off". The value of "High Voltage On" must be over the value of "High Voltage Off".

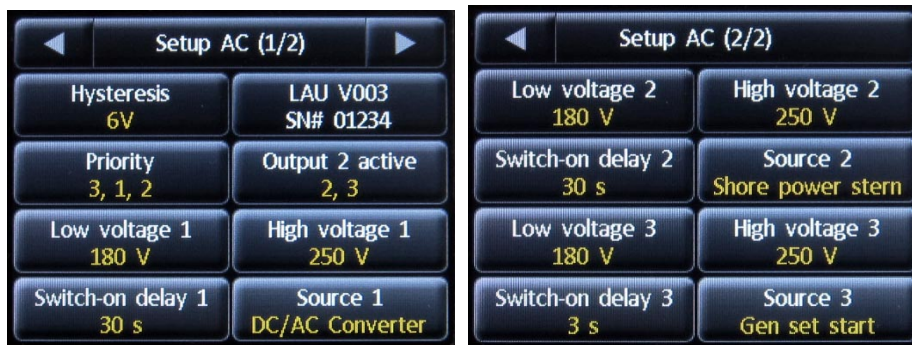
The factory setting is shown on the photos. The voltage values for 24V systems have to be doubled accordingly.

6.6.6 Voltage Display (only FBC)

If the battery voltage at the input terminal of the FBC shall be displayed on the battery display page, this has to be activated in this menu.

6.7 Setup AC (CMW / LAU)

If a switch over unit LAU, or a CMW interface is connected to the PSM network, the display and operational parameters can be adjusted here.



6.7.1 Configuration

Display what type of device is connected (CMW / LAU Xxx).

6.7.2 Identification

The type of hardware (e.g. LAU3xx) is shown, as well as the software version (Vxx) and the serial no. of the device.

6.7.3 Priorities (LAU only)

Priority of the AC sources connected to the automatic switch-over unit can be set here. "Priority 1,2,3" indicates that source 1 has priority over sources 2 and 3, and if AC power is available on source 1, it will be switched through.

6.7.4 Thresholds (LAU only)

The thresholds for undervoltage and overvoltage, plus the time delay for the automatic switching, can be adjusted here for each AC source. If the voltage of an AC source is higher than the undervoltage threshold and below the overvoltage threshold, that source will be switched through if the priority allows it.

6.7.5 Exclusion (LAU only)

AC devices or circuits which are not be supplied from each source can be connected to the additional output XX of the LAU. The activation of this output only by the desired source can be set here. This output is only active when the chosen source is switched through.

6.7.6 Voltage Differential (LAU only)

Unwanted toggling (switching on and off) can occur when switching-on an AC source while significant loads are connected. This is due to the loads being great enough to reduce the incoming voltage to below the switch-off voltage threshold at the moment

the AC source is connected, To reduce the possibility of this happening, the user can enter a voltage differential that will ensure that the AC source is not disconnected until it is below the switch-on voltage less the differential that is entered.

6.7.7 Name

For each AC source the name is shown as and serves for ease of identification.

6.8 Alarm Management



For each monitor the Alarm Management can be activated to show tank alarms as well as battery alarms. If the Alarm Management is turned off, no alarms are displayed. If the Alarm Treatment is activated, a specific adjustment (battery- and/or tank alarm) can be done.

Off: No alarm for this device.

Message: The alarm is shown only on the display – no buzzer sounds.

Message + Buzzer: The alarm is shown on the flashing display and the buzzer sounds.

7. Operation

On the large illuminated colour touch screen display, information of the available systems is displayed and operation and adjustments are possible.
If a device is connected to the network and activated, details will be shown in the appropriate sub menu.



7.0.1 General Operation

For direct activation of the standby-mode, tap the heading line in the centre. The illumination of the display is dependent on the value adjusted in the setup menu for the standby mode (chapter 6.1.4).
By tapping at each point of the display the PSM goes back to normal operation mode.

7.1 Submenu Battery

A maximum of 4 batteries or battery banks are displayed per page. Further batteries can be displayed on subsequent pages. The pages can be changed by pressing the arrow buttons at the top.

If an active SHC Shunt is connected, the available capacity is shown by the height of the coloured section in the appropriate battery symbol.

The available capacity is shown as a percentage along with the voltage and charging/discharging current. By tapping the battery symbol, you can switch between displaying available capacity, the remaining time to the capacity alarm or estimated time of charging, and – if a temperature sensor is connected at the shunt - the temperature.

The current is displayed dynamically to 3 digits (e.g. 120A, 45,0 A or 0.01A). A minus sign before the amperage reading means that the battery is discharging. If no minus sign is present, then the battery will be charging at the amperage shown.

The blue area shows the useable capacity before the alarm threshold. The dark blue area shows the theoretically available capacity until the battery is completely discharged (deep discharge). A deep discharge should be strictly avoided, as the battery will almost certainly be permanently damaged. If the PSM system determines that the point of deep discharge has arrived sooner than it should normally (e.g. by aging), the unusable part will be displayed in the dark grey area.



If the capacity falls below a set threshold a warning appears on the display. The remaining capacity is shown in orange and the battery symbol outline is shown red. If the battery is nearly empty or deeply discharged or if an over-voltage occurs (battery voltage > 15 V) a warning appears. The remaining capacity is shown in orange and the battery symbol outline is shown red. If a second battery is connected to an SHC Shunt, this will be shown by a symbol with white outline and no colour, together with the measured voltage. If this voltage falls below the adjusted alarm threshold (chapter 6.3.17) the battery symbol is shown red.

7.1.1 Features Battery management

7.1.1.1 Remaining time calculation

The remaining time is the time until the battery reaches the capacity alarm threshold on the basis of the actual momentary discharge current. NOTE: If the charging current changes, the remaining time will also change. When charging, the time displayed is calculated to be until the battery is 95% charged. The maximum value while discharging is 99, 9 hours (> 4 days). The remaining time is calculated automatically considering the Peukert function if the battery is being discharged at more than the C20 rate.

7.1.1.2 Recognition of full charging

A battery is recognised as fully charged (100%), if:

- 1) The "Charging Voltage" has been reached (13.5 V / 27.0 V non adjustable)
- 2) The charging current has dropped below 2% of the battery capacity entered .

If all parameters are achieved for 4 minutes, the value of the capacity is set to 100%.

7.1.1.3 Calculation of the Charge Efficiency Factor

While charging, the Charge Efficiency Factor (C.E.F.) is calculated automatically. See 6.3.9

7.1.1.4 Recognition of a prematurely discharging

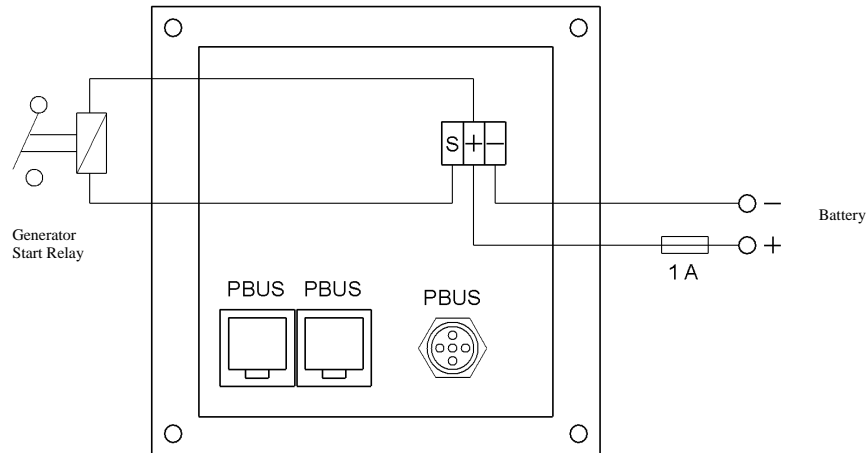
If the battery voltage drops prematurely under a certain voltage threshold, dependent on the load, the charge level is adjusted to 20% or if totally discharged to 0%. If possible the capacity which is recognised as unavailable (the difference between nominal capacity to discharged capacity) is calculated and shown as grey area.

This grey area can serve as indication for the aging of the battery if normally discharged (<C20). Under high load conditions while discharging of >C5 (e.g. electric driven boats) this indicates the normal reduced capacity at high loads.

This function can only be obtained if the battery voltage drops below 11.5 V (dependant on the load) and other fixed preset conditions. If the battery is never discharged below this level, this recognition cannot be obtained and the battery is regarded as 100% sound.

7.1.1.5 Automatic Generator Start (version PSM-G only)

The PSM-G can be used to control a generator according to the capacity of the battery. The PSM-G has a generator start/stop terminal (S) at the rear of the display. The output provides a battery negative when switched on, and must be connected as in the following drawing:

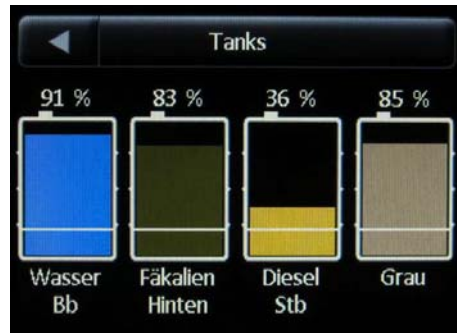


This output will be operated by all battery management Shunts SHC connected. The generator start and stop thresholds are set in the Battery Setup menu. See 6.3.7 and 6.3.8.

Generator start: If the battery capacity falls below the threshold set by the operator, the generator start terminal (S) is activated at negative potential. If several battery management Shunts SHC are connected to the system and are being utilized for generator start/stop, the generator starts when the battery capacity of one the shunts falls below its generator start capacity threshold.

Generator stop: The generator start contact will be deactivated if the battery capacity exceeds the stop threshold. If several battery management Shunts SHC are connected to the system, the generator stops when the capacities of all batteries being utilized for generator start/stop exceed the thresholds set on their respective Shunts SHC. If a battery is not to be utilized for generator start/stop, the start and stop thresholds should be set to 0% (start) and 100% (stop).

7.2 Submenu Tank



7.2.1 Features of Tanks

By touching of one of the tank graphics, the volume indicators change between percentage, litres, and a no-volume display. If a tank is configured for a DFS Flow Sensor, the percentage volume can be changed manually to the new level by tapping on the name of the tank underneath the graphic. This will bring up another screen where you can enter the new level, i.e. enter 100% when filling the tank completely. For a water maker we recommend a tank size of 100 times the hourly water making capability.

7.2.2 Powersave Mode CMT

To reduce the current consumption when using ultrasonic sensors, which draw approx. 50mA per sensor, the "Powersave" mode can be activated.

The Powersave mode is activated as soon as all PSM system monitors connected are in sleep mode (display off). At that point, the measuring changes from continuous to a cyclic routine. If the power supply voltage is between 11.5v and 13v (23v and 26v), a measurement is taken every 30 minutes with a duration of 5 minutes. If the power supply voltage drops below 11.5v (23 v), a 5 minute measurement is made once every 2 hours. Above 13V (26 V) the powersave mode is switched off automatically. Below 10V no measurement is taken.

If the system is in Powersave mode, a measuring cycle can be initiated in order to obtain up-to-date volumes, and this is accomplished by activating the tank menu. During periods where no measurements are being taken, the last measured results are shown.

7.2.3 Troubleshooting tank sensors

If the tank monitor shows wrong values or "---", first check that the sensor is connected properly. Next check the wiring between the sensor and the CMT, as this has shown to be the main source of errors. If the shown values are obviously incorrect, check that the voltage of the power supply is above 10V.

7.3 Submenu Energy

This menu shows the energy balance of the vessels DC systems. Dependent on the deployment of Shunts SHL, the current flow can be analysed in detail. The Energy page shows which energy sources are feeding into the system, and at what amperage, and which loads are taking energy out and at what rate. It is also possible to see if the batteries are being charged or discharged, and arrows show the direction of current flow. The charging sources are shown in the upper part of the display, the loads in the lower part. A "Combi" Inverter/Charger will appear on the bottom line and will show amps being charged or consumed, but will show only accumulative charging Amp/Hrs. In this menu all batteries are combined and shown as one battery in order to give a clear overview. A detailed analysis of the battery systems can be obtained by opening the Battery page.



7.3.1 Energy

By touching the symbols, the display can be switched to show the accumulative amp/hours consumed or delivered since the counter was last reset.

7.4 Submenu Main switch



This menu shows the position of the main switches.

7.4.1 Functions of the Main Switch

Main Switches can be switched on or off by touching the corresponding button. The button has to be pressed for half a second until a short signal sounds, after releasing the switch function operated.

If a PIN is required for actuation, this will be indicated by a small padlock in the switch symbol.

7.5 Submenu AC



This menu shows the energy situation of the AC system, where the symbols on the top line show the available sources. If these sources are active, the voltage is shown (LAU only). The active system source is shown by a line connecting it to the symbol on the lower line. If a transducer ACW is connected, the AC parameters of; voltage, current, frequency, and the kilowatt hours used since the last reset, are shown in the symbol on the lower line.

7.6 Alarm List



If the Alarm Management is activated in SetUp, a list of all triggered alarms will be shown automatically when a new alarm is triggered.

If alarms are triggered, the Title Bar of the PSM display will be colored red. To see what alarms are activated press the middle of the Title Bar.

If the Alarm Notification in Setup is set so that a new alarm will be announced by a message and a buzzer, the display illumination flashes together with the acoustical signal (buzzer) in case of an alarm.

The buzzer will sound max. 60 seconds, but can be silenced earlier by tapping on the display.

8. Software Update

The software of the PSM can be updated by means of a micro-SD card. After having received the software by e-mail, the files need to be copied onto an empty SD-card.

First, remove the power supply plug of the PSM and the PBUS-cables and remove the rear cover by unscrewing the four screws at each corner. At the right hand side of the printed board there is a SD-card reader. The metal cover part has to be pushed approximately 1 mm to the left side and can then be swung open. Next, the SD-card is inserted and the cover closed and moved 1mm back again to the right side until it is locked. The power supply can then be plugged in again and the screen should then show that new software has been recognised and is being installed automatically.

After about 20 seconds, the update is finished and the display asks you to remove the SD-card, which must be done after removing the power supply. After taking out the SD-card, the cover of the SD-card reader has to be closed again and locked by moving the cover to the right side. It is very important that this is done correctly and that the cover is locked in place.

The rear cover can then be installed and all plugs/network cables re-connected. The software update is now operational.

If the PSM operates normally after inserting the SD-card, it signifies that no new software has been detected, or that it is the same version as already installed.

9. Revision History

MRZ 2013	VERSION 14
<ul style="list-style-type: none">- EM-box Firmware update via P-Bus.- Display of tank and battery alarms in a pop-up window. Alarm Treatment.- The voltage measured at the Remote Battery Switch FBC can be shown as battery voltage.	
JAN 2013	VERSION 13
<ul style="list-style-type: none">- Long pressing of the button „back“ (arrow to left) causes a jump back to the start menu.- The voltage measured at the terminal U1 at the Tank Interface CMT can be shown as battery voltage (CMT starting software-version 5)	
JAN 2013	VERSION 12
<ul style="list-style-type: none">- The Peukert factor can be adjusted from 1,00 to 1,40 at the Shunt SHC.- Display of battery temperatures either in °F or °C- The position of the remote main switch buttons can be chosen freely on the screen.	
JUN 2012	VERSION 12
<ul style="list-style-type: none">- New screen drive avoids pixel failures on the display.- The logging of the battery and energy data is possible via SD-card.	
MAI 2012	VERSION 11
<ul style="list-style-type: none">- Integration of the AC- modules LAU	
FEB 2012	VERSION 10
<ul style="list-style-type: none">- Final design implemented at the serial models- The voltage supervision of the Remote Battery Switch FBC can be activated/deactivated.	