

## Installation and Operating Manual

**LCD Battery Computer 100 S with 100 A Smart Shunt**

**No. 1263**


**LCD Battery Computer 200 S with 200 A Smart Shunt**

**No. 1266**

**LCD Battery Computer 400 S with 400 A Smart Shunt**

**No. 1269**

The Votronic LCD Battery Computer S is designed for exact measuring of the charging state of board batteries in caravans, campers, boats, special purpose and intervention vehicles.

 **Please read the mounting instructions and the operating manual including the safety regulations completely prior to starting connection and start-up.**

The VOTRONIC LCD Battery Computer S calculates the exact charging state of the battery and displays the charging state like a "fuel gauge for the battery". In contrast to simple ampere-hour meters, the residual capacity will be determined in ampere-hours (Ah) or the residual charge in % by means of programmed battery-characteristic and will be displayed as state of charge. Apart from this, the LCD Battery Computer S provides the display of the battery voltage (V) of a second battery (starter battery).

The smart-shunt, which is provided with the unit, is extraordinary robust, very exactly and shows extreme overload capacity (refer to "Technical Data"). It is equipped with a programmable output to remote control a main-switch which connects or disconnects consumer loads or further energy supply units, depending on the charging state of the battery.

## Operation LCD Battery Computer S



OFF 3s

Key 1: Next page of the battery computer display, manual disconnection of the terminal (3s).



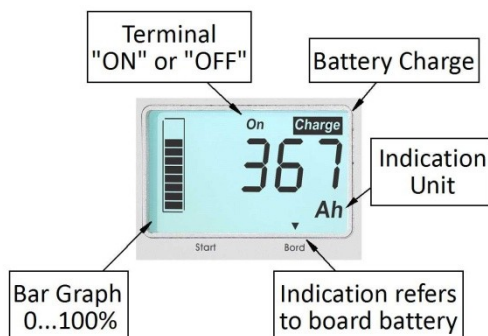
ON 3s

Key 2: Previous page of the display, manual activation of the terminal (3s).



Set 3s

Key 3: Display on/off.  
Set (3s)

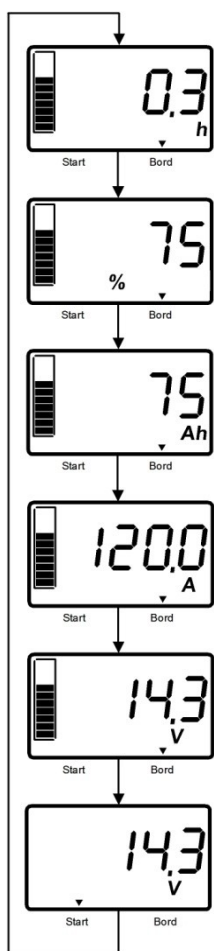


### Activation, Deactivation

The unit is optimized for extremely current saving operation and offers three operation modes.

**Stand-by:** During stand-by mode the display is empty. If the terminal is activated, "ON" will be displayed, and if it is switched-off, "OFF" will be displayed.

**Display with and without illumination:** As soon as the LCD Battery Computer S is operated, the display illumination will be switched-on and will remain activated for 3 minutes. If there is no operation during this time, the illumination will be switched-off automatically. Due to power saving, the illumination duration is just a few seconds while the "Terminal" is off.



### Displays Battery Computers

Use the keys 1 and 2 to display the next or previous page of the measuring and display values.

#### Voltage:

Display of the voltage of the board battery (B1) and of a second battery (B2), such as the starter battery, is possible.

The marking triangles at the lower edge of the display point to the displayed battery.

#### Current:

The current display informs of the current load or charge of the battery. The display shows the instantaneously measured current rate flowing out of the battery.

If the current flows into the battery, the display will show a positive current value and the charging symbol "CHARGE". If the current flows out of the battery, it is negative, and the value will be shown with a preceding negative sign.

#### Capacity Display:

The microcomputer-controlled measurement accurately counts each ampere-hour (Ah) of capacity during charging and discharging, even in splits. The automatic evaluation of the battery load is effected by means of the programmed characteristic lines of the battery. So, a current rate of e. g. 100 Amperes represents an inferior load for a 600 Ah battery, while this is an extremely high load for a 70 Ah battery. Correspondingly, the large storage battery provides almost its full capacity, but the small 70 Ah battery only 42 Ah or 60 % of the indicated nominal capacity, at best.

The result is a correct indication of the available capacity in the battery (residual capacity, charging state), such as it is known from a "fuel gauge". It is a matter of course, that also the self-discharge of the battery in case of long downtimes will be considered. During

charging of the battery, the full charging state will be recognized automatically, and it will be corrected, if required. Depending on the quality of the used charger, the charged capacity may be between 80 % and 100 %. The capacity of the board battery will be displayed in ampere-hours (Ah) and as percentage (%) of the nominal capacity. The bar graph at the left margin of the display represents the capacity in steps of 10 %.

#### Display of the Remaining Time:

The remaining time will be calculated from the residual capacity (up to the adjusted switching-off threshold) and of the actual current. In case of very high current rates, an adaption to the capacity value of the battery will not be effected. Thus, in case of high current rates, the display of the remaining time is only of informative character. It is calculated according to the following formula: (Capacity switching-off threshold - actual capacity) / actual current.

If the battery does not supply current, a calculation of the remaining time is, of course, not possible. Now the sign -.- will be displayed.

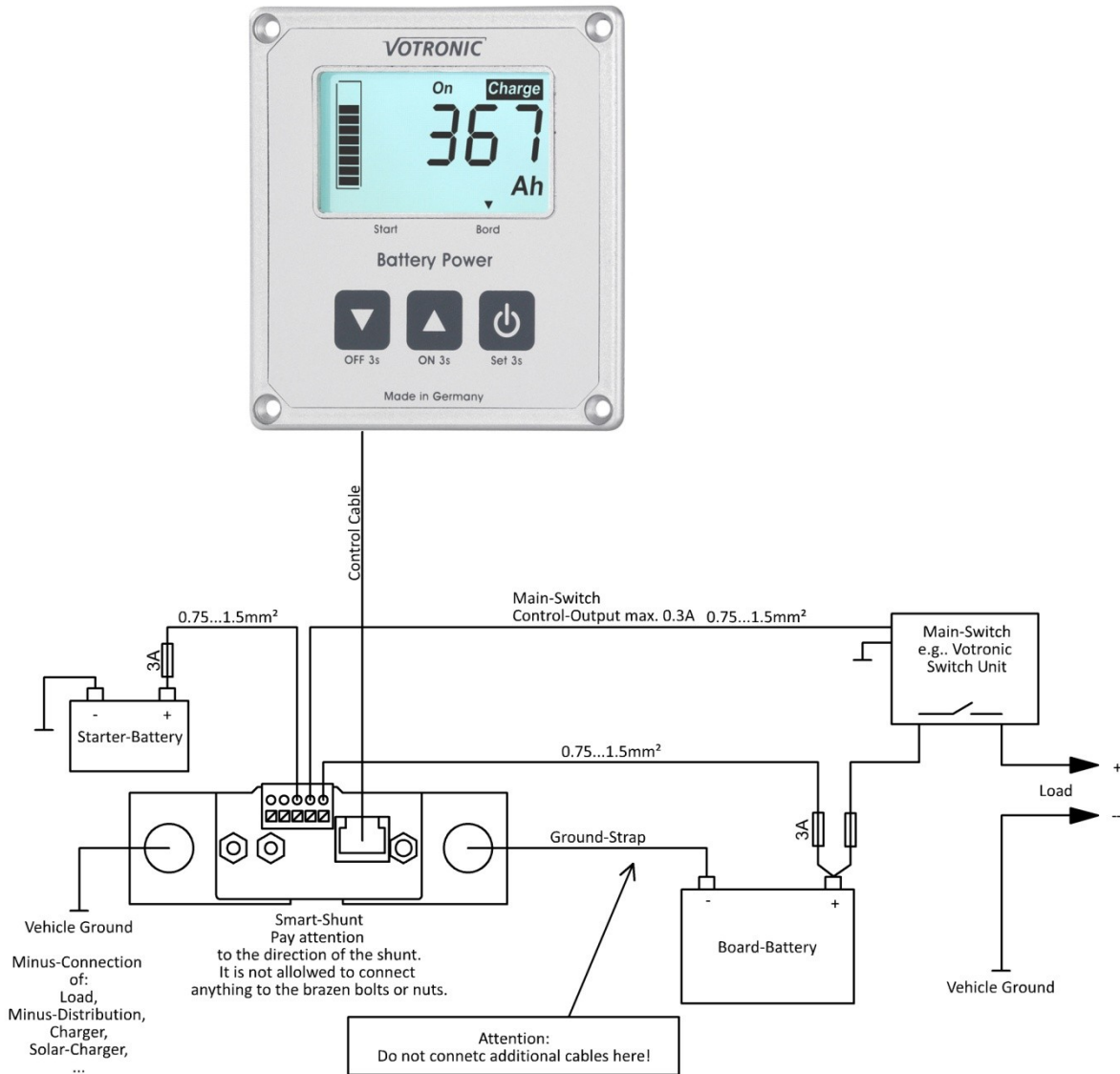
### Installation and Connection:

All terminals are designed in such a way, that end-type terminals are not required. The cable cross-sections can be drawn from the plan. Since fuses serve as cable protection, they must be positioned as close as possible to the battery.

#### Display and Control Panel

Choose a central and easily accessible location in the living area for installation of the display. This will facilitate the legibility of the information and the operation of the functions. The clear width of the cutout is at least 72 x 66 mm. If possible, the rear cutout opening should be covered with electrically nonconducting material to ensure efficient protection of the electronic system and full utilization of the storage space, which might be located behind. Ensure the ventilation of the electronic system.

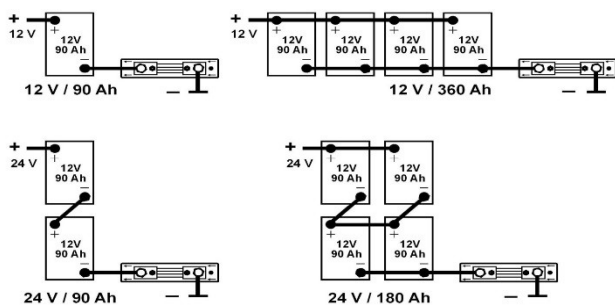
The display will be connected to the smart shunt via a 6-pole control cable of 5 m length. The connection is executed ready to be plugged in, and the cable should be laid according to the safety instructions. If the length of the control cable is not sufficient, an extension of the control cable (5 m), order No. 2005, is available as accessory. The total cable length is then 10 m. Faultless operation is only ensured, if the delivered control cable, as well as the original Votronic control cable extension are used.



## Smart Shunt

The smart shunt measures the battery voltage as well as the current for determination of the residual capacity (level) of the battery. Furthermore, it can measure the voltage of the starter battery, and it is equipped with a terminal for control of a main switching relay, such as the Votronic Switch Unit 40.

## Battery Systems:



Any battery current should flow over the smart shunt. Therefore, it is to be installed directly near the battery (batteries). Correct calculation of the actual battery capacity is only possible, if all currents are detected correctly by the smart shunt.

Ground straps at the connecting screws M8 of the smart shunt are to be screwed in such a way, that one connection is connected to the negative pole of the battery and the other one with the car body. The connections at the negative pole of the battery and

at the body / ground should not be mixed up (see connection plan). Otherwise, a charge is measured as discharge and vice-versa.

Never connect anything to the brass screws of the electronic system of the smart shunt.



The connections at the smart shunt should always be tightened firmly to avoid any transition resistance. Permanent high load might result in heating of the smart shunt.

Except of the smart shunt, no further connection (e. g. of consumers or charging devices) should exist at the negative pole of the battery or at the negative pole of the complete battery system!

A freely programmable terminal is at disposal. At the touch of a button, this terminal can be used as main switch for consumer loads or for capacity disconnection.

In active condition (ON), the battery voltage (+12 V or +24 V) is here at disposal, and it is protected against overload by means of a self-resetting fuse 0.3 A. The terminal can be reinforced by an interposed switching relay.

Due to the high current consumption of standard relays, we recommend to use the switching components "Votronic Switch Unit" (see accessories).

They allow a high switching capacity with very low own consumption (only a few mA). Thus, they are particularly suitable for continuous operation without any load of the battery.

The electronic system of the smart shunt can be protected by means of a cover for the smart shunt (order No. 2023), which is available as option.



Except of the measuring shunt, no further connection should exist at the negative pole (-) of the battery or at the negative pole of the entire battery system!

This concerns all consumer loads, the body ground and all charging units (chargers, solar chargers, charging converters etc.)!

## Initial Start-up

The smart shunt is ready for operation, as soon as all electric connections at the smart shunt and the display panel are made. Besides, the following basic settings must be made compulsory.

### Basic Setting:

The nominal capacity of the board battery must be set.

The used battery type and its nominal voltage must be set.

The switching-off thresholds and switching-on thresholds can be adapted.



After the basic setting, the battery must be charged using a suitable charger (in case of mobile homes using the existing board charger) for a duration of 24 h. This is absolutely required, so that the battery computer is able to recognize 100 % full charging required for starting. If the smart shunt loses its voltage supply (battery disconnected etc.), also proceed as described above.

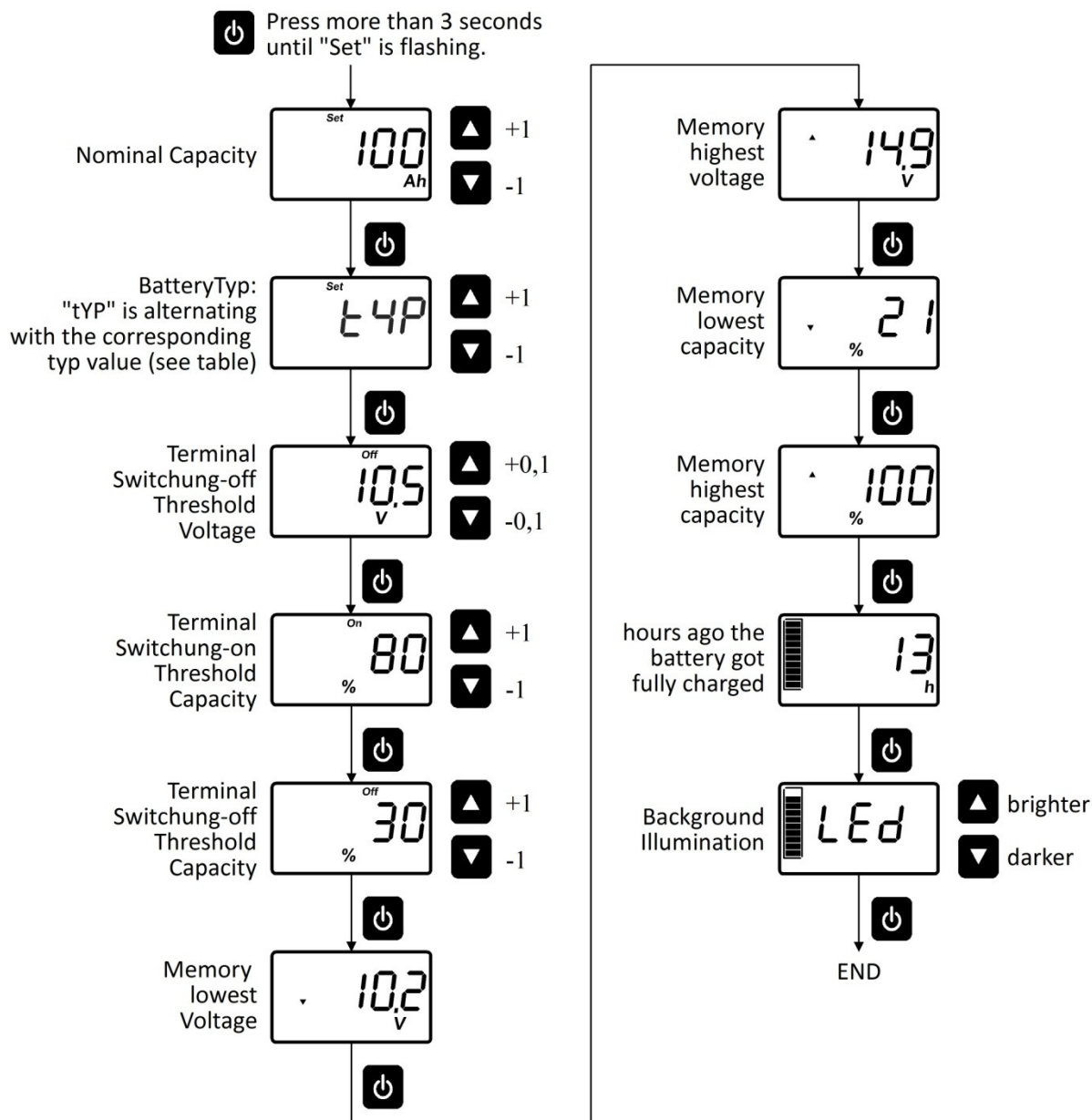
After adjustment of the battery capacity and after loss of the supply voltage, the residual capacity will be estimated automatically by means of the battery voltage. After that, the battery must imperatively be charged for at least 24 hours with a suitable automatic charger to ensure correct display of the capacity. Only when the battery had been fully charged, the system adjusts itself to "its" battery, and the display will show 100 % or the residual capacity of the battery in Ah. The initial settings and the full charging of the battery are absolutely required to ensure proper capacity indication, and it must be repeated whenever the unit or the battery had been disconnected!

### Settings Battery Computer:

The menu for settings is called by pressing and holding key 3 for more than 3 seconds.

The keys 1 and 2 are used to set the values.

In the menu, the key 3 is used to save the setting and to jump to the next menu item. If no key had been pressed within 10 seconds, the display returns to standard operation.



### How to set the Battery Type and the System Voltage

The possible battery types and their number for setting in the menu can be drawn from the table. If the value is not accepted, the setting can be repeated.

Type	Volts U1 approx.	Set Value 12 V System	Set Value 24 V System
Lead-Acid/Lead-Acid	14.4	24	124
Gel	14.4	53	153
AGM-14.4	14.4	34	134
AGM-14.7-14.8	14.7-14.8	47	147
LiFePo4 13.9 V	13.9	89	189
LiFePo4 14.2 V	14.2	82	182
LiFePo4 14.4 V	14.4	84	184
LiFePo4 14.6 V	14.6	86	186
LiFePo4 14.8 V	14.8	88	188

#### Adjustment of the **Nominal Capacity**:

The nominal capacity is indicated in Ah, and it is imprinted on the battery. If several Ah-values can be found, use the value ....Ah (20 h). If several batteries have been combined to a 12 V battery system, add the Ah values. Total capacity for 2 batteries at 110 Ah is 220 Ah. This value -220 Ah- must be set.

#### Adjustment of the Terminal **Switching-on Threshold**:

Here, the switching threshold for the automatic activation of the terminal can be adjusted.

The switching threshold can be set to 101 %. Thus, an automatic activation will never be reached.

#### Adjustment of the Terminal **Switching-off Threshold**:

The same is true as for the switching-on threshold. An automatic disconnection can be prevented by setting this value to 0 %.

The **memories** for the lowest and the highest voltage rates and capacity rates can be reset. Reset them by pressing and holding the keys 1 and 2 simultaneously for 3 seconds. The value will be deleted and „--.-“ will be displayed.

A counter indicates the time in hours, which elapsed from the last 100 % full charging.

#### Adjustment of the **Background Illumination**:

The background illumination can be adapted from bright to completely dark in steps of 10 % according to the requirements.

### **General Information:**

#### **Once a year:**

Check the connecting screws at the measuring shunt for tightness.

Check the connection cable for correct contact and damage.

#### **Aged batteries:**

Lead batteries are subject to wear, which will be growing with the age of the battery, the number of charging/discharging cycles, the rate of discharge (frequent deep discharge) and other factors, such as extreme temperatures, vibration etc. This results in a reduction of the available capacity.

The LCD Battery Computer S is able to consider this loss of capacity for calculation within certain limits. However, we recommend to correcting the set nominal capacity to a lower value (e. g. 5 %, depending on the battery type and the operating condition 2-10 %), once a year.

#### **Cleaning:**

We recommend to use a damp microfibre cloth with pure water or, if required, with water with a few soap. Take care, that no liquid flows along the display screen or the edges of the front panel.



Never use solvents, aggressive household cleaners, and scratching or abrasive agents or objects to clean the front panel and particularly the display itself.

### **Trouble-shooting:**

No display at all:

Reverse battery: Check!

Battery is deeply discharged, below 7 Volts: Recharge immediately!

Connection cable is interrupted, damaged, or it is not inserted: Check!

The display does not show 0.0 A after disconnection of all consumers and chargers:

Check, if latent current consumers are existing!

## Safety Instructions:



### **Safety Regulations and Appropriate Application:**

The LCD Battery Computer S with Smart Shunt has been designed according to the valid safety regulations.

### **Appropriate application is restricted to:**

- Control of commercial types of lead storage batteries (lead-acid, gel, AGM), as well as LiFePo4, of the indicated nominal voltage and of connected consumers in fixed installed systems.
- With observation of the capacity limits of the smart shunt (see "Technical Data").
- Together with the supplied smart shunt.
- Technically faultless condition.
- Installation in a well-ventilated room, protected from rain, humidity, dust, aggressive battery gases, as well as in an environment being free from condensation water.
- With a rear insulating cover of the display unit.
- Never use the unit in locations where the risk of gas or dust explosion exists!
- Open-air operation of the unit is not allowed.
- Cables are always to be laid in such a way that damage is excluded. Observe to fasten them tightly.
- Never lay 12 V (24 V) cables and 230 V mains supply cables into the same cable conduit (empty conduit).
- Check live cables or leads periodically for insulation faults, points of break or loosened connections. Occurring defects must be remedied immediately.
- The unit is to be disconnected from any connection prior to execution of electrically welding or work on the electric system.
- If the user is not able to draw from the present manual, which characteristic values are valid for a unit or which regulations are to be observed, a specialist is to be consulted.
- The user/buyer is obliged to observe any construction and safety regulations.
- Keep children away from the batteries and the smart shunt.
- Observe the safety regulations of the battery manufacturer.
- Ventilate the battery room.
- Always use the same car fuses for replacement!
- The unit is not equipped with parts, which can be replaced by the user.
- Non-observance may result in injury or material damage.
- Never use solvents or aggressive household cleaners for cleaning of the display!
- The warranty period is 36 months from the purchase date (against presentation of the sales slip or invoice).
- The warranty will be void in case of any inappropriate utilisation of the unit, if it is used beyond the technical specification, in case of improper operation or external intervention. We do not assume any liability for any damage resulting hereof. The liability exclusion is extended to any service being executed by third, which has not been ordered by us in writing. Service is to be effected exclusively by VOTRONIC, Lauterbach.

## Technical Data:

System:	
Nominal Voltage Board Battery	12 V/ 24 V
Operating Voltage Range Board Battery	8...32 V
Current Draw	8...60 mA, depending on illumination
Battery Types	See Table "Battery Type"
Nominal Voltage Starter Battery	12 V/ 24 V
Operating Voltage Range Starter Battery	8...35 V
Switching Current Terminal Main Switch	max. 0.3 A
Ambient Conditions, Humidity of Air:	max. 95 % RH, no condensation
Display Unit (LCD Display):	
Technology	LC Display with specific segments, legible with and without illumination, Membrane keyboard
Representation Surface	49 x 28 mm
Lighting	white LED
Dimensions	85 x 80 x 24 mm
Assembly Dimensions Opening Electronic	approx. 72 x 66 mm
Weight	approx. 55 g
Smart Shunt:	100 A    200 A    400 A
Max. Current Rating Smart Shunt:	
Nominal Current	100 A    200 A    400 A
Max. Current Rating 15 Minutes	150 A    300 A    600 A
Max. Current Rating 7 Minutes	200 A    400 A    800 A
Weight	240 g    240 g    245 g
Dimensions Smart Shunt	135 x 32 x 44 mm
Ground Strap:	
Cross-Section	25 mm <sup>2</sup> 35 mm <sup>2</sup> 75 mm <sup>2</sup>
Weight	100 g    140 g    360 g



### Declaration of Conformity:

In accordance with the provisions of Directives 2014/35/EU, 2014/30/EU, 2009/19/EC, this product complies with the following standards or normative documents:  
EN55014-1; EN55022 B; EN61000-6-1; EN61000-4-2; EN61000-4-3; EN61000-4-4;  
EN62368-1; EN50498.



The product must not be disposed of in the household waste.



The product is RoHS compliant. It complies with the directive 2015/863/EU for Reduction of Hazardous Substances in electrical and electronic equipment.

**Quality Management  
System**

**DIN EN ISO 9001**

### Delivery Scope:

1 pc. Battery Computer (Display)  
1 pc. Smart Shunt 100 A, 200 A or 400 A  
1 pc. Ground Strap  
1 pc. Control Cable, Length 5 m  
4 pcs. Fastening Screws  
1 pc. Operating Manual  
1 pc. Drilling Jig

### Available Accessories:

Control Cable Extension, 5 m Length	Order No. 2005
Casing	Order No. 2024
Switch Unit 40	Order No. 2071
Switch Unit 100	Order No. 2072
Battery Protector 300 (Switch Unit 300)	Order No. 3084

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