

SmartCharger Series

Operating Instructions

- Valid from device firmware version 02.00.013 -

Suitable for 12 V DC vehicle electrical networks / batteries



Illustration similar

Important note

This device must only be used by qualified, specialist personnel for its specified application. Read the operating instructions carefully and comply in all cases with the safety instructions and the specifications of the battery manufacturer!

Depending on any customer-specific delivery specifications, the parameters described may differ or some modes may not be available. If you have any questions regarding the parameterization of your device, please contact Deutronic Elektronik GmbH or one of our worldwide service centers.

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Device features

- Extensive protection and self-protection functions
- Short-circuit and reverse polarity protection
- Vehicle electronics/airbag protection
- Protective function in the event of battery defects
- Spark suppression
- Cable compensation
- Depending on the customer-specific requirements, various operating modes are available ex works
- Operating modes: Pb-LTC (long-term charging), Pb charging,
Li/LFP-LTC (long-term charging), Li/LFP charging,
PowerUp and external power supply (EPS/buffer mode).

1. Installation and Safety Instructions

In addition to the operating instructions, always also comply with the specifications of the battery manufacturer, the associated installation and safety instructions and the device-specific data sheets.

The installation and safety instructions, as well as the data sheets, can be found on our website at **www.deutronic.com**. Alternatively, please contact Deutronic Elektronik GmbH or one of our worldwide service centers

2. Assembly

2.1. Mains Connection

The device may only be used with a suitable mains power cable or country-specific adapter.

If an extension lead is used, the correct cable cross section must be selected according to the following table:

| | | | | |
|---|-----|-----|-----|-----|
| Cable length [feet] | 25 | 50 | 100 | 150 |
| AWG sizes | 18 | 16 | 12 | 10 |
| Cable length [meters] | 7 | 15 | 30 | 45 |
| Cable cross-section [mm²] | 1.0 | 1.5 | 4 | 6 |

Table with the recommended AWG sizes as well as the minimum cable cross section for extension leads

2.2. Charging cable

If the charging cable is changed, cable compensation must always be carried out. Even if the cable is exchanged for a cable of the same type, cable compensation must be carried out (see Section 5.1).

3. Control elements

3.1. Control panel

The control elements, incl. LEDs and buttons, are shown below:

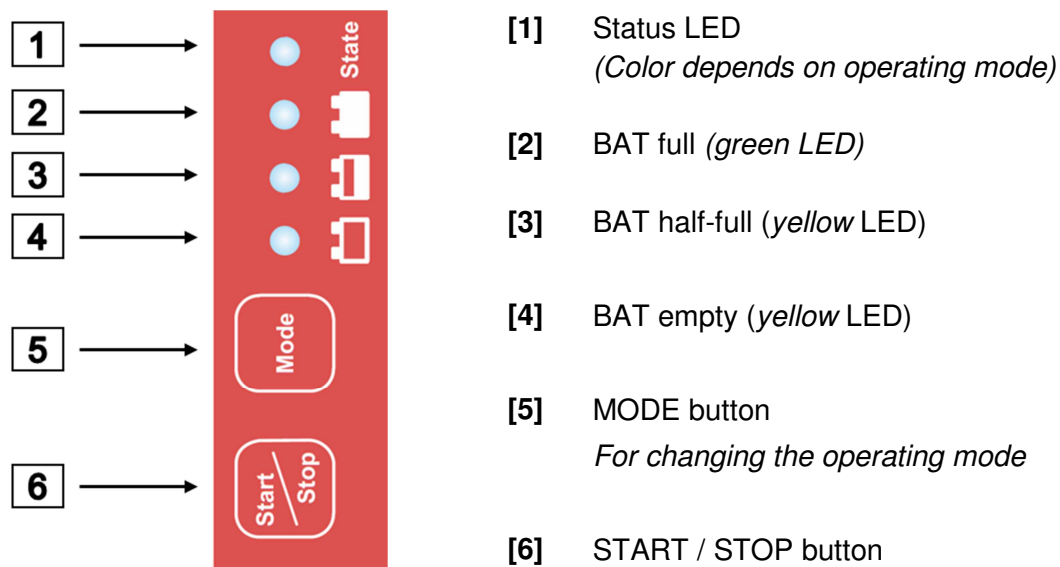


Figure 1: Control panel

3.2. Buttons

START / STOP button:

In “Standby” mode, pressing the START/STOP button will activate the selected operating mode. Pressing the button again will put the device back into “Standby” mode.

MODE button:

In “Standby” mode, pressing the MODE button will change the operating mode.

Note: Changing between the operating modes is not possible in Active mode!

3.3. Signaling

Note: Depending on any customer-specific delivery specifications, the parameters described may differ or some modes may not be available. If you have any questions regarding the parameterization of your device, please contact Deutronic Elektronik GmbH or one of our worldwide service centers.

3.3.1. Standby mode

| Operating mode | Status LED | LED 2 | LED 3 | LED 4 |
|--------------------|--------------------------|----------|----------|----------|
| Cable compensation | Illuminated solid violet | Flashing | Flashing | Flashing |
| Charging Pb LTC | Flashing orange | Flashing | Flashing | Flashing |
| Charging Pb | Illuminated solid orange | Flashing | Flashing | Flashing |
| Charging Li LTC | Flashing blue | Flashing | Flashing | Flashing |
| Charging Li | Illuminated solid blue | Flashing | Flashing | Flashing |
| PowerUp | Flashing green | Flashing | Flashing | Flashing |
| EPS | Illuminated solid green | Flashing | Flashing | Flashing |

3.3.2. Active mode

Operating mode: Cable compensation

| State | Status LED | LED 2 | LED 3 | LED 4 |
|----------------------------------|--------------------------|---|-------|-----------------|
| <i>Load detection active</i> | Illuminated solid violet | | | Flashing |
| <i>Switch-on delay</i> | Illuminated solid violet | | | Flashes quickly |
| <i>Cable compensation active</i> | Illuminated solid violet | Chaser (each LED lights up for 1 second) | | |

Operating mode: Charging Pb LTC (long-term charging)

| State | Status LED | LED 2 | LED 3 | LED 4 |
|------------------------------|-----------------|---|-------|-----------------|
| <i>Load detection active</i> | Flashing orange | | | Flashing |
| <i>Switch-on delay</i> | Flashing orange | | | Flashes quickly |
| <i>Standard</i> | Flashing orange | Chaser (each LED lights up for 1 second) | | |
| Monitoring | | | | |
| Battery full | Flashing orange | Solid | | |
| Battery half-full | Flashing orange | | Solid | |
| Battery empty | Flashing orange | | | Solid |

Operating mode: Charging Pb

| State | Status LED | LED 2 | LED 3 | LED 4 |
|------------------------------|--------------------------|---|-------|-----------------|
| <i>Load detection active</i> | Illuminated solid orange | | | Flashing |
| <i>Switch-on delay</i> | Illuminated solid orange | | | Flashes quickly |
| <i>Standard</i> | Illuminated solid orange | Chaser (each LED lights up for 1 second) | | |
| <i>Maintenance charging</i> | Illuminated solid orange | Chaser (each LED lights up for 1 second) | | |
| Monitoring / battery full | Illuminated solid orange | Solid | | |

Operating mode: Charging Li/LFP LTC (long-term charging)

| State | Status LED | LED 2 | LED 3 | LED 4 |
|------------------------------|---------------|---|-------|-----------------|
| <i>Load detection active</i> | Flashing blue | | | Flashing |
| <i>Switch-on delay</i> | Flashing blue | | | Flashes quickly |
| <i>Standard</i> | Flashing blue | Chaser (each LED lights up for 1 second) | | |
| Monitoring | | | | |
| Battery full | Flashing blue | Solid | | |
| Battery half-full | Flashing blue | | Solid | |
| Battery empty | Flashing blue | | | Solid |

Operating mode: Charging Li/LFP

| State | Status LED | LED 2 | LED 3 | LED 4 |
|------------------------------|------------------------|---|-------|-----------------|
| <i>Load detection active</i> | Illuminated solid blue | | | Flashing |
| <i>Switch-on delay</i> | Illuminated solid blue | | | Flashes quickly |
| <i>Standard</i> | Illuminated solid blue | Chaser (each LED lights up for 1 second) | | |
| <i>Maintenance charging</i> | Illuminated solid blue | Chaser (each LED lights up for 1 second) | | |
| Monitoring / battery full | Illuminated solid blue | Solid | | |

Operating mode: PowerUp

| State | Status LED | LED 2 | LED 3 | LED 4 |
|------------------------------|----------------|---|-------|-----------------|
| <i>Load detection active</i> | Flashing green | | | Flashing |
| <i>Switch-on delay</i> | Flashing green | | | Flashes quickly |
| <i>Standard</i> | Flashing green | Chaser (each LED lights up for 1 second) | | |

Operating mode: EPS (external power supply / buffer mode)

| State | Status LED | LED 2 | LED 3 | LED 4 |
|------------------------------|-------------------------|---|-------|-----------------|
| <i>Load detection active</i> | Illuminated solid green | | | Flashing |
| <i>Switch-on delay</i> | Illuminated solid green | | | Flashes quickly |
| <i>Supply</i> | Illuminated solid green | Chaser (each LED lights up for 1 second) | | |

Note: The signaling of possible faults can be found in Section 6. Error messages

4. Commissioning

Note: Before first use, the device and the equipment used, such as the mains cables or charging cables / clips must be checked for damage.

1. Select the correct mains cable for your country and connect it to the device.
2. Insert the mains cable into a mains socket (100 ~ 240 V AC).
3. To signal that the device has started, LEDs 2–4 will illuminate in a running sequence.

Note: With devices in the SC series with an output greater than or equal to 750 W, the mains switch must also be switched on.

4. Depending on any customer-specific delivery specifications, after being connected to the mains supply or after a restart, the device will enter the last used operating mode when put into active mode.

Note: Changing between the operating modes is not possible in Active mode!

4.1. Preparing the charging cables for use in showrooms

To make it easier to position the device under the vehicle, the charging cables can be separated by means of the decoupler. (See Figure 2)

Note: Separation may only be carried out once the device has been switched off and unplugged from the mains!

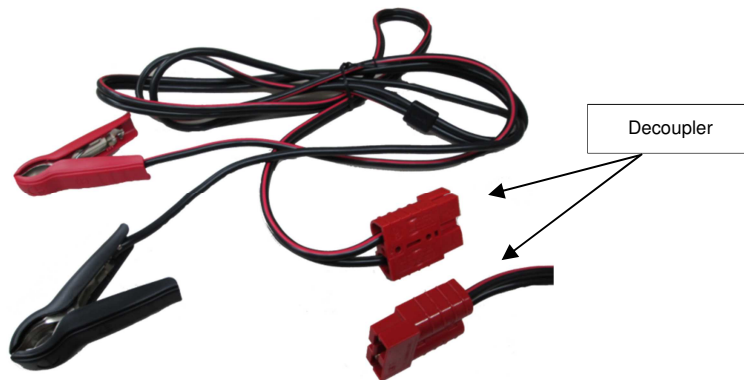


Figure 2: Charging cable in the Smart Charger series

Note: The charging cables shown in Figure 2 are only used with SC300-14 and SC500-14. Charging cables without a decoupler are used from an output power greater than or equal to the SC750-14.

1. Disconnect the device from the mains supply.
2. Disconnect the charging cable at the decoupler provided for this in the middle of the charging cable.
3. Guide the loose charging cable with the decoupler onward and downward through the engine compartment.
4. Connect the charging cable on the decoupler to the device.
5. Connect the charging clips to the charging points provided on the vehicle.
6. Insert the mains cable into a mains socket (100 ~ 240 V AC).
7. To signal that the device has started, LEDs 2–4 will illuminate in a running sequence.
8. Depending on any customer-specific delivery specifications, after being connected to the mains supply or after a restart, the device will enter the last used operating mode when put into active mode.

Note: Changing between the operating modes is not possible in Active mode!

4.2. Initial setup

Once the device has been connected to the mains supply, a chaser appears featuring the three colors of the status LED (red, green, blue) and the three LEDs which display the state of charge (green, yellow, yellow).

Depending on any customer-specific delivery specifications, after being connected to the mains supply or after a restart, the device will enter the last used operating mode when put into active mode. During initial commissioning, this is typically cable compensation mode. (see Section 5.1)

Cable compensation must be performed for the device to operate optimally. For this, both charging clips must be shorted (see Figure 3). The measurement is signaled by a running sequence through LEDs 2–4. After around 30 seconds, the process is complete and the device switches to “Standby” mode. The calculated cable resistance is permanently stored in the device. This value can only be overwritten by performing a new, full cable compensation.

If the cable compensation needs to be repeated, the measurement can be carried out again in cable compensation mode by pressing the START button.



Figure 3: Charging clips in a short circuit

Note:

With device types SC300-14 and SC500-14, the clips must be clamped together at right angles so that the two jaws connected to the cables are positioned on top of each other (see Figure 3). With device types SC750-14 and larger, the clips must be clamped straight into each other. Here too, the jaws that are connected to the charging cable must lie on top of each other.

The clips must remain connected for the entire process.

The device is ready for use following successful cable compensation.

Note: If the charging cable is changed, cable compensation must always be carried out. Even if the cable is exchanged for a cable of the same type, cable compensation must be carried out (see Section 5.1).

5. Operating modes

The chargers are designed for the following usage scenarios, according to the operating mode selected. If the device is connected to the mains, the device will enter the last selected active operating mode when started.

Note: The charger has intelligent temperature regulation. If the device temperature exceeds a pre-defined value, the device's output is reduced.

5.1. Cable compensation

Note: Depending on any customer-specific delivery specifications, the parameters described may differ or some modes may not be available. If you have any questions regarding the parameterization of your device, please contact Deutronic Elektronik GmbH or one of our worldwide service centers.

Cable compensation mode is used to measure or compensate the resistance value of the connected charging cables. This is necessary in order to compensate the voltage drop over the charging cables during battery charging. Cable compensation only starts if the corresponding operating mode is selected and if a short-circuit is detected at the start of compensation. This is done by directly clamping the current clips together. The whole process is described in Section 4.2.

Note: If the charging cable is changed, cable compensation must always be carried out. Even if the cable is exchanged for a cable of the same type, cable compensation must be carried out.

5.2. Charging Pb LTC / Charging Li / LFP LTC

Note: Depending on any customer-specific delivery specifications, the parameters described may differ or some modes may not be available. If you have any questions regarding the parameterization of your device, please contact Deutronic Elektronik GmbH or one of our worldwide service centers.

The XX-LTC operating mode is used for long-term charging and monitoring of vehicles in the showroom with lead (charging Pb LTC) and Li/LFP (charging Li LTC) starter batteries. In support mode, the device supplies the vehicle's electric loads until it reaches its power limit and any charge deficiencies in the vehicle battery are subsequently compensated. The charging process is interrupted at calculated intervals. During these monitoring phases, the battery is analyzed and the parameters for the next charging interval are calculated. A full charge is load-dependent and therefore cannot be guaranteed.

If no battery is connected to the device, load detection is active. This is signaled by LED4 flashing. If the device's charging clips are connected to a battery that has a voltage within the pre-defined range (Pb: 10.0 V – 13.7 V; Li: 11.0 V – 13.7 V), the charging process is started after the switch-on delay. Battery voltages outside the pre-defined ranges are either indicated as "Battery voltage too low" (status LED flashes red) or "Battery full" (status LED continues to indicate the selected mode, and the green LED2 also lights up). Once the charging cycle is complete, monitoring will begin. The battery status is indicated during monitoring. The parameters of the subsequent charging cycle are calculated according to the duration of a monitoring phase. A charging process in progress is signaled by a running light sequence of LEDs 2-4.

5.3. Charging Pb / ChargingLi/LFP

Note: Depending on any customer-specific delivery specifications, the parameters described may differ or some modes may not be available. If you have any questions regarding parameterization, please contact Deutronic Elektronik GmbH or one of our worldwide service centers.

In this operating mode, it is possible to charge either a battery which is installed in the vehicle or a "stand-alone" battery (lead-based battery or Li/ LFP battery, depending on the operating mode). If the charging clips of the device are connected to battery voltage within a predefined range, the charging process will be started after the switch-on delay. The customer is able to select the switch-on voltage threshold. The exact voltage value can be found in the relevant parameterization.

During the charging process, the battery terminals or charging points of the vehicle are supplied with a defined voltage. If the current demand exceeds the maximum output current of the charging device, it switches to current regulation.

If the output current falls below a defined threshold value during the charging process, the device switches to "maintenance charging" mode. To reduce aging of the batteries, the batteries are fed with a voltage below the charging voltage during maintenance charging mode. If the output current exceeds a defined threshold value during the maintenance charging process, the device will switch to recharge mode. The output voltage is again increased to the level of the charging voltage. If the output current falls below a certain value during the maintenance charging process, the device will signal "Battery full" and switch to monitoring mode. If the clip voltage falls below a set value during monitoring, the charger will restart the charging process.

During the charging process, special safety timers will monitor the charge volume and charging duration. If one of the relevant safety thresholds is reached, the device behaves according to its parameterization.

Note: The behavior of the device when the safety threshold is reached depends on the customer-specific parameterization. For example this may trigger a switch-off of the output current, limitation of the charging voltage to the maintenance charging voltage or possibly even no reaction if the parameter has been deactivated.

5.4. PowerUp

Warning! PowerUp must ONLY be used for Li/LFP batteries with a suitable battery management system!

Note: Depending on any customer-specific delivery specifications, the parameters described may differ or some modes may not be available. If you have any questions regarding the parameterization of your device, please contact Deutronic Elektronik GmbH or one of our worldwide service centers.

With lithium-iron phosphate batteries, the battery management system may open a relay to protect the battery in certain circumstances (e.g. deep discharging). With the help of the PowerUp function, the relay can be closed again to restore the functionality of the battery (provided that the internal battery electronics allow this).

Before the actual PowerUp function is started, the battery undergoes testing for around 30 seconds. The "PowerUp" operating mode is signaled by the green flashing status LED. After a successful PowerUp, the device switches to "Standby" mode.

The "PowerUp" process will be aborted if the clip voltage or output current falls below a certain value. (See Section 6.2)

Note: During the PowerUp, all of the vehicle's parallel consumers (ignition, dipped beam, etc.) must be deactivated. If it is not possible to deactivate parallel consumers, the PowerUp should be carried out in standalone mode (disconnect the battery from the vehicle).

When the green status LED and yellow LED4 are flashing, the device is in active load detection mode. This happens if no battery is connected, or if the relay for the connected battery could not be connected within the first minute due to deep discharging.

5.5. EPS (external power supply)

Note: Depending on any customer-specific delivery specifications, the parameters described may differ or some modes may not be available. If you have any questions regarding the parameterization of your device, please contact Deutronic Elektronik GmbH or one of our worldwide service centers.

Warning! Batteries may only be charged in "CHARGE XX" or "XX LTC" modes, as the parameters and monitoring functions required for ensuring safe battery charging are only activated in these programs. These monitoring functions are not active in "EPS" mode.

The "EPS" mode is used to provide power to vehicle electrical systems when the starter battery is not connected. In other words, it takes care of the supply of power to vehicle consumers in support mode up to the device's power limit. If no valid load is present, the device is in load detection mode. In this case, LED4 will also start to flash yellow. If a suitable voltage or load is detected for several seconds (switch-on delay), the device will start to supply voltage.

Note: Modern vehicles have a very low quiescent current - especially two-wheeled motor vehicles. Some of these vehicles are equipped with a start button. This must be pressed multiple times within the first 1-2 seconds during ignition until a running light appears involving LED2-LED4.

During the power supply process, special safety timers monitor the supply volume and supply duration. If one of the relevant safety thresholds is reached, the device behaves according to its parameterization.

Note: The behavior of the device when the safety threshold is reached depends on the customer-specific parameterization. For example this may trigger a switch-off of the output current, or possibly even no reaction if the parameter has been deactivated.

6. Error messages

6.1. Signaling

Note: Depending on any customer-specific delivery specifications, the parameters described may differ or some modes may not be available. If you have any questions regarding the parameterization of your device, please contact Deutronic Elektronik GmbH or one of our worldwide service centers.

| Errors | Status LED | LED 2 | LED 3 | LED 4 | Troubleshooting |
|---|-----------------------|---------------------------------|-------|-------|--|
| Reverse polarity. <i>The output cable was connected to the wrong battery terminal.</i> | Quickly flashing red | Off | Off | Off | Connect the cables the other way round. <i>Red clip - plus terminal</i> <i>Black clip - minus terminal</i> |
| User error. | Flashing red | Depending on the operating mode | | | See Section 6.2 User Errors and Resolution. |
| <i>Device error (internal).</i> | Illuminates solid red | Off | Off | Off | Contact service. |
| <i>Maximum temperature exceeded.</i> | Illuminates solid red | Off | Off | Off | Allow the device to cool down if necessary. Contact service. |

6.2. User Errors and Resolution

Operating mode: Cable compensation

| Signaling | Diagnosis | Troubleshooting |
|------------------------------------|----------------------------|--|
| Cable compensation does not start. | External voltage detected. | Release the charging clips from the battery. |

Operating mode: Pb LTC / LFP LTC

| Signaling | Diagnosis | Troubleshooting |
|--|---|--|
| Status LED flashing red. | Undervoltage/overvoltage. | Battery faulty. |
| Status LED flashing red. | Parameterized current limit exceeded and voltage drop or short-circuit. | Disconnect and reduce consumption or resolve short circuit. |
| Status LED flashing red + current state. | The device detects overheating during operation. Dynamic output and temperature control is active. The device operates with restricted output. | In the event of significant heat development due to high load / inadequate cooling, the device reduces the output current limit but continues to operate with reduced output. Reduce consumption and improve air circulation Allow the device to cool down if necessary. |

Operating mode: Charging Pb / LFP

| Signaling | Diagnosis | Troubleshooting |
|--------------------------|---|---|
| Status LED flashing red. | Undervoltage/overvoltage. | Battery faulty. |
| Status LED flashing red. | Parameterized current limit exceeded and voltage drop or short-circuit. | Disconnect and reduce consumption or resolve short circuit. |
| Status LED flashing red. | Maximum supply time or supply capacity exceeded. | Check the battery / load as there may be a fault. The cause of the safety threshold being reached may also be additional parallel consumers (e.g. light, ignition, navigation / multimedia systems, etc.). |

| | | |
|--|--|--|
| Status LED flashing red + current state. | The device detects overheating during operation. Dynamic output and temperature control is active. The device operates with restricted output. | In the event of significant heat development due to high load / inadequate cooling, the device reduces the output current limit but continues to operate with reduced output. Reduce consumption and improve air circulation Allow the device to cool down if necessary. |
| Status LED flashing red + running light LED2-LED3. | Transition to maintenance charging after the maximum supply time or supply capacity was exceeded. | Check the battery / load as there may be a fault. The cause of the safety threshold being reached may also be additional parallel consumers (e.g. light, ignition, navigation / multimedia systems, etc.). |

Operating mode: PowerUp

| Signaling | Diagnosis | Troubleshooting |
|--|--|---|
| Status LED flashing red. | Parameterized current limit exceeded and voltage drop or short-circuit. | Disconnect and reduce consumption or resolve short circuit. |
| Status LED flashing red. | Current flow too low. | Measure the terminal voltage. The battery may be faulty. |
| Status LED flashing red. | Battery voltage too low. | Battery faulty. |
| Status LED flashing red + current state. | The device detects overheating during operation. Dynamic output and temperature control is active. The device operates with restricted output. | In the event of significant heat development due to high load / inadequate cooling, the device reduces the output current limit but continues to operate with reduced output. Reduce consumption and improve air circulation. Allow the device to cool down if necessary. |

Operating mode: EPS

| Signaling | Diagnosis | Troubleshooting |
|--|--|---|
| Status LED flashing red. | Parameterized current limit exceeded and voltage drop or short-circuit. | Disconnect and reduce consumption or resolve short circuit. |
| Status LED flashing red. | Maximum supply time or supply capacity exceeded. | Check the load as there may be a fault. The cause of the safety threshold being reached may also be additional parallel consumers (e.g. light, ignition, navigation / multimedia systems, etc.). |
| Status LED flashing red + running light LED2-LED4. | The device detects overheating during operation. Dynamic output and temperature control is active. The device operates with restricted output. | In the event of significant heat development due to high load / inadequate cooling, the device reduces the output current limit but continues to operate with reduced output. Reduce consumption and improve air circulation. Allow the device to cool down if necessary. |

Note: It is not permitted to leave consumers (such as the vehicle running light, interior lighting, sound system, etc.) running permanently on the vehicle since the device is only able to interrupt charging mode briefly to check the battery. After this, the vehicle battery is again supplied constantly with charging voltage which can age the battery excessively and even damage it!

7. Service Center / Repairs

Please note the following:

Do not open the device!

All of the connections and adjusting elements required for operation are accessible from the outside.

In order to ensure swift and seamless processing, it is imperative to enclose a completed repair return form (*return service scripture*) for each device sent in which details all relevant data (e.g. address, contact name, telephone number, etc.) as well as a detailed description of the error.

You can find the required repair return form as well as the worldwide service partner addresses on our web page **www.deutronic.com** under the menu item 'Service Worldwide'.

8. Warranty Disclaimer

The customer is responsible for the correct use of the device. Deutronic cannot assume any liability for damages of any kind caused by use of the device.

9. Contact details

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