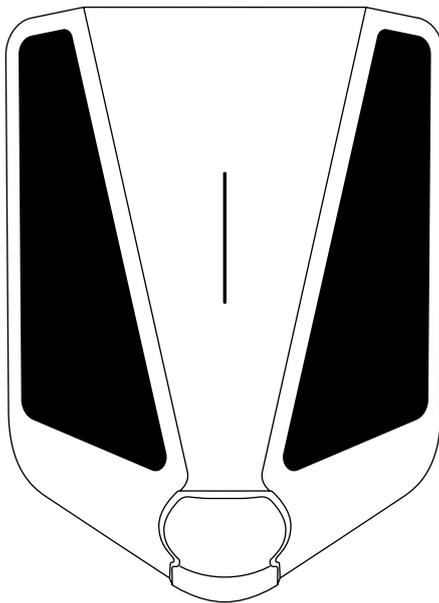


easee



EN Important Installer Information

RCD Functional Description

Easee Charge Max

Content

Technical documentation of residual current protection in accordance with IEC 60364, for charging station Easee Charge Max.

Summary

IEC 60364-7-722:2018 describes methods for residual current protection. The charging station uses the following method:

- The use of an RCD type A in conjunction with a residual direct current detecting device (RDC-DD) complying with IEC 62955.

Easee ASA declares that the charging station will disconnect the power supply if DC fault current exceeds 6 mA. In combination with an internal RCD Type A, this will provide equivalent or higher protection compared to an RCD Type B.

This document is a functional description of how the charging station achieves protection in accordance with IEC 60364:2018. The document contains excerpts from the technical documentation made available for TÜV Rheinland, and that has been used as the basis for testing and type certification in accordance with EN IEC 61851-1:2019.

Residual current protection

The charging station has an internal RCD Type A in accordance with IEC 60947-2. The charging station contains equipment for the detection of DC residual currents (RDC-DD) in accordance with IEC 62955. Disconnection in the event of DC fault currents above 6 mA is ensured through a common switch, which breaks the control current to all the internal relays for simultaneous opening.

The Type-2 connector does not have power until both verification of the RCD test and communication with EV is established.

The internal DC fault protection is automatically tested at startup, between each charging session or at least every 24 hours. The disconnection times are faster than using a modular Type B device.

System	50V < U _g ≤ 120V _s		120V < U _g ≤ 230V _s		230V < U _g ≤ 400V _s	
	AC	DC	AC	DC	AC	DC
TN	0,8	a)	0,4	1	0,2	0,4
TT	0,3	a)	0,2	0,4	0,07	0,2
IT	0,8	a)	0,4	1	0,3	0,4

Table 1: Maximum disconnection times for fault currents above 5 IΔn

In cases where a ground fault is detected, the LED indicator on the charging station will turn red, all relays will open, thus isolating the output to the Type-2 connector. The RCD is reset by disconnecting the charging cable. When the Type-2 connector is not connected to both the charging station and the electric vehicle, all relay contacts are always open.

The disconnection times for ground faults comply with the requirements in IEC 60364-4-41, section 411.3.2.2, for TN-, TT-, and IT-supply systems. The disconnection time for IT supply in Table 1 is derived from Norwegian standard NEK 400, based on IEC 60364.

Technical design

Table 2 provides an overview of the main requirements for the standards used, and performance parameters.

Critical fault mode alarm

In the event of a voltage error on the vehicle, voltage error due to a ground fault, or relay error, the charging station will enter critical fault mode with audio and visual signals and will not be usable. The critical fault mode cannot be reset by the user but must be examined by Easee support.

In the event of a critical fault mode, the opening of relays will be ensured through two separate systems, thereby providing redundancy and increased safety before or during an ongoing charging session.

Temperature monitoring

The charging station is equipped with internal temperature sensors that initiate actions in response to unexpected temperature rises. Should the temperature exceed a pre-defined safety limit will the charging station automatically shut down to prevent overheating, and the user will receive a notification.

Technical performance and design parameters

Parameter	RCCB	RDC-DD	Easee
Standard	EN 60947-2	IEC 62955	EN 60947-2 + IEC 62955
Classification	Type A	RDC-MD (4.11.3)	Type A + RDC-DD
AC trigger level	15-30 mA	30-60 mA	15-30 mA
DC trigger level	N/A	3-6 mA	3-6 mA
Rated current	10-32 A	16-125 A	32 A
Rated voltage	400 V	400 V	400 V
Rated impulse voltage	4 kV	4 kV	4 kV
Break time 30 mA AC	300 ms	N/A	<200 ms
Break time 60 mA AC	150 ms	300 ms	<100 ms
Break time 150 mA AC	40 ms	80 ms	<30 ms
Break time 5 A DC	N/A	80 ms	<30 ms
Break time 6 mA DC	N/A	10 s	<500 ms
Break time 60mA DC	N/A	300 ms	<100 ms
Break time 200mA DC	N/A	100 ms	< 30 ms

Table 2: RCD Performance overview and key parameters

An RCD detection module is used to detect both AC and DC fault currents. An additional fault signal will be active if an internal error is detected in the module. Any of the three fault signals will cause all relays to open, thereby isolating the Type-2 connector from the input current, including the neutral conductor.

Function

The opening of relays in the event of a ground fault is designed as a dual-channel system to provide redundancy and thereby increase reliability in case of failure. A ground fault can be indicated by the sensor, whether it is a fault current of 6 milliamperes direct current (DC), 30 milliamperes alternating current (AC), or a fault in the sensor itself. When such a fault is detected, signals are sent to both a Microcontroller Unit (MCU) and a Complex Programmable Logic Device (CPLD). These two units will immediately open all relays by disconnecting the 12-volt control voltage to the relays. This is done through their own, separate breaking circuits, which are connected in series and controlled completely independently of each other.

This means that in the event of a fault in the MCU unit or its software (SW), the CPLD unit will still open the relays. Similarly, if a fault occurs in the CPLD unit, the MCU unit will still ensure that the relays are opened. This system ensures that a ground fault will always lead to the relays being opened, even if one of the channels fails, thereby significantly increasing safety.

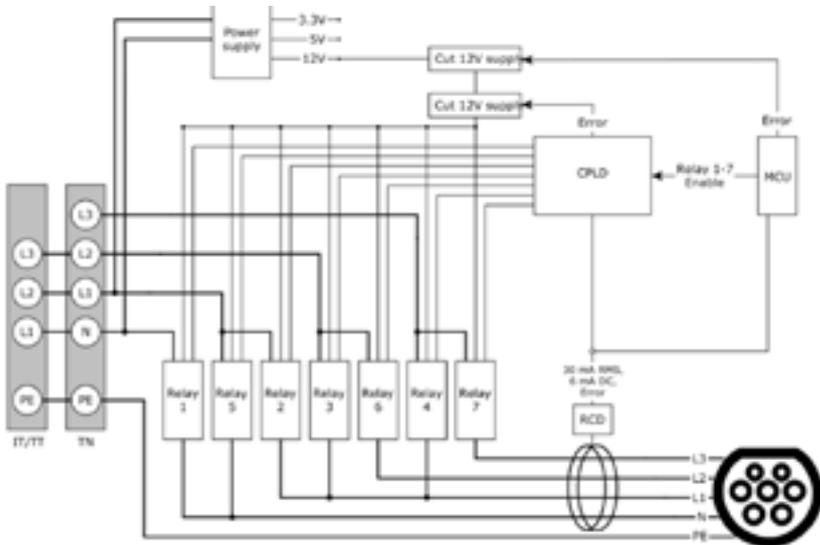


Figure 1: Schematic view of protection circuits

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