CHARGING STATIONS
Requirements for bidirectional systems

This document contains requirements for V2X systems. It is a draft from ElaadNL and contains general requirements as well as requirements derived from the Dutch Grid Code.
Note: the grid code does not officially has V2X in scope. The requirements below form a proposal on current available requirements for production units on the grid, combined with general requirements for charging stations.
Implementation and use of these requirements is to be done with notice to ElaadNL.
ElaadNL also provides the possibility to test in conformance of the requirements below in the ElaadNL Test Lab.
No rights can be derived from the V2X requirements.

V1.2: added data sharing Requirements (chapter 8)

1. General Requirements

1	The responsible CPO reports the location of the V2X charger at the local DSO via the available platform www.energieleveren.nl (Note: a new registration system called CEREX is being prepared by the DSO's. When CEREX is available, registration of bidirectional systems should be done there. For more information https://www.netbeheernederland.nl/nieuws/nieuwe-zonnepanelen-na-27-april-voorlopig-verandert-er-niets--1285

2. Legislation and Standards

2a	NEN-EN 50549-1:2019 Requirements for generating plants to be connected in parallel with distribution networks Part 1: Connection to a LV distribution network Generating plants up to and including Type B

2b	VDE-AR-N 4105 Power Generating Plants in the Low Voltage Grid

3. Physical Requirements

3	The EVSE shows a clear sign or mark that it is capable of bidirectional charging

4. Functional Requirements

4	The system is capable of bidirectional charging. This should be controllable via a central system. Note. The current available (de-facto) standardized communication protocol is OCPP v2.0. The current version does not officially support bidirectional charging. The supplier of the system should develop the required means in order to control bidirectional charging via the central system, using OCPP v2.0 as starting point.
5	It should be possible to charge and discharge within the same transaction.
6	Unbalanced phase supply should be avoided, for example by means of phase-shifting.
7	The supplied energy from and charged energy to the vehicle should be measured on different registers of MID-certified energy meters. Both registers should be readable via a central system/back-end.
8	The V2X system is equipped with means to automatically disconnect from the grid during a power outage (anti-islanding). In order to do so, at least voltage and frequency should be monitored. It is allowed to use the relais in the charging station for the disconnection.

5. DSO Requirements

9	If the connection to the LV grid is made inside a charging station, the Grid Connection Requirements are applicable. When the connection is located in a separate (connection) object/casing, the general requirements of the DSO for connection cabinets apply.
10	The system meets the requirements for a Type A installation as mentioned in the Gird Code Electricity (July 10, 2019) and the Requirements for Generators[1]; especially chapter 3 of the Grid Code Electricity is relevant for the subject of production units. The relevant requirements of Chapter 3 (paragraph 3.3 and 3.4) are copied below. Not all articles of Chapter 3 of the Grid Code are reviewed as relevant for EV and V2X; those articles are not part of the current requirements for V2X. **Note. The Grid Code is only available in Dutch. The translation below is not an official translation and may not be up to date with revisions of the Grid Code. The used version is the version of October 22, 2019.**

GRID CODE § 3.3 CONNECTION REQUIREMENTS FOR ELECTRICITY PRODUCTION UNITS BELOW 800 W

Note. As mentioned in article 3.12, the requirements below are also applicable for higher powers. This is also mentioned in the right column.

Article 3.5	Not applicable for Type A; see article 3.12 section 2 and 3	
Article 3.6	By way of derogation from article 2.27 (Grid Code), the Power Factor in the transfer point of a connection which supplies a production unit may be between 0,9 capacitive and 0,9 inductive.	Also applicable for higher power
Article 3.7	not applicable	
Article 3.8	1. The safety devices of the production unit are selective with the used devices in the grid connection. The DSO may desire a calculation which proves the selectivity. 2. The safety means in the production unit ensures at least: a. A protection for undervoltage that responds within 2 seconds at 80% of nominal Voltage b. A protection for overvoltage that responds within 2 seconds of 110% of nominal Voltage c. A protection for frequency variation that responds within 2 seconds at 48 and 51 Hz. 3. An installation with a synchronous production unit is equipped with a device that ensures a disconnection of the grid when the voltage in one or more phases drops to 70% of its nominal value, unless calculations prove that a faster disconnection is necessary.	Also applicable for higher powers
Article 3.9	1. The neutral point of a production unit that operates in island mode as well as in parallel mode, is properly grounded In any case, measures at a production unit are taken when harmonics in the installation cause the neutral current to reach values in the order of magnitude of the phase current.	Also applicable for higher power
Article 3.10	Not applicable	
Article 3.11	Not applicable	

NETCODE § 3.4 CONNECTION REQUIREMENTS FOR TYPE A ELECTRICITY PRODUCTION UNITS AS MEANT IN ARTICLE 5 OF THE VERORDENING (EU) 2016/631 (NC REQUIREMENTS FOR GENERATORS)

Article 3.12

1. Type A Electricity production units meet the requirements as mentioned in this paragraph.
2. Type A Electricity production units, smaller than 11kW, connected to the Low Voltage grid, also meet the requirements in paragraph 3.3, with exception of article 3.5.
3. Type A electricity production units larger or equal to 11kW, connected to the Low Voltage grid, also meet the requirements in paragraph 3.3, with exception of articles 3.5, 3.7 and 3.11 section 2.

Article 3.13

1. The electricity production unit is able of staying connected to the grid and in operation within the following frequency bandwidths and time periods, as meant in article 13, part 1, section a, sub i of the Verordening (EU) 2016/631 (NC Requirements for Generators):
    a. in the frequency band of 47,5 Hz to 48,5 Hz during 30 minutes;
    b. in the frequency band of 48,5 Hz to 49,0 Hz during 30 minutes;
    c. in the frequency band of 49,0 Hz to 51,0 Hz during unlimited time;
    d. in the frequency band of 51,0 Hz to 51,5 Hz during 30 minutes.
2. [reserved]
3. Not applicable
4. The electricity production-unit for the limited frequency sensitive mode – over frequency (LFSM-O) able to activate frequency response, as meant in article 13, part 2 of the Verordening (EU) 2016/631 (NC Requirements for Generators), in which:
    a. the frequency threshold value is adjustable between 50,2 Hz and 50,5 Hz (including);
    b. the setting of the frequency threshold value is 50,2 Hz;
    c. the droop is adjustable between 4% and 12%;
    d. the default-setting of droop is 5%;
    e. the electricity production-unit remains in operation when reaching the minimum adjustment level;
    f. In case of a power park module (PPM), Pref is, as meant in Figure 1 of the Verordening (EU) 2016/631 (NC Requirements for Generators), equal to the generated active power at the moment the threshold value of the LFSM-O is reached.
5. The electricity production-unit may reduce its active power at a frequency of 49,5 Hz, with a gradient of 10% of the maximum capacity at 50 Hz, per frequency drop with 1 Hz, as meant in article 13, section 4 of the Verordening (EU) 2016/631 (NC Requirements for Generators).
6. When the DSO sets requirements for the equipment with which the active power output of an electricity-production unit can be reduced to zero within 5 seconds as referred to in Article 13, section 6 of the Verordening (EU) 2016/631 (NC Requirements for Generators), those requirements will be published on the website of the DSO.
7. The electricity production-unit is able to automatically re-couple to the grid, as meant in Article 13, section 7 of the Verordening (EU) 2016/631 (NC Requirements for Generators), if:
    a. The voltage is higher or equal to 0,90 pu and lower or equal to 1,10 pu;

	b. The frequency is higher or equal to 49,9 Hz and lower or equal to 50,1 Hz; c. The minimum time the voltage and frequency are in between the values mentioned in sub-parts a and b is 60 seconds; d. The maximum gradient of the active power is 20% of the maximum capacity per minute.
Article 3.14	1. An electricity production-unit with a maximum capacity higher than 11 kW, connected to the LV-grid, is at least equipped with: a. A measuring device for the supplied current; b. A signalling function whether the electricity production-unit is connected in parallel to the grid. 2. The safety means in the production unit are equipped on three phases with at least: a. A protection for undervoltage that responds within 2 seconds at 80% of nominal Voltage and within 0,2 seconds at 70% of nominal voltage; b. A protection for overvoltage that responds within 2 seconds at 110% of nominal voltage; c. A maximum current/time protection; in a Power Electronic convertor a protection for overload; d. A protection for frequency variations that responds within 2 seconds at 47,5 and 51,5 Hz; this protection may be single phase. 3. With an electricity production-unit that is coupled by means of power electronics and a maximum capacity higher than 11 kW, connected to the LV-grid, parallel (re) coupling is allowed several minutes after the grid voltage is restored.

6. Status indicators

11	The EVSE should be equipped with an indicator which shows the current state of the system. There should be a separate indication between charging and discharging. If the indicator is a coloured LED, the shown colour for discharging is different than the already used standard colours for charging infrastructure (for example: charging = blue, discharging is flashing blue or white)

7. Interfaces and Protocols for Communication

12	The communication between EVSE and EV for bidirectional charging is in conformity of a prevailing standard or de-facto standard: - Chademo - ISO/IEC 15118-20 (draft)

13	The communication between EVSE and central system (back end) is in conformity of the OCPP 2.0 specification. Note: The required messages for bidirectional charging are not part of the spec yet. A draft is available via the Open Charge Alliance.
14	When ISO/IEC 15118 and/or OCPP officially support bidirectional charging, implementation of these and future versions of the protocols should be done free of charge.

8. Monitoring & data analysis

For data-analysis, client and contractor should make agreements on the kind and way of data-sharing. Requirements are as follows:

15	Client and Contractor sign an agreement on data-sharing. ElaadNL can provide in an agreement, however it is common for the sharing partner to provide an agreement. Both options are allowed.
16	The data to be provided consists of at least: - Real time CDR's - Meter-readings (every quarter of an hour), including current and voltage per phase - Location data of the charging points
17	The data is to be provided via the following means: - API - OCPI