

# EFAPOWER EV-QC45 STANDALONE QUICK CHARGING STATION

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## Installation and User Manual

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# 1 GENERAL PRODUCT DESCRIPTION

EFAPOWER EV-QC45 charging station is able to charge all electric vehicles compliant with CHAdeMO charging system and Combined Charging System (CCS) standards.

Depending on the battery capacity, EFAPOWER EV-QC45 can charge properly equipped electric vehicles from 0% to 80% in roughly 30 minutes.

The battery charging state is displayed on the HMI and the charging cycle finishes by itself or can be interrupted by user command.

Optional AC outputs are available:  
43kVA, 22kVA, 7kVA and 3kVA (Not in USA market).

EFAPOWER EV-QC45 is user friendly and safe. After user identification, it only requires coupling the charger's output plug in the EV for automatic starting if all safety features are accomplished.

Different configurations are available such as:

- **Power Cabinet Standalone** - which is represented in this installation and user manual - or
- **Kiosk with Power Cabinet** – for a more personalized and attractive user experience (for more information please contact our commercial department).

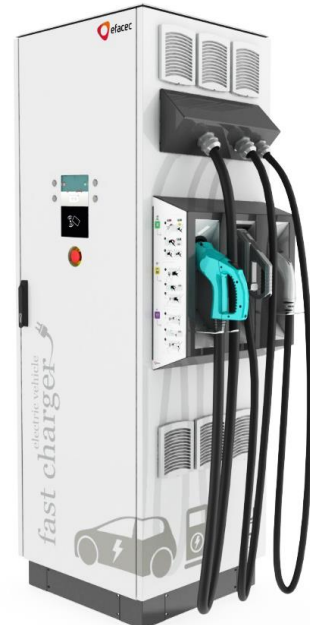


Figure 1 - EFAPOWER EV-QC45 STANDALONE



Figure 2 - EFAPOWER Kiosk

EFAPOWER EV-QC45 has a means of measuring the output energy that can be used for information and monitoring purposes. It uses remote IP communication via GPRS, ADSL, WIFI or any other to communicate business management data and technical data.

The Quick Charger power electronics unique design results in top tier specifications for conductive DC fast charging, such as high power output with an industry best power factor, THD and efficiency.

The Quick Charger is highly recommended for EV fleet bases, service stations, EV service workshops and public EV infrastructure for fast charging.

EFAPOWER EV-QC45 codification and configurations are presented in chapter 3.

## 2 GENERAL CHARACTERISTICS

### 2.1 TECHNICAL CHARACTERISTICS

EFAPOWER EV-QC45 technical characteristics are indicated in the Table 1.

This unit is intended to have at least one DC output connection (CHAdeMO and/or CCS) and in addition can have one of the two AC output<sup>1</sup> connections (AC43 or AC22).

Table 1 – EFAPOWER EV-QC45 Technical Characteristics

Technical Data	CE	ETL
Nominal Input	Phases/Lines	3 phases + neutral + PE
	Voltage	(400 ± 10%) V a.c.
	Current	73 A
	Power	53kVA (@50kW peak power); 48kVA (@45kW)
	Frequency	(50 ± 10%) Hz
	Efficiency	> 93%
	Power Factor	0,98
	THD Input Current	12,3
DC Output: CHAdeMO	Voltage	(50 to 500) V d.c.
	Current	120 A d.c.
	Nominal Power	50kW at peak; 45kW at continuous
	Communications with EV	JEVS G104 - CHAdeMO
	Plug	JEVS G105 - CHAdeMO
DC Output: CCS	Voltage	(50 to 500) V d.c.
	Current	120 A d.c.
	Nominal Power	50kW at peak; 45kW at continuous
	Communications with EV	PLC
	Plug	CCS – Type 2
AC Output: AC43 (or AC22)	Voltage	(400 ± 10%) V a.c.
	Current	63 A a.c. (or 32 A a.c.)
	Nominal Power	43kVA (or 22kVA)
	Plug (or Socket)	IEC62196 Type 2
Insulation	Input / Output / Ground	1500 V a.c.
	Control Circuit / Ground	500 Vac
Cabinet	Dimensions(WxDxH)	600 x 600 x 1800 mm
	Weight	600 kg
	Protection Degree	IP54, IK10
HMI and Command Unit	Contactless card specification	Mifare Classic 1K&4K   Mifare DesFire EV1 (Others under request)
	Local interface	TFT Color display 6.4" Buttons
	Communication Protocol (others under request)	Web Services over IP; Router 3G (GSM or CDMA) OCPP; Efacec; others
	Emergency STOP	Yes
	Temperature	-25° to +50°C
Environment Conditions	Cold option (under request)	-35° to +50°C
	Humidity	5% to 95%
	Place of installation	Indoor / Outdoor
	Altitude	Up to 1000m
	Sound Noise	<55 dB in all directions

Specifications are subject to change, without prior notice.

In case of an AC output connection one of the following scenarios can be supplied:

- AC and DC output connections can only charge one at a time:  
In this case only the nominal current input referred above in Table 1 is needed.
- AC and one DC output connections can charge simultaneous:
  - For AC43: the total nominal current input needed is 136 A.
  - For AC22: the total nominal current input needed is 105 A.

<sup>1</sup> AC output not available for US market

## 2.2 STANDARDS

The EFAPOWER EV-QC45 Quick Charging Station complies with the following standards:

Table 2 – EFAPOWER EV-QC45 Applicable Standards

Technical Data	CE	ETL
Applicable Standards	Universal: 2006/95/CE <sup>2</sup> 2004/108/CE <sup>3</sup> EN/IEC 61851-1 <sup>4</sup> IEC 62196 <sup>5</sup>	UL 2231-1 <sup>6</sup> UL 2231-2 <sup>7</sup> UL 2202 <sup>8</sup> SAE J1772 <sup>9</sup> ADA <sup>10</sup>
	DC Charging System: EN/IEC 61851-23 <sup>11</sup> EN/IEC 61851-24 <sup>12</sup> EN/IEC 61000-6-2 <sup>13</sup> EN/IEC 61000-6-4 <sup>14</sup>	---
	AC Charging System: EN/IEC 61851-22 <sup>15</sup> EN/IEC 61000-6-1 <sup>16</sup> EN/IEC 61000-6-3 <sup>17</sup> EV-READY	---- (not available)



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<sup>2</sup> **2006/95/CE**: Low Voltage Directive

<sup>3</sup> **2004/108/CE**: EMC directive

<sup>4</sup> **EN/IEC 61851-1**: Electric vehicle conductive charging system. Part 1: General Requirements

<sup>5</sup> **IEC 62196**: Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles

<sup>6</sup> **UL 2231-1**: Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements

<sup>7</sup> **UL 2231-2**: Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection devices for Use in Charging Systems

<sup>8</sup> **UL 2202**: Electric Vehicle (EV) Charging System Equipment

<sup>9</sup> **SAE J1772**: SAE Surface Vehicle Recommended Practice J1772, SAE Electric Vehicle Conductive Charge Coupler

<sup>10</sup> **ADA**: American with Disabilities Act

<sup>11</sup> **EN/IEC 61851-23**: Electric vehicle conductive charging system - Part 23: DC electric vehicle charging station

<sup>12</sup> **EN/IEC 61851-24**: Electric vehicle conductive charging system - Part 24: Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging

<sup>13</sup> **EN/IEC 61000-6-2**: Electromagnetic compatibility (EMC). Part 6-2: Generic standards – Immunity for industrial environments

<sup>14</sup> **EN/IEC 61000-6-4**: Electromagnetic compatibility (EMC). Part 6-4: Generic standards –Emission standard for industrial environments

<sup>15</sup> **EN/IEC 61851-22**: Electric vehicle conductive charging system. Part 22: AC Electric Vehicle Charging Station

<sup>16</sup> **EN/IEC 61000-6-1**: Electromagnetic compatibility (EMC). Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments

<sup>17</sup> **EN/IEC 61000-6-3**: Electromagnetic compatibility (EMC). Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

### 3 PRODUCT PARTS PRESENTATION

The mechanical structure is composed by a standalone Power Cabinet. Its codification is presented below.

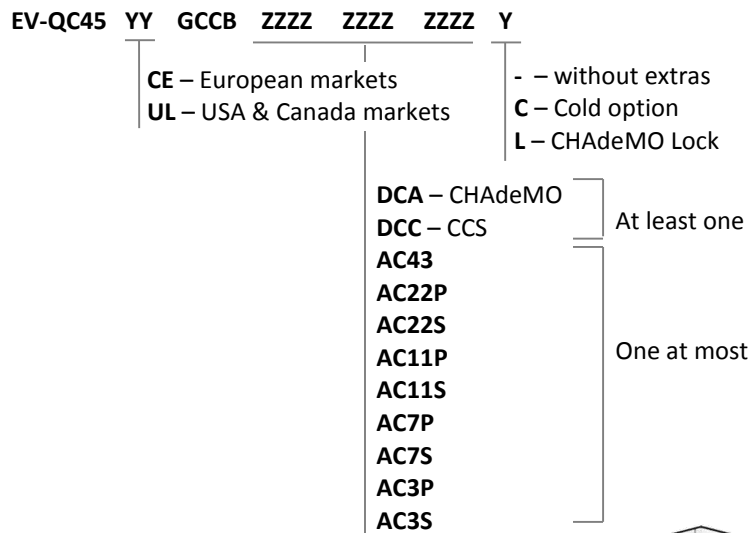


Figure 3 - EV-QC45 Standalone Codes

EFAPOWER EV-QC45 has 9 possible output combinations as showed in the next figure:

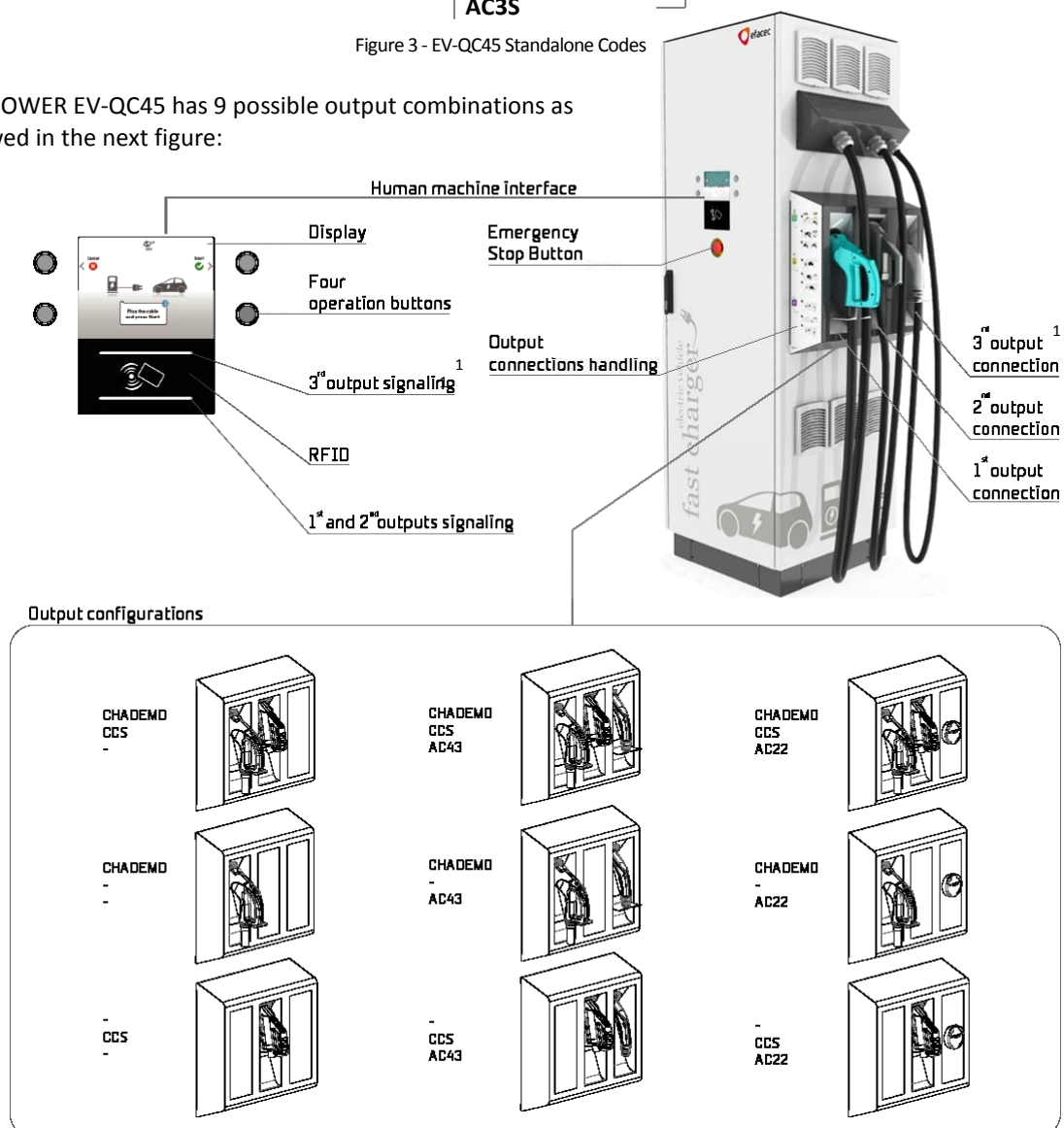


Figure 4 - EFAPOWER EV-QC45 Parts

<sup>1</sup>Not available for USA market

## 4 IMPORTANT SAFETY INSTRUCTIONS

### SAVE THESE INSTRUCTIONS

This manual contains important instructions that must be followed during installation of the EFAPOWER EV QC45 Quick Charging Station.

### Grounding instructions

The EFAPOWER EV QC45 Quick Charging Station must be connected to a grounded, metal, permanent wiring system; or an equipment-grounding conductor is to be run with circuit conductors and connected to the equipment grounding terminal or lead on the Electric Vehicle Supply Equipment (EVSE). Connections to the EVSE shall comply with all local codes and ordinances.

### Safety and compliance

This document provides instructions to install the EFAPOWER EV QC45 Quick Charging Station and should not be used for any other product. Before installing the EFAPOWER EV QC45 Charging Station, you should review this manual carefully and consult with a licensed contractor, licensed electrician and trained installation expert to ensure compliance with local building practices, climate conditions, safety standards, and state and local codes. The EFAPOWER EV QC45 Quick Charging Station should be installed only by a licensed contractor and a licensed electrician and in accordance with all local and national codes and standards. The EFAPOWER EV QC45 Quick Charging Station should be inspected by a qualified installer prior to the initial use. Under no circumstances will compliance with the information in this manual relieve the user of his/her responsibility to comply with all applicable codes or safety standards. This document describes the most commonly-used installation and mounting scenarios. If situations arise in which it is not possible to perform an installation following the procedures provided in this document, contact EFACEC. EFACEC is not responsible for any damages that may occur resulting from custom installations that are not described in this document.

### No accuracy guarantee

Reasonable effort was made to ensure that the specifications and other information in this manual are accurate and complete at the time of its publication. However, the specifications and other information in this manual are subject to change at any time without prior notice.

### Warranty information and disclaimer

Your use of, or modification to, the EFAPOWER EV QC45 Quick Charging Station in a manner in which the EFAPOWER EV QC45 Quick Charging Station is not intended to be used or modified will void the limited warranty. Other than any such limited warranty, the EFACEC products are provided "AS IS," and EFACEC and its distributors expressly disclaim all implied warranties, including any warranty of design, merchantability, fitness for a particular purposes and non-infringement, to the maximum extent permitted by law.

### Limitation of liability

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## 5 INSTALLATION

All matters for installing the EFAPOWER EV-QC45 are described in this chapter.

### 5.1 ENVIRONMENTAL REQUIREMENTS

EFAPOWER EV-QC45 reliability is dependent upon compliance of environmental specifications. The design of the environmental control system for your EFAPOWER EV-QC45, in case of extreme environmental conditions, must ensure that the Unit can operate reliably while remaining within the range of its operating specifications.

#### 5.1.1 LOCAL CONDITIONS



**The installation of EFAPOWER EV-QC45 shall not be made in a commercial garage (repair facility) or closer than 508mm (20 feet) of an outdoor motor fuel dispensing device.**

EFAPOWER EV-QC45 is in an IP54, IK10 (NEMA 3R) enclosure. This Unit is intended to work below 50°C (122°F) ambient temperature.

##### Clearance around the cabinet

The air must circulate freely throughout the ventilation grids in order for the charger's cooling system to be effective. The ventilation areas on the sides and back must not be blocked, assuring that the Quick Charger cooling system can be effective. Efacec recommends clearance of at least 1meter (40") in the front (HMI interface) and on right side (output cables) and 500mm (20") of clearance in the remaining sides of the cabinet.

##### Input Power Cables

AC input cables must be copper with appropriate power rating.

EFAPOWER EV-QC45 can be placed in 3 alternative positions as showed in Figure 5.



Figure 5 - EFAPOWER EV-QC45 alternative orientations

Even though, non-conductive dust does not influence the system's operation, it may however, with excessive accumulation, not allow proper cooling, therefore limiting the equipment's thermal capabilities. Consequently, dust accumulation must be avoided in order to guarantee a better thermal performance. Conductive dust and acid vapors must be kept away from the Quick Charger.

On locations with harsh weather conditions (high temperatures, heavy dust, snow and/or very low temperatures) it's recommended to provide additional protection, either inside a building or a shelter, or providing a protection roof for the Unit. See example in Figure 6.

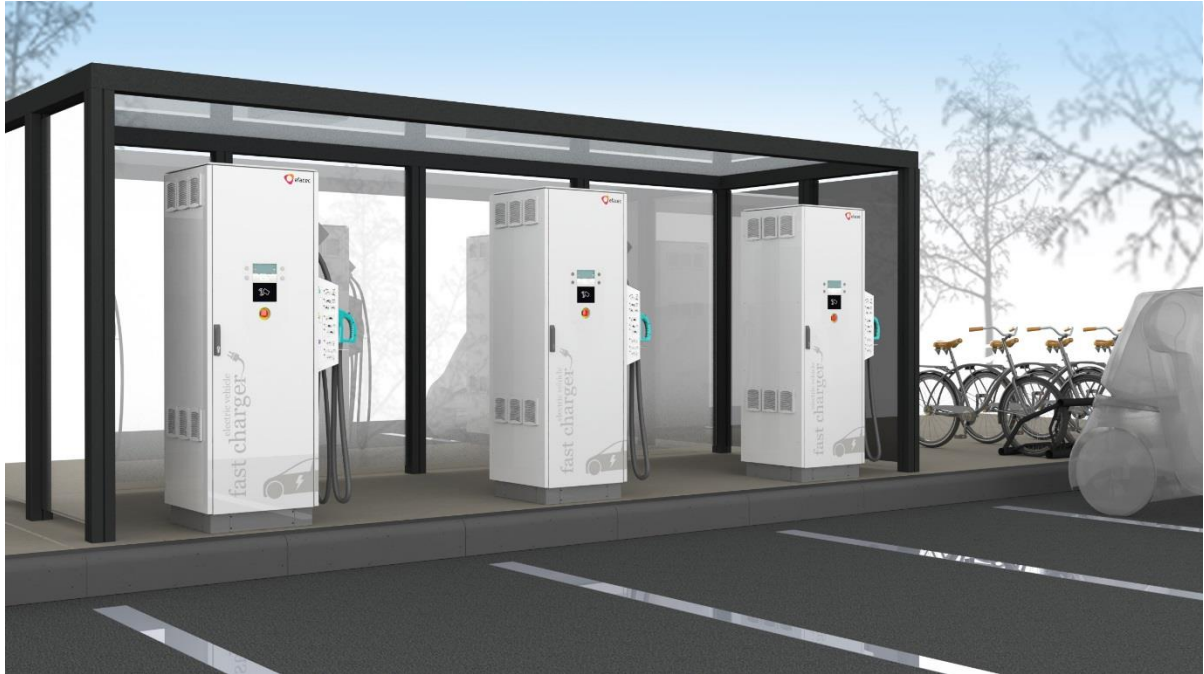


Figure 6 - EFAPOWER EV-QC45 with shelter

### 5.1.2 SITE VERIFICATION AND INSPECTION

- ✓ **Check if the installation of the Quick Charger is not planned to be made in a commercial garage** (repair facility) **or closer than 508mm (20 feet) of an outdoor motor fuel dispensing device;**
- ✓ **Check if the access passages to the Quick Charger Station layout site are not blocked in order to allow its transportation;**
- ✓ **Check if Quick Charger Station layout site is compliant with the specified clearance around the cabinet.**

## 5.2 SITE PREPARATION

Once the local conditions are verified, it is time to set up the site in order to be ready for the installation of the EFAPOWER EV-QC45.

### 5.2.1 UPSTREAM WIRING INFORMATION

Depending on the configuration of the EFAPOWER EV-QC45 we can have two wiring schemes as represented in Figure 7:

- **Only DC output** connections:



Requires dedicated **80A circuit breaker 3P C curve** for DC output(s)

or

- **AC and one DC output** connections (not available for USA market):



Requires dedicated **80A circuit breaker 3P C curve** for DC output(s)

+ Depending on the AC output connection:



Requires dedicated **80A circuit breaker 3P C curve** for AC output and its wiring  
or



Requires dedicated **40A circuit breaker 3P C curve** for AC output and its wiring

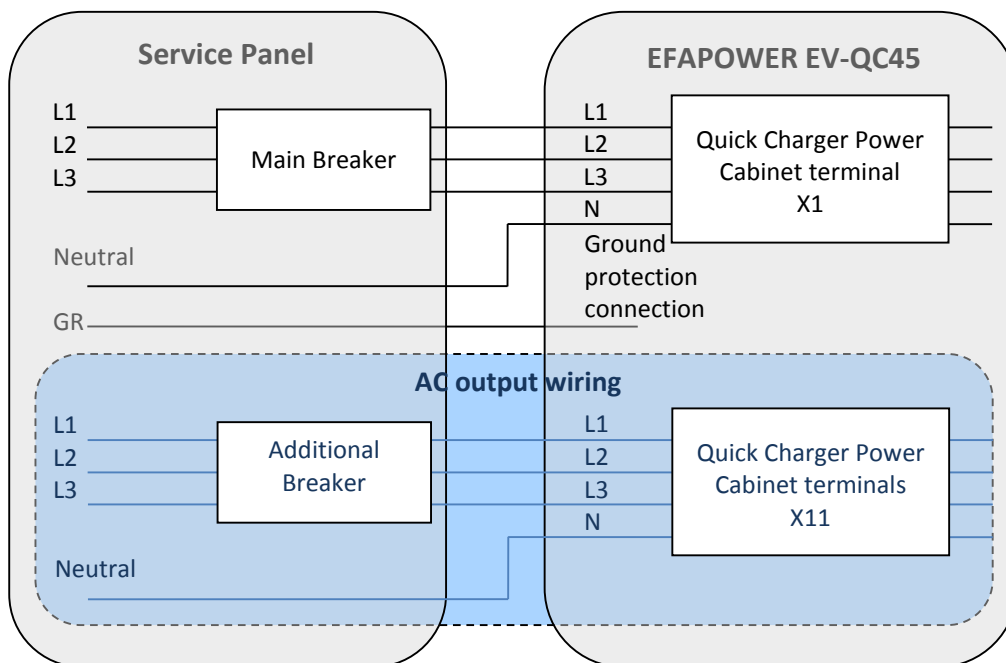


Figure 7 - EFAPOWER EV-QC45 Wiring Information

#### NOTES:

In areas with frequent thunder storms, Efacec recommends adding transient voltage surge suppression (TVSS) at the service panel for all circuits.

Unless required by local codes it is not necessary to install a residual-current device (RCD) for the circuit breaker. The EFAPOWER EV-QC45 already has this protection.

## 5.2.2 SURFACE PREPARATION

Efacec recommends a concrete pad of at least 800mm (31.5") square, by 254mm (10") deep. Check local codes to ensure compliance.

### Flatness

To avoid warping of the doors, the Quick Charger Station power cabinet must be mounted on a surface with a maximum slope of 2mm/m (¼ inch rise per 10 feet of run).

## 5.2.3 RESOURCES FOR INSTALLATION

The following resources will be needed for installation of the EFAPOWER EV-QC45:

### Fasteners:

- 4 (four) chemical anchors, M8 (5/16"), 10mm thread diameter – length must comply with local codes, but must have at least 120mm (5")
- 4 (four) galvanized bolts M8 (5/16"), with matching nuts and washers (must extend at least 30.5mm (1.2") above the concrete and 89.5mm (3.52") into the concrete)
- 4 (four) sealing screws: Socket head button cap screws M12x25 (metric), with matching flat rubber washers (supplied with the Quick Charging Station)

### End terminals for input wiring:

- Depending on the EFAPOWER EV-QC45 configuration:
  - Only DC outputs: 5 (five) end terminals up to 35mm<sup>2</sup> (3phases + neutral + protective ground), or
  - DC and AC outputs (not available for US market): 5 (five) end terminals up to 35mm<sup>2</sup> + 5 (five) end terminals up to 16mm<sup>2</sup> (3phases + neutral+ protective ground)

### Tools:

- 13mm (1/2") wrench - for anchoring the Unit on the pad
- 10mm Hex key/bit - for Sealing Screws
- Crimping tool - for power and earth cables
- Torque screwdriver with flat blade - for input terminal blocks

## 5.2.4 SITE VERIFICATION AND INSPECTION

- ✓ **Check** if **Quick Charger** has the **appropriate upstream protection** depending on the configuration of it
- ✓ **Check** if the **surface** where the Quick Charging Station will be placed is **leveled** as specified

## 5.3 HANDLING AND PLACING



### IMPORTANT: Before installing stations

The instructions provided in this manual assume that the appropriate wiring, circuit protection, and metering are in place at the installation location.

To assist in the process of preparing the installation site, it is recommended that before you begin installing Quick Charging Station, you thoroughly review the contents of this document to familiarize yourself with the required installation steps.

In case of any doubt regarding items described in this guide, please contact us at:



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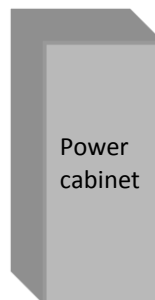
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### 5.3.1 PACKAGING

EFAPOWER EV-QC45 is shipped in a package with the following dimensions (WxDxH):

- 1150x850x2150mm (45.3x33.5x84.6 inches)



### 5.3.2 VISUAL INSPECTION

- ✓ **Check if the exterior packaging** has been **damaged** by mechanical impacts or any accidents during transportation
- ✓ If applicable, **check if the exterior panels** of the EFAPOWER EV-QC45 are in **perfect condition**
- ✓ **Check if** the interior of the **Quick Charger** Station is **clean**
- ✓ **Check if** the **door** of the Quick Charger Station is **working properly**
- ✓ **Check** for proper Quick Charger Station **protective ground connection point**, which should be interconnected with the low voltage switchboard ground connection during the installation

### 5.3.3 HANDLING

Due to its heavy weight, 4 (four) lifting hooks are provided on the top of the Power Cabinet as indicated on Figure 8.



#### IMPORTANT:

Never try to move the power cabinets by using tools under panels; this will create a risk of deformation.



Figure 8 - EFAPOWER EV-QC45 lifting hooks

After the power cabinet is placed, the lifting hooks must be removed, and the M12 sealing screws must be inserted in their holes in order to guarantee the IP54, IK10 (NEMA 3R) protection degree.

### 5.3.4 PLACING

#### 5.3.4.1 ANCHORING TO THE CONCRETE PAD

The Quick Charging Station must be anchored on the surface compliant with the specifications mentioned in chapter 5.2.2.

The power cabinet must be installed on a concrete pad using 4 (four) chemical anchors, M8 (5/16"), 10mm thread diameter – length must comply with local codes, but must have at least 120mm (5").

In the following figure some details are shown regarding the drilling layout for the Power Cabinet. Only 4 (four) points are needed to anchor the Unit on the concrete pad (marked with a red circle).

For the power cabinet, the conduits must extend 160mm (6.3") above the concrete, or according to local codes. The **cable entrance shall only be located as shown in the image below** (marked in green).

The access to all the controls and **commands including the buttons and the card reader**, must comply with local codes and **ADA requirements**. That includes being **under 1200mm (48")** off the ground.

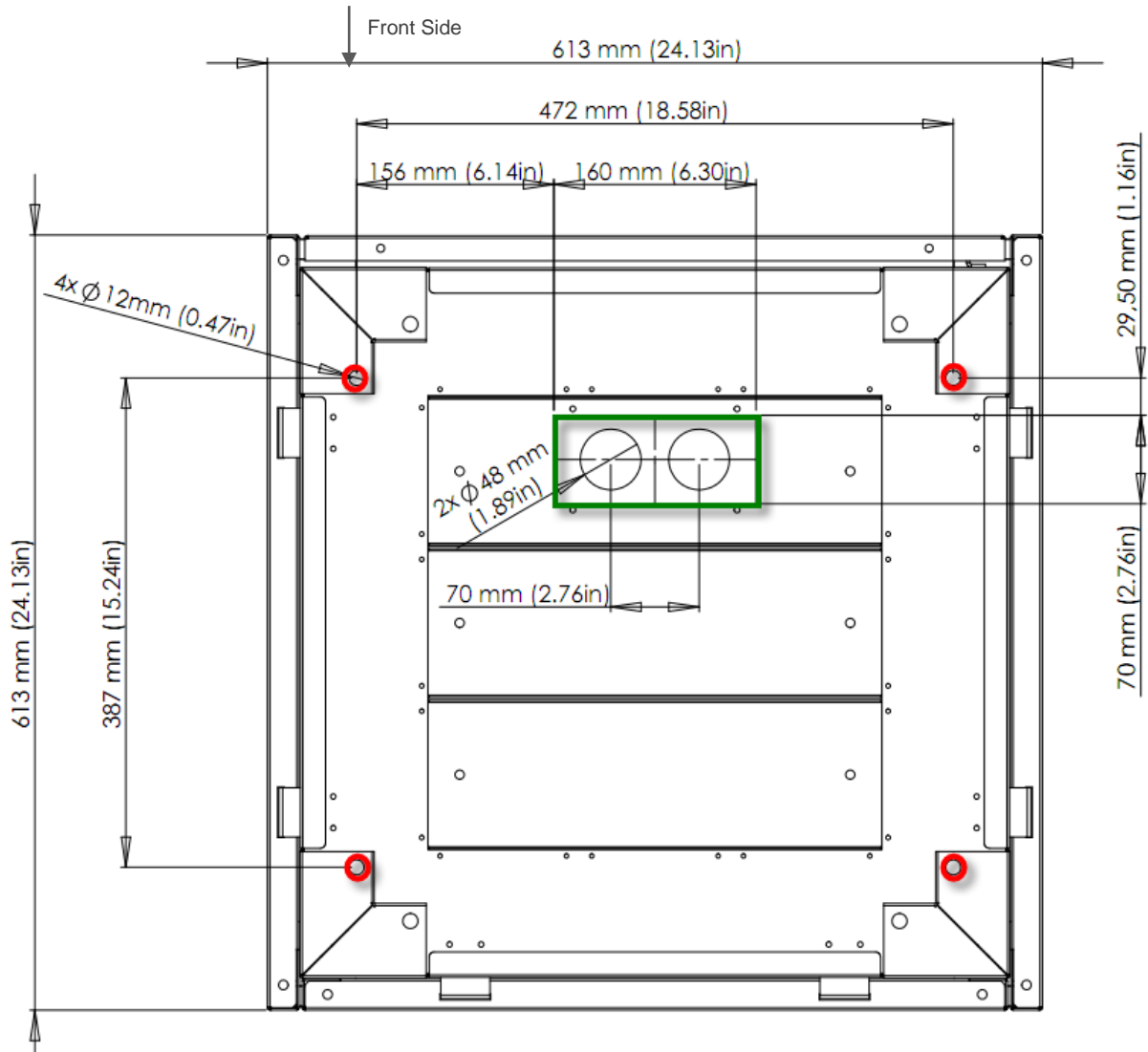


Figure 9 - EFAPOWER EV-QC45 Drilling and conduits layout  
(bottom view)



### IMPORTANT:

- The use of chemical anchors must be in compliance with the manufacturer's instructions
- For the Power Cabinet it's advised to have a concrete block of at least 800mm (31.5") square, by 254mm (10") deep. Check local codes to ensure compliance
- The bolts must extend at least 30.5mm (1.2") above the concrete and 89.5mm (3.52") into the concrete



**ALL SERVICING MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL. DO NOT ATTEMPT TO SERVICE THE EFAPOWER EV QC45 QUICK CHARGING STATION YOURSELF.**

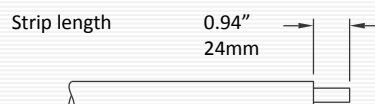
**BY OPENING THE DOOR OR REMOVING THE EFAPOWER EV QC45 QUICK CHARGING STATION SIDE PANELS YOU RUN THE RISK OF EXPOSURE TO DANGEROUS VOLTAGES!**

### 5.3.4.2 POWER CABLES CONNECTION

The connection to the AC input terminals of each Quick Charger Station is accessed through the bottom of the cabinet:

- **X1 – MUST BE CONNECTED regardless of the EFAPOWER EV-QC45 configuration**  
(35mm<sup>2</sup> terminal blocks)
- **X11 – Must be connected if AC OUTPUT is available**  
(16mm<sup>2</sup> terminal blocks)

Strip wires 24 mm (0.94"), crimp the end terminal and insert into the terminal block as shown, and tighten screws between 3.2 N.m (28.3 inch-lbs) and 3.7 N.m (32.7 inch-lbs).



#### IMPORTANT:

- **45** Always requires dedicated 80A circuit breaker 3P C curve
- If AC output available, additional circuit breaker is needed:
  - **43** 80A circuit breaker 3P C curve, or
  - **22** 40A circuit breaker 3P C curve
- Use copper conductors only
- Before starting to work on the Quick Charger Station, connect the ground wire to the ground terminals of the Quick Charger Station
- In areas with frequent thunder storms, we advise to add transient voltage surge suppression (TVSS) at the service panel for all circuits
- All bolts/nuts must be sealed

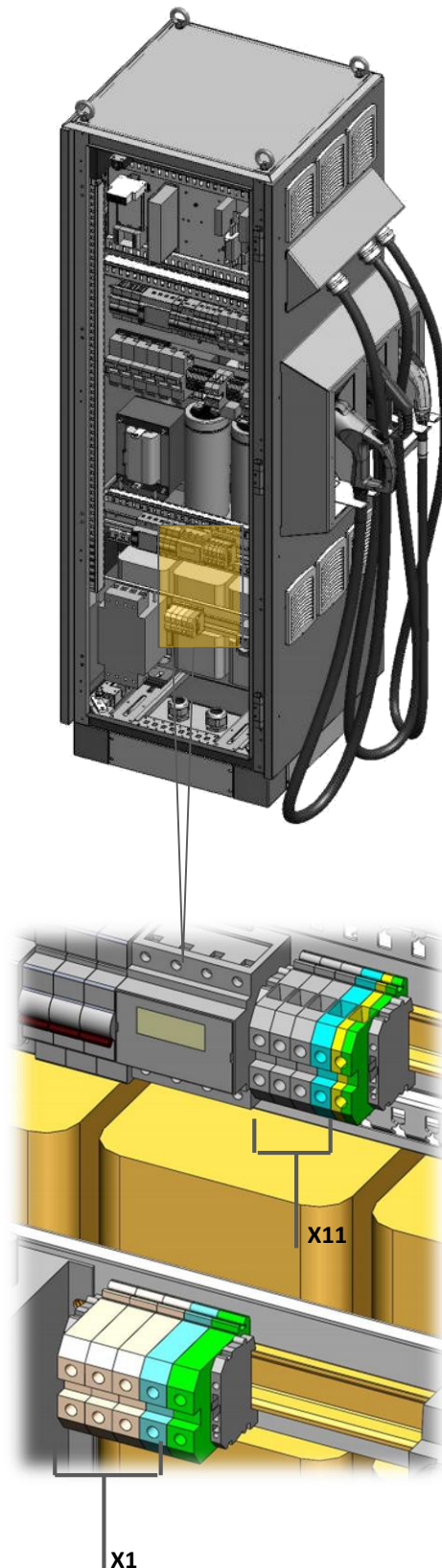


Figure 10 - EFAPOWER EV-QC45 Input Terminals

### 5.3.4.3 PROTECTIVE GROUND

The metallic structure of the rectifier system is connected to the protective ground connection, which should be interconnected with the low voltage switchboard ground connection.

The protective earth cable must have a section, at least of 16 mm<sup>2</sup> (#6AWG) or according to local codes.

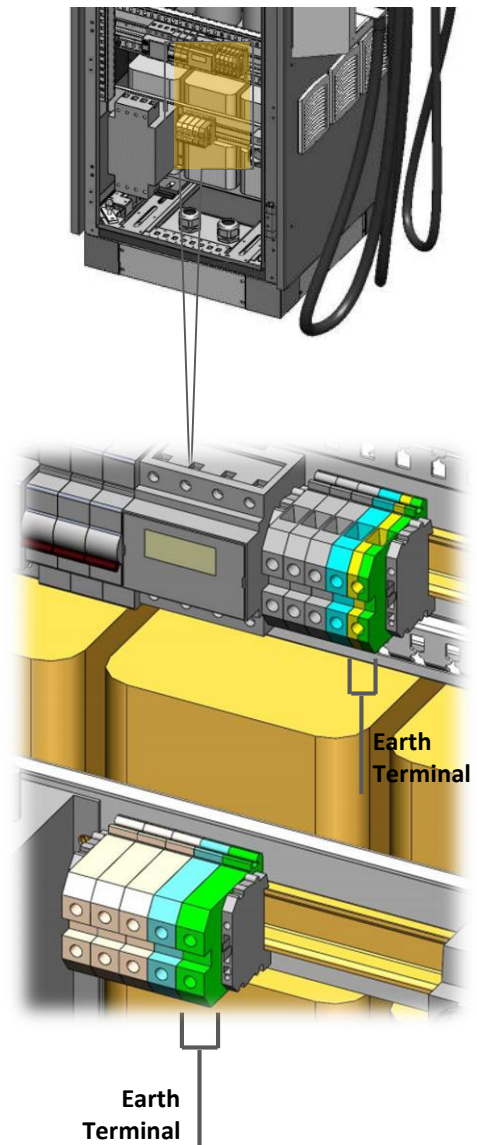


Figure 11 - EFAPOWER EV-QC45 Earth Terminal

## 6 START-UP

### 6.1 VERIFICATION AND INSPECTION

- ✓ Check if the **bolts** of the AC and **protective ground** cables of the Quick Charging Station are correctly **tightened** to the **specified torque**
- ✓ Check the **resistance between** the **Quick Charger protective ground** and the **low voltage switchboard ground** connection; the **value** must be **according** to **local codes**
- ✓ Before switching ON all the fuses and circuit breakers, **check** the **supply voltage** between lines: it must be **400V ± 10% 50Hz**, for **CE marked Units** (and **480V ± 10% 60Hz** for **ETL marked Units**)
- ✓ At this stage, **whenever the Unit shall be integrated** with a **Network Management System**, **Efacec shall already have the following information**:
  - ✓ For **Unit configuration**: **Station(s) ID** and **Central Management Endpoint**
  - ✓ For **Router configuration**: **APN** and **PIN**, **Username** and **Password** (if applicable)

### 6.2 SWITCH ON



**BEFORE ATTEMPTING TO INSTALL OR START UP THE EFAPOWER EV QC45 QUICK CHARGING STATION THE USER MUST ENSURE THAT THE SAFETY INSTRUCTIONS IN THIS MANUAL ARE CAREFULLY READ AND OBSERVED BY TECHNICALLY COMPETENT PERSONNEL.**

**KEEP THIS MANUAL WITH THE EFAPOWER EV QC45 QUICK CHARGING STATION FOR FUTURE REFERENCE.**

**THIS EFAPOWER EV QC45 QUICK CHARGING STATION MUST NOT BE STARTED OR PUT INTO USE WITHOUT HAVING BEEN COMMISSIONED BY A FULLY TRAINED AND AUTHORIZED PERSON.**



**ALL SERVICING MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL. DO NOT ATTEMPT TO SERVICE THE EFAPOWER EV QC45 QUICK CHARGING STATION YOURSELF.**

**BY OPENING THE DOOR OR REMOVING THE EFAPOWER EV QC45 QUICK CHARGING STATION SIDE PANELS YOU RUN THE RISK OF EXPOSURE TO DANGEROUS VOLTAGES!**

**IN CASE OF ANY KIND OF DOUBT REGARDING THIS, PLEASE CONTACT:**



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**THIS MANUAL MAY NOT BE COPIED NOR REPRODUCED WITHOUT PRIOR WRITTEN PERMISSION OF EFACEC**

- ✓ **Switch on all the fuses and circuit breakers** in the Quick Charging Station power cabinet:

Fuses: **F2, F7, F3, F4**

Circuit Breakers: **Q1, Q2, Q7, Q3, Q4, Q10, Q11** (only if cold option), **Q6, Q12** (auxiliary supply for maintenance), **Q14** (only if AC43 or AC22 outputs), **Q20** (only if AC43 output), **Q15** (only if AC22S output)

### EV-QC45 CE components layout

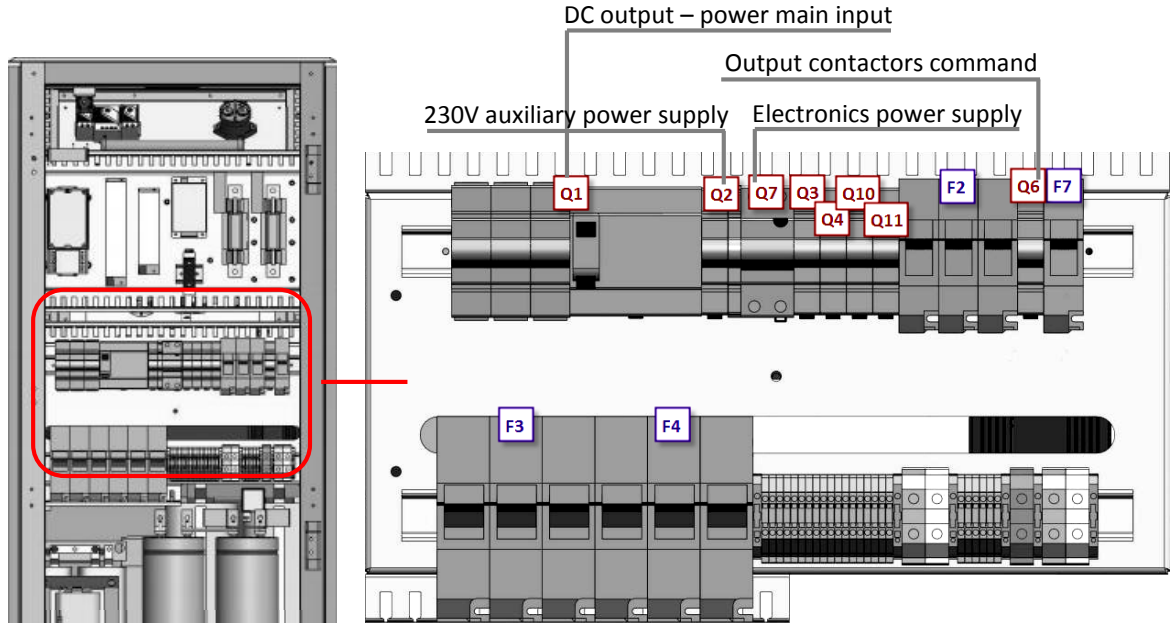


Figure 12 – CE Input Plate

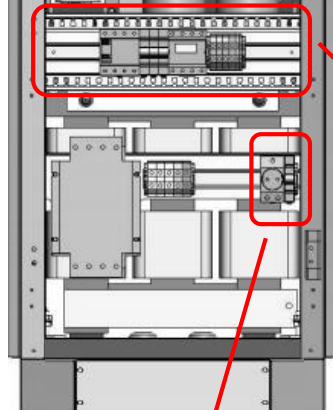


Figure 14 - EV-QC45 interior front view

If AC output connections:

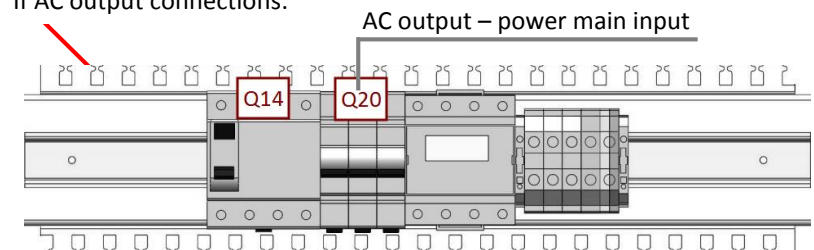


Figure 13 – AC43 Plate

or

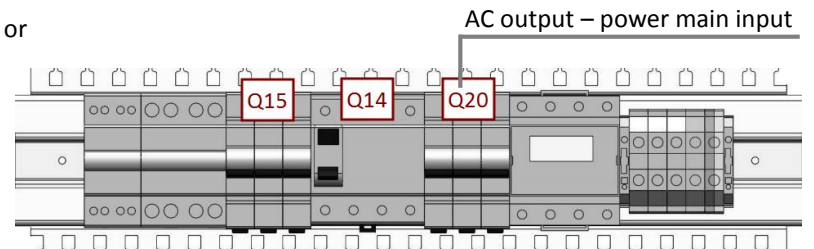


Figure 15 - AC22S Plate

or

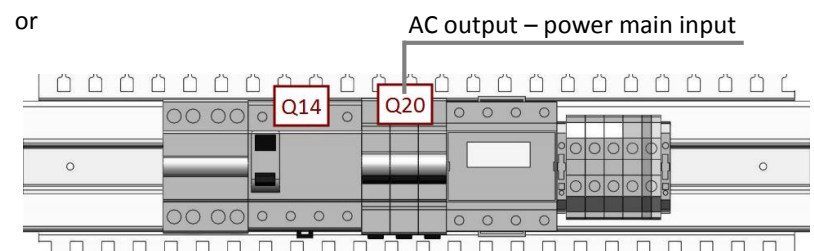


Figure 17 - AC22P Plate

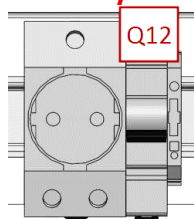


Figure 16 – Auxiliary supply for maintenance

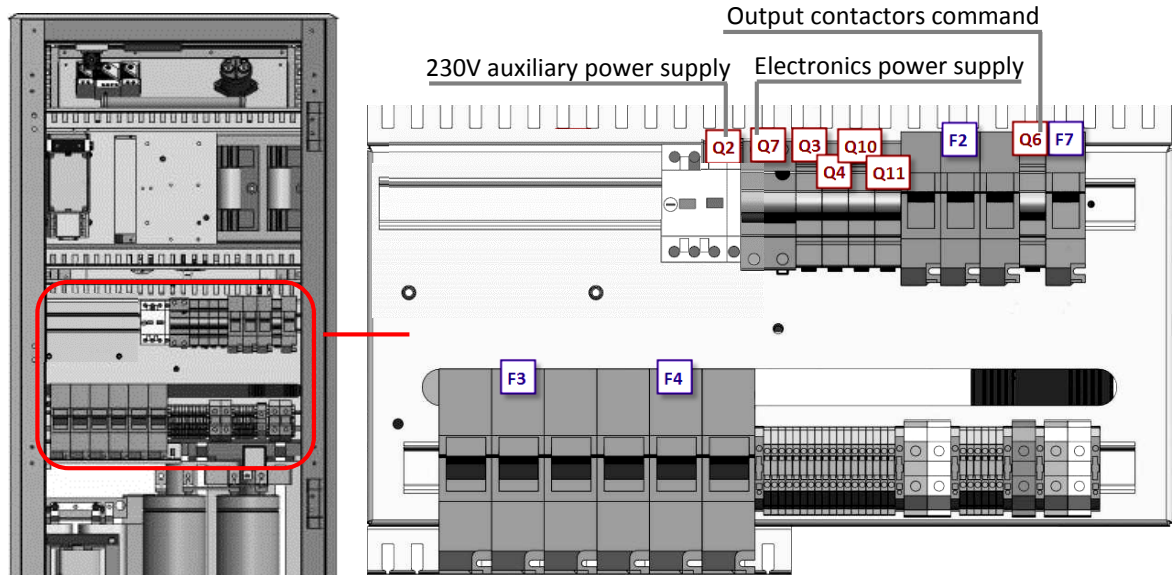
EV-QC45 UL components layout

Figure 18 – UL Input Plate

Figure 19 - EV-QC45 UL interior front view

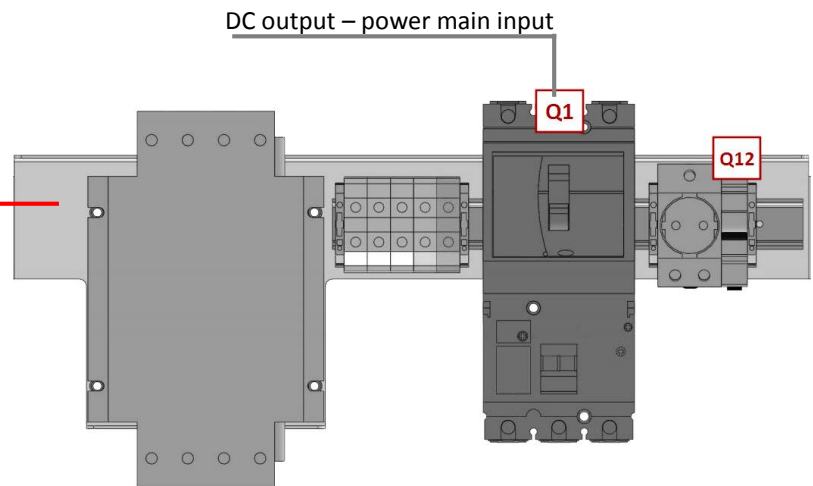


Figure 20 – UL RFI Plate

NOTE: if any of the following events do not happen, please consult Section 8.1 Power up errors.

- ✓ The display will show the following image during the boot process of the operating software:

```
Setting up networking....
Configuring network interfaces...[ 14.471034] eth0: link up, 100Mbps, full-dup
lex, lpa 0x05E1
done.
Starting portmap daemon....
[ 14.907890] NET: Registered protocol family 10
[ 14.908812] lo: Disabled Privacy Extensions
Setting console screen modes and fonts.
INIT: Entering runlevel: 2
Starting watchdog keepalive daemon: wd_keepalive.
Starting system log daemon: syslogd.
Starting system message bus: dbus.
Starting OpenBSD Secure Shell server: sshd.
Not starting internet superserver: no services enabled. (warning).
nocat splash daemon disabled - read /etc/default/nocat splash.
Starting Hardware abstraction layer: hald.
Starting periodic command scheduler: crond.
Stopping watchdog keepalive daemon: wd_keepalive.
Starting watchdog daemon: watchdog.
e2fsck 1.41.3 (12-Oct-2008)
/dev/hda5: clean, 273/62848 files, 9633/250896 blocks
[ 17.207702] kjournald starting. Commit interval 5 seconds
[ 17.293638] EXT3 FS on hda5, internal journal
[ 17.294443] EXT3-fs: mounted filesystem with writeback data mode.
```

Figure 21 - EFAPOWER EV-QC45 Initialization

- ✓ Wait for around 2-3 minutes. The display will present a picture as below:



Figure 22 - EFAPOWER EV-QC45 Initialization (continue)

- ✓ Finally the display will present the following screen saver:



Figure 23 - EFAPOWER EV-QC45 Screen Saver

The EV-QC45 shall be ready to charge any car that has a charging system according to the EFAPOWER EV-QC45 configuration. Although, **is highly recommended to test the charger station with a car or a simulator**. See how to operate the charger station in chapter 7.

AT THIS POINT THE **COMMISSIONING CHECK LIST REPORT**, WHICH WAS PROVIDED WITH THIS MANUAL, **SHALL BE FILLED IN AND SENT AFTERWARDS TO EFACEC FOR THE E-MAIL: [APV-SA@EFACEC.COM](mailto:APV-SA@EFACEC.COM) OR [SUPPORT.EEM.USA@EFACEC.COM](mailto:SUPPORT.EEM.USA@EFACEC.COM)** (FOR USA MARKET).

## 7 USER MANUAL

The EFAPOWER EV-QC45 operation depends on its output connections: CHAdeMO, CCS, AC43 or AC22.

During the charging process, the Human Machine Interface (HMI), presented in chapter 3, will give instructions and will signal different stages. These sequences are shown in this chapter.

### 7.1 OUTPUT CONNECTORS AND OUTLETS

EFAPOWER EV-QC45 is prepared to charge electric vehicles according to the mentioned charging systems.

#### 7.1.1 CHADEMO CONNECTOR

CHAdeMO connectors have a lock button.

##### Sumitomo



Figure 24 - Sumitomo CHAdeMO Connector

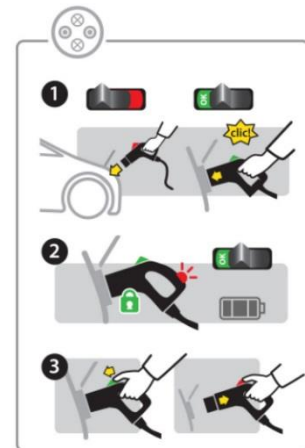


Figure 25 - Sumitomo Handling

##### Yazaki Gen 2



Figure 27 – Yazaki Gen 2 CHAdeMO Connector

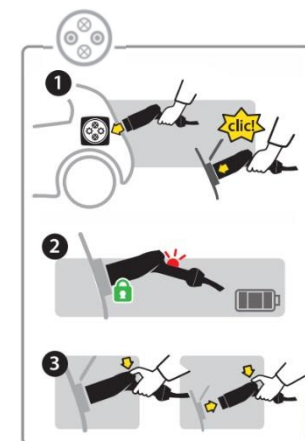


Figure 26 – Yazaki Gen2 Handling

#### 7.1.2 CCS CONNECTOR

##### Combo T2



Figure 28 - Combo T2 Connector

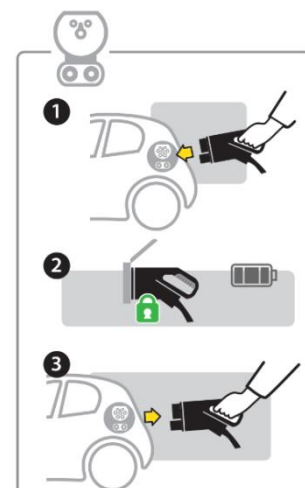


Figure 29 - Combo T2 Handling

**Combo T1**

Figure 30 - Combo T1 Connector

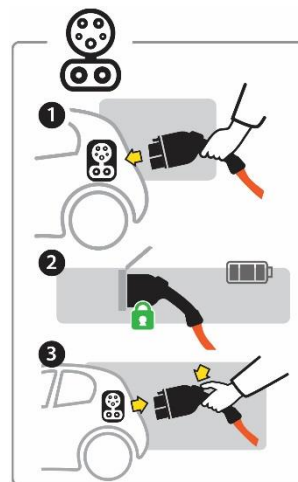


Figure 31 - Combo T1 Handling

**7.1.3 AC CONNECTOR****Type 2**

Figure 33 - Type 2 Connector

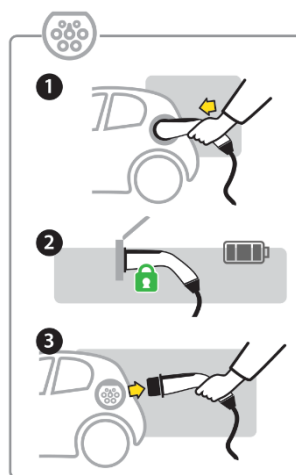


Figure 32 - Type 2 Handling

**7.1.4 AC OUTLET****Mode 3**

Figure 35 - Mode 3 Outlet

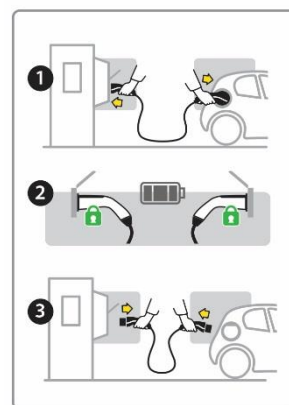


Figure 34 - Connector for AC22 Handling

## 7.2 OPERATION

When a user starts an operation on the EFAPOWER EV-QC45, the HMI display will show one of the following screen savers if:

- All output connections are idle or,
- The unit allows the charging of DC and AC simultaneously and one is already charging

- The unit only allows one vehicle to charge at a time, and a vehicle is currently charging



Figure 36 - Display Screen Saver 01

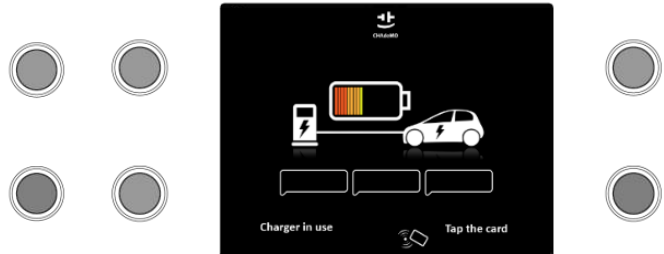


Figure 37 - Display Screen Saver 02

Below the display are the LEDs which signal the charging status. As explained in chapter 3:

- the ribbon on the TOP refers to the stage of the AC output connection (if the unit does not have output connection in this position, this ribbon does not exist)
- the ribbon on the BOTTOM refers to the stage of the DC output connections

Definition of the three LED colors is represented in the image below:



Figure 38 - LEDs ribbons and RFID

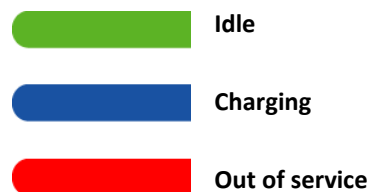


Figure 39 - EFAPOWER EV-QC45 Stages

## 7.2.1 OPTIONS INTERFACES

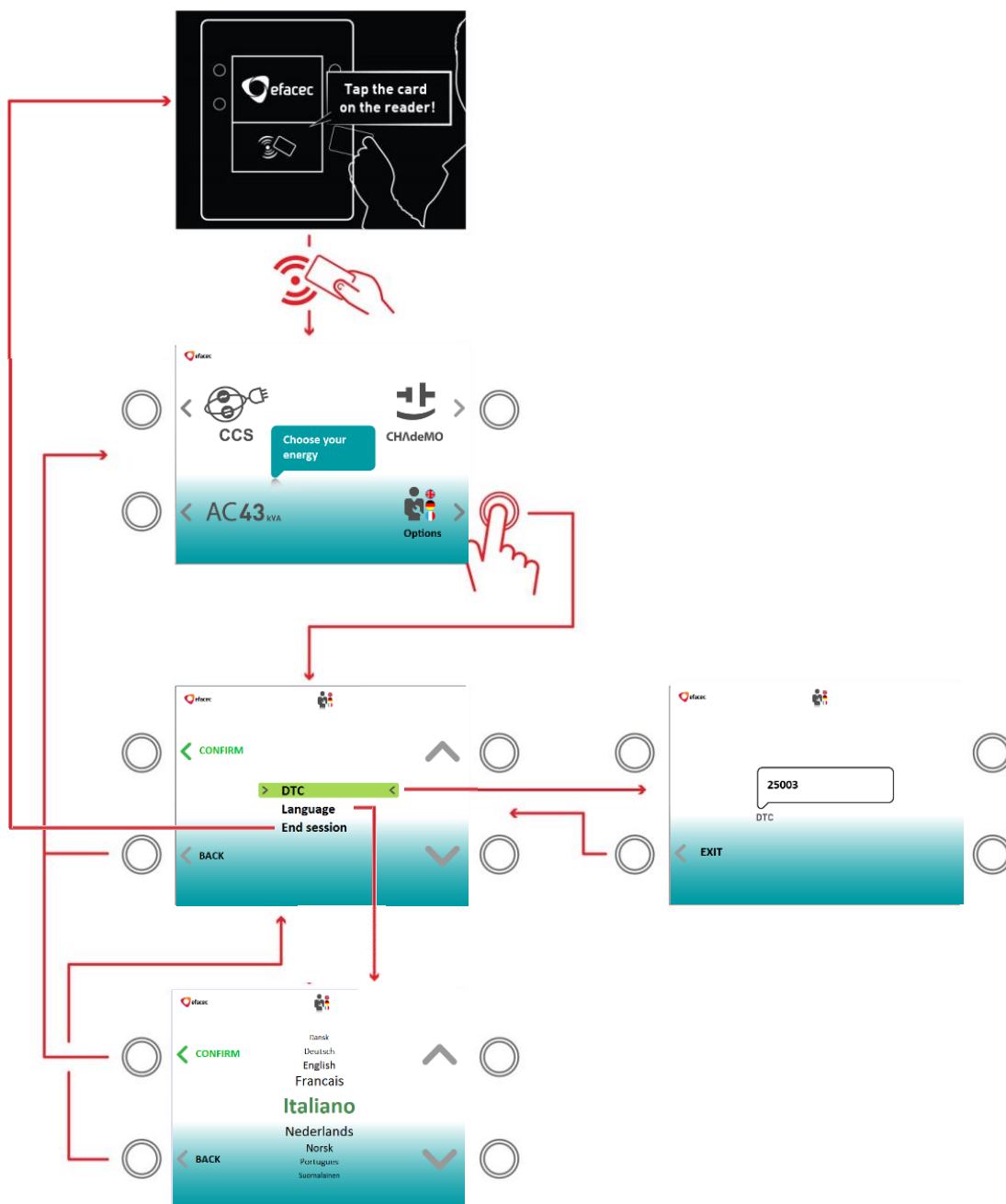


Figure 40 - Options interfaces

## 7.2.2 CHADEMO CHARGING SYSTEM INTERFACES

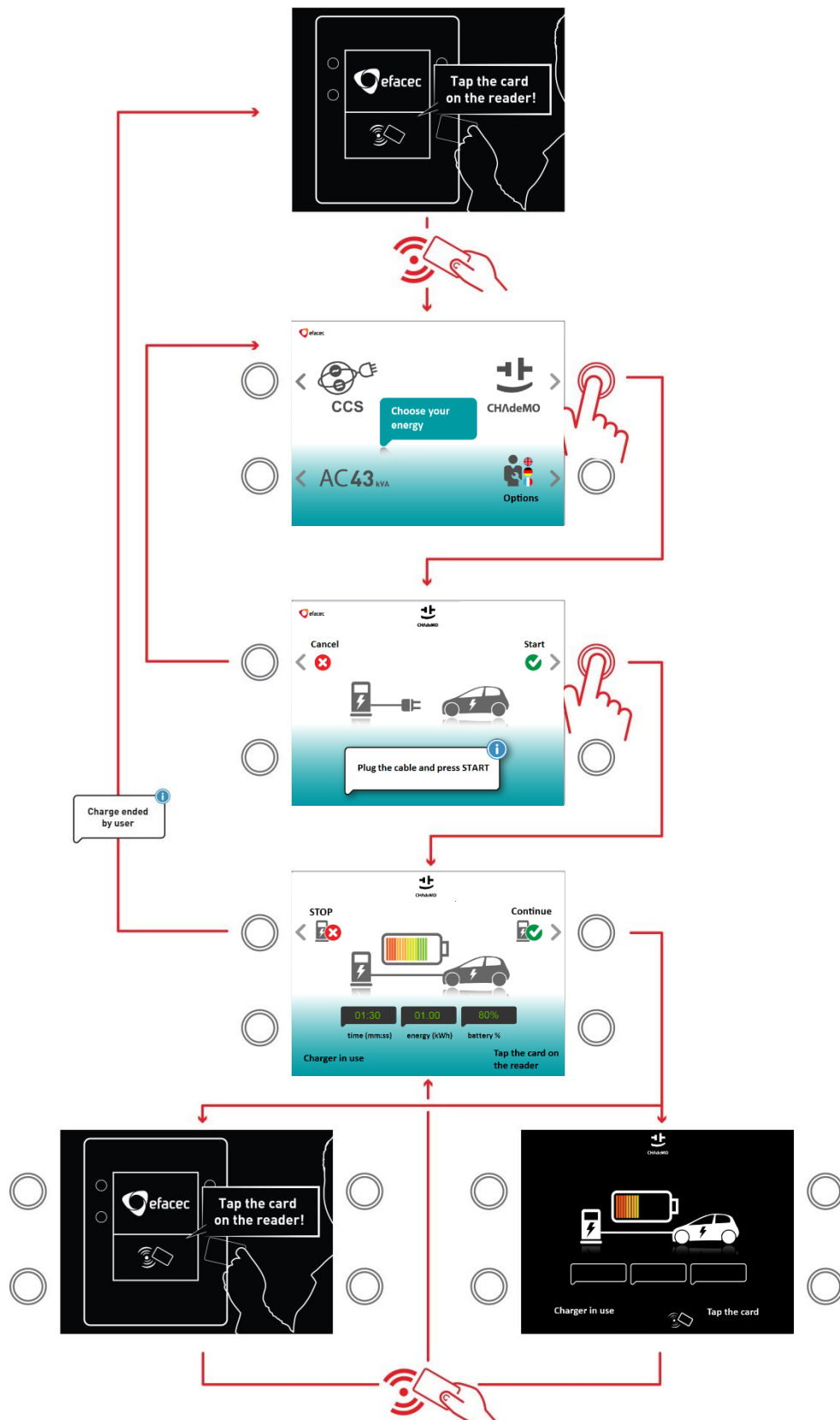


Figure 41 - CHADEMO interfaces

## 7.2.3 COMBINED CHARGING SYSTEM (CCS) INTERFACES

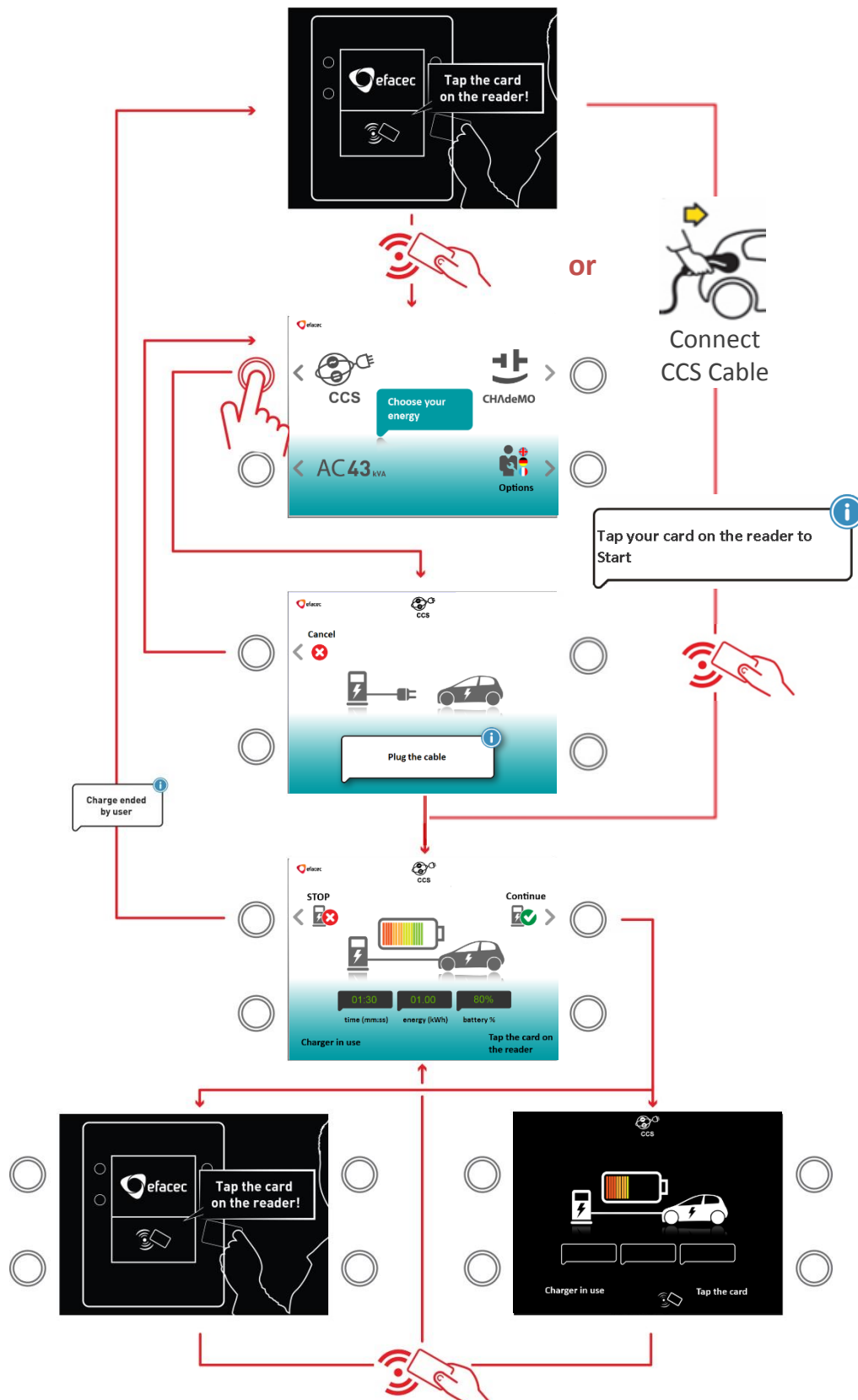


Figure 42 - CCS interfaces

## 7.2.4 AC43 CHARGING SYSTEM INTERFACES

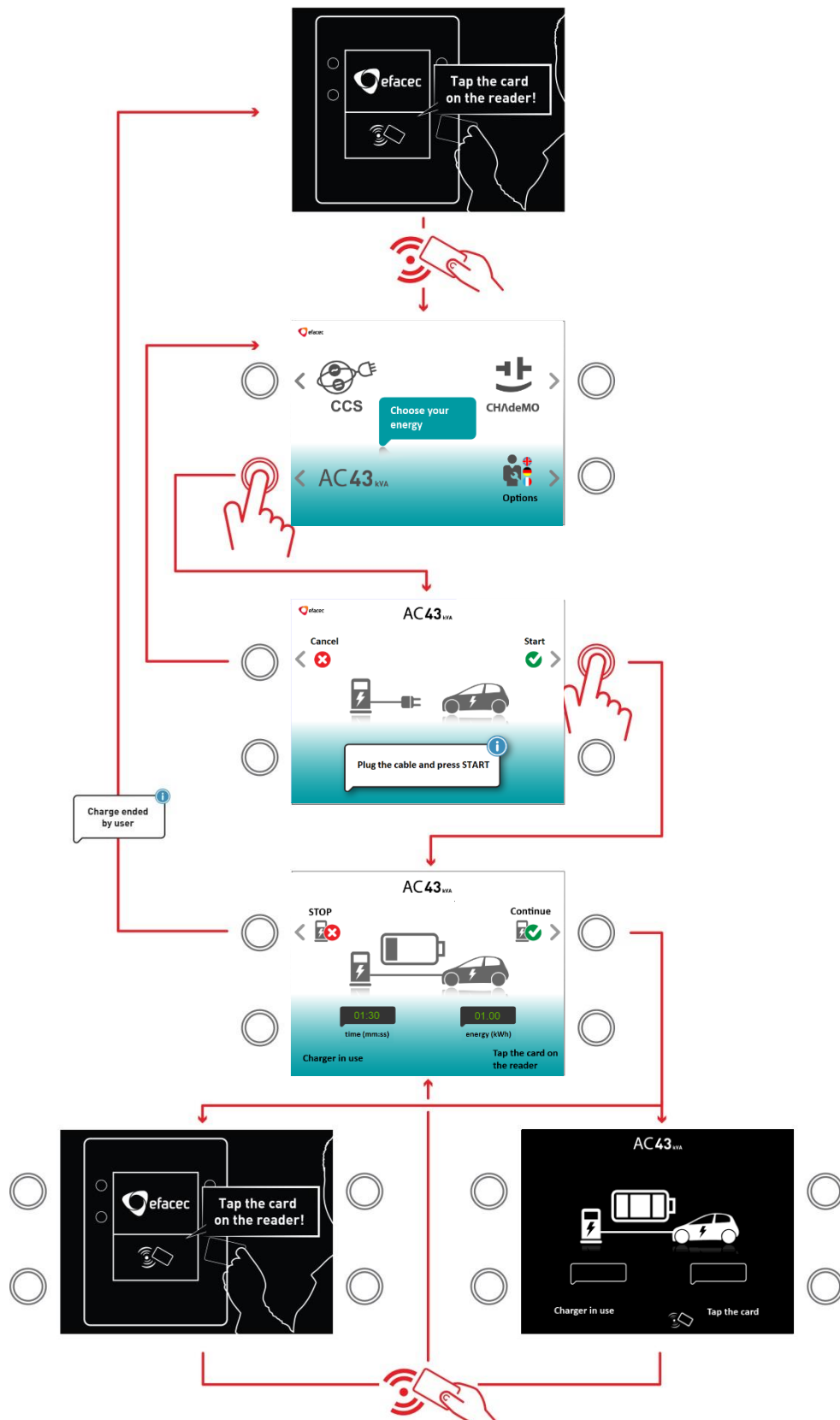


Figure 43 - AC43 interfaces



## 8 MAINTENANCE MANUAL



**ALL SERVICING MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL. DO NOT ATTEMPT TO SERVICE THE EFAPOWER EV QC45 QUICK CHARGING STATION YOURSELF.**

**BY OPENING THE DOOR OR REMOVING THE EFAPOWER EV QC45 QUICK CHARGING STATION SIDE PANELS YOU RUN THE RISK OF EXPOSURE TO DANGEROUS VOLTAGES!**

**IN CASE OF ANY KIND OF DOUBT REGARDING THIS CONTACT:**



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**THIS MANUAL MAY NOT BE COPIED NOR REPRODUCED PRIOR TO WRITTEN PERMISSION OF EFACEC.**

**BEFORE ANY MAINTENANCE, THE OPERATOR OR SERVICE TECHNICIAN MUST NOT TOUCH THE CAPACITORS' TERMINALS UNTIL THEY ARE DISCHARGED AND REACH THE SAFETY VALUE OF 50V (D.C.).**

### 8.1 POWER UP ERRORS

The following errors / messages can occur when the Quick Charging Station powers up.

Table 3 - EFAPOWER EV-QC45 Power Up Errors

Fault	Possible Cause	Action
<b>The display does not start</b>	Circuit breakers Q3 and/or Q7 are OFF	Switch circuit breakers Q3 and/or Q7 ON
	Unit A6 (auxiliary power supply) failure	Check and replace unit A6 if necessary
	Display failure	Check and replace unit if necessary
<b>Earth Leakage Fault</b>	Current higher than expected	Disconnect and reconnect power (by turning the power to the charging station off then back on again. If the message continues to be displayed, call Efacec Customer Support.
<b>The charger does not start charging</b>	The card is not accepted	Use a valid and authorized card
	Emergency Stop Button pressed	Turn the Emergency Stop Button to allow the charge

## 8.2 PREVENTIVE MAINTENANCE



**ALL SERVICING MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL. DO NOT ATTEMPT TO SERVICE THE EFAPOWER EV QC45 QUICK CHARGER STATION YOURSELF.**

**BY OPENING THE DOOR OR REMOVING THE EFAPOWER EV QC45 QUICK CHARGING STATION SIDE PANELS YOU RUN THE RISK OF EXPOSURE TO DANGEROUS VOLTAGES!**

We advise compliance with the specified maintenance plans which provide cleaning procedures for the terminals, microswitches, capacitors, interface buttons and ventilation filters.

Cleaning should be performed every 12 (twelve) months and more often if in harsh environmental conditions such as excessive snow or dust accumulation.

Table 4 - EFAPOWER EV-QC45 Preventive Maintenance

Operation	Periodicity	Estimated time(min)	Tools
Visual checking of the installation	Each 12 months	15	
Cleaning dust	Each 12 months	30	
<b>AC input cables:</b> Check the tightening torque of the cable connections.	Each 12 months	15	Standard Tools Torque wrench
<b>Output cables:</b> check if the connectors, cables and its connections are in perfect condition.	Each 12 months	15	Standard Tools Torque wrench
Check if microswitches from the circuit breakers, fuses are working correctly.	Each 12 months	15	Multimeter
Check the correct work of the cabinet fans, actuating the thermostat E2	Each 12 months	2	Standard tools
Check the correct work of the Heater (if exists), actuating the thermostat E4 and the Hygrostat E3	Each 12 months	5	Standard tools
Check the Emergency Stop Button correct work	Each 12 months	1	
Clean/Replace the fan filters	Each 12 months	15	
Panels cleaning – with fresh water and a detergent, then rinsed with fresh water	Each 12 months	15	

## 8.3 CHARGER / VEHICLE PROBLEMS



**ALL SERVICING MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL. DO NOT ATTEMPT TO SERVICE THE EFAPOWER EV QC45 QUICK CHARGER STATION YOURSELF.**

**BY OPENING THE DOOR OR REMOVING THE EFAPOWER EV QC45 QUICK CHARGING STATION SIDE PANELS YOU RUN THE RISK OF EXPOSURE TO DANGEROUS VOLTAGES!**

The following errors / messages can occur when attempting to charge a vehicle. In case of a Quick Charger Station problem, you should receive the message “**Charger Problem**” otherwise should appear “**Charger/Vehicle Problem**”.

In this case you should return the charging connector to its holder and call Efacec Customer Support at:



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These errors/messages are identified by a code, which is needed to be decoded. To do so, user must follow the procedure represented in Figure 40 into chapter Options Interfaces 7.2.1.

Table 5 - EFAPOWER EV-QC45 General

DTC No.	Possible cause
1000	Main controller board reset – The charger was powered up

### Charger problems

Table 6 - EFAPOWER EV-QC45 Charger Problems

DTC No.	Message on Display / Indication for user	Possible cause
10000	Charger problem	Short circuit in output
10002	Charger problem	Ground fault
10003	Charger problem	Over voltage in output
10004/ 10014	Charger problem	Over current in output
10005	Charger problem	Heatsink overheat
10006	Charger problem	Connector lock status maintenance
10007	Charger problem	Connector unlocked
10008	Charger problem	HMI ↔ charger communication problem
10009	Charger problem	Power controller communication problem
10010	Charger problem	Low mains voltage
10011	Charger problem	Tilt fault activated
15000	Charger problem	Input contactor failed or door opened
15001	Charger problem	mains breaker opened
15002	Charger problem	Fuses blown
15003	Charger problem	Auxiliaries breaker opened
15004	Charger problem	Inrush current contactor problem
19999	Charger problem	No communication between controller and HMI
30xxx	Charger problem	High voltage in the output

## Charger/Vehicle problems

Table 7 - EFAPOWER EV-QC45 Charger/Vehicle Problems

DTC No.	Message on Display / Indication for user	Possible cause
20000	Charger/Vehicle problem	Car contactors closed before they should
20001	Charger/Vehicle problem	Car contactors insulation failure
20002	Charger/Vehicle problem	Battery not sensed
20003	Charger/Vehicle problem	Car requested a higher current than charger can supply
20004	Charger/Vehicle problem	CAN communications timeout
20005	Charger/Vehicle problem	Car didn't sent a Current request
20006	Charger/Vehicle problem	Car detected an overvoltage in the battery
20007	Charger/Vehicle problem	Car detected an under voltage in the battery
20008	Charger/Vehicle problem	Car detected a difference in its current measure and the measure provided by charger
20009	Charger/Vehicle problem	Car detected an high battery temperature
20010	Charger/Vehicle problem	eCar detected a difference in its voltage measure and the measure provided by charger
25007	Charger/Vehicle problem	Someone force removed the connector
25008	Charger/Vehicle problem	Vehicle made an emergency stop

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