

Installation Guide

EV Power Chargers, 3kW HE



Traction Battery Charger Modules ~ IP20
Electric Vehicle Power Chargers Range

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Safety Precautions

- The equipment represents an **energy hazard** and failure to observe this could cause terminal injury and invalidate our warranty
- There are **hazardous voltages inside** the power charger. As they incorporate large charged capacitors, it is dangerous to open the modules even if the mains supply is disconnected.
- Products into which our components are incorporated have to **comply with a number of requirements**. Installation is to be in accordance with the recommendations herein
- Please read the manual carefully before using the equipment

This booklet describes following modules:

Part no.	Description
241121.010	EV Power Charger 110/3000 HE IP20 G2
241121.020	EV Power Charger 220/3000 HE IP20 G2
241121.030	EV Power Charger 360/3000 HE IP20 G2

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1. Installation *EV Power Chargers, 3kW HE, IP20*

Safety Precautions

Get acquainted with the safety precautions on page 2, before installing or handling the equipment.



Device hazard

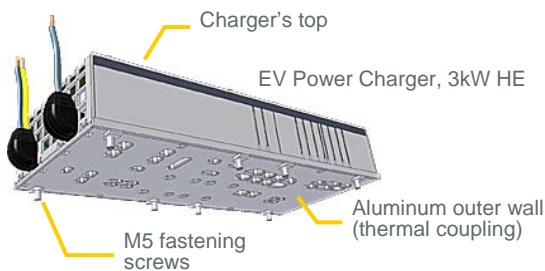
CAUTION: The battery chargers may be warm, but **do not hand-carry** them by the Multi-Crimp Terminal wires.



CAUTION: Double Pole / Neutral Fusing. There is a Mains fuse in each line.

Mechanical Installation

The *EV Power Chargers, 3kW HE* are designed in a very compact box measuring 49x280x120 mm.



The charger's mechanical design implements thermal coupling, by mounting all internal major heat generating components against a solid aluminum outer wall.

The *EV Power Chargers, 3kW HE* must be fastened with this solid aluminum outer wall against a cold-plate, which is either water cooled or has sufficient heat transfer capacity to comply with the environmental specification of the installation site.

Also, the charger is to be housed to comply with the IP ratings required by the installation site.

Figure 1 Aluminum outer wall in the *EV Power Chargers, 3kW HE* **

WARNING: The cold-plate must have a **heat transfer capacity of minimum 220W**, keeping the charger at a lower temperature than **60°C** (output power derating level).

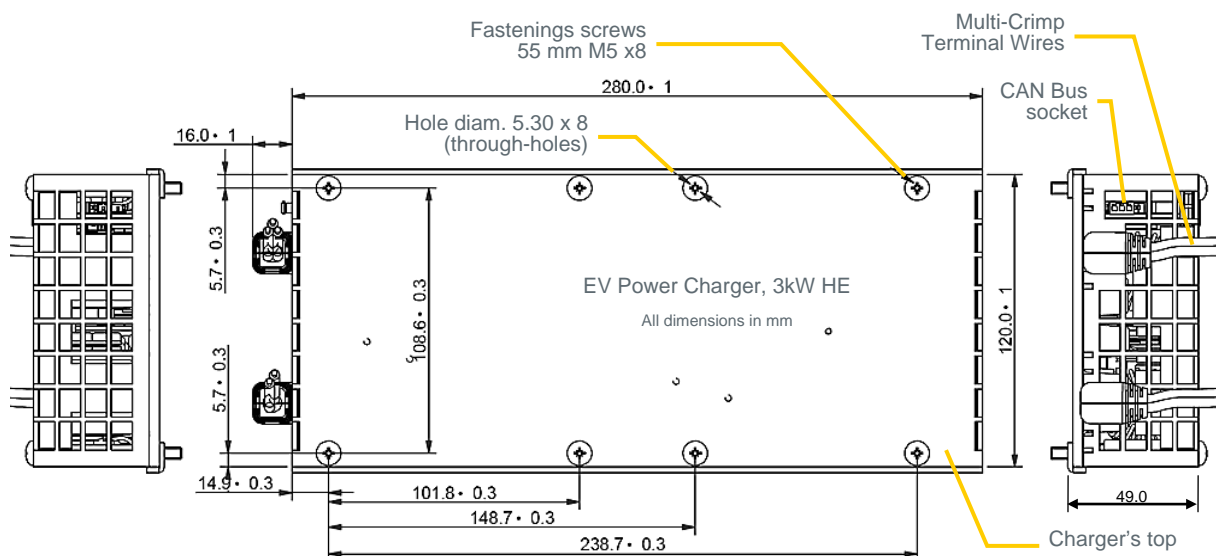


Figure 2 Mounting screws and dimensions for the *EV Power Chargers, 3kW HE*

** Refer to the photo on the cover page, for correct orientation of terminal wires.

1. Prepare the Cold-Plate

The *EV Power Chargers, 3kW HE* must be mounted on a cold-plate, which is either water cooled or has sufficient heat transfer capacity to comply with the environmental specification of the installation site.

Prepare the cold-plate for mounting the charger, as follows:

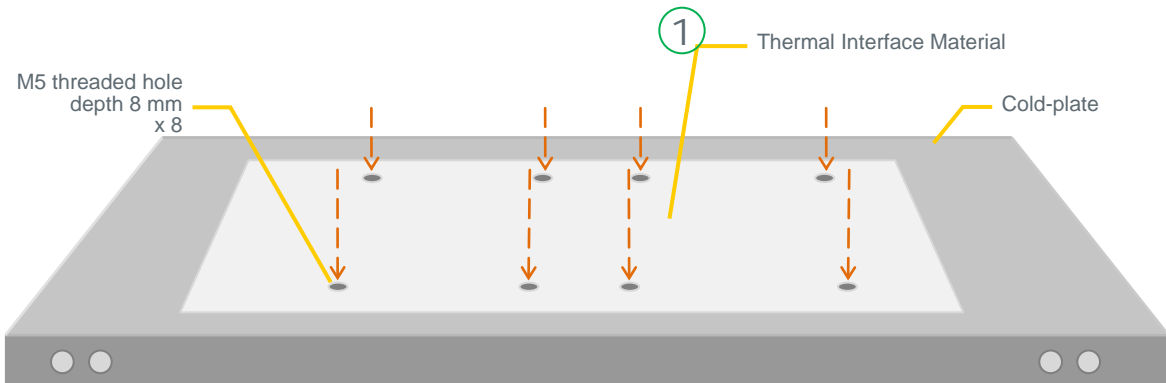


Figure 3 Cold-plate preparations: drilling holes, cutting threads and applying thermal interface material

Cold-Plate Preparation Procedure — Steps	Action	OK
1. Clean the surface and apply a thermal interface material	<ul style="list-style-type: none"> Thoroughly clean the cold-plate's holes and the surface using rubbing alcohol (isopropyl alcohol) or pure acetone Apply a thin Thermal Interface Material (TIM) to the surface <p>Warnings: — The TIM should be a thermally conductive foil, for instance HALA TFO-X300-SI or similar, with 3 W/mK heat conductivity or better</p>	

2. Prepare the Battery Charger

To ensure safe transportation, the *EV Power Chargers, 3kW HE* (A) are shipped from factory with 2 transportation rails (C) fastened to the charger's aluminum outer wall with 8 screws (D).

WARNING:

Both rails (C) are **to be removed before fastening** the charger to the cold-plate.
Handle the charger carefully, keeping the screws (D) inside the through-holes, after you have removed the rails.

Prepare charger for mounting on the cold-plate, as follows:

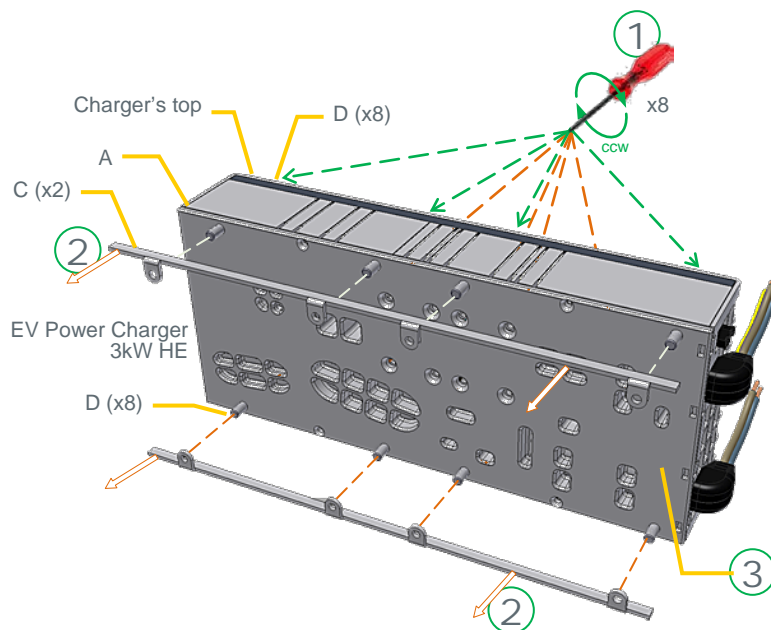


Figure 4 *EV Power Chargers, 3kW HE* preparations: removing the transportation rails **

Charger Preparation Procedure — Steps	Action	Power is OFF!	OK
1. Unscrew both transportation rails (C)	<ul style="list-style-type: none"> Using the screwdriver, unscrew (but do not pull out of the charger) the 8 screws (D) on the charger's top. <p>Warning: Keep the charger's top upwards, so that the screws (D) do not fall out of the through-holes.</p>		
2. Remove both transportation rails (C)	<ul style="list-style-type: none"> After unscrewing the screws (D) — and while keeping charger's top upwards — remove both transportation rails (C) from underneath the charger <p>Warning: Do not leave the charger around without the transportation rails, but proceed with fastening the charger to the cold-plate. Refer to next chapter "3. Position and Fasten the Battery Charger" on page 7</p>		
3. Clean the surface underneath	<ul style="list-style-type: none"> Thoroughly clean the charger's surface underneath (aluminum outer wall) using rubbing alcohol (isopropyl alcohol) or pure acetone 		

** Refer to the photo on the cover page, for correct orientation of terminal wires.

3. Position and Fasten the Battery Charger

After preparing the cold-plate and the *EV Power Chargers, 3kW HE* for installation, fasten the charger to the cold-plate with the 8 screws(D), as follows:

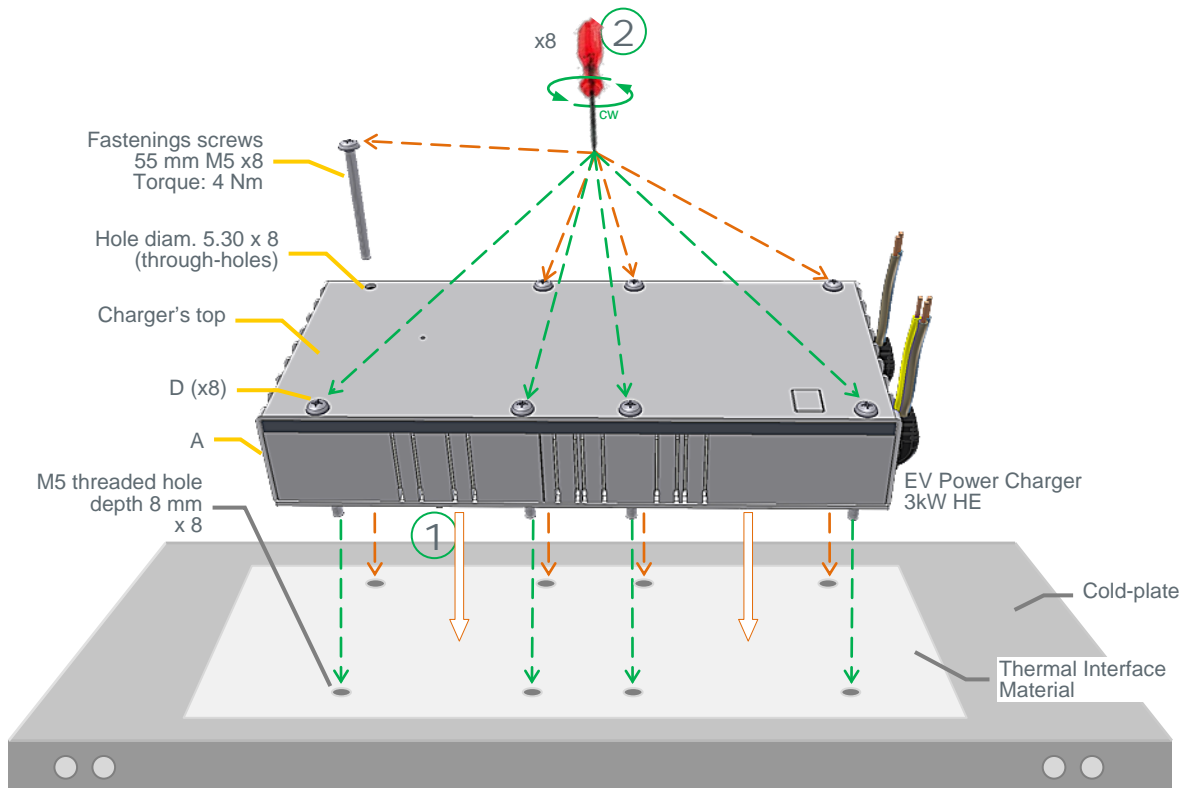


Figure 5 Fastening the EV Power Chargers, 3kW HE to the cold-plate **

Charger Fastening Procedure — Steps	Action	Power is OFF!	OK
1. Position the charger on the cold-plate	<ul style="list-style-type: none"> Carefully position the charger's bottom (aluminum outer wall) against the cold-plate, so that the 8 screws (D) meet with the threaded holes on the cold-plate 		
2. Fasten the screws (D)	<ul style="list-style-type: none"> Using the screwdriver, fasten the 8 M5 screws in the cold-plate's threaded holes (torque 4 Nm) 		

NOTICE: The car manufacturer must carefully consider the need for **additional spring washers or glue to secure the screws**, in order to maintain a good contact between charger and cold plate/heat sink over time. Although long term vibration tests, performed on complete drive train inside a vehicle, have indicated that there should be no need for this, this may depend on the actual application.

** Refer to the photo on the cover page, for correct orientation of terminal wires.

Electrical Installation

All connections to the *EV Power Chargers, 3kW HE* are implemented by plugging the AC input and DC output connectors (at the end of the multi-crip terminal wires) to the car's respective sockets. Also, connecting the car's controller to the CAN bus socket.

Connect the charger to the car, as follows:

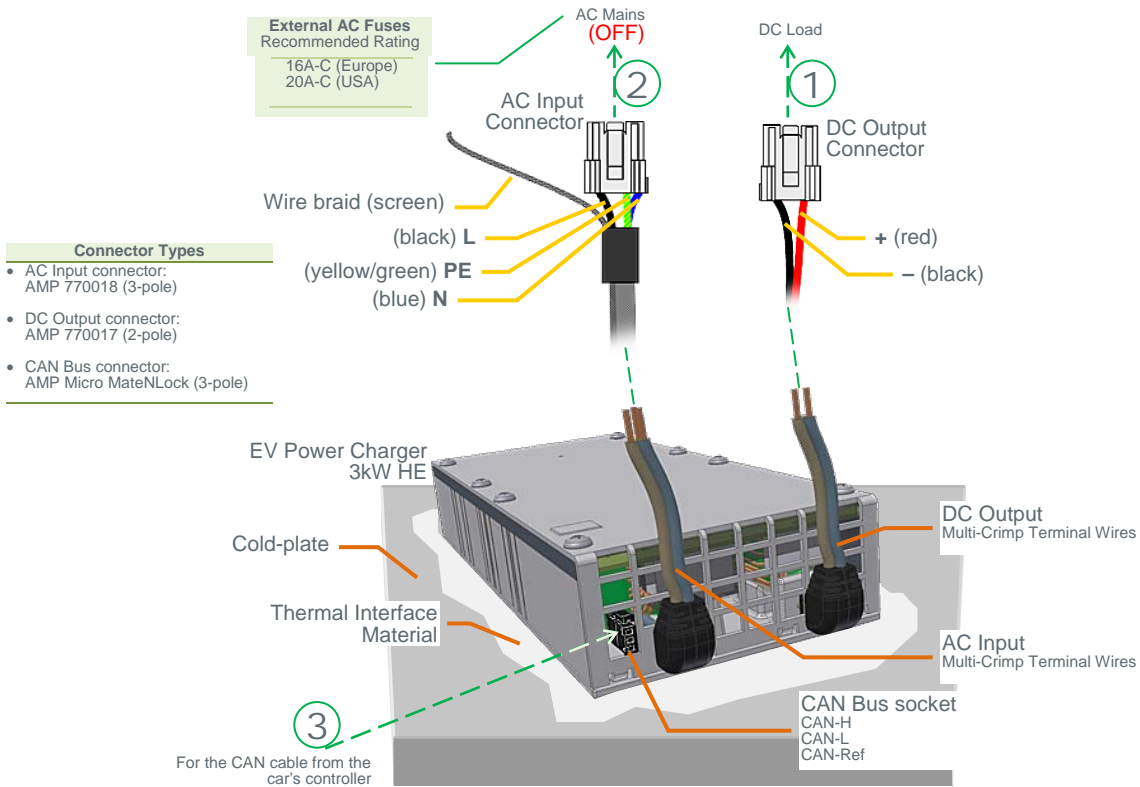


Figure 6 Connecting the EV Power Chargers, 3kW HE **

Charger Connection Procedure — Steps	Action	Power is OFF!	OK
1. Connect the DC Output connector	<ul style="list-style-type: none"> Plug the DC Output connector — at the end of the multi-crip terminal wire — into the car's correct "load" socket. (the "load" is the car's onboard DC high-voltage battery bank) 		
2. Connect the AC Input connector	<ul style="list-style-type: none"> Plug the AC Input connector — at the end of the multi-crip terminal wire — into the car's correct "AC" socket (the "AC" socket will normally get current from a standard single phase AC outlet, 16A wall socket, external to the car) <p>Note: The twisted wire braid (screen) is usually connected to chassis.</p>		
3. Connect the car's controller to the charger	<ul style="list-style-type: none"> Plug the CAN bus connector — on the CAN bus cable from the car's controller — to the charger's CAN bus socket 		

** Refer to the photo on the cover page, for correct orientation of terminal wires.

CAN Bus Communication

The *EV Power Chargers, 3kW HE* utilize the CAN¹ bus — a digital interface architecture that supports a dedicated communication channel between the car's controller, the battery charger and other CAN devices or nodes connected to the bus.

The *EV Power Chargers, 3kW HE* support CAN 2.0A/2.0B at the speed of 125, 250 and 500kbits/s, and implements CAN Bus signals: "CAN-L", "CAN-H" and "CAN-Ref".

The *EV Power Chargers, 3kW HE* are by default designed to be OFF, when connected to AC mains. To turn the chargers ON, they have to receive via the CAN bus a message containing voltage, current limit and power limit settings.

For prototype testing, *Eltek Valere* can provide a dedicated computer program for integration with the car electronics and the battery management system. Please, refer to the description of *Eltek Valere's* CAN bus communication protocol, see chapter "Reference Documents" on page 11.

Firmware Upgrade of the Battery Charger

Please, contact your *Eltek Valere* Local Office if you need to upgrade the chargers' firmware, or if you need support with software integration.

¹ Control Area Network. Serial protocol utilised for communication between CAN devices

2. Technical Specifications

Specifications *EV Power Chargers, 3kW HE, IP20*

AC Input	
Voltage	85-275 VAC (Nominal 230VAC)
Frequency	45-65 Hz
Current	14 A _{rms} maximum
Power Factor	>0,99 at 50% load or more
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines

DC Output	
Voltage	See table below for adjustable voltage range **
Current	See table below
Charge control:	Controlled over CAN bus <ul style="list-style-type: none"> ○ Enable/Disable (On/Off) ○ Constant voltage ○ Current limit ○ Power limit ○ Available power (mains dependent)
Dynamic voltage regulation	±5% for 10-90% or 90-10% load variation, regulation time < 100ms
Ripple and Noise	< 250 mVrms
Output Protection	<ul style="list-style-type: none"> ○ Output fuse ○ Overvoltage shutdown ○ Short circuit proof ○ High temperature protection ○ Under-voltage shutdown: 50V for *.010 & *.110 chargers, 110VDC 100V for *.020 & *.120 chargers, 220VDC 170V for *.030 & *.130 chargers, 360VDC

Other Specifications	
Efficiency	96% at 50% load, 95% at 100% load
Isolation	<ul style="list-style-type: none"> ○ 1.5 KVAC – input to earth ○ 1.5 KVAC – output to earth ○ 3.0 KVAC – input to output
Alarms/error messages:	<ul style="list-style-type: none"> ○ Internal communication failure ○ Control system communication timeout ○ High mains shutdown ○ Low mains shutdown ○ High temperature shutdown ○ Low temperature shutdown ○ Charger failure ○ DC voltage high (overvoltage shutdown) ○ DC voltage low
Warnings:	<ul style="list-style-type: none"> ○ Rectifier in power derate mode
Measurements:	Available on CAN bus: <ul style="list-style-type: none"> ○ AC voltage, current and frequency ○ DC voltage and current ○ Rectifier temperature (two measurements)
Operating temp	-40 to 60°C
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Cold plate
Reliability	<ul style="list-style-type: none"> ○ MTBF > 162 000 hours, with 60°C cold plate temperature
Humidity	<ul style="list-style-type: none"> ○ Operating: 5% to 95% RH non-condensing ○ Storage: 0% to 99% RH non-condensing
Dimensions	<ul style="list-style-type: none"> ○ 49x280x120mm (IP20)
Weight	<ul style="list-style-type: none"> ○ 2.8 kg (IP20)

Applicable Standards	
Electrical safety	IEC 61851-1 UL 2202 Compliant to IEC/UL 60950
EMC	EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry)
Mains Harmonics	EN 61000-3-2
Environment	WDS 00.00EA-D11

Specifications are subject to change without notice

241121.nnn.DS3 – v3(b)

Part no.	Description	Output Power	Output Voltage Range	Output Current
241121.010	EV Power Charger 110/3000 HE IP20 G2	3000W	70 – 122Vdc	25A
241121.020	EV Power Charger 220/3000 HE IP20 G2	3000W	150 – 250Vdc	16A
241121.030	EV Power Charger 360/3000 HE IP20 G2	3000W	250 – 420Vdc	10A

** Please, refer to technical specifications for further details

Reference Documents

Doc no.	Description
2090184	Technical specification EV PC 360/3000 HE IP20
2090186	Technical specification EV PC 220/3000 HE IP20
2090188	Technical specification EV PC 110/3000 HE IP20
2086930	EV Power Charger CAN protocol description

