VOTRONIC

Mounting Instructions and Operating Manual for Fully Automatic Battery Chargers:

Automatic Charger Pb 1215 SMT 2B	Charging Capacity 12 V / 15 A	**No. 3100**
Automatic Charger Pb 1220 SMT 2B	Charging Capacity 12 V / 20 A	**No. 3101**
Automatic Charger Pb 1225 SMT 2B	Charging Capacity 12 V / 25 A	**No. 3102**
Automatic Charger Pb 1230 SMT 2B	Charging Capacity 12 V / 30 A	**No. 3114**

Please completely read this operating and installation manual thoroughly prior to connection and start-up, in particular "Safety Regulations and Appropriate Application", s. page 10.

Fully automatic battery charger with 2 charging ports for intervention vehicles and special purpose vehicles, high-quality campers and the marine field.

VOTRONIC chargers of series "Pb SMT" distinguish by their compact design, low weight (high-frequency switching power supply, Switch Mode Technology), as well as full charging capacity - even in the event of large fluctuations in the power supply (undervoltage/overvoltage, sine wave form, frequency).
The intelligent microprocessor charging control with charging characteristic lines "IU1oU2oU3" and dynamic charging time calculation ensures automatic, quick and gentle full charging, as well as subsequent 100 % trickle charge of the connected batteries from any initial charging state. At the same time, simultaneous supply of 12 V consumers, which are connected in parallel, is ensured or charging of very large batteries (depending on case of application).

1. Charging Port "**I**": Selectable Charging Programs Depending on the Type of Battery (Technology), s. **Page 6-7**:
   1) **"Lead Acid/AGM 1":** Closed and open **acid/lead-acid-**lead batteries, as well as **AGM "14.4 V"**
   2) **"AGM 2":** Closed, gas-tight **AGM** batteries (absorbed glass mat) **"14.7 V"**
   3) **"Gel":** Closed, gas-tight **Gel** batteries, (dryfit, determined electrolyte)
   4) **"LiFePO4":** Charging voltage **14.4 V** for lithium LiFePO4 batteries with completely integrated electronic system balancer and safety circuit (BMS).
   5) **Li Storage:** Automatic trickle charging of the LiFePO4 battery when the vehicle is stopped (seasonal operation) to maintain a charging state of 50-80 %, which is advantageous for the battery lifetime. Powers also 12 V consumer loads, such as alarm systems, WLAN etc., as well as the vehicle's starter battery, see **page 5**.

2. Charging Port "**II**":
   Separate auxiliary charging port 12 V / 2 A, 3 A for support charging and trickle charging of the vehicle's starter (lead) battery with overcharge protection. It can also be used as signalling port for a vehicle engine immobilizer by external relays, see **page 4**.

Further Characteristics of the Unit:

- The **charging voltage** is **free from peaks** and is **controlled in such a way,** that **overcharging** of the batteries **is excluded**.
- **Fully Automatic Continuous Operation:** The charger may be connected continuously to the battery, thus keeping the full charge. Battery discharge in case of power failure **is avoided** (separation by safety relay).
- **Lithium LiFePO4 Auto Wake Up**: Periodical automatic activation of the battery cell balancing BMS.
- **Battery regeneration in case of extended standstill periods:** twice a week to avoid harmful acid accumulation.
- **Parallel and Floating Operation:** In case of simultaneous consumption, the battery will either continue to be charged or maintained via trickle charging. Calculation and control of the adaptation of the charging times is effected automatically by the charger.
- **Unattended Charging:** Multiple protection against overload, overheating, overvoltage, short circuit, reverse battery, incorrect behaviour and back discharge of the battery by electronically controlled gradual reduction down to complete separation of charger and battery by integrated safety relays.
- Connection for **Battery Temperature Sensor** (Accessory Temperature Sensor 825, Order No. 2001):
  Lead batteries (acid, gel, AGM): In case of **low outside temperatures**, full charging of the weak battery is **improved** by automatic adaptation of the charging voltage to the **battery temperature**, and in case of summery temperatures **unnecessary battery gassing** and battery load will be avoided.
  For **LiFePO4** batteries, the battery temperature sensor is required:
  It serves for battery protection in case of high temperatures or particularly in case of low temperatures below 0 °C.
- **Silent Run Function:** Noise-optimised operation (night operation) at the touch of a button.
- **Power Pack Function: Allows supply**of the consumers without battery (such as during battery replacement).
- **Charging Cable Compensation:** Automatic compensation of voltage losses on the charging cables.

- **Integrated On-board Mains Suppression Filter:** Unproblematic **parallel operation** with solar systems, wind and petrol-driven generators, dynamos etc. on one **battery.**
- **Charging aid for totally discharged lead batteries:** Gentle preliminary charging of the (lead-acid, gel, AGM) battery to 8 V, followed by powerful support of the battery, in case of possibly switched-on consumers.

Battery Lifetime and Efficiency:

- **Keep the batteries cool, LiFePO4** preferably **above 0 °C.** Choose an appropriate location for installation.
- **Store only fully charged batteries and recharge them periodically.**
- **Open lead-acid batteries and batteries being "maintenance-free according to EN / DIN": Check the acid level periodically!**
- **Recharge deeply discharged batteries immediately!**
- **LiFePO4: Only use complete batteries with BMS and safety circuit.**
  ! Deep discharge is to be absolutely avoided!

Installation of the Unit:

Install the charger **near battery I (short charging cables)** at a clean, level and hard mounting surface, which is protected from moisture and humidity.
The unit can be installed in any position. Protect the unit from aggressive battery gases.

Despite the charger's high efficiency, heat is produced, which is brought out of the casing by means of the built-in fan. The vent holes of the unit should never be covered (minimum distance 10 cm) to ensure full charging capacity. Ensure sufficient **ventilation** in the environment **of the unit,** so that the heat can be dissipated.
Otherwise, in the event of overheating, the charger will reduce its charging capacity.
Solid and vibration reducing installation by means of the rubber feet. Never remove these rubber feet!

Battery Connection and Battery Settings for Start-up:

Observe the connection plan with the cable cross-sections and the lengths of the cables, the polarity, as well as the fuses near the battery!

1. Connect the battery to the large terminals "**– I II**" and "**+ I** " observing the correct polarity (+/-).
2. Fasten the temperature sensor at battery "I" and at the terminals "**T T**" (option).
3. **Never forget to set** the charging program for the type I (design) of the main battery: See **page** 6.
4. Option: The terminal "+ II" 12 V can be used as:
   a.) Auxiliary charging port for the vehicle's starter battery.
   b.) Signalling port for a vehicle engine immobilizer by external relay.
5. Insert the mains plug (unit rear), and the automatic charging process starts.

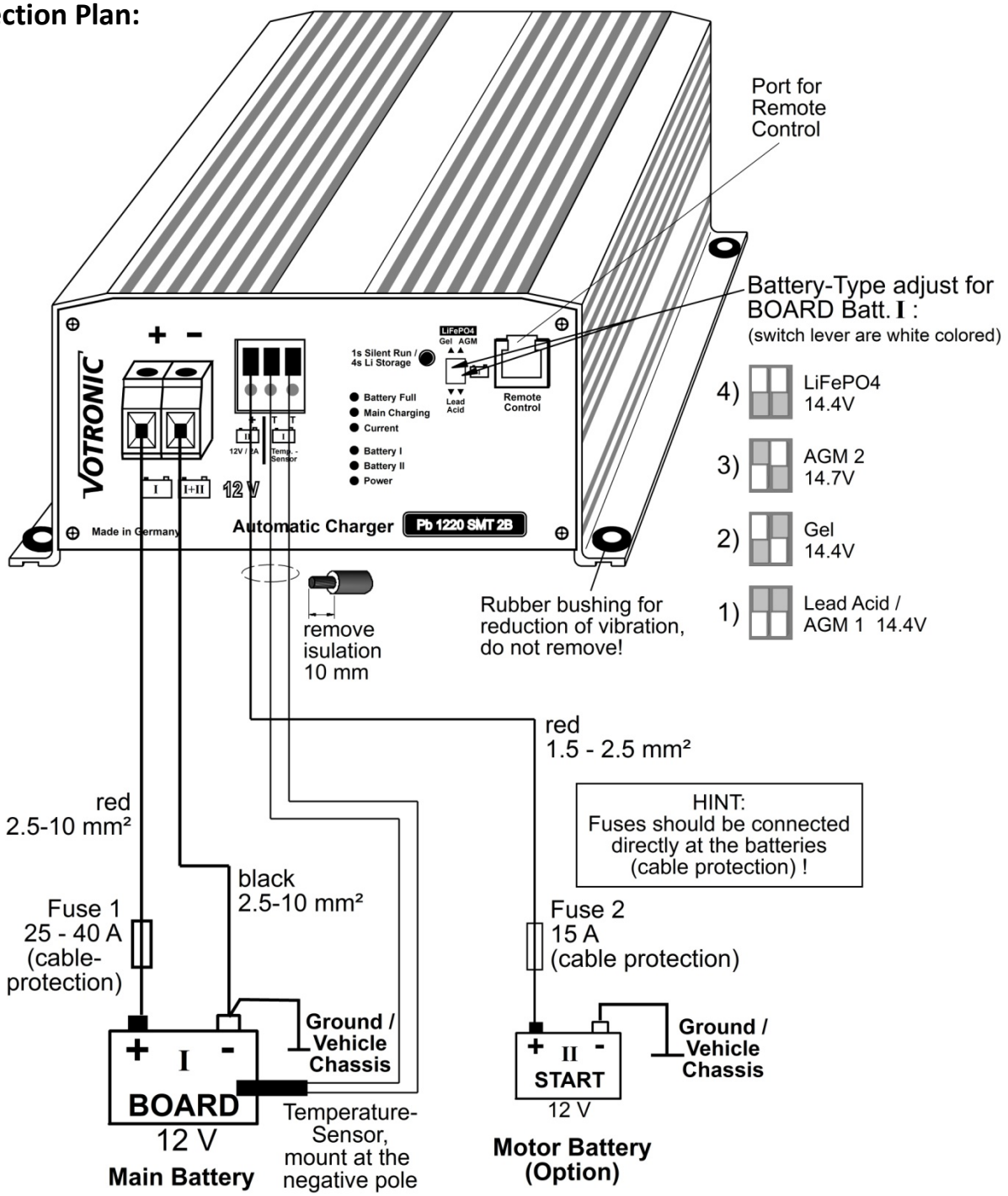
Battery Port " I ":

Connect the main battery observing the recommended cross-sections and lengths for charging cables according to **Table 1**.

Option: Several Batteries at Main Charging Port I:

Parallel charging of two or several batteries of the same voltage (12 V) is admissible. The batteries are to be "paralleled", i. e. the "+" connections of the batteries have to be coupled and should be connected to the "+" connection of the charger. The minus (-) connections have to be coupled in the same way. **The total capacity (total Ah) should not exceed the indicated maximum battery capacity (depending on the case of application).**
According to the battery manufacturers, permanent parallel operation is admissible in case of two or several batteries of the same voltage, type, capacity, as well as of about the same age (history) in cross connection.

Connection Plan:



*Note: For safety reasons, the unit does not operate with LiFePO4 batteries, unless the **temperature sensor** had been connected! The sensor must be screwed-down to the negative pole of the battery.*

Table 1: Recommended Cross-sections and Lengths for Charging Cables between Unit and Main Battery I:

Cable Cross-sections	Pb 1215	Pb 1220	Pb 1225	Pb 1230
2.5 mm^2	2x 0.6 ... 1.7 m	2x 0.5 ... 1.3 m	--	--
4 mm^2	2x 1.0 ... 2.7 m	2x 0.8 ... 2.0 m	2x 0.6 ... 1.6 m	2x 0.5 ... 1.3 m
6 mm^2	2x 1.5 ... 4.0 m	2x 1.1 ... 3.0 m	2x 0.9 ... 2.4 m	2x 0.8 ... 2.0 m
10 mm^2	2x 2.5 ... 6.7 m	2x 1.9 ... 5.0 m	2x 1.5 ... 4.0 m	2x 1.3 ... 3.3 m
Fuse 1	≥ 25 A	≥ 25 A	≥ 40 A	≥ 40 A

Safety Instruction: Connection is only allowed to a shock-proof socket, which has been installed according to the valid technical regulations, protected with max. 16 A (if required mobile/stationary with a fault current breaker (FI) with a nominal residual current of 30 mA).

Option: Charging/Signalling Port "II" 12 V / 2 A - 3 A

Combined port, which can be used:

- For the **2nd Battery** for support charging and trickle charging of the **vehicle's starter battery** in case of extended standstill periods and for equalization of the charge for short-term consumer loads, such as interior lighting of the driver's cabin etc. It is active together with the main charging port I. The output voltage is slightly lower than the output voltage of the main charging port, and its current intensity is limited to approx. 2 A or 3 A. Overcharging of the vehicle's starter battery is excluded.
- As **signalling port** for an indication "mains supply available" or as vehicle engine immobilizer preventing an engine start, if the power supply of the vehicle is still inserted.
  The port **always supplies voltage, as soon as mains voltage is supplied to the unit**, also if battery failures have been recognized.

The auxiliary charging port of battery II may be used or not used, the function of the main charging port of battery I will not be affected, except that the current rate is reduced by the inferior current rate of battery II.

Option: Temperature Sensor (required for LiFePO4 charging program)

Connect the temperature sensor 825 (accessory, order No. 2001) to the **terminals "T T"** (any polarity).

The temperature sensor controls the **temperature** of **battery "I".**
Ensure that the installation place of the sensor is not influenced by any source of heat (engine heat, exhaust, heater etc.)!

Lead-Acid, Gel, AGM Batteries:

Installation: The **thermal contact** of sensor and **battery inside temperature should be well.** Thus, it should be screwed down to the negative pole or positive pole of the battery. It is also possible to fasten it at the sidewall centre of the battery casing.

Function: The temperature-dependent charging voltage of the battery will be adapted automatically to the battery temperature (automatic temperature equalization). The temperature sensor measures the battery temperature. In case of low temperatures (winter operation), the charging voltage will be increased, in order to improve and accelerate full charging of the weak battery. Sensitive consumers are protected by a voltage limitation in case of very low outside temperatures.
In case of summery temperatures, the charging voltage is reduced to minimize the load (gassing) of the battery and to extend the lifetime of gas-tight batteries.

Battery Protection: In case of excessive battery temperatures (from +50 °C), the charging voltage will be reduced strongly to the **safety charging voltage**, approx. 12.80 V, for battery protection, and the maximum charging current rate will be halved (safety mode, LED **"Board I"** is flashing. Any charging data being recorded hitherto will be kept in memory. Battery charging is then interrupted, but the supply of possibly connected consumers will be continued by the unit, and the battery is allowed to cool down.

The unit recognizes automatically a missing sensor, cable break or short circuit of the sensor cables, as well as unreasonable measuring values. In that case, it will switch automatically to the usual charging voltage rates of 20 °C / 25 °C being recommended by the battery manufacturers.

LiFePO4 Batteries:

Installation: The **thermal contact** of sensor and **inside temperature** of the battery **should be well**. Thus, it should be screwed down to the **negative pole** of the battery, because in most of the cases, this is the cooler side (the positive pole is often biased by the exhaust heat of internal fuses of the battery, electronic systems for cell equalization, balancers etc.)

Function: In case of abnormal battery temperatures, such as < -20 °C, > 50 °C, the charging voltage will be reduced strongly to the **safety charging voltage**, approx. 12.80 V, for battery protection, and the maximum charging current rate will be halved (safety mode, LED **"Battery I" is flashing**). Any charging data being recorded hitherto will be kept in memory. Battery charging is then interrupted, but the supply of possibly connected consumers will be continued by the unit, and the battery is allowed to cool down.

Below 0 °C, the charging current will be reduced more strongly for battery protection, LED **"Battery I" turns off shortly** every 2 seconds and longer charging times can be expected.

If the charging program LiFePO4 had been set, the temperature sensor must be connected for reasons of battery safety. Otherwise, the unit will not operate, and the LED **"Main Charging"** will be **flashing**!

Unit **Key** on the Front Panel " **1s Silent Run / 4s Li Storage** ", Functions:

Short keystroke **1 sec. „Silent Run"** noise-optimised operation (night operation)

- The internal cooling fan of the unit will be set to constant lowest noise, steady speed.
- All light-emitting diodes will be switched off, only the current display "Current" will still be lighting weakly.
- Of course, all charging and control functions continue working internally to the full extent.
- The lower cooling capacity might effect a slightly reduced charging capacity. **

Reactivation of the display and thus of the full charging capacity:

- is possible at any time by pressing the key again.
- Automatic reactivation after 10 hours by integrated timer (end of nighttimes)

** *With the most powerful unit type Pb 1230 SMT 2B the charging capacity will be limited to approx. 80 % (AC limit). Operation of the unit is also possible, if the local 230 V mains only offers smaller capacity rates (weak protection of the parking lot with only 2 amperes, shore power supply or Marina, generator operation).*

5) **Longer** keystroke **4 sec.**: Special charging program **" Li Storage "** for LiFePO4 maintenance (**seasonal** operation)

This charging mode can only be activated, if the "charging program LiFePO4" had been set. It cannot be activated for lead charging programs!

Press the key > 4 sec. until the light-emitting diodes "Battery Full" and "Main Charging" will be flashing quickly. Then, release the key:

After that, **"Battery Full" and "Main Charging" are flashing slowly and alternately,** the charger had switched, ready.

This special charging program automatically maintains an advantageous charging state of 50-80 % of the LiFePO4 battery when the vehicle is stopped. This charging state is advantageous for the battery lifetime and simultaneously supplies the 12 V consumer loads of body and systems, such as alarm systems, WLAN etc., as well as the vehicle's starter battery and the consumer loads in idle mode.

Note: For reasons of safety, the charger always remains in this operating mode, even in case (inadvertently) of power failure, engine start, higher charging of the battery (batteries) by the solar system, high 12 V consumer current rates etc., in the meantime. Of course, the temperature control for the LiFePO4 battery and the internal monitoring functions of the equipment continue working.

The lighting intensity of the LED "Current" will be reduced or increased depending on the supplied current intensity. It will turn off, if the charging current rates are approx. < 0.2 A.

At the beginning of this charging mode there are two possibilities in practice:

1. *Low charging state of the battery: The LED "Current" is lighting:*

The unit charges the battery to the desired charging state of 50-80 % and keeps it constant.
Further action is not required.

2. *High charging state of the battery: The LED "Current" is turned off:*

The charger cannot discharge the battery by itself. This is effected by the 12 V consumer loads being continuously connected.
The battery will be discharged until the charger automatically "catches" it and the consumer loads. From this moment, the desired charging state of 50-80 % is kept. Further action is not required.
Depending on the consumer loads and the battery size, this can take long, possibly days. However, the process is executed automatically.
*Users in a hurry can drop the battery with strong consumer loads, until the LED "**Current**" is lighting **intensively** for an extended period or an existing battery computer indicates approx. 60-70 % charging state. The system levels off automatically over the coming weeks.*

Return to the standard LiFePO4 charging program:

This is solely and **only** possible by a **longer keystroke** of min. **4 sec.** until the LEDs "Battery Full" and "Main Charging" will be flashing quickly. Then release the key. Ready. Actions, such as withdrawal of the mains plug, do not have any effect (see above).

It follows the automatic full charging process with the charging program LiFePO4. End of season break.

Option: Remote Control (Plug "Remote Control")

If the charger has been installed in a difficult to access location, the **Remote Control S for Automatic Charger (Order No. 2075)** can be used for remote control of the charging process (plug-and-go connection cable of 5 m length is included in the delivery scope).

Connection:

Just insert the plug of the remote control into the tip jack "Remote Control" of the charger.

Function:

The remote control is equipped with the same pilot lamps (light-emitting diodes) as the charger.

Switch Function:

Position "ON": Charger works with full charging capacity.

Position "OFF": Ensures silent operation on board by means of the function "silent run ", noise-optimised operation (night operation), see above.

Unit Settings:

How to Set the Type (Design, Technology) of Main Battery "I":

4 Charging programs for the different battery types are stored in the unit. They can be selected by means of the **2 micro slide switches** at the unit front:

The **control levers** of the slide switches are shown in **white**.

If not being specified divergently by the battery manufacturer, the suitable charging program for the supply battery
Board I can be determined by means of the following description and the technical data (voltage rates U1 and U2).

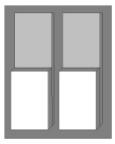
The possible parallel/floating operation with 12 V consumer loads being connected to the main battery "I" is also automatically considered by all charging programs.

TS = Temperature Sensor 825 (effect with/without connection of the temperature sensor)

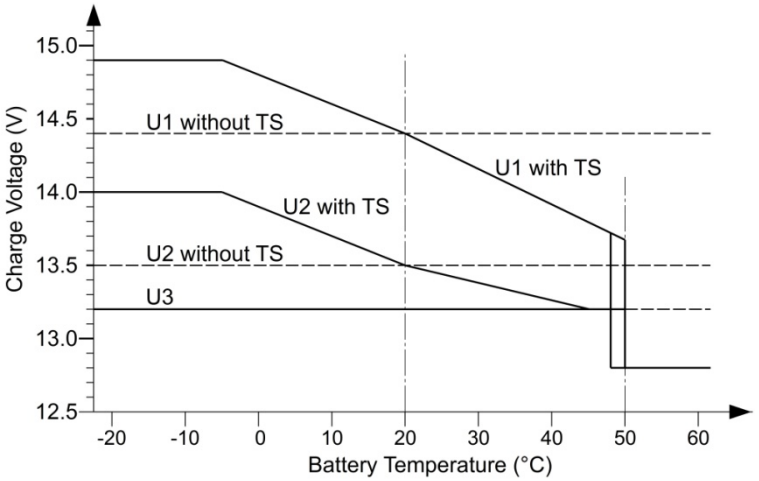
Lead Batteries (Acid, Gel, AGM)**:**

Three (3) charging programs, charging voltage rates and temperature equalization for batteries in lead technology:

1 "Lead Acid/AGM 1 14.4 V" Switch Position



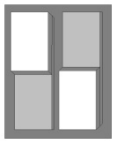
U1=14.40 V	U2=13.50 V	U3=13.20 V
2-5 h	24 h	Continuous



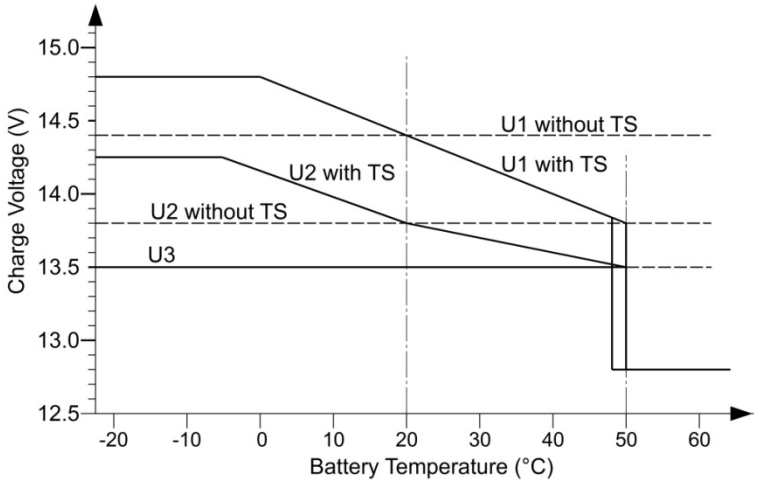
Universal charging program IU1oU2oU3 for acid-lead-acid batteries acc. to DIN 57 510 / VDE 0510 for charging and trickle charging of supply (board) batteries.
Ensures short charging times, high charging factor and acid mixing for open standard batteries and closed, SLA, low-maintenance, maintenance-free "non-solid electrolyte", "lead-acid", drive, lighting, solar and heavy-duty batteries. Also suitable for recently developed batteries (low-antimonous, with silver-alloy, calcium or similar) and batteries with low (L) and very low (VL) water consumption.
Adapted to closed, gas-tight **AGM** (absorbed glass mat) / lead-fleece batteries **VRLA** with indication of the charging voltage "**14.4 V**".

2 "Gel"

Switch Position



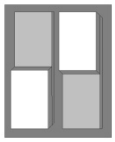
U1=14.40 V	U2=13.80 V	U3=13.50 V
6-12 h	48 h	Continuous



Charging program IU1oU2oU3, adapted to closed, gas-tight **Gel/dryfit** batteries **VRLA** with determined electrolyte, which are generally requiring longer dwell times U1 to achieve particularly high capacity storage and to avoid deep discharge (becoming "deaf") of the battery, such as EXIDE, Sonnenschein, "dryfit", Varta, Bosch, Banner, Mobil Technology etc. If not being specified divergently by the battery manufacturer, also recommended for batteries in round cell technology, such as EXIDE MAXXIMA (DC).

3 "AGM 2 14.7 V"

Switch Position

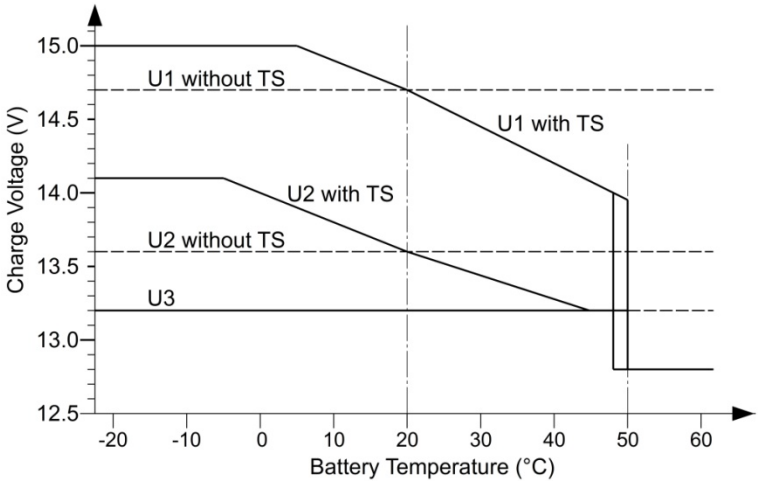


U1=14.70 V	U2=13.60 V	U3=13.20 V
1.5-5 h	24 h	Continuous

Charging program IU1oU2oU3, adapted to closed gas-tight **AGM**
(absorbed glass mat / lead-fleece batteries VRLA), which are requiring a particularly high level U1 fur full charging with the
indication of the charging voltage "14.7 V or 14.8 V".

It is highly recommended to check the specification sheet of the battery concerning the high charging voltage U1 **14.7 V**!

Or else, in case of doubt, set the charging program 1 "Lead Acid/AGM **14.4 V**".



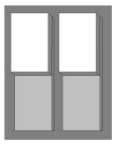
LiFePO4 Battery:

Charging program Li, charging voltage rates and temperature control adapted to lithium batteries:

- **The charging regulations of the battery manufacturer are absolutely to be observed!**
- **An operation of the unit at a LiFePO4 battery without BMS Battery Management System and without equalization charging of the cells (balancing) as well as safety circuit is not admissible!**
- **The battery temperature sensor must be installed at the battery (screw to the negative pole)** and connected at the unit. It serves as protection for the battery.
  No function without temperature sensor, LED **"Main Charging" is flashing**!
- If possible, the battery temperature should be kept above 0 °C.

4) "LiFePO4 14.4 V"

Switch Position



U1=14.40 V	U2=13.80 V	U3=13.45 V
0.3-1 h	24 h	Continuous

Charging program IU1oU2oU3 adapted to

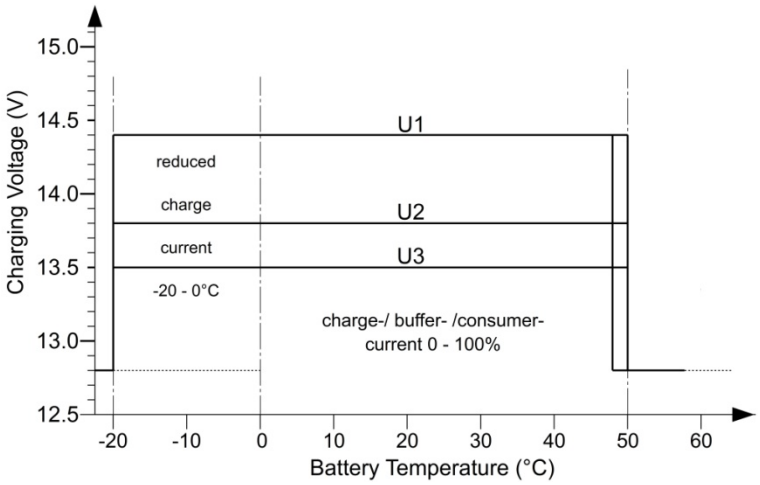
- **RELION types "RB" ****
- **Super B SB12Vxx - M (Epsilon) ****
- **MT-LiFePO4 Professional Series**

of the indicated capacity rates, types with integrated safety circuit and integrated BMS.

** also to be used with indication "Charging Voltage: 14.6 V", because of the lower battery load.

- **Super B SB12VxxE**
- **GNB/Exide SL12 xxxHC with BMS**

of the indicated capacity rates. Operation only with own BMS and prescribed safety circuit!



Pilot Lamps:

"Battery Full" Battery (Batteries) fully charged, **green**) **:

- If it is on: Battery (batteries) has (have) been charged to 100 %, trickle charge U2 and storage charge U3, finished.
- If it is flashing: Main charging process is effected in the charging phase U1, the display of the residual charging time rises gradually from approx. 75 % (lead) or 90 % (LiFePO4) (short flashing) to 100 % (long flashing).
- Off: Main charging process is still effected in the phase I.

"Main Charging" (Main charging, **yellow**) **:

- If it is on: Main charging process is effected in the phase I and after that in the charging phase U1.
- Off: Trickle charge U2 or U3.
- If it is flashing:
  1. Battery temperature sensor at terminals "**I T T**" is not connected (only with LiFePO4).
  2. External overvoltage battery I or II, > 15.50 V 20 sec. disconnection, automatic reset after drop to the nominal voltage.

"Current" (Charging Current, **red**):

- If it is on: The lighting intensity will be **reduced or increased** depending on the **supplied charging current.**
- Off Charging current is less than approx. 0.2 A

"Battery I" (**yellow**)**:**

- If it is on: Charging port "I" is active.
- Off: Charging port is blocked (safety switch).
- If it is flashing: Battery protection: Battery overtemperature **"I"** > 50 °C: Switchover to low safety charging voltage and half of the max. charging current, automatic return in case of slightly dropped temperatures.
- Turns off shortly: Is lighting longer and turns off shortly approx. every 1.5 sec., only with charging program LiFePO4: Li battery protection, battery temperature below 0 °C, the charging current might be reduced for protection of the Li battery, in case of discharged battery, longer charging times can be expected.

"Battery II" (**yellow**)**:**

- If it is on: Charging port "I" is active.
- Off: Charging port is blocked (safety switch) or low voltage < 7 V.

"Power" (Mains, **red)**:

- If it is on: Mains supply is available and charger is ready for operation
- If it is flashing:
  1. Disconnection by the safety timer, duration of the charging phase I was too long (> 15.5 h), excessive current consumption by consumers, battery defective (short-circuit of the cells). Reset is only possible by withdrawing the mains plug.
  2. Internal unit failure (overheating), automatic reset after cooling down.

****** **"Battery Full"** and **"Main Charging"** are flashing **slowly and alternately**:

The charging program **5) Li Storage** is active (such as during seasonal operation).
It automatically maintains an advantageous charging state of 50-80 % of the LiFePO4 battery, when the vehicle is stopped. This charging state is advantageous for the battery lifetime. See **page 5.**

Return from this function to the standard charging program LiFePO4:

Only possible by pressing the **key "Silent Run"** for more than **4 seconds**.
Withdrawal of the mains plug does not have any effect!

During power pack operation (without batteries or with defective fuse) the active charging ports provide the desired charging voltage. The LEDs "I" and "II" are still lighting.

Further actions or maintenance at the unit are not required.

Chronological Sequence at the Main Port Battery I:

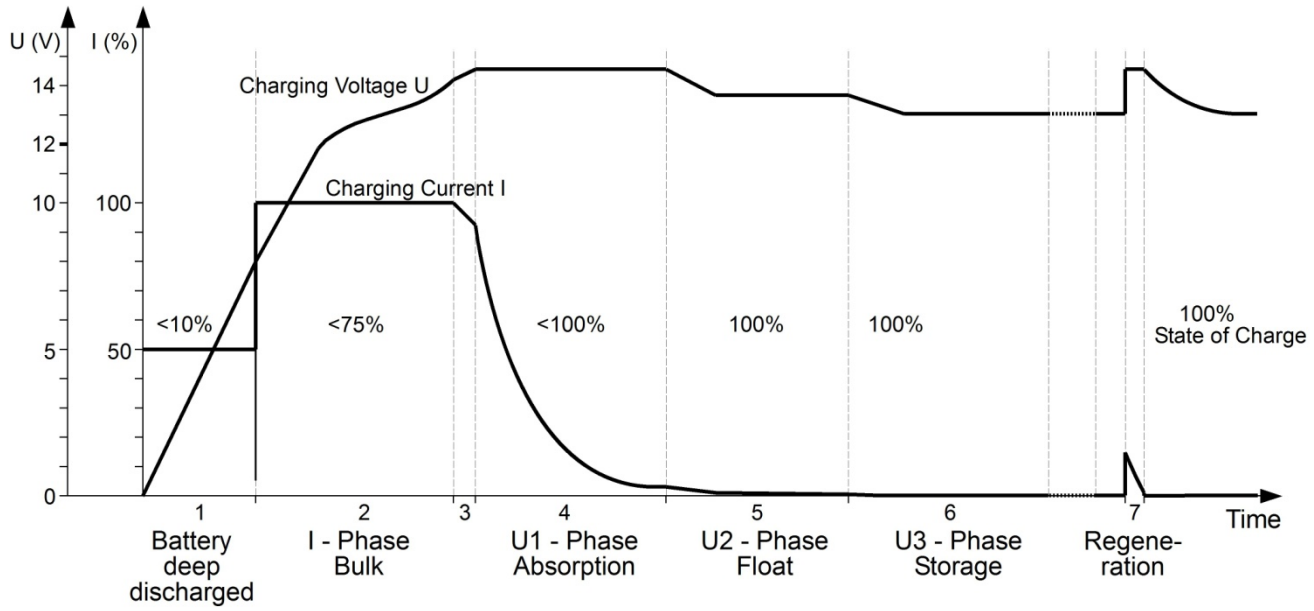
A new, complete main charging cycle will be executed:

- After a power failure.
- If the battery voltage drops below the reset voltage of 12.75 V / 13.25 V due to high current load beyond the maximum charger current for 30 seconds.

1. Charging aid for deeply discharged (lead) batteries. From 0 V, they will be subject to gentle preliminary charging for recovery with a small current rate up to approx. 8 V or a switched-off LiFePO4 battery will be reactivated.
2. **Main charging** with maximum charging current (**phase I**) in the mean voltage range up to close to the phase U1 **for short charging times**, LED **"Main Charging"** is lighting, and approx. 75 % (lead), approx. 90 % (LiFePO4) of the capacity will be charged. The duration of phase I depends on the battery conditions, the load by additional consumers and the charging state. The charger is recording the course of charging. For reasons of safety, the phase I will be terminated by the safety timer after 15.5 hours, at the latest (cell defects of the battery etc.).
3. In case of high battery voltage rates, the charging current will be slightly reduced for battery protection (orientation phase). After that, automatic switching to the following phase U1.
4. During the **phase U1** (**full charging**, cell equalization charging, LED "**Main Charging**" is lighting), the battery voltage will be kept constant on a high level. The green LED **"Battery Full" is flashing** (at first, short flashing, with rising charge increasingly longer flashing), and gentle charging of the additional high battery capacity. The charger controls the charging time and the charging current. From these values and from the course of charging being recorded during the phase I, the charger determines the **100 % full charge point** of the battery for automatic switching to U2. In case of slightly discharged batteries, the duration of phase U1 will be kept short for relief of the battery and low maintenance expenditure. In case of major discharge, the phase U1 must be extended for full charging of the battery and cell equalization charging. During this process, any influence by consumer loads is avoided reliably. The LED **"Main Charging"** turns off at the end of the phase U1.
5. **Phase U2 (Full trickle charge, LED "Battery Full" is lighting permanently):** The charger has now switched to the lower voltage for trickle charge maintaining and buffering 100 % charge of the battery. Depending on the battery type, the duration of the phase U2 is limited to 24 to 48 hours to allow gentle recharging and equalization charging of the cells with small charging current rates.
6. **Phase U3 (storage charge,** LED **"Battery Full" is permanently on**, adapted to the battery type):
   In case of long-term operation, such as for extended standstill periods or during winter break with lead batteries, the charging voltage will be reduced to the low level U3 for minimization of battery gassing and corrosion.
7. **Regeneration of Lead** Acid/AGM/Gel **Batteries**: For battery activation (avoidance of electrolyte accumulation and sulphation), the charger will automatically run up to the charging voltage U1 twice a week for a short time (approx. 1 hour). After that, direct return to the lower storage charge U3.

   LiFePO4 Auto Wake Up: Periodical automatic activation of the cell equalization charging (balancing) by the battery BMS in case of extended standstill periods by systematic voltage increase every 10 days for half an hour. After that, return to the lower storage charge U3. This function is blocked during “Li Storage” charge.

Note: During the phases **U1, U2, U3** (battery full) **almost the total charger current** is available for **additional supply** of consumers without any discharge of the battery.



Safety Regulations and Appropriate Application:

The charger has been designed according to the valid safety regulations.

Appropriate application is restricted to:

1. **Charging of lead-gel, lead-AGM, lead-acid or LiFePO4-complete-batteries (with integrated BMS, balancing, safety circuit and approval!) Charging of batteries of the indicated nominal voltage and simultaneous supply of the consumers being connected to these batteries in fixed installed systems with the indicated battery capacities and charging programs.**
2. **Connection to a shock-proof socket, which has been installed according to the valid technical regulations, protected with max. 16 A (if required mobile/stationary with a fault current breaker (FI) with a nominal residual current of 30 mA).**
3. **Connection in consideration of the indicated cable cross-sections at the charging ports.**
4. **Fuses of the indicated capacity are to be provided near the battery to protect the cabling between battery and charger output.**
5. **Technically faultless condition.**
6. **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.**

Never use the unit in locations where the risk of gas or dust explosion exists!

- Open-air operation of the unit is not allowed.
- Lay the cables in a way, that damages are excluded and 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, as well as loosened or overloaded connections and remedy possible defects.
- 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 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.
- **The unit does not contain any parts, which can be replaced by the user.** Even after withdrawal of the mains plug, the unit may be **extremely live** for an extended period (particularly in case of failure).
- Keep children away from the charger and the batteries.
- Observe the safety regulations of the battery manufacturer; deaerate the battery room.
- Non-observance may result in injury or material damage.
- 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.

Operating Instructions:

- **Display of the residual charging time:**

  A flashing pilot lamp **"Battery Full"** allows conclusions concerning the progress of the charging phase U1 (full charging). Directly after the charging phase I (approx. 75 % for lead, approx. 90 % for LiFePO4), the pilot lamp will only be flashing momentarily. With progressing charging time, flashing will change more and more to permanent lighting, until the pilot lamp will be lighting most of the time and will only stop lighting for a short moment shortly before 100 % full charge is reached.

- **Interruption of the charging process:**

  In case of a power failure or withdrawal of the mains plug during the charging process, the charging process will be interrupted. The connected batteries will **not** be discharged by the charger. Thus, the charging process can be interrupted at any time.

  In case of frequent interruptions, particularly before reaching full charge (LED "Battery Full" is lighting **permanently**), the battery should be subject to an **occasional full charging cycle of 24 hours** for equalization of the charge.

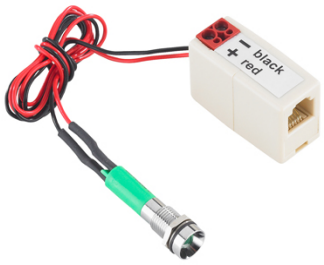
- **Overvoltage Protection:**

  The unit protects itself against connection of excessive battery voltage rates or will be switched-off in case of defective additional charging systems (solar systems, generators or similar systems), switching threshold 15.5 V, delay 20 s. Automatic charging, if the battery voltage drops to nominal level.

- **Overvoltage Limitation:**
  Charging voltage limitation to max. 15.0 V during all charging modes to protect sensitive consumers.
- **Overload / Overheating Protection Charger:**
  The charger is equipped with a double electronic protection against overload and protects itself against adverse installation conditions (e. g. insufficient ventilation, excessive ambient temperatures) by gradual reduction of the charging capacity.

Technical Data:	***Pb 1215 SMT 2B***	***Pb 1220 SMT 2B***	***Pb 1225 SMT 2B***	***Pb 1230 SMT 2B***
Supply Voltage (Mains Frequency 45 - 65 Hz):	110 V - 230 V	(110 V-) 230 V	(110 V-) 230 V	(110 V-) 230 V
Voltage Range Mains Function, all Types:		85 V - 270 V, short-time 305 V (5 sec.)		
Mains Voltage Range for Full Charging Capacity:	95 V - 270 V	180 V - 270 V	180 V - 270 V	180 V - 270 V
Mains Power Consumption max.:	240 W	330 W	400 W	490 W
Mains Power Consumption at Readiness for Charging:	1.9 W	1.9 W	2.1 W	2.1 W
Active Sinusoidal Power Factor Correction (CosPhi = 1):	Yes	Yes	Yes	Yes
Approx. Charging Current at 110 V Supply Voltage:	15 A	18 A	18 A	18 A
Main Charging Port Battery I:				
Nominal Battery Voltage Lead/LiFePO4 Battery:	12 V/12 V-13.3 V	12 V/12 V-13.3V	12 V/12 V-13.3 V	12 V/12 V-13.3 V
Selectable Charging Programs Lead-Gel/AGM/Acid, LiFePO4:	4	4	4	4
Battery Capacity (recommended):	60 Ah-110 Ah	80 Ah-145 Ah	100 Ah-180 Ah	120 Ah-230 Ah
Battery Capacity (acc. to case of application, such as also LiFePO4)	38 Ah-170 Ah	50 Ah-230 Ah	60 Ah-290 Ah	75 Ah-350 Ah
Charging Current Main Charging, Phase **I**, 8 V to U1; 0-15.5 h:	15 A	20 A	25 A	30 A
Charging/Floating/Load Current, controlled, Phase U1-U2-U3:	0 A-15 A	0 A-20 A	0 A-25 A	0 A-30 A
Minimum Battery Voltage for Charging Start:	0 V	0 V	0 V	0 V
Preliminary Charging Current (Deeply Discharged Batt. 0 V-8 V):	7.5 A	10.0 A	12.5 A	15.0 A
Reverse Current from Battery (Power Failure):	<0.5 mA	<0.5 mA	<0.5 mA	<0.5 mA
Reset Voltage (30 sec.), depending on Battery Type:	12.75 V/13.25 V	12.75 V/13.25 V	12.75 V/13.25 V	12.75 V/13.25 V
Limit of Charging Voltage (Protection of Connected Consumers):	15.0 V	15.0 V	15.0 V	15.0 V
External Overvoltage Disconnection (20 sec.):	15.5 V	15.5 V	15.5 V	15.5 V
Ripple Factor Voltage:	< 30 mV rms	< 30 mV rms	< 30 mV rms	< 30 mV rms
Charging Timer:	4-fold	4-fold	4-fold	4-fold
Safety Protect. ag. Reverse Batt./Short-circuit/Back Discharge:	Yes	Yes	Yes	Yes
Safety Timer per Charging Phase I/U1/U2:	Yes	Yes	Yes	Yes
Lead Battery Regeneration at extended down-time 2x week: 1 h:	Yes	Yes	Yes	Yes
LiFePO4 Auto Wake Up at extend. down-time, every 10 days 0.5 h:	Yes	Yes	Yes	Yes
or Li Storage, LiFePO4 Standstill Trickle Charge (Seasonal):	Yes	Yes	Yes	Yes
Input for Battery Temperature Sensor:	Yes	Yes	Yes	Yes
Power Pack Operation (e. g. Supply During Battery Replacement):	Yes	Yes	Yes	Yes
2. Auxiliary Port Vehicle's Starter Battery II (Signalling Port Mains)**:**				
Nominal Battery Voltage (Lead):	12 V	12 V	12 V	12 V
Charging Current or Rating as Signalling Port:	0 A-2 A	0 A-2 A	0 A-3 A	0 A-3 A
Safety Protect. ag. Reverse Batt./Short-circuit/Back Discharge:	Yes	Yes	Yes	Yes
Connection for Remote Control Automatic Charger:	Yes	Yes	Yes	Yes
Fitting Position of Unit:	any	any	any	any
Temperature Range:	-20/+45 °C	-20/+45 °C	-20/+45 °C	-20/+45 °C
Speed-controlled, temperature-controlled Fan:	Yes	Yes	Yes	Yes
Gradual Reduction of Charging Capacity at Overtemperature:	Yes	Yes	Yes	Yes
Safety Disconnection in Case of Overheating:	Yes	Yes	Yes	Yes
Noise-reduction of Fan, Night Operation (Silent Run):	Yes	Yes	Yes	Yes
Protection Class/System of Protection:	I / IP21	I / IP21	I / IP21	I / IP21
Dimensions, incl. Mounting Flanges (mm):	215 x 160 x 72	215 x 160 x 72	215 x 160 x 72	215 x 160 x 72
Weight:	1250 g	1280 g	1300 g	1350 g
Ambient Conditions, Humidity of Air:		max. 95 % RH, no condensation		
Safety Regulations:		EN 60335-2-29		

Option: Remote Indicator IP67 , Order No. 2081



The green light-emitting diode indicates the readiness for operation of the charger and the mains power supply.

The remote indicator can be installed at any desired location via a bore hole, 8 mm. It can be installed at a well visible location in the inside area (for instance in the dash board), as well as outside, such as near the driver's door. The delivered packing washer allows front installation with high tightness IP67.

Connection: Just insert the plug of the remote control into the tip jack "Remote Control" of the charger.

Delivery Scope: Connection strands red/black of 0.4 m length, connection adapter, connection cable of 5 m length, plug-and-go on both sides, packing washer, coupling ring.

Option: Extension of the control cable, 5 m length, 6 poles with modular coupling, Order No. 2005

If required, for further extension of the connection cable, plug-and-go on both sides.

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; EN 61000-3-2; EN 61000-3-3; EN61000-6-1; EN61000-4-2; EN61000-4-3; EN61000-4-4; EN61000-4-5; EN 61000-4-6; EN 61000-4-11; EN60335; EN50498.

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

The product is RoHS compliant. It complies with the directive 2011/65/EU for Reduction of Hazardous Substances in electrical and electronic equipment.

Quality Management System
DIN EN ISO 9001

Delivery Scope:

- Charger
- Power Cable
- Operating Manual

Available Accessories:	Battery Temperature Sensor 825	Order No. 2001
	Remote Control S for Automatic Charger	Order No. 2075
	Remote Indicator IP67	Order No. 2081

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