Connection requirements for 3x25A – 3x80A charging stations

For installing a standardised grid connection in a charging station

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Contents

1. Introduction

This document contains the requirements for the integration of a 3x25A to 3x80A grid connection in a charging station for electric vehicles. It concerns charging stations where a new grid connection has to be realised, including newly placed charging stations and charging stations which have to be placed elsewhere. This document is intended for manufacturers of these charging station.

The requirements have been drawn up in such a way that safe and reliable connection to the electricity grid of the grid operator remains ensured. The charging station will be inspected by ElaadNL, together with the grid operators, for admission to the electricity grid in accordance with these requirements. An overview of the charging stations that are already approved by the grid operators can be found on the website of ElaadNL.

2. Application

The requirements drawn up in this document relate to the grid operator's section in a charging station with a connected load of 3x25 A to 3x80 A. Application of a smart meter which has been required in public charging stations since 24 June 2017 on account of the order in council entitled "Decree on the infrastructure for alternative fuels" is included. The grid operator is responsible for this part of the charging station and uses protection devices as shown in Appendix 1. The customer is responsible for the customer's part which is located beyond the transition point of the grid operator (the meter).
The following applies to the inspection of charging stations based on the connection specifications v3.0 from the 1st of April onwards:

- New charging stations: all charging stations which have yet to be placed need to adhere to the connection requirements v3.0.
- Charging stations which have been already been inspected according the connection requirements v2.1: charging stations which have already successfully been inspected according to the connection requirements v2.1 can apply for a shorter inspection process under certain circumstances in consultation of ElaadNL.

Pilots and research assignments relating to charging stations which are part of demonstrable arrangements which have been agreed with the grid operators are exempted from the inspection requirements.

3. Connection method

Manufacturers are expected to configure the charging station so that a compact connection module as used by the grid operator is incorporated (see requirement 20). With the compact connection module, the applied protection devices have also been further standardised, which can be seen in Appendix 1. The possibilities with regard to software selectivity will also be evaluated based on the current, relevant pilot projects. Until then, this version of the connection requirements will apply.

4. Change history

Date+version	Requirements affected	Type of change
1-1-2017, v1.0	-	-
30-1-2017, v1.1	H2 + requirements 33 and 34	Requirement relating to telephone number for failure reporting added Responsibility for cylinder added H2 responsibilities clarified
30-4-2018, v2.0	3, 6, 8, 18, 20, 22, 23, 26, 27, 28, 31, 35 and 36	Requirements in v1.1 which have been removed
	1, 2, 7, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 26, 33 and 34	Requirements in v2.0 which have been adjusted compared to v1.1
	3, 4, 5, 6, 8, 9, 11, 24, 27, 28, 29, 30, 31 and 32	Requirements in v2.0 which are new compared to v1.1
17-5-2018, v2.0 REV B	Section 2, Requirement: 1, 2, 10 and 22 14	Textual Addition of cable pipe diameter
11-06-2018, v2.0 REV C	Section 3 20 33	Textual Adjustment of type of stainless steel screw Textual
19-06-2019, v2.0 REV C-1	Section 11	Addition of optional master-slave requirements
12-07-2019, v2.0 REV C-2	Appendix 2, 3, 4 and 5	Clarification of requirements
01-07-2020, v2.1	Section 9	Change in connectivity requirements smart meter
	Requirements 2, 18, 19 en 20 Appendix 4	Clarification of requirements for strain relief (textual and visual)
	Appendix 1	Used protection devices extended
09-2022, v3.0	1, 17, 18, 20, 21, 23, 24, Appendix 1, 2, 3	Requirements in v3.0 that have been adjusted compared to v2.1, such as tension relief, the compact connection module, size of the grid operator's section and the prefab mounting plates.
	19	Requirements that have been removed in v3.0
	19	Requirements that are new compared to v2.1

5. General information and requirements

#	Description	Inspection assessment
1	The meter in the grid connection will be supplied and installed by the grid operator. That meter is a Smart kWh meter used by the grid operators.	N/a.
2	The external diameter of the connection cable for the charging station may vary from 14 up to and including 27 mm. This Information is to be used for the choice of strain relief.	N/a .
3	The whole assembly complies with IEC-61439-7.	Test report.

4	The charging station complies with IEC-61851.	Test report.
5	Where the requirements refer to the charging station, this means the zone where the grid operator's components are installed, unless it is clear from the context that reference is made to the whole charging station including the customer compartment.	N/a.
6	These specifications apply to normal environmental conditions in accordance with IEC-61439. In specific cases, different environmental conditions may apply for which specific additional requirements may be set.	Clarification of the conditions which the charging station is suitable for.

6. Requirements relating to the housing of the charging station

#	Description	Inspection assessment
7	The housing of the charging station has IP44 protection (in accordance with NEN/EN/IEC 61439-7 and NEN/EN/IEC 61851-1).	Test report in accordance with NEN-EN-IEC 60529.
8	The housing of the charging station has IK10 impact resistance (in accordance with NEN/EN/IEC 61439-7).	Test report in accordance with NEN-EN-IEC 62262.
9	The mechanical strength of the charging station shall comply with the requirements for installation in public spaces in accordance with subsection 10.2.102 of NEN/EN/IEC 61439-7.	Test report in accordance with NEN-EN-IEC 61439-7.
10	The average air temperature in the charging station at the connection box and the smart meter must not be higher than 55 degrees Celsius over a period of one hour. It is assumed that the ambient temperature (*) outside the charging station is 40 degrees.	Test/measurement report in accordance with NEN-EN-IEC 61439-7.
11	Condensation could be formed in the charging station. This must not lead to hazardous situations or cause equipment to fail. Adequate measures are to be taken in order to prevent this.	Visual inspection/Manufacturer's comments.
12	The housing of the charging station does not let any UV radiation pass so that the grid operator's components will not be affected by UV radiation (leading to ageing).	Visual inspection and in the case of a transparent housing a material declaration relating to UV absorption.

** The term 'ambient temperature' refers to the outside temperature at a distance of 1.5 m from the charging station. The grid connection will be installed in the charging station where the air temperature in the charging station shall be higher than the ambient temperature.*

7. Requirements relating to the foundations

#	Description	Inspection assessment
13	If applicable or necessary, the charging station is mounted on the foundation. This mount can	Visual inspection.

	only be made and removed from inside the charging station.	
14	A round impact-resistant cable pipe with a thickness of 3 mm and diameter of 50 mm is supplied with the charging station. This is only designated for the grid operator's connection cable to pass through. The earthing cable of the earthing rod must be laid in a separate cable pipe. The cable pipe(s) has/have a minimum bending radius of 500 mm for the grid operator's connection cable. If the cable pipes are cast in the foundations, they are to be arranged so that the connection cable is 20mm above the edge of the foundation so the connection cable cannot scrape against any sharp edges in the foundations. For clarification see the example in appendix 3.	Visual inspection (supplier must make this demonstrable; cable pipe(s) must also be supplied).
15	The connection cable may be fed in on a minimum of two sides of the foundations. The infeed height of the connection cable is 60 cm below ground level.	Visual inspection.

8. Requirements in respect of cable inlet, connection and protection

N#	Description	Inspection assessment
16	An installation manual in accordance with the agreed format is provided with the charging station (see the ElaadNL website for the format).	Check to make sure that the manual is in accordance with the format.
17	It must not be possible for damage to be caused to the connection cable and any earthing cable when they are fed into the charging station. Additionally, the connection cable should be guided through the foundation from inside to outside to prevent any form of damage.	Visual inspection.
18	The connection cable must be able to be relieved in tension in a straight line from the foundation and be connected via the Tension relief is integrated in the compact connection module. For this to work properly, it is of high importance that the connection cable is fixated onto the compact connection module in a straight line.	Visual inspection.
19	For the fixation of the compact connection module, two prefab mounting plates (article number Connectens: CT100 403) must be built into the charging station, one above the other. Additionally, a resting point must be added for the spacer of the compact connection module.	Trial installation.

	This resting point is fixated directly beneath the compact connection module mounting plates, 50 mm in height, 30 mm wide and equally deep as the mounting plates (see Appendix 3 for illustration). The resting point for the spacer must be made of waterproof material and should offer mechanical strength to prevent the plug from bending. The compact connection module will be fixated onto the prefab mounting plates without any tools (by clicking the components onto each other).	
20	The space required for the grid operator's section at the bottom of the charging station measures 755 (h) x 180 (w) x 150 mm (d), where the height is measured from ground level. Additionally, the access hatch should have a width of minimally 190 mm and should be positioned in front of the grid operator's section. The grid operator's section consists of a smart meter, a connection module and sufficient free space so that technicians can work safely and to avoid rising damp. Appendix 3 gives an overview of the grid operator's section, including dimensions.	Trial installation, measurement and visual inspection based on dimensional drawing.
21	A main earthing rail is mounted at the bottom of the charging station. It must be possible to connect the following to this: - the (customer's) earth electrode; - the connection to all third-party conductive parts of the charging station; - if the housing of the charging station is made of metal it should always be earth neutral (if applicable). - an extra connection point for the grid operator. - if earthing is offered by the grid operator, earthing will be connected to the plug of the compact connection module. Important: this requirement is aimed at earthed distribution systems (class 1). In case the distribution system is installed in a completely isolated manner (class 2), NEN1010 is to be consulted and your contact at ElaadNL should be informed.	Visual inspection.

22	During maintenance, it should be possible to connect a safety earthing without having to disconnect existing wiring. This safety earthing must be installed ahead of the protection device when viewed from the grid.	Visual inspection using an earthing case.
23	There is selectivity between the protection device in the charging station (and any slaves connected) and the protection device in the grid connection[1]. The protection device used in the grid connection is in accordance with the overview of protection devices used by each grid operator (see Appendix 1).	Provision of proof by the supplier in the form of a selectivity calculation/graphs.
24	The manufacturer of the charging station is responsible for ensuring a sufficient length of wiring for connecting the grid operator's smart meter. If the distance between the topside of the compact connection module and the master switch is larger than 150 mm, the manufacturer of the charging station is responsible for ensuring a sufficient length of wiring for connecting the grid operator's smart meter. If said distance is smaller than 150 mm, the grid operator will provide sufficient wiring to connect the smart meter to the main switch of the charging station. This flexible wiring, fitted with 18 mm conductor end sleeves, is connected to the customer's installation. Besides, the wiring is heat resistant up to 90 Celsius (pD90). The outgoing wiring is 16 mm^2 for connections up to 3x80 A and 25 mm^2 for a 3x80 A connection. The diameter of the neutral conductor should be at least equal to the diameter of the phase conductors. Important: Connectens offers these flexible wires with a pluggable solution. If the manufacturer wishes to make use of this solution, please contact Connectens.	Visual inspection.

[1] Software based selectivity is not allowed in RENDO area as a method to guarantee selectivity between the protection devices in the grid operator's part and the protection devices of the charging station itself.

9. Requirements relating to the use of a smart meter

The grid operator uses a meter which can be read out remotely. The 450, 800, 900, 1800 and 2100 MHz mobile datacom solutions available in the Netherlands will be used for this purpose. Housings of charging stations form a relatively strong barrier to the wireless signal for smart meters. The (radio) damping of this signal at the location where the meter will be installed is often between 15 and 30 dB and will depend on the type of station and the frequency.

Requirements must be set for a charging station in order to guarantee the reception of the smart meter signals. The radio damping of the charging station must be sufficiently low: The manufacturer has to take measures so that the radio damping of the charging station is reduced. Possible suitable measures have been investigated by the grid operators and may be requested.

#	Description	Inspection assessment
25	The kWh meter supplied by the grid operator should be installed and replaced in accordance with the applicable assembly instructions.	Visual inspection + trial installation.
26	There is 20 mm of free space on the top of the kWh meter. There is 50 mm of free space on the bottom from the terminal strip (under the terminal cover). It must be possible for the calibration of the kWh meter to be carried out safely. The connection wires must not obstruct the measuring terminals and wires in order to ensure that the risk of shorting between the housing and test pin is ruled out.	Physical measurement or visual inspection based on dimensional drawing.
27	The damping of the station is lower than 8 dB for all current frequencies, namely the current 450, 800, 900, 1800 and 2100 MHz frequencies.	Research report (carried out according to the applicable test protocol) which shows that the radio damping at the mounting position of the smart meter is lower than 8 dB for all current frequencies. ElaadNL has the right to verify the report on behalf of the grid operators.

10. Requirements relating to access

#	Description	Inspection assessment
28	The access hatch/door of the charging station is fitted with a lever for the installation of two cylinders. 1. The cylinder of the CPO/maintenance party for the charging station is to be fitted by the manufacturer before the charging station is connected to the grid. 2. The grid operator's cylinder, installed by the grid operator when the charging station is connected. The manufacturer is to provide an opening in which the grid operator can install the grid operator's cylinder (S2 half euro profile cylinder). It should be possible for the grid operator to open the door for the purpose of realising the connection of the charging station and installing the grid operator's cylinder, initially using an installation key/pass key, without the intervention of third parties. For safety concerns, it must not be possible to put an object inside the charging station directly via the opening for the cylinder. Therefore a barrier is to be provided in front of (on the outside of)/behind (on the inside of) the cylinder opening. The installation manual should clearly describe how the grid operator can open the charging station, initially using an installation key/pass key, and how the cylinder can be fitted, without the intervention of third parties.	Visual inspection.
29	The telephone number for failure reporting of the CPO/customer/owner of the connection is clearly and durably displayed on the charging station so that unsafe situations can be reported and it is possible to communicate with the grid operator via the CPO.	Markings which are applied by means of moulding, pressing, engraving or a comparable method, including plastic laminated labels: visual inspection. In all other cases: visual inspection and check on the durability of printing by rubbing a rag soaked in water over the marking for 15 s followed by a rag soaked in petroleum ether for another 15 s. After the test, the marking must be easily legible to the naked eye.

11. Optional requirements for the primary - secondary construction

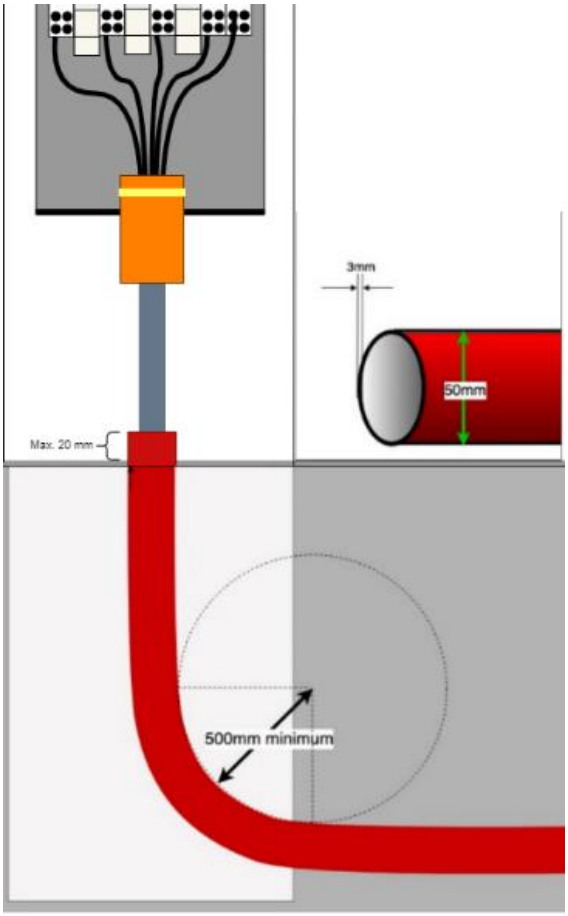
#	Description	Inspection assessment
30	There is sufficient space available in the charging stations to install outgoing cable(s) safely. The outgoing cable(s) must not affect the safety, operation or accessibility of the grid operator's components.	Visual inspection.
31	The outgoing cable(s) must not be routed via the cable glands and cable pipes of the grid operator's connection cable and earthing cable.	Visual inspection.
32	The outgoing cable(s) to the slaves must be connected to a separate circuit in the customer's section; looping through directly from the grid connection is not permitted. For selectivity, see requirement 23.	Visual inspection.
33	Just like the feeder cable for the charging station, the outgoing cable(s) should be provided with its own strain reliefs of at least 400 N.	This is an advise and will not be inspected.
34	It must be possible to visually distinguish the outgoing cable(s) and cable pipe of the master charging station from the grid operator's cable based on pipe colour, printing or labels on the cable pipe.	Visual inspection.
35	If a different object is used as a distributor such as a distribution box. In that case, you should consult the relevant grid operator to find out the grid operator's requirements which have been set for that object. The layout of this charging station is to be submitted to the relevant grid operator for approval.	N/a.

Appendix 1. Overview of protection devices used by each grid operator

Protection devices charging stations			Grid Operator					
Capacity	Protection device grid operator	Characteristic	Coteq	Enexis*	Liander	Rendo	Stedin	Westland Infra**
3 x 25A	Miniature circuit breaker	C	x		x	x		x
	Cartridge fuse 10,3 x 38 mm	gG		x	x		x	
	Centered tag fuse NH000	gG		x	x		x	
3 x 35A	Centered tag fuse NH000	gG	x	x	x	x	x	x
3 x 50A	Centered tag fuse NH000	gG	x	x	x	x	x	x
3 x 63A	Centered tag fuse NH000	gG	x	x	x	x	x	x
3 x 80A	Centered tag fuse NH000	gG	x	x	x	x	x	x

*Enexis also offers the option of implementing gFF characteristic protection devices.
** Westland Infra might change the applied protection devices on the short term, if so, this table will be updated accordingly.

Appendix 2. Requirement 14: application round (red) impact resistant cable pipe diameter



Appendix 3. Requirement 18, 19 & 20: inlet of the connection cable in a straight line and layout and dimensions of the grid operator's section