

**HEDNO S.A.
SPECIFICATION**

**MODE-3 ELECTRIC VEHICLE
CHARGING STATIONS**

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TECHNICAL SPECIFICATION
MODE-3 CHARGING STATIONS FOR ELECTRIC VEHICLES

SCOPE

This specification determines the manufacturing, the operational, the physical and the electrical specifications, the tests, the acceptance testing and packaging for transportation and delivery to HEDNO warehouses of the following products:

- a. Mode 3 Charging Stations for Electric Vehicles.
- b. Device for Testing the Operation of Mode 3 Charging Stations for Electric Vehicles.

OPERATING CONDITIONS

1. The charging station should be able to operate and be stored in the following operating conditions:

Maximum altitude	2.000 m
Minimum ambient temperature	-20°C
Average ambient temperature	20°C
Maximum ambient temperature	55°C
Minimum Storage Temperature	-20°C
Maximum Storage Temperature	70°C
Maximum temperature at external surfaces due to solar radiation	70°C
Minimum relative humidity	5%
Maximum relative humidity	95%
Atmospheric conditions	salty, foggy and dusty atmosphere

STANDARDS

STANDARD/ REGULATION	TITLE
IEC 61851-1:2017	Electric vehicle conductive charging system – Part 1: General requirements
IEC 62196-1	Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 1: General requirements
IEC 62196-2	Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories

IEC 61439-7	Low-voltage switchgear and controlgear assemblies - Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations
Ocpp 1.6	Open Charge Point Protocol 1.6
IEC 14443	"Identification cards - Contactless integrated circuit cards - Proximity cards
ISO/IEC 18092	Information technology -- Telecommunications and information exchange between systems -- Near Field Communication -- Interface and Protocol (NFCIP-1)
ISO/IEC 15693	Identification cards -- Contactless integrated circuit cards -- Vicinity cards
IEC 61439	"Low-voltage switchgear and controlgear assemblies"
2014/32/EC	Measuring Instruments Directive (MID)
2014/30/EU	Electromagnetic Compatibility Directive
2002/95/EC	Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
93/465/EEC	"CE" conformity marking

2. The charging stations shall be industrial products manufactured according to International-European EN/IEC regulations / standards and to HEDNO Technical Specifications as mentioned above, which are valid on the day of the bids submission as well as on the day of installation and delivery.
3. Whenever the requirements of this Specification contradict with the above editions of International Regulations / Standards or any other relevant Standards, the corresponding HEDNO specification shall prevail.
4. The meters shall have markings according to the European Standards and they are particularly required to have the "CE" conformity mark.

CHARGING STATION

5. The charging station shall be ground mounted and be accompanied by the appropriate embedded anchorings for the concrete foundation, the upper side of which will be at a height of 10cm from the final surface.
6. The charging station shall be supplied by AC three-phase power supply, at a rated grid voltage of 230/400V.
7. The Charging Mode of electric vehicles shall be Mode 3 AC charging according to the standard IEC 61851-1, and according to the Ministerial Decision 71287/6443, Government Gazette B' 50/2015.
8. The charging station shall be OCPP 1.6 ready.

9. Communication between the charging station and the Electric Vehicle shall be performed according to the IEC 61851 standard.
10. The charging station shall be equipped with tampering alarm for its exterior cover which should be triggered in case of tampering, while at the same time sending the relevant information message to the Central Charging Station Management System (via OCPP 1.6).
11. The charging station shall be equipped with water detection mechanism and the relevant protection for all the active equipment compartments.
12. The charging station shall be equipped with tilt detection mechanism which shall interrupt the power supply to the outlets in case of tilt detection.
13. The charging station shall be designed and manufactured according to the protection class IP54 for outdoor installation according to EN/IEC 60529.
14. The charging station shall be designed and manufactured for a pollution degree 3 according to IEC 61439-1, §7.1.3 and IEC 60947, in an environment with salty, foggy and dusty atmosphere.
15. The degree of protection of the charging station against external mechanical impact shall be at least IK 10.
16. The charging station shall have antivandalism protection.
17. Access to each compartment of the charging station shall be restricted by using a lock with a common key for all the stations.

POWER SUPPLY AND PROTECTION

18. The charging station will be supplied by a HEDNO No 4 (55 kVA) Low Voltage Power Supply, and thus:
 - 18.1. A concentric supply cable at least $4 \times 25 \text{mm}^2$ Cu or Al of equivalent cross section will be used. The supply cable will be supplied and installed by HEDNO.
 - 18.2. The supply cable will be routed underground to the interior of the charging station. The charging station shall be equipped with the appropriate glands for water sealing of all the active equipment compartments
19. The charging station shall be able to be installed in a grid with TT earthing and TN-C-S earthing with local direct connection to earth on the side of the consumer.
20. The charging station shall be able to be installed in EN/IEC 50160 grids (Interconnected system and Non-Interconnected Island (NII) system).
21. The charging station will be delivered with all protection devices fully installed and wired.

22. The charging station shall be equipped with a DIN-rail micro circuit breaker (MCB), 3-pole, 100A, 10kA, IEC 60898-1 curve C, IEC 60947 pollution degree 3, to which the supply cable will be connected.
23. The charging station shall have a micro circuit breaker, 4-pole, 80A, 10kA, IEC 60898-1 curve C, IEC 60947 pollution degree 3, to which the output of the HEDNO meter will be connected.
24. The protection devices of the charging station shall perform the following functionalities:
 - 24.1. Over-current protection shall be provided for the controller and the electronic equipment of the charging station according to IEC 60898-1 Curve C, IEC 60947 pollution degree 3.
 - 24.2. Residual current protection shall be provided for the controller and the electronic equipment of the charging station of the appropriate rated current and of type Asi.
 - 24.3. Over-current protection shall be provided for each socket-outlet according to IEC 60898-1 curve C, IEC 60947 pollution degree 3, 40A, 10kA.
 - 24.4. Variable over-current trip set at level dynamically determined by the charging station according to the rated current of the charging cable.
 - 24.5. Residual current protection shall be provided for each socket-outlet (RCD) and type-A or type-B protection, 4-pole, 40A, 10kA, having a rated residual operating current not exceeding 30mA.

In case the station is equipped with a type-A RCD, protection against DC fault current shall also be provided with the appropriate equipment that ensures the disconnection of the supply in case of DC fault current above 6mA, as specified in clause 8.5 of IEC 61851-1:2017.
 - 24.6. Each socket-outlet shall be switched on with the appropriate 4-pole, normally-open relay, according to the specifications determined in 61851-1:2017, §12.2.5. The relays shall comply with IEC 61810-1, being able to withstand at least 100,000 operational cycles and be of a contact category of at least CC2.
 - 24.7. Automatically restore the power supply to the socket outlets after tripping of the over-current or the residual current protection devices for the socket-outlets. For protection reasons, automatic restore shall only be performed when the charging cable is not connected to the charging station and the cover of the outlet is shut.

NAMEPLATES-INDICATIONS

25. The charging station shall have visual indications (e.g. LED, display etc.) to indicate its operational status.
26. Minimum indications of operational status are:

- 26.1. Charging station available for the connection of electric vehicle.
 - 26.2. Successful user authorization, no-active charging.
 - 26.3. Charging cable connected, no-active charging.
 - 26.4. Active Charging operation.
 - 26.5. Charging Station out of service.
 - 26.6. Incorrect Operation.
27. The indications of the operational status concerning the socket-outlets shall be visible and indicate the operational status of each relevant socket-outlet.
 28. There shall be a label with the charging station's user instructions in a visible place, which shall be approved by HEDNO during the final sample approval procedure and with, at least, the following information:
 - 28.1. Charging Procedure.
 - 28.2. Early Charging Interruption Procedure.
 - 28.3. Explanation of the Operational Status Indications.
 29. A nameplate shall be placed in the station in such a way that it remains visible after the station is installed, providing at least the following information:
 - 29.1. The PPC logo,
 - 29.2. The PPC Material Code and the Contract Number,
 - 29.3. IEC/EN standards being applied, CE conformity mark,
 - 29.4. Manufacturer name, Year of Manufacture, Serial Number,
 - 29.5. Nominal Voltage in V, Nominal Frequency in Hz, Nominal Current in A, Number of phases, Nominal Current of each socket-outlet,
 - 29.6. IP protection degree.

SOCKET-OUTLETS

30. The charging station shall be equipped with two (2) 3-phase, Type-2 socket-outlets, according to IEC 62196-2 (VDE-AR-E-2623-2-2), in accordance with the Ministerial Decision No. 71287/6443, ΦEK B' 50/2015 and Article 8, §3, N. 4439 (2014/94/EU Directive).
31. The socket-outlets dimensions shall be in accordance with the dimensions specified in IEC 62196-2.
32. In case the station is equipped with socket-outlets other than Type-2, the station shall be delivered with those outlets disabled.
33. The nominal power of each socket-outlet shall be 22kVA/7kVA for 3-phase/1-phase power supply and the maximum current per phase for each socket-outlet shall be 32A. The station shall be able to charge two vehicles simultaneously at either 22kW or 7kW, according to the vehicle's power requirements.

34. In case two vehicles are simultaneously connected to the same charging station, the station shall be capable of supplying both vehicles according to all the relevant standards for safety and metrological accuracy.
35. When electric vehicles are charging at single phase, the charging station shall have the ability to select the phase to supply power to the socket outlets.
36. When two electric vehicles are charging simultaneously from the same charging station at single phase 7KW, then the station shall be able to supply the two outlets from a different phase.
37. The charging station shall be equipped with a locking mechanism in order to prohibit the disconnection of the charging cable from the outlet, while charging operation is in progress. The charging cable shall be released when the user has indicated that they want to finish charging or in the event of a power failure.
38. The socket-outlet shall be behind a lockable shutter in order to prevent acts of vandalism without any tools.
39. The shutter shall only unlock after the identification of a valid user.
40. The contacts of the socket-outlets shall be silver coated.

HEDNO METER COMPARTMENT

41. The charging station shall have a properly configured compartment for the installation of the HEDNO meter. This compartment will be sealed by HEDNO and will provide the following:
 - 41.1. Space for the HEDNO meter with minimum dimensions: 180mm width, 300mm height, 120mm depth.
 - 41.2. Mount for the HEDNO meter with distances according to DIN 43857.
 - 41.3. The micro circuit breaker of point 22.
 - 41.4. Fully pre-wired, with wires ready for the installation of the meter.

METERS

42. Each socket-outlet shall have a separate energy meter.
43. The meters of the socket outlet shall be certified according to the Measuring Instrument Directive (MID) 2014/32/EU and in accordance with the Ministerial Decision DPP 1418/2016 – Government Gazette 1231 / issue B' / 27.04.2016, for class-B from ISO 17025 certified laboratories.
44. The meters of the socket-outlets shall have metrological LEDs and indicate the meter's constant (pulses / kWh).
45. The meter of each outlet shall have a non-resettable register for recording the cumulative energy in kWh.
46. The reading of the aforementioned register for the cumulative energy shall be visible from outside the charging station or the potential display of the charging station.

47. The meter of each outlet shall only register the energy and the charging power of the relevant outlet without including the charging station self-consumption.
48. The values of the meters registers shall be capable of being read if and when it is required from the station's controller, with a maximum read cycle delay of 2 seconds, at a frequency of up to 0.5 Hz.

COMMUNICATION UNIT (MODEM)

49. The communication unit (MODEM) that will be used for the communication link with the Central Management System shall:
 - 49.1. Be of GSM/GPRS/3G type.
 - 49.2. Be GPRS multislots Class 8 or higher.
 - 49.3. Support communication based on the TCP/IP protocol.
 - 49.4. Support dynamic and static IP address for GPRS/3G communication.
 - 49.5. Operate with all mobile communication networks of the country.
 - 49.6. Perform automatic switching to GSM communication with capability for automatic restoration to GPRS/3G communication, when the signal is lost in case of GPRS/3G communication.
 - 49.7. Auto restart in order to find GSM or GPRS/3G communication signal in case of voltage loss and subsequent voltage restoration.
 - 49.8. Be capable to automatically reboot at regular intervals, configurable from 1 to 24 hours.
 - 49.9. Communicate at speed from 9600 to at least 19.200 bps, with the capability of remote and local selection of the desired speed.
 - 49.10. Be able to remotely change the communication mode from GSM to GPRS/3G and vice versa.
 - 49.11. Provide capability for reading and parameterization (speed, codes, communication status, signal strength, etc.) via remote commands.
 - 49.12. Be accompanied by an appropriate antenna of suitable gain and dimensions, so that it can be placed in the station.
 - 49.13. Provide operating indications (i.e. using LED) that include signal strength and are visible in the interior of the charging station when the modem is fully installed.
 - 49.14. Provide device for placement of the SIM card.
 - 49.15. Have the CE mark and conform with the R&TTE Directive
 - 49.16. Provide protection (in conjunction with its power supply from the charging station) against overvoltage.
 - 49.17. Have a protection system against destruction of the SIM card when the card is removed from the modem without prior disconnection of the modem power supply.

CHARGING STATION CONTROLLER

50. The hardware and software of the controller embedded in the charging station shall:
 - 50.1. Handle connections to multiple peripherals and data streams in near real time.
 - 50.2. Be capable of operating autonomously when connectivity to the Central Management System is unavailable, and be able to switch seamlessly between "online" and "offline" mode.
 - 50.3. Be capable of performing firmware updates. The firmware updates shall be provided to HEDNO free of charge for a 5 year period after the last delivery. Installation of the updates shall be performed after HEDNO approval.
 - 50.4. Be remotely managed.
 - 50.5. Allow remote problem diagnosis.
 - 50.6. Be capable of detecting that a charging process has been completed.
 - 50.7. Be capable of recording the time interval during which the vehicle remains connected to the station.
 - 50.8. Provide remote control and monitoring of the overcurrent protection and the RCDs of the socket-outlets. Activation of the protective devices, the control actions as well as their success/failure, shall be recorded in the log file, while notifying the central management system at the same time.
 - 50.9. Provide remote software initiated residual current test capability (e.g. >30 mA leakage to earth circuit).
 - 50.10. Detect if a contact has stuck closed on any phase. In case of a fault the supply to the relevant outlet shall be cut. The fault shall be recorded in the log file, while notifying the central management system at the same time.
 - 50.11. Provide the ability to remotely set the maximum charging current, including the value "0 A".

END-USER IDENTIFICATION SYSTEM

51. The station shall be equipped with a system with RFID/NFC reading capability that will allow the connection/disconnection of the electric vehicle.
52. In offline mode, the charging station shall be capable of identifying a number of cards that will be defined by a corresponding list. This list may change dynamically and remotely from the central charging station management system.
53. The following RFID/NFC related standard protocols shall at least be supported (while also supporting ad-hoc billing):

- 53.1. ISO/IEC 14443-A (RFID)
- 53.2. ISO/IEC 14443-B (RFID)
- 53.3. ISO/IEC 18092 (NFC)
- 53.4. IEC 15693

COMMUNICATION WITH THE CENTRAL MANAGEMENT SYSTEM

- 54. The charging station shall provide full remote access to the log file.
- 55. Documentation shall be submitted that fully include the description of the structure of the messages that are being exchanged, the available user authentication mechanisms and any other necessary information to create software for the remote:
 - 55.1. access to the log file,
 - 55.2. control and monitoring of the protection devices,
 - 55.3. and the station sensors (tilt, humidity etc.)
- 56. The charging station shall implement all the communication messages from and to the central management system, as described in clauses 4 and 5 of the OCPP 1.6 standard.
- 57. Parameterization for the communication of the charging station with HEDNO Central Management System will be performed upon agreement with HEDNO.

SPARE PARTS

- 58. The suppliers shall guarantee the availability of spare parts for a period of 10 years after delivery of the final batch.
- 59. The suppliers shall submit with their bid, a price list for the necessary spare parts.

CHARGING STATION PARAMETERISATION

- 60. The charging stations shall be delivered configured, with the parameterization and the passwords that will be proposed and agreed by HEDNO, during the sample approval procedure, before the series production of the charging stations.
- 61. The charging stations shall be delivered with the real-time clock (RTC) programmed at the local time in Greece.

GUARANTEE

- 62. The charging stations shall be accompanied by five (5) years warranty from their delivery date.

PACKAGING

- 63. The charging stations shall be placed, carefully packed, inside protective boxes.
- 64. The boxes shall be placed on EU palettes to facilitate transport.
- 65. These boxes shall be externally and indelibly marked with the Contract number, the material Code and the Manufacturer's Data.

66. With the aforementioned packaging the stations shall be able to be stored outside without any additional protection against weather conditions (rain or humidity).

SAMPLE

67. It is required to submit a sample of the charging station as well as the device for testing the operation of the station, identical to the ones offered, accompanied with their parameterization software, the necessary software licenses, as well as instructions for installation, configuration and usage.

DEVICE FOR TESTING THE OPERATION OF THE STATION

68. The devices for testing the operation of the station shall indicate the correct operation of a 3-phase, Mode 3 charging station, and be accompanied with the corresponding Type-2 charging cable.
69. The device for testing the operation of the station shall perform the following tests:
- 69.1. Check voltage presence and connections (phase-neutral inversion).
 - 69.2. RCD trip test.
70. The device for testing the operation of the station shall also perform the following tests:
- 70.1. Check the control pilot circuit (Measure PWM signal via coaxial plug).
 - 70.2. Simulate all electric vehicle states, according to IEC 61851-1.
71. The devices for testing the operation of the station shall have markings according to the European Standards and they are particularly required to have the "CE" conformity mark.

TESTS

DEFINITION OF TESTS

- **Type Tests**

All tests intended to identify the type characteristics of the material in order to prove the compliance with the requirements of the relevant standards/regulations that these characteristics are required to comply with.

- **Series tests**

Tests performed on new materials to ensure that they comply with the results of the above tests or to prove that the batch meets the specialized general and specific requirements of the relevant specification.

- **Acceptance tests**

Sampling tests performed on a batch of materials prior to delivery for the purpose of making a decision regarding the acceptance or rejection of the batch.

72. All tests shall be performed as described in each relevant and most recent issue of the IEC standards.

Type Tests

73. The charging stations shall comply with the type tests described in IEC 61851-1:2017.

Series Tests

74. The charging stations shall comply with the series tests described in IEC 61439-1 and IEC 61439-7.

Sample tests (acceptance tests)

75. The sampling procedure for the tests shall be according to IEC 60410 using the following criteria:

- Test level II table I, IEC 60410.
- Simple or double sampling (tables II and III, IEC 60410).
- Acceptable quality level A.Q.L. = 1 for each separate test.

DOCUMENTS TO BE SUBMITTED

76. Each charging station tender shall include the following documents:

- 76.1. Technical description of the charging station, including the description for all the individual protection equipment (micro circuit breakers, residual current devices etc.).
- 76.2. Construction drawings in which the dimensions of the stations shall be presented.
- 76.3. Electrical drawings in which the basic wiring is presented and the energy is shown to be measured at the appropriate points.
- 76.4. Full type test certificates for the charging stations, according to IEC 61439-7.
- 76.5. Table AA.1 of Annex AA in IEC 61439-7, completed according to the features of the offered charging station.
- 76.6. Full type test certificates for the charging stations, according to IEC 61851-1:2017.
- 76.7. Full type test certificates for the RCDs, according to one of the following standards: IEC 61008-1, 61009-1, IEC 60947-2, IEC 62423.
- 76.8. Full type test certificates for protection against DC residual current, if it is used (paragraph 24.5) according to the relevant IEC standards that are applied.
- 76.9. Full type test certificates for the over-current protection devices and micro circuit breakers, according to IEC 60898-1, IEC 60947-2.
- 76.10. OCPP 1.6 compatibility certificate.
- 76.11. IEC 61851-1:2017 compatibility certificate.
- 76.12. ISO 14443 compatibility certificate.
- 76.13. Certificates of compliance, for the production factory of the meters used in the charging stations, with the EU Directive 2014/32/EC (Measuring

Instruments - MID) and according to the Ministerial Decision ref. DPP 1418/2016 - Government Gazette 1231 / issue B' / 27-04-2016 (Measuring Instruments) / MID, for the manufacture of electric energy meters.

- 76.14. Certificates of compliance for the stations' meters, according to the EU Directive 2014/32/EC (Measuring Instruments - MID), for class B, issued by a competent Notified Body.
 - 76.15. Test Certificate or Test Protocol issued by an accredited and certified by EN ISO / IEC 17025: 2005 test laboratory, proving that the station's meters have been already successfully tested regarding their tolerance to the influence of symmetric high frequency currents (range 2kHz - 150kHz), such as those produced by photovoltaic inverters.
 - 76.16. Full Quality Management System Certificate according to EN/ISO 9001:2008 covering the design, development and production for the factory producing the offered charging stations, the energy meters, the communication unit, the charging station socket-outlets, and the protective devices (§21, §22, §23).
 - 76.17. Environmental Management Certificate according to EN/ISO 14001:2004 for the factory producing the offered charging stations, the energy meters, communication unit, charging station socket-outlets, and the protective devices (§21, §22, §23).
 - 76.18. Certificate of Compliance according to EN ISO/IEC 17025:2005 for the test laboratories, the production factory, and the inspection place, if it is different than the production factory, for the meters of the charging station.
 - 76.19. Instructions for usage, installation and configuration of the stations shall be provided in Greek or English.
 - 76.20. Full versions of the necessary software (including the MODEM software), as well as the corresponding user licenses.
 - 76.21. User Instructions for the necessary software.
 - 76.22. Documentation according to §55.
77. The type test certificates for all the offered materials shall be issued by an internationally accredited test laboratory certified according to EN ISO/IEC 17025:2005.