**Eaton Guide Specification**

**Notes and instructions to specwriter**

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ELECTRIC VEHICLE DC FAST CHARGERS

PART 1 GENERAL

1.1 SUMMARY

A. This specification describes the Eaton Green Motion DC EV Charger, which is a Level 3 DC electric vehicle supply equipment (EVSE) device. The charging station will be integrated within a circuit breaker and shall operate as a smart charger to provide recharge current to battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV) that accept a J1772 plug.

1.2 SYSTEM DESCRIPTION

A. EV DC Fast Charger System Components

1. EV DC Fast charger power assembly containing a quantity of 25kW power modules

2. DC Power cables

3. Nozzles: CCS1, NACS

1.3 REFERENCES

THE DC FAST CHARGER SHALL BE DESIGNED, MANUFACTURED, AND TESTED IN ACCORDANCE WITH THE LATEST APPLICABLE STANDARDS OF UL AND SAE:

1. UL 1998 – Standard for Software in Programmable Components

2. UL 2202

3. UL 2231-1 – Standard for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits; Part 1: General Requirements

4. UL 2231-2 – Standard for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems

5. UL 2251 – Standard for Plugs, Receptacles, and Couplers for Electric Vehicles

6. UL 2594 – Standard for Electric Vehicle Supply Equipment (EVSE)

7. CSA C22.2 No. 107.1, No 281.1-12, No 281.2-12

8. SAE J1772 – Society of Automobile Engineers Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler, 2017 ed.

9. FCC Part 15 – Radio Frequency Devices

10. OCPP 1.6J – Open Charge Point Protocol, ver. 1.6J

11. NFPA 70 (NEC) Article 625 – Electric Vehicle Power Transfer System

12. ISO 15228

13. Energy Star Certified

14 ISO 15118

1.4 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:

1. DC Fast Charger description

2. Final as-built drawings

2. DC Fast Charger site plan drawing and unpackaging

3. DC Fast Charger Installation, Operations and Maintenance Manual

4. Optional accessory installation

5. DC Fast Charger theory of operation

6. System events

7. Performance and technical specifications

8. Wiring requirements and recommendations

9. Physical features and requirements

10. Dimensional Outline Drawing

11. Product data sheets

1.5 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Paragraph 1.4, and shall incorporate all changes made during the manufacturing process

2. Wiring diagrams

3. Installation information

1.6 QUALIFICATIONS

A. The supplier shall have a minimum of twenty years’ experience in the design, manufacture and testing of power electronics.

B. The supplier shall have ISO 9001 certification for engineering/R&D, manufacturing facilities and service organization.

C. The supplier shall maintain a staffed 7x24x365 call center for technical and emergency support.

D. Field Engineering Support: The DC Fast Charger supplier shall directly employ a nationwide field service department staffed by factory-trained field service engineers dedicated to startup, maintenance, and repair of DC Fast Charger equipment. The organization shall consist of local offices managed from a central location. Field engineers shall be deployed in key population areas to provide on-site emergency response within 24 hours. A map of the United States showing the location of all field service offices shall be submitted with the proposal. Third-party service or maintenance will not be accepted.

E. Spare Parts Support: Parts supplies shall be located in the field to provide 80% of all emergency needs. Parts are stocked in regional logistics centers, ensuring a 95% First Time Fix rate and maximizing system availability.

F. Product Enhancement Program: The supplier shall make available feature upgrade service offerings to all users as they are developed. These upgrades shall be available as optional field-installable kits.

G. Maintenance Contracts: A complete range of preventative and corrective maintenance contracts shall be provided and offered with the proposal. Under these contracts, the supplier shall maintain the user’s equipment to the latest factory revisions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. The DC Fast Charger shall withstand any combination of the following external environmental conditions without operational degradation.

1. Ambient Operating Temperature: -35 degrees C to +55 degrees C (-31 degrees F to 131 degrees F). 150kW product has de-rated output above 50 degrees C.

2. Storage Temperature: -40 degrees C to +60 degrees C (-40 degrees F to 140
degrees F).

3. Relative Humidity (operating and storage): 0-95% non-condensing.

4. Elevation:

a) Operational: 6500 ft. (2000 m) maximum without de-rating. Above this rating, altitude de-rating as per IEC 62040-3

b) Transportation: Capable of air transport, up to 49,000 feet (15,000m)

1.8 WARRANTY

A. Seller warrants that the Products supplied will conform to Seller’s applicable specifications and be free from failure due to defects in workmanship and material for two (2) years from the date of original purchase.

1.9 REGULATORY REQUIREMENTS

A. The DC Fast Charger shall be UL labeled.

B. The DC Fast Charger shall be certified by A Nationally Recognized Testing Laboratory (NRTL) in accordance with UL 2202, Standard for Safety for Electric Vehicle (EV) Charging System Equipment

C. The DC Fast Charger shall be certified by the Canadian Standards Association in accordance with CSA C22.2 No. 107.1, No 281.1-12, No 281.2-12

D. Cabinet shall be IP54 for outdoor environment, enclosure designed to IK10 for impact

1.10 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with the manufacturer’s instructions.

1.11 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each kit shipped and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 PRODUCTS

2.1 SUPPLIERS

A. Eaton (basis of design)

B. \_\_\_\_\_\_\_\_\_\_

C. \_\_\_\_\_\_\_\_\_\_

The listing of specific suppliers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Suppliers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2 Modes of Operation

1. Single EV recharge operation: DC Fast Charger will charge up to the max power rating of the charger while not exceeding the EV’s max rate of charge.

2. Two vehicle simultaneous operation: Half of the DC Fast Charger’s max power rating will be allocated to each vehicle. In instances that the DC Fast charger has an odd number of power modules, the extra power module is allocated to the vehicle which initiated charge later.

2.3 RATINGS

A. The DC Fast charger shall be available in the following power ratings: 50, 75, 100, 125, 150kW

B. The DC Fast Charger shall be fed from a 3 pole 480V rated breaker or fuse.

C. The DC Fast Charger shall be rated for 3 phase and shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 65kAIC rms symmetrical.

D. Maximum charger current: 350A (max current limited by DC cable ratings)

E. FCC RATING: CFR 47 Part 15 Subpart B, Class A

F. Surge Protection: ANSI C62.41 Cat B3/C1

G. IP54 for environment, enclosure designed to IK10 for impact

2.4 ACCEPTABLE INPUT SOURCES:

A. Input Voltage: Single 480 Vac 3-Phase Wye source. 3-Wire + Ground

B. Operating input frequency range shall be 59 to 61 Hz.

C. Input current total harmonic distortion (THD) shall be less than 5% at nominal line voltage.

D. Input surge withstand capability: The DC Fast Charger shall withstand 6kV @ 3000V, and complies with IEEE 587 (ANSI C62.41), Category B3/C1.

E. Input Power Factor: >0.99 at full load

F. Connectivity:

2. 4G/5G cellular connection

3. 1GB wired Ethernet

G. DC Fast Charger Continuous Input Ratings. The charger shall be rated:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rating (max)** | **Input Voltage** | **Max Input Amps** **(at 480V)** | **Feeder Breaker 80% rated** | **Feeder Breaker 100% rated** | **Output Voltage (DC)** |
| **50 kW** | 480V | 64A | 80A | 70A | 200V to 1000V |
| **75kW** | 96A | 125A | 100A |
| **100 kW** | 128A | 175A | 150A |
| **125 kW** | 160A | 200A | 175A |
| **150 kW** | 192A | 250A | 200A |

2.4 OUTPUT CHARACTERISTICS

A. Output voltage: Ranges from 200 – 1000 VDC

B. Metering: Voltage, current, frequency, and energy (kWh)

C. Accuracy: +/- 0.2% (revenue grade tested to ANSI C12.20)

D. Cooling: Cable shall be passively cooled via natural convection.

E. Charger efficiency shall be 94% or greater at full load.

2.5 CONSTRUCTION

1. DC Fast Chargers shall have the following Nozzle standards available: CCS1 (125 A, 200 A or
300 A), CHAdeMO (125 A), NACS
2. Cable Lengths: Private fleet Chargers shall have 24.5” cable lengths.
3. DC Fast Charger will have remote control capability via an internal relay.
4. DC Fast Charger shall be equipped with a nozzle holsters for tidy storage of cables when not in use.
5. Control power for the DC Fast Charger shall be derived internally from the main input power connections. DC Fast Chargers that require a separate input feed dedicated to control power are not acceptable.

2.6 MECHANICAL DESIGN

1. Enclosures: The DC Fast Charger shall be housed in free-standing enclosure (safety shields behind doors). The enclosure shall be designed for outdoor installation. Access doors shall have locks to prevent unauthorized entry.
2. Modular construction: The DC Fast charger shall be comprised of Power Modules, each hardware-rated for 25kW, and each including the rectifier, battery converter, power and control circuitry. These power modules shall be draw-out assemblies that can be quickly exchanged or replaced as necessary.

C. Ventilation: The DC Fast Charger shall be designed for forced-air convection via cooling fans. Air inlets shall be on the front of the unit. Air outlet to exhaust warm air at the top of the cabinet. Eighteen inches of clearance over the DC Fast Charger outlets shall be required for proper air circulation (top exhaust) or working space (rear exhaust). An air filter shall be mounted in the front door of the DC Fast Charger.

1. Cable entry: Standard cable entry for the DC Fast Charger cabinet shall be through the enclosure bottom.
2. Service area requirements: The system shall require no more than thirty two (32) inches of front service access room and no more than thirty two (20) inches of side service access room

2.7 SOFTWARE / COMMUNICATIONS

1. The chassis shall have a touch screen display as the human machine interface. Fleet chargers shall not require tap to pay.
2. DC Fast Charger shall be a Wi-fi connected device. It shall connect to the 2.4GHz (IEEE 802.11 b/g/n) channel of a router. Additionally, the Fast Charger shall have the ability to connect to 3G/4G Ethernet from an internal modem with mobile carrier plan.
3. With a loss of Wi-fi or internet connectivity, the EV charger shall be able to charge an electric vehicle at a predetermined set rate, or at full rated current, depending on user definition.
4. The EV charger hardware shall support firmware updates and the supplier shall install firmware upgrades as necessary.
5. For commercial applications, the DC Fast Charger shall support either API integration or OCPP 1.6J (Open Charge Point Protocol version 1.6J) for monitoring and control into Eaton Charge Network Manager (CNM) software or 3rd party Charge Point Operator (CPO) software.
6. The DC Fast Charger shall support smart charging capabilities such as:

1. Charge session scheduling

2. Adjustable charging rate

3. Remote start/stop of charging session

4. Access control

5. Load management

6. User state of charge

1. The DC Fast Charger will operate in “free mode” if not connected to a network.

J. The DC Fast Charger can be connected to the Eaton Charger Network Manager (CNM) or to a 3rd party network that supports OCPP 1.6J.

K. The site host provided 2.4GHz router will be used for connecting the DC Fast Charger over Wi-Fi if Wi-Fi is used.

PART 3 EXECUTION

3.1 INSTALLATION

1. The equipment shall be installed in accordance with manufacturer’s recommendations. Refer to manufacturer’s installation instructions for additional details.
2. The equipment shall conform to all NEC and local codes.
3. Refer to the manufacture’s installation manual for specific site requirements.

3.2 COMMISSIONING

A. Factory start-up shall be provided on a 5x8 basis (7 x 24 optional). Start-up service shall be provided at no extra charge and shall include one visit to perform all procedures and tests specified within EV Charger Installation and Operation manual. DC Fast Charger supplier shall also offer the following optional services:

1. Pre-energize visit to inspect installation and provide guidance to installers as required.

2. Post-start-up visit for alarm notification configuration, operator training, etc.

B. The following procedures and tests shall be performed by Field Service personnel during the DC Fast Charger startup:

1. Visual Inspection:

a) Visually inspect all equipment for signs of damage or foreign materials.
b) Visually inspect all equipment for signs of shipping damage and/or foreign materials.

c)Observe type of site installation, use of proper signs and any safety related items that may be noteworthy

2. Mechanical Inspection:

a) Check internal power connections in Charger module for tightness while observing proper safety precautions.

b) Check all control wiring terminations and plugs in Charger module for tightness and/or proper setting.

c) Check to see that all factory connections, power modules, subassembly pans and legs are secure.

3. Electrical Pre-check:

a) Check system for ground faults at all power inputs and outputs

b) Check DC bus for short circuits and proper polarity.

c) Checks input and bypass power terminations for proper voltages and phase rotation inside all modules.

d) Check and adjust, if necessary, all power supply voltages.

e) Verify CTO and Serial numbers programmed into system match the equipment labels

4. Initial Startup:

a) Verify all system annunciations are in "go" condition.

b) Energize unit(s) and verify proper DC walkup and AC voltages.

5. Operational Training: Before leaving the site, the field service engineer shall familiarize responsible personnel with the operation of the DC Fast Charger. The DC Fast Charger equipment shall be available for demonstration of the modes of operation.

1. **OPERATIONAL INSPECTION**
	1. Check proper system operation
	2. Check multi-module if applicable
	3. Verify system calibrations and adjust as necessary
2. **FUNCTIONAL TEST**
	1. Test charge mode
	2. Local and Remote Emergency Power Off testing
3. **INSTALL EATON CHARGE NETWORK MONITORING SERVICE**
	1. CNM Service Description and Customer Requirements
		1. Contractor will provide the Eaton Charge Network Monitoring Service on subscribed Covered Equipment. The CNM Service shall include alarm notifications via a dashboard, mobile application, and monthly report summarizing alarms and Equipment Data.
			1. Access to the CNM Service shall be from Contractor’s web portal and include Covered Equipment status, alarms, reports and service history.
			2. Contractor’s obligation shall be to enable enrollment in the CNM Service by Customer, validation of the CNM Service, and to notify Customer contact when a critical alarm occurs.
			3. Contractor will remotely diagnose critical alarms and if appropriate, resolve emergency events as if Customer has requested Covered Equipment Service, enabling Contractor to arrive at the location of the Covered Equipment per the contracted CPM hours. If subscribed Covered Equipment has no contracted Covered Equipment Service coverage other than the CNM Service, Contractor’s obligation will solely be to notify Customer contact when a critical alarm occurs.
			4. Display and availability Equipment Data will vary and depend on the Covered Equipment, connectivity equipment and access to Customer provided network.
		2. The CNM Service will only be available if a Contractor supplied wireless modem equivalent network is installed or (along with necessary network configuration information (including IP addresses) to facilitate connectivity).
		3. Covered Equipment will continue to transmit Customer Equipment Data to Contractor until Customer disconnects or disables the network connection. Upon termination of the CNM Service, Customer is responsible for disconnecting or disabling any Covered Equipment from Customer’s network connection. Contractor will not be responsible for notifying or reminding Customer that it must disconnect or disable any Covered Equipment from Customer’s network connection after termination of the CNM Service. Contractor will continue to own the Equipment Data and not incur any liability as a result of Customer’s failure to disconnect or disable any Covered Equipment from the network connection.
		4. Customer shall register at [www.predictpulseapp.eaton.com](http://www.predictpulseapp.eaton.com) with a valid email address, self-maintain a complex password, and contact information in order to access the CNM Service.
		5. Parts and labor coverage for all Covered Equipment is separate from the CNM Service.
		6. The customer shall maintain the Connectivity Equipment (Charger network communication) per contractor recommendations (refer to the individual Charger information). This maintenance shall include restricting access to unauthorized personnel, regularly (at least monthly) patch and apply updates/firmware updates to address vulnerabilities and verify device configurations. The customer should register for cybersecurity notifications and updates at [www.eaton.com/cybersecurity](http://www.eaton.com/cybersecurity).
	2. Data
		1. Unless it receives Customer’s prior written consent, Contractor: (a) shall not disclose to third parties or publish Customer Equipment Data and (b) shall not intentionally grant any third-party access to Customer Equipment Data. Notwithstanding the foregoing, Contractor may disclose Customer Equipment Data as required by applicable law or by proper legal or governmental authority. Contractor shall give Customer prompt notice of any such legal or governmental demand and reasonably cooperate with Customer in any effort to seek a protective order or otherwise to contest such required disclosure, at Customer’s expense.
		2. Contractor shall own all Equipment Data and all results from processing such data, including without limitation, compilations and derivative works of such data. Contractor may use such Equipment Data for any purpose, including without limitation, for data mining, analysis and trending purposes, and may disclose Equipment Data to third parties without Customer’s consent for any purpose, including without limitation, for comparison and reliability reporting.
		3. Contractor collects Personal Data from Users of the CNM Service for the purpose of allowing Eaton to provide the CNM Service to Customer. Contractor does not sell Personal Data disclosed to it through the CNM Service, but it may transfer such Personal Data outside of the United States and share the information with third parties that Contractor retains to provide services on its behalf and to Contractor’s sales representatives, which include third parties. In addition, Contractor may disclose Personal Data it collects as required by law, an arbitral body, a court of competent jurisdiction, a law enforcement agency, or any other government agency, and may disclose personal information it collects when it believes it is appropriate to prevent physical or financial loss or in connection with an investigation of suspected or actual illegal activity. If a User desires to withdraw its consent to Contractor’s use of his/her Personal Data in connection with the CNM Service, such User can submit a request to Contractor to remove his/her Personal Data from the CNM Service at the following email address: iam@eaton.com or auto link mailto:iam@eaton.com, specifying removal of your Personal Data from the CNM Service. Following receipt of such request, Contractor will remove all of such User’s Personal Data from the CNM Service. If a User withdraws his/her consent to Contractor’s use of Customer’s Personal Data as described in this Agreement, Contractor may terminate such User’s Customer’s access to the CNM Service. To the extent that a User inputs or otherwise provides in the CNM Service the Personal Data of another individual, whether or not an employee of Customer or whether or not such individual is another User of the System (“Other Individual”), Customer represents that it has obtained such Other Individual’s prior written consent to: 1) allow such User to input such Other Individual’s Personal Information into the CNM Service and 2) the foregoing Personal Data privacy terms. Customer shall have sole responsibility for any violation of privacy laws as a result of its failure to obtain the Other Individual’s prior written consent as described in the preceding sentence.
		4. Contractor makes no warranty regarding, and has no obligation with respect to, the accuracy, completeness, or omissions of any Customer Equipment Data or any report, alarm, notification, or recommendation generated or not generated by the CNM Service based on the Customer Equipment Data. Customer must use reasonable judgment in interpreting this data and information and contact his or her local Eaton sales representative or Contractor Technical Support with any questions.
		5. Customer recognizes and agrees that hosting data online involves risks of unauthorized disclosure or exposure and that, in accessing and using the CNM Service, Customer assumes such risks. To the extent permitted by law, Contractor offers no representation, warranty, or guarantee that Customer Equipment Data and/or Personal Data will not be exposed or disclosed through errors or the actions of third parties.
		6. Customer recognizes and agrees that the Customer Equipment Data collected from the Customer Equipment sent to CNM is unencrypted and contains potentially (non-personal) critical data (e.g. model number, serial number, mac address, and event information). Contractor assumes the customer will restrict unauthorized physical and logical access to the field equipment, network equipment, email servers, and other access to the data.
	3. Customer Restrictions
		1. Customer shall not: (a) use the CNM Service for any purpose other than for its intended purpose or otherwise misuse the CNM Service; (b) provide CNM Service passwords or other log-in information to any third party; (c) share non-public CNM Service features or content with any third party; (d) access the CNM Service in order to build a competitive product or service, to build a product using similar ideas, features, functions or graphics of the CNM Service, or to copy any ideas, features, functions or graphics of the CNM Service; (e) attempt to penetrate or disable any security system, or intentionally distribute a computer virus, launch a denial of service attack, or in any other way attempt to interfere with the functioning of the CNM Service, including without limitation any computer, communications system, or website associated therewith; or (f) attempt to access or otherwise interfere with the accounts of other users of the CNM Service. In the event that it suspects any breach of the requirements of this Section 10.3.1, including without limitation by Users, Contractor may suspend Customer’s use of the CNM Service without advanced notice, in addition to such other remedies as Contractor may have. This Agreement does not require Contractor to take any action against Customer or any User or other third party for violating this Section 10.3.1 or this Agreement, but Contractor is free to take any such action it sees fit.
4. **INSPECTION COMPLETION**
	1. Ensure dead fronts and door panels are reinstalled
	2. System will be left in normal mode when environmental controls are operational
	3. Conduct on-site customer system operation training
	4. Final EEPs, calibration EEPs, meters report, service log, and configuration reports will be downloaded and stored
	5. Startup data forms and reports are available as required.
	6. Clean up tools and debris around the system.
	7. WARRANTY
5. All components of the DC Fast Charger system shall be covered by a standard two-year limited factory warranty.
6. Two-year limited factory warranty shall include replacement coverage for parts for a period of 30 months from shipment or 24 months from start-up, whichever occurs sooner. Labor coverage is for 90 days after product startup.
7. Optional one-year service protection package shall include 5x8 on-site repair/replacement labor for DC Fast Charger parts; 5x8 technical support coverage; and 5x8 remote monitoring service (with monthly reports for DC Fast Charger performance). Standard response time shall be 8 hours from receipt of call.