



# Manual - Orion XS 1400 DC- DC battery charger

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This manual is also available in [HTML5](#).

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# 1. Safety instructions



**SAVE THESE INSTRUCTIONS – This manual contains important instructions that shall be followed during installation and maintenance.**



**Danger of explosion from sparking and danger of electric shock**

## General

Please read the safety instructions below before installing and using the Orion XS to avoid risks of fire, electric shocks, personal injuries or equipment damage.

This product is designed and tested in accordance with international standards. The equipment should be used for its designated application only and in accordance with the specified operating parameters.

## Installation

- For electrical work, follow the local national wiring standards, regulations and these installation instructions.
- Install the product in a heatproof environment. Ensure therefore that there are no chemicals, plastic parts, curtains or other textiles, etc. in the immediate vicinity of the equipment.
- It is normal for the Orion XS to get hot during operation. Keep any objects that are heat-sensitive away.
- Never install or use the product at sites where gas or dust explosions could occur.
- Use flexible multi-stranded copper cables for the connections (UL: Class I; IEC: Class 5).
- The installation must include a fuse in accordance with the recommendations in the table [Cable type recommendations \[5\]](#).

## Operation, service and maintenance

- Ensure that the equipment is used under proper operating conditions.
- This device is not to be used by persons (including children) with reduced physical, sensory or mental capabilities or lack of experience and knowledge unless they have been given supervision or instruction.
- Always provide proper ventilation during charging.
- Avoid covering the Orion XS 1400 DC-DC battery charger.
- Never place the battery charger on top of the battery during charging.
- Prevent sparks close to the battery. A battery being charged could emit explosive gasses.
- Refer to the battery manufacturer's specifications to ensure that the battery is suitable for use with this product. The safety instructions of the battery manufacturer must always be observed.
- In addition to this manual, the system operation or service manual must include a battery maintenance manual applicable to the type of batteries used.
- Do not use the device if it shows any signs of damage or does not function properly.
- Do not use the Orion XS 1400 DC-DC battery charger if it is broken, defective, cracked, damaged, or malfunctioning.
- The Orion XS 1400 DC-DC battery charger contains no serviceable parts.
- Regular maintenance of the Orion XS 1400 DC-DC battery charger is not required.
- Avoid moisture, oil/soot/vapours, and keep the device clean.
- Clean the front side of the Orion XS 1400 DC-DC battery charger using a dry cloth.

## 2. General

### 2.1. Introduction

The Orion XS can be used as a battery charger or as a power supply with a wide input and output voltage range.

In charger mode, the four-stage charge algorithm will increase battery life by properly charging the battery.

Especially in the case of vehicles with a Euro 5 or 6 smart alternator, which often supplies charging voltage that is too low even with the engine running or in the event of a voltage drop over long cables, controlled charging is crucial.

Controlled charging also protects the alternator in lithium systems from overloading, as the low impedance of lithium batteries results in a high alternator current.

In power supply mode, the output voltage remains stable regardless of the applied load or fluctuating input voltage (within the specified range).

The output voltage is fully adjustable and remains independent of the input voltage, thanks to the automatic buck-boost control. This control also guarantees that the current will never exceed the set value, even when the input voltage is higher than the output voltage.

The Orion XS can be set only to supply power when the engine is running. This is possible thanks to the integrated engine shutdown detection. This eliminates the need to adjust in-vehicle wiring or add an engine detection sensor to determine if charging can start. It also prevents the voltage on board the vehicle from getting too low. In addition to this detection, the Orion XS can also be forced on via the remote on/off port.

The Orion XS is fully programmed and monitored using the [VictronConnect App](#). This also includes remote access via VictronConnect-Remote (VC-R) when connected to a GX device (requires a GX device connection to the [VRM Portal](#)) via the integrated VE.Direct port, monitoring via the GX Remote Console or from a PC, Apple computer with macOS or Android device in conjunction with a [VE.Direct to USB interface](#) and VictronConnect. Discover all setting and monitoring options in the [Setup & monitoring with VictronConnect \[15\]](#) chapter and the [VictronConnect manual](#).

### 2.2. Features

#### Smart alternator compatibility

It is common for vehicle manufacturers to install "smart" ECU (Engine Control Unit) controlled alternators to increase fuel efficiency and reduce emissions. Smart alternators provide variable output voltage and shut down when not needed. The Orion XS has an integrated mechanism that detects whether the engine is running (engine shutdown detection), so the charger is only activated when the alternator is supplying power. This ensures that the charger only draws power when the alternator supplies power. Please refer to the [Engine shutdown detection \[12\]](#) chapter and the [Setup for Euro 6 vehicles \[13\]](#) section for more information.

#### Separation of the starter battery and the service battery

The Orion XS separates the starter battery from the service battery.

#### Comprehensive electronic protection

The charger is protected against overtemperature (heat sink  $>90^{\circ}\text{C}$ ) by reducing the output power when the maximum product temperature is reached.

- Protected against overload
- Protected against short circuit
- Protected against excessive temperatures

#### Adaptive charging in four stages

The Orion XS is configured by default for a four-stage charging process.

##### • Bulk — Absorption — Float — Storage

##### • Bulk

During this phase, the Orion XS supplies as much charging current as possible to quickly charge the batteries.

##### • Absorption

When the battery voltage reaches the absorption voltage setting, the charger switches to constant voltage aka absorption mode. For lead-acid batteries, it is important that the absorption time is kept short during superficial discharges to avoid overcharging the battery. After a deep discharge, the absorption time is automatically increased to ensure that the battery is

fully charged again. For lithium batteries, the absorption time is fixed, 2 hours by default. Fixed or adjustable modes can be selected via the battery settings.

- **Float**

During this phase, the battery is charged with a trickle charge voltage to keep it in a fully charged state. When the battery voltage drops far below this level, for example, due to a high load for at least 1 minute, a new charge cycle is activated.

- **Storage**

The battery voltage is maintained at the configured storage voltage, which is slightly reduced compared to the float voltage to minimise gassing and extend battery life whilst the battery is unused and on continuous charge.

### **Flexible charge algorithm**

The Orion XS has fully programmable charge algorithms and eight pre-programmed battery settings. Configurable with VictronConnect.

### **Adaptive Absorption Time**

In adaptive absorption time mode, the correct absorption time is calculated automatically. Configurable with VictronConnect.

### **Repeated Absorption**

To refresh the battery and prevent slow self-discharge while in storage stage over an extended period, a 1-hour absorption charge will automatically occur every 7 days (or as configured).

### **Temperature-compensated charging**

The optimum charge voltage of a lead-acid battery is inversely proportional to temperature. The Orion XS measures the ambient temperature at the start of the charging phase and compensates for the temperature during charging. The temperature is measured again when the battery charger is in low current mode during absorption or storage. Special settings for a cold or warm environment are therefore not required.

### **Adjustable charge current**

The charge current is adjustable with a minimum step size of 0.1A. Configurable with VictronConnect.

### **Low-temperature shutdown**

Prevents damage to lithium batteries by turning off the charger at low temperatures. Configurable with VictronConnect.

### **Input voltage lock-out**

Shut down the charger when the input voltage falls below the lock-out value and restart when the input voltage rises above the restart value. Configurable with VictronConnect.

### **Remote On/Off**

The inverter can be switched on and off remotely via the remote on/off connector or the VictronConnect App. Typical applications include a wired switch or a lithium battery with a Battery Management System (BMS) that has an ATC (allowed to charge) output.

### **DVCC controlled**

The Orion XS can be DVCC controlled via a GX device, provided it is connected to the GX device via the VE.Direct port and the Orion is switched to charger mode (there is no DVCC control when the Orion XS is in power supply mode). Charging currents and voltages are then set automatically; thus, the internal bulk, absorption, and float algorithms are no longer used. Charging or discharging are stopped at low or high cell voltage or low temperature.

Note that when the Orion XS is configured as a charger and DVCC is enabled on the GX system, the output of the Orion XS must be connected to the main battery controlled by the GX system. The reason for this is that the GX system manages the Orion XS by synchronising its charging state with that of the main battery. If the output is instead connected to a secondary battery, one of the following actions must be taken:

1. Disable DVCC on the GX system.
2. Disconnect the Orion XS VE.Direct connection from the GX system.
3. Set the Orion XS to power supply mode. In this mode, the Orion XS outputs a fixed voltage and no longer follows a charge cycle.

For more details about DVCC, please see the GX device manual.

### **Monitoring locally via a GX device as well as remotely on the [VRM Portal](#)**

Monitor and control (on/off) the Orion XS via a wired VE.Direct connection from a GX device such as the [Cerbo GX](#), [Ekrano GX](#), or use a PC, Apple computer (requires macOS), or Android device in conjunction with VictronConnect.

If the Orion XS is connected to a GX device with internet access, you can also monitor the Orion XS remotely via the VRM portal. Predefined widgets with all the necessary parameters are already available in the VRM portal. You can also create your own customised widgets.

**Configuration and monitoring via VictronConnect App and Bluetooth**

Built-in Bluetooth Smart: the wireless solution to change settings, monitor activities and update software using Apple and Android smartphones, tablets or other devices. Various parameters can be adjusted and monitored with the [VictronConnect App](#).

This also includes Instant Readout, which displays the most important data of the Orion XS (and other smart products) on the Device list page without the need to connect to the product. This includes visual notifications of warnings, alarms, and errors that enable diagnostics at a glance.

VictronConnect is available for Android, iOS, Windows and macOS. See the [VictronConnect manual](#) to get the most out of the VictronConnect app when connected to a Victron smart product.

**Remote voltage-, temperature and/or current sensing via VE.Smart Networking**

Use VE.Smart Networking to receive Vsense, Tsense and Isense data over the wireless network for your Orion XS DC-DC battery charger, for example, from a BMV, a SmartShunt, or a Smart Battery Sense<sup>1)</sup>. The charger uses the available information from the battery to optimise the charging parameters. This improves charging efficiency and extends battery life. For more information, please see [Remote sensing with VE.Smart Networking \[25\]](#) and the VE.Smart Networking manual which can be downloaded from the [VictronConnect download section](#). Please note that the Orion XS does not support synchronised charging.

<sup>1)</sup> The Smart Battery Sense does not support Isense.

**Waterproof**

The Orion XS complies with ingress protection rating IP65; this means the product is dust-tight and protected against heavy rain.

**Silent**

The heat is dissipated through natural convection, eliminating the need for a noisy cooling fan.

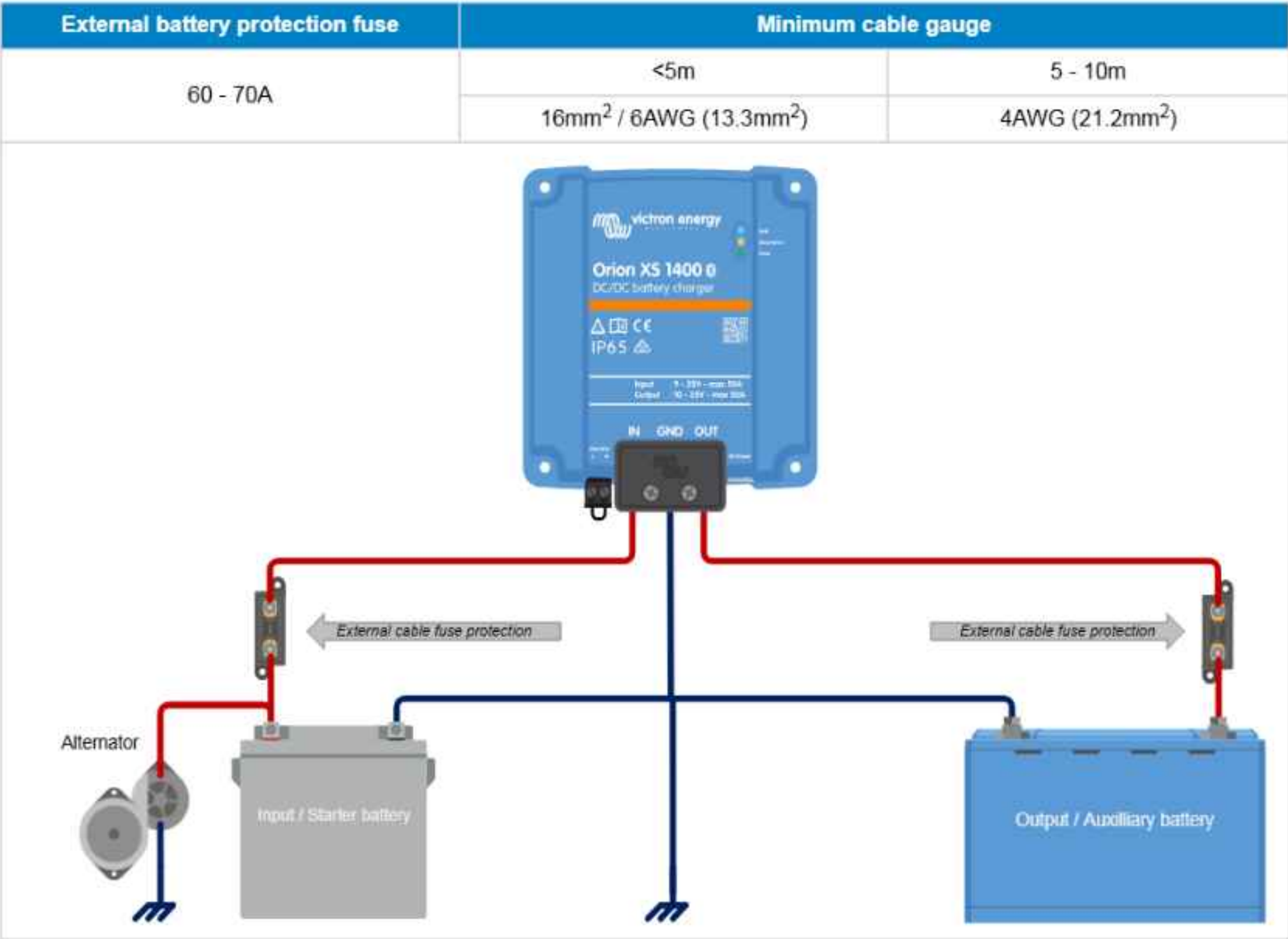
**2.3. What's in the box?**





5. Hold the recommended torque for at least 5 seconds; this will give the screw time to settle to the set torque. This maximises the force on the wire, thereby maintaining a gas-tight contact pattern during heating and cooling cycles over time. Take the time to do it right. This is important. This is a UL486 test requirement and a requirement for all factory and field installations.

3.3. Cable and fuse recommendations



3.4. Recommended torque



| AWG | mm <sup>2</sup> | in-lb | Nm  |
|-----|-----------------|-------|-----|
| 4   | 21.2            | 35    | 4   |
| 6   | 16              |       |     |
| 8   | 10              | 25    | 2.8 |
| 10  | 6               | 20    | 2.3 |
| 12  | 4               |       |     |

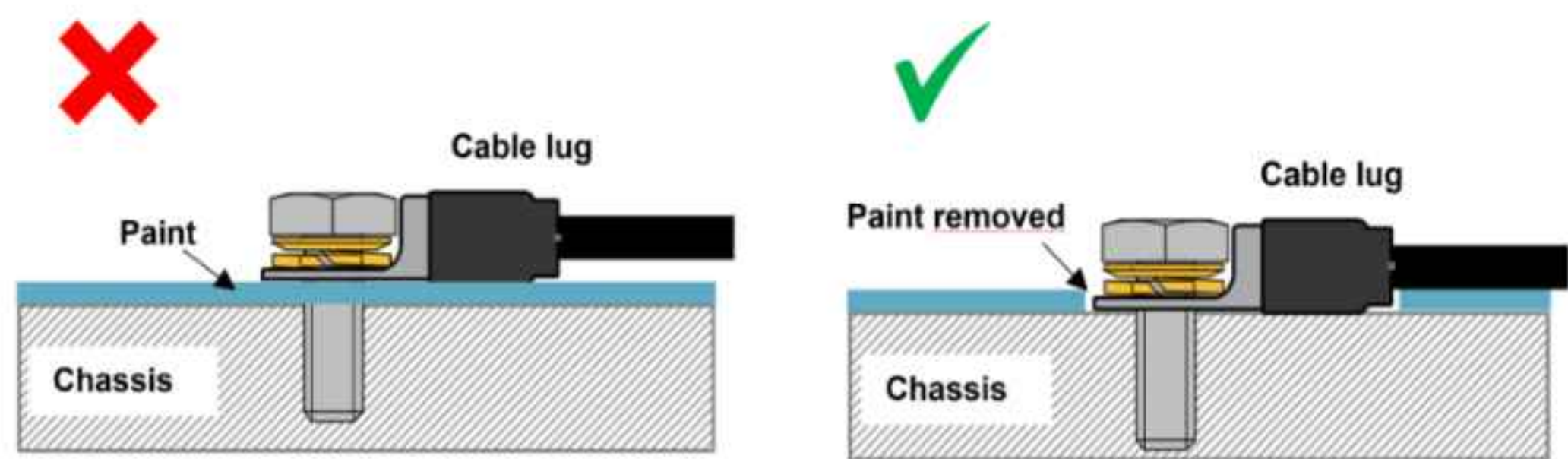
For the cable cover use a torque of <0.7Nm (6 in-lb).

### 3.5. GND connection

In many cases, the GND connection is connected to the chassis via a cable lug. For a low-impedance connection, the cable lug must have direct contact with the metal of the chassis, the contact surface must therefore be free of paint, see below images.



Make sure the GND connection on the vehicle's chassis has a low impedance.



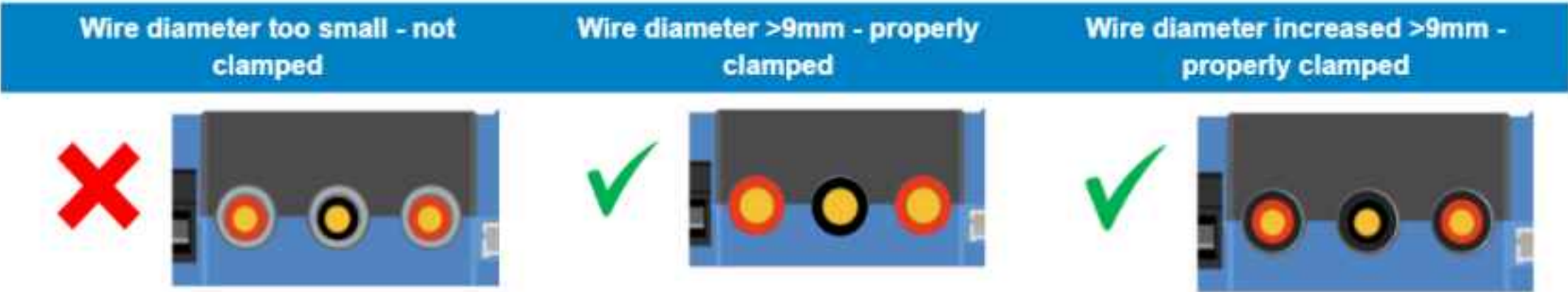
### 3.6. Strain Relief

The connector type in this charger is sensitive to constant mechanical stress. Prolonged loading (pulling, pushing or twisting) of the connector should be avoided. For this reason, the charger is equipped with a strain relief in the cable cover. It is very important that the strain relief is applied correctly. The weight of the wire or other forces hanging from the connectors should be close to zero.



Insufficient strain relief can lead to connector damage in the long term.

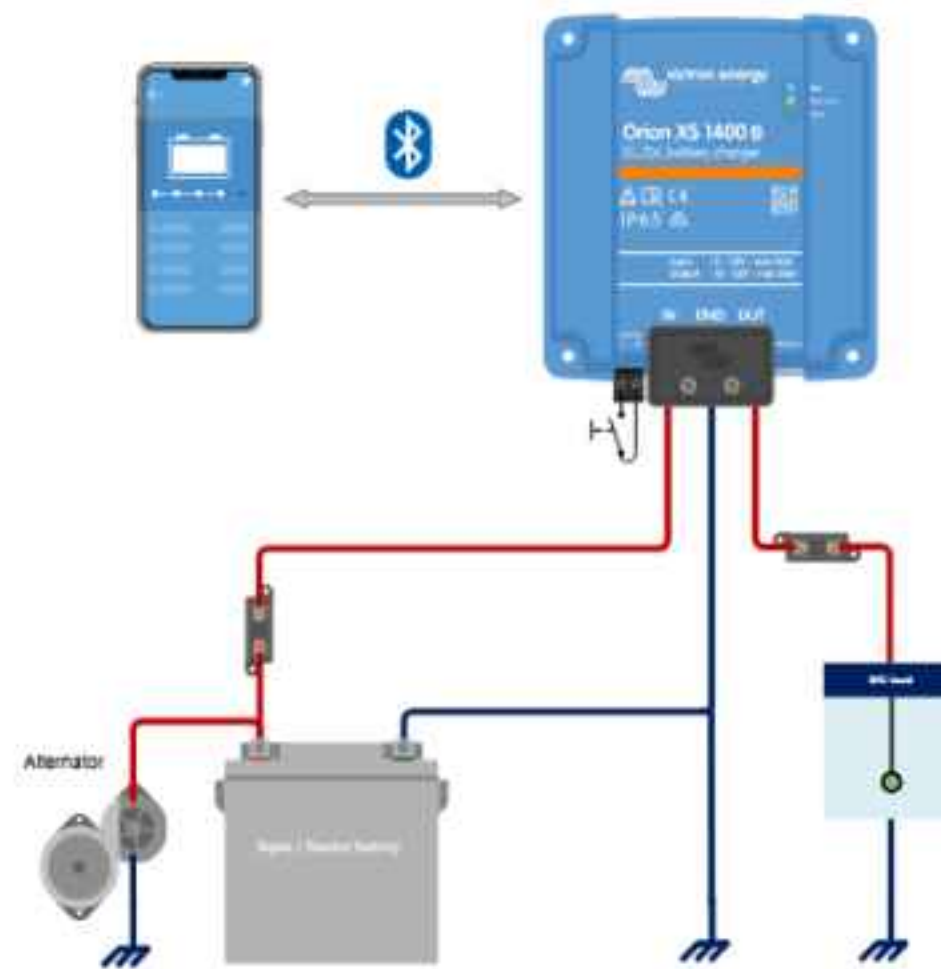
The strain relief in the cable cover is designed so that wiring with an outer diameter >9mm is sufficiently clamped. With thinner wiring, the diameter must be increased to >9mm; this can be done simply by applying shrink tubing.



### 3.7. Connection setup for DC-DC power supply mode

1. Disconnect the remote on/off (remove the wire bridge or remove the entire remote on/off terminal block).
2. Connect the input power cables.
3. Open the VictronConnect app to set up the product (**always adjust the output voltage before connecting a load or battery to the output**).  
For details, see [Power supply mode settings](#) [17].
4. Connect the load.
5. Reconnect the remote on/off to activate the product. The product is now ready for use.

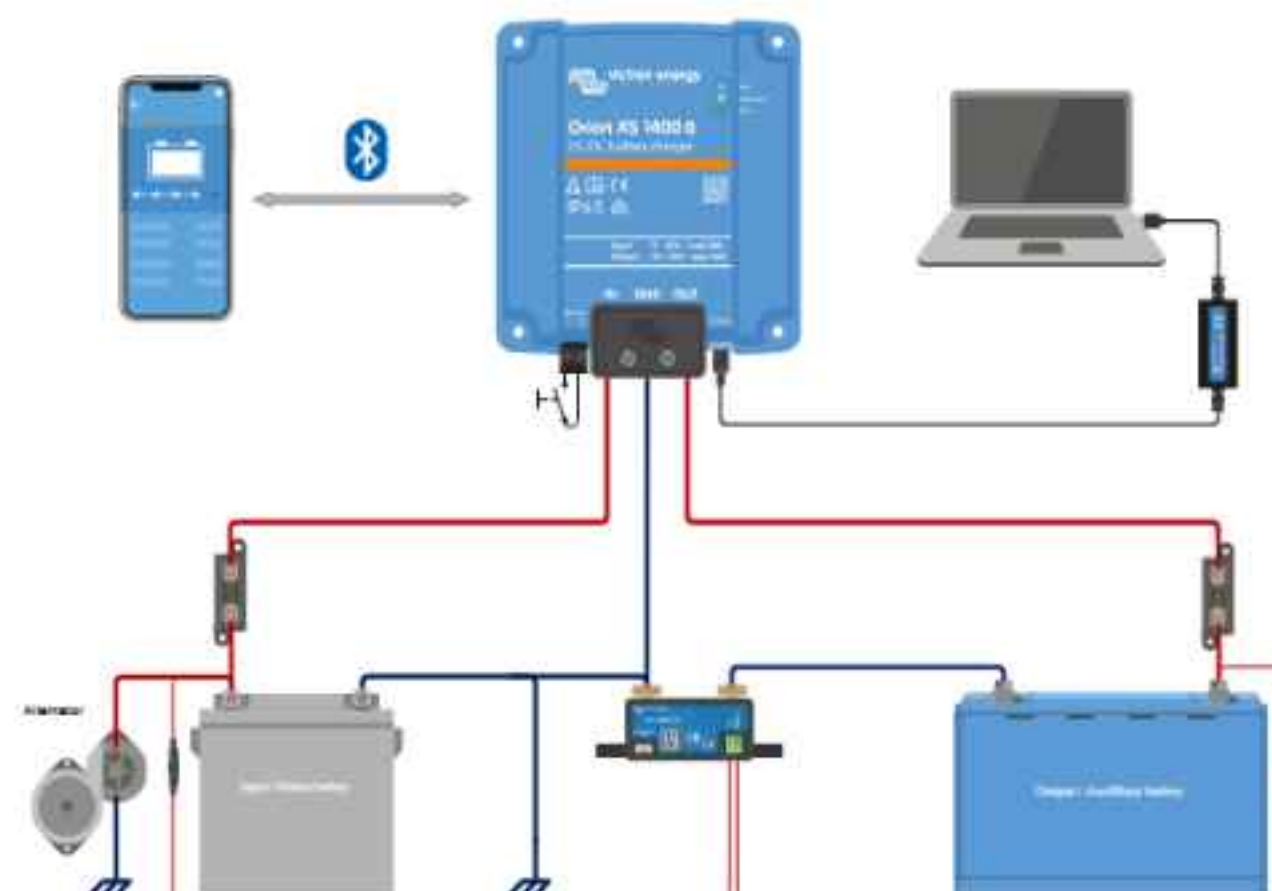
Typical connection setting as DC-DC battery charger



### 3.8. Connection setup for charger mode

1. Disconnect the remote on/off (remove the wire bridge or remove the entire remote on/off terminal block).
2. Connect the input power cables.
3. Open the VictronConnect App to set up the product (**always set up the correct charging algorithm before connecting a battery to the output**).  
For details, see [Charger mode settings](#) [15].
4. Connect the battery to be charged.
5. Reconnect the remote on/off to activate the product. The product is now ready for use.

Typical connection setting as DC-DC battery charger:



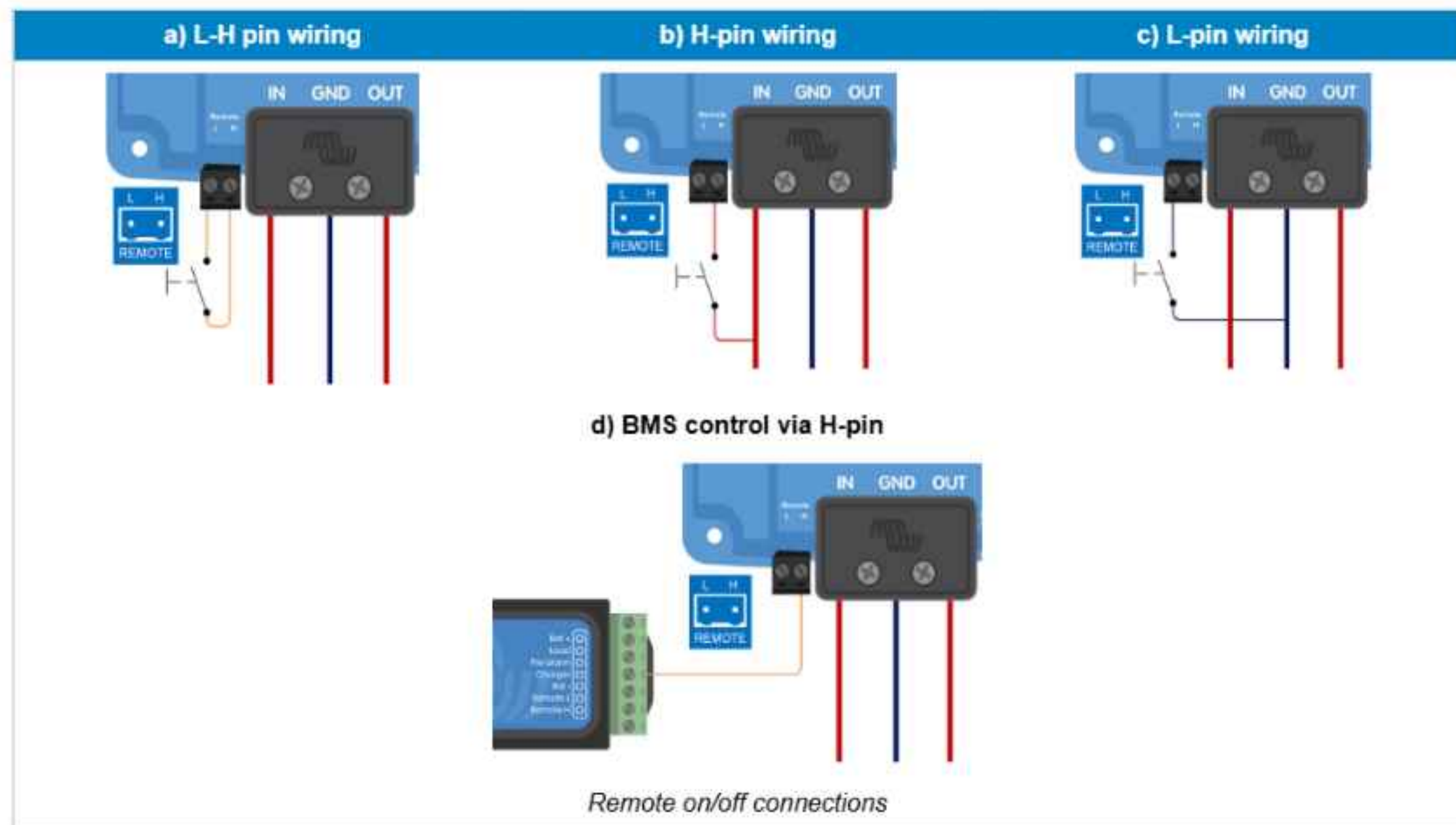
### 3.9. Connection setup for remote on/off

The recommended use of the remote on/off input is:

- A switch wired between the L-H pins (ON switch level impedance between L-H pins:  $< 30\text{k}\Omega$ )
- A switch wired between (input/output) battery positive and H pin (ON switch level  $> 4\text{V}$ )
- A switch wired between the L-pin and (input/output) ground (ON switch level  $< 6\text{V}$ )
- BMS control via the H-pin (e.g. between BMS ATC output and H-pin)



Note the voltage tolerance between L- & H-pin:  $\pm 70\text{VDC}$





*Disable engine shutdown detection*



When the engine shutdown detection has been switched off in Victron Connect ('forced charging'), **current will be drawn from the starter battery even if the engine is not running.**



During 'forced charging' the input voltage lockout is the only limit left to disable charging automatically, make sure this level is not set too low, in most applications 12.5V is sufficiently low.





### 4.4. LED indicators

The Orion XS has 3 coloured LEDs showing the charger's status. Their meaning and behaviour are explained below.

LED status:

| LED behaviour      | Description           | Symbol                                                                                |
|--------------------|-----------------------|---------------------------------------------------------------------------------------|
| On                 | Permanently on        |    |
| Off                | Permanently off       |    |
| Very slow blinking | Blinking 1x per 1.6s  |    |
| Slow blinking      | Blinking 2x per 1.6s  |    |
| Blinking           | Blinking 4x per 1.6s  |    |
| Fast blinking      | Blinking 8x per 1.6s  |   |
| Pulsating          | Short pulses per 1.6s |  |

LED indications overview:

| Orion XS status          | Bulk LED                                                                            | Absorption LED                                                                        | Float LED                                                                             |
|--------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Off                      |  |  |  |
| Error mode               |  |  |  |
| Identify                 |  |  |  |
| Power supply mode        |  |  |  |
| Bulk mode                |  |  |  |
| Absorption mode          |  |  |  |
| Float mode               |  |  |  |
| Storage mode             |  |  |  |
| Equalisation mode        |  |  |  |
| Repeated absorption mode |  |  |  |
| BatterySafe              |  |  |  |
| Software update          |  |  |  |
| Other                    |  |  |  |





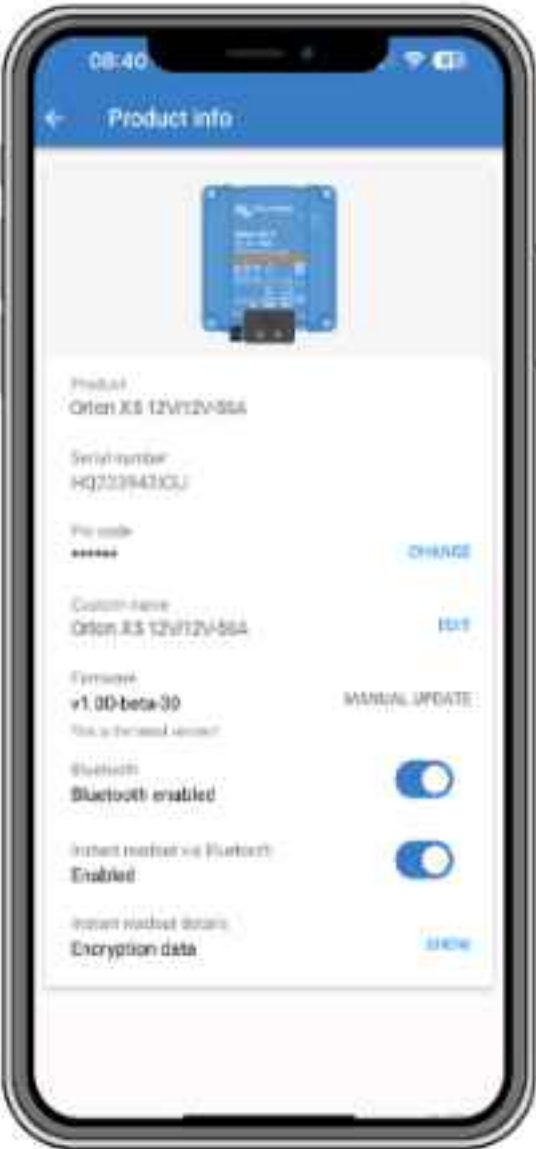






4.5.7. Product information page

By clicking the  button on the top right of the Settings menu, it is possible to access the product information screen:

|                                                                                                                                                                                                                                          |                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Product</b> shows the Orion XS model.                                                                                                                                                                                                 |  |
| <b>Serial number</b> shows the serial number of the unit.                                                                                                                                                                                |                                                                                      |
| <b>Pin code</b> allows the pin code to be changed. This is recommended to be done so settings and information won't be easy to access.                                                                                                   |                                                                                      |
| <b>Custom name</b> allows you to change a custom product name to your liking. By default, the product name "Orion XS" plus the serial number is displayed.                                                                               |                                                                                      |
| <b>Firmware</b> shows the firmware version currently installed on the device and also allows the charger to be updated if required.                                                                                                      |                                                                                      |
| <b>Bluetooth:</b> Bluetooth is enabled by default and can be disabled if necessary. To re-enable Bluetooth, please see the "How to disable and re-enable Bluetooth" chapter in the <a href="#">VictronConnect manual</a> .               |                                                                                      |
| <b>Note that re-enabling Bluetooth requires a <a href="#">VE.Direct to USB interface</a> connection between the Orion XS and a PC, Mac or Android device. iOS devices such as the iPhone and iPad do not support serial USB devices.</b> |                                                                                      |
| <b>Instant readout via Bluetooth:</b> Use the slider to disable/enable Instant readout.                                                                                                                                                  |                                                                                      |
| <b>Instant readout details:</b> Displays the MAC address and encryption key for the unit.                                                                                                                                                |                                                                                      |



4.5.10. Charger mode - Graph screen

Orion XS [serial number] or a specified custom name confirms the connected device.

**Charger State Graph:** indicates the current charging state of the Orion XS and provides a short description of the current state.

4.5.11. History screen

The history page shows a summary of the charge cycles over the previous 40 cycles. Swipe the screen to the right or left to show any of the 40 cycles. Each column represents a cycle. Tapping on one of the bars reveals further information about duration and current for each of the charge states. Other items are:

|                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------|
| <b>Status</b>                                                                                                     |
| <b>Elapsed</b>                                                                                                    |
| <b>Charge:</b> The accumulated charge current                                                                     |
| <b>Maintain:</b> The current that keeps the battery fully charged during the float or storage phase.              |
| <b>Type:</b> Battery profile used                                                                                 |
| <b>Vstart:</b> The lowest battery voltage at the start of the charge cycle                                        |
| <b>Vend:</b> The lowest battery voltage at the end of the charge cycle                                            |
| <b>Operation time:</b> Accumulated run time of the Orion XS                                                       |
| <b>Cycles started:</b> Number of charge cycles started                                                            |
| <b>Cycles completed:</b> The number of charge cycles completed (must have reached float or storage voltage stage) |
| <b>Charged Ah:</b> Total amphours charged with the Orion XS                                                       |

4.5.12. Trends screen

The VictronConnect app allows data to be displayed graphically via the trends screen. The prerequisite is that the VictronConnect app must be open and connected with the Orion XS. The data is not stored permanently. The following parameters can be displayed:

- Input voltage
- Input current
- Input power
- Output voltage
- Output current
- Output power
- Battery temperature (only if it is provided by an external device, for example, a BMV via a VE.Smart Network).



4.5.13. Instant readout over BLE

VictronConnect can display key data of the Orion XS (and other compatible smart products) on the Device list page without the need to connect to the product. This includes visual notifications of warnings, alarms, and errors that enable diagnostics at a glance. Please see the [Instant Readout chapter](#) in the VictronConnect manual for more information and how to set it up.

The advantage is:

- Better range than a regular Bluetooth connection
- No need to connect to the smart product
- Key data at a glance
- Encrypted data







## 5. Troubleshooting & Support

Consult this chapter in case of unexpected behaviour or if you suspect a product fault.

The correct troubleshooting and support process is first to consult the common issues described in this chapter.

Should this fail to resolve the issue, contact the point of purchase for technical support. If the point of purchase is unknown, refer to the [Victron Energy Support webpage](#).

### 5.1. The Orion XS is not operational

Once powered up and operational, the controller LED(s) will illuminate or flash and can communicate with VictronConnect via Bluetooth or via the VE.Direct port.

Once the charger is powered up, VictronConnect can be used to:

1. Check the charger status
2. Check for error messages
3. Update firmware
4. Make or change settings

If the unit does not power up, use this chapter to check the possible reasons why the controller is not operational.

#### 5.1.1. Visual Check

Before any electrical inspection, it is a good idea to visually check the charger to determine if the charger is damaged.

1. Check for mechanical damage and burn marks.  
Note that this kind of damage is usually not covered by warranty.
2. Are the connecting wires making contact with the plug/terminals?
3. Are the wires stripped to the correct length and tightened with the correct torque?  
See [Recommended torque \[6\]](#).
4. Inspect the battery terminals.

If there are burn marks on the terminals or if the cables or connectors are molten, this damage is usually not covered by warranty.











The charge voltages have to match the recommended voltages as stated in the battery manufacturer's documentation.

### **5.3.2. Battery unable to deal with equalization**

During equalization, the battery charge voltage will be quite high, and if the battery is unsuitable to be equalized, the battery will be overcharged.

Not all batteries can be charged with equalization voltages. Check with the battery manufacturer if your battery needs a periodic equalizing charge.

Generally speaking, sealed batteries and lithium batteries cannot be equalized.















