



# Modul-Connect Battery Charger DC-DC 30A

## Owner's Manual



For safe and optimum performance, the **Modul-Connect Battery Charger DC-DC 30A** must be used properly. Carefully read and follow all instructions and guidelines in this manual and give special attention to the **CAUTION** and **WARNING** statements.

## PLEASE KEEP THIS MANUAL FOR FUTURE REFERENCE

### Disclaimer

While every precaution has been taken to ensure the accuracy of the contents of this guide, Modul-System assumes no responsibility for errors or omissions. Note as well that specifications and product functionality may change without notice.

### Important

Please be sure to read and save the entire manual before using your **Modul-Connect Battery Charger DC-DC 30A**. Misuse may result in damage to the charger and receiving vehicle and/or cause harm or serious injury.

### Product Number

21500-04 Modul-Connect Battery Charger DC-DC 30A

Also covers

16-21500-04EV	Modul-Connect EV Battery Charger DC-DC 30A
16-21500-04LI	Modul-Connect Lithium Battery Charger Dc-Dc 30A
16-21500-04EVLI	Modul-Connect EV Lithium Battery Charger Dc-Dc 30A

### Additional part/s

21006-04 DC-DC Charger mounting plate

**Revision:** Rev 9

**Revision date:** 2023-05-10

### Document Part Number

MSDCDC\_2.0\_WS\_rev9

### Service Contact Information

E-mail: [info@modul-system.com](mailto:info@modul-system.com)

Phone: +46 31 746 87 00

Web: [www.modul-system.com](http://www.modul-system.com)

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# 1. Introduction

Thank you for purchasing the **21500-04 Modul-Connect Battery Charger DC-DC 30A**.

This battery charger unit allows you to charge an auxiliary battery from a vehicle starter battery. The unit is suited for all light commercial vehicles, including vehicles with Euro 5 and Euro 6 engines, smart alternators, regenerative braking technology and start/stop functionality.

This battery charger unit is configured for optimum operation with any AGM or lead acid battery.

For charging any Lithium battery ONLY 30 amp Chargers with part numbers 16-21500-04LI and 16-21500-04EVLI can be used.

Please read and follow these instructions and precautions carefully.

## 1.1 Important safety information

This section contains important safety information for the Modul-Connect Battery Charger DC-DC 30A. Each time, before using the product, READ ALL instructions and cautionary markings on or provided with the charger, and all appropriate sections of this guide.

The battery charger contains no user serviceable parts. See Warranty section for how to handle product issues.

### **DANGER: Fire and/or Chemical Burn Hazard.**

Do not cover or obstruct any air vent openings and/or install in a zero-clearance compartment.

### **DANGER: Failure to follow these instructions can result in death or serious injury.**

- When working with electrical equipment or lead acid batteries, have someone nearby in case of an emergency.
- Study and follow all the battery manufacturer's specific precautions when installing, using and servicing the battery connected to the battery charger.
- Wear personal protective equipment including eye protection (that protects eyes from all angles) and gloves.
- Avoid touching your eyes while installing the battery charger. Keep fresh water and soap on hand in the event battery acid comes in contact with eyes. If this occurs, cleanse right away with soap and water for a minimum of 15 minutes and seek medical attention.
- ALWAYS remove personal metal items (such as rings, bracelets, necklaces and watches) when working with a battery. A short circuit through one of these items can melt it, causing a severe burn. Batteries produce explosive gases. DO NOT smoke or have an open spark or fire near the system.
- ALWAYS keep flames, matches, lighters, cigarettes or other ignition sources away from battery.
- Keep the battery charger away from moist or damp areas. Avoid dropping any metal tool or object on the battery. Doing so could create a spark or short circuit, which goes through the battery or another electrical tool, that may create an explosion.
- DO NOT put flammable material on, under or near the battery to be charged.
- ALWAYS remove grounded terminal from battery first.
- Some sealed, maintenance free batteries have a battery condition indicator. A light or bright coloured dot indicates low water. Such a battery needs to be replaced, not charged or jump started. Charge battery with caps in place. Most batteries are made with flame arresting caps. DO NOT pry caps off sealed batteries.
- Make sure the area around the battery is well ventilated before and during charging process.

- NEVER position face near battery.
- ALWAYS keep other people away from the battery.
- Avoid contact with battery acid.
- Battery posts may have acid corrosion. DO NOT get corrosion in your eyes. Avoid touching eyes while working near battery.
- In very cold weather a discharged battery may freeze. NEVER charge a frozen battery. Gases may form, cracking the case, and spray out battery acid.
- DO NOT modify the charging system circuitry without written confirmation from Modul-System.
- If a fuse needs replacing, only use the same rating as removed.
- Locate the leads so that they will not be stepped on, tripped over, or otherwise subject to damage or stress. DO NOT lay the leads on the battery. DO NOT operate the system with damaged cables or plugs – have them replaced immediately.
- This system is designed specifically for charging automotive lead acid batteries. DO NOT use with dry-cells that are commonly used with home appliances, flashlights, etc. These batteries may burst and cause injury to persons and damage to property.
- This system is not intended to supply low-voltage power for applications other than battery charging.

**DANGER: Shock Hazard. Keep away from children!**

- The battery charger's internal components are conformal coated to cope with lower temperatures. It is advisable to avoid moisture.
- Never expose unit to snow, water etc.

**DANGER: Explosion hazard!**

- DO NOT use the Modul-Connect Battery Charger DC-DC 30A in the vicinity of flammable fumes or gases (such as propane tanks or large engines).
- AVOID covering the ventilation openings. Always operate unit with a minimum of 30mm 'free air gap' around the unit.
- Prolonged contact to high heat or freezing temperatures will decrease the working life of the unit.

**CE EMC INFORMATION**

This equipment has been tested and found to comply with the limits for CE EMC standard. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

**LIMITATIONS ON USE**

Do not use in connection with life support systems or other medical equipment or devices.

## 2. Product description

The Modul-Connect Battery Charger is a 30A, 3-stage DC-DC charger with enhanced battery charging capabilities for charging of an AGM type auxiliary battery or batteries. The charger will work on all light commercial vehicles, including vehicles with Euro 5, 6, 6.1 and 6.2 engines, smart alternators, regenerative braking technology and/or start/stop functionality.

The Modul-Connect Battery Charger package (21500-04) includes the items listed below.

- Battery Charger DC-DC 30A
- Connection pack
- Owner's manual

## 3. Installation

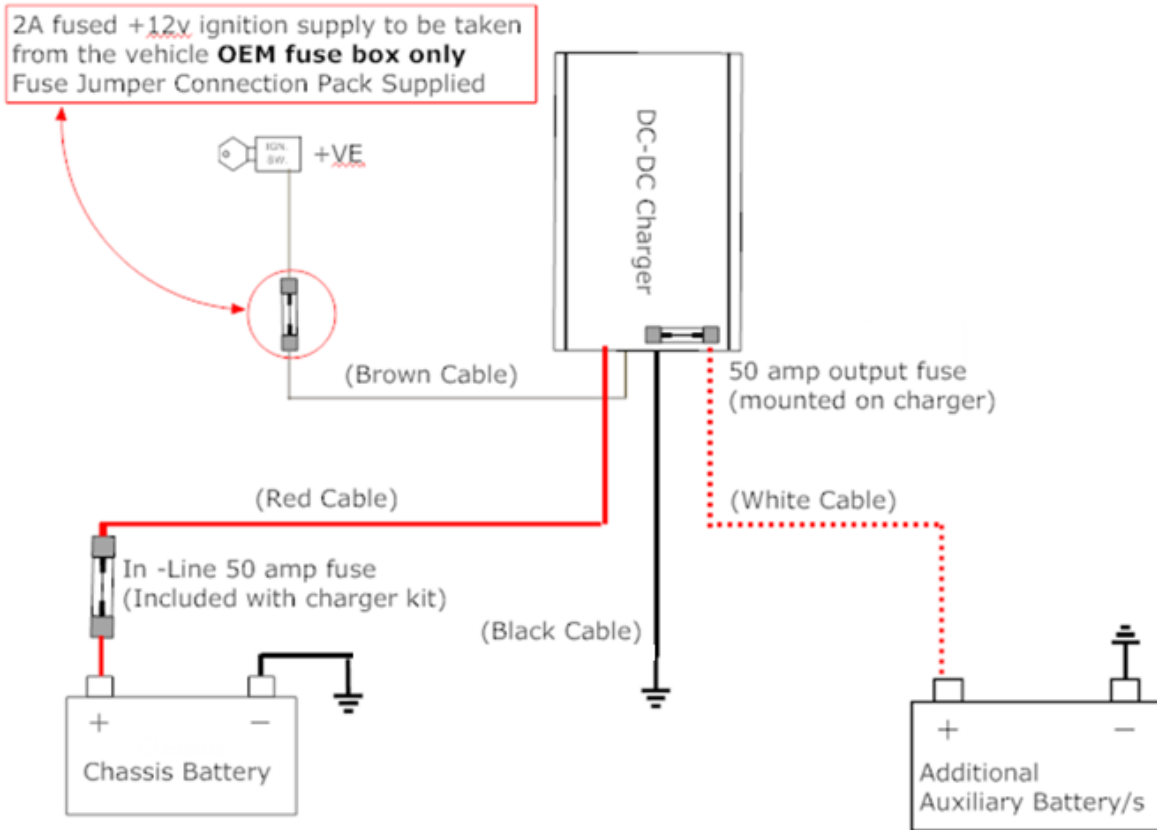
**WARNING:** Modul-System recommends that all wiring be done by a certified technician or electrician to ensure adherence to the applicable electrical safety wiring regulations and installation codes. Failure to follow these instructions can damage the unit and could also result in personal injury or loss of life.

**CAUTION:** Before beginning your installation, please consider the following:

- The Modul-Connect Battery Charger should be used or stored in an indoor area, away from direct sunlight, heat, moisture or conductive contaminants.
- When installing the unit, allow a minimum of 30 mm of space around the unit for optimal ventilation.



## 21500-04 Modul-Connect Battery Charger DC-DC 30A.



### **NOTE! Charger must be installed between the vehicle STARTER and AUXILIARY battery**

- The use of an AGM battery is highly recommended for the second auxiliary battery.
- For battery size, you need to identify how much you will be using them between charges.
- Modul-System recommends you purchase as much battery capacity as possible.

### **Fuse or Circuit Breaker:**

- DC-rated fuse or DC-rated circuit breaker connected along both of the DC positive lines are required.
- The battery charger is supplied with 1 off in-line 50A fuse for the chassis battery and the auxiliary battery connection has a 50A fuse mounted on the charger.
- A 2A mini blade fuse and several connection options for the ignition sensing cable are also supplied.
- Never replace a fuse with one that has different amperage than the original on the DC Input, Output and ignition positive cables.

### **Cable:**

- Use the low resistance cable that is supplied with the charger for all the DC connections between the battery charger and the battery bank.
- The battery charger is supplied with input (red) and output (white) 10mm<sup>2</sup> cables, with a length of 5 meters on the input and 4 meters on the output.
- The input (red) and output (white) 10mm<sup>2</sup> cables can be cut down to length to suit the installation.

- If the input (red) 10mm<sup>2</sup> cable needs to be extended beyond 5 meters, it should be replaced at the battery charger by 16mm<sup>2</sup> cable (up to a maximum total length of 10 meters).
- If the output (white) 10mm<sup>2</sup> cable needs to be extended beyond 4 meters, it should be replaced at the battery charger by 10mm<sup>2</sup> cable and can be extended up to 9 meters.
- Beyond 9 meters, it should be replaced at the battery charger by 16mm<sup>2</sup> cable (up to a maximum total length of 10 meters).

The 1mm<sup>2</sup> ignition positive (+) (brown) cable can be extended beyond 5 meters by the same 1mm<sup>2</sup> cable, as this cable draws very little load.

**Modul-Connect Battery Charger Installation:**

- Choose an appropriate mounting location.
- All fuses, fuse holders and connecting cables are supplied with the product.
- This battery charger shall be mounted and connected as close to the auxiliary battery (which is being charged) as possible.
- The battery charger must be securely mounted on a metal or non-combustible surface.
- Use a mounting template to mark the positions of the mounting screws.
- The battery charger has 4 off fixing holes (6.5mm diameter) and 4 off fixing slots (6mm x 10mm) for ease of mounting.
- It is recommended to use a minimum of 4 off M5 fixings to secure the battery charger.
- Drill the 4 mounting holes, place the charger in position and fasten it to the mounting surface.

**IMPORTANT: Connection Procedure / Power up sequence to ensure normal operations:**

1. Remove all in-line fuses from the fuse holders.
2. Connect the charger negative cable (black) to the battery negative or chassis earth.
3. Connect the charger input cable (red) to the chassis battery.
4. Connect the positive remote input cable (brown) to the ignition supply using supplied cables and fuse holder.
5. Connect the auxiliary battery positive cable (white) to the auxiliary battery.
6. Insert 50A chassis battery fuse.
7. Insert the 2A fuse into the ignition feed.

If this order is not followed the unit may flash amber for up to 10 minutes at key on (even if the auxiliary battery is fully charged). After the elapsed time the Modul-Connect Battery Charger will resume normal function.



## 4. Battery charger DC input connection

**CAUTION: Reversing the DC Input terminal will damage the unit and cannot be repaired.**

Damage caused by reverse polarity connection is NOT covered by the warranty.

### **Ignition Supply (brown 1mm<sup>2</sup> cable)**

The ignition supply cable (brown) is a positive (+) signal supply to the battery charger. The charger will operate when this cable is powered. This cable must be fused (2A) to protect the charger and the cable run.

The Modul-Connect Battery Charger DC-DC 30A is supplied with 3 options of connection:

- Option 1: A mini blade 'ignition jumper' fuse.
- Option 2: An 'in-line' fuse.
- Option 3: Installer option.

OPTION 1: Most manufacturers use mini blade fuses or Micro2 blade fuses in their OEM fuse boxes. The mini blade 'ignition jumper' fuse can be located in the fuse box of the vehicle to 'piggy back' from an ignition (+) circuit without cutting into any cables on the vehicle.

The mini blade 'ignition jumper' has two circuit slots on one side and a fuse plug on the other. When plugged into one of the vehicle's circuit slots, the fuse tap provides space for an additional fuse. The mini blade 'ignition jumper' **MUST NOT be used to replace the fuse in any primary vehicle safety system.** i.e. ABS, EBD, airbag, fuel system control, vehicle ECU or BCM feeds.

The mini blade 'ignition jumper' is rated at a maximum of 10A and the removed ignition feed fuse must not be rated at more than this. The mini blade 'ignition jumper' must be inserted into the fuse box in the correct orientation. If a fuse is removed it must be inserted from the fuse box into the 'ignition jumper' to make the circuit. The jumper **MUST have the OEM fuse and accessory fuses fitted.** After fitting, make sure that the circuit which the OEM fuse was protecting is still functioning correctly.

Example:



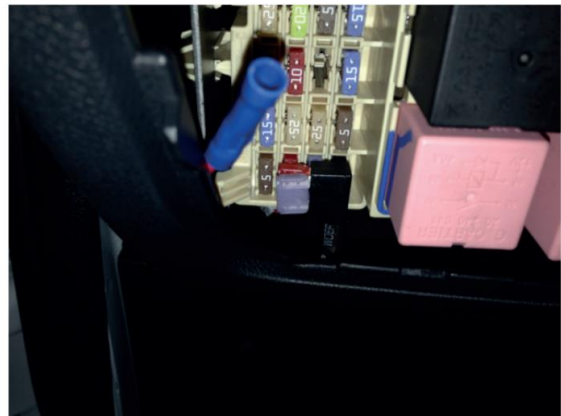
1. Identify ignition (+) fuse circuit i.e. radio. DO NOT connect to any primary vehicle safety systems.



3. Place selected fuse in lower jumper terminal. Place 2A fuse, which supplies the ignition feed to the DC-DC charger, in top terminal. Be mindful of orientation

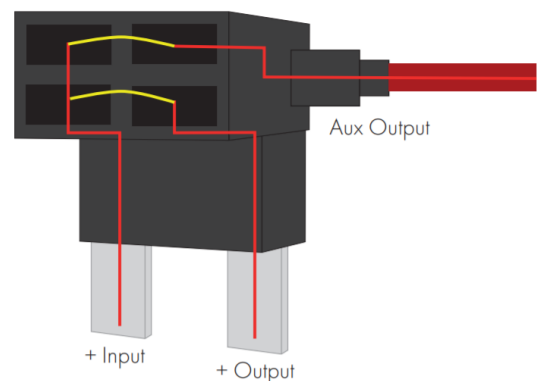


2. Open fuse box and remove selected fuse.



4. Insert fuse jumper into fuse box.

NOTE! When removing the ignition fuse from the fuse box, test for the positive terminal out of the fuse box. The positive terminal needs to be connected to the positive input of the fuse jumper.



### OPTIONS 2 & 3:

Connect to a vehicle positive (+) ignition supply via the supplied 2A fuse using OEM vehicle manufactures recommendations.

Further connection information for vehicle makes and models is available from Modul-System.

## 5. Introduction-EV Charger



The **16-21500-04EV Modul-Connect EV Battery Charger DC-DC 30A** unit allows you to charge AGM or Lead acid additional auxiliary battery/s in an Electric vehicle.

The unit is suited for all (LCV) light commercial vehicles and specifically all 'Electric' LCV's with the supporting infrastructure:

- (BEVs or EVs) Battery Electric Vehicles
- (HEV) Hybrid Electric Vehicles
- (PHEV) Plug-In Hybrid Electric Vehicles
- (REEVs) Range Extended Electric Vehicles

The Modul-System unique EV Dc-Dc Charger allows the vehicles additional auxiliary batteries to be charged at the same time as vehicles high voltage (HV) drive battery and 12v chassis battery. If you are powering tools and accessories without fitting additional auxiliary batteries power is drawn directly from the vehicles HV drive battery reducing range and running the risk of having insufficient power at the end of the vehicles duty cycle to complete the return journey. This contributes to unplanned down time events, range anxiety a potentially shorter working day. If an EV vehicle is idle with vehicle equipment such as side lights, headlights, and radio operating as well as any supplementary equipment this will draw down power from the vehicle's small capacity 12v chassis battery.

*(It is not that commonly known by many drivers and operators that all EV vehicles still require a 12v chassis battery to start the vehicle, even if the drive battery is fully charged, if the chassis start battery is flat the vehicle cannot move. The risk is that a stationary vehicle with a draw on the 12v vehicle chassis battery for extended periods can result in the vehicle having to incur a breakdown call or unplanned down time event).*

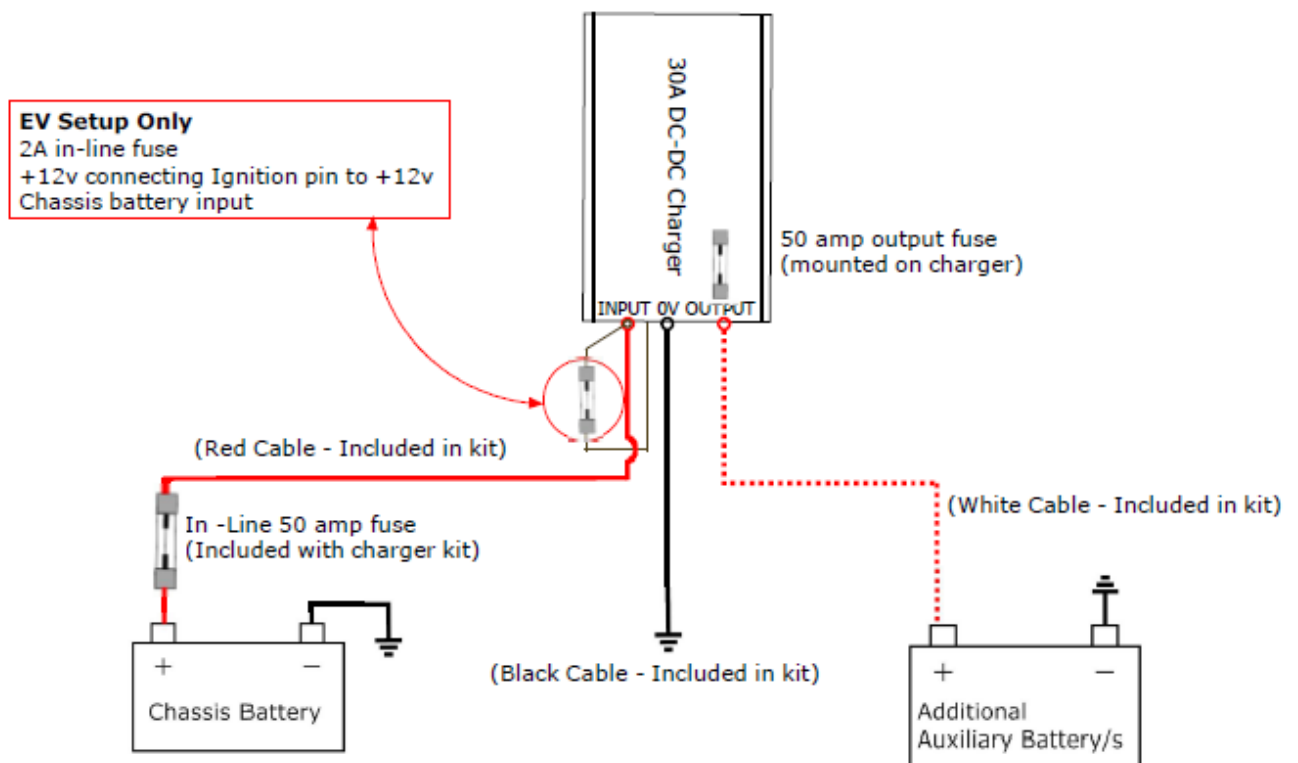
With the addition of Modul-System's new unique vehicle Dc-Dc Charger the vehicle's high voltage (HV) drive battery, 12v chassis battery, and additional auxiliary batteries are all charged at the same time from a single OEM shore-line connection to an EV charging point during down time (overnight) charging. This ensures that all batteries start work fully charged and the vehicles drive batterie is at maximum capacity. This also preserves driving range and extends the vehicle's daily duty cycle.

As the working day progresses if the additional auxiliary batteries start to run low these can be topped up from the vehicle's high voltage (HV) power supply, this will extend the operational availability of auxiliary power and the operators working day.

The Dc-Dc chargers can also be configured via Modul-Connect (a control platform for all digital and electrical devices in commercial vehicles) to isolate the Dc-Dc Charger for the additional auxiliary batteries if the driver/operator has concerns about end of day range to get back to home or a charge point. This can be activated at any time to manage range anxiety or the risk of a stranded vehicle.

This battery charger under part number 16-21500-04EV is configured for optimum operation with any AGM or Lead acid battery. 16-21500-04LI and 16-21500-04EVLI are configured for Lithium batteries.

## 6. Installation-EV Charger



**NOTE! Charger must be installed between the vehicle STARTER and AUXILIARY battery**

- The use of an AGM battery is highly recommended for the second auxiliary battery.
- For battery size, you need to identify how much you will be using them between charges.
- Modul-System recommends you purchase as much battery capacity as possible.

## 7. Charger operation – all chargers

The Modul-Connect Battery Charger DC-DC 30A operates with an input voltage between 9-32V. (The charger can be used on a 24 volt system to charge a '12 volt' electrical system).

- The Standard battery charger is turned on and off with the vehicle ignition and the EV charger by an internal voltage monitoring logarithm.
- The output current is limited to 30A for the charger.
- In case of a low input voltage (<9V), the output voltage is reduced to prevent damage to the charger.

The charger is protected against overheating and resumes normal operation when it cools down.

- The 3-colour status LED on the battery charger end panel shows the status of the charger. In 'normal' operation the LED will either be off (ignition key off), flashing amber (charging) or green (charged).
- The 3-colour status LED also shows the status of the charger as follows:

Status LED colour	Status LED output	Mode	Note
Off	Off	Off	Ignition off. The charger is switched off.
Red	Flashing	Fault mode	Refer to the codes below for the number of short flashes followed by number of long flashes.
Amber	Constant flashing	Charging	Current/boost charging.
Green	Constant flashing	Charging	Float charging.

## 8. Troubleshooting

To troubleshoot the Modul-Connect Battery Charger DC-DC 30A, please note the LED display and review the “Understanding the Error Codes” in section 8.1. Also:

- Check that the voltage at the output pins is the same as the batteries and that the polarity is correct.
- Check that all the fuses are OK.
- Check LED flashes status as the power is applied to the ignition feed (brown wire).
- If the battery charger LED flashes AMBER but the battery voltage is not increasing, wait 10 minutes and re-check your readings.

### 8.1 Understanding the error codes

Status LED colour	Short flashes	Long flashes	Fault
Red	3	0	Force idle (check connection and fuses to chassis battery and auxiliary battery)
Red	3	1	Starter battery voltage below 9 volts (<9V)
Red	3	2	Starter battery voltage over 36 volts (>36V)
Red	3	3	Starter battery voltage over 33 volts (>33V)
Red	3	4	Internal charge controller temperature MT over 70°C
Red	3	5	Internal charge controller temperature FT over 115°C
Red	3	7	Thermistor disconnected
Red	3	8	Damaged battery detected

## 9. Technical specification

Note: The specifications are subject to change without notices.

<b>30A Modul-Connect DC-DC Charger</b>			
<b>PARAMETERS</b>	<b>MINIMUM</b>	<b>Float Charge</b>	<b>MAXIMUM</b>
<b>CHARGER PERFORMANCE</b>			
DC input voltage operating range	9 Vdc		32 Vdc
DC output voltage operating range AGM and Lead acid options	0 Vdc	13.8 Vdc	14.1 Vdc
DC output voltage operating range Lithium options	0 Vdc	13.6 Vdc	14.4 Vdc
Operating temperature	-20°C ambient		70°C ambient
Relative humidity	5% non-condensing		90% non-condensing
IP Rating	IP60 in any mounting position		IP65 mounted vertically with the cable connections at the bottom of the charger
<b>SAFETY AND ENVIRONMENTAL</b>			
CE EMC & LVD EN61204-3:2000 EN61000-4-2:2009 EN61000-4-3:2009 + A1:2008 + A2:2010		EN61000-4-5:2014 EN61000-4-6:2014 CISPR16-2-3:2006 EN50581:2012	
<b>DIMENSIONS AND WEIGHTS</b>			
Shipping Weight			3.2 Kg
Dc-Dc Charger Weight			1 Kg
Dc-Dc Charger Loom Weight			2.2 Kg
Dc-Dc Charger Dimensions Excluding connection studs	L – 180 mm	D – 144 mm	H – 56 mm
Dc-Dc Charger Dimensions Including connection studs	L – 205 mm	D – 144 mm	H – 56 mm

## 10. Warranty

### **TWO YEAR LIMITED WARRANTY**

The limited warranty program is the only one that applies to this unit, and it sets forth all the responsibilities of Modul-System. There is no other warranty, other than those described herein. Any implied warranty of merchantability of fitness for a particular purpose on this unit is limited in duration to the duration of this warranty.

This unit is warranted, to the original purchaser only, to be free of defects in materials and workmanship for two years from the date of purchase without additional charge. The warranty does not extend to subsequent purchasers or users.

Manufacturer will not be responsible for any amount of damage in excess of the retail purchase price of the unit under any circumstances. Incidental and consequential damages are specifically excluded from coverage under this warranty.

This warranty does not apply to damage to units from misuse or incorrect installation/connection. Misuse includes wiring or connecting to improper polarity power sources.

### **RETURN/REPAIR POLICY:**

If you are experiencing any problems with your unit, please contact our customer service department at [info@modul-system.com](mailto:info@modul-system.com) or phone +46 31 746 87 00 before returning product. After speaking to a customer service representative, if products are deemed non-working or malfunctioning, the product may be returned to Modul-System within 30 days of original purchase. Any defective unit that is returned to manufacturer within 30 days of the date of purchase will be replaced free of charge.

If such a unit is returned more than 30 days but less than two years from the purchase date, manufacturer will repair the unit or, at its option, replace it, free of charge. If the unit is repaired, new or reconditioned replacement parts may be used, at manufacturer's option. A unit may be replaced with a new or reconditioned unit of the same or comparable design. The repaired or replaced unit will then be warranted under these terms for the remainder of the warranty period. The customer is responsible for the shipping charges on all returned items.

### **LIMITATIONS:**

This warranty does not cover accessories, such as adapters and batteries, damage or defects result from normal wear and tear (including chips, scratches, abrasions, discoloration or fading due to usage or exposure to sunlight), accidents, damage during shipping to our service facility, alterations, unauthorized use or repair, neglect, misuse, abuse, failure to follow instructions for care and maintenance, fire and flood.

If your problem is not covered by his warranty, contact our Customer Service Department [info@modul-system.com](mailto:info@modul-system.com) or +46 31 746 87 00 for general information if applicable.