and its distributors are present on many important boatshows all around Europe. On these boat shows you will receive a large amount of information regarding electrical boat equipment. You will also get an insight of discussions between boat operators and manufacturer. Perhaps you would like to exchange ideas or experiences.
This brochure is intended to advise anyone according to the best of our knowledge. A legal obligation may not be deducted from there. The illustrations of the products and the circuit diagrams are without obligation. We will not be held responsible for printing errors or inadvertently wrong indications.

We reserve the rights to alter our products in accordance to the latest technical advancements.

### Summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Distribution Panel</strong></td>
<td></td>
</tr>
<tr>
<td>Power Distribution Panels Series 200</td>
<td>4</td>
</tr>
<tr>
<td>Accessories for Power Distribution Panels Series 200</td>
<td>12</td>
</tr>
<tr>
<td>Custom-made Panels</td>
<td>14</td>
</tr>
<tr>
<td>Power Distribution Panels Series 100</td>
<td>15</td>
</tr>
<tr>
<td>Accessories for Power Distribution Panels Series 100</td>
<td>19</td>
</tr>
<tr>
<td>Power Distribution Panels, Watertight Series 700</td>
<td>22</td>
</tr>
<tr>
<td><strong>On-board Monitoring</strong></td>
<td></td>
</tr>
<tr>
<td>Philippi System Monitor PSM</td>
<td>24</td>
</tr>
<tr>
<td>P-BUS Shunt SHC, SHL</td>
<td>28</td>
</tr>
<tr>
<td>P-BUS Tank Interface CMT, Main Switch FBC</td>
<td>30</td>
</tr>
<tr>
<td>P-BUS Switch Interface CMR, Temperature Monitor</td>
<td>32</td>
</tr>
<tr>
<td>Digital Battery Monitor BCM</td>
<td>34</td>
</tr>
<tr>
<td>Digital AC Monitor ACM</td>
<td>38</td>
</tr>
<tr>
<td>Digital Tank Monitor TCM</td>
<td>39</td>
</tr>
<tr>
<td>Tank Sensors</td>
<td>40</td>
</tr>
<tr>
<td><strong>Charger Technologies: Inverters</strong></td>
<td></td>
</tr>
<tr>
<td>Battery Charger, Charging Monitor</td>
<td>43</td>
</tr>
<tr>
<td>Inverter-Charger Combination, Sine Wave Inverter DC/AC</td>
<td>48</td>
</tr>
<tr>
<td>DC/DC Converter</td>
<td>52</td>
</tr>
<tr>
<td><strong>AC Shore Power Connection</strong></td>
<td></td>
</tr>
<tr>
<td>Shore Power Connection Units</td>
<td>53</td>
</tr>
<tr>
<td>Switch Over Units, Selector Switches</td>
<td>56</td>
</tr>
<tr>
<td>Shore Power Connection</td>
<td>57</td>
</tr>
<tr>
<td>Isolating Transformer / Galvanic Isolator</td>
<td>60</td>
</tr>
<tr>
<td><strong>DC Internal Installation</strong></td>
<td></td>
</tr>
<tr>
<td>Energy Management Box</td>
<td>62</td>
</tr>
<tr>
<td>GEL, AGM-Batteries, Battery Clamps</td>
<td>64</td>
</tr>
<tr>
<td>Deep Discharge Protection</td>
<td>66</td>
</tr>
<tr>
<td>Lithium Battery Systems</td>
<td>67</td>
</tr>
<tr>
<td>Drop-free Battery Isolator</td>
<td>68</td>
</tr>
<tr>
<td>Charging relay, Battery Optimizer</td>
<td>69</td>
</tr>
<tr>
<td>Battery Main Switches</td>
<td>70</td>
</tr>
<tr>
<td>Remote Battery Main Switches</td>
<td>71</td>
</tr>
<tr>
<td>Fuse Blocks, Circuit Breakers, Strip Fuses</td>
<td>72</td>
</tr>
<tr>
<td>Terminal Blocks, BusBars, Terminal Bars</td>
<td>78</td>
</tr>
<tr>
<td><strong>Connectors</strong></td>
<td></td>
</tr>
<tr>
<td>Cable Clamps</td>
<td>81</td>
</tr>
<tr>
<td>Round Plug Connectors Waterproof Series 692, 694</td>
<td>82</td>
</tr>
<tr>
<td>UHF, Magnet &amp; Mini Connectors</td>
<td>84</td>
</tr>
<tr>
<td>High Current Connectors, USB Sockets</td>
<td>85</td>
</tr>
<tr>
<td>Connectors DC 12V/24V</td>
<td>86</td>
</tr>
<tr>
<td>Dimmer, Sockets and Switches</td>
<td>88</td>
</tr>
<tr>
<td><strong>Wiring</strong></td>
<td></td>
</tr>
<tr>
<td>Cable Termination, Crimping Tools</td>
<td>90</td>
</tr>
<tr>
<td>Cables</td>
<td>92</td>
</tr>
<tr>
<td><strong>LED Lights</strong></td>
<td></td>
</tr>
<tr>
<td>Interior illumination DC 12V/24V</td>
<td>94</td>
</tr>
</tbody>
</table>
Dear Customers,

for more than three decades we have been designing and manufacturing products within the battery and transformer technology. On the base of experiences in this specialised field combined with the knowledge of requirements in the marine environment, we have been able to develop the total package now known and recognised as the philippi marine electrical system.

Production commenced in 1978 and philippi gmbh has been in existence over 38 years during which time marine electrical technology has advanced substantially into the high-tech field. Our company was the first commercial enterprise in marine electrical products to incorporate the parameters and regulations of VDE/EN ISO and Germanischer Lloyd authorities. With continuous innovations such as the introduction of automatic charging equipment and digital battery and tank monitors we have made an important contribution towards the present level of progress.

Over the last 30 years there has been a rapid development in this product group in response to demand on the part of boat builders, dealers and private owners seeking dependable electrical systems. In the meantime we have built up contacts and have established supply contracts with boat builders and customers in Europe and overseas.

Twice our workshops proved too small for our operations so that we built a new factory which we occupied in 1991. This new facility enabled us to expand our production program as well as to enlarge our research and development activity to meet the latest demands of the industry.

We are also engaged in the distribution of products of such renown companies as Binder, E-T-A, Turowest and Pro-Car in Germany and other countries.

We are actively engaged in further development of electrical equipment through our involvement in such important institutions as the German Boat and Ship Builders Association - Hamburg and the Federal Economic Society of Pleasure Craft - Köln. We are the founder of the working group „Electrics and electronics for yachts“ in the DBSV.

Michael Kögel and the philippi-team

Our facilities in Remseck. Here we’re developing new products, producing carefully, handling your orders.

---

**IMPORTANT CHARACTERISTICS OF OUR EQUIPMENTS**

<table>
<thead>
<tr>
<th>Function and Design</th>
<th>All of our developed equipment and switch boards combine a logical layout with an attractive and pleasing design. Main features are safety of operation and simplicity of control, especially in emergencies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>The professional maritime marine and skippers of sailing yachts and power boats demand that electrical installations on board must comply with stringent requirements. The personal safety of crew and passengers must always be guaranteed. Therefore, we manufacture to standards approved and sanctioned by the leading responsible authorities.</td>
</tr>
<tr>
<td>Durability and</td>
<td>The marine environment is aggressive and vibration, salt water and air means that equipment and components must be specially protected in order to withstand the effects of corrosion. All our equipment offers a high degree of resistance through the use of non-corroding materials such as aluminium, stainless steel, thermoplastics, immersed and baked transformers and thus ensure a long service life and obviates early failure and corrosion of components.</td>
</tr>
<tr>
<td>Operating Life</td>
<td></td>
</tr>
<tr>
<td>Warranty</td>
<td>We grant a warranty to our products of two years. You can be sure that we will assist you in any case of problems with our products.</td>
</tr>
<tr>
<td>Made in Germany</td>
<td>All our manufactured products have been developed in house and have been tested in operation. This guarantees a continuously high level of quality as well as a rapid response and complete service package. Should you have any queries regarding our products please consult with our local dealer or ourselves. Our staff will be happy to deal with any questions or technical problems.</td>
</tr>
</tbody>
</table>
For completion of our product range we work together with well-known German and international companies. We favour companies producing to the highest standards and also are situated in the German speaking part in order to get best quality products together with best technical assistance and knowledge in special details.

Our most important partners are:

- **binder**
  - Connectors

- **ProCar**
  - Connectors

- **E-T-A**
  - Circuit breakers

- **STUDER**
  - Sine wave inverters, combis

- **Berker**
  - Connectors / Switches

- **Hilling**
  - Main switches and relays

- **alfatronix**
  - DC/DC-converters

- **Fischer Panda**
  - Gensets

- **BLUE SEA SYSTEMS**
  - DC-Installation

- **prebit**
  - LED-lights

---

**THE CE-CLASSIFICATION**

The CE classification indicates that the marked product is in accordance to the current and relevant legal requirements which are based on European guidelines. From 1996, for instance, only equipment which conforms to the EMV guidelines may be brought into the market. The CE classification does not refer to the quality of the product and, therefore, does not express an indication of quality.

All our manufactured and distributed products conform to the European and national safety regulations. Guideline 73/23 EEC of the Council of the European Union and Equipment Safety Law (GGG). In addition the requirements related to radio interference.


With the CE classification philippi marine electrical systems declare, according to the regulations of the guidelines 73/23/EEC and 89/392/EEC, that their products bearing this classification conform to the above named norms and the specific related documents. Legal warranty and liability may not be deduced from this confirmation.
The power distribution panels series 200 combine user comfort through a simple design and technical dependability. Each circuit is switched and protected by a thermic circuit breaker with its own rocker switch (ETA 3130). It contains an integrated light diode that shows circuit status. In case of short circuit, the breaker switches automatically off and the light is off. Once the problem is corrected, the breaker can be manually pushed to ON position. Each circuit breaker has an internal failsafe mechanism that will not react (turn on) during a problem in circuitry until the problem is solved.

**SERIES 200**

The measurements of the power distribution panels are matching to each other to allow the choice of vertical or horizontal combination. Cut-out dimensions will be smaller of 13 mm each edge. Rocker switch circuit breakers with 10A are normally built in, but can be changed on request to 6A, 16A, or 20A. Circuit breakers are connected on the reversed side with spade terminals 6,3mm. Self adhesive labels are included.
During short circuit or overload, the light goes out and the switch clicks to the off position. Once the problem is corrected, the breaker can be switched again to the ON position for continued use. The circuit breakers have an intern trip switch that cannot be influenced during a problem by pressing on the rocker switch.

Digital monitors for battery supervision, battery charger control und tank monitoring.

Control switches for a comfortable system control. Labelling through a self adhesive label.

- Switching from a remote control switch (1)-0-(2)
- Bilge pump (auto-manual, 1-2)
- Voltmeter switch-over battery 1-0-2
- Tank alarm switch on-off
- Monitoring switch (Tank 1-0-2)
- Panel lighting on-off
- Inverter on-off
- Low discharge protection

Power distribution panel with a navigation light display reveals the position of a navigation light failure through a control light and an alarm. The acoustic alarm is acknowledgable by push button.
10 power circuits with thermal circuit breakers 10 A.

**Dimensions**  
W 105 x H 210 x D 70 mm  
Suitable terminal blocks type RK L 10.

---

7 power circuits with thermal circuit breakers 10 A, DC - and dual USB charging socket.

**Dimensions**  
W 105 x H 210 x D 70 mm  
Suitable terminal blocks type RK L 10.

---

4 power circuits with thermal circuit breakers 10 A, display sailing yacht incl. electronic navigation lights monitor POS 6 with alarm, for use with LED lanterns or normal bulbs, for 12V and 24V.

**Dimensions**  
W 105 x H 210 x D 70 mm

---

7 power circuits with thermal circuit breakers 10 A, battery monitor BCM 1, (alternatively tank monitor TCM4V) and 2 control switches for individual use. Shunt SHA has to be ordered separately (please see page 37)!

**Dimensions**  
W 210 x H 157,5 x D 70 mm  
Suitable terminal blocks type RK L 10.

---

2 power circuits with thermal circuit breakers 10 A and display power boat incl. electronic navigation lights monitor POS 6 with alarm, for use with LED lanterns or normal bulbs, for 12V and 24V.

**Dimensions**  
W 210 x H 105 x D 70 mm

---

8 power circuits with thermal circuit breakers 10 A

**Dimensions**  
W 210 x H 105 x D 70 mm  
Suitable terminal blocks type RK L 10.
**POWER DISTRIBUTION PANELS SERIES 200**

- **STV 220**
  - Order No.: 0 2000 2200
  - 20 power circuits with thermal circuit breakers 10 A
  - Dimensions: W 210 x H 210 x D 70 mm
  - Suitable terminal blocks type RKL 20

- **STV 214 -12V**
  - Order No.: 0 2001 2140
  - 14 power circuits with thermal circuit breakers 10A, volt- and ammeter (0-40 A), 3 control switches (0-1, 1-0-2, 1-2) for individual use.
  - Dimensions: W 210 x H 210 x D 70 mm
  - Suitable terminal blocks type RKL 16/4

- **STV 203**
  - Order No.: 0 2000 2030
  - 3 power circuits with thermal circuit breakers 30A.
  - Dimensions: W 105 x H 105 x D 70 mm
  - Suitable terminal blocks type RKL 10

- **STV 204**
  - Order No.: 0 2000 2040
  - 4 power circuits with thermal circuit breakers 10A.
  - Dimensions: W 105 x H 105 x D 70 mm
  - Suitable terminal blocks type RKL 10

- **STV 200-5**
  - Order No.: 0 2000 2005
  - 5 circuits with rocker switch (31.5x14 mm) and lamp diodes display. Rocker switches can be exchanged to other models, please see page 21.
  - Dimensions: W 105 x H 105 x D 50 mm

- **STV 230 -12V**
  - Order No.: 0 2001 2300
  - Order No.: 0 2002 2300
  - 20 power circuits with thermal circuit breakers 10A, Moving coil gauges, class 1.5: voltmeter, ammeter 0-40 A and tank level instrument. DC- and dual USB charging socket.
  - 6 control switches (0-1, 1-0-2, 1-2) for individual use and display “Sailing Boat” with electronic navigation lights monitor PDS 6 incl. alarm.
  - Dimensions: W 420 x H 210 x D 70 mm
  - Suitable terminal blocks type RKL 20
The models STV 222, STV 224 and STV 264 offer the complete protection and monitoring for a medium sized sailing yacht with one panel possible. Apart from the thermal protection of the electric circuits a navigation lights monitoring with notification of failure is available. There are also control switches for individual use, e.g. remote control of main switches, bilge pump automatics, inverter, loudspeaker change over and further arbitrary applications. Instead of the digital battery monitor BCM 1 a tank monitor TCM 4V can be ordered also. An active shunt for the battery monitor BCM and the P-BUS components for the PSM have to be ordered separately!

**STV 222**
Order No.: 0 2002 2220
20 power circuits with thermal circuit breakers 10 A, battery monitor BCM 1, tank monitor TCM 4V, display sailing yacht incl. navigation lights monitor POS 6 with alarm, 1 DC - and 1 dual USB charging socket and 2 control switches (0-1, 1-0-2) for individual use. Shunt SHA has to be ordered separately (see page 37)!

**STV 224**
Order No.: 0 2002 2240
24 power circuits with thermal circuit breakers 10 A, battery monitor BCM 1 (alternatively tank monitor TCM 4V can be ordered), display sailing yacht incl. navigation lights monitor POS 6 with alarm, 1 DC - and 1 dual USB charging socket and 2 control switches for individual use. Shunt SHA has to be ordered separately (see page 37)!

**STV 228**
Order No.: 0 2000 2280
8 power circuits with thermal circuit breakers 10A, battery monitor BCM 1, tank monitor TCM 4V, dual USB charging socket and 2 control switches for individual use. Shunt SHA has to be ordered separately!

**STV 215**
Order No.: 0 2000 2150
15 power circuits with thermal circuit breakers 10 A, battery monitor BCM 1 (alternatively tank monitor TCM 4V can be ordered). Shunt SHA has to be ordered separately!

Dimensions

- **W** 210 x **H** 210 x **D** 70 mm
- Suitable terminal blocks type RKL 16/4

Dimensions

- **W** 420 x **H** 210 x **D** 70 mm
- Suitable terminal blocks type RKL 30

Dimensions

- **W** 210 x **H** 210 x **D** 70 mm
- Suitable terminal blocks type RKL 10
Power distribution panels with system monitor PSM integrated for supervision of batteries, tanks, energy, AC mains and switching as well as connection of further PBUS - components. USB - double charging sockets are for DC 12V and 24V.

- **STV 250**  
  Order-No.: 0 2002 2500  
  10 power circuits with thermal circuit breakers 10A, system monitor PSM, DC- and dual USB charging socket, 2 switches (0-1, 1-0-2). PBUS components have to be ordered separately!  
  Dimensions: W 210 x H 210 x D 70 mm  
  Suitable terminal blocks type RKL 16/4

- **STV 256**  
  Order-No.: 0 2000 2560  
  14 power circuits with thermal circuit breakers 10 A, system monitor PSM, display sailing yacht incl. navigation lights monitor POS 6 with alarm, DC- and dual USB charging socket and 2 control switches (0-1, 1-0-2) for individual use.  
  Shunt and further PBUS components have to be ordered separately (see page 26)!  
  Dimensions: W 315 x H 210 x D 70 mm  
  Suitable terminal blocks type RKL 16/4

- **STV 264**  
  Order-No.: 0 2002 2640  
  24 power circuits with thermal circuit breakers 10 A, philips system monitor PSM, display sailing yacht incl. navigation lights monitor POS 6 with alarm, DC- and dual USB charging socket and 2 control switches (0-1, 1-0-2) for individual use.  
  Shunt and further PBUS components have to be ordered separately (see page 26)!  
  Dimensions: W 420 x H 210 x D 70 mm  
  Suitable terminal blocks type RKL 30

- **BPA 202**  
  Order-No.: 0 2800 2032  
  Bilge pump control panel for selective activation of the bilge pump either by an external bilge pump switch or manual operation. The operational readiness of the bilge pump is being displayed by two LED control lights. During the operation of the pump the integrated buzzer gives an alarm signal.  
  Rated voltage: DC 12/24 V  
  Rated current: 16 A  
  Dimensions: W 105 x H 52,5 x D 60 mm

- **MPE 202**  
  Order-No.: 0 2800 2020  
  Panel for 2x PSD or USB sockets. Sockets have to be ordered separately, please see pages 85 / 88.  
  Dimensions: W 105 x H 52,5 x D 70 mm

- **MPE 203**  
  Order-No.: 0 2990 0203  
  Panel for 3 parts: sockets series RTQ and / or push button RDS.  
  Dimensions: W 105 x H 52,5 x D 70 mm

- **RTQ USB**  
  Order-No.: 6 0002 1002  
  USB 2.0 socket with USB-cable 30cm.

- **RTQ LAN**  
  Order-No.: 6 0002 1008  
  Socket with 2x RJ45 sockets (front / rear).

- **RDS O-(1)**  
  Order-No.: 6 0002 0010  
  Push button O-(1), Ring is green illuminated, 0.1A
In order to protect the power circuits on aluminium and steel vessels, double pole circuit breakers are fitted to ensure a complete galvanic isolation from the vessels hull.

The thermal circuit breakers E-T-A 3130 are available in the power ratings 6 A/10 A/16 A. Circuit breakers with a rating of 10 A are fitted as standard.

These panels have the same dimensions as the other panels series STV 200 and may be easily combined, for example with AC-panels.

The power circuits are marked with self-adhesive labels which are included.

Suitable terminal blocks please see at page 80.

STV 203-2p Order-No.: O 2000 2032
3 power circuits with thermal circuit breakers 10 A, double-pole
Dimensions W 105 x H 105 x D 70 mm

STV 206-2p Order-No.: O 2000 2062
6 power circuits with thermal circuit breakers 10 A, double-pole
Dimensions W 105 x H 210 x D 70 mm
Suitable terminal blocks type RKL 14

STV 214-2p Order-No.: O 2002 2142
14 power circuits with thermal circuit breakers 10A, battery monitor BCM (alternatively tank monitor TCM 4V can be ordered), display sailing yacht incl. electronic navigation lights monitor POS 6 with alarm, 1 DC - and 1 dual USB charging socket and hull isolation test. Shunt SHA has to be ordered separately (see page 37)!
Dimensions W 420 x H 210 x D 70 mm
Suitable terminal blocks type RKL 14

STV 254-2p Order-No.: O 2002 2542
14 power circuits with thermal circuit breakers 10A, system monitor PSM, display sailing yacht incl. electronic navigation lights monitor POS 6 with alarm, 1 DC - and 1 dual USB charging socket and hull isolation test. Shunt and further PBUS components has to be ordered separately (see page 26)!
Dimensions W 420 x H 210 x D 70 mm
Suitable terminal blocks type RKL 14
The AC shore power connection units series LAE 200 match perfectly our DC power distribution panels series STV 200. The electrical connection will be done on the rear side via terminal clamps. The terminal clamps are constructed to be hands on safe. For safety reasons, the panel has to be installed so that the reverse side is covered and only accessible with the help of tools. For further AC devices such as a switching units, see page 53.

**LAE 233**
Order No.: 0 1000 2332
3 double pole power circuits with thermal circuit breakers 10A for AC 230V / 50 Hz.
Dimensions: W 105 x H 105 x D 70 mm

**LAE 235**
Order No.: 0 1000 2350
Shore power unit with RCBO leakage protector (16A/30mA), power indication light and a Schuko socket. Connection with terminal clamps on rear side.
Dimensions: W 105 x H 210 x D 100 mm

**LAE 232**
Order No.: 0 1000 2320
Shore power unit with RCBO leakage protector (16A/30mA), power indication light and 2 double pole thermal circuit breakers 10A for 230V / 50 Hz. Connection with terminal clamps on rear side.
Dimensions: W 105 x H 210 x D 100 mm

**LAE 236**
Order No.: 0 1000 2362
6 double pole power circuits with thermal circuit breakers 10A for AC 230V / 50 Hz.
A panel with a RCBO leakage protector has to be installed before the input of this panel.
Dimensions: W 105 x H 210 x D 70 mm

**LAE 234 LG**
Order No.: 0 1000 2340
Shore power unit with RCBO leakage protector (16A/30mA), 3 AC monitor lights and 4 double pole thermal circuit breakers 10A for AC 230V / 50 Hz.
Shore - generator (LG) or shore - generator - inverter (LGW) - switch over and voltmeter 230V. Connection via terminal clamps on rear side.
Stronger versions are available on request.
Dimensions: W 210 x H 210 x D 110 mm

**LAE 234 LGW**
Order No.: 0 1000 2341
Shore power unit for inverter/charger-combination with shore-generator-switch over with switching off of designated consumers while inverter operation. RCBO leakage protector (32A/30mA), 3 AC monitor lights and 4 double pole thermal circuit breakers 10A for AC 230V / 50 Hz. Shore-generator-switch over (25A) and voltmeter 230V. Connection via terminal clamps on rear side. Generator set max. 6 kW. Stronger versions are available on request.
Dimensions: W 210 x H 210 x D 110 mm

The shore power indication panel LAR shows the correct electrical connection of the shore power. Green means: connection is correct; red means that the live (L) and the neutral (N) are changed.
Both lights on: protective earth (PE) not connected.
Dimensions: W 105 x H 52.5 x D 50 mm

**LAR**
Order No.: 0 1000 0231

Shore power unit with RCBO leakage protector (16A/30mA), 3 AC monitor lights and 4 double pole thermal circuit breakers 10A for AC 230V / 50 Hz.
Shore - generator (LG) or shore - generator - inverter (LGW) - switch over and voltmeter 230V. Connection via terminal clamps on rear side.
Stronger versions are available on request.
Dimensions: W 210 x H 210 x D 110 mm

**LAE 230**
Order No.: 0 1000 2320
Shore power unit with RCBO leakage protector (16A/30mA), power indication light and 2 double pole thermal circuit breakers 10A for 230V / 50 Hz. Connection with terminal clamps on rear side.
Dimensions: W 105 x H 210 x D 100 mm
**ACCESSORIES FOR POWER DISTRIBUTION PANELS SERIES 200**

**THERMAL CIRCUIT BREAKERS**

**E-T-A 3130**


- Cut out dimensions 14,8 x 34,2 mm, Width 18 mm.
- Rated voltage DC 30 V, Power consumption of the LED: 0,7 mA at 12 V

Circuit breakers available ex stock

- **3130-F11B-K7T1-W29AG3-2A**  Order No. 1 3130 2002
- **3130-F11B-K7T1-W29AG3-6A**  Order No. 1 3130 2006
- **3130-F11B-K7T1-W29AG3-10A** Order No. 1 3130 2010
- **3130-F11B-K7T1-W29AG3-16A** Order No. 1 3130 2016
- **3130-F11B-K7T1-W29AG3-20A**  Order No. 1 3130 2020

- **3130-F11B-L7T1-U29AG3-10A (Push button)** Order No. 1 3130 4010

Double pole DC: double pole rocker switch/thermal circuit breaker.

- Cut out dimensions 26,3 x 34,2 mm, Width 29,3 mm, Rated voltage DC 30 V.
- Current consumption of the LED: 0,7 mA at 12 V.

Circuit breakers available ex stock

- **3130-F12B-S2T1-W29AG3-6A**  Order No. 1 3131 2006
- **3130-F12B-S2T1-W29AG3-10A** Order No. 1 3131 2010
- **3130-F12B-S2T1-W29AG3-16A** Order No. 1 3131 2016
- **3130-F12B-S2T1-U29AG3-10A (Push button)**  Order No. 1 3131 4010

Double pole AC 230 V: double pole rocker switch/thermal circuit breaker.

- **3130-F12B-S2T1-W24AR7-6A**  Order No. 1 3130 5006
- **3130-F12B-S2T1-W24AR7-10A** Order No. 1 3130 5010
- **3130-F12B-S2T1-W24AR7-16A** Order No. 1 3130 5016
- **3130-F15B-L7T1-W24AR7-20A**  Order No. 1 3130 5020

Analog precision meter with LED illumination

More models available on request.

- **Dimensions** W 48 x H 48 x D 46 mm
- **Cut-out** W 45,5 x H 45,5 mm

- **Voltmeter DC**
  - SQB 8-16V  Order No. 6 0490 0816
  - SQB 16-32V  Order No. 6 0490 1632

- **Tank gauge (DC 10-30V) for TGT/TGW**
  - SQB Water (10-180°C)  Order No. 6 0490 9182
  - SQB Fuel (10-180°C)  Order No. 6 0490 9183

- **Ammeter DC (internal/external shunt)**
  - SQB 0-40A (internal)  Order No. 6 0491 0040
  - SQB 0-40A/60mV  Order No. 6 0492 0040
  - SQB 0-60A/60mV  Order No. 6 0492 0060
  - Shunt 40 A/60 mV  Order No. 7 3060 0040
  - Shunt 60 A/60 mV  Order No. 7 3060 0060

- **Voltmeter AC (without illumination)**
  - SQB 250V (AC)  Order No. 6 0495 0250
Working navigation lights at night are an essential safety requirement for every boat.

Up to six navigation lights (port-, starboard-, stern-, steaming-, anchor- and tricolour- light) can be connected to and monitored by the position light monitor POS6. The electronic supervises the circuits and recognises each failure of a bulb or LED or the break of the cables. Each navigation light will be shown by a relating control LED on the panel.

The failure of a lantern will be announced by an optical and an acoustic alarm, which can be acknowledged. The relating diode will be blinking on the display.

Both normal bulbs and LED lights can be supervised, even mixed. Existing equipment can be upgraded easily with a navigation light control electronic POS 6. If more than 6 lights have to be supervised you can install several POS 6 modules parallel.

**Navigation lights control for commercial vessels**

For switching and supervision of navigation lights on commercial ships we offer a dedicated range of panels with double pole circuit breakers incl. harness and connection boxes. DNV approval is pending. Separate documentation is available, for standard products we can offer:

**Navigations lights control panel with junction box DC 12 / 24V**

6 or 12 double pole circuit breakers, switch-over to 2 battery systems.
6 or 12 channel navigation lights supervision, LED dimmer on signal LEDs.
1 meter cable to circuit board equipped with 2.5 mm² screw terminals
Output for external alarm

**GMDSS panel with junction box**

3 double pole circuit breakers, LED indication for ok / error on GMDSS battery, water alarm for 4 rooms.
1 meter cable to circuit board equipped with:
DC/DC charger 15A for charging the battery GMDSS
9 V rechargeable battery for supplying the alarm system
2.5 mm² screw terminals, Output for 2 separate external alarms
Main supply connection for GMDSS battery and 2 battery banks

**DC Main board with junction box**

30 double pole Circuit Breakers and PSM Monitor, Ground fault test
USB charging connector. 1 meter cable to bottom electrical circuit board equipped with 2.5 mm² screw terminals. Main supply connection with possibility of installation of fuses and shunt

---

**POS 6**

Order-No.: 0 8000 6060

For installation of an individual navigation lights control with separate electronic incl. an alarm

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>DC 10-30 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>6 with alarm</td>
</tr>
<tr>
<td>Max. power</td>
<td>3 A each outlet</td>
</tr>
<tr>
<td>Breaking capacity</td>
<td>0,2 -36 W/12 V 0,5 - 72 W/24 V</td>
</tr>
<tr>
<td>Switch level</td>
<td>10 mA</td>
</tr>
<tr>
<td>Voltage drop</td>
<td>max. 0,1 V (3 A)</td>
</tr>
<tr>
<td>Own consumption</td>
<td>10 - 20 mA</td>
</tr>
<tr>
<td>Dimensions W x H x D</td>
<td>88 x 126 x 27 mm</td>
</tr>
</tbody>
</table>

**POS 6 E**

Order-No.: 0 8000 6061

Replacement electronic for hardware update of older POS-SY panels with navigation lights control for the use with LED - lanterns. Incl. acoustic alarm & control-LEDs.
Easy to replace by changing of the complete module!
Are you planning to build a new boat? Maybe just refit the one you have? When it comes to planning electrical wiring allow us to be your guide! We have decades of experience on electrical systems aboard yachts and sporting boats. With our extensive variety of products, we are sure to simplify all your electrical needs. You can be sure to receive complete systems (plan & components) with the guarantee that all parts received fit with each other. Since we work hand in hand with working crews of the boating industry, our products remain up-to-date including construction standards and laws.

A central part of this planning is the production of special, individual switchgear. For example, switch panels for a current supply of DC 12V /24V or a system voltage of AC 230V/400V. Engine panels, switch plates for external areas and for larger 230V systems, we plan and produce complete control boxes.

Based on the technic of our power distribution panels and shore connection units, the diagram presents a special version of switch gear as well as instrument panels for external readings. Labelled through a process of screen printing, illuminated letters, or self adhesive labels. It is possible to print the outline of a customers yacht on the electronic monitor panel.

We supply instrument panels in special custom production to all dimensions, forms and colour variations. Complete systems ready to be installed consisting of:

- Shore power connection
- Distribution switch circuits
- Analogue gauges/ digital monitors for batteries, tanks, battery chargers
- Sockets and switches
- Cut-out for special components

In order to submit a quotation as well as for the design and manufacture of these circuit distribution panels we require exact details regarding the requirement on board.

On our website www.philippi-online.de you can download a questionnaire
The navigation lights electronic POS 6 supervises up to 6 navigation light circuits and recognises each failure of a bulb or LED or the break of the cables. Each navigation light will be shown by a relating control LED on the panel. The failure of a lantern will be announced by an optical and an acoustic alarm, which can be acknowledged. The relating diode will be blinking on the display. Both normal bulbs and LED lights can be supervised, even mixed.

Power distribution switch panels in a build-up system for individual switching installations for ship’s supply. Standard circuit breakers with a nominal power rating of 8A are fitted. Circuit breakers with nominal power rating of 4A/6A/8A/10A/12A/16A may be fitted upon request or supplied for later fitting. STKZ self-adhesive labels (165 per page) are included. The power distribution unit is supplied wired for 12V/24V with the relevant cable diameter. The connection is made with flat spade terminals 6.3 mm on the back of the unit.

The dimensions of the power distribution panels are matched to each other to allow the choice of horizontal or vertical combination.

Circuit breakers with nominal power rating of 4A/6A/8A/10A/12A/16A may be easy exchanged later on.

The connection is made with flat spade terminals 6.3 mm on the rear side of the unit.

Set of labels “STKZ”
Self-adhesive labels will be provided (see page 19)
**POWER DISTRIBUTION PANELS SERIES 100**

**STV 108**  
Order No.: 0 2000 1080  
8 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches.  
Dimensions: W 110 x H 145 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 106/1**  
Order No.: 0 2000 1061  
6 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches and protected small socket with protective cap.  
Dimensions: W 110 x H 145 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 105**  
Order No.: 0 2000 1050  
5 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches, DC- and dual USB charging socket.  
Dimensions: W 110 x H 145 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 106**  
Order No.: 0 2000 1060  
6 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches.  
Dimensions: W 110 x H 117 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 110**  
Order No.: 0 2000 1100  
10 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches.  
Dimensions: W 110 x H 180 x D 70 mm  
Suitable terminal blocks type RKL 10

**PV -12 V**  
Order No.: 0 2801 0120  
**PV -24 V**  
Order No.: 0 2802 0120  
Voltmeter with switch over for service- und starter battery as addition to switch boards series STV 100.  
Dimensions: W 110 x H 72,5 x D 80 mm

**STV 103**  
Order No.: 0 2000 1030  
3 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches.  
Dimensions: W 110 x H 72,5 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 101**  
Order No.: 0 2000 1010  
1 power circuit with thermic circuit breaker (8 A), lamp diode display, rocker switch.  
Dimensions: W 110 x H 36,2 x D 70 mm

---

**Recommended wires cross section for consumers supply lines**

<table>
<thead>
<tr>
<th>Circuit breaker A</th>
<th>6</th>
<th>10</th>
<th>16</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire mm²</td>
<td>1,0</td>
<td>1,5</td>
<td>2,5</td>
<td>4</td>
</tr>
</tbody>
</table>

---

**STV 108**  
Order No.: 0 2000 1080  
8 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches.  
Dimensions: W 110 x H 145 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 106/1**  
Order No.: 0 2000 1061  
6 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches and protected small socket with protective cap.  
Dimensions: W 110 x H 145 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 105**  
Order No.: 0 2000 1050  
5 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches, DC- and dual USB charging socket.  
Dimensions: W 110 x H 145 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 106**  
Order No.: 0 2000 1060  
6 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches.  
Dimensions: W 110 x H 117 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 110**  
Order No.: 0 2000 1100  
10 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches.  
Dimensions: W 110 x H 180 x D 70 mm  
Suitable terminal blocks type RKL 10

**PV -12 V**  
Order No.: 0 2801 0120  
**PV -24 V**  
Order No.: 0 2802 0120  
Voltmeter with switch over for service- und starter battery as addition to switch boards series STV 100.  
Dimensions: W 110 x H 72,5 x D 80 mm

**STV 103**  
Order No.: 0 2000 1030  
3 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches.  
Dimensions: W 110 x H 72,5 x D 70 mm  
Suitable terminal blocks type RKL 10

**STV 101**  
Order No.: 0 2000 1010  
1 power circuit with thermic circuit breaker (8 A), lamp diode display, rocker switch.  
Dimensions: W 110 x H 36,2 x D 70 mm

---

**Recommended wires cross section for consumers supply lines**

<table>
<thead>
<tr>
<th>Circuit breaker A</th>
<th>6</th>
<th>10</th>
<th>16</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire mm²</td>
<td>1,0</td>
<td>1,5</td>
<td>2,5</td>
<td>4</td>
</tr>
</tbody>
</table>
The new compact digital 2.4” touchscreen monitor PDM is designed for the supervision of batteries and tanks on small and medium sized systems. You can monitor the voltages of up to 2 battery banks (starter and service battery). For the tank supervision there are 3 inputs available. At the input of tank 1 only a sensor series TGT/TGW can be connected. At the input of the tanks 2 and 3 you can connect either sensors series TGT/TGW or ultrasonic sensors UTV. The pressure sensor TDS can be connected only with hardware modification.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STV 312/4 -SY -12 V</td>
<td>020013120</td>
<td>Combined power distribution panel with navigation lights monitor for sailing yachts, 12 power circuits with thermal circuit breakers (8 A), lamp diode display, rocker switches as well as 4 additional circuit breakers (8 A), voltmeter with switch over, moving coil gauge, class 1.5. Display “Sloop” with electronic monitor POS 6.</td>
</tr>
<tr>
<td>STV 312/4 -SY -24 V</td>
<td>020023120</td>
<td></td>
</tr>
<tr>
<td>STV 311/5 -12 V</td>
<td>020213115</td>
<td>11 power circuits with thermal circuit breakers (8 A), lamp diodes display, rocker switches as well as 5 additional thermal circuit breakers (8 A). Voltmeter with switch over 1-0-2, moving coil gauge, class 1.5.</td>
</tr>
<tr>
<td>STV 311/5 -24 V</td>
<td>020223115</td>
<td></td>
</tr>
<tr>
<td>POS -SY</td>
<td>025020000</td>
<td>Coated aluminium panel with yacht diagram - sailing yacht “Sloop” and electronic navigation lights control POS 6.</td>
</tr>
<tr>
<td>POS -KY</td>
<td>025000001</td>
<td>Coated aluminium panel with yacht diagram - sailing yacht “Ketch/Yawl” and electronic navigation lights control POS 6.</td>
</tr>
<tr>
<td>POS -MY</td>
<td>025000005</td>
<td>Coated aluminium panel with yacht diagram - “Power boat” and electronic navigation lights control POS 6.</td>
</tr>
<tr>
<td>UKW 3130</td>
<td>020000502</td>
<td>For VHF devices with a double pole circuit breaker with integrated lamp diode (10 A).</td>
</tr>
<tr>
<td>STV 088</td>
<td>020008800</td>
<td>8 thermal circuit breakers 8 A</td>
</tr>
<tr>
<td>STV 08</td>
<td>020000800</td>
<td>8 rocker switches</td>
</tr>
</tbody>
</table>
## Accessories for Power Distribution Panels Series 100

### Power Circuit Labels

Power circuit labels for individual power circuits mounted on panels. Self adhesive waterproof vinyl foil. 165 different signs in languages German, Dutch, English, French, Dansk, Polish, Italian (only 62 labels). Dimensions 27 x 8 mm.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Order No.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>STK2 - D</td>
<td>Blank panel Leer 103</td>
<td>0 2900 1650</td>
<td>W 110 x H 72.5 x D 2 mm</td>
</tr>
<tr>
<td>STK2 - NL</td>
<td>Blank panel Leer 108</td>
<td>0 2900 1651</td>
<td>W 110 x H 145 x D 2 mm</td>
</tr>
<tr>
<td>STK2 - GB</td>
<td>Blank panel Leer 110</td>
<td>0 2900 1652</td>
<td>W 110 x H 180 x D 2 mm</td>
</tr>
<tr>
<td>STK2 - I</td>
<td>Blank panel Leer 316</td>
<td>0 2900 1655</td>
<td>W 220 x H 145 x D 2 mm</td>
</tr>
</tbody>
</table>

### Blank Panels

Blank panels for covering larger cut-outs and individual panels. Plastic-coated aluminium board with 4 mounting holes.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Order No.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank panel Leer 103</td>
<td>Order No. 0 2900 1030</td>
<td></td>
<td>W 110 x H 72.5 x D 2 mm</td>
</tr>
<tr>
<td>Blank panel Leer 108</td>
<td>Order No. 0 2900 1080</td>
<td></td>
<td>W 110 x H 145 x D 2 mm</td>
</tr>
<tr>
<td>Blank panel Leer 110</td>
<td>Order No. 0 2900 5100</td>
<td></td>
<td>W 110 x H 180 x D 2 mm</td>
</tr>
<tr>
<td>Blank panel Leer 316</td>
<td>Order No. 0 2900 3160</td>
<td></td>
<td>W 220 x H 145 x D 2 mm</td>
</tr>
</tbody>
</table>

### ETA 1140F114-P1-M1

Single pole thermal circuit breaker with push-to-reset, failsafe, trip-free (EN 60934). Snap-in type. Cut out measurement: 22 x 11.3 mm. Rated voltage DC 48 V, AC 240 V. Current ratings 4...16 A

Circuit breakers available ex stock

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Order No.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETA 1140F114-P1-M1-4A</td>
<td>Order No. 1 1140 0004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETA 1140F114-P1-M1-6A</td>
<td>Order No. 1 1140 0006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETA 1140F114-P1-M1-8A</td>
<td>Order No. 1 1140 0008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETA 1140F114-P1-M1-10A</td>
<td>Order No. 1 1140 0010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETA 1140F114-P1-M1-12A</td>
<td>Order No. 1 1140 0012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETA 1140F114-P1-M1-16A</td>
<td>Order No. 1 1140 0016</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### LED 3 mm

Lamp diodes with minimal power consumption of 6 mA (12V) and 12mA (24V). Connectable directly to 12/24V (DC 30V). Fitting hole: Ø 4,2 mm

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Order No.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 3 mm, red</td>
<td>Order No. 7 0000 3050</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED 3 mm, yellow</td>
<td>Order No. 7 0000 3051</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED 3 mm, green</td>
<td>Order No. 7 0000 3052</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### LED 5 mm

Lamp diodes with minimal power consumption of 4 mA (12 V) / 8 mA (24 V). Connectable directly to 12/24V (DC 30V). Fitting hole: Ø 6,2 mm

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Order No.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 5 mm, red</td>
<td>Order No. 6 0005 0600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED 5 mm, yellow</td>
<td>Order No. 6 0005 0610</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED 5 mm, green</td>
<td>Order No. 6 0005 0620</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### LED 10 mm

Lamp diodes with minimal power consumption of 7 mA (12V) / 16mA (24V). Connectable directly to 12/24V (DC 30V). Fitting hole: Ø 10 mm

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Order No.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 10 mm, red</td>
<td>Order No. 6 0005 1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED 10 mm, yellow</td>
<td>Order No. 6 0005 1010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED 10 mm, green</td>
<td>Order No. 6 0005 1020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SL 9 rot (AC 230 V)

Signal lamp for AC 230V/50Hz. Cable length: 20 cm. Fitting hole Ø 8 mm.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Order No.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL 9 rot</td>
<td>Order No. 6 0009 0557</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Precision measuring instruments with coil cores for direct current and moving coil SQE for alternating current (Class 1.5), in contrast to the normally used instruments in the marine industry, are more precise and have an own consumption of only 1 mA.

Dimensions
W 48 x H 48 x D 46 mm
Cut-out
W 45.5 x H 45.5 mm

Analogue marine gauges with integrated LED-illumination. Watertight front part. Fitting hole φ 52 mm, outer diameter φ 58 mm. For the use at 24 V rated voltage a pre-resistor Rturo is needed for some gauges. Matching tank gauges: Water / Fuel / Waste Water please see page 40.

VOLTMEETER DC
- SQS 48 /8-16 V  Order-No. 6 0480 0816
- SQS 48 /16-32 V  Order-No. 6 0480 1632

AMMETER DC
- SQS 48 /0-25 A  Order-No. 6 0481 0025
- SQS 48 /0-40 A  Order-No. 6 0481 0040

AMMETER DC for separate shunt
- SQS 48 /0-60 A/60 mV  Order-No. 6 0482 0060
- SQS 48 /0-100 A/60 mV  Order-No. 6 0482 0100

SHUNT for Ammeter DC
- Shunt 60 A/60 mV  Order-No. 7 3060 0060
- Shunt 100 A/60 mV  Order-No. 7 3060 0100

VOLTMEETER AC
- SQS 48 /0-250 V  Order-No. 6 0485 0250

AMMETER AC
- SQE 48 /0-15/30 A  Order-No. 6 0485 1530
- SQE 48 /0-25/50 A  Order-No. 6 0485 2550

FREQUENCY METER AC
- ZQS 48 /45-50/55Hz  Order-No. 6 0485 4555

PRESSURE MEASURING INSTRUMENT
Pressure measuring instruments with resistance range of 10-180 ohms. With LED illumination. Nominal voltage 12 V, (24 V with resistor Rturo), power consumption max. 80 mA/14 V, installation depth 76 mm. Matching VDO pressure sensors
- Druck 5 bar  Order-No. 2 0771 0681
- Druck 10 bar  Order-No. 2 0771 0761

TEMPERATURE MEASURING INSTRUMENT
Temperature measurement instrument for cooling water temperature (40-120 °C). With LED illumination. Matching the VDO-temperature sensors. Nominal voltage 12 V, (24 V with resistor Rturo), power consumption max. 80 mA/14 V, installation depth 76 mm
- Temp 120 °C  Order-No. 2 0772 0641

OPERATING HOURS COUNTER
The hours meter indicates the effective working time of the engine from starting until stop. With LED illumination. Nominal voltage 12/24 V, power consumption 5 mA/14 V, Scale range: 0:99999.9 h, installation depth 83 mm
- HOURS  Order-No. 2 0761 0461

PRE-RESISTOR
Pre-resistor for 24 V operation of some instruments
- Rturo  Order-No. 2 0800 0000
ACCEssories For Power Distribution Panels Series 100

- **STV 066/25 sw** Order-No. 0 2800 6625
  - Plastic coated assembly plates for 1-pole rocker switch 21 x 15 mm.
  - Dimensions W 46 x H 25 x D 30 mm
- **STV 066/40 sw** Order-No. 0 2800 6640
  - Plastic coated assembly plates for 1-pole rocker switch 31.5 x 14 mm.
  - Dimensions W 46 x H 40 x D 40 mm
- **STV 066/50 sw** Order-No. 0 2800 6650
  - Plastic coated assembly plates for 2-pole press switch 33 x 25 mm.
  - Dimensions W 50 x H 46 x D 50 mm

- **Panel 66/25** Order-No. 0 2990 6625
  - Panel without switch. Dimensions as above.
- **Panel 66/40** Order-No. 0 2990 6640
  - Panel without switch. Dimensions as above.
- **Panel 66/50** Order-No. 0 2991 0018
  - Panel without switch. Dimensions as above.

- **Rocker switch 21 x 15** Order-No.
  - Switch off 0-1 5 1801 1102
  - Touch button 0-1 5 1801 1202
  - Ch-over switch 1-2 5 1803 1102
  - Ch-over switch 1-0-2 5 1808 1103
  - Ch-over switch 1-0-(2) (touch) 5 1808 1202
  - Protective cap 5 2308 9011
  - Single-pole change-over button 21 x 15 mm.
  - Cut-out 19 x 13 mm, spade terminals 4.8 mm

- **Rocker switch 31.5 x 14** Order-No.
  - Switch off illum. 230 V 0-1 5 1830 3112
  - Switch off 0-1 5 1831 3312
  - Touch button 0-1 5 1831 3402
  - Ch-over switch 1-2 5 1833 3302
  - Ch-over switch 1-0-2 5 1838 3502
  - Ch-over switch 1-0-(2) 5 1838 1602
  - Ch-over switch (1)-(0)-(2) 5 1838 3402
  - Single-pole change-over button 31.5 x 14 mm.
  - Cut-out 30 x 11 mm, spade terminals 6.3 mm

- **Selector switch** Order-No.
  - CG 4 A 241 (0-1-2-3) 6 4004 2410
  - CG 4 A 232 (0-1-2-3-4) 6 4004 2320
  - Rated current 10 A
  - Panel 30 x 30 mm Depth 50 resp. 63 mm

- **Lever switch** Order-No.
  - Lever switch 0-1 5 1821 1101
  - Protective cap 5 3430 1023
  - Dimensions 21 x 15 mm. Hole Ø. 12 mm, spade terminals 4.8 mm.

- **ZSK 15** Order-No. 5 0031 0104
  - Push-pull switch with a long tread shank.
  - Dimension 58 x Ø 14 mm (knob), Inst. hole Ø 8 mm. Wall thickness max. 14 mm. Power load 15 A.

- **SL230 rt** Order-No. 5 1837 3102
  - Power control light AC 230 V/50 Hz.
  - Dimensions 31.5 x 14 mm.

- **SL230 gr** Order-No. 5 1837 3108

- **WIP 25** 5 2013 0112
  - WIP 25 RD 12V (red LED) 5 2013 0210
  - WIP 25 GN 12V (green LED) 5 2013 0212
  - Splashproof rocker switch Ø 25 mm (IP65), Max. current 10 A, Inst. hole Ø 20.2 mm, spade terminals 4.8 mm

- **Rocker switch**
  - Switch off 0-1 5 1932 3112
  - Ch-over switch 1-0-2 5 1939 3311
  - Ch-over button (1)-0-(2) 5 1939 3312
  - 2-poles of spray water protected rocker switches 33 x 25 mm. Enclosure IP65, installation cut-out 30 x 22 mm, spade terminals 6.3 mm, max 20 A

- **Lever switch chrome** Order-No.
  - Lever switch chrome 0-1 5 0031 6838
  - Lever switch chrome (1)-0-(2) 5 0031 6592
  - Lever switch chrome 1-0-2 5 0031 6594
  - Two-pole lever switch (15 A) with chrome lever.
  - Hole Ø 12 mm, spade terminals 6.3 mm.
Watertight switching units are advised for external use upon yachts. Many a time only watertight on-off switches were available, the circuit breakers were always installed internally on board.

The power distribution panels series 700 allow directly switching and protection from the same device at the cockpit. Therefore is no longer the need to install cables and direct them to circuit breakers that are installed somewhere internally.

Circuit breakers are available in 6 A, 10 A, 16 A, 20 A or as push button in 10 A. Also there are three position switches and three position push buttons available (but these are not protected).

The circuit breakers have an internal function control light with a special switchable night illumination. During circuit supply the control light is on. The symbols are drawn with laser to make them impermeable to all types of weather.

In order to label each power circuit individually each actuator will be clipped on at his position. Therefore please order the actuators separately.

The panels are mounted on the reverse side with threaded studs. The supplied gasket is for water proof mounting.

---

**STV 715**

Order No.: 0 2000 7150

Waterproof panel with 5 thermal circuit breakers 10 A, incl. gasket.

Actuators have to be ordered separately.

Please see page 23.

Dimensions: W 147 x H 69 x D 65 mm

---

**STV 722**

Order No.: 0 2000 7220

Waterproof panel with 12 circuit breakers 10 A. Mounting via screws from the front.

Actuators have to be ordered separately. Please see page 23.

Dimensions: W 329 x H 69 x D 65 mm

---

**STV 714**

Order No.: 0 2000 7140

Waterproof panel with 3 circuit breakers 10 A and cigarette socket 21 mm, incl. gasket.

Actuators have to be ordered separately.

Please see page 23.

Dimensions: W 147 x H 69 x D 65 mm

---

**STV 711**

Order No.: 0 2000 7110

Waterproof panel with 1 thermal circuit breaker 10 A, incl. gasket.

Actuator has to be ordered separately.

Please see page 23.

Dimensions: W 43 x H 69 x D 65 mm

---

**STV 713**

Order No.: 0 2000 7130

Waterproof panel with 3 thermal circuit breakers 10 A, incl. gasket.

Actuators have to be ordered separately.

Please see page 23.

Dimensions: W 95 x H 69 x D 65 mm

---

Alignable frame for circuit breakers series 3131 consisting of side- and middle-module. Minimum cut-out for 2 side modules: W 51,2 x H 48,3 mm; a middle module spreads the complete frame width by 26,2 mm each.

Dimensions: side module: W 35 x H 68 mm, middle module: W 26,2 x H 68 mm
ACCESORIES FOR POWER DISTRIBUTION PANELS SERIES 700

NEW

**MVD**
Order No.: 7 0010 1733

Monitors DC voltage on a bright, waterproof, daylight readable OLED screen.
The front is watertight IP66.
- 8-36 V DC, resolution 0.01 V, max. 13 mA
- Reverse polarity protected
- Mounting hole Ø 29 mm, outerØ 40 mm

NEW

**SUM 29**
Order No.: 7 0010 1070

Water tight buzzer for 12 V / 24 V, IP68. Rotating
bezel adjusts alarm volume in a wide range.
- Operating current: 5 mA (12 V) / 12 mA (24 V)
- Aperture hole: Ø 29 mm
- Outer diameter: 35 mm

NEW

**USD EK**
Order No.: 7 0010 1039

Dual USB charger switch mount
- Input Voltage Range 9-32 V DC
- Maximum Output Current 4.8 A DC (total)
- Output Voltage 5 V DC ±5%
- Parasitic Current Draw 1 mA

Actuators for circuit breakers series E-T-A 3131 / STV700

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>1 2222 8201</td>
</tr>
<tr>
<td>Power boat interior illumination</td>
<td>1 2222 8801</td>
</tr>
<tr>
<td>Power boat anchor light</td>
<td>1 2222 8802</td>
</tr>
<tr>
<td>Power boat cockpit illumination</td>
<td>1 2222 8803</td>
</tr>
<tr>
<td>Power boat position lights</td>
<td>1 2222 8804</td>
</tr>
<tr>
<td>Power boat bow lantern</td>
<td>1 2222 8843</td>
</tr>
<tr>
<td>VHF</td>
<td>1 2222 8805</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>1 2222 8806</td>
</tr>
<tr>
<td>Anchor winch control</td>
<td>1 2222 8807</td>
</tr>
<tr>
<td>Anchor winch up/down</td>
<td>1 2222 8844</td>
</tr>
<tr>
<td>Wind screen wiper</td>
<td>1 2222 8808</td>
</tr>
<tr>
<td>Bilge pump</td>
<td>1 2222 8809</td>
</tr>
<tr>
<td>Fresh water pump</td>
<td>1 2222 8810</td>
</tr>
<tr>
<td>Horn</td>
<td>1 2222 8811</td>
</tr>
<tr>
<td>Ventilation</td>
<td>1 2222 8812</td>
</tr>
<tr>
<td>Instruments illumination</td>
<td>1 2222 8813</td>
</tr>
<tr>
<td>Navigation instruments</td>
<td>1 2222 8814</td>
</tr>
<tr>
<td>Radio / Tuner</td>
<td>1 2222 8815</td>
</tr>
<tr>
<td>Heating system</td>
<td>1 2222 8816</td>
</tr>
<tr>
<td>Shower pump</td>
<td>1 2222 8817</td>
</tr>
<tr>
<td>Spray nozzle</td>
<td>1 2222 8820</td>
</tr>
<tr>
<td>Searchlight</td>
<td>1 2222 8823</td>
</tr>
<tr>
<td>Autopilot</td>
<td>1 2222 8824</td>
</tr>
<tr>
<td>Trim tab</td>
<td>1 2222 8825</td>
</tr>
<tr>
<td>Sailing boat position lights</td>
<td>1 2222 8827</td>
</tr>
<tr>
<td>Sailing boat cock pit illumination</td>
<td>1 2222 8828</td>
</tr>
<tr>
<td>Sailing boat deck illumination</td>
<td>1 2222 8829</td>
</tr>
<tr>
<td>Sailing boat anchor light</td>
<td>1 2222 8830</td>
</tr>
<tr>
<td>Socket</td>
<td>1 2222 8841</td>
</tr>
<tr>
<td>Blue light</td>
<td>1 2222 8842</td>
</tr>
<tr>
<td>Underwater illumination</td>
<td>1 2222 8870</td>
</tr>
<tr>
<td>Bimini illumination</td>
<td>1 2222 8871</td>
</tr>
<tr>
<td>Step illumination</td>
<td>1 2222 8872</td>
</tr>
<tr>
<td>Stern flap</td>
<td>1 2222 8873</td>
</tr>
<tr>
<td>Main sail</td>
<td>1 2222 8874</td>
</tr>
<tr>
<td>Winch</td>
<td>1 2222 8875</td>
</tr>
<tr>
<td>ON / OFF</td>
<td>1 2222 8877</td>
</tr>
<tr>
<td>Lift</td>
<td>1 2222 8878</td>
</tr>
<tr>
<td>Seat inclination</td>
<td>1 2222 8879</td>
</tr>
<tr>
<td>Seat forwards/backwards</td>
<td>1 2222 8880</td>
</tr>
</tbody>
</table>

Circuit breakers series E-T-A 3131

Snap in single pole on/off circuit breaker, water tight (IP 66) with overload protection
and LED control and nightlight Three position switches without protection (max. 20A)!
Cut-out dimensions: 37 x 21.1mm Width: 24mm.
Rated voltage DC 10-30 V, Rated current 6...20 A. Delivery without actuator.

<table>
<thead>
<tr>
<th>Circuit breaker</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3131-AFIE-00000-3Y2-6A</td>
<td>1 3135 1006</td>
</tr>
<tr>
<td>3131-AFIE-00000-3Y2-10A</td>
<td>1 3135 1010</td>
</tr>
<tr>
<td>3131-AFIE-00000-3Y2-16A</td>
<td>1 3135 1016</td>
</tr>
<tr>
<td>3131-AFIE-00000-3Y2-20A</td>
<td>1 3135 1020</td>
</tr>
</tbody>
</table>

Circuit breaker push button function

<table>
<thead>
<tr>
<th>Circuit breaker</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3131-CFIE-00000-3Y2-10A</td>
<td>1 3135 2010</td>
</tr>
</tbody>
</table>

Three position switch 1-0-2 without protection

<table>
<thead>
<tr>
<th>Circuit breaker</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3131-BF1Q-00000-2Y2-20A</td>
<td>1 3135 3020</td>
</tr>
</tbody>
</table>

Three position push button (1)-0-(2) without protection

<table>
<thead>
<tr>
<th>Circuit breaker</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3131-DF1Q-00000-2Y2-20A</td>
<td>1 3135 4020</td>
</tr>
</tbody>
</table>
The combination of the system monitor PSM with a digital shunt SHC as battery monitor for the main battery including voltage measurement for a starter battery can be the first step for this new system. By fitting additional shunts SHC for further batteries and/or other devices such as tank interfaces or switching interfaces it’s easy to extend the system to your desire. All further connections of PBUS components expand the system monitor PSM to a multifunctional monitor.

For the interconnection of the P-BUS components we use the watertight M12 connection system which is well known for industrial purposes under the name DeviceNet®. This connection system is also used by the NMEA2000® system, but please don’t connect them directly - due to different CAN-Bus systems and power supply you cannot connect the P-BUS and the NMEA2000® system with one backbone. Only by using the NMEA2000®-bridge CBN it’s possible to interconnect them. In order to save valuable energy all connected P-BUS components will be switched to standby mode if all PSM system monitors are in standby mode or switched off.

The PSM system monitor is the central indicating and operating device of the electrical system on board. It enables the monitoring and controlling of all connected philippi PBUS compatible components and further components connected to PBUS - interfaces. The clear structure of the system monitor PSM provides an intuitive and logical operation via the touchscreen.

The PBUS system design allows to connect more than one system monitor side by side to obtain information about tanks, batteries, energy management and AC-power simultaneously. Alternatively several PSM system monitors may be installed on board at different locations to obtain the required information independently of each other.
**SYSTEM MONITOR PSM**

**BATTERY MONITOR**
Apart from the current, voltage and capacity display the battery level is shown graphically. Further information as remaining time and statistics are available on command. If you connect further shunts SHC the system monitor PSM can display all information of e.g. the starter, bow or second service battery.

**TANK MONITOR**
Different kind of liquids are shown in different colours independently from the tank sensor. If the tank level exceeds or falls below a given threshold the respective tank will be displayed in red. The names and locations of the tanks are adjustable individually.

**DIGITAL SWITCHING**
The switching of consumers in a digital CAN bus system enables a comfortable operation from one or more locations on the boat. By using the interface CMR you can dimm Prebit LED-lights without interferences.

**ENERGY MONITOR AC**
The voltage and frequency of the connected sources, the active source and it’s power data will be displayed. There’s a sub menu for gensets and inverters which shows specific information and from where you have operational possibilities.

**MAIN SWITCH MONITOR**
The battery main switches can be switched by keypress. An optional PIN code protects the system against unauthorised use. The deep discharge protection of the batteries can be activated on demand.

**ENERGY MONITOR DC**
The ongoing charge or discharge currents of the sources and loads are displayed in an energy scheme. Alternatively the energy up to now charged or used can be shown (e.g. the harvest of a solar panel per season). There’s a sub menu for chargers which displays their specific data and from where you operate and change the settings.

**P-BUS**

**SHC, EM-box**

**CMT 2**

**CMR 4, E-T-A PowerPlex**

**CAV**

**FBC, TSC, EM-box**

**SHL, ACE, EM-box**

**EM-Box**

**AC-Interface CAV**

**NMEA2000® Bridge**

**Temperature Interface TPC**

**Battery Charger ACE**

**Energy-Shunt SHL 312**
The 3,5 inch coloured touch screen graphic display of the System Monitor PSM informs you about all available data of your electrical system on different pages.

**DAY-, NIGHT- AND POWER-SAVE MODE**

By pressing a button you can switch between day and night mode directly. A long press on the button will bring the PSM into standby mode, where the PSM consumes only 6mA in order to save valuable battery capacity. Each contact on the touchscreen brings the PSM back to operational mode.

**PROTOCOL**

If a micro-SD is inserted, all data of the batteries and energy sources can be recorded and be analysed later on a computer. Even if the PSM is in stand-by mode the data will be recorded each minute. The data are written in CSV format and can be shown easily in a spreadsheet analysis.

**ALARM MESSAGING**

Messages of empty batteries, overvoltage, deep discharge disconnection or of full / empty tanks are recorded on an alarm messaging list. If a new alarm occurs this list will be shown automatically and if desired an acoustical alarm can be activated.

In the main menu you can see which data is available. If an interface or device is connected and delivers data this symbol will be shown coloured.

In the setup menu the approach to the setup menu and the optional activating of the battery main switches is protected by a 4 digit PIN code. This PIN code can be changed by the user.

---

**PSM 2**

Order No. 0 7100 2235

P-BUS System Monitor PSM for displaying and operating the PBUS. Intuitive coloured TFT touch screen graphic display, with adjustable brightness. A M12-T-cable and both P-BUS Terminator resistors are part of delivery.

- **Operation voltage**: 8-60 V
- **Consumption**: 100 mA, Stand-by: 6 mA
- **Dimensions**: L 105 x B 105 x H 35 mm
- **Cut out**: 88 x 88 mm

---

**PIN ENSURED ADJUSTMENTS**

The approach to the setup menu and the optional activating of the battery main switches is protected by a 4 digit PIN code. This PIN code can be changed by the user.

---

**PHILIPPI SYSTEM MONITOR PSM**
The System Monitor PSL is the big brother of the PSM 2 and comes with a 5" full coloured touchscreen. He informs on different pages about all available data of the electrical onboard system. A NMEA2000® bridge enables the circulation of data to the NMEA2000® data network.

The System Monitor PSS serves as a supplement to a PSM or PSL monitor. It has got a 2,4" full coloured touchscreen and shows selected data on different pages. Because the PSS has no opportunity of a device configuration access in the setup menu it can only be used as an additional monitor to a PSM or PSL.

**P-BUS System Monitor PSM for displaying and operating the PBUS.**

5" intuitive full coloured TFT touch screen graphic display, with adjustable brightness.
A M12-T-cable and both P-BUS Terminator resistors are part of delivery.

- **Operation voltage**: 8 - 32 V DC
- **Consumption**: max. 200 mA
- **Dimensions**: W 157,5 x H 105 x D 35 mm
- **Cut out**: W 120 x H 80 mm

**P-BUS System Monitor PSM for displaying and operating single menus.**

2,4" full coloured TFT touch screen graphic display.
A M12-T-cable is part of delivery.

- **Operation voltage**: 8 - 32 V DC
- **Consumption**: max. 200 mA
- **Cut out**: W 87 x H 65 mm

**P-BUS System Monitor PSM for displaying and operating single menus.**

2,4" full coloured TFT touch screen graphic display.
A M12-T-cable is part of delivery.

- **Operation voltage**: 8 - 32 V DC
- **Consumption**: max. 200 mA
- **Cut out**: W 87 x H 65 mm

**If you want to see your P-BUS data not only on the System Monitor PSM, but also on the chart plotter or other NMEA2000® compatible devices you need a NMEA2000® Bridge, which converts the data accordingly.**

Following PGN are supported: PGN 127501, PGN 127505, PGN 127506, PGN 127508, PGN 127744, PGN 127747, PGN 127750.

Please check, which PGN can be displayed actually, because this depends on the manufacturer and software revision. Delivery includes a M12-T-cable.

**Power supply via the NMEA2000® network.**

- **Dimensions**: L 107 x W 85 x H 40 mm

**If you got a Mastervolt lithium battery or a Mastervolt inverter / charger combination you need the CMB bridge in order to display the data on the PSM. Also it’s possible to enter the setup menu for the configuration from the PSM by using the CMB interface.**

**Power supply via the Masterbus® network.**

- **Dimensions**: H 66 x W 78 x D 32 mm
The battery management shunts for P-BUS connection SHC record precisely the current, voltage and capacity of a related battery. In addition a voltage of a starter battery or part-voltage of a 24V system can be supervised. The temperature of the battery can be measured via an optional temperature sensor. The PBUS interface of the shunt enables the measuring even of a galvanically to the on-board system insulated battery system (e.g. an emergency battery for the VHF system or an extra battery system for an electric drive).

The measured data will be displayed via the System Monitor PSM by a battery symbol on the coloured screen.

**CAPACITY OF THE BATTERY**
The height of the bar shows the remaining capacity of the battery. The light blue area shows the usable capacity until the adjustable capacity threshold is reached. The dark blue area shows the theoretically available capacity until the complete discharge of the battery (deep discharge), which should be avoided by all circumstances in order not to damage the battery.

If the Shunt SHC recognises the early achievement of the alarm threshold during the operation so that the nominal battery capacity isn’t available any longer (e.g. from aging) the unavailable part of the battery capacity is shown in the dark grey area.

By pressing on the battery symbol you can change between the display of the remaining amp hours in Ah, %, the remaining time until the adjusted alarm threshold is reached, and the temperature of the battery (if a temperature sensor Temp-BT is installed).

**BATTERY ALARMS**
If an overvoltage occurs, or if the capacity goes below the adjusted threshold, or if the battery is recognized as nearly empty / deep discharged, an alarm message appears on the display.

**ANALYSIS OF THE BATTERY**
At each charge/discharge cycle the collected data will be analysed so you can see the CEF (charge efficiency factor) and the amount of cycles where the previously set minimum cycle depth had been reached. In addition you can see the amount of deep discharges and the average cycle depth. With all this data you can draw conclusions on the health of the battery and it’s aging / wearout.

**BATTERY TEMPERATURE MONITORING**
The temperature of the battery can be monitored by use of an optional temperature sensor.

**MEASURING A SECOND BATTERY VOLTAGE**
Beside the monitoring of the service battery, the voltage of a starter battery can be recorded.
The second battery voltage will be displayed by a separate single coloured battery symbol. If the voltage of this battery falls below the adjusted alarm threshold the battery will be shown in red and an alarm message appears.

**SUPERVISION OF A 24V BATTERY**
For the supervision of a 24V battery bank we recommend the measuring of the 12V part voltage, so you can see if an uneven charging happens. If so this could cause a premature loss of the batteries.
Digital battery management shunt for installation in the negative line between battery and neg. terminal. Power supply via the positive measuring line. Connection bolts M10.

**Current rating**

- 300 A, 600 A 1 min, 1500 A 0,5 s
- 6 mA@12 V, 4 mA@24 V

**Consumption**

- 8-60 V

**Current range**

- 10 mA - 300 A

**Dimensions**

- L 118 x W 40 x H 65 mm

**Temp-BT**

Temperature sensor for battery-management-shunt

**Order No.**

- 0 5 900 3000

---

**SHL 312**

Order No. 0 7100 0312

Digital battery management shunt as SHC 312 but for higher currents / bigger loads. Connection bolts M16. Matching minus bus bar SAS 4

**Current rating**

- 600 A, 800 A 1 min, 2500 A 0,5 s
- 6 mA@12 V, 4 mA@24 V

**Consumption**

- 8-60 V

**Current range**

- 10 mA - 600 A

**Dimensions**

- L 185 x W 44 x H 75 mm

---

**SHL 612**

Order No. 0 7100 0612

**Current rating**

- 300 A, 600 A 1 min, 1500 A 0,5 s
- 6 mA@12 V, 4 mA@24 V

**Consumption**

- 8-60 V

**Current range**

- 10 mA - 300 A

**Dimensions**

- L 118 x W 40 x H 65 mm

---

**SHC 312**

Order No. 0 7100 0312

Digital battery management shunt for installation in the negative line between battery and neg. terminal. Power supply via the positive measuring line. Connection bolts M10.

**Current rating**

- 300 A, 600 A 1 min, 1500 A 0,5 s
- 6 mA@12 V, 4 mA@24 V

**Consumption**

- 8-60 V

**Current range**

- 10 mA - 300 A

**Dimensions**

- L 118 x W 40 x H 65 mm

---

**SHC 612**

Order No. 0 7100 0612

Digital battery management shunt as SHC 312 but for higher currents / bigger loads. Connection bolts M16. Matching minus bus bar SAS 4

**Current rating**

- 600 A, 800 A 1 min, 2500 A 0,5 s
- 6 mA@12 V, 4 mA@24 V

**Consumption**

- 8-60 V

**Current range**

- 10 mA - 600 A

**Dimensions**

- L 185 x W 44 x H 75 mm

---

**P-BUS DIGITAL CURRENT MEASURING SHUNT SHL**

Beside the information of the up-to-date battery bank status, it’s interesting to know more, for instance, which energy sources, like solar panels, wind generators, alternators or hydro generators, are producing the power and which loads are using power. The display of the battery management shunt SHC shows only the difference between charging and discharging current, not the single source or load as the energy shunt SHL.

**DC ENERGY BALANCE**

The PSM has an energy menu where you can see the balance of your DC system. Depending on the configuration of current measuring shunts SHL, or an EM-box (8 shunts), you can analyse the current flow in detail.

The charging sources are displayed in the upper part, and the loads and the battery system in the lower part. So it’s easy to see which sources are supplying energy into the DC system and which loads (consumers) are using this energy.

DC Energy Balance

In this menu all battery banks are shown as one single battery, so you can see if the battery system supplies energy or will be charged.

**RECORDING OF THE ENERGY PRODUCTION**

Would you like to know how many amp hours your solar panels or other regenerative energy sources produce over time?

By touching the energy menu the display switches from the current display to the supplied or used amp hours since the last reset of the counter.
To get the level information of your tank sensors into the P-BUS network you need the interface CMT2. It receives the information of up to four sensors, supplies the sensors and provides this information to the P-BUS. The adjustment of the parameters (like sensor type, tank volume, tank characteristic, alarm level etc.) will be done via the System Monitor PSM.

**TANK-MONITORING**

**MANY TANK SENSORS CONNECTABLE**
You can connect different tank sensors (also mixed) to the tank interface CMT2: matching tank sensors please see page 40:
- Tank sensor 10–180 Ohm (Series TGW / TGT)
- Tank sensor 240–33 Ohm
- Tank sensor 0–300 Ohm (free adjustment)
- Tank sensor 4–20 mA (Pressure sensor TDS)
- Ultrasonic-tank sensor 0,5–2,5 V (UTV)
- Ultrasonic-tank sensor: free adjustment of tank depth (UTV 40/80)
- Tank sensor 0–5V (0–10V with hardware modification)
- Flow sensors DFS
- Tank sensor 0–1 (Switch sensors TRS 130 / RSW)

**DISPLAY OF % OR LITRES (GALLONS FOR USA)**
By touching a tank symbol the display of the PSM switches between percent, no unit and litres / gallons.
Flow sensor DFS: after having filled up the tank the volume can be adjusted by pressing the relating tank symbol for a while.

**CONFIGURATION OF THE DISPLAY**
For each connected tank sensor there is an individual menu in the setup of the PSM for the following adjustments: i.e. name, place, type of sensor, compensation, tank volume, alarm threshold, alarm duration.

**COMPENSATION OF THE TANK GEOMETRY**
If your tank isn’t rectangular, there is a correction / compensation opportunity in order to get the most exact display for each tank.
If the tank is designed very unusual, the values for 0, 25, 50, 75 and 100% can be set in the menu in order to get the optimum display of the measured tank volume.

**INTEGRATION OF A WATER MAKER**
By using 2 Flow Sensors DFS the water level can be calculated by measuring both water consumption and water production (water maker).
The sum will be displayed on the relating tank symbol on the PSM.

**P-BUS TANK INTERFACE CMT2 / AC INTERFACE CAV**

**NEW**

Interface for the P-BUS for the integration / measurement of up to 4 different tank sensors. Connection by plug-in screw terminals. Connection to the P-BUS via a M12-terminal. A M12-T-cable is part of delivery.

- **Operation voltage**: DC 8-30 V
- **Consumption**: Stand by: 7,5 mA @ 13 V
- **Active**: 10 mA @ 13 V
- **Dimensions**: L 107 x W 85 x H 40 mm

**NEW**

**P-BUS AC INTERFACE CAV**

The AC interface CAV provides the AC performance data for the P-BUS:
- AC mains voltage V and AC mains current A
- Used kilowatt-hours kWh since last reset

In combination with an automatic switch over unit LAU (see page 56) there’s the possibility to display also the different AC sources, their voltages and the active source.
The main battery switch FBC is used for the safe and easy switching of the battery plant or for the switching of high current loads (energy management) such as winches, windlass and inverters. The adjustable undervoltage and overvoltage protection protects your batteries from a damaging deep discharge.

If the nominal current load is higher than 260 A (e.g. a bow thruster), it is possible to raise this nominal power up to 500A by the combination of the interface TSC together with the remote main switch FBr 500.

For the P-BUS independant operation we recommend to install a separate control push button also in case of an emergency.

The battery main switch can be operated manually directly at the relay by pressing the red or yellow button.

### PIN Protected Switching

In order to avoid unauthorised operation of the main switches, the activation can be protected by a PIN code. If this protection is activated, you can see it by a small key in the symbol. Each main switch can be named individually so that it’s identification is unique.

### Adjustable Deep Discharge Protection

If you want to protect the connected battery against deep discharge or overvoltage, there’s a menu where you can activate this protection and adjust the relating voltages and delay times. These thresholds and times can be adjusted individually.

### Battery Voltage Display

If the battery voltage at the input of the main switch should be shown in the battery menu, you can activate this in the setup menu of the PSM. Thereby it can be omitted to install a special voltage measuring line.
Switching interface incl. 4 monostable relays (10 A nominal rating). Integrated time base for the system clock.
4 potential free relay outputs with fuseholder for a fuse / circuit breaker
4 operation inputs for direct switching at the interface
4 PWM-outputs for the dimming function (open-collector and 8V voltage signal)
Connection by screw terminals. M12-t-cable included in delivery.

**Operation voltage**

<table>
<thead>
<tr>
<th>Consumption</th>
<th>Operation voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand by all relays off</td>
<td>9 mA @ 13 V</td>
</tr>
<tr>
<td>Active all relays off</td>
<td>13 mA @ 13 V</td>
</tr>
<tr>
<td>Active all relays on</td>
<td>85 mA @ 13 V</td>
</tr>
</tbody>
</table>

**Current rating / relay**

- 10 A

**Dimensions**

- L 115 x W 105 x H 50 mm

The switching interface CMR4 is designed to control 4 different load circuits via the System Monitors PSM-V, PSM2 or PSL. Alternatively following operation functions can be realised:

**ENERGY MANAGEMENT**

If the remaining battery capacity is low, you can switch off dedicated loads. The information for the switching operation will be delivered from a battery management shunt SHC (you can choose between selected capacity levels). You can operate monostable or bi-stable high current solenoids.

**CONTROL OF AN AC GENERATOR**

For the operation of an AC generator with automatic start or start/stop buttons. The information for the switching operation will be delivered from a battery management shunt SHC (adjustment: Generator ON/OFF). This switching information can be given by one or several shunts as well. To avoid the start of the generator (e.g. while the shore power is connected) you have the possibility to connect a control signal. Also a working time can be fixed.

**VISUALISATION OF ALARM MESSAGES**

If an alarm occurs on the PSM display you have the possibility to send this alarm to an external buzzer or an alarm light at another place.

**OPERATION OF PUMPS AT A TANK ALARM**

If a tank gives a level alarm (e.g. empty / full) a pump can be switched for an adjustable time.

The configuration of the switching interface CMR4 will be done via the system monitor, no additional computer will be needed.

**DIMMING FUNCTION FOR LED-LIGHTS**

If the symbol button will be pressed longer, a new menu appears where the brightness of the lamp can be adjusted. Premise is a dimmable LED lamp with a matching control input. For example LED lights from Prebit in the slave version can be connected and be dimmed.

**SWITCHING OF LOADS WITH DIMM FUNCTION**

Via the System Monitor PSM loads can be switched on / off. There’s a big library of graphic symbols to choose from. They can be named additionally.

Also the E-T-A Powerplex-System can be operated by sending switching messages as well as receiving feedback information.

**SWITCHING WITH FEEDBACK**

By pressing the symbol button the load is switched on / off. A small green hook symbol shows that the load circuit is turned on. If the fuse protection at the output is blown, a small red flash symbol appears.
If you want to display important temperature degrees you can install a temperature interface TPC 4. You can connect up to 4 temperature sensors Temp-HT or Temp-BT. Up to four interfaces TPC 4 can be connected to the P-BUS.

In the setup menu you can adjust a threshold for each temperature sensor individually, so the System Monitor PSM gives an alarm if the temperature falls below or rises above the adjusted limit.

Following temperature values are interesting onboard of yachts and vehicles:

**Air temperatures**
(Inside / outside / battery area / engine room / stowage space / refrigerator / ice box)

**Water temperatures**
Engine cooling water sweet and salty / exhaust collector / sea water / water tank / water heater

**Further temperatures**
Alternator / gear box / exhaust / cylinder head / turbocharger / engine block / engine oil

---

**TEMPERATURE-MONITORING**

---

**TPC 4**
Order No.: 0 7100 0104

Interface for 4 temperature sensors
Connection via pluggable screw terminals.
A M12-T-cable is included in delivery.

- **Operation voltage**: DC 8-32 V
- **Consumption**: 8 mA
- **Dimensions (mm)**: L 107 x W 85 x H 40

---

**Temp-HT**
Order No.: 0 5900 3300

Temperature sensor for temperature monitor TPM 5 and temperature interface TPC 4. NTC-sensing element, encapsulated in a plastic housing with PVC-cable 2.8 m.

Application: measuring of temperatures of water and air between –30°C and +70°C.

---

**Temp-BT**
Order No.: 0 5900 3000

Temperature sensor for Temperature Monitor TPM 5 and Temperature Interface TPC 4. NTC-sensing element, encapsulated in a plastic housing with PVC-cable 2.8 m.

Application: measuring of temperatures of water and air between –30°C and +70°C.

---

**TPM 5**
Order No.: 0 8000 1010

Temperature monitor in built-in housing for up to 5 temperatures. Delivery without temperature sensors.

- **Operation voltage**: DC 8-32 V
- **Consumption**: 8 mA
- **Dimensions (mm)**: L 105 x W 105 x T 40
- **Cut out**: 88 x 88 mm
The digital battery monitors BCM with monochrome display stand out due to their very low power consumption and their easy readability even without switched-on illumination.

The monitors are available in following versions:

- Battery Monitor BCM 1 for the measuring of the capacity of one battery group and the voltage reading of two further batteries.
- Battery Monitor BCM 2 for the measuring of the capacity of two battery groups and the voltage reading of two further batteries.
- Battery Monitor BCM G for the measuring of the capacity of one battery group and the voltage reading of two further batteries and additionally operating of a generator.
- Battery Monitor BCM 1-48 V for nominal voltage of 36V or 48V.

- Applicable for all nominal battery voltages (12 V/24 V/36 V/48 V), even if single battery groups have different voltages.
- Well readable energy saving illuminated LCD-display
- Very low power consumption (2,5 mA at 12 V) allows continuous operation
- Possibility of extension of the data line (up to 100 m).
- Reliable data transfer via RS485

If the main battery reaches the configured capacity threshold or one of the further batteries the voltage threshold, an acoustic alarm comes on and an appropriated symbol appears on the display.

**BATTERY MONITOR BCM**

**Indication of charge and discharge current**
The dynamic indicator is matching the measurement range (0,01 A, 14,0 A, 123 A) to the corresponding current.

**Voltage indicator of the additional batteries**
(e.g. starter- or bow - batteries)

**Indication of remaining battery capacity**
The bar level represents the charge level of the battery in %. Alternatively, by pressing a key (mode), the remaining time, until the adjusted alarm threshold will be reached at the momentary discharge current, will be retrieved.

**Easy reading**
All important data is shown on the display. You don’t need to switch between different sub menus.

**Time and mode genset**
The model BCM G can operate a generator in dependence of the battery charge level. For the operation of the generator a time window can be defined.

**Setup**
In the setup the battery capacity and voltage thresholds for the alarm function will be configured as needed. More information can be retrieved from the battery. Measuring configurations and values are saved even if the power supply will be turned off.
Each charging/discharging cycle of the battery will be monitored and the available data analyzed. Based on these data informations the CEF (Charging efficiency factor) and the number of cycles, where the min. cycle-depth has been reached can be obtained. Furthermore the number of deep discharges and the average discharge depth will be recorded. This information is very useful to get conclusions of your battery use and the lifespan of your batteries.
The battery monitor BCM 1 can supervise the capacity of a service battery and the voltage of two further batteries (starter). The BCM 1 is available as built-in unit or with built-on housing. For supervision of 2 battery groups the type BCM 2 has to be used. The electrical connection is by plug-in screw terminals. For the BCM 2 you need a shunt SHA xxx and a second shunt SHA xxx-A2.

**IMPORTANT !**

For the measuring of the currents of a battery group a shunt SHA 300 or SHA 610 is required. For the battery monitor BCM 2 you need a shunt SHA 300 or SHA 610 and additionally for the second group of batteries a shunt SHA 300-A2 or SHA 610-A2.

**BATTERY MONITOR FOR GENERATOR OPERATION BCM-G**

The battery monitor BCM G 12V or 24V can be used to start a generator automatically, if the capacity level of a battery bank falls below an adjustable threshold.

The generator will be operated via integrated potential free contacts. The relay activation /deactivation thresholds are adjustable in the setup menu. Even when the battery is recognised empty before the set threshold is reached, the generator will be started.

Due to the built-in clock the operation time of the generator can be defined. This avoids e.g. an unwanted starting of the generator at night. In addition there is a control inlet for the start en-/disabling of the generator for instance to avoid starting while shore power is available. Both generators with automatic start (switching function ON/OFF) as well as generators with start / stop automatic (turn on pulse for start and stop) can be triggered.

Both potential free relay contacts are fused on the rear side of the monitor by plugable blade fuses.
Battery monitor with 2 internal potential free contacts to activate a mono- or bistable relay. Ready to use connection cable to the active shunt SHA included, length 5 m. Longer cables available on demand.

**Dimensions**
W 105 x H 105 x D 70 mm
Cut out 88 x 88 mm

**Recommended bistable high current relay**
- **260 A**
  - **Order No.:** 0 8302 265
- **500 A**
  - **Order No.:** 0 8302 500
- **24 V**
  - **Order No.:** 0 8302 245

**Recommended monostable relay**
- **70 A**
  - **Order No.:** 0 8000 7012
- **12V**
  - **Order No.:** 0 8000 7024

**Active shunt SHA**

- **SHA 300**
  - **Order No.:** 0 7000 0300
- **SHA 300-A2**
  - **Order No.:** 0 7000 0302

Active shunt for up to 300A nominal current. Suitable for loads / charging sources of max. 3600W (12V) or 7200W (24V). The shunt SHA 300 is for installation in the negative line between battery and negative terminal.

**Rated current**
- 300 A
- 600 A 1 min, 1500 A 0.5 s

**Rated voltage**
- 12 V, 24 V, 36 V, 48 V

**Consumption**
- 6 mA/12 V, 4 mA/24 V

**Operation voltage**
- 8–60 V

**Current range**
- 10 mA - 300 A

**Dimensions**
- L 118 x W 40 x H 65 mm

**Cable connection**
- M 10

**SHA Kabel 10 m**
- **Order No.:** 0 7000 1099

**SHA 2 Kabel 10 m**
- **Order No.:** 0 7000 1092

Longer ready made cable (BCM2: cable set) for the connection between shunt and monitor, if the 5m cable isn’t long enough. Will be delivered instead of the 5m cable (set). Other lengths are available.

**SHA Kabel 10 m**
- **Order No.:** 0 7000 1099

**SHA 2 Kabel 10 m**
- **Order No.:** 0 7000 1092

**Temp-BT**
- **Order No.:** 0 5900 3000

Battery temperature sensor for battery monitor BCM - BH.

More information please see page 33.

**Fuse holder for blade fuse to protect voltage measurement lines e.g. of the BCM. Blade fuse (1A). included. Flat terminals 6,3mm.**
- **ASH 1-1A**
  - **Order No.:** 6 0030 3411
Today the AC-system on board is getting more and more important. Even under way without available shore power the use of generators and inverters are more common to get the benefits of AC-power: charging of the batteries, air condition, espresso machine, refrigerator, freezer or computers and entertainment are mostly driven by 230V devices.

Meanwhile the AC-onboard system is switched automatically to the active power source or even reinforced by an inverter. Even then you should get a general idea what’s going on with the active AC-system.

The AC-monitor ACM gives a global overview over all parameters of the AC-system on board. The transducer ACW 3 measures all values and transmits all information about voltage, current, frequency and consumption (kWh) to the AC monitor ACM via a RS485 interface.

You can connect the ACW to one-, two- or three-phase supplies (stern- or triangle) as well.

On the illuminated display you get following information:
- an exact overview over the active AC-system: voltage, current, frequency
- the active power source (generator, shore 1, 2 or inverter)
- consumption in kWh with the possibility of a reset
- adjustable alarm-functions for low/ high voltage or high current

**AC-Monitor**

Display of the voltage, current, frequency & consumption of the active AC-system.

Display of the active power source
To display the active source a relay per source has to be connected.

Setup menu
In the setup menu all the values as amount of phases, alarms, symbols of the power sources etc. are configurable.

Reset - button
for the reset of the recorded consumption (kWh)

**Housing ACW**
Order No.: 0 1990 0011
Dimensions ACW (4 TE) L 200 x W 120 x H 110 mm
Dimensions ACW+3 (6 TE) L 200 x W 195 x H 110 mm

**Relais 4031-230V**
Order No.: 0 1990 0009

**Relais base 4031**
Order No.: 0 1990 0015

**AC-monitor for supervision of the AC-system. Built-in device. Connection cable to the transducer ACW included, length 5m.**

Transducer ACW has to be ordered separately.

**Order No.: 0 7000 2330**

**Dimensions** W 105 x H 105 x D 40 mm
**Cut out** 88 x 88 mm
The well readable digital Tank Monitor TCM 4V shows a clear overview of the filling level of up to four tanks, e.g. water, fuel and waste water tanks. Instead of 1 - 4 tanks it can supervise and display 1 - 3 tanks together with 2 battery voltages. Nearly all existing sensors can be connected - even mixed- at each tank monitor TCM 4V. Maybe a hardware modification is needed.

**CONFIGURATION OF THE DISPLAY**
For each connected tank sensor there is an individual menu in the setup of the TCM 4V for the following adjustments: sensor type, compensation, tank volume and alarm threshold.

**DISPLAY OF LITRES (OR GALLONS) OR %**
The volume of each tank will be safed in the setup, so that the filling level can be calculated and displayed in litres (resp. gallons). Alternatively the level can be shown in % value or only as level bar. Please keep in mind that because of the limited resolution of the sensors, the shown liters / level will never be exact (exc.: flow sensor DFS).

**COMPENSATION OF THE TANK GEOMETRY**
If your tank isn’t rectangular, there is a correction / compensation opportunity in order to get the most exact display for each display. If the tank is designed very unusual, the values for 0, 25, 50, 75 and 100% can be set in the menu in order to get the optimum display of the measured tank volume.

**POWER SAVE MODE**
An interval measurement procedure reduces the energy consumption of the system to a minimum. If the power supply voltage drops under 11,5 V / 23 V the power save mode will be activated automatically. If activated, the measurement frequency will be reduced in order to save valuable energy.

**BATTERY AND TANK SUPERVISION**
Each tank has an adjustable alarm threshold so that the tank monitor supervises all tanks and activates the alarm if a tank level is coming out of a limit. The acoustical alarm (duration is 1 min.) can be acknowledged. Also the battery voltages are supervised and an alarm occurs if one voltage level is coming out of the limit (over- & undervoltage protection). The relating tank / battery is blinking.

---

### MANY TANK SENSORS CONNECTABLE
You can connect different tank sensors: please see page 40:
- Tank sensor 10 – 180 Ohm (Series tGW / tGT)
- Tank sensor 240 – 33 Ohm
- Tank sensor 0 – 300 Ohm (free adjustment)
- Tank sensor 4 – 20 mA (Pressure sensor TDS)
- Ultrasonic-tank sensor 0,5 – 2,5 V (UTV)
- Ultrasonic-tank sensor: free adjustment of tank depth (UTV 40/80)
- Tank sensor 0 – 5 V (0 –10V with hardware modification)
- Flow sensors DFS
- Tank sensor 0 – 1 (Switch sensors TRS 130 / RSW)

---

### TANK MONITOR TCM

**TANK SENSORS SERIES TGT/TGW (RESISTANCE SIGNAL)**
Can be connected directly to the monitor, this kind of sensor is the factory setting of the tank monitor.

**PRESSURE SENSOR TDS (HARDWARE MODIFICATION)**
Active tank sensor with current output 4 – 20 mA as well as other sensors with an output of 0-10V need a factory hardware modification.

**ULTRASONIC SENSORS SERIES UTV**
For tank depths of up to 40 cm the ultrasonic sensor UTV 40 is the correct choice, for tank depths between 41 and 80 cm the UTV 80. In the setup menu you have the possibility to adjust the tank depth. Also if you’re installing a distance ring UTS (to eliminate the dead zone of the sensor) you can change the setup to get the best calculation and display of your tank level.

**FLOW SENSOR DFS**
If you’re using a flow sensor DFS the accuracy of the display is litre precise. After having filled up the tank you have to tell the tank monitor the up to date filling level by pressing the relating button for a while - then you get into the volume menu to adjust the displayed amount.

**INTEGRATION OF A WATERSHAKER**
By using 2 flow sensors DFS you can measure the water consumption as well as the water production and the tank monitor calculates and displays the addition. If you’re using this function, the tank monitor display is reduced to 3 tanks instead of 4 tanks.

All sensors as ultrasonic sensors UTV, sensors series TGW/TGT and flow sensors DFS have to be ordered separately!
To monitor the fluid levels of all tanks on board the high resolution sensor series TGT/TGW are the first choice. The tank sensors are constructed for vertical installation in water and fuel tanks.

Thanks to its flange mounting it is easy to unscrew and take out the tank sensor at any time for inspection purposes.

- The sensors have reed contacts each 16 mm giving a very high resolution over the entire field instead of common simple systems with few contacts only.
- The advantage over the normal sensors with a lever is the space saving and reliable construction
- The electronic is galvanically insulated from the housing. This is important to avoid galvanic corrosion.

### Tank sensor for gasoline/fuel

<table>
<thead>
<tr>
<th>Type</th>
<th>Numbers of switch cont.</th>
<th>Required min. tank depth</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TGT 200</td>
<td>7</td>
<td>185 mm</td>
<td>6 6011 7080</td>
</tr>
<tr>
<td>TGT 250</td>
<td>10</td>
<td>235 mm</td>
<td>6 6011 7081</td>
</tr>
<tr>
<td>TGT 300</td>
<td>13</td>
<td>285 mm</td>
<td>6 6011 7082</td>
</tr>
<tr>
<td>TGT 350</td>
<td>16</td>
<td>335 mm</td>
<td>6 6011 7083</td>
</tr>
<tr>
<td>TGT 400</td>
<td>19</td>
<td>385 mm</td>
<td>6 6011 7084</td>
</tr>
<tr>
<td>TGT 450</td>
<td>23</td>
<td>435 mm</td>
<td>6 6011 7103</td>
</tr>
<tr>
<td>TGT 500</td>
<td>26</td>
<td>485 mm</td>
<td>6 6011 7085</td>
</tr>
<tr>
<td>TGT 600</td>
<td>32</td>
<td>585 mm</td>
<td>6 6011 7086</td>
</tr>
<tr>
<td>TGT 700</td>
<td>38</td>
<td>685 mm</td>
<td>6 6011 7087</td>
</tr>
<tr>
<td>TGT 800</td>
<td>44</td>
<td>785 mm</td>
<td>6 6011 7088</td>
</tr>
<tr>
<td>TGT 900</td>
<td>50</td>
<td>885 mm</td>
<td>6 6011 7089</td>
</tr>
</tbody>
</table>

Flange and gasket are included in delivery!

### Tank sensor for water

<table>
<thead>
<tr>
<th>Type</th>
<th>Numbers of switch cont.</th>
<th>Required min. tank depth</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TGW 200</td>
<td>7</td>
<td>185 mm</td>
<td>6 6011 7091</td>
</tr>
<tr>
<td>TGW 250</td>
<td>10</td>
<td>235 mm</td>
<td>6 6011 7092</td>
</tr>
<tr>
<td>TGW 300</td>
<td>13</td>
<td>285 mm</td>
<td>6 6011 7093</td>
</tr>
<tr>
<td>TGW 350</td>
<td>16</td>
<td>335 mm</td>
<td>6 6011 7094</td>
</tr>
<tr>
<td>TGW 400</td>
<td>19</td>
<td>385 mm</td>
<td>6 6011 7095</td>
</tr>
<tr>
<td>TGW 450</td>
<td>23</td>
<td>435 mm</td>
<td>6 6011 7104</td>
</tr>
<tr>
<td>TGW 500</td>
<td>26</td>
<td>485 mm</td>
<td>6 6011 7096</td>
</tr>
<tr>
<td>TGW 600</td>
<td>32</td>
<td>585 mm</td>
<td>6 6011 7097</td>
</tr>
<tr>
<td>TGW 700</td>
<td>38</td>
<td>685 mm</td>
<td>6 6011 7098</td>
</tr>
<tr>
<td>TGW 800</td>
<td>44</td>
<td>785 mm</td>
<td>6 6011 7099</td>
</tr>
</tbody>
</table>

Flange and gasket are included in delivery!

**Technical data TGT/TGW**

- **Resolution**: 16 mm
- **Resistance Range**: 5-180 ohm
- **Connection cable**: 2x 0.34 qmm, length 10 cm
- **Installation**: vertical, ± 20°
- **Temperature**: 10...70 °C
- **Pressure**: max. 1 bar
- **Protection**: IP 65
Pressure sensor TDS for the most precise and reliable tank level measuring!
The pressure sensor TDS will be submerged to the bottom of the tank. The current tank level is being measured via the hydrostatic pressure of the liquid. The PUR connection cable of the sensor contains a thin air hose for the pressure compensation of the measuring unit. Thereby barometric variations can be compensated automatically and don’t result in falsification of the measured values. This sensor is suitable for diesel, water, grey & waste water tanks, but not for petrol, kerosine, petroleum (EEx-zone). Very precise and reliable measurement at a very high solution (under 1 cm), also at swell.

In scope of delivery there’s a mounting flange (Ø 79 mm) with different screw hold circles (matching TGT and SAE) and PG-fitting and if needed we can deliver a guide tube for the mechanical guidance.

As monitor for the pressure sensor TDS you can use our tank monitor TCM 4V or the system monitor PSM (through the tank interface CMT 2). Analog gauges cannot be used. Attention: the TCM4V needs a hardware modification „4 - 20 mA“!

<table>
<thead>
<tr>
<th>TDS 200</th>
<th>Order No.: 6 6026 1206</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>0 - 200 mbar (correlates to 1-200 cm)</td>
</tr>
<tr>
<td>Output</td>
<td>DC 4 – 20 mA, 2-line-principle</td>
</tr>
<tr>
<td>Voltage range</td>
<td>10 – 30 V DC over measuring cable and pre-resistor</td>
</tr>
<tr>
<td>Temperature range</td>
<td>+5 – 40 °C</td>
</tr>
<tr>
<td>Sensor housing</td>
<td>Stainless steel 1.4404 (316 L, V4A), L 97 mm, Ø 22 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>0.2 kg, without cable</td>
</tr>
<tr>
<td>Submerging cable</td>
<td>PUR black, length 6 m, oil-resistant</td>
</tr>
</tbody>
</table>

Gobiuss Tank Measuring

That’s the solution without drilling a hole in the tank!
The filling level is determined by 3 acoustic sensors, which are placed at the outside wall of the tank. Each sensor recognises in an acoustical way if there’s liquid behind the tank wall. The filling level will be shown in 4 steps: 0%, 33%, 66% and 100%
The installation is easy: the 3 tank sensors will be fixed sideways to the tank with a special tape. Thereby no hole has to be drilled and also the sensors can’t get dirty - they’re not in touch with the liquid.

There are two types of sensors:
the model „Gobiuss 4 Waste“ is made especially for waste water tanks, the model „Gobiuss 4“ is designed for water and fuel.
Suits all tank materials:
- Steel / Stainless steel Wall thickness 1-3 mm
- Aluminium Wall thickness 2-5 mm
- Plastic (Polyethylene) Wall thickness 2-10 mm
- Glass fibre Wall thickness 4-8 mm

The filling level will be shown on a small panel with 4 control LEDs. Parallel the level can be shown on analog gauges as well (10 - 180 Ω or 240 - 33 Ω).

Flow sensor for fresh water. Flow measurement quantity 1-25 l/min. Flange for water hose 10 - 12 mm, cable length 20 cm.

<table>
<thead>
<tr>
<th>DFS 24</th>
<th>Order No.: 7 0003 0324</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>L 110 x W 23 x H 57 mm</td>
</tr>
</tbody>
</table>

Flow sensor for fresh water. Flow measurement quantity 1-25 l/min. Flange for water hose 10 - 12 mm, cable length 20 cm.

<table>
<thead>
<tr>
<th>DFS 24</th>
<th>Order No.: 7 0003 0324</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>L 110 x W 23 x H 57 mm</td>
</tr>
</tbody>
</table>

Adapter flange for hose 1/2”, 1pc.
The contactless measurement of liquid level in tanks using ultrasonic technology does not require mobile parts any more to be gotten dirty or damaged. Due to this fact they’re suitable especially for the measuring inside a waste water tank.

**SYSTEM CAUSED LIMITATIONS:**
The „off“ zone 5 cm directly underneath the sensor cannot be measured and the display shows possibly wrong values. The distance ring UTS serves as compensation for this zone.

While a boat is under way, the heeling and swell makes a measurement impossible. By using a focus tube UFT the measurement will be improved. It protects the sensor from dirt and stain and improves the measurement if there’s a froth on the liquid surface. Another positive effect is the acoustic decoupling at metal tanks, where a feedback could disturb the measurement.

**SUMMARY:**
- we recommend ultrasonic sensors only for waste water tanks, especially in connection with a focus tube UFT.
- for fuel and water tanks they’re not really recommended because of the off zone (5 cm underneath the sensor) if the tank is full or nearly full.
- While the boat / vehicle is under way you don’t get a reliable measurement.

**Technical data UTV**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>10 – 30 V</td>
</tr>
<tr>
<td>Consumption</td>
<td>50 mA</td>
</tr>
<tr>
<td>Output signal</td>
<td>0,5 V - 2,5 V</td>
</tr>
<tr>
<td>Switch-on time</td>
<td>5 s (1. measurement)</td>
</tr>
<tr>
<td>Averaging time</td>
<td>50 s</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40°C to +85°C</td>
</tr>
</tbody>
</table>

**Focus tube**
- UFT 40 400 mm 7 0219 9400
- UFT 80 800 mm 7 0219 9800
  - Incl. in delivery is a gasket
  - Built-on height 6 mm.

**Distance ring**
- UTS 25 25 mm 7 0219 9025
  - Incl. in delivery are a gasket and 5 screws

**UTV**
- UTV 20 200 mm 7 0219 3520
- UTV 25 250 mm 7 0219 3525
- UTV 30 300 mm 7 0219 3530
- UTV 35 350 mm 7 0219 3535
- UTV 40 400 mm 7 0219 3540
- UTV 45 450 mm 7 0219 3545
- UTV 50 500 mm 7 0219 3550
- UTV 60 600 mm 7 0219 3560
- UTV 70 700 mm 7 0219 3570
- UTV 80 800 mm 7 0219 3580

**Waste UTW**
- No. 2 0778 2041
  - Analogue gauge matching the ultrasonic sensor UTV.
  - Operation at 12 V and 24 V DC.

**RSW**
- Order No. 0 8930 0008
  - Float lever for installation on the side of tanks for sensoring of the level. Depending on the installation position the switch opens or closes if the inside level rises or falls. Housing - material Polyamid black suitable for oil or diesel. Max. switching current: 0,5 A. Installation from inside to outside.

**DSW**
- Order No. 0 8930 0019
  - Same function as float lever RSW. The DSW can be installed from outside without installing a counternut from inside. The installation is easy, because the DSW has a gasket ring which can be tightened from outside. Mounting hole: ø 22 - 24 mm. Gasket 12 mm wide for wall thickness of max. 5 mm. Only able to take small filling pressure. Max. switching current: 0,5 A. Installation from outside!
Automatic charger for small plants of up to 2 battery groups (service-starter and battery) and capacities of up to 150 Ah. The compact dimensions and plug connectors facilitate the rapid installation.

Noise free convection cooling. An optional temperature sensor can be connected to both versions. Proven devices since a long time!

### AUTOMATIC CHARGER AL

#### Type

<table>
<thead>
<tr>
<th>Type</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>0 4212 1512</td>
<td>0 4224 0822</td>
</tr>
</tbody>
</table>

#### Charge current

<table>
<thead>
<tr>
<th>Current</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 A</td>
<td>8 A</td>
<td></td>
</tr>
</tbody>
</table>

#### Rated voltage

<table>
<thead>
<tr>
<th>Voltage</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 V</td>
<td>24 V</td>
<td></td>
</tr>
</tbody>
</table>

#### Number of outlets

<table>
<thead>
<tr>
<th>Outlets</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

#### Recom. battery capacity

<table>
<thead>
<tr>
<th>Capacity</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 - 150 Ah</td>
<td></td>
<td>20 - 80 Ah</td>
</tr>
</tbody>
</table>

#### Charging curves

- iUoUoU, 2nd output adjustable
- Gel/AGM: 14,4V/13,8V/13,2V
- Open-lead-battery: 14,2V/13,5V/13,2V

#### Charging voltage

- Gel/AGM: 14,4V/13,8V/13,2V
- Open-lead-battery: 14,2V/13,5V/13,2V

#### Optional connection

- FAL, Temp-AL

#### Input voltage range

<table>
<thead>
<tr>
<th>Voltage</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 - 264 V / 50-60 Hz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Load consumption on 230V

<table>
<thead>
<tr>
<th>Consumption</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Short circuit protection

- Convection cooling

#### Cooling

- Return current: < 2 mA
- Temperature range: -15°C - 50 °C, power will be derated from 40 °C

#### Protection

<table>
<thead>
<tr>
<th>Protection</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP 20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Weight

<table>
<thead>
<tr>
<th>Weight</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2 kg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>AL 12/15</th>
<th>AL 24/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>W 250 x D 142 x H 84 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### LED remote control panel

- Order No. 0 4900 2002
- LED remote control panel for monitoring the operational condition of the charger (charging/full) Connecting cable length 5m
- Dimensions W 105 x H 52,5 x D 40 mm

#### Ready made cables

- Order No. 0 4922 0015
- KS 2-15
- Ready made cables for battery charger, length 2 m.

#### Temperature sensor

- Order No. 0 5900 3001
- Temp-AL
- Temperature sensor to measure the battery’s temperature. Cable length 2,8m. Cable can be lengthened to any length you need.

#### Convection cooling

- No noise - no fan is needed due to convection cooling.

#### Pluggable connections

- for battery, temperature sensor and display connection facilitate the installation of all lines even at close / cramped installation places.
The charger AL 12/15 Fi was designed especially for small installations. It is based on the technique of automatic charger series AL combined with a shore power connection unit. This reduces the installation procedure, as only this device and a shore power connector is needed to get a safe AC system with an AC socket and proper charger on board. The RCBO device and the socket are at the front side. Another AC connection possibility at the rear side provides a the safe connection of further AC loads 230 V/50 Hz.

Why investigate into a high-quality charger technology?

When a battery will be discharged and not immediately re-charged again, the plates begin to sulphate. If the battery won’t be correctly charged the sulphating becomes sulphate crystals what results in a reduced battery capacity and also reduced life span of the battery. In case of a very strong sulphating great parts of the electrodes can be permanently damaged. This means, the capacity goes down and also the voltage is lower. In case of a deep discharge the battery got damaged irrevocable. The sulphating process will be egalised by a well controlled charging process with a 4 step charging characteristic.

### AL 12/15 Fi

- **Order-No.**: 0 4312 1512

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge current</td>
<td>15 A</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>12 V</td>
</tr>
<tr>
<td>Charging characteristic</td>
<td>IUnUoU-characteristic, Gel: 14,4V/13,8V/13,2V Open lead battery 14,2V/13,5V/13,2V</td>
</tr>
<tr>
<td>Number of outlets</td>
<td>2</td>
</tr>
<tr>
<td>Recom. battery capacity</td>
<td>50 - 150 Ah</td>
</tr>
<tr>
<td>Terminals for</td>
<td>FAL, LCM, Temp-AL</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>180 - 264 V</td>
</tr>
<tr>
<td>Frequency</td>
<td>50-60 Hz</td>
</tr>
<tr>
<td>Load consumption on 230V</td>
<td>1 A</td>
</tr>
<tr>
<td>Weight</td>
<td>3 kg</td>
</tr>
<tr>
<td>Dimensions</td>
<td>W 250 x H 174 x D 190 mm</td>
</tr>
<tr>
<td>Cooling</td>
<td>Convection cooling without fan</td>
</tr>
<tr>
<td>Return current</td>
<td>&lt; 2 mA</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-15°C - 50 °C, power derating from 40°C</td>
</tr>
<tr>
<td>Protection</td>
<td>IP 20</td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>yes</td>
</tr>
</tbody>
</table>
The new charger series ACE is the start of a completely new designed charger range. The new models represent up-to-date switch mode technology in terms of efficiency and system effectiveness. Thereby the self-heating and the need of cooling has been minimized. All chargers up to an output current of 40 A at 12 V and 20 A at 24 V have no fan built in and so without noise! This fact provides a great advantage in comfort especially at night when you want to sleep. Another advantage thereby is the opportunity of full charging current until an environment temperature of 55°C. So you get even in the Mediterranean area the complete power you need. The chargers are optimised for wall mounting regarding humidity protection and cooling, which is the preferred mounting position on board. All connections are pluggable and easy to fit even in difficult accessible places.

**World wide operational due to input voltage range AC 110-230 V and also in connection with AC generators**

Even when the available AC source has a reduced voltage the charger works with full power due to the most up-to-date design of the switch mode electronic. So you are able to charge your batteries with the same power even at piers with very long feed cables or while using the onboard generator. The built-in power factor-correction provides an optimal utilisation of the input energy. Therefore you got a low power consumption from the AC shore power and nevertheless a high output power for your batteries. The integrated soft start electronic avoids high peak input currents, which would end in a switch-off of the pier AC-source protection. If there’s a very weak AC source you can reduce the input power by programming the charger via the digital charge monitor CLM or the system monitor PSM.

**Simultaneous charging of the batteries and power supply of the connected loads**

If the charger is connected to an AC-source, all connected loads will be supplied by the charger and at the same time the batteries will be charged with the available part of the charging current.

**Connection cooling**

The models ACE 12/25, 12/40 and 24/20 are working without a fan and so without any annoying fan noise. The medium-power models ACE 12/60 and 24/30 have a fan which works only if really necessary. Via the remote control a silent mode can be activated (than the device works with reduced power for 8h timer controlled, so no fan will be needed).

**Charging of several battery banks**

The automatic charger ACE all have 3 separate charging outlets and have thereby the opportunity to charge e.g. a starter-, a house- and a bow-thruster-battery at the same time. Or you can charge different battery banks as 2 starter- and one house-battery. The available charge current will be split, so that every battery gets the current it needs.

**Intuitive touch screen for control and individual setup of different battery systems**

The charger models ACE 12/60 and ACE 24/30 have an integrated touch screen monitor for the easy control of each function. You can read the charging current, the individual charging voltages, the AC - input voltage and more. Also you can easily activate a silent mode and a power reduction for weak AC sources via push buttons. The charging curves can be chosen by internal DIP switches, via the remote charging control CLM, the system monitor PSM or by the integrated touch screen. You have the choice of 7 different curves. In addition there’s a free adjustable curve, a winter storage mode as well as a power supply mode. Also you can activate a refresh function for the extension of the battery’s lifetime.

**Pluggable connections / add-ons**

At the device all connections for the AC-power supply, the temperature sensor and the charging outlets are pluggable for the ease of installation and maintenance. You can plug in different interface modules (touchscreen monitor, P-Bus, CLM). A shore power cable, temperature sensor and DC-connector are included.
**REMOTE CONTROL CLM**

The digital Remote Control CLM informs about the operational status of the charger ACE and enables the setup adjustments of all parameters. In the main menu you can see the actual current, the charging voltage, the current charging phase, the battery temperature and the AC mains voltage. You can activate a current limit as well as the Silent Mode via the remote control.

**LED-remote control panel incl.**
- Interface printed board for inserting into the ACE. Incl. 5 m connection cable.
- **Dim.** W 105 x H 52,5 x D 40 mm

**F-Ace**
- **Order-No.:** 0 8000 4002

**ACE-TFT**
- **Order-No.:** 0 8000 4971
- Touchscreen module with P-BUS interface for retrofitting of models ACE 12/40 and ACE 24/20.
- Delivery incl. ACE-Cable.

**ACE-PBUS**
- **Order-No.:** 0 8000 4970
- Interface module P-BUS for inserting into the charger ACE 12/25, ACE 12/40 and ACE 24/20.
- Delivery incl. M12 T-cable

**ACE-T-Kabel**
- **Order-No.:** 5 0411 1161
- M12-cable for P-BUS connection, length 0,2 m.
  - Only for the retrofitting of models ACE 12/60 + 80 and ACE 24/30 - 100

**2,4" TFT-Touch-remote control Panel for the charger series ACE.**
- Interface printed board for inserting into the charger and a 5m connection cable to the monitor is included. Version CLM-i without Interface board for ACE 12/60 and 24/30.
- **Dimensions** W 105 x H 75 x D 40 mm
Automatic battery charger for medium and large arrangements of up to 3 groups of batteries (starter, house and bow battery) and capacities of up to 1000 Ah.

The large models of the ACE series are also also equipped with the latest state-of-the-art switching power supply technology and deliver full charging power up to an ambient temperature of 50°C. This means that the full performance is also available in the mediterranean environment. Automatic detection of the AC input voltage, combined with the wide AC input voltage range of 90 - 265 V / 47 - 65 Hz, ensures that the device can be used worldwide without sacrificing performance. So full charging power is always supplied regardless of the AC current source or genset.

The lightweight, rugged aluminum casing can be installed quickly and safely using the external wall bracket. The electrical connection compartment is covered by a front-side flap and allows safe and secured installation.

The smart color synoptic for charger status informs about charger status, an optionally a 2.4 ” color touch-screen control panel can be integrated. The cooling of the device is made by an automatic controlled fan.

A 5-stage charging profile for fast and complete charging for all battery types: flooded, Lead-sealed, Calcium-Lead, AGM, Gel, Lithium, user-defined profile, power supply mode. The included temperature probe adjusts charging profile to the battery temperature.

A PSM monitor for remote control of the charger can be connected to the integrated P-BUS (ACE T-cable required).

<table>
<thead>
<tr>
<th>Type</th>
<th>ACE 12/80</th>
<th>ACE 24/45</th>
<th>ACE 24/60</th>
<th>ACE 24/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order-No.:</td>
<td>0 4512 8013</td>
<td>0 4524 4523</td>
<td>0 4524 6023</td>
<td>0 4525 0023</td>
</tr>
<tr>
<td>Nominal current</td>
<td>80 A</td>
<td>45 A</td>
<td>60 A</td>
<td>100 A</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>12 V</td>
<td>24 V</td>
<td>24 V</td>
<td>24 V</td>
</tr>
<tr>
<td>Recom. battery bank</td>
<td>400-800 Ah</td>
<td>200-450 Ah</td>
<td>250-600 Ah</td>
<td>400-1000 Ah</td>
</tr>
<tr>
<td>Input Voltage / Frequency</td>
<td>90 - 265 VAC (47 - 65 Hz)</td>
<td>single-phase automatic, efficiency 87% typical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. consumption 230/115 VAC</td>
<td>6,0 - 12,0 A</td>
<td>6,8 A/13,6 A</td>
<td>9,0 A/18,1 A</td>
<td>15,1 A / 30,2 A</td>
</tr>
<tr>
<td>Number of battery banks</td>
<td>3</td>
<td>(each bank can be used individually and deliver the rated current)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection on threaded rods</td>
<td>M8</td>
<td>M6</td>
<td>M6</td>
<td>M8</td>
</tr>
<tr>
<td>Dimensions (L x H x D)</td>
<td>270 x 360 x 130 mm</td>
<td>270 x 360 x 130 mm</td>
<td>270 x 360 x 130 mm</td>
<td>270 x 410 x 130 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>6,2 kg</td>
<td>5,2 kg</td>
<td>5,2 kg</td>
<td>7,5 kg</td>
</tr>
<tr>
<td>Charging profile</td>
<td>IU or IuO through internal dip switches (Boost, Absorption and Floating – factory setting). Selectable automatic refresh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery type</td>
<td>Lead-sealed as factory setting - Wet, Gel, AGM, Calcium Lead, LiFePO4, DC power-supply mode, custom characteristic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boost / Floating voltage</td>
<td>14,4 V / 13,8 V DC</td>
<td>28,8 V / 27,6 V DC as factory setting for Lead-sealed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling</td>
<td>Electric fan controlled in temperature and current &lt; 50 dBA at 1m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>Rated charge from -20°C to +50°C, derating above 50°C. Automatic switch off above 60°C; automatic restart</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>From -20°C to +70°C, relative humidity up to 96% without condensation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casing</td>
<td>Painted aluminium, protection factor IP23, fixing screw (wall) 4 x M6 round screws, mounting kit + securing screws</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protections against</td>
<td>leaking input surge by VDR - Not covered by warranty / output polarity reversal by fuse rupture / short-circuit and surge / abnormal overheating by cutting off the charger</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- KS 2-30 (up to 30 A) | Order-No.: 0 4922 0030 |
- KS 2-40 (up to 40 A) | Order-No.: 0 4922 0045 |
- KS 2-60 (up to 60 A) | Order-No.: 0 4922 0060 |

Ready made cables for battery charger, length 2 m.

**NEW**

2.4” TFT-Touch Screen Monitor for display of all operational parameters. For retrofitting at the front of the chargers ACE 12/80 and 24/45 - 100.
The sine wave inverter-charger combination of the series Xtender is a result of development for many years. The new smart boost function permits the support of external selectable sources, i.e. the inverter can switch an existing electric net or a genset, in order to enable e.g. the start of air conditioning systems with weak shore power connection or gensets. In order to increase the available power delivering, the Xtender series can also be combined with already existing inverters.

A pure sine wave voltage, an extraordinary overload and a very high efficiency enables the safe start up of motors with a high inrush current.

INVERTER / CHARGERS

Connected to shore power it will automatically charge batteries with a PFC regulated stage and in addition deliver 230 V for AC supplied devices. The power-sharing function allows an automatic reduction of the charging current to the load limit of the AC source.

The smart boost function
This function increases the performance of another AC power source, such as a genset or the shore power, even if specific consumers (inductive, asymmetric, with a high inrush current, etc.) are connected. You can also combine the Xtender with almost all existing inverters to increase the available power.

Increasing the output power
Several Xtender can be connected in parallel or in three phases. This allows up to nine Xtender together in a system and to supply consumers up to 63 kW. You can also combine the Xtender with almost all existing inverters to increase the available power.

Using the remote control RCC-02/RCC-03 the Xtender can be configured to retrieve any information of the system state to the graphical display. For details see page 49

Configurable shore power connection
The converter will be switched on automatically if the adjustable power supply current is increased. Similarly, the loading capacity will be regulated to the shore power capacity.

Automatic power recognising
Adjustable load detection in a wide range starting from a very low value (stand-by).

Multifunctional contacts
Two floating switch-over contacts can be programmed to be used for many different applications. These are able to react to all conditions outside and inside the Xtender (availability of the shore power, battery voltage, fault detection, etc.). They are also time programmable, or can operate during certain hours (night, weekend ...). Thus, it can serve as a starter generator facility, to shutdown less important consumers, to display a fault, situational battery charger, etc.
Remote monitor for control and display of the inverter/charger series XtM / XtH. Build-in version. incl. connecting cable 2 m.
Dimensions L 170 x W 170 x H 45 mm

Remote monitor for control and display of the inverter/charger series XtM / XtH. Build-on version. incl. connecting cable 2 m.
Dimensions W 130 x H 120 x D 40 mm

Add-on module for remote control ON/OFF of the inverter/charger series XtM / XtH. For DIN rail assembly. incl. connecting cable 3 m.
Dimensions W 45 x H 73 x D 45 mm

Communication module CAN/RS-232 with datalogger function for X-Tender XTS / XTM / XTH / VT.
Dimensions L 113 x W 76 x H 25 mm

Battery temperature sensor to adjust the charging voltage to the battery temperature. Cable length 3 m
Dimensions W 58 x H 52 x D 23 mm

Communication cable to connect the inverter combination with remote control RCC 02/03, or to build three-phase systems or parallel connection of several devices.

**Inverter/charger**

<table>
<thead>
<tr>
<th>Order No.</th>
<th>XTM 1500-12</th>
<th>XTM 2000-12</th>
<th>XTH 3000-12</th>
<th>XTM 2400-24</th>
<th>XTM 3500-24</th>
<th>XTH 5000-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal input voltage</td>
<td>12 V</td>
<td>12 V</td>
<td>12 V</td>
<td>24 V</td>
<td>24 V</td>
<td>24 V</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>9,5 V - 17 V</td>
<td>9,5 V - 17 V</td>
<td>9,5 V - 17 V</td>
<td>19 V - 34 V</td>
<td>19 V - 34 V</td>
<td>19 V - 34 V</td>
</tr>
<tr>
<td>Output voltage, -frequency</td>
<td>Sine 230 V AC (± 2 %), 50 Hz ± 0,05 % (adjustable from 45 to 65 Hz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distortion THD</td>
<td>&lt; 2 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cos ϕ max.</td>
<td>0,1 - 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated power</td>
<td>1500 VA</td>
<td>2000 VA</td>
<td>2500 VA</td>
<td>2000 VA</td>
<td>3000 VA</td>
<td>4500 VA</td>
</tr>
<tr>
<td>Max. power 30 min</td>
<td>1500 VA</td>
<td>2000 VA</td>
<td>2500 VA</td>
<td>2000 VA</td>
<td>3000 VA</td>
<td>4500 VA</td>
</tr>
<tr>
<td>Max. power 5 sec</td>
<td>3400 VA</td>
<td>4800 VA</td>
<td>7500 VA</td>
<td>6000 VA</td>
<td>9000 VA</td>
<td>12000 VA</td>
</tr>
<tr>
<td>max. efficiency</td>
<td>93 %</td>
<td>93 %</td>
<td>93 %</td>
<td>94 %</td>
<td>94 %</td>
<td>94 %</td>
</tr>
<tr>
<td>Consumption off / stand by /on</td>
<td>1,2/1,4/8 W</td>
<td>1,2/1,4/10 W</td>
<td>1,7/2,2/14 W</td>
<td>1,4/1,6/9 W</td>
<td>0,8/0,9/9 W</td>
<td>1,8/2,5/20 W</td>
</tr>
<tr>
<td>Rated current.</td>
<td>135 A</td>
<td>180 A</td>
<td>225 A</td>
<td>89 A</td>
<td>134 A</td>
<td>178 A</td>
</tr>
<tr>
<td>Charging current adjustable</td>
<td>0 - 70 A</td>
<td>0 - 100 A</td>
<td>0 - 160 A</td>
<td>0 - 55 A</td>
<td>0 - 90 A</td>
<td>0 - 140 A</td>
</tr>
<tr>
<td>Max. current transfer system</td>
<td>50 A</td>
<td>50 A</td>
<td>50 A</td>
<td>50 A</td>
<td>50 A</td>
<td>50 A</td>
</tr>
<tr>
<td>Weight</td>
<td>15 kg</td>
<td>18,5 kg</td>
<td>34 kg</td>
<td>16,2 kg</td>
<td>21,2 kg</td>
<td>40 kg</td>
</tr>
<tr>
<td>Dimensions (L x W x H) in mm</td>
<td>322 x 133 x 466</td>
<td>322 x 133 x 466</td>
<td>300 x 230 x 500</td>
<td>322 x 133 x 466</td>
<td>322 x 133 x 466</td>
<td>300 x 230 x 500</td>
</tr>
</tbody>
</table>

**RCC-02**

Remote monitor for control and display of the inverter/charger series XTH can be retrieved using the graphical display of the remote control RCC-02/-03. In addition it can recognize, display and record, on time, all fault conditions to potential problems.

Using the graphical display of the remote control RCC-02/-03 you can configure many settings at the remote RCC-02/-03 for the combined inverter, such as the charging curves of the battery charger and the various operating modes. Also the programming of two auxiliary contacts, for example a starting generator facility, shutdown of less important consumers, display a fault, display current conditions of battery charging is possible.

For example there are three generator starting modes and one generator stopping mode for a freely adjustable voltage-time combination available. Furthermore performance factors of the combined inverters can be added.

Using the remote control RCC-02/-03 the integrated SD Card can be pre-configured in the combined inverter externally or update software, so that the device is always up-to-date.
The sine wave inverter-charger combination of the series XPC are very interested in pricing. Other then the series XTM and XTH they don’t have a smart-boost-function, so that the power of the inverter cannot be added to the shore- or generator power. Almost all functions are adjustable directly on the device, optional there’s a remote control RCC 01 available.

### SINE-WAVE INVERTER/CHARGER COMBINATION XPC

The solar charge controller VarioTrack complies with the highest industrial standards, is very flexible and programmable and gives you thereby the most optimal power from your solar plant. If the VarioTrack is connected to the batteries and the solar panels, it charges the batteries automatically and with the highest efficiency of the available solar energy due to a clever algorithm, which searches the highest possible working level (MPPT). The Maximum Power Point Tracking, MPPT, supervises continuously the solar plant for the optimal voltage in order to receive the maximum available power. This working level varies permanently in dependency of the environmental conditions (solar radiation, temperature) to which the VarioTrack has to adapt itself (tracking).

By using the most advanced technology the efficiency is at the highest level: Tracking & energy efficiency: > 99% 4-step charging characteristic for a longer battery lifespan. 8 pre-defined standard battery charging curves.

Completely configurable system:
- Comprehensive display, setup possibility and data protocols by using the remote control monitors RCC-02/-03
- Compatible to all solar systems
- Maximum utilisation together with a Xtender system and a synchronised battery management

### SOLAR CHARGE CONTROLLER VARIO TRACK

<table>
<thead>
<tr>
<th>Inverter/charger</th>
<th>XPC 1400-12</th>
<th>XPC 2200-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order-No.</td>
<td>7 0006 1112</td>
<td>7 0006 1824</td>
</tr>
<tr>
<td>Nominal input voltage</td>
<td>12 V</td>
<td>24 V</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>9.5 V - 16 V</td>
<td>19 V - 34 V</td>
</tr>
<tr>
<td>Output voltage - frequency</td>
<td>Sine 230 V AC (0 - 10 %), 50 Hz ± 0.05 %</td>
<td></td>
</tr>
<tr>
<td>Distortion THD</td>
<td>&lt; 2 %</td>
<td></td>
</tr>
<tr>
<td>Cos phi max.</td>
<td>0.1 - 1</td>
<td></td>
</tr>
<tr>
<td>Rated power</td>
<td>1100 VA</td>
<td>1600 VA</td>
</tr>
<tr>
<td>Max. power 30 min</td>
<td>1400 VA</td>
<td>2200 VA</td>
</tr>
<tr>
<td>Max. power 5 sec</td>
<td>3300 VA</td>
<td>4800 VA</td>
</tr>
<tr>
<td>max. efficiency</td>
<td>94 %</td>
<td>95 %</td>
</tr>
<tr>
<td>Consumption off/stand by/on</td>
<td>0.5/0.6/4 W</td>
<td>0.8/0.9/7 W</td>
</tr>
<tr>
<td>Rated current</td>
<td>98 A</td>
<td>100 A</td>
</tr>
<tr>
<td>Charging current adjustable</td>
<td>0 - 45 A</td>
<td>0 - 37 A</td>
</tr>
<tr>
<td>Max. current transfer system</td>
<td>16 A</td>
<td>16 A</td>
</tr>
<tr>
<td>Weight</td>
<td>11.7 kg</td>
<td>12.6 kg</td>
</tr>
<tr>
<td>Dimensions (L x W x H) in mm</td>
<td>215 x 145 x 410</td>
<td>215 x 145 x 410</td>
</tr>
</tbody>
</table>

### CT 35

Order-No.: 7 0006 9001

Battery temperature sensor to adjust the charging voltage to the battery temperature.
- Cable length 3 m
- Dim.: W 58 x H 52 x D 23 mm

### RCC 01

Order-No.: 7 0006 9000

Remote control for monitoring and display of inverter/charger series XPC. Incl. connecting cable 20 m.
- Dimensions: L 112 x B 138 x H 25 mm

### VarioTrack

<table>
<thead>
<tr>
<th>VarioTrack</th>
<th>VT 65</th>
<th>VT 80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order-No.</td>
<td>7 0006 8065</td>
<td>7 0006 8080</td>
</tr>
<tr>
<td>max. charging current</td>
<td>65 A</td>
<td>80 A</td>
</tr>
<tr>
<td>Battery nominal voltage</td>
<td>12 / 24 / 48 V</td>
<td>12 / 24 / 48 V</td>
</tr>
<tr>
<td>max. solar panel voltage</td>
<td>80 V</td>
<td>80 V</td>
</tr>
<tr>
<td>max. power of the PV</td>
<td>1000 / 2000 / 4000 W</td>
<td>1250 / 2500 / 5000 W</td>
</tr>
<tr>
<td>Weight</td>
<td>5.2 kg</td>
<td>5.5 kg</td>
</tr>
<tr>
<td>Dimensions W x D x H</td>
<td>120 x 220 x 310 mm</td>
<td>120 x 220 x 350 mm</td>
</tr>
<tr>
<td>Return current</td>
<td>&lt; 1 W in night mode</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>IP 54</td>
<td>IP 54</td>
</tr>
<tr>
<td>Special features</td>
<td>Protection against wrong connection and pole-changing</td>
<td></td>
</tr>
</tbody>
</table>
**SINE WAVE INVERTER**

The sine wave inverters series "AJ" allow the operation of 230V/50 Hz loads regardless of the shore power 230 V/50 Hz AC. This is derived from the 12 V or 24 V batteries. The high overload capacity of the device allows to take 3 times the rated power, allowing the safe operation of motors, such as vacuum cleaners, refrigerators and power tools of all kinds, even if their power consumption is greater than the inverter performance.

The low distortion sine wave output voltage enables the uninterrupted operation of computer monitors, VCRs and TVs and provides for the safe start-up of motors with a high inrush current.

The control button turn the sine wave inverter on/off

The green control light indicates the function of the device. If the display flashes, the sine wave inverters is in standby mode, which is characterized by very low power consumption.

An acoustic signal is sounding, when the sine wave inverter is threatened or overload voltage stopped, or even after the power on is in proper condition.

The stand-by mode (Type AJ 500 and higher), stops the sine wave inverter automatically when consumers are no more in operation. This threshold is adjustable between 1-20 W to ensure the supply of smaller consumers (for example digital clock).

**Remote control FB-AJ**  
Order No.: 049007000

For remote on/off AJ 1000, AJ 2100. Visual and acoustic status indicators. A connection cable (5 m) is included. Dimensions W 105 x H 52.5 mm

**Sinewave inverter**  
*Order No.*
AJ 275-12  
AJ 500-12  
AJ 1000-12  
AJ 2100-12  
AJ 350-24  
AJ 600-24  
AJ 1300-24  
AJ 2400-24

<table>
<thead>
<tr>
<th>Nominal battery voltage</th>
<th>12 V</th>
<th>12 V</th>
<th>12 V</th>
<th>12 V</th>
<th>24 V</th>
<th>24 V</th>
<th>24 V</th>
<th>24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage range</td>
<td>10,5 V - 16 V</td>
<td>10,5 V - 16 V</td>
<td>10,5 V - 16 V</td>
<td>10,5 V - 16 V</td>
<td>21 V - 32 V</td>
<td>21 V - 32 V</td>
<td>21 V - 32 V</td>
<td>21 V - 32 V</td>
</tr>
<tr>
<td>Input current/nominal oper. max. Efficiency</td>
<td>18 A</td>
<td>36 A</td>
<td>72 A</td>
<td>180 A</td>
<td>13 A</td>
<td>22 A</td>
<td>45 A</td>
<td>90 A</td>
</tr>
<tr>
<td>Output voltage range</td>
<td>230 V ± 5 %</td>
<td>230 V ± 5 %</td>
<td>230 V ± 5 %</td>
<td>225 V ± 3 %</td>
<td>225 V ± 3 %</td>
<td>230 V ± 5 %</td>
<td>230 V ± 5 %</td>
<td>225 V ± 3 %</td>
</tr>
<tr>
<td>Output frequency</td>
<td>50 Hz ± 0,05 %</td>
<td>50 Hz ± 0,05 %</td>
<td>50 Hz ± 0,05 %</td>
<td>50 Hz ± 0,05 %</td>
<td>50 Hz ± 0,05 %</td>
<td>50 Hz ± 0,05 %</td>
<td>50 Hz ± 0,05 %</td>
<td>50 Hz ± 0,05 %</td>
</tr>
<tr>
<td>Rated power</td>
<td>200 VA</td>
<td>400 VA</td>
<td>800 VA</td>
<td>2000 VA</td>
<td>300 VA</td>
<td>500 VA</td>
<td>1000 VA</td>
<td>2000 VA</td>
</tr>
<tr>
<td>Max. load for 5 sec</td>
<td>200 VA</td>
<td>1000 VA</td>
<td>2400 VA</td>
<td>5000 VA</td>
<td>550 VA</td>
<td>1400 VA</td>
<td>3000 VA</td>
<td>5000 VA</td>
</tr>
<tr>
<td>Consumption stand-by/ON</td>
<td>−/1,9 W</td>
<td>0,3/3,8 W</td>
<td>0,3/9 W</td>
<td>0,5/13 W</td>
<td>−/2,5 W</td>
<td>0,3/4 W</td>
<td>0,3/5 W</td>
<td>0,3/18 W</td>
</tr>
<tr>
<td>Stand by mode (1-20 W)</td>
<td>− yes yes yes − yes yes yes − yes yes yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote control (Option FB-AJ)</td>
<td>− yes yes − yes yes − yes yes yes − yes yes yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>2,3 kg</td>
<td>4,5 kg</td>
<td>8,5 kg</td>
<td>19 kg</td>
<td>2,4 kg</td>
<td>4,5 kg</td>
<td>8,5 kg</td>
<td>18 kg</td>
</tr>
<tr>
<td>Dimensions D 142 x H 84</td>
<td>W 174 mm W 252 mm W 440 mm 273x415x117</td>
<td>W 174 mm W 252 mm W 440 mm 273x415x117</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Many navigation devices, radios and receivers cannot be used with a 24 V power supply, because they are designed for 12 V operation only. A DC/DC converter converts an input of 24 V to an output of 12 V for powering all the equipment which is designed for 12 V supply.

- **Efficiency typ. 93 %**
  - Small heat development by up to date circuit technology

- **Life time warranty**
  - Optimal circuit design makes high durability possible.

- **Easy installation**
  - Snap on by assembly clips

- **Completed galvanic isolated output (Type PV i)**
  - Type PV i with galvanic separated output for isolated power supply on board of ships and cars.

Converter in a compact housing. Switch mode technology in SMD technology. Stable aluminium housing with nylon end caps. Electronic protection against overheating and over-voltage. Protection against inverted polarity by internal fuse. Connection via plug contacts 6.3 mm. Supply with assembly clips. Protection IP 53.

---

### Technical data for the models PV (24/12V)

<table>
<thead>
<tr>
<th>Input voltage range (PV)</th>
<th>17 - 32 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage range (PV)</td>
<td>13.6 - 13.9 V</td>
</tr>
<tr>
<td>Ripple</td>
<td>&lt; 50 mV</td>
</tr>
<tr>
<td>Efficiency</td>
<td>typ. 93 %</td>
</tr>
<tr>
<td>Operation temperature</td>
<td>from 30 °C: current decreasing</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Type/Order-No.:</th>
<th>Input-/Rated power</th>
<th>Max. load</th>
<th>Quicent current/Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC/DC Converter 24V/12V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PV 3s 7 0020 0003</td>
<td>24 V / 12 V</td>
<td>3 A</td>
<td>6 A</td>
<td>10 mA / 7 mA</td>
</tr>
<tr>
<td>PV 6s 7 0020 0006</td>
<td>24 V / 12 V</td>
<td>6 A</td>
<td>10 A</td>
<td>10 mA / 7 mA</td>
</tr>
<tr>
<td>PV 12s 7 0020 0012</td>
<td>24 V / 12 V</td>
<td>12 A</td>
<td>18 A</td>
<td>10 mA / 7 mA</td>
</tr>
<tr>
<td>PV 18s 7 0020 0018</td>
<td>24 V / 12 V</td>
<td>18 A</td>
<td>21 A</td>
<td>10 mA / 7 mA</td>
</tr>
<tr>
<td>PV 24s 7 0020 0024</td>
<td>24 V / 12 V</td>
<td>24 A</td>
<td>30 A</td>
<td>10 mA / 9 mA</td>
</tr>
<tr>
<td>DD 24-12 600 7 0020 0050</td>
<td>24 V / 12 V</td>
<td>50 A</td>
<td>60 A</td>
<td>22 mA / 22 mA</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Type/Order-No.:</th>
<th>Input-/Rated power</th>
<th>Max. load</th>
<th>Quicent current/Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC/DC Converter 24V/12V with galvanically isolated output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PV 3i 7 0021 0003</td>
<td>24 V / 12 V</td>
<td>3 A</td>
<td>6 A</td>
<td>11 mA / 3 mA</td>
</tr>
<tr>
<td>PV 12i 7 0021 0012</td>
<td>24 V / 12 V</td>
<td>12 A</td>
<td>18 A</td>
<td>11 mA / 3 mA</td>
</tr>
<tr>
<td>PV 24i 7 0021 0024</td>
<td>24 V / 12 V</td>
<td>24 A</td>
<td>30 A</td>
<td>11 mA / 3 mA</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Type/Order-No.:</th>
<th>Input-/Rated power</th>
<th>Max. load</th>
<th>Quicent current/Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC/DC Converter 12V/12V or 24V/24V with galvanically isolated output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDi 12-12 36 7 0022 1103</td>
<td>8-18 V / 13.6 V</td>
<td>3 A</td>
<td>4 A</td>
<td>17 mA / 0 mA</td>
</tr>
<tr>
<td>DDi 12-12 72 7 0022 1107</td>
<td>8-18 V / 13.6 V</td>
<td>6 A</td>
<td>10 A</td>
<td>17 mA / 0 mA</td>
</tr>
<tr>
<td>DDi 24-24 240 7 0022 2224</td>
<td>16-36 V / 27.2 V</td>
<td>10 A</td>
<td>12 A</td>
<td>17 mA / 0 mA</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Type/Order-No.:</th>
<th>Input-/Rated power</th>
<th>Max. load</th>
<th>Quicent current/Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC/DC Converter 24V/12V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DD 12-24 72 7 0022 1207</td>
<td>12 V / 26.5 V</td>
<td>3 A (24 V)</td>
<td>4 A (24 V)</td>
<td>110 mA / 40 mA</td>
</tr>
<tr>
<td>DD 12-24 240 7 0022 1228</td>
<td>12 V / 27.6 V</td>
<td>10 A (24 V)</td>
<td>12 A (24 V)</td>
<td>10 mA / 10 mA</td>
</tr>
<tr>
<td>DD 12-24 600 7 0022 1260</td>
<td>12 V / 27.6 V</td>
<td>25 A (24 V)</td>
<td>30 A (24 V)</td>
<td>10 mA / 10 mA</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Type/Order-No.:</th>
<th>Input-/Rated power</th>
<th>Max. load</th>
<th>Quicent current/Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC/DC Converter 48V/12V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DD 48-12 108 7 0022 4111</td>
<td>48 V / 13.6 V</td>
<td>9 A (12 V)</td>
<td>11 A (12 V)</td>
<td>15 mA</td>
</tr>
</tbody>
</table>
Shore power connections are installed on-board to ensure a safe and problem-free power supply in accordance with GL - Germanischer Lloyd safety regulations and the European Standards EN ISO 13297 for AC power supply.

The main element is a double pole RCBO leakage protector, which separates the on-board AC-system from the shore power supply in case of a fault. In order to facilitate the installation we use double pole RCBO leakage protectors. They combine a leakage protector, which interrupts the power by means of a 30 mA and a line protector in case of a short. Important is the use of a double pole switch, because on-board of yachts the life (L) and the neutral (N) are not well defined. At some power supply connectors the life (L) and neutral (N) could be interchanged.

Please pay attention to use watertight or -protected power connectors. If they are installed outside and exposed to rain, protection class should be IP 55, if the shore power connector could be flooded or underwater for a short time, the protection should be IP 56.

Our shore power units are built according to EN ISO 13297 using best components available.

Included in the delivery is a manual and a CE-certification in case of need of an acceptance certification. The self-extinguishing plastic housing protects against inadvertent contact with terminals. The controls are fitted on anodized aluminium faced plates with plastic coating.

When mounting a shore power connection unit more than three meters far from the source, a double pole circuit breaker is necessary near the shore power connection on board to protect against electrical accidents.

Cables for AC 230V installation have to be installed well protected, best in cable ducts. Please take care that the AC 230V and the DC 12V / 24V wiring is installed in separate channels.

Encased terminals ensure protection against accidental contacts.

A simple and sure connection via through lead clamps outside of the housing. This means a shure appliance connection without problems.

**NEW**

**LAR**

Order-No.: 0 1000 0231

The mains indication panel LAR shows the correct electrical connection of the AC onboard system to the AC shore power: Green light: all correctly connected

Red light: reverse polarity (life L and neutral N are changed)

Red and green light: protective earth conductor PE not connected

Leakage current 1.4 mA. Cannot be used for AC systems with 2 phases without protective earth PE, otherwise always a fault indication is displayed.

Dimensions: W 105 x H 52,5 x D 50 mm

**NEW**

**PHB 16**

Order-No.: 0 1100 1160

The AC reverse polarity control unit PHB 16 switches automatically the AC shore power to the correct onboard AC polarity. If the shore power wiring is reversed (life L and neutral N are exchanged) the PHB detects this status and switches life and neutral, so that the onboard polarity is always correct. Thereby the triggering of the RCBO leakage protector at the pier will be avoided. Leakage current 1.4 mA. Cannot be used for AC systems with 2 phases without protective earth PE, otherwise always a fault indication is displayed.

Dimensions: W 160 x H 200 x D 115 mm
**Connection of gensets and inverters according to EN/ISO 13297**

For additional AC power sources on board, as a generator and/or an inverter, all poles must be separated by a switching device. This will prevent a simultaneous connection of multiple sources in the onboard system. Additionally, the switch over unit must have a voltmeter. Control lights show the availability of power sources. During the use of an inverter the operating of a charger must be excluded because the charger would use the power from the inverter and the batteries would be discharged unintentionally without any use.
**SHORE POWER CONNECTION UNITS**

**Type**
- LAE 220
- LAE 211
- LAE 230
- LAE 205

**Order No.:**
- 0 1000 2201
- 0 1000 2110
- 0 1000 2300
- 0 1000 2050

**Shore power connection unit for 230 V/50 Hz supply.**

**AC control-LED shows shore power connection. Circuits are connected inside to the clamps of the 2-pole automatic RCBO leakage protector. Cable lead with grommets. Watertight full plastic housing with flap cover. Protective system IP 65.**

**Dimensions**
- W 80 x H 150 x D 97 mm

**Applicaiton**
- AC connection unit for shore power

**Bow Stern Switch Over**

If there is a shore power connection for each bow and stern a double pole switch must be used for separation of the two provided inputs. The switch keeps the unused connectors free of potential. If no switch is used, dangerous voltage occurs because the pins at the flange plug of the unused shore power connection are also at AC main power voltage. Danger of life!

**CAG 20 BH**

Order No. 6 4120 2111

Switch over to select two feed lines (bow / stern), manual, max. 25 A

Dimensions
- W 82 x H 92 x D 92 mm

**LAE 241**

Order No. 0 1000 2410

Switch over to select two feed lines, automatic, max. 16 A

Dimensions
- W 94 x H 94 x D 81 mm

**LAE 220 CH**

Order No. 0 1000 2205

Shore power connection unit for 230 V/50 Hz supply for Switzerland. AC control-LED shows shore power connection. Circuits are connected inside to the clamps of the 2-pole automatic RCBO leakage protector. Cable lead with grommets. Watertight full plastic housing with flap cover. Protective system IP 65.

**RCBO Leakage protector**
- 13A / 0,03A 2-pole

**Dimensions**
- W 80 x H 150 x D 97 mm

**LAE 212 CH**

Order No. 0 1000 2120

Shore power connection unit for 230 V/50 Hz supply with 2 sockets for Switzerland. AC control-LED shows shore power connection. Circuits are connected inside to the clamps of the 2-pole automatic RCBO leakage protector. Cable lead with grommets. Watertight full plastic housing with flap cover. Protective system IP 65.

**RCBO Leakage protector**
- 13A / 0,03A 2-pole

**Dimensions**
- W 80 x H 250 x D 92 mm
Switch over of several power sources

If a generator and/or inverter will be connected additionally to the shore power connection into an existing on-board AC-system it is necessary to use switch over units. They separate and switch over safely all power sources. The switch over units have a delay time when switching among different sources. So the risk of a short circuit, caused by phase-shift in the sources and inductive load currents is prevented.

When installing a switch over unit you have to ensure that the outputs are connected to a RCBO leakage protector.

Automatic switch over units are useful for comfortable switching over between shore-/on-board-generators- and/or inverters. The new switch over units of the series LAU are measuring the input voltage of each source and connect them to the on-board system if the voltage is high enough for the intended need (voltage & timewindow adjustable). Because of this, an AC-generator isn’t connected before it is ramped up correctly and reached it’s voltage.

The switch over units LAU are prepared for the connection to the philippi P-BUS using the interface CAV. In connection with the interface CAV such factors as switch over delay time and voltage threshold are adjustable to each power supply source on the system monitor PSM.

An additional power output circuit enables an exclusion for example of the charger during the use of an inverter; because then the batteries would be discharged unintentionally without use.

The switch over units can be used either as only switch over units for existing AC-systems or with integrated RCBO leakage protector. In addition there is space to integrate optional components such as an AC-transducer ACW (see page 38) or double pole circuit breakers MCB. While integrating an AC-transducer ACW the performance data of the AC-system could be displayed on the system monitor PSM.

Optional the shore power units can be designed and built to your special needs regarding the amount and power output of the sources and loads.

The units shown are a small example of the varieties possible. Please don’t hesitate to ask for more information.

---

<table>
<thead>
<tr>
<th>Type</th>
<th>Order-No.:</th>
<th>LAU 216</th>
<th>LAU 216 F</th>
<th>LAU 325</th>
<th>LAU 325 F</th>
<th>LAU 340</th>
<th>LAU 340 F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0 1100 2160</td>
<td>0 1100 2161</td>
<td>0 1100 3250</td>
<td>0 1100 3251</td>
<td>0 1100 3400</td>
<td>0 1100 3401</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>230 V / 50 Hz</td>
<td>230 V / 50 Hz</td>
<td>230 V / 50 Hz</td>
<td>230 V / 50 Hz</td>
<td>230 V / 50 Hz</td>
<td>230 V / 50 Hz</td>
<td>230 V / 50 Hz</td>
</tr>
<tr>
<td>AC-input 1</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
</tr>
<tr>
<td>AC-input 2</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
</tr>
<tr>
<td>AC-input 3</td>
<td>–</td>
<td>–</td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
</tr>
<tr>
<td>RCBO</td>
<td>16 A / 30 mA</td>
<td>16 A / 30 mA</td>
<td>16 A / 30 mA</td>
<td>16 A / 30 mA</td>
<td>16 A / 30 mA</td>
<td>16 A / 30 mA</td>
<td>16 A / 30 mA</td>
</tr>
<tr>
<td>AC-output 1</td>
<td>16 A</td>
<td>16 A</td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
</tr>
<tr>
<td>AC-output 2</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
</tr>
<tr>
<td>Dimensions (WxHxD)</td>
<td>160 x 200 x 115 mm</td>
<td>195 x 200 x 115 mm</td>
<td>266 x 200 x 115 mm</td>
<td>266 x 200 x 115 mm</td>
<td>335 x 270 x 145 mm</td>
<td>335 x 270 x 145 mm</td>
<td>335 x 270 x 145 mm</td>
</tr>
<tr>
<td>P-BUS connection</td>
<td>via interface CAV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Switch over of several power sources</th>
<th>Input 1</th>
<th>Input 2</th>
<th>Input 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation switch over</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusion output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output 1</td>
<td>Ausgang 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output 2</td>
<td>Ausgang 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Rotary Selector Switches for AC 230V**

- **CAG 20 LG**  
  Order No.: 64120 2110  
  Manual switch over to select two feed lines (shore/genset), max. 25 A  
  Dimensions: W 82 x H 92 x D 92 mm

- **Leer CA**  
  Order No.: 02900 2060  
  Blank plate for easy mounting of a rotary selector switch of the series CH 16 for example in a wooden wall. Delivery without rotary selector switch.  
  Dimensions: W 70 x H 70 x D 3 mm

For assembly on front plates with a max. thickness of 5 mm. For bigger thickness please use blank panel CA.

<table>
<thead>
<tr>
<th>Switch</th>
<th>Main switch 0-1</th>
<th>Shore Generator switch over 1-0-2</th>
<th>Shore Inverter switch over 1-0-2</th>
<th>Shore Generator Inverter switch over 1-0-2-3</th>
<th>Shore Generator Inverter switch over 1-0-2-3, with limit on use of charger while inverter op.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>CH 16 A 291</td>
<td>CH 16 A 211 LG</td>
<td>CH 16 A 211 LW</td>
<td>CH 16 A 251</td>
<td>CH 16 D 926</td>
</tr>
<tr>
<td><strong>Order No.</strong></td>
<td>6 4020 2910</td>
<td>6 4020 2110</td>
<td>6 4020 2111</td>
<td>6 4020 251</td>
<td>6 4020 7980</td>
</tr>
<tr>
<td><strong>Max. load</strong></td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
<td>25 A</td>
</tr>
<tr>
<td><strong>Front/Mounting depth</strong></td>
<td>48 x 48 / 44 mm</td>
<td>48 x 48 / 58 mm</td>
<td>48 x 48 / 58 mm</td>
<td>48 x 48 / 86 mm</td>
<td>48 x 48 / 86 mm</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>CA 63 A 291</td>
<td>CA 63 A 211 LG</td>
<td>CA 63 A 211 LW</td>
<td>CA 63 A 251</td>
<td>CA 63 D 926</td>
</tr>
<tr>
<td><strong>Order No.</strong></td>
<td>6 4042 2910</td>
<td>6 4042 2110</td>
<td>6 4042 2111</td>
<td>6 4042 251</td>
<td>6 4042 7980</td>
</tr>
<tr>
<td><strong>Max. load</strong></td>
<td>63 A</td>
<td>63 A</td>
<td>63 A</td>
<td>63 A</td>
<td>63 A</td>
</tr>
<tr>
<td><strong>Front/Mounting depth</strong></td>
<td>64 x 64 / 43 mm</td>
<td>64 x 64 / 56 mm</td>
<td>64 x 64 / 56 mm</td>
<td>64 x 64 / 81 mm</td>
<td>64 x 64 / 81 mm</td>
</tr>
</tbody>
</table>

**Watertight Connector for Shore Power 230V/50Hz**

Complete plug connection for shore power connection 230V/50Hz -16A “RS 692 Land” includes: coupling socket and flange plug (2 pole + PE), two protective caps and angular housing with compact dimensions. Ideal for space saving on board. Protective system - IP 67. To protect against inadvertently damaging of the coupling plug you can use the stainless steel protective clamp 570. Matching shore power cables you find next page.

- **RS 692 Land GL**  
  Order No.: 4 0692 3003  
  Complete plug connector for shore power supply 230 V/50 Hz-16 A (2+PE). Includes coupling socket, flange plug, two protection caps and angular housing.

- **RS 692 Land GL/ DK**  
  Order No.: 4 0692 3002  
  Complete plug connector for shore power supply 230 V/50 Hz-16 A (2+PE). Includes coupling socket, flange plug, two protection caps and angular housing.

- **570**  
  Order No.: 0 0570 0000  
  Stainless steel protective clamp to prevent damage of angular mounted round plug of the 692 series.

**RS 692 Land GL/ DK**
Order No.: 4 0692 3002
Complete plug connector for shore power supply 230 V/50 Hz-16 A (2+PE). Includes coupling socket, flange plug, two protection caps and angular housing.

**RS 692 Land GL**
Order No.: 4 0692 3003
Identical to RS 692-Land GL/DK, but without angular housing (no picture).
The new MP16 shore power system has been designed to hook up your boat quickly and easily. Based on the world standard CEE connectors this system offers a reliable and approved shore power connection. The corrosion resistance stainless steel power inlet adds to the finishing touch of every boat. Easy locking waterproof cap (IP 56).

**Attention:** normal CEE-coupling plugs cannot be used in connection with the MP16-10!

Ready made yellow marine cord sets with watertight moulded connectors make these AC connector system the perfect choice! Watertight and rugged.

Integrated in the cord set connector is a LED power indicator light.

Finished manufactured cable with moulded CEE coupling plug and socket with protecting cap. Yellow weatherproof PUR cable type H07BQ-F.

**Flange plug with stainless steel housing 16A**
- Outer-Ø 87 mm, hole-Ø 48 mm, -depth 52 mm.

**Flange plug with stainless steel housing 16A**
- Outer-Ø 107 mm, hole-Ø 75 mm, -depth 100 mm.

**Coupling plug for self mounting connecting cable (without indication-LED) 16A.**

**Coupling plug for self mounting connecting cable (without indication-LED) 32A.**

**Finished watertight PUR-cable H07BQ-F.**
- Ideal for shore power cables. Details please see page 93.

**Black weatherproof neoprene isolated cable H07RN-F.**
- Details please see page 93.

**Shore power organizer bag**

**Order-No.:**
- 7 0050 1610
- 7 0050 1611
- 7 0050 3216
- 7 0050 3217
- 7 0050 2821
- 7 0050 2822
- 7 0050 2832
- 7 0050 2838
- 7 0050 7021
NEW

**MP-CEE 2.5-15**
Order No.: 7 0050 2834

Ready made CEE-extension cordset with moulded CEE-coupling plug and coupling socket with protective cap. Yellow weatherproof PUR cable type H07BQ-F.
3x2,5 mm². Length 15 m or 25 m.

NEW

**SPC**
Order No.: 7 0057 0038

Shore Power Clip - Set with 6 pcs. clips for shore power connection cable. Very useful to fix the cable to the guard rail - no more slipping on this cable!
To avoid galvanic currents between the hull and the shore power, a galvanic isolator can be used. Two anti-parallel diodes in the line produce a voltage drop high enough to avoid galvanic currents.

The galvanic isolator is also suited for yachts with a GRP hull to avoid galvanic corrosion caused by the shore power connection to the propulsion.

Isolating transformer with an electric potential 230/230 V allows a galvanic isolation of the shore power supply.

To operate a network on board with 115 V by a shore power supply of 230 V, an electric transformer of 230/115 V is required.

To operate an optional network with an electric potential of 115 V or 230 V on board a selector switch is used to divide the shore power supply.

Housing by salt water resistant aluminium with a plastic coating as surface protection for installation on a wall or the floor. Connection via internal terminals. Inrush current protection by circuit breaker MCB 16A. Equipped as standard with a professional electronic soft start and inrush current limiting ESB.

Dimensions W 410 x D 290 x H 170 mm

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Input - voltage</th>
<th>Output - voltage</th>
<th>Nominal power</th>
<th>Weight</th>
<th>Input-voltage switch over</th>
<th>Inrush current limiting</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTR 25 230//230</td>
<td>0 6025 2323</td>
<td>230 V</td>
<td>230 V</td>
<td>2500 W</td>
<td>21 kg</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>RTR 25 115//230</td>
<td>0 6025 1123</td>
<td>115 V</td>
<td>230 V</td>
<td>2500 W</td>
<td>21 kg</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>RTR 25 230//115</td>
<td>0 6025 2311</td>
<td>230 V</td>
<td>115 V</td>
<td>2500 W</td>
<td>21 kg</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>RTR 25 115//230//230</td>
<td>0 6025 1223</td>
<td>115//230 V</td>
<td>230 V</td>
<td>2500 W</td>
<td>21 kg</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>RTR 36 230//230</td>
<td>0 6036 2323</td>
<td>230 V</td>
<td>230 V</td>
<td>3600 W</td>
<td>27 kg</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>RTR 36 115//230</td>
<td>0 6036 1123</td>
<td>115 V</td>
<td>230 V</td>
<td>3600 W</td>
<td>27 kg</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>RTR 36 230//115</td>
<td>0 6036 2311</td>
<td>230 V</td>
<td>115 V</td>
<td>3600 W</td>
<td>27 kg</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>RTR 36 115-230//230</td>
<td>0 6036 1223</td>
<td>115//230 V</td>
<td>230 V</td>
<td>3600 W</td>
<td>27 kg</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Further models on request (Delivery time ca. 3 weeks)

To avoid galvanic currents between the hull and the shore power, a galvanic isolator can be used. Two anti-parallel diodes in the line produce a voltage drop high enough to avoid galvanic currents.

The galvanic isolator is also suited for yachts with a GRP hull to avoid galvanic corrosion caused by the shore power connection to the propulsion.

### Galvanic Corrosion (Electrolysis)

Corrosion is an ever present fact of life with boats. The mixing of salt water and different metals is enough to cause galvanic corrosion. All metals when immersed in an electrically conductive fluid (called electrolyte) have a specific electrical potential. Given any two metals immersed in an electrolyte, when an electrical connection is made between them, the current flows from the higher-voltage metal to the lower-voltage metal. The current flowing through the electrolyte is generated by an electrochemical reaction that steadily consumes the lower-voltage metal (galvanic corrosion). This process will continue until the metal with the lowest potential is used up. Corrosion will occur, even if the metals are on different vessels. With the shore power based electrical system we have a further nature of galvanic corrosion. Many of these galvanic currents pass from one boat to another, or to the dockside, down the grounding wire (green/yellow) of the AC shore power cord. This kind of galvanic couple is easily broken with an isolation transformer on-board. The best solution is to install an isolation transformer, which will ensure that the shore power connection is separated from the hull.
The heart of each DC-system are the batteries. Depending on the size of the boat, the intended use and the standard of comfort each system can be very differently in size, but the basics are nearly the same:

- starter battery only to start the engine (AGM)
- service or main battery for all other consumers (Gel)
- optional: battery in the bow for the bow thruster / windlass (AGM)

The capacity of the batteries should be high enough because of physicochemical aspects you should use only 60% of the capacity of a battery in order to avoid the premature failure of the battery. In any case a deep discharging must be prevented.

If you need several batteries in a bank (parallel connection) you should pay attention to the following points:
- connect only batteries of the same type, size and age
- diagonal current drawing (positive at battery 1, negative at battery 2)
- same length of connection cables (+/-) between the batteries
- for 24/36/48 V systems (serial connection) installation of one or more BLA battery equalizer (see page 69) for charge equalisation.

In accordance with the European Standard (EN ISO 10133) a description of electrical DC installation is given.

An important point deals with the well known fuse protection of individual switch panel leads and all direct battery leads. One concept effectively places a main fuse as close as possible to the battery. The large leads from the battery are capable of letting high currents through during a short circuit. This flow of energy between battery and leads can result in overheating and eventually a fire!

Even a starter battery stores enough energy to cause a fire in a yacht. That is why the main leads of a battery should not be too far away from the next mechanically protected fuse. The picture above shows the concept of fuse protection to direct battery arrangements.

Every outgoing lead to switch panel, charger, windlass, instruments, heater, etc. must be fuse protected according to its cross-section.

For example: If a switch panel receives a lead with a 16 mm², as shown on the diagram page 74, it has to be protected by a 50 A fuse. Smaller leads are connected to the fuses on the switch panel and are therefore not to be considered during the connection of outgoing lead fuses. The battery main fuse switch is placed close to the battery to cut-off on board DC power supply.

Loads such as bilge pumps, alarms, navigation instruments are connected directly to the battery to prevent accidental cut off. These cross sections however, are also fuse protected. To protect these cross sections, ETA circuit breakers are suggested or as an alternative, a strip fuse may be set in (page 74f.).
The EM-Box is an innovative power management marine product for the complete energy management of a yacht. The combination of measuring & controlling units, electronic diode splitters, advanced alternator-regulator, remote battery switches and main fuses in one single device simplifies the installation and reduces potential failures. This makes installation and fault finding extremely easy. Electrical systems on boats have multiple points of failure, with many connections, fittings and wirings which are responsible for 80% of electrical system failures.

Different batteries have different charging needs. The integrated charging management of the EM-Box detects what these needs are and delivers what is required. This prolongs the batteries’ lives, minimise environmental impacts and regular replacement expense for the boat owner. Together with the system monitor PSM the boat owner gets all information about the charging state of all batteries connected. The innovative integrated multiple current measuring allows the controlling of all charging and discharging currents. Not only battery currents are measured, also the currents of all main consumers and charging sources can be displayed, which is the base for an effective energy management.

**REDUCTION OF HIGH CURRENT WIRES TO A MINIMUM**

The EM-box replaces completely all wires, which would be necessary between the single components (batteries, fuses, main switches etc.). Also extra wiring to the electronic diode splitter and battery measuring shunts is unnecessary. Integrated is a protected output for continuous current loads. So you have to connect batteries, engine, onboard-power supply cables and high current loads to the EM-box only and the installation is ready and safe to operate.

**SAFE EVEN AT A BREAKDOWN**

Manual operation of the battery main switches possible directly at the EM-box

**DC ENERGY BALANCE**

The integrated 10 current measuring shunts enable an overview and analysis of all relevant currents.

**3 INTEGRATED BATTERY MAIN SWITCHES**

For the starter and service batteries and the emergency operation of the engine by starting the engine from the service battery.

**THE EM-BOX REPLACES:**
- Battery Main Switches
- Charge Distributor
- Main Fuses
- TDDeep Discharge Protect.
- Battery Controller
- Smart Regulator

**IDEAL FOR NEW INSTALLATION OR REFIT OF THE BATTERY-PLANT**

**INTELLIGENT CURRENT SPLITTER**

The splitter distribute the charging current from the alternator to the connected batteries and supervises the correct charging. If there’s an alternator with a sensing line (as used e.g. at Volvo-Penta), the EM-box controls the charging voltage of the alternator and enables thereby an optimal charging of all connected batteries.

**SAFE AND CLEARLY ARRANGED WIRING**

The compact design of the EM-box offers a safe, clear and space saving connection of all batteries, the alternator, the starter, charging sources and the fusing of the main loads wiring.
If a System Monitor PSM is connected to the EM-box, it provides all necessary information of the onboard DC system without installing further components. This information can be recorded continuously for later analysis.

**Battery disconnect switch**

<table>
<thead>
<tr>
<th>Battery disconnect switch</th>
<th>Rating current</th>
<th>Overload</th>
<th>Voltage drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bistable relay with save manual override. No corrosion by water-tight housing. No current consumption after switching.</td>
<td>260A @23°C</td>
<td>190A @85°C (1500A 0.5s)</td>
<td>&gt; 40 mV @100A</td>
</tr>
</tbody>
</table>

**Alternator regulator, charge distribution**

3 step IUO charging characteristic for each connected battery bank (starter/house/bow) individual adjustable. All battery banks connected will be supervised by current and voltage and protected against overcharge independent of the charging source.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>max. current</th>
<th>recom. alternator</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjustable</td>
<td>150A</td>
<td>35 – 150A</td>
</tr>
</tbody>
</table>

**Current measuring, state of charge**

Individual measurement of current, voltage and temperature for each battery bank (external sensor). For all consumers and connections individual current measurement.

<table>
<thead>
<tr>
<th>Consumer outlets</th>
<th>Rating current</th>
<th>Overload</th>
<th>Resolution</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>external fusing via bolt fuses M8</td>
<td>200A</td>
<td>1500A 0.5s</td>
<td>10mA</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

For the main switch operation independently of the System Monitor PSM you can install the control panel STC 3.

**STC 3**

<table>
<thead>
<tr>
<th>STC 3</th>
<th>Order No. O 7100 0103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel with 3 push buttons and LED-control lights integrated</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>105x52.5x70 mm</td>
</tr>
</tbody>
</table>

For the fusing of the load wiring directly at the positive poles of the EM-box you need bolt fuses series SHB.

**EM-box 12V**

Order No. O 7100 1000

<table>
<thead>
<tr>
<th>EM-box 12V</th>
<th>Order No. O 7100 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery disconnect switch</td>
<td>Rating current</td>
</tr>
<tr>
<td>Bistable relay with save manual override. No corrosion by water-tight housing. No current consumption after switching.</td>
<td>260A @23°C</td>
</tr>
</tbody>
</table>

**Alternator regulator, charge distribution**

3 step IUO charging characteristic for each connected battery bank (starter/house/bow) individual adjustable. All battery banks connected will be supervised by current and voltage and protected against overcharge independent of the charging source.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>max. current</th>
<th>recom. alternator</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjustable</td>
<td>150A</td>
<td>35 – 150A</td>
</tr>
</tbody>
</table>

**Current measuring, state of charge**

Individual measurement of current, voltage and temperature for each battery bank (external sensor). For all consumers and connections individual current measurement.

<table>
<thead>
<tr>
<th>Consumer outlets</th>
<th>Rating current</th>
<th>Overload</th>
<th>Resolution</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>external fusing via bolt fuses M8</td>
<td>200A</td>
<td>1500A 0.5s</td>
<td>10mA</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

For the main switch operation independently of the System Monitor PSM you can install the control panel STC 3.

**STC 3**

<table>
<thead>
<tr>
<th>STC 3</th>
<th>Order No. O 7100 0103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel with 3 push buttons and LED-control lights integrated</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>105x52.5x70 mm</td>
</tr>
</tbody>
</table>

For the fusing of the load wiring directly at the positive poles of the EM-box you need bolt fuses series SHB.

**EM-box 12V**

Order No. O 7100 1000

<table>
<thead>
<tr>
<th>EM-box 12V</th>
<th>Order No. O 7100 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery disconnect switch</td>
<td>Rating current</td>
</tr>
<tr>
<td>Bistable relay with save manual override. No corrosion by water-tight housing. No current consumption after switching.</td>
<td>260A @23°C</td>
</tr>
</tbody>
</table>

**Alternator regulator, charge distribution**

3 step IUO charging characteristic for each connected battery bank (starter/house/bow) individual adjustable. All battery banks connected will be supervised by current and voltage and protected against overcharge independent of the charging source.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>max. current</th>
<th>recom. alternator</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjustable</td>
<td>150A</td>
<td>35 – 150A</td>
</tr>
</tbody>
</table>

**Current measuring, state of charge**

Individual measurement of current, voltage and temperature for each battery bank (external sensor). For all consumers and connections individual current measurement.

<table>
<thead>
<tr>
<th>Consumer outlets</th>
<th>Rating current</th>
<th>Overload</th>
<th>Resolution</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>external fusing via bolt fuses M8</td>
<td>200A</td>
<td>1500A 0.5s</td>
<td>10mA</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

For the main switch operation independently of the System Monitor PSM you can install the control panel STC 3.

**STC 3**

<table>
<thead>
<tr>
<th>STC 3</th>
<th>Order No. O 7100 0103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel with 3 push buttons and LED-control lights integrated</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>105x52.5x70 mm</td>
</tr>
</tbody>
</table>

For the fusing of the load wiring directly at the positive poles of the EM-box you need bolt fuses series SHB.
Which type of battery is best?

Conventional open lead batteries have only a cycle stability of around 70 cycles at a discharging level of 50%. If the battery will be discharged deeper (80%), the cycle stability is only around 30 cycles. These batteries are used usually as starter batteries. For service or main batteries we recommend the use of cycle stable types of batteries for instance the Exide EP-Serie (AGM) with around 300 cycles at a discharge level of 50% or best the use of GEL-batteries (Exide ES-series with 1000 cycles at a discharge level of 50%).

The most important requirement for a long battery life span is a correct charge technology with a temperature compensated IUoU characteristic, especially AGM and GEL-batteries need a very good charger otherwise they fail ahead of time.

The EXIDE-GEL is the first life maintenance-free battery based on the SONNENSCHEN GEL-Electrolyte technology. The superior battery choice for recreation and sport provides a reliable onboard power supply and a powerful engine start, even in emergencies under water. Also ideal to accumulate the "green" solar energy.

The first choice in cyclic loading in the consumer-battery.

- **Leakproof**
  Battery acid is sealed in a gel type substance which makes the battery leak proof, even if it receives outer damage

- **Very low self discharge**
  After six months of storage, the battery retains its nominal capacity of over 80%. After two years, 50%.
  The battery can be kept in winter storage without routine check-up.

- **Maintenance free**
  No acid check, no water refill!

- **Positioning free**
  Battery is sealed even when placed upside down. Even under water!!!

- **Discharge safe**
  Dryfit-System handles short discharge without damage.

- **Cycle strong and long life**
  Best cycle stability (charging - discharging)

- **Extreme low gassing and sealed**
  No acid vapor escapes. Gas recondenses to water in every cell.
  Pressure vents to let escape build up pressure.

- **Clean and non-harmful to environment**
  No acid mess, no aggressive acid vapor

---

<table>
<thead>
<tr>
<th>EXIDE-GEL Type</th>
<th>Voltage</th>
<th>Capacity</th>
<th>Dimensions (Block)</th>
<th>Weight</th>
<th>Corresp. starter battery weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Order-No.</td>
<td>V</td>
<td>C20 (Ah)</td>
<td>C100 (Ah)</td>
<td>L (l)</td>
</tr>
<tr>
<td>ES 650 (G 60)</td>
<td>6 0131 0057</td>
<td>12</td>
<td>60</td>
<td>67</td>
<td>278 (278)</td>
</tr>
<tr>
<td>ES 900 (G 80)</td>
<td>6 0131 0075</td>
<td>12</td>
<td>80</td>
<td>90</td>
<td>353 (353)</td>
</tr>
<tr>
<td>ES 950 (G 85)</td>
<td>6 0131 0080</td>
<td>12</td>
<td>85</td>
<td>95</td>
<td>330 (330)</td>
</tr>
<tr>
<td>ES 1200 (G 110)</td>
<td>6 0131 0110</td>
<td>12</td>
<td>110</td>
<td>125</td>
<td>284 (254)</td>
</tr>
<tr>
<td>ES 1350 (G 120)</td>
<td>6 0131 0115</td>
<td>12</td>
<td>120</td>
<td>130</td>
<td>513 (475)</td>
</tr>
<tr>
<td>ES 1600 (G 140)</td>
<td>6 0131 0135</td>
<td>12</td>
<td>143</td>
<td>155</td>
<td>513 (475)</td>
</tr>
<tr>
<td>ES 2400 (G 210)</td>
<td>6 0131 0200</td>
<td>12</td>
<td>210</td>
<td>235</td>
<td>518 (475)</td>
</tr>
</tbody>
</table>

---

Battery clamps with M8-threaded terminal (- pole) and M10-threaded terminal (+ pole)

Mid size battery clamps max. 50 mm²

Angular battery clamps max. 50 mm²
EXIDE DUAL AGM batteries are high current batteries and have been designed to supply the DC system with energy as well as to deliver high power current for a good engine starting.

- Maintenance free
- Suitable for long breaks at 0 A consumption
- Without space restrictions
- Safe and clean (leak proof)
- High vibration resistance & tipping possibility
- Up to 50 % shorter charge time

EXIDE-AGM

<table>
<thead>
<tr>
<th>Type</th>
<th>Order-No.:</th>
<th>Voltage V</th>
<th>Capacity K10 (Ah)</th>
<th>CCA (A)</th>
<th>Dimensions L x W x H (mm)</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>EK 920</td>
<td>6 1874 9900</td>
<td>12</td>
<td>92</td>
<td>860</td>
<td>353</td>
<td>190</td>
</tr>
<tr>
<td>EP 900</td>
<td>6 0132 0100</td>
<td>12</td>
<td>100</td>
<td>720</td>
<td>330</td>
<td>173</td>
</tr>
<tr>
<td>EP 1200</td>
<td>6 0132 0140</td>
<td>12</td>
<td>140</td>
<td>700</td>
<td>513</td>
<td>233</td>
</tr>
<tr>
<td>EP 1500</td>
<td>6 0132 0180</td>
<td>12</td>
<td>180</td>
<td>900</td>
<td>513</td>
<td>223</td>
</tr>
<tr>
<td>EP 2100</td>
<td>6 0132 0240</td>
<td>12</td>
<td>240</td>
<td>1200</td>
<td>518</td>
<td>279</td>
</tr>
</tbody>
</table>

2V GEL BATTERIES (OPZV)

The gel batteries in 2V technology (OPzV) is the professional solution for big battery-capacities in order to avoid the parallel connection of small batteries. The possibility to check the voltage of each cell at any time offers a quick check during the lifetime. The construction in tube plate technology (armour plate battery) ensures a very long lifespan even under rough conditions as vibration and shock.

Delivery incl. cell connectors.

- Outstanding cycle quality
  2400 cycles at 60% disch. level (C10) and 20°C
- Absolutely maintenance free battery
  acc. DIN 40742
- Deep discharge safe
  acc. DIN 43 539 T5
- Low self discharge
  Storage life up to 1 year at +30°C
- Installation also in horizontal position
  easy installation and maintenance
- Approvals
  Germanischer Lloyd (GL), (UL), DIN/Gost/TÜV

Cover for battery poles type BK 6 and BMK for cable cross section from 25 up to 50 mm². Delivery as pair red/black.

Cover for battery poles type BK 6 and BMK for cable cross section up to 95 mm². Delivery as pair red/black.

Single black cover for battery poles type BK 6 and BMK.
When a battery is discharged, sulphating occurs in the electrodes and with so called deep discharging, an irreversible loss of capacity will take place. This is due the crystallization of materials around the electrodes. It also increases the risk of micro-short-circuits that would cause a faster self discharging the battery.

Deep discharging must be prevented in any case in order to avoid the premature failure of the batteries. The deep discharging protector saves the batteries before a dangerous situation by switching off the loads as soon as the voltage threshold is reached for a certain time. The reconnection will be done automatically when the batteries are recharged again and reach the switch-on level.

Dangerous deep discharging of a battery

Two stage deep discharge protection for optimal protection of your batteries

An energy management function can be activated, what means, that certain loads like an additional cooling box, a heating device or boiler will be activated only while the engine is running or a solar panel delivers enough energy, that the voltage rises above 13V.

Deep discharging must be prevented in any case in order to avoid the premature failure of the batteries. The deep discharging protector saves the batteries before a dangerous situation by switching off the loads as soon as the voltage threshold is reached for a certain time. The reconnection will be done automatically when the batteries are recharged again and reach the switch-on level.

Remote control panel with switch and control - LED. The LED shows the operation status of the main switch and warns by a flashing display before an oncoming switch off.

The remote controllable battery main switch TSA265 is suitable for the switching of a complete onboard DC-system incl. inverter. The remote panel FAR displays an optical warning before the TSA265 switches the system off when reaching the low voltage threshold. This panel allows a remote switching too. The reconnection takes place automatically at 12.5V/25V. The very low own consumption is no further load for the battery. If you need a higher current relay the switching interface TSR offers the same features as the TSA265. Together with the battery main switch FBR500 (500A nominal power) it can be used as deep discharge relay. The manual emergency override at the relay is always possible.

Remote control panel for switch and control - LED. The LED shows the operation status of the main switch and warns by a flashing display before an oncoming switch off.

The remote controllable battery main switch TSA265 is suitable for the switching of a complete onboard DC-system incl. inverter. The remote panel FAR displays an optical warning before the TSA265 switches the system off when reaching the low voltage threshold. This panel allows a remote switching too. The reconnection takes place automatically at 12.5V/25V. The very low own consumption is no further load for the battery. If you need a higher current relay the switching interface TSR offers the same features as the TSA265. Together with the battery main switch FBR500 (500A nominal power) it can be used as deep discharge relay. The manual emergency override at the relay is always possible.

Remote control panel for switch and control - LED. The LED shows the operation status of the main switch and warns by a flashing display before an oncoming switch off.
The lithium battery is suitable for the design of battery banks in series (24V, 48V) or also parallel circuits (higher capacity). The following external components are required:
- Main switch relay BDSA Order-No. 0 8930 0011 for the protection of the Super-B battery against overcharging and deep discharging
- M12-Cables for internal communication at 24V systems (please inquire)

The integrated battery management system, in conjunction with an external relay, protects the lithium cells from overcharging and deep discharging and monitors the temperature. Balancing is also carried out by the internal battery management.

Charging takes place with a normal GEL / AGM battery charger and can be carried out from 0 °C. At lower temperatures, the charging current should not exceed 0.1C.

The lithium battery for direct replacement against a standard 90Ah lead-acid battery in 12V systems. To increase capacity, several batteries can be connected in parallel. Integrated charging and discharging management system.

No external components required!

<table>
<thead>
<tr>
<th>Lithium - battery</th>
<th>SB 12V160E</th>
<th>SB 12V90E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order-No.</td>
<td>7 0101 2160</td>
<td>7 0101 2090</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>13.2 V</td>
<td>13.2 V</td>
</tr>
<tr>
<td>Capacity</td>
<td>160 Ah, completely usable</td>
<td>90 Ah, completely usable</td>
</tr>
<tr>
<td>Max. charging current</td>
<td>160 A (1C)</td>
<td></td>
</tr>
<tr>
<td>Lowest discharge voltage</td>
<td>10 V</td>
<td>10 V</td>
</tr>
<tr>
<td>Max. continuous current</td>
<td>480 A (3C)</td>
<td>480 A (3C)</td>
</tr>
<tr>
<td>Pulse discharging current 10 / 60 s.</td>
<td>1280 A (8C) / 800 A (5C)</td>
<td>1280 A (8C) / 800 A (5C)</td>
</tr>
<tr>
<td>EqPb (Equals lead-acid-battery)</td>
<td>350 Ah</td>
<td>350 Ah</td>
</tr>
<tr>
<td>Operat. temperature (charge / discharge)</td>
<td>0 °C to 45 °C / –20 °C to +60 °C</td>
<td>–20 °C to +60 °C / –30°C to 60°C</td>
</tr>
<tr>
<td>Interface</td>
<td>CAN-open</td>
<td>CAN-open, CI-Bus (LIN)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>L 413 x W 226 x H 314 mm</td>
<td>L 353 x W 175x H 190 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>28 kg</td>
<td>15 kg</td>
</tr>
</tbody>
</table>

Lithium batteries on yachts

The lithium-iron phosphate accumulator (LiFePO4) is characterized by high charging and discharging currents, a very good temperature-stability and a life expectancy of more than five times over conventional lead-acid batteries. The lithium-iron phosphate technology is safe because there can be no self-ignition during overheating. As a result, there is also no danger of explosion due to overcharging and gas formation. In contrast to lead batteries, the lithium iron phosphate batteries can also be stored in a partially discharged state for a prolonged period, without permanent damage. The flat discharge curve provides the maximum power up to full discharge (no "voltage or capacity break-in", as with lead-acid batteries). The very low aging losses allow a high cycle number of up to 5000 charging cycles with an identical discharge depth of comparable gel batteries.

The high cycle durability and the high current output capability of 1C - 3C continuous and up to 10C when the super-B lithium batteries are fast-charged makes the application very interesting with high-current loads and charging by combi-inverters for example.
Electronic diode splitter to charge several battery groups. In case the engine stops and the alternator too the batteries are separated completely and a mutual influence between the batteries will be prevented. The electronic diode splitter is an improvement of the conventional battery isolator with a very low voltage drop by MOS-FET-technology during the charge operation.

All disadvantages of voltage drop (0.7-1.0 V) and subsequently power lost are eliminated and the batteries will be charged with maximal acceptable current.

- Simultaneous charge of all connected batteries, empty batteries will be considered first.
- May be used for all charge units like alternator, battery charger, solar units, wind generators etc.
- No wearing and no mechanical switching
- Independent of size and type of battery (GEL, open lead, AGM)
- For alternator charging current up to 150 A or 200 A.

For standard and for not self excited alternator and for all types of batteries.

Connection by bolts M8.

<table>
<thead>
<tr>
<th>Type</th>
<th>MBI 150-2</th>
<th>MBI 150-3</th>
<th>MBI 200-3</th>
<th>MBI 2-100-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order-No.</td>
<td>7 0006 1502</td>
<td>7 0006 1503</td>
<td>7 0006 2003</td>
<td>7 0006 2103</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outputs</th>
<th>2</th>
<th>3</th>
<th>3 (2 inputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>12/24 V</td>
<td>12/24 V</td>
<td>12/24 V</td>
</tr>
<tr>
<td>Current rating</td>
<td>150 A</td>
<td>150 A</td>
<td>200 A</td>
</tr>
<tr>
<td>Resistance</td>
<td>&lt; 4 mΩ</td>
<td>&lt; 4 mΩ</td>
<td>&lt; 4 mΩ</td>
</tr>
<tr>
<td>Stand-by-current/ON</td>
<td>&lt; 0.5 mA / &lt; 15 mA</td>
<td>&lt; 0.5 mA / &lt; 15 mA</td>
<td>&lt; 0.5 mA / &lt; 15 mA</td>
</tr>
<tr>
<td>Dimensions</td>
<td>L 146 x W 85 x H 95 mm</td>
<td>L 153 x W 147 x H 95 mm</td>
<td>L 153 x W 147 x H 95 mm</td>
</tr>
</tbody>
</table>
An active charging relay is used if you don’t want or cannot change the wiring to the alternator and you want to add a second battery group which has to be charged while the engine is running. The active charging relay detects if the alternator is running and the voltage rises and then it connects both battery groups together automatically. If the voltage drops under a certain threshold the batteries are separated automatically in order to prevent an unintentional discharging of the starter battery. Automatical metering and setup to 12 V- or 24 V operation mode.

**ACR 12/24**
Order No.: 7 0010 7610

- for battery groups < 200 Ah
- optional connection of an external control LED

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>12 V + 24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continued rating</td>
<td>120 A</td>
</tr>
<tr>
<td>Excessive- / peak current</td>
<td>210 A / 280 A</td>
</tr>
<tr>
<td>Combine voltage 30 s (120 s)</td>
<td>13.6 V (13.0 V) / 27.6 V (26.0 V)</td>
</tr>
<tr>
<td>Cut-off voltage 10 s (30 s)</td>
<td>12.4 V (12.8 V) / 24.8 V (25.6 V)</td>
</tr>
<tr>
<td>Cut off high voltage</td>
<td>16 V / 30 V</td>
</tr>
<tr>
<td>Power consumption</td>
<td>15 mA</td>
</tr>
<tr>
<td>Terminals</td>
<td>Ø 10 mm</td>
</tr>
<tr>
<td>Dimensions</td>
<td>L 99 x W 98 x H 48 mm</td>
</tr>
<tr>
<td>Protection</td>
<td>IP67 (water tight)</td>
</tr>
</tbody>
</table>

**VSR 200**
Order No.: 0 8311 2000

- for battery groups > 200 Ah, emergency start function by remote button
- also useful as active load relay to activate certain loads only while the alternator is running.

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>12 + 24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continued rating</td>
<td>190 A</td>
</tr>
<tr>
<td>Excessive- / peak current</td>
<td>400 A / 1500 A</td>
</tr>
<tr>
<td>Combine voltage 30 s (120 s)</td>
<td>13.8 V (13.4 V) / 27.6 V (26.8 V)</td>
</tr>
<tr>
<td>Cut-off voltage 10 s (30 s)</td>
<td>12.5 V (13.0 V) / 25.0 V (26.0 V)</td>
</tr>
<tr>
<td>Cut off high voltage</td>
<td>16 V / 32 V</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1 mA</td>
</tr>
<tr>
<td>Terminals</td>
<td>M 8</td>
</tr>
<tr>
<td>Dimensions</td>
<td>L 120 x W 110 x H 50 mm</td>
</tr>
</tbody>
</table>

---

The BLA is recommended to equalize voltages when charging batteries are connected in series. The BLA always works when a voltage difference occurs between the 12V - battery blocks. It works during charging and discharging.

Differences in cell chemistry and temperature occur in batteries connected in series due to unbalanced voltage. The charger cannot eliminate the differences in voltages between the batteries.

This means that one battery is overloaded and the other is insufficiently charged.

Subsequent charging cycles reinforce this effect and lead to prematurely breakdown of the batteries.

The bi-directional BLA works in a way to balance the load in both directions regardless the condition of the batteries. If the voltage difference between both batteries reach 10 mV, the BLA switches on step by step.

The BLA gets its power from both batteries and remains connected all the time.

The BLA can balance one 24 V battery group, for higher voltages extra BLA are connected in series, it means that for a 36 V battery system 2 BLAs must be used, for a 48 V-system 3 units are necessary.

| Nominal voltage | 24 V (2x12V) |
| Equalizing current | 0 - 5A |
| Stand-by | < 3 mA |
| Dimensions | 70 x 70 x 27 mm |
Main battery switch for high strain and high current range. Professional high quality design based on the experience from the relay technique in waterproof execution.

The key of all models is removable (e.g. BH 200-80F) when switched off. Built-in or flange mounting, hole \( \phi 25 \text{ mm} \), max. wall thickness 33 mm.

Universal battery main switch series BHM for all purposes. The double pole model BHM 230 connects the positive poles of the start and service batteries at the same time. In the combine position, the batteries are linked to the emergency starting.

---

### Type

BH 200 F
BH 200-80 F
BH 400 F
BH 500 F
BH 220 F (2-pole)

### Order-No.:

6 0003 5200
6 0003 5210
6 0003 5400
6 0003 5500
6 0003 5220

### Cont. current, max. voltage

<table>
<thead>
<tr>
<th>Type</th>
<th>BH 200 F</th>
<th>BH 200-80 F</th>
<th>BH 400 F</th>
<th>BH 500 F</th>
<th>BH 220 F (2-pole)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 A / 32 V</td>
<td>200 A / 80 V</td>
<td>400 A / 32 V</td>
<td>500 A / 32 V</td>
<td>2 x 200 A / 32 V</td>
<td></td>
</tr>
<tr>
<td>500 A / 3 min</td>
<td>500 A / 3 min</td>
<td>1200 A / 4 min</td>
<td>1500 A / 4 min</td>
<td>2 x 500 A / 4 min</td>
<td></td>
</tr>
<tr>
<td>1000 A / 30 s</td>
<td>1000 A / 30 s</td>
<td>2000 A / 10 s</td>
<td>2500 A / 10 s</td>
<td>2 x 1000 A / 30 s</td>
<td></td>
</tr>
<tr>
<td>M10</td>
<td>M10</td>
<td>M10</td>
<td>M10</td>
<td>M8</td>
<td></td>
</tr>
<tr>
<td>IP 67</td>
<td>IP 67</td>
<td>IP 67</td>
<td>IP 67</td>
<td>IP 67</td>
<td></td>
</tr>
<tr>
<td>( \phi 55 \times 105 \text{ mm} )</td>
<td>( \phi 55 \times 105 \text{ mm} )</td>
<td>120 x 70 x 120 mm</td>
<td>120 x 70 x 126 mm</td>
<td>120 x 70 x 120 mm</td>
<td></td>
</tr>
</tbody>
</table>

### Protection

IP 67

### Connection

M10

### Dimensions

72 x 72 mm

### Application

Main switch ON/OFF

---

### Type

BHM 300
BHM 220 (2-pole)
BHM 230 (2-pole)
BWS 350

### Order-No.:

7 0010 6006
7 0010 6010
7 0010 6011
7 0010 9001

### Continues current

300 A

### Peak current

700 A / 9 s

### Protection

IP67

### Montage

Build-in/Build-on

### Connection

M10

### Dimensions

72 x 72 mm

### Application

Main switch ON/OFF
2 poles for metal hull

---

### Type

BHM 300
BHM 220 (2-pole)
BHM 230 (2-pole)
BWS 350

### Order-No.:

7 0010 6006
7 0010 6010
7 0010 6011
7 0010 9001

### Continues current

350 A

### Peak current

1600 A / 100 ms

### Protection

IP67

### Montage

Build-on

### Connection

M10

### Dimensions

96 x 98 x 80 mm

### Application

One main switch ON/OFF for two battery groups
Parallel switch I+II

---

### Type

BHM 300
BHM 220 (2-pole)
BHM 230 (2-pole)
BWS 350

### Order-No.:

7 0010 6006
7 0010 6010
7 0010 6011
7 0010 9001

### Continues current

350 A

### Peak current

1600 A / 100 ms

### Protection

IP67

### Montage

Build-on

### Connection

M10

### Dimensions

96 x 98 x 80 mm

### Application

One main switch ON/OFF for two battery groups
Parallel switch I+II

---

### Type

BHM 300
BHM 220 (2-pole)
BHM 230 (2-pole)
BWS 350

### Order-No.:

7 0010 6006
7 0010 6010
7 0010 6011
7 0010 9001

### Continues current

350 A

### Peak current

1600 A / 100 ms

### Protection

IP67

### Montage

Build-on

### Connection

M10

### Dimensions

96 x 98 x 80 mm

### Application

One main switch ON/OFF for two battery groups
Parallel switch I+II

---

### Type

BHM 300
BHM 220 (2-pole)
BHM 230 (2-pole)
BWS 350

### Order-No.:

7 0010 6006
7 0010 6010
7 0010 6011
7 0010 9001

### Continues current

350 A

### Peak current

1600 A / 100 ms

### Protection

IP67

### Montage

Build-on

### Connection

M10

### Dimensions

96 x 98 x 80 mm

### Application

One main switch ON/OFF for two battery groups
Parallel switch I+II

---

### Type

BHM 300
BHM 220 (2-pole)
BHM 230 (2-pole)
BWS 350

### Order-No.:

7 0010 6006
7 0010 6010
7 0010 6011
7 0010 9001

### Continues current

350 A

### Peak current

1600 A / 100 ms

### Protection

IP67

### Montage

Build-on

### Connection

M10

### Dimensions

96 x 98 x 80 mm

### Application

One main switch ON/OFF for two battery groups
Parallel switch I+II

---

### Type

BHM 300
BHM 220 (2-pole)
BHM 230 (2-pole)
BWS 350

### Order-No.:

7 0010 6006
7 0010 6010
7 0010 6011
7 0010 9001

### Continues current

350 A

### Peak current

1600 A / 100 ms

### Protection

IP67

### Montage

Build-on

### Connection

M10

### Dimensions

96 x 98 x 80 mm

### Application

One main switch ON/OFF for two battery groups
Parallel switch I+II

---

### Type

BHM 300
BHM 220 (2-pole)
BHM 230 (2-pole)
BWS 350

### Order-No.:

7 0010 6006
7 0010 6010
7 0010 6011
7 0010 9001

### Continues current

350 A

### Peak current

1600 A / 100 ms

### Protection

IP67

### Montage

Build-on

### Connection

M10

### Dimensions

96 x 98 x 80 mm

### Application

One main switch ON/OFF for two battery groups
Parallel switch I+II
The installation of a remote control main switch has several advantages: the safe and comfortable switching from a well accessible place which is easy to reach also in case of an emergency. The wiring system benefits from an installation of the main switch near the battery. Thus the voltage drop by longer wires will be avoided and the system works optimal.

**REMOTE BATTERY MAIN SWITCH**

Bistable main switch relay with integrated electronic control and LED status indication. Operation via external switch 0-1 or remote control panel FAR (page 66).

**Important:** in case of an emergency you can switch the relay manually!

*Rated Voltage: DC 12 V + 24 V*
*Live Current Rating: DC 260 A @ 20 °C, 50 mm²*
*Interruption / Cranking Rating: DC 400 A/5 s, 1500 A/0,2 s*
*Operating Current: 1 mA*
*Dimensions, Terminal: L 120 x W 110 x H 50 mm, M8*
*Protection: IP 54*

**FBR 265**
Order-No.: 0 8302 2650

**FBR 500-12**
Order-No.: 7 0010 7700

**FBR 500-24**
Order-No.: 7 0010 7702

Bi-stable remote battery switch with manual override knob. Protection IP 66.
Remote control switch incl. in delivery.

Matching panel for remote switch: panel 711 (please order separately).

*Rated voltage: 12 V or 24 V*
*Live Current Rating: DC 500 A @ 20 °C, 95 mm²*
*Consumption: 0 mA*
*Terminal stud size: 3/8”-16 (M10)*
*Dimensions: W 139 x H 95 x D 53 mm*

**CG A 200**
Order-No.: 6 4004 2001

Key operated switch (0-1) for remote control of FBR 265. The key can be withdrawn in off position.
Rated current 10 A, Mounting hole ø 22 mm

**RC 5-0-1**
Order-No.: 7 0010 2155

Remote control switch (0-1) with LED state indicator for remote control main switch FBR 265 and TSA 265.
Matching mounting panel: Panel 711
Order-No.: 0 2990 7110 (please order separately)

**BATTERY MAIN SWITCH**

Battery main switch for low-cost application. Both models with removable key when switched off.

**Type**

**Order-No.:**

**BH 1000 F**
7 6210 0840

**BH 1000 B**
7 6210 0842

**Continuous current**

| 140 A |
| 140 A |

**Installation**

| Flange fitting |
| Directly on battery |

**Connection**

| M10 |
| M10 |

**Dimensions**

| 116 x ø 64 mm |
| Hole ø 25 mm |
| 116 x ø 64 mm |

**RELAY**

Battery isolation relay for small battery plants or general use.

**Type**

**Order-No.:**

**REL 40 -12 V**
0 5999 2012

**TR 70 -12 V**
0 8000 7012

**TR 70 -24 V**
0 8000 7024

**Coil**

| 12 V / 1,8 W |
| 12 V / 1,8 W |
| 24 V / 1,8 W |

**Current**

| 40 A |
| 50 (70) A |
| 50 (70) A |

**Connection**

| Flat term. 6.3 mm |
| Flat terminals 9.6 mm / 6.3 mm |
| W 32 x L 29 x H 59 mm |

**Dimensions**

| W 139 x H 95 x D 53 mm |
Supply lines of bilge pump, alarm systems and lines for voltage and current measurement devices have to be protected by thermal fuses or - better - thermal circuit breakers. They must be installed as close as possible to the batteries. The circuit breakers of the series E-T-A 1610 and E-T-A 1170 are the best solution due to the easy plugging possibility.
**FUSE BLOCKS UP TO 30 A**

**ET-A 1140-G111-P1M1**

Miniaturised single pole thermal circuit breaker with push-to-reset failsafe, trip-free, snap on mechanism (R-type TO CBE to EN 60934). Panel mounting. Fitting hole ø12 mm. Rated voltage DC 28 V, AC 250 V. Current ratings 10 A...16 A. Width 11 mm.

Available ex stock:
- 1140-G111-P1M1-10A  No. 1 1141 0010
- 1140-G111-P1M1-16A  No. 1 1141 0016

**ET-A 2-5700-IG1-K10-DD**

Single pole thermal circuit breaker with press-to-reset, failsafe, trip-free, snap action mechanism. For panel mounting ø 10 mm. Protection caps (optional) particularly available for high humidity and other damp conditions. (see page 75)

Rated voltage DC 28 V, AC 250 V. Current ratings 6...25 A.

Circuit breakers available ex stock:
- 2-5700-IG1-K10-DD-6A  No. 1 2570 0006
- 2-5700-IG1-K10-DD-8A  No. 1 2570 0008
- 2-5700-IG1-K10-DD-10A  No. 1 2570 0010
- 2-5700-IG1-K10-DD-12A  No. 1 2570 0012
- 2-5700-IG1-K10-DD-16A  No. 1 2570 0016
- 2-5700-IG1-K10-DD-20A  No. 1 2570 0020
- 2-5700-IG1-K10-DD-25A  No. 1 2570 0025

---

**Why using a circuit breaker?**

The use of a circuit breaker instead of a main switch and separate fuse has the following advantages:

- Less space required, because only one item.
- Much easier and faster installation, because no additional wire between switch and fuse is required.
- No change of the fuse after a short.
- The cost of a circuit breaker isn’t higher than for a main switch and high power fuse.

---

**FUSE BLOCKS UP TO 30 A**

**ASB 6**

Fuse holder for 6 blade fuses. Common potential for all slot connections. Lug terminals ø 6 mm facilitate installation. Included is an easy removable transparent cover with label boxes and storage for two spare fuses. Maximum current per circuit: 30 A, (total 100 A). Order No. 7 0010 5028

**ASM 6**

Order No. 7 0010 5025

**ASM 12**

Order No. 7 0010 5026

Fuse holder for 6 (12) blade fuses and common connection for all slots and in addition negative terminals. Lug terminals ø 6 mm facilitate installation. Included is an easy removable transparent cover with label boxes and storage for two spare fuses.

Maximum current per circuit 30 A, (total 100 A).

Dimensions ASM 6

L 125 x W 84 x H 39 mm

Dimensions ASM 12

L 165 x W 84 x H 39 mm

---
Fuses & Fuse Blocks up to 125 A

Fuse blocks are useful for loads which don’t need an extra switching function from the distribution panel. They provide a clear, compact and reasonable priced solution for smaller boats or additional requirements.

- **SHF 150**
  Order No.: 7 0010 7748
  Safety hub fuse block with integrated negative busbar for small to medium size yachts. 4 MIDI fuses type STM (25-125 A) and 6 blade fuses type FSS (1-25 A). Watertight and ignition protected cover provides storage space for 4 spare fuses. Please order fuses separately!
  Dimensions L 165 x W 129 x H 48 mm

Protection of on board installation

An electrical fire is a terrifying situation at anytime, but on board a boat consequences can be catastrophic. E-T-A circuit breakers are designed to minimize the danger of fires in electrical wiring and systems by providing efficient and reliable protection against overload and short circuit conditions.

At the same time E-T-A circuit breakers are conveniently resetable once the fault has been corrected. This eliminates the need of replacement fuses or the risk of fitting unsuitable temporary fuse replacement. The problems of corrosion and fatigue often associated with fuses are also eliminated.

In addition, nearly all circuit breakers on the following pages may be operated as switches.

It is particularly important to be sure that the current rating selected for the circuit breakers is not greater than the current rating of the cables. As a general guide the adjacent table (Germanischer Lloyd) may be followed for single conductors in well ventilated areas.

### Single Conductor referring to “Germanischer Lloyd”

<table>
<thead>
<tr>
<th>Conductor-Cross Section Area mm²</th>
<th>Current Rating amps</th>
<th>Recommended Circuit Breaker Rating amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>2.5</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>29</td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>16</td>
<td>54</td>
<td>50</td>
</tr>
<tr>
<td>25</td>
<td>71</td>
<td>60</td>
</tr>
<tr>
<td>35</td>
<td>87</td>
<td>80</td>
</tr>
<tr>
<td>50</td>
<td>105</td>
<td>100</td>
</tr>
<tr>
<td>70</td>
<td>135</td>
<td>125</td>
</tr>
<tr>
<td>95</td>
<td>165</td>
<td>160</td>
</tr>
</tbody>
</table>

MIDI Strip fuse up to 125 A.
Nominal voltage 32 V. Fixing hole distance 30 mm.
Dimensions W 42 x H 12 x D 8 mm

- **SHM 1**
  Order No.: 6 5631 0001
  Small fuse holder for MIDI strip fuses up to 50 A.
  Especially for the protection of lines up to 10 mm². Connecting terminals M5.
  Dimensions L 70 x W 50 x H 22 mm

- **STM 30**
  Order No.: 6 5631 5301
  STM 50
  Order No.: 6 5631 5401
  STM 60
  Order No.: 6 5631 5501
  STM 80
  Order No.: 6 5631 5601
  STM 100
  Order No.: 6 5631 5801
  STM 125
  Order No.: 6 5631 5901
  Order No.: 6 5631 6001

- **SHN 1**
  Order No.: 7 0010 7720
  Safety fuse block for MIDI- fuses STM up to 125 A. Max. 32 V with watertight and ignition protected cover IP 66. Terminal stud size M8. Please order fuses separately!
  Dimensions L 127 x W 47 x H 41 mm
**THERMAL CIRCUIT BREAKER FOR CURRENTS UP TO 100 A**

- **TCB 30 A**
  - Order No.: 7 0010 7181
- **TCB 40 A**
  - Order No.: 7 0010 7182
- **TCB 50 A**
  - Order No.: 7 0010 7183
- **TCB 70 A**
  - Order No.: 7 0010 7185
- **TCB 100 A**
  - Order No.: 7 0010 7187


- **4130-G211-K4M1-30 A**
  - Order No.: 1 4130 0030
- **4130-G211-K4M1-40 A**
  - Order No.: 1 4130 0040
- **4130-G211-K4M1-50 A**
  - Order No.: 1 4130 0050
- **4130-G211-K4M1-60 A**
  - Order No.: 1 4130 0060
- **4130-G211-K4M1-70 A**
  - Order No.: 1 4130 0070

Single pole thermal circuit breaker with an unstoppable release. Fitting hole ø 12 mm. Width of breaker: 18 mm. Rated voltage DC 28 V. Current ratings 30...70A. Splash water proof cap is available (see below)

- **B017**
  - Order No.: 1 2107 3901
Protection cap for E-T-A 2-5700 for watertight panel installation, IP 64.

- **B006**
  - Order No.: 1 2008 0101
Protection cap for E-T-A 413, 4130 for watertight panel installation, IP 66.

**MPE 120**
- **Order No.: 0 2800 4500**
Mounting panel for 2 circuit breakers series 2-5700, 413, 4130. Circuit breakers have to be ordered separately!

**BOLT FUSES AND TERMINAL FUSE BLOCKS UP TO 300 A**

The terminal fuse block ABH 1 is designed for an easy and space saving installation of high current bolt fuses directly on a battery or a bus bar. Maximum current of the fuse holder ABH 1 is 300A. Rated voltage 58V.

- **ABH 1**
  - Order No.: 7 0010 5191
  
  Terminal fuse block for a single bolt fuse SHB. For protection of different wire-diameters at one bolt. Delivery without bolt fuse SHB, please order separately!
  
  Dimensions: L 63 x B 21 x H 47 mm
  
  Bolt: M 8
  
  Mounting hole: 10 mm

Optional cascade installation for fusing of different wire diameters at one place.

- **SHB 30 A**
  - Order No.: 6 0892 5301
- **SHB 50 A**
  - Order No.: 6 0892 5501
- **SHB 75 A**
  - Order No.: 6 0892 5751
- **SHB 100 A**
  - Order No.: 6 0892 6101
- **SHB 125 A**
  - Order No.: 6 0892 6121
- **SHB 150 A**
  - Order No.: 6 0892 6151
- **SHB 200 A**
  - Order No.: 6 0892 6201
- **SHB 250 A**
  - Order No.: 6 0892 6251
- **SHB 300 A**
  - Order No.: 6 0892 6301

Fuses for M 8 - bolt. Rated voltage DC 58V.
The strip fuses consist of a melting strip within a ceramic holder with window. Type B/BN. Mouth width 11 mm.

Example of a power connection box using busbars MSB, terminal blocks ABH, battery management shunts SHC, remote main battery switches FBC and switching interface CMR.
PROTECTION OF MEDIUM SIZE LOADS

The circuit breaker block CLB 6 is recommended for the fusing of continuous current loads up to 30A like bilge pumps, heater and autopilot. Installation close to the battery.
Up to 6 loads can be protected via the circuit breaker block CLB 6. Quick connect clips allow circuit breakers series 1659 to snap easily into place.
This block is an optimal replacement part for melting fuses. The circuit breakers series 1659 stand out due to a very attractive price/ performance ratio.

Please note: The circuit breakers series 1659 are not switchable and use therefore only as replacement for melting fuses.
All inputs of the CLB 6 are connected, so that you need only one supply line.
Clear insulating cover with square format label recesses. Breakouts allow wire access in two directions. Optional push button waterproof boots are available (Order-No.: 7 0010 4135) for the circuit breakers series 1659. One circuit breaker is part of delivery of the CLB 6, others have to be ordered separately.

CIRCUIT BREAKER FOR HIGH CURRENT LOADS

These hydraulic-magnetic circuit breakers are used for supply lines of panels, anchor windlass and bow thrusters, which can be immediately reactivated after a short without time- killing replacement of a fuse. The circuit breaker series 8345 combines main switch and fuse and are thereby a cost- efficient and space- saving alternative to standard battery main switches with a separate fuse. They should be mounted as close as possible to the battery.

Single pole push button reset only thermal circuit breaker in compact design with thread mounting. Trip free design cannot be held ON during fault current condition. While triggered, a white/black push button can be seen.
• Quick manually reset
• Trip free design
• Approved to UL 1077, TÜV, CCC and EN 60934

Rated voltage 32 V DC
Amperage max per block 100 A DC
Amperage max per fuse 32 A DC
Dimensions (mm) L170 x W 71 x H 70
Temperature range -10 - 60°C
Thread 3/8”-27T

Single pole high performance hydraulic-magnetic circuit breaker, with failsafe, trip-free lever function. Panel mounting, width 19mm. Rated voltage DC 80V, AC 240V. Current ratings 1..125A. Terminal stud size M6

Single pole high performance hydraulic-magnetic circuit breaker, with failsafe, trip-free lever function. Panel mounting, width 33 mm. Rated voltage DC 80V, AC 240V. Terminal for screw M8.

Single pole push button reset only thermal circuit breaker in compact design with thread mounting. Trip free design cannot be held ON during fault current condition. While triggered, a white/black push button can be seen.
• Quick manually reset
• Trip free design
• Approved to UL 1077, TÜV, CCC and EN 60934

Single pole high performance hydraulic-magnetic circuit breaker, with failsafe, trip-free lever function. Panel mounting, width 33 mm. Rated voltage DC 80V, AC 240V. Terminal for screw M8.

Single pole high performance hydraulic-magnetic circuit breaker, with failsafe, trip-free lever function. Panel mounting, width 33 mm. Rated voltage DC 80V, AC 240V. Terminal for screw M8.
**POWER POST CABLE CONNECTORS**

- **DFB schwarz**  Order No.: 7 0010 2203
- **DFB rot**  Order No.: 7 0010 2204

Terminal feed through connectors (red/black) with M8 terminal pins at each side.
Fitting hole ø 17.5 mm
Dimensions (front)  H 32 x W 51 mm

- **EKS**  Order No.: 6 1690 0147

Installation bolt M10. Screw thread 25 mm
Dimensions  L 32 x W 28 x H 45 mm

- **FSB 3**  Order No.: 6 1388 6033

Flat slot block for flat terminals 6.3 mm, 3 separate potentials with 4 terminals each.
Max. 25 A.
Dimensions  L 53 x W 36 x H 22 mm

- **SSP 1**  Order No.: 7 0010 2003

Central mounting base with screw and bolt ø 9.5 mm. Two drilled holes ø 6.3 mm for attaching base. Incl. red cap.
Dimensions  L 90 x W 50 x H 57 mm

- **SSP 1/8**  Order No.: 7 0010 2103

Central mounting base with 8 additional fasteners. Screw and bolt ø 9.5 mm. Two drilled holes ø 6.3 mm for attaching base. Incl. red cap.
Max. 150 A.
Dimensions  L 90 x W 50 x H 57 mm

- **SSP 2**  Order No.: 7 0010 2017

Two pole cable connector. 2 socket threaded bolts 9.5 mm. There are two mounting holes ø 6.3mm at the base. Caps are included.
Dimensions  L 70 x W 48 x H 45 mm

**BUS BARS**

High standard negative pole bus bar for larger installations. Suitable for battery leads to windlass, bow thrusters and other consumers. The rated cross section of the bus bar carries 300 mm² - rated current 500 A.
It’s made of electro tin plated copper bar mounted on plastic isolation blocks.

- **MSS 9**  Order No.: 0 8000 9045

Fits: 4 x 95 mm² (M8) and 5 x 25 mm² (M6) lugs or terminals.
Dimensions  L 238 x W 39 x H 42 mm

- **MSB 6**  Order No.: 0 8000 9006

Fits 6 x lugs or terminals with hole 10 mm (M10).
Dimensions  L 240 x W 39 x H 55 mm

- **MSB 4**  Order No.: 0 8000 9004

Fits 4 x lugs or terminals with hole 10 mm (M10).
Dimensions  L 180 x W 39 x H 55 mm
BUS BARS

COMPACT DOUBLE BUS BAR WITH 5 CONSUMERS (10-32 SCREWS) AND 2 CABLE CONNECTIONS (1/4” BOLTS). FOR LUGS DIAMETER 4 (6) mm². INCL. REMOVABLE TRANSPARENT COVER.

**Dimensions**

**SMS 7**
- Order No.: 7 0010 2304
- Dimensions: L 107 x W 22 x H 22 mm

**SMS 12**
- Order No.: 7 0010 2301
- Dimensions: L 155 x W 32 x H 32 mm

**SMS 22**
- Order No.: 7 0010 2302
- Dimensions: L 235 x W 32 x H 32 mm

**SMS 7**
- Order No.: 7 0010 2304
- Dimensions: L 107 x W 22 x H 22 mm

**SMS 12**
- Order No.: 7 0010 2301
- Dimensions: L 155 x W 32 x H 32 mm

**SMS 22**
- Order No.: 7 0010 2302
- Dimensions: L 235 x W 32 x H 32 mm

WATERPROOF JUNCTION BOXES

The junction boxes (AZK) reveal a new dynamic in technic and design. The moulded technic in the model AZK 25 offers mounting comfort. Because the moulds leading diaphragm are injected, their membranes can be punctured as needed. The leads are driven through the punctured opening leaving the box itself water sealed. Model AZK 60 has plenty of room for connection, and an accessible segment fitting. The leads are easily placed under the segment fitting for an organized fit. Junction boxes may be mounted if needed, close to one another on either of the four sides. The AZK 60 and larger, require grommets for all connecting leads. All junction boxes are made of impact and flame resistant polystyrene. Square dimensions. Protective system IP 65.

**AZK 25**
- Order No.: 6 0780 2407
- Dimensions: L 80 x W 80 x H 52 mm
- Matching cable screw gland: (M20x1,5)

**AZK 60**
- Order No.: 6 0780 6407
- Dimensions: L 110 x W 110 x H 67 mm
- Matching cable screw gland: (M20x1,5/25x1,5)

**AZK 100**
- Order No.: 6 0781 0410
- Dimensions: L 140 x W 140 x H 79 mm
- Matching cable screw gland: (M20x1,5/25x1,5)

**Grey junction box with 5 poles screw terminals of 2.5 mm² (4 x 1.5 / 4 x 2.5 mm²), soft sealing entry membrane M20. IP 65, seal range 2 - 16 mm**
The terminal bar is the interface connection for all electrical systems on board. All installation wires are connected and listed there. The terminal bars produce a secure overall view of the on board installation and a quicker access during service or add-ons without painful searching.

Distribution panels with circuit breakers are also connected to the terminal bars.

The terminal bars can be added on at all time. For main connection, the negative and positive pole terminals have a large cross-section of 10 mm² and 35 mm². The terminals for the outlets are suitable for 4 and 6 mm² cable. The negative poles of all single pole terminals are bridged together. It replaces the function of a bus bar for negative connections.

We also manufacture terminal bars according to your desire. There are all sizes and models of terminals available. Furthermore, terminals for very big cable diameters (> 50 mm²) and for control and measurement circuits are available.

Please contact us for more information...
**WATERTIGHT CONNECTORS / CABLE LEAD THROUGH**

**ROUND PLUG CONNECTORS**

Watertight round connectors are mostly used to disconnect electrical wirings on board of yachts and sport boats.

Attributes such as:
- high nominal power
- screw terminals
- small dimensions
- simple to secure screw closures
- space for comfortable installation

meets with the requirements of applications aboard pleasure crafts.

<table>
<thead>
<tr>
<th>Series</th>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD 06</td>
<td>0 8400 0006</td>
<td>Stainless steel lead through for VHF cable plug, cable Ø 4-10 mm, flange Ø 50 mm</td>
</tr>
<tr>
<td>DD 10</td>
<td>0 8400 0010</td>
<td>Stainless steel lead through for VHF cable plug, cable Ø 7-14 mm, flange Ø 50 mm</td>
</tr>
<tr>
<td>DD 16</td>
<td>0 8400 0016</td>
<td>Stainless steel lead through for round plug Series 692, cable Ø 6-15 mm, flange Ø 70 mm</td>
</tr>
</tbody>
</table>

Cable lead throughs are used for leading cables in various diameters through the deck. The series DD 06 - 20 are designed to lead the complete cable including the connectors through the deck. The connection of the outlets are hereby protected below deck and they prevent sensitive contact points, (such as the coaxial plugs) from corroding. A gasket cover for winterising is included. Due to the Pg closure the connection is watertight and strain relieved.

Round plug connector series 692 are available for:
- 2 and 4 pole for illumination
- 7 pole for wind speed indicator
- 2+PE for shore power 230 V

Round plug connector series 694 are available for:
- 13 and 24 pole for signal
- radar cable with 16 NF- and 2 RF contacts
- coaxial cable of RG 58 C/U and RG 213 U
- 4+PE for shore power 400 V

Gyl logo

The round plug connectors are tested by Germanischer Lloyd and approved for use in low voltage 230 V/50 Hz cycles and voltage up to 50 V water craft.

<table>
<thead>
<tr>
<th>Series</th>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDK 06 / 4-10 mm</td>
<td>7 7000 8011</td>
<td>For leading cables through deck. Robust plastic version to protect against corrosion and salt water. The use of O-rings guards against leaks. Perfect avoidance of cable stress.</td>
</tr>
<tr>
<td>DDK 10 / 5-12 mm</td>
<td>7 7000 8013</td>
<td></td>
</tr>
<tr>
<td>DDK 16 / 10-14 mm</td>
<td>7 7000 8016</td>
<td></td>
</tr>
<tr>
<td>KDT 8</td>
<td>5 0081 2163</td>
<td>For leading cables through mast. Max. cable range 8 mm, hole Ø 12 mm.</td>
</tr>
</tbody>
</table>

Stainless steel lead through for round plug Series 694, cable Ø 8-15 mm, flange Ø 80 mm
**Series 692**

<table>
<thead>
<tr>
<th>No. of poles</th>
<th>2+PE</th>
<th>2</th>
<th>4</th>
<th>7</th>
<th>Protective cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. cross sections</td>
<td>2,5 mm²</td>
<td>2,5 mm²</td>
<td>2,5 mm²</td>
<td>1,5 mm²</td>
<td></td>
</tr>
<tr>
<td>Type of connection</td>
<td>screwed</td>
<td>screwed</td>
<td>screwed</td>
<td>screwed</td>
<td></td>
</tr>
<tr>
<td>Cable bore</td>
<td>10-12 mm</td>
<td>6-8 mm</td>
<td>6-8 mm</td>
<td>6-8 mm</td>
<td></td>
</tr>
<tr>
<td>Contact surface</td>
<td>Ag</td>
<td>Ag</td>
<td>Ag</td>
<td>Ag</td>
<td></td>
</tr>
<tr>
<td>Type of protection</td>
<td>IP 66</td>
<td>IP 66</td>
<td>IP 66</td>
<td>IP 66</td>
<td></td>
</tr>
<tr>
<td>Housing material</td>
<td>PBT-gv</td>
<td>PBT-gv</td>
<td>PBT-gv</td>
<td>PBT-gv</td>
<td>PBT</td>
</tr>
<tr>
<td>Rated power per contact</td>
<td>16 A</td>
<td>16 A</td>
<td>16 A</td>
<td>10 A</td>
<td></td>
</tr>
<tr>
<td>Rated voltage according VDE 0110/72</td>
<td>230 V</td>
<td>50 V</td>
<td>50 V</td>
<td>50 V</td>
<td></td>
</tr>
</tbody>
</table>

**ACCUSSORIES FOR ROUND PLUG CONNECTORS - SERIES 692**

- **“566” Angular housing**
  - Order No.: 0 0566 0000
  - 90° angular housing for horizontal fitting of flange plug and socket on deck.
  - Dimensions: L 56 x W 53 x H 36 mm

- **“567” Square housing**
  - Order No.: 0 0567 0000
  - Square housing for vertical fitting on deck. By use of this housing only the diameter of cable is drilled through deck.
  - Dimensions: L 56 x W 53 x H 25 mm

- **“568” Block housing 3**
  - Order No.: 0 0568 0000
  - Block housing for deck fitting with 3 flange plugs, sockets or Pg 13,5 closure for cable through deck.
  - Dimensions: L 117 x W 56 x T 25 mm

- **Flange plug**
  - Order No.: 0 0566 0000
  - Flange plug for assembly on a block or angular housing - Series 692. Suitable for leading through a coaxial plug cable with max. 22 mm diameter. A screw-on cap is included.

- **Protecting cap**
  - Order No.: 0 0565 0000
  - Protective cap against contact on connection side of plug and socket.

- **Flange Ring Pg 13.5**
  - Order No.: 0 0569 0000
  - Pg closure with flange ring for assembly on a block or angular housing - Series 692.
# Series 694

<table>
<thead>
<tr>
<th>Feature</th>
<th>4-Pe</th>
<th>13</th>
<th>24</th>
<th>Radar (16NF-2HF)</th>
<th>Co-axial</th>
<th>Protection cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of poles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. cross section</td>
<td>2.5 mm²</td>
<td>1 mm</td>
<td>0.25 mm²</td>
<td>0.25 mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of connection</td>
<td>screwed</td>
<td>soldered</td>
<td>soldered</td>
<td>soldered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable bore</td>
<td>Pg 13.5/10-12 mm</td>
<td>Pg 13.5/10-12 mm</td>
<td>Pg 13.5/10-12 mm</td>
<td>Pg 13.5/10-12 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>L 74 x W 70 x H 45 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coupling plug Order No.</td>
<td>4 0709 0005</td>
<td>4 0717 0013</td>
<td>4 0737 0024</td>
<td>4 0785 0018</td>
<td>4 0783 0001</td>
<td>4 0425 1700</td>
</tr>
<tr>
<td>Coupling socket Order No.</td>
<td>4 0710 0005</td>
<td>4 0718 0013</td>
<td>4 0738 0024</td>
<td>4 0786 0018</td>
<td>4 0782 0001</td>
<td>4 0426 1700</td>
</tr>
<tr>
<td>Flange plug Order No.</td>
<td>4 0711 0005</td>
<td>4 0719 0013</td>
<td>4 0739 0024</td>
<td>4 0787 0018</td>
<td></td>
<td>4 0427 1700</td>
</tr>
<tr>
<td>Flange socket Order No.</td>
<td>4 0712 0005</td>
<td>4 0720 0013</td>
<td>4 0740 0024</td>
<td>4 0788 0018</td>
<td>4 0784 0001</td>
<td>4 0428 1700</td>
</tr>
</tbody>
</table>

## ACCESSORIES FOR ROUND PLUG CONNECTORS - SERIES 694

### Angular housing
- **Order No.:** 0 0666 0000
- **Dimensions:** L 74 x W 70 x H 52 mm
- **Description:** 90° angular housing for horizontal fitting of flange plug and socket on deck.

### Square housing
- **Order No.:** 0 0667 0000
- **Dimensions:** L 74 x W 70 x H 45 mm
- **Description:** Square housing for deck fitting. By use of this type of housing, only the diameter of cable is drilled through deck.
The newest technology in connectors is the MagCode system. A completely new and revolutionary plug. Contacts are connected and hold together with the power of magnetic force. As long as the plug and socket are not closed, the contacts are absent of power and prevent a short. Only after bringing both contact groups together again the circuit will be closed. The MagCode connectors are available in voltage rates of 12 V and 24 V.

The small fitting depth allows a simple mounting in any problem space. Easy to fit is the cap for protection against moist and dirt. High operation safety in case of vibrations or in heavy seas, very important for mobile phones or notebooks, which need an interruption-free power supply. An encoder prevents connection between 12 V and 24 V.

**MINIATURE CONNECTORS FOR OUTSIDE USE**

- Coupling plug Serie 720 - 3pol. Order-No.: 4 9105 0303
- Coupling socket Serie 720 - 3pol. Order-No.: 4 9106 0303
- Coupling plug Serie 720 - 5pol. Order-No.: 4 9113 0305
- Coupling socket Serie 720 - 5pol. Order-No.: 4 9114 0305
- Cap for coupling plug Order-No.: 4 2587 0000
- Cap for coupling socket Order-No.: 4 2586 0000

Sub-miniature round plug connection with very small dimensions. 3 and 5 pole version. Usable for plug-in data processing in wind measurement, etc. Housing polyamide (PA 66), bearing tube PBTB. Soldered connection. Gold plate contacts. Max. cable clamp 4 - 6 mm. IP 67

- Dimensions coupling plug, -socket  L 57 x Ø 16 mm
- Current in each contact (3 pole version) 7 A
- Current in each contact (5 pole version) 5 A

**HIGH DUTY PLUG CONNECTORS FOR INSIDE**

This is a plug connection in 2-pole version for special applications in the area of higher current up to 80 A / 96 V made of heavy duty material.

- LB 80 S Coupling plug incl. hand grip Order-No.: 6 1209 8000
- LB 80 D Coupling socket Order-No.: 6 1210 8000
- LB 80 H Grip only Order-No.: 6 1768 0000

The contacts may be crimped or soldered. Assembly in the housing is without fasteners (snap-in). A hand grip is available as accessory. It can be fitted either on the plug or socket part. Connection diameter max. 25 mm², protection type IP 23.
This connector is designed for high current applications up to 65 A. It can be used for outboard engines, wind generators, solar panels, hydro generators or electric propulsions. The internal clip mechanism allows an easy connection: insert the dismantled cable, close the clip and fasten the housing - that’s it! The connector is watertight protection IP 68 while connected. The locking mechanism avoids unintended disconnection of the connector.

### USB-CHARGING SOCKETS

#### USB FM
Order No.: 7 0030 0240

USB double charging socket DC 12/24 V, output USB: 5 V, 2 x 1.5 A. Fitting hole Ø 30 mm, front fitting version. Ø 47 mm, depth only 23 mm!

#### USB GW
Order No.: 7 0030 0250

USB double charging socket DC 12/24 V, output USB: 5 V, 2 x 1.5 A. Fitting hole Ø 30 mm, fastening by a hex nut Ø 37, depth only 23 mm!

#### USB EK
Order No.: 7 0010 1039

USB double charging socket incl. cap, DC 12 / 24 V, output USB: 5 V 2x 2.5 A, max. 4.8 A. Cut-out: 37 x 21.5 mm, depth 60 mm. For use with panels series STV 700.

#### USF 3A
Order No.: 3 6733 9000

Flat USB built on socket 12/24VDC
Output USB: 5 V, 3 A.
Dimensions L 42 x W 34 x H 15 mm

#### UWB
Order No.: 3 6730 2100

Angle adjustable USB-double charging socket DC 12/24 V, output 5 V (2 x 2.5 A). For the use with cigarette lighter or standard socket outlets.

#### USB
Order No.: 7 0010 1044

USB data inlet incl. cap and USB extension-cable, length 1.5 m. Fitting hole Ø 29 mm, suits USB 2.0.

#### USD 5D
Order No.: 3 6732 1100

USB double charging socket DC 12/24 V. Output USB: 5 V, 2 x 2.5 A. Fitting hole Ø 28 mm, depth 60 mm, fastening by a hex nut.

#### USD 5D MP
Order No.: 3 6732 2000

USB double charging socket DC 12/24 V with assembly plate 60 x 40 mm. Output USB: 5 V, 2 x 2.5 A. Fitting hole Ø 28 mm, depth 60 mm.

#### USA 3
Order No.: 3 6733 1000

as above, 1xUSB-output 5 V, 3 A, without cap

#### USA 3 MP
Order No.: 3 6733 2000

as above, 1xUSB-output 5 V, 3 A, without cap

#### USD 12/24 A
Order No.: 3 6732 3000

Double USB built on socket DC 12/24 V / Output USB: 5 V, 2 x 2.5 A. No cap.
Dimensions L 85 x W 34 x H 33 mm

#### USB 3
Order No.: 3 6733 3000

as above, 1xUSB-output 5 V, 3 A, without cap
**CONNECTORS DC 12/24 V**

- **US 12/24-8 A**  
  Order No.: 3 6771 1000
  - Universal plug with screw-on connection, pull relief. The red adaptor can be firmly positioned by a bayonet catch. Suitable for cigarette lighter sockets and normal plug. 6-24 V.

- **US 12/24-16 A**  
  Order No.: 3 6771 1010
  - Universal plug with integrated LED and pull relief. The red adaptor can be firmly positioned by a bayonet catch. Matches to built in socket 12 and 21 mm.

- **USL 12/24-8 A**  
  Order No.: 3 6771 1100
  - Universal plug with integrated LED and pull relief. The red adaptor can be firmly positioned by a bayonet catch. Matches to built in socket 12 and 21 mm.

- **SUS 12/24-8 A**  
  Order No.: 3 6771 2000
  - Universal plug with integrated fuse 8 A with screw connection and pull relief. The red adaptor can be firmly positioned by a bayonet catch. Matches to built in socket 12 and 21 mm. 6-24 V.

- **SWS 12/24-8A**  
  Order No.: 3 6774 2000
  - Angle adjustable universal plug with integrated fuse 8 A. The red adaptor can be firmly positioned by a bayonet catch, fitted for cigarette lighter and standard socket outlets. Rated voltage 6-24 V. Up to max. 1,5 mm² cable diameter.

- **UWS 12/24-8A**  
  Order No.: 3 5773 0000
  - Universal angle plug with function control light (LED) and integrated fuse. The tightening collar with bayonet snap-in ensures a tight closure. Rated voltage 6-24 V, current 7.5 A. Up to max. 1.5 mm² cable diameter.

- **NS 12/24-15**  
  Order No.: 3 5300 5001
  - Standard plug for all kinds of additional equipment connection, matches to all normed plug sockets. Rated voltage 6-24 V, current 15 A.

- **ASD 12/24**  
  Order No.: 3 5760 8002
  - Built-in socket with protective cap. Suitable for normed/standard and universal plugs. Connection via flat terminals 6.3mm. Rated voltage 6-24 V, current 16 A.

- **ESD 12/24 MP**  
  Order No.: 0 8000 0401
  - Built-in normed socket with protective cap and assembly plate. Suitable for normed and universal plugs. Connection via flat terminals 6.3mm. Rated voltage 6-24 V, current 16 A. Dimensions W 60 x H 45 x D 40 mm.

- **ESD 12/24**  
  Order No.: 3 5760 7002
  - Built-in normed socket with protective cap against dust and spray. Suitable for normed/standard and universal plugs. Hole Ø 18 mm. Connection via flat terminals 6.3mm. Rated voltage 6-24 V, current 16 A.

- **DSD 12/24**  
  Order No.: 3 5761 2002
  - Built-in socket with protective cap. Suitable for normed/standard and universal plugs. Drill diameter Ø 18 mm, panel thickness max. 13 mm, completed with cable length 0.3 m.

- **WSD 12/24**  
  Order No.: 3 5200 5000
  - Waterproof built-in socket with protective cap. Suitable for normed/standard and universal plugs. Drill diameter Ø 18 mm, panel thickness max. 13 mm, completed with cable length 0.3 m.

- **USL 12/24**  
  Order No.: 3 5762 0000
  - Coupling for cable extension of power supply to electrical equipment, lighting and multi-contact connection. Suitable for normed/standard and universal plugs. Rated voltage 6-24 V, current 16 A.
CONNECTORS DC 12/24 V

- **AZS 12V**
  - Order-No.: 700021212
  - Rated voltage 6-24 V.

- **AZS 24V**
  - Order-No.: 700021224
  - Rated voltage 6-24 V.

- **ESD 12 V square**
  - Order-No.: 700021206
  - Rated voltage 6-24 V, current 16 A.
  - Dimensions: L 57 x W 33 x D 48 mm

- **ESD 12V round**
  - Order-No.: 700021216
  - Rated voltage 6-24 V, current 16 A.
  - Dimensions: Ø 46 x D 48 mm

- **ESD 12V screw**
  - Order-No.: 700021218
  - Rated voltage 6-24 V, current 16 A.
  - Dimensions: Ø 36 x D 48 mm

- **PSD 12/24 MP**
  - Order-No.: 368041000
  - Rated voltage 6-24 V, max. current rate 20 A, mounting hole 28 mm.
  - Dimensions: W 60 x H 45 x D 60 mm

- **AZD 12/24**
  - Order-No.: 367604000
  - Built-on socket for universal plug.
  - 16A/6-24V
  - Dimensions: L 85 x W 34 x H 33 mm

- **ZDK 12/24**
  - Order-No.: 367652000
  - Twin socket connector with universal plug, two standard socket outlets to connect two electric accessories.
  - Rated voltage 6-24 V, current 2 x 8 A.

- **PSD 12/24**
  - Order-No.: 357906100
  - Built-on socket with cover - without mounting plate.

- **AZD 12/24**
  - Order-No.: 367601000
  - 3 pole built-on socket for universal plugs 16 A/6-24 V. Connection via flat terminals 6.3 mm.
  - Dimensions: L 85 x W 99 x H 33 mm

- **WVK 12/24**
  - Order-No.: 367818100
  - Extension cord 2 x 0.75 mm² with safety universal plug has an integrated 8 A fuse. Socket connector interior Ø 21 mm. Helix cable, length 0.6 m to 3.0 m. Rated voltage 6-24 V, max. 8 A.

- **VK 12/24**
  - Order-No.: 367814000
  - Extension cord with safety universal plug and exchangeable 8 A fuse. Flat cable length 4 m. Rated voltage 6-24 V, current 8 A.

- **ZKFP 12/24**
  - Order-No.: 367879000
  - Extension cord 2 x 0.75 mm², length 1 m, for temporary connection with crocodile clips for the battery poles. Socket connector interior Ø 21 mm.
  - Rated voltage 6-24 V, current 8 A.

- **ND 12/24**
  - Order-No.: 367872000
  - Adapter to connect normed plug and coupling. Socket connector interior Ø 21 mm.
  - Rated voltage 6-24 V, max. 8 A.

- **AK 12/24**
  - Order-No.: 367872000
  - Adapter to connect normed plug and coupling. Socket connector interior Ø 21 mm cigarette lighter socket, with flat cable, length 0.25 m. 6-24 V, max. 8 A.
This **dimmer for halogen lamps** series ZHD, are especially designed to use on board with DC 12/24 V supply and have the best technology in pulse width control system aim the time. An efficient electronic has a small dissipation (< 1 W). A current limiter protects the output from an excess load and a short. The dimmer matches to the size of switches and sockets.

- **ZHD 24-240 white** Order-No. 3 5002 2000
- **ZHD 24-240 brown** Order-No. 3 5002 2010
- **ZHD 24-240 black** Order-No. 3 5002 2020

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>DC 10-30 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>positive controlled, max. 10 A</td>
</tr>
</tbody>
</table>

**Cigarette lighter socket without cover**

- **ZDoD 12/24 brown** Order-No. 6 0945 7151
- **ZDoD 12/24 black** Order-No. 6 0945 7155

<table>
<thead>
<tr>
<th>Rated voltage 12 V / 24 V, flat terminals 6,3 mm.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ZDoD 12/24 brown</strong> Order-No. 6 0945 7151</td>
<td></td>
</tr>
<tr>
<td><strong>ZDoD 12/24 black</strong> Order-No. 6 0945 7155</td>
<td></td>
</tr>
</tbody>
</table>

**TV-Socket**

- **TV brown** Order-No. 6 0945 1111
- **TV white** Order-No. 6 0945 1112
- **TV black** Order-No. 6 0945 1115

**Socket for extra-low voltage**

- **KD 12/24 brown** Order-No. 6 0495 1751
- **KD 12/24 white** Order-No. 6 0495 1759
- **KD 12/24 black** Order-No. 6 0495 1755

<table>
<thead>
<tr>
<th>Rated voltage 12 V / 24 V, max.16A, Flat terminals 6,3 mm, fitting Depth 54 mm</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KD 12/24 brown</strong> Order-No. 6 0495 1751</td>
<td></td>
</tr>
<tr>
<td><strong>KD 12/24 white</strong> Order-No. 6 0495 1759</td>
<td></td>
</tr>
<tr>
<td><strong>KD 12/24 black</strong> Order-No. 6 0495 1755</td>
<td></td>
</tr>
</tbody>
</table>

**USB Double charging socket (5 V / 2x 2.1 A)**

- **USB 12/24 brown** Order-No. 6 0945 2601
- **USB 12/24 white** Order-No. 6 0945 2609
- **USB 12/24 black** Order-No. 6 0945 2605

<table>
<thead>
<tr>
<th>Für DC 8-32 V</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USB 12/24 brown</strong> Order-No. 6 0945 2601</td>
<td></td>
</tr>
<tr>
<td><strong>USB 12/24 white</strong> Order-No. 6 0945 2609</td>
<td></td>
</tr>
<tr>
<td><strong>USB 12/24 black</strong> Order-No. 6 0945 2605</td>
<td></td>
</tr>
</tbody>
</table>

**Cigarette lighter socket for extra low voltage**

- **ZD 12/24 black** Order-No. 6 0945 7055

<table>
<thead>
<tr>
<th>Rated voltage 12 V / 24 V, connection at the rear side via flat terminals 6,3 mm, fitting depth 59 mm.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ZD 12/24 black</strong> Order-No. 6 0945 7055</td>
<td></td>
</tr>
</tbody>
</table>

**Socket, connector for satellite receiver (F)**

- **FD koax brown** Order-No. 6 0945 1951
- **FD koax white** Order-No. 6 0945 1959
- **FD koax black** Order-No. 6 0945 1955

**Dimensions**

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>W 59,5 x H 59,5 mm</td>
</tr>
<tr>
<td>Fitting hole</td>
<td>Ø 46 mm</td>
</tr>
</tbody>
</table>
SOCKET AND SWITCH

Socket - German standard

16 A/250 V, Threaded terminal end, protective cover.
Insert socket Ø 49 mm. Fitting depth 46 mm.
- ND 230 brown Order No. 6 0941 8551
- ND 230 white Order No. 6 0941 8552
- ND 230 black Order No. 6 0941 8555

Socket - Swiss standard

10 A/250 V, Threaded terminal end. Protective cover.
Insert socket Ø 49 mm. Fitting depth 46 mm.
- ND 230 CH brown Order No. 6 0962 5951
- ND 230 CH white Order No. 6 0962 5952
- ND 230 CH black Order No. 6 0962 5955

Socket - French standard

16 A/250 V, Threaded terminal end, protective cover.
Insert socket Ø 49 mm. Fitting depth 46 mm.
- ND 230 F brown Order No. 6 0961 8551
- ND 230 F white Order No. 6 0961 8582
- ND 230 F black Order No. 6 0961 8555

Rocker switch - universal selective switch

16 A/250 V, Threaded terminal end. Fitting depth 10 mm.
- ES 230 W brown Order No. 6 0936 5651
- ES 230 W white Order No. 6 0936 5659
- ES 230 W black Order No. 6 0936 5655
- ES 230 W chrome matt Order No. 6 0936 5628
- ES 230 W chrome glossy Order No. 6 0936 5618
- ES 230 W stainless steel Order No. 6 0936 5625

Button, N/O

16 A/250 V, Threaded terminal end. Fitting depth 10 mm.
- ES 230 T brown Order No. 6 0936 7151
- ES 230 T white Order No. 6 0936 7159
- ES 230 T black Order No. 6 0936 7155
- ES 230 T chrome matt Order No. 6 0936 7128
- ES 230 T chrome glossy Order No. 6 0936 7118
- ES 230 T stainless steel Order No. 6 0936 7125

Double rocker switch

16 A/250 V, Threaded terminal end. Fitting depth 10 mm.
- ES 230 S brown Order No. 6 0936 5551
- ES 230 S white Order No. 6 0936 5559
- ES 230 S black Order No. 6 0936 5555
- ES 230 S chrome matt Order No. 6 0936 5528
- ES 230 S chrome glossy Order No. 6 0936 5518
- ES 230 S stainless steel Order No. 6 0936 5525

Double button N/O

16 A/250 V, Threaded terminal end. Fitting depth 10 mm.
- ET 230 S brown Order No. 6 0936 7551
- ET 230 S white Order No. 6 0936 7559
- ET 230 S black Order No. 6 0936 7555
- ET 230 S chrome matt Order No. 6 0936 7528
- ET 230 S chrome glossy Order No. 6 0936 7518
- ET 230 S stainless steel Order No. 6 0936 7525

Mounting panel

Mounting panel with hinged cover for all sockets types.
Dimensions: 59.5 x 59.5 mm.
- KLD brown Order No. 6 0918 2851
- KLD white Order No. 6 0918 2859
- KLD black Order No. 6 0918 2855
- KLD chrome matt Order No. 6 0918 2828
- KLD chrome glossy Order No. 6 0918 2818
- KLD stainless steel Order No. 6 0918 2825

Single mounting panel

Single mounting panel for all sockets and switch types.
Dimensions: 59.5 x 59.5 mm.
- ADR 1 brown Order No. 6 0918 2751
- ADR 1 white Order No. 6 0918 2759
- ADR 1 black Order No. 6 0918 2755
- ADR 1 chrome matt Order No. 6 0918 2728
- ADR 1 chrome glossy Order No. 6 0918 2718
- ADR 1 stainless steel Order No. 6 0918 2725

Double mounting panel

Double mounting panel for all sockets and switch types.
Dimensions: 59.5 x 119 mm.
- ADR 2 brown Order No. 6 0918 2651
- ADR 2 white Order No. 6 0918 2659
- ADR 2 black Order No. 6 0918 2655
- ADR 2 chrome matt Order No. 6 0918 2628
- ADR 2 chrome glossy Order No. 6 0918 2618
- ADR 2 stainless steel Order No. 6 0918 2625

Mounting panel for three items

Mounting panel for three items.
For all sockets and switch types.
Dimensions: 59.5 x 178.5 mm.
- ADR 3 brown Order No. 6 0918 1951
- ADR 3 white Order No. 6 0918 1959
- ADR 3 black Order No. 6 0918 1955
- ADR 3 chrome matt Order No. 6 0918 1928

Distance ring

Height 10 mm.
- DZR brown Order No. 6 0918 2951
- DZR white Order No. 6 0918 2952
- DZR black Order No. 6 0918 2955

Construction unit

- ABG brown Order No. 6 0911 5151
- ABG white Order No. 6 0911 5159
- ABG black Order No. 6 0911 5155
**CONNECTION**

- **Heat shrink tubes, black.** 5 pcs. (3.2 / 4.8 / 6.4 / 9.5 / 12.7 mm) length 50 cm each. Shrinkage 2:1.
- **Heat shrink tubes with melting glue** for professional sealing and polarity identification. Shrinkage 3:1, diameter 19 mm. Content: red and black, one each., length 0.3 m.

**Pin terminals**

- **Material E-Cu tube with galvanic tin-plated surface.**
  - SKS 16, 10-16 mm²
  - SKS 35, 25-50 mm²
  - SKS 70, 50-95 mm²

**Butt connectors**

- **Material E-Cu tube with galvanic tin-plated surface.**
  - SV 16, 16 mm²
  - SV 25, 25 mm²
  - SV 35, 35 mm²
  - SV 50, 50 mm²

**Heavy Duty Lug / Terminal Crimper**

- Hexagonal pressing. With turnable tools for diameter choice.
  - WW 6/70
  - WW 10/120

**Heavy Duty Lugs**

- Material E-Cu tube with galvanic tin-plated surface.
  - RKS 6 mm², Hole-Ø 8 mm
  - RKS 6 mm², Hole-Ø 10 mm
  - RKS 10 mm², Hole-Ø 6 mm
  - RKS 10 mm², Hole-Ø 8 mm
  - RKS 10 mm², Hole-Ø 10 mm
  - RKS 16 mm², Hole-Ø 6 mm
  - RKS 16 mm², Hole-Ø 8 mm
  - RKS 16 mm², Hole-Ø 10 mm
  - RKS 25 mm², Hole-Ø 6 mm
  - RKS 25 mm², Hole-Ø 8 mm
  - RKS 25 mm², Hole-Ø 10 mm
  - RKS 35 mm², Hole-Ø 6 mm
  - RKS 35 mm², Hole-Ø 8 mm
  - RKS 35 mm², Hole-Ø 10 mm
  - RKS 50 mm², Hole-Ø 8 mm
  - RKS 50 mm², Hole-Ø 10 mm
  - RKS 50 mm², Hole-Ø 12 mm
  - RKS 70 mm², Hole-Ø 8 mm
  - RKS 70 mm², Hole-Ø 10 mm
  - RKS 70 mm², Hole-Ø 12 mm
  - RKS 70 mm², Hole-Ø 16 mm
  - RKS 95 mm², Hole-Ø 8 mm
  - RKS 95 mm², Hole-Ø 10 mm
  - RKS 95 mm², Hole-Ø 12 mm
  - RKS 95 mm², Hole-Ø 16 mm
  - RKS 120 mm², Hole-Ø 12 mm

**Pin terminals**

- Material E-Cu tube with galvanic tin-plated surface.
  - SKS 16, 10-16 mm²
  - SKS 35, 25-50 mm²
  - SKS 70, 50-95 mm²

**Butt connectors**

- Material E-Cu tube with galvanic tin-plated surface.
  - SV 16, 16 mm²
  - SV 25, 25 mm²
  - SV 35, 35 mm²
  - SV 50, 50 mm²

**Heavy Duty Lug / Terminal Crimper**

- Hexagonal pressing. With turnable tools for diameter choice.
  - WW 6/70
  - WW 10/120

**Heavy Duty Lugs**

- Material E-Cu tube with galvanic tin-plated surface.
  - RKS 6 mm², Hole-Ø 8 mm
  - RKS 6 mm², Hole-Ø 10 mm
  - RKS 10 mm², Hole-Ø 6 mm
  - RKS 10 mm², Hole-Ø 8 mm
  - RKS 10 mm², Hole-Ø 10 mm
  - RKS 16 mm², Hole-Ø 6 mm
  - RKS 16 mm², Hole-Ø 8 mm
  - RKS 16 mm², Hole-Ø 10 mm
  - RKS 25 mm², Hole-Ø 6 mm
  - RKS 25 mm², Hole-Ø 8 mm
  - RKS 25 mm², Hole-Ø 10 mm
  - RKS 35 mm², Hole-Ø 6 mm
  - RKS 35 mm², Hole-Ø 8 mm
  - RKS 35 mm², Hole-Ø 10 mm
  - RKS 50 mm², Hole-Ø 8 mm
  - RKS 50 mm², Hole-Ø 10 mm
  - RKS 50 mm², Hole-Ø 12 mm
  - RKS 70 mm², Hole-Ø 8 mm
  - RKS 70 mm², Hole-Ø 10 mm
  - RKS 70 mm², Hole-Ø 12 mm
  - RKS 70 mm², Hole-Ø 16 mm
  - RKS 95 mm², Hole-Ø 8 mm
  - RKS 95 mm², Hole-Ø 10 mm
  - RKS 95 mm², Hole-Ø 12 mm
  - RKS 95 mm², Hole-Ø 16 mm
  - RKS 120 mm², Hole-Ø 12 mm

**Pin terminals**

- Material E-Cu tube with galvanic tin-plated surface.
  - SKS 16, 10-16 mm²
  - SKS 35, 25-50 mm²
  - SKS 70, 50-95 mm²

**Butt connectors**

- Material E-Cu tube with galvanic tin-plated surface.
  - SV 16, 16 mm²
  - SV 25, 25 mm²
  - SV 35, 35 mm²
  - SV 50, 50 mm²

**Heavy Duty Lug / Terminal Crimper**

- Hexagonal pressing. With turnable tools for diameter choice.
  - WW 6/70
  - WW 10/120

**Heavy Duty Lugs**

- Material E-Cu tube with galvanic tin-plated surface.
  - RKS 6 mm², Hole-Ø 8 mm
  - RKS 6 mm², Hole-Ø 10 mm
  - RKS 10 mm², Hole-Ø 6 mm
  - RKS 10 mm², Hole-Ø 8 mm
  - RKS 10 mm², Hole-Ø 10 mm
  - RKS 16 mm², Hole-Ø 6 mm
  - RKS 16 mm², Hole-Ø 8 mm
  - RKS 16 mm², Hole-Ø 10 mm
  - RKS 25 mm², Hole-Ø 6 mm
  - RKS 25 mm², Hole-Ø 8 mm
  - RKS 25 mm², Hole-Ø 10 mm
  - RKS 35 mm², Hole-Ø 6 mm
  - RKS 35 mm², Hole-Ø 8 mm
  - RKS 35 mm², Hole-Ø 10 mm
  - RKS 50 mm², Hole-Ø 8 mm
  - RKS 50 mm², Hole-Ø 10 mm
  - RKS 50 mm², Hole-Ø 12 mm
  - RKS 70 mm², Hole-Ø 8 mm
  - RKS 70 mm², Hole-Ø 10 mm
  - RKS 70 mm², Hole-Ø 12 mm
  - RKS 70 mm², Hole-Ø 16 mm
  - RKS 95 mm², Hole-Ø 8 mm
  - RKS 95 mm², Hole-Ø 10 mm
  - RKS 95 mm², Hole-Ø 12 mm
  - RKS 95 mm², Hole-Ø 16 mm
  - RKS 120 mm², Hole-Ø 12 mm

**Pin terminals**

- Material E-Cu tube with galvanic tin-plated surface.
  - SKS 16, 10-16 mm²
  - SKS 35, 25-50 mm²
  - SKS 70, 50-95 mm²

**Butt connectors**

- Material E-Cu tube with galvanic tin-plated surface.
  - SV 16, 16 mm²
  - SV 25, 25 mm²
  - SV 35, 35 mm²
  - SV 50, 50 mm²
Soldered connections of big cross sections are dangerous due to bad soldering joints. In that case the connection has a high resistance and danger of fire hazard. For professional result of lug and terminal crimps use only well matching tools. Our high quality tools are designed to provide exact crimping and are easy to use in installation and maintenance of your boat electrical system.

All lugs, terminals and spades are especially designed for the heavy harsh marine environment to accomplish all requirements. Pure tinned copper terminals, non-insulated or nylon-insulated give the best electrical contact.

**Crimped ratchet tool for isolated flat connectors.**
Crimped ratchet mechanism places a single crimp on insulated terminals in three cavities 0.5 - 6.0 mm².

- UNI-Crimp WZ 42 Order No. 5 0000 0042

**Flat connectors isolated.** Package 10 pcs

- FSI 6.3 mm / 0.5-1 mm² rot Order No. 5 9163 0510
- FSI 6.3 mm / 1.5-2.5 mm² blau Order No. 5 9163 1525
- FSI 6.3 mm / 4.6 mm² gelb Order No. 5 9163 4060

**Multi box with assortment of five different pigtails, nylon-insulated.**

- A EH BOX Order No. 5 9165 9000

**Flat connectors non isolated.** Package 10 pcs

- FSH 6.3 mm / 1.5-2.5 mm² Order No. 5 9063 1525
- FSH 6.3 mm / 4.6 mm² Order No. 5 9063 4060

**Multi stack connector, non isolated.** Package 10 pcs

- AZH 6.3 mm / 1.5-2.5 mm² Order No. 5 9263 1525

**Terminal boots, transparent, for flat connectors.** Package 10 pcs

- ITT 6.3 mm Order No. 5 9963 1525
Flexible, fine-strand copper cables, designed to install on board of yachts, power- and pleasureboats. The list next rank shows the nominal current rating referring to the international standards ISO 10133 and 13297. The values of the upper list are valid for grouping of up to 3 single lines for installations in rooms at a temperature of 30°C. In engine rooms or other installations with a temperature of over 60°C or for cables with more than 3 lines you have to use the lower list.

Flexible lines, single-core, for universal applications, for installation in tubes or trunk cable systems, not combustible, self extinguishing, nominal voltage 450V, temperature range –30...+80°C.

High flexible single core wire for engine and battery installations.

Flexible, fine-strand copper cables, designed to install on board of yachts, power- and pleasureboats. The list next rank shows the nominal current rating referring to the international standards ISO 10133 and 13297. The values of the upper list are valid for grouping of up to 3 single lines for installations in rooms at a temperature of 30°C. In engine rooms or other installations with a temperature of over 60°C or for cables with more than 3 lines you have to use the lower list.

Flexible lines, single-core, for universal applications, for installation in tubes or trunk cable systems, not combustible, self extinguishing, nominal voltage 450V, temperature range –30...+80°C.

Flexible, fine-strand copper cables, designed to install on board of yachts, power- and pleasureboats. The list next rank shows the nominal current rating referring to the international standards ISO 10133 and 13297. The values of the upper list are valid for grouping of up to 3 single lines for installations in rooms at a temperature of 30°C. In engine rooms or other installations with a temperature of over 60°C or for cables with more than 3 lines you have to use the lower list.

Flexible lines, single-core, for universal applications, for installation in tubes or trunk cable systems, not combustible, self extinguishing, nominal voltage 450V, temperature range –30...+80°C.

Flexible lines, single-core, for universal applications, for installation in tubes or trunk cable systems, not combustible, self extinguishing, nominal voltage 450V, temperature range –30...+80°C.

Flexible lines, single-core, for universal applications, for installation in tubes or trunk cable systems, not combustible, self extinguishing, nominal voltage 450V, temperature range –30...+80°C.

Flexible lines, single-core, for universal applications, for installation in tubes or trunk cable systems, not combustible, self extinguishing, nominal voltage 450V, temperature range –30...+80°C.

Flexible lines, single-core, for universal applications, for installation in tubes or trunk cable systems, not combustible, self extinguishing, nominal voltage 450V, temperature range –30...+80°C.
CABLES AND CAPS

Multicore flexible cable for DC or mast installation.
Can be used in dry, humid or wet places, isolation grey PVC. Temperature range –40...+80 °C. Non combustible, nominal voltage 300 V.

Multicore flexible cable for AC 230 V installation.
Can be used in dry, humid and wet areas, but only for inside installation. Isolation grey PVC. Temperature range –40...+80 °C. Non combustible, nominal voltage 300 V.

Shore power cable 230 V / 16 A. for the use outside, weatherproof. Isolation black neoprene 3 lines, non combustible, temperature range –30...+60 °C, nominal voltage 450 V.

Tinned Shore power cable 230 V / 16 A. for the use outside, weatherproof. Isolation EPR/PUR - yellow, oil and acid resistant, temperature range –40...+80 °C, non combustible, nominal voltage 450 V.

Multicore flexible control cable (without shield) and data cable (shielded)
Can be used in dry, humid and wet areas, but only for inside installation. Isolation grey PVC. Temperature range –40...+80 °C. Non combustible, self extinguishing.

Multicore flexible control cable (without shield) and data cable (shielded)
Can be used in dry, humid or wet places, isolation black PVC. Temperature range –40...+80 °C. Non combustible, nominal voltage 300 V.
LED LIGHTS

NEW

LED WL5  Order-No.: 3 9000 5450
Waterproof wall light for inside and outside use. Very small and efficient, completely encapsulated electronic. Destinated for the illumination of shelves, stowage rooms or for outside illumination. Light outlet at the side, DC 8 - 30 V, 5 W, luminous colour 4000 K. Luminous colour 2700 K on demand. Dimensions: L 100 x W 50 x H 6 mm

NEW

LED WL1.2  Order-No.: 3 9000 5457
Waterproof wall light for inside and outside use. Very small and efficient, completely encapsulated electronic. Destinated for the illumination of shelves, stowage rooms or for outside illumination. Light outlet at the side, DC 8 - 30 V, 1.2 W, luminous colour 4000 K. Luminous colour 2700 K on demand. Dimensions: L 60 x W 20 x H 6 mm

NEW

LED LRT Alu  Order-No.: 3 9000 5254
Super flat surface light with power LED, Housing aluminium style with acrylic glass, Ø 75 mm, height 10 mm. Push button for: ON / OFF / Dimming DC 8 - 30 V, 3 W, luminous colour 2700 K.

NEW

LED LRT Chrom  Order-No.: 3 9000 5256
Super flat surface light with power LED, Housing chrome with acrylic glass, Ø 75 mm, height 10 mm. Push button for: ON / OFF / Dimming DC 8 - 30 V, 3 W, luminous colour 2700 K.

NEW

LED LLT 30  Order-No.: 3 9000 5498
Built on light, 50 powerLEDs produce a constant and shadowfree illumination. Push button for: ON / OFF / Dimming DC 8 - 30 V, 7 W, luminous colour 2700 K. Dimensions: L 280 x W 20 x H 10 mm

NEW

LED LBF 20  Order-No.: 3 9000 0968
Spot light 2.5 W with a flexible arm 20 or 30 cm, Push button at the base for: ON / OFF / Dimming. Cable outlet underneath the base, Angle of light 22°, DC 8 - 30 V, 2.5 W, luminous colour 2700 K

NEW

LED MFT  Order-No.: 3 9000 5441
The very small flexible spot is designed as an optimal reading light. The length of the flexible neck is 20 cm with a diameter of 4 mm, the base-Ø is 26 mm. The head of the light is very small: only 7x7x65 mm! Push button at the base: ON / OFF / 3 step dimming. DC 8 - 30 V, 1.5 W, luminous colour 4000 K.
**LED-LIGHTS FOR EXTERIOR USE**

The compact and lightweight LED exterior lights of the TRILLIANT® series produce a wide flood light and are designed for the use as work- / deck-light and suit well the requirements of boats and vehicles. The robust construction from coated die cast aluminium is designed to withstand vibrations, corrosion, humidity and dust. LEDs from the newest generation together with an up to date reflector technology produce a wide flood light. A brilliant designed thermo management guarantees a continuous light stream during the whole lifetime of the light. (> 40,000 hours).

**LED-LIGHTS**

These high power LED-lights use up to date LED-electronics with a luminous colour of 2700 K. The special designed electronic provides a constant illumination indepenedantly of the power supply voltage (8-30 V) and protects the LED from overload. The housing is made from anodized aluminium and guarantees a very efficient heat dissipation and long light lifetime of the light.

---

**NEW**

**LTQ 1200 WF**

Order No.: 6 0156 3631

Wide flood spot light with square diecast aluminium housing, black coated. Hard coated polycarbonate glass. Corrosion resistant to SAE J2139. Daylight similar white light for authentical colours. Inclusive watertight DT-2 (Deutsch) connector.

- **Nominal voltage**: DC 12 - 24 V
- **Power consumption / luminous flux**: 18 W / 1200 Lumen
- **Protection**: IP69K

**NEW**

**LTR 26 WF**

Order No.: 6 0156 4015


- **Nominal voltage**: DC 12 - 24 V
- **Power consumption / luminous flux**: 18 W / 1750 Lumen
- **Protection**: IP69K
LED-LIGHTS

WALL-MOUNTED

CHART TABLE

SURFACE-MOUNTED

RECESSED

EXTERIOR

prebit®

PLEASE ASK FOR THE LATEST CATALOG: INFO@PHILIPPI-ONLINE.DE
1. Offers are without obligation. Right of prior sale and delivery is reserved. We are also reserve the right to amend the design of equipment as well as the utilisation of components with similar technical specifications.

2. All individual prices are ex-warehouse at Remseck am Neckar or another external warehouse exclusive of packaging. Invoices are based on current actual prices except when otherwise agreed.

3. Delivery is on the basis of cash on delivery.

4. Invoices are payable within 30 days net. Interest may be added to outstanding payments at the current bank interest rate. We reserve the right to charge costs related to low volume orders or a handling fee thereon.

5. Deliveries are made at the risk and cost of the customer also when freight costs are paid by the manufacturer. The costs of packaging at net value will be invoiced to the customer, not, however, returns.

6. Goods must be checked upon receipt with regard to correctness, completeness, as well as freight damage. In the case of damage the customer must advise the Post Office, transport company, railway, or forwarding agent. Complaints of every nature may be recognised by the manufacturer only within 8 days of receipt of goods.

7. Warranty is limited to the correct function of the equipment in accordance with the operating instructions of the manufacturer when the damage is not caused by reason of improper assembly, installation, or incorrect operation. The duration of warranty is 24 months after installation, but expires at the latest 30 months after date of purchase. Warranty includes factory repairs and labour as well as replacement of defective components. For repair the equipment must be despatched by prepaid post to us or one of our affiliated dealers. Costs related to disassembly and re-installation are the responsibility of the customer. The manufacturer will not be responsible for any consequential loss through contingency claims, penalties for non-performance of contracts, damages or loss arising out of improper operation insofar as they are not attributable to the manufacturerís deliberate or grossly negligent actions.

8. The goods remain the property of the manufacturer until payment for them has been completed. In the case of invoiced sales we are entitled to immediately reclaim our property when payment is delayed or substantive disimprovement in the financial status of the customer occurs. Repossession of the goods does not invalidate the contract insofar as this is not otherwise stated.

9. The place of contract is D - 71686 Remseck am Neckar. The relevant court jurisdiction district is Ludwigsburg.