No. 7(8)/2015-AEI (Pt.)(11976)
Government of India
Ministry of Heavy Industries & Public Enterprises
Department of Heavy Industry

Udyog Bhavan, New Delhi-110011
Dated the 21st November, 2017

ORDER

Subject: Standardization of Protocol for EV Charging Infrastructure - Bharat Public EV Charger Specifications - regarding.

Govt. of India, Ministry of Heavy Industries & Public Enterprises, Department of Heavy Industry, constituted a Committee under the Chairmanship of Prof. Ashok Jhunjhunwala to finalize the protocol for charging infrastructure for different combination of voltage and speed of charging.

2. The Committee has submitted its report to the Govt. Of India on 11th October, 2017. The Committee has come out with recommendations in the form of specifications for AC and DC chargers namely Bharat EV Charger AC-001 and Bharat EV Charger DC-001. These specifications are intended to cater to the immediate need of existing and announced electric 2 W, electric 3W and passenger cars/vehicles having battery voltage less than 100 V. The Committee has addressed all the comments received and made suitable changes in the recommendations, as deemed appropriate.

3. Department of Heavy Industry is the nodal Department for the FAME-India Scheme and is responsible for planning implementation and review of the scheme. Department of Heavy Industry is also nodal agency for addressing issues relating to the guidelines and for removal of difficulties in the implementation of the Scheme and for issue of guidelines as and when necessary in order to meet the objectives of the scheme.

4. FAME-India Scheme envisages setting-up of adequate public charging infrastructure to instill confidence among xEV users, through active participation and involvement of various stakeholders including Govt. & Non Govt. agencies.

5. Govt. of India has considered the recommendations made by the Committee and has Adopted the Report on Bharat Public EV Charger Specifications submitted by the Committee.

6. Accordingly, the Report on Bharat Public EV Charger Specifications is circulated to all stakeholders for information and implementation of the recommendations made by the Committee in its report.

This has been issued with the approval of competent authority.

(Sunil Kumar Singh)
Director (Auto)
Tel: 011-23061862

To,

All concerned Ministries/Departments, GOI
(MoRTH, M/o Power, MNRE, M/o UD, DIPP, DoC, DST);

Copy to:

1. Director, ARAI,
2. DG, SIAM;
3. DG, ACMA,
4. Director, SMEV
5. Director (Auto) –DHI
6. Deputy Secretary(Finance) – DHI
7. Technical Director & HOD(NIC)-DHI with a request to host the report on the website of DHI; and
8. NetCreativeMind Solutions Pvt. Ltd., New Delhi (Ms. Navinta Vasudeva) with a request to host the report on the website of FAME-India Scheme.

11th October 2017

Sub: Report of the Committee on Standardisation of Protocol for EV Charging Infrastructure

Dear Sh. Singh,

This is with reference to letter no. 7(8)/2015-AEI dated 15.2.2017 from Shri Pravin Agrawal, Director (Auto), Department of Heavy Industry, constituting Committee for standardization of protocol for EV charging infrastructure under the Chairmanship of Prof. Dr. Ashok Jhunjhunwala, Advisor – Ministry of New & Renewable Energy (MNRE).

The committee has carried out deliberations with wide stakeholder consultation and has come out with recommendations in the form of specifications for AC and DC chargers namely Bharat EV Charger AC-001 and Bharat EV Charger DC-001. These specifications are intended to cater to the immediate need of existing and announced electric 2 wheelers, electric 3 wheelers and passenger cars / vehicles having battery voltage less than 100 V. Draft committee report was hosted by DHI on Ministry website for stakeholder comments. The Committee has addressed all the comments received and made suitable changes in the recommendations, as deemed appropriate. These specifications have also been adopted by Technical Standing Committee of CMVR in its 49th meeting held on 2nd May 2017 under the Chairmanship of Joint Secretary (Road Transport), Ministry of Road Transport and Highways.

I am extremely happy to submit the copy of the Committee Report to DHI for formal adoption.

The Committee further intends to work on the formulation of specifications for high power EV charging systems required by the industry in future and requests advice from DHI for the same.

With best regards,

Anand Deshpande
Deputy Director - ARAI, Pune &
Member Secretary

Shri Sunil Kumar Singh
Director (Auto)
Ministry of Heavy Industries & Public Enterprises
Department of Heavy Industry
Udyog Bhawan
New Delhi 110 011

Recd.
12/10/17.

2017

Report of the Committee on Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

2017

Report of the Committee on Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

Index

2017

1. Constitution of Committee

Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

F.No. 7(8)/2015-AEI
Government of India
Ministry of Heavy Industries & Public Enterprises
Department of Heavy Industry
****

Dated the 15th February 2017

ORDER

Subject: Constitution of Committee for standardization for protocol of charging infrastructure

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To finalise the protocol for charging infrastructure for different combination of voltage and speed of charging within a time bound period, it has been decided to constitute a Committee of Experts under the chairmanship of Dr. Ashok Jhunjhunwala, Adviser to Ministry of New & Renewable Energy (MNRE) and comprising the following members :-

(i) Shri Akshay Kumar Panda, Economic Adviser, D/o Heavy Industry - *Permanent Invitee*

(ii) Representative of Ministry of Road Transport & Highways (MoRTH) - *Member*

(iii) Smt. Rashmi Urdhwareshe, Director, Automotive Research Association of India (ARAI) - *Member*

(iv) Dr. Sajid Mubashir, Scientist G, D/o Science & Technology - *Member*

(v) Dr. Saad Alam, Associate Professor, Aligarh Muslim University - *Member*

(vi) Shri Chetan Maini, Expert - *Member*

(vii) Shri Anand Deshpande, Deputy Director, Automotive Research Association of India (ARAI) - *Member Secretary*

Committee is free to co-opt any other expert in this field as member of this Committee.

2. The terms of reference for the committee would be

a) To suggest various types of standards that may be required to cater all types of vehicles like low voltage/high voltage, fast charging, slow charging etc.

contd. /-

b) To finalise the standards / protocol for charging equipment's / chargers / connectors etc that will be required for charging of Electric Vehicles.

c) To extend expert advice on the charging infrastructures and Battery swapping projects received under FAME India Scheme.

d) Economic models for charging infrastructures

e) Any other related issue.

3. The Committee is to submit their report on Standardization of protocol within 15 days.

4. This issues with approval of the Secretary (Heavy Industry).

15/02/17

(PRAVIN AGRAWAL)
Director (Auto)

To

All members of the Committee

Copy to:-

1. PrSO to Secretary (Heavy Industry).
2. PPS to Joint Secretary (Auto).
3. Guard File.

2017

2. Committee Approval

Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

Report of the Committee on Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

Prof. Ashok Jhunjhunwala
Principal Advisor, Minister of Power and New and Renewable
Chairman

SIGNED
Shri Akshay Kumar Panda
Economic Advisor, DHI
(Permanent Invitee)

Smt Rashmi Urdhwareshe,
Director, ARAI

Dr. Sajid Mubashir
Sc. G (DST)

Dr. Saad Alam
Assoc. Prof., Aligarh Muslim University

Shri Chetan Maini, Expert

Shri Anand Deshpande
Deputy Director, ARAI
(Member Secretary)

2017

3. Report

Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

2017

Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

Creation History

Date	Details of Amendments / Revisions	Version No
March, 2017	Initial draft	V 1.0
August, 2017	First draft	V1.1

Contents

Chapter1: Introduction

1.1 EV Charger

An EV charger, also called Electric Vehicle Supply Equipment (EVSE) is an element in EV infrastructure that supplies electric energy for recharging the electric vehicles. As proliferation of EVs depends on access to the charging infrastructure, the nation needs to follow common specifications and standards for the infrastructure be used for all categories of vehicles and help it scale seamlessly.

This document details on the classification of EVSE and provides the detailed specification for AC and DC public chargers.

1.2. Charger Type

1.2.1. Private charger

The home private chargers are generally used with 230V/15A single phase plug which can deliver a maximum of up to about 2.5KW of power. Thus, the vehicles can be charged only up to this rate. The billing for the power is part of home-metering. *This will be continued till a policy evolves to charge the home users differently for EV use, however, inclusion of RCD (Residual Current Devices) should be ensured.* IEC 60309 Industrial connector to be used and existing Indian safety guidelines should be followed.

1.2.2. Public charger

For charging outside the home premises: the electric power needs to be billed and payment needs to be collected. Further, the charges may depend on state of grid (whether it is power-surplus or is in power-deficit state). The power utilities may also want to manage power drawn by these chargers from time to time. *This document will here-on deal with only Public Chargers.*

1.3. Charger Classification

With reference to the charger types discussed above, it is more appropriate to **classify chargers based on power rating** instead of the rate of charging vis-à-vis "slow-chargers" or fast-chargers". The definition of "slow chargers" and "fast chargers" is not sufficient, as the same charger should be acting as a slow charger or a fast charger depending upon the vehicle to be charged. For example, a 2.5KW charger will be slow charger for a 4-wheeler but could be a fast charger for a 2-wheeler.

1.4. AC Chargers

Batteries are DC and needs DC power for charging it. If the public chargers (also known as **off-board chargers**) are DC chargers, the batteries / vehicles could be charged directly. For public outlets feeding AC supply to the EV, the chargers are on-board and these **on-board chargers** are supplied by vehicle manufacturer. The specifications here deals with only **Public off-board chargers**.

The electric 2-wheeler, 3-wheeler and 4-wheeler vehicles in India do not have an **on-board charger** beyond 2.5kW or 3kW. This is to save or minimize costs in vehicle. This is likely to continue. 4-wheeler manufacturer may not even have a *higher power* **on-board charger.** In Europe, Vehicles have on board chargers with higher power ratings (for example Tesla have a 16KW charger).However, as India is unlikely to have on board chargers with higher rating in near future, definition and building of AC fast charger beyond 2.5 / 3kW is not taken up in this document. As and when one sees vehicles in India which have higher-power on-board chargers, higher power AC chargers can be defined.

This document therefore defines specifications of **AC Public off-board Chargers** up to a maximum charging rate of 2.5 kW or 3 kW. For such chargers, the charging point needs to be only 230V single phase. The detailed specifications are given in Chapter 2

These AC 2.5KW or 3KW Chargers could fast charge a 2-wheeler (for a battery capacity of 2.5KW if they have appropriate on-board charger) in an hour's time; 4-wheeler or larger vehicles with batteries of 12 KWh or more will be charged in five to six hours.

1.5. DC Public off-board Chargers

Depending on the nature of battery and vehicles used, different sizes of higher capacity DC fast chargers are required. Some basic variations in charging rate and voltage rating may be

i. 10kKW/15kW/30kW/50kW or even higher capacity DC fast chargers
ii. Voltage Rating at which charging has to be carried out:
   a. 48V / 60V / 72V for 2W, 3W, small and medium 4W.
   b. Up to 750V or even higher for medium to high end 4W
iii. Costs associated with chargers of different voltages and powers are very different,
iv. Cost of DC Chargers below 100V and charge rate of 10 kW to 15kW may be USD2000 to USD2500 in volumes.
v. Above 100V and charge rate between 30kW to 50kW. The costs may be higher. They may be required in select places.

Therefore, DC Public off-board Chargers are classified as follows:

1.5.1. Level 1 DC Chargers

Public off-board DC Chargers at output voltage of 48V / 60V / 72V, with power outputs of 10 kW / 15 kW with maximum current of up to 200A. These will be called **Level 1 DC Chargers.** The specifications of Level I DC Chargers are defined in detail in Chapter 3

1.5.2. Level 2 DC Chargers

Public off-board DC Chargers at output voltage up to 1000V, with power outputs of 30 kW / 150 kW. These will be called **Level 2 DC Chargers.** The specifications for Level II DC chargers will be specified in due course.

1.6. Requirements for DC Public Chargers

The architecture for the whole EV infrastructure as shown in Fig. 1. All public chargers should be as follows:

1.6.1. Communication for Chargers, also called EV Supply Equipment (EVSE)

i. EVSE needs to communicate with BMS of battery pack in EV, to enable it to charge at right rate for maintaining SOH of batteries. **Physical layer for this communication will be CAN, as it is commonly used by vehicle manufacturers in India.**

ii. Communication between EVSE and Central management system (CMS) located at power utility company, so as to

a. Enable maximum charging rate to be controlled depending upon the rates of grid supply

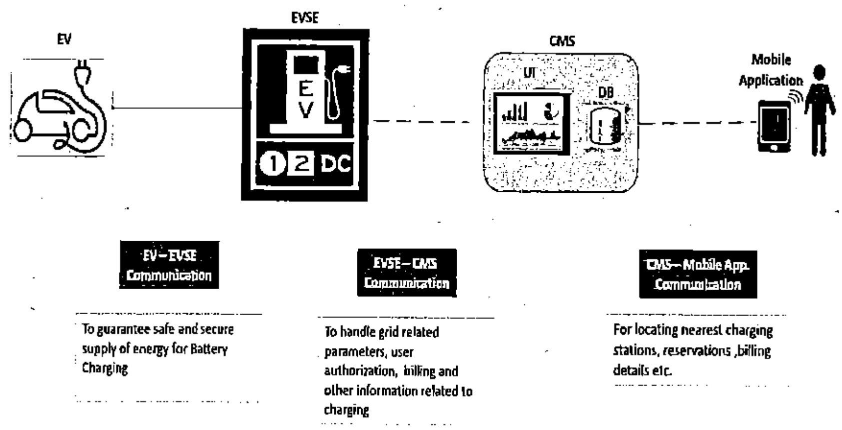


Figure 1: Architecture for EV and Charging Infrastructure

b. This will also enable metering at different rates. This is critical as whenever vehicles consume large currents and grid should be able to supply it
c. This will also enable reservation of chargers by users.

For all Public off-board chargers, the communication protocol used will be OCPP. This will be carried on Internet, using wired media or wireless (Wi Fi/Ethernet/2G/ 3G/4G).

iii. Communication between CMS and user / charging operator mobiles.

1.6.2. Billing and Payment

The customers need to be billed for the charging and payment needs to be made. There are multiple options, including debiting the user's account based on VIN (vehicle identification number). **Direct debiting the funds to user's equipment based on VIN will be adopted.** Alternately a mobile application to be defined, which allows a user to charge using BHIM or Bharat QR code or other digital payment schemes specified by Indian Government, to be used both for AC as well as DC chargers.

I. Displays and keypads should be kept to minimum to minimize costs. Communication with mobiles is encouraged.
II. EVSE should have right safety systems built-in and environmental protection.

1.7. Economic Models for Public Chargers (EVSE)

A preliminary economic model for AC Chargers and for DC L1-Chargers has been carried out. As volume prices fall, the chargers can be stand-alone business. Besides the capital costs of chargers and cost of provision of electrical line, space cost-sharing and manpower costs dominate. If the number of vehicles being charged per day falls, the business is dicey. The computation shows that it may be best to enter into revenue sharing arrangement with space providers and with those who supervise.

CHAPTER 2: Bharat EV AC Charger (BEVC-AC001)

This chapter presents the specifications of a Public metered AC outlet (PMAO) which is to provide AC input to the vehicle which has on-board chargers. This document applies to electric road vehicles for charging at 230V standard single phase AC supply with a maximum output of 15A and at a maximum output power of 3.3kW. PMAO is a slow charger for low-power vehicles.

2.1 General Requirements

The EV shall be connected to PMAO for conductive energy transfer function. The system will have following general specifications:

i. PMAO is supplied with three phase AC power and outputs single phase AC power.
ii. Energy Transfer Mode is Conductive.
iii. Each outlet will have up to three independent charging sockets.
iv. The PMAO has built-in metering, safety & monitoring.
v. PMAO and Central Management System communicate with each other to serve purposes of firmware, reservation, cancellation, addition and deletion of PMAOs etc.

2.2. Input Requirements

i. A.C. Supply System is 3 phase, 5 wire AC system (3 phases + N + PE)
ii. Nominal Input Voltage is 415V (+6% and -10%)as per IS 12360
iii. Input Frequency is 50Hz ± 1.5 Hz
iv. Input Supply Failure back-up: Battery backup for minimum 1 hour for the control system and billing unit. Data logs should be synchronized with CMS during back up time, in case battery drains out.

2.3. Output Requirements

i. Number of Outputs: 3
ii. Type of each output: A.C., 230V (+6% and -10%) single phase as per IS 12360
iii. Output Details: 3 Independent charging sockets as per IEC 60309, given in Annex A. Female connector to be used on the PMAO Side
iv. Output Current: Three vehicles charging simultaneously, each at 15A current
v. Output Connector Compatibility: IEC 60309 Industrial Blue connectors to be used.
vi. Connector Mounting: ensure IP 54. Angled connector mounted looking downwards for outdoor use is preferred.
vii. Double-pole breaking RCD (IEC 60309 Blue connector) of less than 30mA (As per section 7.4 of AIS 138 Part 1) is recommended.

viii. Limiting Output Current: Circuit breaker for each outlet limited to 16A current output. Breaker should be reset to resume operation.

ix. Output selection: the breaker inside to be energized in sequence - one round of all three phases before the second round.

x. Socket readiness: An LED to indicate that the socket is ready.
   a. Three LEDs, one for each Phase/socket shall indicate the readiness/in-use status
   b. LED failure/ LED not glowing shall mean that socket is not ready

xi. Isolation: Charger shall comply to class 1 or class 2 insulation class as defined in AIS 138 Part 1, clause 3.3.1 and 3.3.2.

2.4. User Interface and Display requirements

i. Visual Indicator: Error indication, Presence of input supply indication, Charge process indication and other relevant information.

ii. Display Messages: PMAO should display appropriate messages for user during the various charging stages like
   a. Suggestive sequence of charger operation
   b. Vehicle plugged in / Vehicle plugged out
   c. Duration since start of charge, kWh
   d. Authorization status
   e. Fault conditions

iii. ON- OFF (Start-Stop) switches

iv. Emergency Stop Switch is mushroom headed push button type (Red color), visible and easily accessible

v. Display Screen Size is minimum 3.5" inches with720x480 pixels, user interface can be touch screen or keypad.

vi. User Authentication is by using mobile application or user interface (OCPP gives only a field mandate, media to be used is open), following Annex B.

vii. Metering Information: Consumption Units

2.5. Billing and Payment Requirements

i. Metering - metering as per units consumed for charging the battery of each vehicle as per Indian standards.

ii. Billing – Grid Responsive Billing

Payment –BHIM / Bharat QR or UPI complaint mobile application payment

2.6 Protection and Safety Requirements

2.6.1. Safety Parameters

Safety and protection to be ensured for India specific environment (As per AIS 138 Part1).

2.6.2 EMI/EMC: as per AIS 138-1 (section 11.11.3.2)

2.6.3. Start of Charging

The outlet will be locked and covered, the connector will be exposed to charging only after user authentication using user interface or mobile application. Only when the lock opens and connector is properly connected, the switch/relay will turn ON to feed power to EV.

i. Lock will be opened only after full charging and authentication by user or the operator (the authentication procedure is detailed in Annexure B)
ii. Once disconnected, the charging session terminates.

2.6.4. Power failure

If there is a power failure, user is indicated

i. If the user wants to terminate the session, the user can shut-off the switch and remove the plug
ii. If user does not remove the plug, the charging resumes when power comes back.

2.6.5. Interruption of Charging

i. Temperature based safety mechanism to trigger switching off of the charging to ensure the temperature is not more than 80°C for a duration less than 10s. In such situation, an appropriate signal will be sent to turn the switch/relay OFF in order to stop the charging. Once disconnected, the charging session terminates.
ii. If plug is taken out (for more than 2 seconds) and then reinserted for charging, the charging-session will disconnect. A new session will be required to continue charging.
iii. These shall ensure that no one can remove a vehicle being charged and insert their own cable and use the infrastructure without paying or at someone else's account

2.7 Mechanical Requirements

2.7.1. Suggested Cable Security

PMAO should have locking mechanism for the connector while charging.

i. The vehicle may also have locking mechanism during charging to ensure the safety of the cable (Suggestion to OEM to have shutter lock for security purpose of the cable during charging session).

2.7.2. Mechanical Stability

i. Shall not be damaged by mechanical impact energy: 20 J (5 kg at 0.4 m) (Section 11.11.2.2. of AIS 138 Part 1).
ii. IP Ratings: IP 54 (Section 11.11.2.4. of AIS 138 Part 1).
iii. Cooling: Air cooled or forced air cooled to protect the equipment against temperature hazards.

2.8 Environment Requirements

i. Ambient Temperature Range: 0 to 55°C
ii. Ambient Humidity: 5 to 95% as per AIS 138 Part 1 section 11.2

iii. Ambient Pressure: 86 kpa to 106 kpa as per AIS 138 Part 1 section 11.11.2.4
iv. Storage temperature: 0 to 60°C

2.9 Communication Requirements

i. Communication between PMAO and Central Management System: Open Charge Point Protocol (OCPP) 1.5 protocol.
    a. The higher versions of OCCP if used should be compatible to OCCP1.5. .
    b. Should enable handshaking between PMAO and CMS for discovery.
    c. It should authorize the operation, before electric vehicle can start or stop charging
    d. PMAO should respond to CMS for various queries and commands like reservation, cancellation and other functions specified on OCPP.
ii. Metering: Grid responsive metering as per units consumption of each vehicle
iii. Interface between charger and central management system(CMS): Reliable Internet Connectivity

2.10. AC001 Specification Summary

The specifications discussed in Chapter 2 are summarized in Table 1.

TABLE 1: SUMMARY OF AC001 SPECIFICATIONS

#	Parameter	Requirement
	General Requirements	
1	EVSE Type	AC
2	Energy Transfer Mode	Conductive
	Input Requirements	
1	AC Supply System	Three-Phase, 5 Wire AC system (3Ph.+N+PE)
2	Nominal Input voltage	415V (+6% and -10%) as per IS 12360
3	Input Frequency	50Hz, ±1.5Hz
4	Input Supply Failure backup	Battery backup for minimum 1 hour for the control system and billing unit. Data logs should be synchronized with CMS during back up time, in case battery drains out.
	Environmental Requirements	
1	Ambient Temperature Range	0 to 55°C
2	Ambient Humidity	5 to 95%
3	Ambient Pressure	86 kpa to 106 kpa
4	Storage temperature	0 to 60°C
	Mechanical Requirements	
1	Suggested Cable Security	PMAO and the vehicle connector outlet to have provision for locking mechanism during charging to ensure the safety of the cable
2	Mechanical Stability	Shall not be damaged by mechanical impact impact energy : 20 J (5 kg at 0.4 m)

3	IP Ratings	IP 54
4	Cooling	Air cooled or forced air cooled to protect the equipment against temperature hazards
	Output Requirements	
1	Number of outputs	3
2	Type of each output	230V (+6% and -10%) single phase, 15A as per IS 12360A.C.
3	Output Details	3 Independent charging sockets, given in Annex-A
4	Output Current	Three Vehicles charging simultaneously, each at 15A current
5	Output Connector Compatibility	IEC 60309
6	Limiting output current	Circuit breaker for each outlet limited to 16A current output. Breaker should be reset to resume operation
7	Connector Mounting	Angled connector mounted looking downwards for outdoor use
8	Isolation	class 1 or class 2 insulation as per AIS138 (3.3.1 and 3.3.2)
	User Interface & Display Requirements	
1	ON- OFF (Start-Stop) switches	Mandatory
2	Emergency stop switch	Mushroom headed Push button type (Red color), visible and easily accessible
3	Visual Indicators	Error indication, Presence of input supply indication, Charge process indication and other relevant information
4	Display size	Minimum 3.5" inches with 720 x 480 pixels, user interface through touch screen / keypad
5	Display Messages	EVSE should display appropriate messages for user during the various charging states like • Vehicle plugged in / Vehicle plugged out • Fault conditions; metering: units consumption; Duration since start of charge, Time to charge, kWh
6	User Authentication	Using mobile application or User interface (OCPP gives only a field mandate, media to be used is open)
7	Metering Information	Consumption Units
	Billing & Payment Requirements	
1	Metering	Metering as per units' consumption for charging each vehicle
2	Billing	Grid responsive billing
3	Payment	BHIM / Bharat QR or UPI compliant mobile application payment
	Communication Requirements	

1	Communication between EVSE and Central Server	Open Charge Point Protocol (OCPP) 1.5 protocol or higher versions compatible to OCPP 1.5
2	Metering	Grid responsive metering as per units' consumption of each vehicle
3	Interface between charger and central management system(CMS)	Reliable Internet Connectivity
	Protection & Safety Requirements	
1	Safety Parameters	Safety and protection to be ensured for India specific environment (As per AIS 138 Part1)
2	Start of Charging	The outlet will be locked and covered, the connector will be exposed to charging only after user authentication using user interface or mobile application. Only when the lock opens and connector is properly connected, the switch/relay will turn ON to feed power to EV. Lock will be opened only after full charging and authentication by user or the operator. Once disconnected, the charging session terminates. The authentication procedure is detailed in Annex B.
3	Power failure	If there is a power failure, user is indicated about this. The charging resumes when power comes on. If the user wants to terminate the session during power failure, the user can shut-off the switch and remove the plug

4	Interruption of Charging	O Connector terminals to be mounted with temperature sensors to avoid burning of connectors. Safety mechanism to trigger switching off of the charging at temp.>80°C for a duration <10s.In such situation, an appropriate signal will be sent to turn the switch/relay OFF to stop the charging. Once disconnected, the charging session terminates. O If the above locking mechanism is mandated then the following point won't be required: If plug is taken out (for more than 2 seconds) and then reinserted for charging, the charging-session will disconnect. A new session will be required to continue charging to ensure that no one can remove a vehicle being charged and insert their own cable and use the infrastructure without paying or at someone else's account

2.11. Type testing

Sr. No	Criteria	Parameter	Clause No. of AIS 138 Part 1
1	Safety functions Verification	Earth Presence Detection (Socket - EVSE)	6.4.1.1
		Earth Continuity Check (EVSE-EV)	6.4.1.2
		Over Current and Short-Circuit Protection	6.4.1.5
		Leakage Current (RCD)	6.4.1.6
		Dielectric withstand voltage	11.6.1
2	Mechanical Stability	Mechanical impact	11.11.2.2
		IP TESTING	11.11.2.4
3	Climatic environmental tests	Ambient air temperature	11.11.1.2
		Ambient humidity	11.11.1.4
4	EMC Verification	Immunity to electrostatic discharges	11.11.3.2
		Supply voltage dips and interruptions.	11.11.3.2
		Fast transient bursts	11.11.3.2
		Voltage surges	11.11.3.2

CHAPTER 3: Bharat EV DC Charger (BEVC-DC001)

This chapter prescribes the definition, requirements and specifications for low voltage DC electric vehicle (EV) charging stations in India, herein also referred to as "DC charger", for conductive connection to the vehicle, with an AC input voltage of 3-phase, 415 V.

It also specifies the requirements for digital communication between DC EV charging station and electric vehicle for control of DC charging.

3.1. General Requirements

The method for charging an EV is to use an off-board charger for delivering direct current. The EV shall be connected to the EVSE so that in normal conditions of use, the conductive energy transfer function operates safely.

i. Energy transfer mode: Conductive
ii. EVSE type: Dual-connector DC EVSE
iii. No. of outputs: 2
iv. Charging mode: Mode 4 – DC Charging [DC charging is defined as Mode 4 as per IEC61851-1 section6.2]

3.2. System Structure

The System requirement parameters are derived from Table D1 of Annex DD of IEC 61851-23.

i. Regulation: Regulated DC EV Charging station with combination of the modes: controlled voltage charging (CVC) and controlled current charging (CCC)
ii. Isolation: Isolated DC EV charging station, according to the type of insulation between input and output: a) Basic insulation, b) Reinforced insulation, c) Double insulation
Each DC output should be isolated from each other [Section 7.5.101 of IEC 61851-23].
iii. Environmental conditions: Outdoor use. EVSEs classified for outdoor use can be used for indoor use, provided ventilation requirements are satisfied.
iv. Power supply: AC mains to DCEV charging station
v. DC output voltage rating: Up to and including 100 V
vi. Charge control communication: Communicate by digital and analog signals
vii. Output Current: 200A
viii. Interface Inter-operability: Interoperable with any EV (non-dedicated, can be used by any consumer).
ix. Operator: Operated by a trained operator or EV owner

3.3. Input Requirements

3.3.1. Rating of the AC supply voltage

I. The AC supply system would be 3-Phase, 5 Wire AC system (3Ph+N+E)
Nominal Input Voltage is 415V (+6% and -10%) as per IS 12360

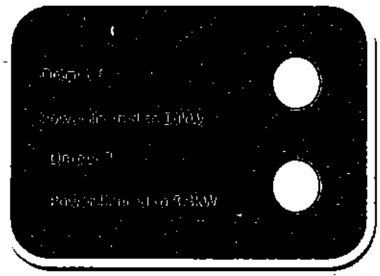
II. The Rated value of the frequency is 50 Hz ± 1.5Hz.

3.3.2. Battery back-up

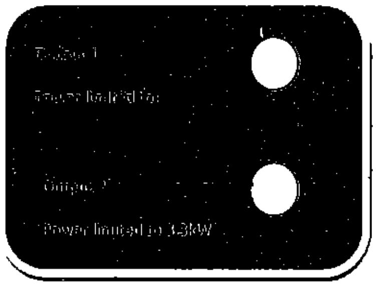
The Input supply system to have a battery backup for minimum 1 hour for control and billing unit. The data logs should be synched with CMS during back-up time, in case battery drains out.

3.4. Output Requirements

The Charger can provide two DC outputs suitable for 48V/60V/ 72V vehicle battery configurations. There can be two categories of chargers based on the limit on output power of the chargers as shown in Figure 2 below.



(a)



(b)

Figure 2: a) Charger with Power Limited to 10kW (Type 1)
b) Charger with Power limited to 15kW (Type 2)

The chargers should allow charging of one vehicle with maximum power (10 kW or 15 kW) or 2W vehicle with limited power (3.3 kW at 48V only) as per the output configurations types given in section 3.4.1

i. DC Output voltage: 48V /60V/ 72 V nominal battery voltages
ii. Output current: limited to 200A
iii. Converter Efficiency: > 92% at nominal output power
iv. Power factor: > 0.90 (Full Load)

The service life of coupler and breaking capacity of the coupler as defined in Section 9 of IEC 61851-23.

3.4.1. Charger Configuration Types

i. **Type 1**: Single vehicle charging at 48V/ 60V / 72V with a maximum of 10kW power, or a 2W vehicle charging at 48V with maximum power of 3.3 kW.
ii. **Type 2**: Single vehicle charging at 48V with a maximum of 10kW power or 60V / 72V with a maximum of 15 kW power or a 2W vehicle charging at 48V with maximum power of 3.3 kW.

3.4.2. Output Connector Requirements

i. Number of Outputs: 2 outputs
ii. Output 1: to be used for 10 kW or 15 kW charging, Connector is GB/T20234.3. The Connector details are provided in Annex C1
iii. Output 2: connector to be used for 3.3 kW charging will be defined in due course of time.

3.5. Cable Requirements

i. Charging Cable Assembly: As per Section 10 of AIS 138 Part 2, with the functional characteristics defined as below
    a. Functional characteristics: The maximum cord length will be 5 meter, straight cable
ii. Cable Connection Type: supply cable will be with EVSE as per Case C defined in section 6.3.1 of IEC61851-1.
iii. Cord Extension Set: No extension cord to be used, as per Section 6.3.1. of AIS 138 Part 1
iv. Adaptors: No adapters to be used as per Section 6.3.2 of AIS 138 Part 1
v. Storage means of the cable assembly and vehicle connector: EVSE should have storage for cable and connector when not in use, at a height between 0.4m to 1.5m above ground level, as per IEC 61851-23 Section 101.1.3

3.6. Environmental Requirements

i. Ambient Temperature Range: 0°C to 55°C as per 11.11.1.2 of AIS 138 Part 1
ii. Ambient Humidity: 5% to 95% as defined in Section 11.2 of AIS 138 Part 1
iii. Ambient Pressure: 86 kpa to 106 kpa as defined in Section 11.11.2.4. of AIS 138 Part 1
iv. Storage Temperature:0°C to 60°C

3.7. Mechanical Requirements

i. Ingress Protection: The minimum IP degrees for ingress of objects is IP 54
ii. Mechanical Impact: As per IEC 61851-1 Section 11.11.2
iii. Mechanical Stability: As per section 11.11.2.2. of AIS 138 Part
iv. Cooling: Air cooled or forced cool for protection and safety of equipment from any fire hazards

3.8. Protection Requirements

i. Protection against Electric Shock: As per AIS 138 Part 1, Section 7.0
ii. Effective earth continuity between the enclosure and the external protective circuit, as per AIS 138 Part 1 Section 6.4.1.2

3.9. Specific Requirements

DC FC shall have provision of emergency switching, protection against uncontrolled reverse power flow from vehicle, Output current regulation in CCC, Output voltage regulation in CVC, Controlled delay of charging current in CCC, limited periodic and random deviation (current ripple) and limited periodic and random deviation (voltage ripple in CVC), as per Section 102.2 of IEC 61851-23.

The specific requirements defined in Section 102.2 of IEC 61851-23 except for the functions provided with descriptions:

i. Rated outputs and maximum output power: The clause from Section 101.2.1.1 of IEC 61851-23 is applicable except for the ambient temperature range to be 0 °C to 55 °C for Indian climatic conditions.
ii. Descending rate of charging current: In case of normal condition, DCFC should be able to reduce the descending current at a rate of 100A per second or more as per Section 101.2.1.4 IEC 61851-23.
iii. Load dump: In any case of load dump, voltage overshoot shall not exceed 110% of the maximum voltage limit of the battery systems, as per Annex BB 3.8.3 of IEC61851-23.
iv. EMI/EMC as per AIS 138-2 (section 11.11.3.2 and section 11.11.3.3)

3.10. Functional Requirements

The functional requirements should be as per Section 6.4.3 of IEC 61851-1 and Section 6.4.3 of IEC 61851-23 except for the following functions, to be implemented as follows.

i. Measuring current and voltage: The accuracy of output measurement of system B shall be within the following values (as per AIS 138-2, Annexure C3.1):
   - Voltage measurement: ± 0,5%
   - Current measurement:
     - ±1 A if the actual current is less than or equal to (≤) 50 A

ii. ±2 % if the actual current is above (>) 50 A Protection against overvoltage at the battery: The DC EV charging station shall reduce the DC output current to less than 5 A within 2 s, to prevent overvoltage at the battery, if the output voltage exceeds the maximum voltage limit of the battery system for 1 s

3.11. Communication Requirements

3.11.1. EV – EVSE Communication

A dedicated CAN communication is used for digital communication between a DC EV charging station and an EV for control of DC charging.

The physical layer shall be CAN bus over twisted pair cable and should comply with requirements defined in ISO 11898 -2:2003. The communication shall use the CAN framing format at a rate of 250 kbps, using 29-bit identifier of CAN extended frame. The CAN specifications and framing details are provided in Annex C2.

The system definition for communication between DC EV charging station and electric vehicle shall follow AIS 138-2. The application layer for this pair of communication is derived from Annexure G of AIS 138-2 protocol. The amendments in messages for control of DC charging are given in Annex C3.

3.11.2. EVSE – CMS Communication

The EVSE should be able to communicate with CMS using Open Charge Point Protocol (OCPP) 1.5 or higher versions compatible to OCCP1.5.

i. Communication interface: Reliable Internet connectivity
ii. Should enable handshaking between EVSE and CMS for its discovery, firmware version, vendor Version, vendor etc. It should authorize the operation, before electric vehicle can start or stop charging. EVSE should respond to CMS for the queried parameters. Reservation, cancellation addition and deletion of EVSE should be possible from CMS.
iii. Metering: Grid responsive metering as per units consumption of the vehicle
iv. Should be upgradable to next version of OCPP whenever it is released.

3.12. Billing and Payment Requirements

i. Billing: Based on grid responsive metering
ii. Payment: BHIM / Bharat QR or UPI compliant mobile payment
iii. Metering: As per Indian metering standard

3.13. User Interface and Display Requirements

1	ON- OFF (Start-Stop) switches	Mandatory
2	Emergency stop switch	Mushroom headed Push button type in Red Color, visible and easily accessable
3	Visual Indicators	Error indication, Presence of input supply indication, State of charge process indication and other relevant information
4	Display	Minimum 3.5" inches with 720 x 480 pixels TFT LCD Screen, user interface with touch screen or keypad
5	Support Language	English
6	Display Messages	EVSE should display appropriate messages for user during the various charging states like: ➢ Suggestive sequence of charger operation ➢ Vehicle plugged in / Vehicle plugged out ➢ Duration since start of charge, Time to charge, kWh. ➢ User authorization status ➢ Idle / Charging in progress: SOC ➢ Fault conditions ➢ Metering Information: Consumption Units
8	User Authentication	As per OCPP (through mobile application). OCPP gives only a mandate field, media to be used is open. Authentication to be done as given in Annex B (same as BEVC-AC001). Charging starts only after user authentication is successful.
9	End of Charging	Once the charging stops, the connector shall be released only after successful payment receipt / acknowledgement is received as detailed in Annex B.

3.14. Summary of BEVC-DC001 Specification

The specifications given in chapter 3 are summarized in Table 2.

TABLE 2: BEVC-DC001 SPECIFICATIONS SUMMARY

#	Parameter	Description
General Requirements		
1	EVSE Type	Dual-connector DC EVSE
2	Energy Transfer Mode	Conductive
3	Charging mode	Mode 4

7	Reliability and Serviceability	Modularity, self-diagnostic features, fault codes and easy serviceability in the field
System Structure		
1	Regulation Method	Regulated d.c EV charging station with combination of CVC or CCC but not simultaneously
2	Isolation	Each output isolated from each other with proper insulation
3	Environmental conditions	Outdoor use
4	Power supply	d.c. EV charging station connected to a.c. mains
5	DC output voltage rating	Up to and including 100 V
6	Charge control communication	Communicate by digital and analog signals
7	Interface inter-operability	Inter-operable with any EV(non-dedicated, can be used by any consumer)
8	Operator	Operated by a trained person or EV Owner
Input Requirements		
1	AC Supply System	3-Phase, 5 Wire AC system (3Ph+N+E)
2	Nominal Input voltage	3Ø, 415V (+6% and -10%) as per IS 12360
3	Input Frequency	50Hz, ±1.5Hz
4	Input Supply Failure backup	Battery backup for minimum 1 hour for control system and billing unit, to enable activities such as billing, to be provided.
Output Requirements		
1	Output Details	Suitable for 48V/60V72V vehicle battery configuration
2	Charger Configuration Types	i. Type 1: Single vehicle charging at 48V / 60V / 72V with a maximum of 10kW power, or a 2W vehicle charging at 48V with maximum power of 3.3 kW. ii. Type 2 : Single vehicle charging at 48V with a maximum of 10kW power or 60V /72V with a maximum of 15 kW power or a 2W vehicle charging at 48V with maximum power of 3.3 kW.
3	Output Current	200 Amp Max
4	Number of Outputs	2
5	Output Connectors	2 output connectors
6	Output Connector Compatibility	one connector with GB/T 20234.3 as per Annex C1 + 1 connectors to be defined
7	Converter Efficiency	> 92 % at nominal output power
8	Power factor	≥ 0.90 (Full load)

Cable Requirements		
1	Charging Cable Length	5 Meter, Straight Cable
2	Cable Type	Charging cable and connector permanently attached to DC FC
Environmental Requirements		
1	Ambient Temperature Range	0°C to 55°C
2	Ambient Humidity	5 to 95%
3	Ambient Pressure	86 kpa to 106 kpa
4	Storage Temperature	0 to 60°C
Mechanical Requirements		
1	Ingress Protection	IP 54
2	Mechanical Stability	Shall not be damaged by mechanical impact as defined in Section 11.11.2 of IEC 61851-1
3	Cooling	Air Cooled
4	Mechanical Impact	Shall not be damaged by mechanical impact as defined in Section 11.11.3 of IEC 61851-1
5	Dimension(W*H*D)/Weight	To be decided e.g W*H*D mm, xxx Kg
User Interface & Display Requirements		
1	ON-OFF (Start-Stop) switches	Mandatory
2	Emergency stop switch	Simple Push button type in Red Color, visible and easily accessible
3	Visual Indicators	Error indication, Presence of input supply indication, State of charge process indication
4	Display	Minimum 3.5" inches with 720 x 480 pixels TFT LCD Screen, user interface with touch screen or keypad
5	Support Language	English
5	Display Messages	EVSE should display appropriate messages for user during the various charging states like: • Vehicle plugged in / Vehicle plugged out • Duration since start of charge, Time to charge, kWh. • User authorization status • Idle / Charging in progress: SOC • Fault conditions • Metering Information: Consumption Units
7	Authentication	As per OCPP (through mobile application or card reader)
Performance Requirements		

1	DC Output voltage and current tolerance	DC Output current regulation in Constant Current Charging (CCC): ± 2.5 A for the requirement below 50 A, and ± 5 % of the required value for 50 A or more DC Output voltage regulation in Constant Voltage Charging (CVC): Max. 2 % for the max rated voltage of the EVSE
2	Control delay of charging current in CCC	DC output current Demand Response Time: <1 s Ramp up rate: 20 A/s or more Ramp Down rate: 100 A/s or more
3	Descending rate of charging current	EVSE should be able to reduce DC current with the descending rate of 100 A/s or more
4	Periodic and random deviation (current ripple)	DC output current ripple limit of EVSE: 1.5 A below 10 Hz, 6 A below 5kHz, 9A below 150 kHz
5	Periodic and random deviation (voltage ripple)	Max. ripple voltage: ±5 V. Max slew rate: ±20 V/ms
Communication Requirements		
1	Communication between EVSE and Vehicle	CAN based as per Annexure G of AIS138-2
2	Communication interface between charger and central management system(CMS)	Ethernet(Standard)/ Wi-Fi/2G/3G/4G
3	Communication between EVSE and Central Server	Open Charge Point Protocol (OCPP) 1.5 protocol or higher versions compatible to OCPP 1.5. Metering: Grid responsive metering
Billing Requirements		
1	Billing	Grid responsive metering
2	Payment	BHIM / Bharat QR or UPI compliant mobile application payment
Protection & Safety Requirements		

1	Safety Parameters	Over current, under voltage, over voltage, Residual current, Surge protection, Short circuit, Earth fault at input and output, Input phase reversal, Emergency shut-down with alarm, Over temperature, Protection against electric shock
	Marking of BEVC DC001	
1	Marking Requirements	The BEVC shall bear the markings in a clear manner as per clause No. 11.14.3 of AIS 138 Part 1.

3.15. Type testing

Sr. No	Criteria	Parameter	Clause No. of AIS 138 Part 1
1	Safety functions Verification	Earth Presence Detection (Socket - EVSE)	6.4.1.1
		Earth Continuity Check (EVSE-EV)	6.4.1.2
		Over Current and Short-Circuit Protection	6.4.1.5
		Leakage Current (RCD)	6.4.1.6
		Dielectric withstand voltage	11.6.1
2	Mechanical Stability	Mechanical impact	11.11.2.2
		IP TESTING	11.11.2.4
3	Climatic environmental tests	Ambient air temperature	11.11.1.2
		Ambient humidity	11.11.1.4
4	EMC Verification	Immunity to electrostatic discharges	11.11.3.2
		Supply voltage dips and interruptions.	11.11.3.2
		Fast transient bursts	11.11.3.2
		Voltage surges	11.11.3.2
		Radiated electromagnetic disturbances Electrical field (30 MHz-1000 MHz)	11.11.3.3 (Only for BEVC-DC001)

4. REFERENCES

The following referenced documents are indispensable for the application of this document.

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

AIS 138-1: Electric Vehicle conductive AC charging system

AIS 138-2: Electric Vehicle Conductive DC charging system

IEC 61851-1: Edition 2.0 2010-11, Electric vehicle conductive charging system–Electric vehicle conductive charging system –Part 1: General Requirements

IEC 61851-23: Edition 1.0 2014-03, Electric vehicle conductive charging system–Electric vehicle conductive charging system –Part 23: DC electric vehicle charging station

IEC61851-24:2014, Electric vehicle conductive charging system–Part 24: Digital communication between a DC EV charging station and an electric vehicle for control of DC8 charging

ISO 11898-2, Road vehicles–Controller area network (CAN)–Part 1: Data link layer and physical signaling

IEC 60364-5-54:2011, Low-voltage electrical installations–Part 5-54: Selection and erection of electrical equipment – Earthling arrangements and protective conductors

IEC/TS 60479-1:2005, Effects of current on human beings and livestock - Part 1: General aspects

IEC 60950-1:2005, Information technology equipment - Safety - Part 1: General requirements Amendment 1:2009, Amendment 2:2013

IEC 61140, Protection against electric shock–Common aspects for installation and equipment

IEC 61557-8, Electrical safety in low voltage distribution systems up to 1 000 V AC and1 500 VDC – Equipment for testing, measuring or monitoring of protective measures – Part8: Insulation monitoring devices for IT systems

IS/IEC 60309 (Part 1):2001 Plugs, sockets-outlets, couplers for industrial purposes Part 1 General requirements

IS/IEC 60309-2:1999 Plugs, sockets-outlets and couplers for industrial purposes Part 2 : dimensional interchangeability requirements for pin and contact-tube accessories.

IS 12360: voltage bands for electrical installations including preferred voltages and frequency

GB/T 20234.3 : connection set for conductive charging of electric vehicles part 3: DC charging coupler

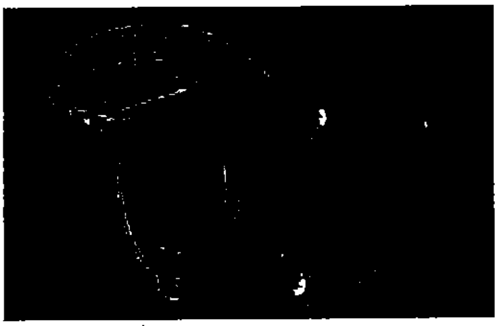
GB/T 27930-2015: communication protocols between off board conductive charger and battery management system for electric vehicle

Open charge point protocol: OCPP specifications

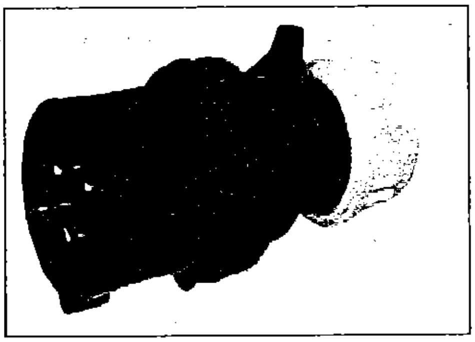
ANNEX A: Output Connector for PMAO

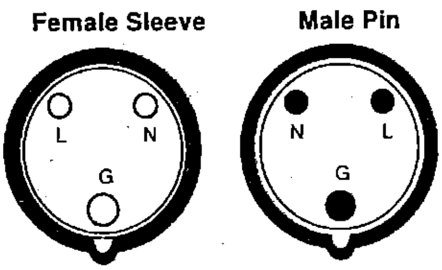
AC Slow: The connector on the PMAO side and the mating connector are as below:

IEC 60309 Female Connector (PMAO side)



IEC 60309 Male Connector (Cable with EV)





Pins	**Functions**
1	L
2	N
3	Protective Earth

For details, refer **IS 60309(Part 1): 2002/ IEC 60309-1:1999,** Plugs, socket-outlets and couplers for industrial purposes – Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories.

Cable Assembly for AC Slow Charging

Type of cable assembly for charging option in AC slow is Cable B, which has an industrial plug IEC 60309 (15 A, single-phase) on the PMAO side and a suitable charging connector on the vehicle side.

ANNEX B : User Authorization Flow using Mobile application for DC Public Charger

B1.1 Pre-requisite

The EV driver/user to have the mobile application and registered with CIMS through app. During registration, user's email ID is used for his identification and VIN are saved in CMS.

The Charge Point to have a QR code for identifying Charge Point ID and the Connector ID. The QR code to be issued by some authorizing agency.

For DC public charger two connectors are provided. However only one connector is operative at a time and this connector ID to be sent along with Charge point ID for identification at CMS.

B1.2 Authentication Procedure

The following steps describe the flow of authorization. The flow diagram is given in Figure B1.2.1.

Step 1: The EV user scans the QR code provided at the connector in the charge point.

Step 2: On successful scanning, the interpreted data from QR code is sent to CMS along with registered email ID and VIN of the Vehicle.

Step 3: CMS would cross-check for the email ID and VIN with the registered details and would generate an OTP on successful verification and sent to mobile application. If verification fails, then the authorization request from mobile application would fail and would be communicated to the user.

Step 4: EV user enters this OTP on EVSE using numeric keypad. EVSE would send the OTP using Id Tag parameter of Authrorize.req and receive response from using Authorize.conf operation of OCPP protocol. CMS will check whether the OTP is blocked, invalid, expired or accepted and send the response back to EVSE. If the OTP is accepted, the EVSE would authorize the user and proceed for charging otherwise reject it.

1. OTP would be valid for 15 minutes after generation.
2. EV user could be blocked by the CIMS admin in that case his authorization request would be rejected.
3. OCPP Operations: Since OCPP does not have a specific tag to carry OTP, the ID Tag parameter is used to carry the OTP between EVSE and CMS. So, the EVSE and CMS should make necessary changes in relevant messages to accommodate this.

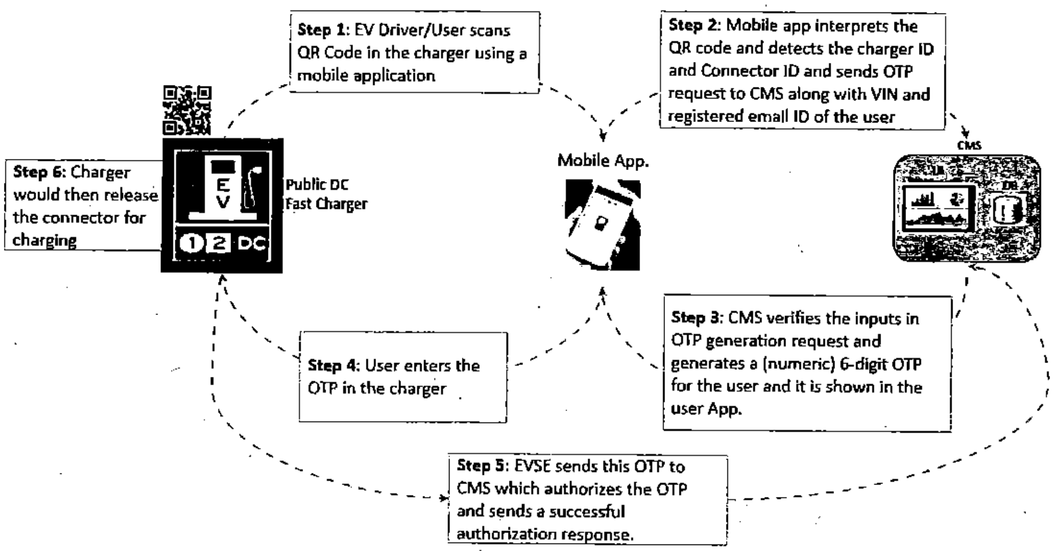
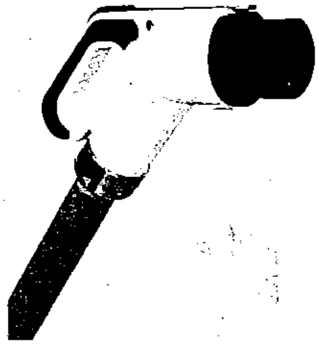


Fig B1.2.1: Authorization Flow

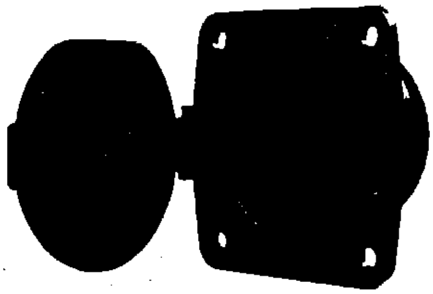
ANNEX C1: Output Connectors for Low voltage DC FC

The Connector (female) to be used on the EVSE Side for low voltage DCFC is GB/T 20234.3.The connector on the EVSE side and the mating connector are as below:

C1.1. EVSE Plug

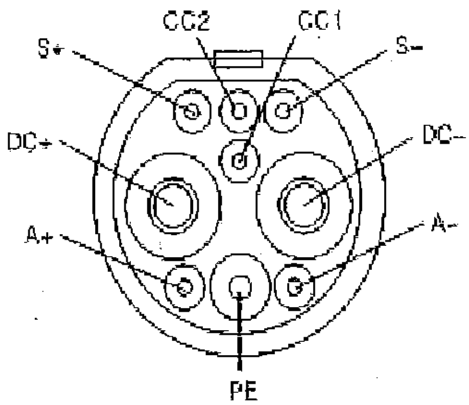


C1.2. EV Socket



C1.3. Pin Details

DC+ : Positive DC power
CC2 : Connection confirmation 1
DC– : Negative DC power
CC1 : Connection confirmation 2
PE : Protective ground cable
A+ : Positive Low auxiliary power
S+ : Charging Communication CAN–H
A– : Negative Low auxiliary power
S– : Charging Communication CAN–L



ANNEX C2: CAN Specifications and framing details

C2.1. Physical Layer

CAN 2.0 complies to ISO 11898-2

C2.2. Application Layer

Extended CAN frame using 29-bit identifier

C2.3. Extended CAN Frame

SOF	11-bit Identifier	SRR	IDE	18 bit Identifier	RTR	R1	R0	DLC (4)	Data Field 0 - 8 Bytes	CRC 15 bit	DEL	ACK	DEL	EOF

SOF – Start of Frame

11-bit ID – 11-bit Identifier

IDE – Identifier Extension

29-bit ID – 29-bit Identifier

SRR – Substitute Remote Request

RTR – Remote Transmission Request

R0 – Reserved Bit

R1 – Reserved Bit

DLC – Data Length Code

CRC – Cyclic Redundancy Check

DEL - Acknowledgment Delimiter

ACK - Acknowledgment Bit

EOF - End of Frame

ANNEX C3: Digital communication for control of DC EV charging system (normative) – Modified Messages

C3.1. PGN 9728 Charger Handshake Message (CHM)

Message function: when the charger and electric vehicles have been subjected to physical connection and charged and the voltage is normal when detected, the charger will send charger handshake message every other 250ms to the BMS to determine whether they shake hands normally. PGN 9728 message format is detailed in Table B.3.1. The messages added/modified are highlighted in Italics.

TABLE B.3.1 PGN9728 MESSAGE FORMAT

Start byte or bit	Length	SPN	SPN definition	Delivery option	Remarks
1	3 bytes	2600	In this standard, as for the charger communication protocol version No., its current version is specified as V1.1 and is expressed as: byte3, byte2--0001 H; byte 1--01H. *To differentiate pure GB/T and proposed Indian specification BEVC, the protocol will use the MSB as 1 and hence the byte3,2 and 1 values will respectively be 80H 01H 01H.*	Mandatory	GB/T protocol specifies 3 byte version number as 000101H. The version number has to be differentiated between pure GB/T and the proposed Indian version of the standard. This is done by modifying the MSB of the third byte and making it 800101H.

C3.2. PGN512 BMS and vehicle Recognition Message (BRM)

Message function: Send BMS and vehicle recognition information to the charger at the charging handshake stage. When BMS receives the charger recognition message of SPN2560=0x00, it will send message to the charger once every other 250ms; if the data field length exceeds 8 bytes, it will transport by using the transport protocol function, with the format as detailed in 6.5 and the inter-frame sending interval of 10 ms, until it receives the charger recognition message of SPN2560=0xAA over a 5s period. The PGN 512 modified message format is detailed in Table B.3.2

TABLE B.3.2 PGN512 MESSAGE FORMAT

Start byte or bit	Length	SPN	SPN definition	Delivery option	Remarks
1	3 bytes	2565	In this standard, as for the BMS communication protocol version No., its current version is specified as V1.1 and is expressed as: byte3, byte2--0001 H; byte 1--01H.*To differentiate pure GB/T and this Indian specification XXX, will use the MSB as 1 and hence the byte3,2 and 1 values will respectively be 80H 01H 01H*	Mandatory	GB/T protocol specifies 3 byte version number as 000101H. The version number has to be differentiated between pure GB/T and the proposed Indian version of the standard. This is done by modifying the MSB of the third byte and making it 800101H
4	1 byte	2566	Battery type, 01H: lead acid battery; 02H: nickel hydrogen battery; 03H: lithium iron phosphate battery; 04H: lithium manganite battery; 05H: cobalt based lithium battery; 06H: ternary material battery; 07H: polymer lithium-ion battery; 08H: lithium ion battery; *09H: NMC (Lithium Nickel Manganese Cobalt Oxide)*	*Optional*	List of battery types will be added as and when available. (Total 255 types are possible). the option may be exercised by the charging infra operator

			0AH: NCA(Lithium Nickel Cobalt Aluminum Oxide). *0BH: Lithium titanate oxide (LTO)* *0CH: Lithium Nickel cobalt manganese* *FFH: other batteries*		
5	2 bytes	2567	Power storage battery system of whole vehicle, with rated capacity/Ah, 0.1 Ah/bit; 0Ah offset	Mandatory	
7	2 bytes	2568	Power storage battery system of whole vehicle, with rated total voltage/V, 0.1 V/bit; 0V offset	Mandatory	
9	4 bytes	2569	Battery manufacturer name and standard ASCII code. The charger may be configured to charge batteries only from a known set of Battery manufacturer name and standard ASCII code. Refer table A.3.3's Fault cause for charger suspending charging bits 15,16	Optional	
13	4 bytes	2570	Battery pack No., which is reserved and will be defined by the manufacturer	Optional	
17	1 byte	2571	Battery set production date: years, 1 year/bit; offset in 1985; data scope: 1985~2235	Optional	
18	1 byte		Battery set production date: months, 1 month/bit; offset of 0 month; data scope: January~December	Optional	
19	1 byte		Battery set production date: days, 1 day/bit; offset of 0 day; data scope: the 1st day ~ the 31st day	Optional	
20	3 bytes	2572	Battery set charging frequency: 1 time/bit, offset of 0 times, which is subject to BMS statistics.	Optional	

23	1 byte	2573	Battery set property right mark (<0>: = lease; <1>: existing on vehicle)	Optional	
24	1 byte	2574	Reserve	Optional	
25	17 bytes	2575	Vehicle identification number (VIN)	*Mandatory*	*VIN is mandatory for public charging.*
42	8 bytes	2576	BMS software version number 8byte represents current BMS version information, determined according to hexadecimal coding. Hereinto, Byte8, byte7, byte6-000001H~FFFFFEH, reserved, fill in FFFFFFH;Byte5-byte2, as BMS software version compilation time information marker, Byte 5,Byte4-0001H~FFFEH represents "year" (e.g. The year of 2015: fill in Byte5-DFH, byte4-07H);Byte3-01H~0CH represents "month" (e.g. November: fill in Byte 3 0BH); Byte2-01H~1FH represents "day" (e.g. the 10the day: fill in Byte 2 0AH); Byte1-01H~FEH represents edition serial number (e.g. 16: fill in Byte 1-10H). The above value represents: BMS uses 16th version on November 10, 2015 and not fill in certification authorization code)	Optional	

50	8	2577	*Last charge status* *Last Recharge Date: 6 Bytes, DD MM YY HH mm SS* *DD - 1 day/bit; offset of 0 day; data scope: the 1st day ~ the 31st day* *MM - months, 1 month/bit; offset of 0 month; data scope: January~December* *YY - 1 year/bit; offset in2000; data scope: 2017~2267* *HH - the 1st hour ~ the 24th hour* *mm – 00 to 59* *SS– 00 to 59* *Duration of last charging: 2-bytes, Duration in minutes 0 ~ 600*	*Optional*	*This field indicates the last charge date and the duration of charge. (Justification provided along with Byte 58)The option to be exercised by the charger infra operator.*
58	6	2578	*Start SoC during last Charging: 2 Bytes, Data resolution: 0.1 % /bit, 0% offset; data scope: 0~100%;* *End SoC during last Charging: 2 Bytes, Data resolution: 0.1 % /bit, 0% offset; data scope: 0~100%;* *Distance travelled since last charge: 2Bytes, distance in km*	*optional*	*This field indicates the start SoC and end SoC. The option to be exercised by the charger infra operator.With the combination of SOC changed and information from Byte 50 (above e.g. duration of charge), the charger can get crucial information of health of battery. The charger can do some extra checks in some special cases to ascertain if the charging can be continued or not, e.g. how soon the battery is discharging, residual capacity of battery etc.*

					Will also enable the second use of battery along with byte 63.
64	*1*	*2579*	*Last Charging End Reason, 1 byte: 00 <Normal>, 01<Charger Terminated>, 10 <BMS Terminated>*	*Optional*	*This parameter can help in deciding whether to proceed with charging or do some diagnostics test if last charging was terminated by charger, before proceeding with charging. The option to be exercised by the charger infra operator.*
65	*1*	*2580*	*Continuous charge failure due to battery count: 1 byte, the number of consecutive times the charging session was terminated because of a BMS error. If this number reaches a threshold, the charger will not attempt to charge the battery and will indicate same in CST Fault case bits 13 and 14 as 01. (Refer table A.3.3.)*	*Optional*	*If the charging fails continuously and upon reaching certain threshold number, the charger can generate fault case as indicated in bits 13 and 14 of CST. The option to be exercised by the charger infra operator.*

66	4	2581	Reserved		

* Optional parameters can be mandated based on the class of vehicles by power regulatory.

C3.3. PGN6656Charger Suspending Message (CST)

TABLE B.3.4 PGN6656 MESSAGE INTERPRETATION

SPN	SPN Definition	Start bit	Stop bit	Meaning	Bit-1	Bit-2	Meaning	Justification
3521	Cause for charger suspending charging	1	2	suspends due to reaching the condition set by charger	0	0	Normal	
					0	1	suspends due to reaching the condition set by charger	
					1	0	untrusted state	
		3	4	suspends artificially	0	0	Normal	
					0	1	artificial suspension	
					1	0	untrusted state	
		5	6	fault suspension	0	0	Normal	
					0	1	Fault	
					1	0	untrusted state	
		7	8		0	0	Normal	

				BMS actively suspends	0	1	BMS suspension (receive BST frame);	
					1	0	untrusted state	
3522	Fault cause for charger suspending charging	1	2	charger over temperature	0	0	charger temperature normal	
					0	1	charger over temperature	
					1	0	untrusted state	
		3	4	charging connector fault	0	0	charging connector normal	
					0	1	charging connector fault	
					1	0	untrusted state	
		5	6	charger is over temperature at the internal part	0	0	internal charger temperature normal	
					0	1	internal charger over temperature	
					1	0	untrusted state	
		7	8	the required electric quantity cannot be transmitted	0	0	electric quantity is transmitted normally	
					0	1	electric quantity cannot be transmitted;	
					1	0	untrusted state	
		9	10	sudden stop of charger	0	0	normal	
					0	1	sudden stop of charger	
					1	0	untrusted state	

		11	12	other faults	0	0	normal	
					0	1	fault	
					1	0	untrusted state	
		13	14	*abort on continuous failure threshold breach*	*0*	*0*	*normal*	Abort when the charger had failed to charge the battery continuously due to the threshold breach or the BMS manufacturer not in the white list(as an option if only certain manufacturers are allowed or not allowed)
					0	*1*	*fault*	
					1	*0*	*untrusted state*	
		15	16	*abort on BMS manufacturer code not in white list of Charger*	*0*	*0*	*BMS manufacturer ASCII code present in allowed list*	
					0	*1*	*BMS manufacturer ASCII code not present in allowed list*	
					1	*0*	*untrusted state*	
35 23	Error cause for charger suspending charging	1	2	current mismatching	0	0	current is normal	
					0	1	current matching	
					1	0	current mismatching	
		3	4	voltage is abnormal	0	0	normal	
					0	1	abnormal	
					1	0	untrusted state	

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4. Background Note by the Chairman

Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

A background note for standardisation of public Electric Vehicle Chargers in India

1. Charging standards: In the world there are three common EV charging standards. Japan has its own EV fast DC-charging standard using Chademo protocol and China has a somewhat advanced version of the DC charging standard called GB/T. Europe has a little more newer DC charging standard called CCS. Chademo and CCS DC fast chargers costs ₹10 lakhs to ₹20 lakhs per unit. CCS uses PLCC for communication with vehicles. Indian auto-companies (two-wheelers, three-wheelers and four-wheelers) are so-far averse to using PLCC.
2. The charging standards include protocols to be used between EV and EVSE (Charger) and protocols to be used between EVSE and the Centralised Management system (CMS). All three standards are compatible with OCPP for EVSE and CMS communication and the committee decided to adopt that. Fortunately all three EV to EVSE protocols were implemented by IIT Madras as a DHI project a couple of years back, and India has the source code of this implementation and is not dependent on any country. The charging standards also have connector specified for DC charging.
3. Therefore Committee took into account the above in specifying the AC-001 and DC-001 standards. It also took into account the possible business case for specified chargers.
4. As vehicles in India do not have on-board chargers, which use more than 3 kW AC input, the committee decided to define AC-001 for charging up to 3 kW using standard 15A industrial plug used in India. The EVSE to CMS protocol used is OCPP. This could be useful for all the 2-wheeler, 3-wheelers and 4-wheelers available in India today or for which the near future visibility exists in India. The committee recommends that a AC-002 be specified as soon as industry gives feedback on what power-rating of on-board chargers are likely to be available in vehicles in India. DHI should ask the industry for the power-ratings needed, expected duration, volumes, estimated costs of chargers and the business case for such chargers. The committee will in parallel work on this.
5. DC fast charging charges battery directly and does not require an on-board charging. But the charging voltage and the maximum charging power rating depends on the battery voltage, capacity and type of batteries. The costs of chargers is also critically dependent on the power and the voltage. For example for voltage below 100V and charging rate of up to 15 kW, chargers can be developed at low costs (may be ₹1.25 lakhs to ₹1.5 lakhs), the chargers with voltage of 400V or 800V and power ratings of 50 kW / 100 kW makes the DC charger cost exceed ₹15 lakhs. In India, all existing and announced vehicles, whether they are two-wheelers or three-wheelers or 4-wheelers use voltages less than 100V and power of less than 15 kW. Therefore the committee decided to have two types of DC Chargers. DC chargers with less than 100V / 15 kW was defined as DC-001 and the one with higher voltage / power is to be called DC-002. As existing vehicles could all be supported by DC-001, the committee has defined the specifications accordingly. On the other hand, the committee awaits inputs from industry for the requirements of DC-002, especially in the higher voltage ranges (300V

or 400V or 600V or 800V or 1000V) and the higher power rating (30kW / 50 kW/ 70 kW/100 kW/ more). As soon as there is clarity , the DC-002 standardisation will begin, and the committee is keen to take this effort

6. The currently specified charger, DC-001 is a fast charging standard using 3-phase AC input and up to 10 kW / 15 kW charging for vehicles at current limited under 200A and voltages less than 100V DC. These chargers would be low-cost (about ₹1.25 lakhs in volumes of thousands) and could be used by 2-wheelers / 3-wheelers / small 4-wheelers. All existing Indian EVs will therefore be supported. As mentioned earlier, the EVSE to CMS protocol used is OCPP . As none of the Indian vehicles or EV manufacturers support PLCC, CCS protocol was ruled out. Chademo protocol did not have enough richness to support Indian requirements. As India already has all the software, it was decided that "Bharat charger specs for DC-001" will start with GB/T. However, commands have been added which make the standard used as Bharat Charger DC-001 specs and not GB/T specs. The charger specified also could ensure low-cost.
7. The DHI Committee has also recommended that DC-002 charger be evolved for DC higher power-levels (30 kW / 50 kW/ 70 kW / 100 kW or more) and higher voltage levels (300V / 400V / 600V / 800V / 1000 V maximum). The industry needs to converge on the power and voltage levels. These chargers would be more expensive. If the high-end Indian vehicles agree to use PLCC, CCS could potentially be used to evolve Bharat charging protocol for DC-002. This charger would need further consideration to make business sense.

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5. Summary of comments by stakeholders and decisions of the Committee

Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

MINUTES OF MEETING OF COMMITTEE ON STANDARDIZATION OF PROTOCOL FOR CHARGING INFRASTRUCTURE HELD ON 26TH JULY 2017 AT MNRE, DELHI

Present:
Prof Ashok Jhunjhunwala
Mr. A. Deshpande, ARAI
Dr. Sajid, Mubashir, DST
Mr. Chetan Maini, Expert committee member
Dr. Prabhjot Kaur, Invitee, IITM
Mr. Abhijit B. Mulay, Invitee, ARAI

1. Mr. Deshpande presented the status on the finalization of tenderable specifications of
    a. Public AC charging stations with 3.3kW output (*Bharat EV Charger – AC001)*
    b. Public DC charging stations up to 100V DC output and 10/15kW power (*Bharat EV Charger -DC001*)

   Technical highlights of the report were presented and discussed. The specifications also detail about backward communication and payment gateway needs.

2. The Report was hosted on DHI website for stakeholder comments. Comments were received from various stake holders like SMEV, SIAM, Electric mobility Alliance, IEEMA, EV Motors, Mitsubishi Motors Corp- Japan, L&T-EAIC, Legrand, Charge Dock, Charge point , ABB, Delta, etc. Each comment received from stake holders has been addressed and deliberated extensively.
   Details about discussion related to major comments received are given in table below

1.1 BEVC-AC

Sr. No.	Major Comment	Suggested Approach by Committee
1	High power AC charging to be defined with Type 2 connector	The suggestion is acceptable. Committee decided to incorporate Type 2 connector in *Bharat EV Charger – AC002* specifications. Chairman will seek inputs from the Automotive Industry about the voltage range and power output requirement for these chargers along with the estimated cost of such chargers in high volumes, rough business plan for such chargers. The committee will wait for inputs from industry for high power AC chargers requirement for inclusion in the specification which can then be defined as AC-002 charger. It was decided not to include Type 2 connector in present AC-001 charger specifications.
2	PF and THD monitoring to be made mandatory for PMAO	For AC charger PF and THD is solely a responsibility of On-board charger. Hence such monitoring may not be included in the PMAO specifications.
3	Type tests to be defined	Minimum safety type tests for charging stations have been identified from AIS 138 Part 1. Details are given in Annexure-01

1.2 BEVC-DC

Sr. No.	Major Comment	Suggested Approach by Committee
1	Charging protocol should be worldwide acceptable and not a country specific	Committee has deliberated on protocol selected for low voltage high current (DC001) charger. There are three acceptable protocols in the world. First of all, IITM has developed the complete stack for all three protocols and we are not dependent on any country for any of these protocol stacks. CCS uses PLCC instead of CAN and Indian manufacturers of low-end vehicles are averse to PLCC; thus, CCS is ruled out for less than 100V DC charger. Chademo is the first standard and old and does not have all that is required today. Also, its connector is expensive and does not support requisite current. Thus for fast charger DC-001, protocol based on GB/T standard (as referred from IEC 61851) has been adopted from the point of view of support to higher current up to 200A and economical cost. However for deciding about protocol standardization for high voltage/ high power DC chargers DC-002 committee will have a fresh look at other worldwide options. This will be used for higher-end vehicles and they may be able to afford higher cost connectors.
2	Open protocol be allowed with private partnership / investment	Open protocol is not desirable as standardization is necessary. Charging infrastructure using Private Partnership/ Investment will have to follow standardization notified by Government.
3	Multi-outlet (DC FC, AC FC, AC slow) charger be allowed	Multi outlet chargers can be developed using combinations of AC 001, DC 001 & AC002, DC 002 which will be developed in future.
4	European CCS combined AC & DC charger system be allowed	European combined charging system (CCS) is suitable charging system as it provides combined AC and DC charging option. It is also suitable for smart grid application. However considering that it employs power line communication instead of CAN communication, consultation with automotive industry will have to be done for ascertaining its readiness for the same. If industry is willing, this could be considered for DC-002.
5	Additional communication parameters between EV & EVSE such as VIN, battery SoC be not mandated	This point was discussed in detail and it was finally decided that communication of VIN from EV to EVSE will be mandatory. All other parameters related to Battery type and status will be optional and whether to insist on it before charging or not will be decided by the charging infrastructure operators.
6	Type tests to be defined	Minimum safety type tests for charging stations have been identified from AIS 138 Part 1. Details are given in Annexure-01

3. Apart from above major comments, minor/ editorial comments were reviewed by the committee and the summary of decisions is given in Annexure-02
4. Based on accepted minor/ editorial comments, committee report will be modified suitably and will be submitted to DHI for approval.
5. One of the task pending for low voltage DC charging specifications DC-001 is definition of suitable connector for DC fast charging of electric 2W. Chairman requested all committee members to explore this aspect expeditiously and suggest suitable solution. Till such time this point will be open in the report.
6. After adoption of this committee report by Government, AIS 138 Part 1. Part 2 will be suitably amended. Also appropriate amendment of AIS 038 for mandating vehicle side coupler and communication with EVSE will be taken up.

Type Testing for BEVC-AC001 and BEVC-DC001

Apart from functional verification of charger following tests to be performed.

Sr. No	Criteria	Parameter	Clause No. of AIS 138 Part 1
1	Safety functions Verification	Earth Presence Detection (Socket - EVSE)	6.4.1.1
		Earth Continuity Check (EVSE-EV)	6.4.1.2
		Over Current and Short-Circuit Protection	6.4.1.5
		Leakage Current (RCD)	6.4.1.6
		Dielectric withstand voltage	11.6.1
2	Mechanical Stability	Mechanical impact	11.11.2.2
		IP TESTING	11.11.2.4
3	Climatic environmental tests	Ambient air temperature	11.11.1.2
		Ambient humidity	11.11.1.4
4	EMC Verification	Immunity to electrostatic discharges	11.11.3.2
		Supply voltage dips and interruptions.	11.11.3.2
		Fast transient bursts	11.11.3.2
		Voltage surges	11.11.3.2
		Radiated electromagnetic disturbances Electrical field (30 MHz-1000 MHz)	11.11.3.3 (Only for BEVC-DC001)

Summary of Comments Received from Companies on Bharat EV AC Charger (BEVC-AC001)and 'Bharat EV DC Charger (BEVC-DC001)

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
ChargePoint, Inc. (Contact Person: Ajay Agrawal)	3.10	Accuracy for current	No accuracy specified for current > 50 A		Recommended	Clause 3.10 : "i" To be appended as follows "±2 % of the actual current if the actual current is above (>) 50 A " (Refer AIS 138-2 ANNEX B 3.1)
Electric Mobility Alliance (Contact Person: Ankit Singhvi, President, Electric Mobility Alliance)	1.4.	This document therefore defines specifications of AC Public off-board Chargers up to a maximum charging rate of 2.5 kW or 3 kW. For such chargers, the charging point needs to be only 230V single phase.	To be added: As and when one sees vehicles in India which have higher power off-board AC chargers (more than 3 kW), higher power AC off board chargers can be defined.	Currently known/available solutions should not limit the future possibilities of innovation but the solutions shall be compatible with existing ecosystem	Not Recommended	will define a new standard when industry is ready
	1.5.2.	Public off-board DC Chargers at output voltage up to 1000V, with power outputs of 30 kW / 150 kW. These will be called Level 2 DC Chargers	To be added: As and when one sees vehicles in India which have higher power off-board DC chargers (more than 150 kW), higher power DC off board chargers can be defined. Same vehicle can use multiple connectors for higher energy transfer rate (> 150 kW).	Currently known/available solutions should not limit the future possibilities of innovation but the solutions shall be compatible with existing ecosystem	General Comment, already addressed	high voltage is to be defined in separate specifications.
	1.6.1.	EVSE needs to communicate with BMS of battery pack in EV, to enable it to charge at right rate for maintaining SOH of batteries. Physical layer for this communication will be CAN, as it is commonly used by vehicle manufacturers in India.	Communication protocol should be open standard.	GB standard uses CAN protocol and has been facing compatibility issues & a low max rate of charging (kW)	Not Recommended	Bharat charger is defined and is made open.
	2.1.	Each outlet will have up to three independent charging sockets	Number of sockets shall be determined as per operational requirement at the location of deployment	Charging locations will have different level of space availability and electricity power supply connection. Innovative solutions can be found to optimize utilization	Not Recommended	A modular designe of 3 outputs at 3 different phases for grid balancing.
	2.2. and 3.3.2.	Input Supply Failure back-up: Battery backup for minimum 1 hour for the control system and billing unit. Data logs should be synchronized with CMS during back up time, in case battery drains out.	Charger should be connected to power backup to avoid data loss in case of grid power failure.	Many places operate facility level power backup. Power backup may be battery based or diesel generator or solar/wind or any other form of energy supply. Thus, power backup must be supplied as per locally available resources and shall provide sufficient power backup to avoid data loss with no limit of one hour.	Not Recommended	the specification for power back up is only for auxilliary power for controllers and data logging. The form of input supply/backup is not under the perview of specifications
	2.4.	User Interface and Display requirements	viii: ON – OFF (Start – Stop) switches as per OEM standard fitment x: Display and touch screen be as per OEM standard fitment providing all required information and functionality	Standardization should not be too prescriptive on product design which will curtail innovation.	Rephrased	The innovation is not curtailed. Clause 2.4-viii Remove : "Simple push button Type "
	3.1.	No. of outputs: 2	Number of sockets shall be determined as per operational requirement at the location of deployment	Charging locations will have different level of space availability and electricity power supply connection. Innovative solutions can be found to optimize utilization.	Not Recommended	no change

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
	3.2. and 3.4	DC output voltage rating: Up to and including 100 V Output Current: 200A	As and when one sees vehicles in India which have higher power off-board DC chargers, higher power DC charger output voltage and current can be defined.	Currently known/available solutions should not limit the future possibilities of innovation but the solutions shall be compatible with existing ecosystem	document covers	will be defined seperately. This specs is to promote all exisiting and near future availability of Evs.
	3.4.2.	Output 1: to be used for 10 kW or 15 kW charging, Connector is GB/T20234.3. The Connector details are provided in Annex B1	Connector should be open standard foreseeing future potential growth in EV ecosystem.	Public charging system should be interoperable and scalable **GB/T is a Chinese EV standard controlled by China.** Prescription should be either based in Indian standard (AIS 138) or an open source standard **GB standard and CAN protocol is facing compatibility issues and has low max charging rate (kW).** Alternatively, CCS, an Open standard protocol, supports Buses & Pantograph systems up to 350kW charging, which allows for very efficient charging cycles of the battery. As batteries become smaller & more efficient soon 350kW will be a standard for busses. Note that CCS protocol will identify the EV's battery & EVSE will adjust the max power that can be delivered to the battery. E.g. downgrade charging rate from 350kW to 50 kW when necessary. CCS offers one plug for both AC & DC charging. CCS plug is much simpler & requires less communication cabling. (which is important as less cabling means less risk of failure & lower maintenance costs. This is one of the critical issues of GB is that charging cables will have to be replaced more frequently. Which means down cycles, less efficient use of the EVSE & increased maintenance costs)	Not Recommended	High voltage, high power Charger specs will be different (the protocol defined is India specific, largely for 2W and 3W or for low voltage cars. The committee will consider other protocols for high end vehicles, to be defined seperatly.)
	3.11.1.	The application layer for this pair of communication is derived from GB/T 27930 protocol. The amendments in messages for control of DC charging are as below.	Physical layer and application layer protocol shall be derived from an open standard	GB/T is a Chinese EV standard and is controlled by China. Prescription should be either based in Indian standard (AIS 138) or an open source standard. GB standard and CAN protocol is facing compatibility issues and has low max charging rate (kW).	Not Recommended	Charger is based on AIS standard. Communication protocol is based on GB/T with added features required.
	3.13.	User Interface and Display Requirements	1: ON – OFF (Start – Stop) switches as per OEM standard fitment 4. Display and touch screen be as per OEM standard fitment providing all required information and functionality	Standardization should not be too prescriptive on product design which will curtail innovation	Rephrased	Clause 3.13 Remove : "Simple push button Type "
Mitsubishi Motors Corporation (Japan), (Contact Person: Nobuya Furukawa)		Rated current of IEC 60309 Industrial blue plug/outlets for normal charging cable : 16A (see chapter 2, section 2.3, 2.10, etc.)	Accordingly, limiting current of circuit breaker for each outlet : Greater than 16A	The rated current of said industrial plug/socket is 16A, not 15A in the relevant IEC standard.	Not Recommended	15A is as per Indian standard that has been followed up since decades.
EV Motors	Bharat EV AC Charger (BEVC-AC001)					

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
India Pvt. Ltd (Contact Person: Vinit Bansal, Managing Director)	Input Requirements Point #4:	Input Supply Failure backup Battery backup for minimum 1 hour for the control system and billing unit. Data logs should be synchronized with CMS during back up time.	Synchronization process with CMS for control system and billing is instantaneous. So we suggest one-minute battery backup is sufficient.		Not Recommended	any smallest size battery is sufficient for 1 hr battery back up, retained.
	Output Requirements - Point # 5: Output Connector Compatibility	IEC 60309	Also allow for GB/T 20234		Not Recommended	....
	Point # 7: Connector Mounting	Angled connector mounted looking downwards for outdoor use	Please do not mandate only downwards, allow any direction but it should be weather proof.		Rephrased	Point #7 : Connector Mounting Ensure IP 55. Angled connector mounted looking downwards for outdoor use is prefered
	Environmental Requirements - Point # 1: Ambient Temperature Range	0 to 55°C	As many parts of our country touches below Zero degree temp. So minimum range could be -10 . So the ambient temperature range should be -10 to 55 degree C.		Not Recommended	any wider range is acceptable
	User Interface & Display Requirements - Point # 1: ON- OFF (Start-Stop) switches	Simple Push button type	Also allow Touch Screen Interactive On-Off		Rephrased	The innovation is not curtailed. Clause 2.4-viii Remove : "Simple push button Type "
	Protection & Safety Requirements - Point # 1: Safety Parameters	Safety and protection to be ensured for India specific environment (As per AIS 138 Part1)	Also allow for GB standards		Not Recommended	its AC so is as per AIS138
	Mechanical Requirements - Point # 4: Cooling	Air cooled or forced air cooled to protect the equipment against temperature hazards	Should not be mandatory if charger can perform within the specified temperature range without forced cooling.		document addresses	ambient/air/forced air Natural cooling/forced cooling
	Bharat EV DC Charger (BEVC-DC001)					
	Input Requirements Point #4:	Input Supply Failure backup Battery backup for minimum 1 hour for the control system and billing unit. Data logs should be synchronized with CMS during back up time.	Synchronization process with CMS for control system and billing is instantaneous. So we suggest one-minute battery backup is sufficient.		Not Recommended	...same...
	Environmental Requirements - Point # 1: Ambient Temperature Range	0 to 55°C	As many parts of our country touches below Zero degree temp. So minimum range could be -10 . So the ambient temperature range should be -10 to 55 degree C.		Not Recommended	...same...
	User Interface & Display Requirements - Point # 1: ON- OFF (Start-Stop) switches	Simple Push button type	Also allow Touch Screen Interactive On-Off		Not Recommended	...same...
	Communication Requirements - Point #2: Communication interface between charger and central management system(CMS)	Ethernet (Standard), Wi-Fi	Also add 3G/4G		Recommended	any media to be added: Ethernet/2G/3G/4G/Wi-Fi
IEEMA International	Nominal input voltage	415V (+6% and -10%)	415V (+6% and -6%)		Not Recommended	retained, as per Indian standard
	Input Frequency	50Hz, ±1.5Hz	50Hz, ±1 %		Not Recommended	retained, as per Indian standard

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
Copper Association India (Contact Person: Virender Kumar Gupta)	Ambient Temperature Range	0 to 55°C (as per AIS138)	to be minus 5 to 55°C	retained due to cost involved at designing Power electronics at sub zero temperatures: Dr. Deshpande	Not Recommended	retained due to cost involved at designing Power electronics at sub zero temperatures: Dr. Deshpande
	IP Ratings	IP 54	IP 55 (as mentioned in Cl. 11.3 of AIS 138 Part 2)	considered, will, be updated	Not Recommended	IP 55 refers to water spray using jet. Vehicle inlet needs to be IP 55 because vehicle will be washed by user. However charger system will not be subjected to any jet spray (washing). It need to be protected only for water splash (IP 54) including charger outlet coupler.
	3.5 for Cable Requirements		Cable Properties to be as per IEC 60245-6	considered: will be updated	Document adresses	considered: will be updated
L&T-EAIC	Communication Protocol	Charger and the EV BMS	1.1.1. Protocol Frame structure must include ALL mandatory as well as optional bytes as a complete stack. 1.1.2. An elaborate procedure for accessing mandatory and optional byte should be provided. e.g. a separate communication query or by providing message for device profile. With this, at Charger controller level, universal driver can be designed to ensure interchangeability and interoperability. 1.1.3. Metering accuracy in charger should be defined. Is a separate meter required or the does same functionality need to be built in Charger control board? Tamperproof features may be defined.		Document addresses	The required standards to be referred to for completion are specified in the document.
		Central Management System (CMS) & Charger: OCPP Protocol	1.2.1. If there are different operators managing different CMS, the data structure for all communications between CMS and Charger must be common/ same. (Hence, for EV Chargers, we must have national level uniformity at the initial stage itself so that serviceability, Interoperability and training of manpower is made simple.) 1.2.2. While defining the protocol like OCPP, consideration may be given to other grid protocols to have cohesive approach to entire smart grid structure.		General Comment	yes, standardisation helps. Following OCPP by all, will ensure interoperability and interchangeability. Other protocols may be integrated as an when required
	Environment related		2.1. Storage temperature specified is 0 to 60 deg C. Due consideration should be given to extreme ambient conditions prevailing in some parts of India. 2.2. IP54 construction may not be suitable for many locations like outdoor. For such cases suitable ingress protection category needs to be specified. 2.3. EMI/EMC requirements need to be specified.		Rephrased	a. 0 to 55 deg is the range, going to a wider range is not an issue. B. IP55 will be updated in the document c. EMI/EMC as per AIS 138
SMEV	AC charging connector		Under voltage protection and spike protection required		Document addresses	Included as per AIS 138, already in specs
			BHIM application is mentioned other e wallets platforms to be available		Not Recommended	epayment confirming to wider coverage

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
	DC charging		48 and 72 V only ,60 V is omitted		Rephrased	48V to 72V ; 3.4 and 3.14 Output Requirements : 1) Output Details : Suitable for 48 V/60 V/ 72 V Nominal battery voltages
			as some of the manufacture's coming with Battery that will be 60 V, so charging infrastructure to have DC 60 V spec as option		Rephrased	same as above
			Vehicle connectors to have DC connector GB/T 20234.3 as standard and Charger one end will need to be modified. Separate charging for 48, 60, and 72 V required with IEC 60309 Connector support. VIN no is being acquired at charging station can be relayed via GPS for leasing mechanism. Vehicle Distance km data is being acquired by station – data to be shared to battery and vehicle manufacturers if necessary.		Not Recommended	Connector details to be forwarded by SMEV, committee will deliberate on it
				Others:		
Novateur Electric & Digital Systems (LEGRAND) (Contact Person: Rajkumar Panicker, GM)	1.2.1	Private chargers	For domestic IEC 60884-1 socket standard to be mentioned	Inline with conductive EV charging systems as per IEC 61851-1	Not Recommended Rephrased	15A current drawing is standradised in India Rephrased as " IEC 60309 Industrial connector to be used and existing Indian safety guidelines should be followed. "
	1.3	Charger classification	As per UE regulation it should be classifed into normal and fast as normal EV and Light EV(2wheeler) should not in same category and it should be classified in to normal chargers up to 22kW and fast chargers beyond 22kW	In Light EV category only classification in E26practical not above 3.7kW.	Not Recommended	committee has decided for the classification that makes best sense.
	1.4	AC chargers	On board Charger	Domestic socket on infrastructure and domestic socket on EV side it is really the best solution to allow charging everywhere with 2.5-3kW	Not Recommended	domestic sockets are not best suitable for EV charging.
	1.6.1	OCPP	OCPP to be replaced with V2G in future	In Europe OCPP is replaced by ISO 15118 (EV and DC charging station) it will be the best solution to deal with the next step "VE to Grid" (V2G).	Not Recommended	V2G guidelines are not included comitte may consider for high voltage vehicles
	2.3(v)	Out put connector	In IEC in mode 3 charging system, IEC 61851-1 standard promote "type 2" plug and socket complying IEC 62196-2.	Because P&S system is really designed to support a continuous charging current (6 hours or more) and no specific test included in IEC 60309	Not Recommended	The present specifications address power upto 3.3kW with IEC 60309 connector
	2.3(vii)	RCD	DP RCD 30mA should be mandate	For Human Safety	Documentaddresses	already there
	4	References	IEC 61851-1: Edition 2.0 2010-11, to be replace with Edition 3	Edition 3 is the latest	query	
	4	References	IEC 62196-3, Plugs, socket-outlets and add IEC 62196-2 for mode 3 in AC charging systems	IEC 62196-2 for mode 3 in AC charging systems	query	

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
	4	References	ISO 11898-2,(ISO 15118 Ed 1)			
		Annexure A	IS 60309(Part 1): 2002/ IEC 60309-1:1999,	Very old standards not adapted to continuous charging current (15A and more)	query	
Charge Dock (Contact Person: Ashwin Mohan Gautham, Founder)	DC Fast Charging Stations:		GB/T being used only on a couple of Vehicles as of Today (example E20/E20 Plus P8/ E-Verito Fleet variant only)		General comments	No suggestions made
			Charging Station are Bulky & occupies substantial space at locations that decide to host the charger		General comments	
			May not be compatible with vehicles launching in the future (Ex Nissan Leaf that comes with CHAdeMo, BWM i3 Chevy Bolt & etc.)		General comments	
			GB/T charging stations will cannot be used by regular consumers (Since they will not have the GB/T connector on vehicle)		General comments	
			High Capital Burn for any company of any size or the government		General comments	
			Connector is pretty large to be used on all vehicle types		General comments	
			Lower efficiency due to conversion of power from AC to DC on charger		General comments	
	AC Fast Charging Stations		IEC 62196 Type 2 Connector is capable of both AC Slow (230v Phase) & AC Fast Charging (415v @ 63A max – 3 Phase)		General comments	
			1 single port/cable to charge at home & at public locations		General comments	
			AC Fast Charging parameters as listed by ARAI (As listed in AIS 138 Part 1) creates the aspect of commonality. This means any vehicle from a 2 wheeler, 3 wheeler & 4 wheeler can charge on the same Charging Station, irrespective of make & model.		General comments	
			Reduces risk on ROI for the location hosting the charger		General comments	
			Charger costs need not be footed by any specific organization or government		General comments	
			Using IEC 62196 Type 2 connector will ensure that even regular consumers can use the public charging infra. Thus increasing adoption & reducing costs		General comments	
			Size of AC Fast chargers are 40% that of DC Fast Charging Stations. – Occupies less space & we can add multiple chargers (To charge up to 3-4 vehicles simultaneously)		General comments	
			Removes the need of having 2 different connectors on vehicles (AC Port for slow charging & DC port for fast charging will not be needed)		General comments	
			Achieves same speed of charging as DCFC stations (Up to 22Kw)		General comments	
			Higher power transfer efficiency		General comments	
			Multiple Levels of Safety for user, charging station host & hardware itself		General comments	

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
SIAM	1.2.1	Private charger:	In line with AIS 138 P1 - IEC 60309 connector on EV vehicle side should not be mandatory, connector at charger side can be standardized & EV left with manufactures as per individual configurations.inlet side need to be		Recommended/ Rephrased	1.2.1 to be changed accordingly
	1.4	AC Chargers	In line with AIS 138 P1 provision for higher power rating need to be kept.		Not Recommended	The present scope of specifications is limited to 3.3kW.
	2.3	Limiting output current	IEC60309 blue connectors are rated for 20A. PMAO outputs should be 16 A because circuit breaker trip point should be at a higher level to let 15 A continuous charging without spurious tripping and also as per IS1293, the rating of household plugs is rated for 16 A continuous. a. Also, clarity is required on who should reset the circuit breaker. If that is the customer, then the procedure and the mechanism should also be specified.		Recommended/ Rephrased	Tripping at 16A for circuit breaker is acceptable Reset for the circuit breaker should be done by the operator.
	2.3	Socket readiness	The LED indication for socket readiness needs further clarification. a. If one user connects the charger on phase A, will the LED on phase B immediately light up to indicate that Phase B can be used? b. Expected operation after LED failure needs to be specified.		Rephrased for clarity	a) Three LEDs , One LED for each Phase/socket shall indicate the readiness/ In-use status b) LED failure/ LED not glowing shall mean that the socket is not ready.
	2.3 xi	Isolation	Isolation resistance or equivalent standard to be mentioned.		Rephrased for clarity	Report text may be modified as " Isolation : Charger shall comply to class 1 or Class 2 insulation class as defined in AIS 138-1 3.3.1 and 3.3.2 "
	2.4	User interface and Display requirements	In the specified IEC60309 connector, there is no provision for alternate communication lines. Hence without communication between PMAO and vehicle, it will not be possible for the PMAO to display SOC and time to charge.		Recommended	2.4 iv : Remove Time to charge 2.4 vi : Remove SOC
	2.4 I	Visual Indicator	Need to specify the appropriate symbols and its colour's or equivalent standard.		Not Recommended	Indicator types are left to the vendors as per their creativity
	2.4 II,	Display Messages	User also should be communicated vis display message for sequence of charger connection with vehicle. Like Insert the charger, ensure park brake applied in vehicle, switch on the charger. Like pre-charge communication.		Recommended / Rephrased	2.4 ii : Suggestive sequence of charger operation

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
	2.4 ix,	Emergency stop switch	Need to be specified the mounting height from ground, location and its visibility of the switch at the charging station. Access during of necessary emergency.		Recommended / Rephrased	2.4 ix : To be added " Visible and easily accesible"
	2.4 x,	Display and Touch Screen Size:	The LCD display could be made optional. Insisting on a touch screen capable of withstanding 0- 55 deg C and kept in open air directly exposed to sun and dust could increase the cost of charging stations. The display can be non-touch switch base also.		Not Recommended	
	2.6	Protection and Safety Requirements	It is recommended that PMAO monitor the power factor and Total Harmonic Distortion of the current drawn by the vehicle and stop charging if the power factor goes below a threshold (0.95) or THD goes above a threshold (6%).		Not Recommended	New point to be added 2.6.4 iv : Charger Interruption The PMAO shouild monitor the Power factor and Total Harmonic Distortion of the current drawn by the vehicle and stop charging if the power factor goes below a threshold (0.90) or THD goes above a threshold (6%).
	2.6	Protection and Safety Requirements	The minimum mating cycles for connector should be 10,000 cycles for current interruption at rated load at 35 deg C ambient temperature. The temperature rise at end-of-life should be less than 30 deg C			TBD
	2.6.2	Start of Charging	It is not clear how the connector disconnection is sensed by PMAO controller. Normally connector presence is sensed by additional two proximity sense lines. In the specified IEC60309 connector, there is no provision for alternate communication lines		query	by way of limit switch as 60309 does not have pilot communication
	2.6.3	Power failure	In the event of power failure and subsequent resumption, re-authentication will be necessary to validate that the same vehicle is still connected to the charger. This again needs that the PMAO monitors the status of connector attached to the charging connector		query	Yes this is true
	2.6.4	Interruption of Charging	This also needs to sense the presence of charging cable. Secondly, duration for charging temperature beyond 80 deg C needs to be mentioned		Recommended	Duration : <10 sec
	2.7.1	Suggested Cable Security	For interoperability, the PMAO connector locking mechanism dimensional details should be specified in the standard, both for the PMAO socket and cable plug		Not recommended	
	2.7.2	Mechanical Stability: IP Ratings:	IP rating must be minimum IP 67 due to rainy wind condition and user may have wet condition hand		Not recommended	As per AIS 138
	2.8 i	Environment Requirements:	Ambient Temperature Range: Indian ambient consideration in automotive up-to 60 deg C in socking condition		Not recommended	As per AIS 138

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
	2.8 iv	Environment Requirements	Storage temperature: It is recommended to have storage temperature specification as -30 deg C to 60 deg C to facilitate air shipment of PMAO equipment.		Not recommended	
	2.9 l. c	Authentication	It is not clear how authentication can be ensured before stop of charge, if the user suddenly pulls the charging plug out.		query	This clause specifies communication between PMAO and CMS for User authentication before charging and billing authentication after charging as per OCPP
	3.4 I	DC Output voltage	The charger voltages need to be consider higher than the battery voltage. And need to specify the tolerance as well.		Rephrased	48V to 72V ; 3.4 and 3.14 Output Requirements : 1) Output Details : Suitable for 48 V/60 V/ 72 V Nominal battery voltages
	3.4 iv	Power factor	Minimum power factor should be specified as 0.98. Lower power factor will cause system stability issues as the number of charging stations grow exponentially		Not recommended	May be considered for future enhancements
	3.7	Mechanical Requirements	The vehicle inlet connector should have a locking mechanism, similar to the one specified in 2.7.1. To ensure functional safety, this locking mechanism should be automatic, and its state should be sensed by the EVSE and the vehicle controller		Not recommended	The scope is under AIS 038 for functional safety, Post acceptance the same can be reflected in the specifcations
	3.7	Mechanical Requirements	The minimum mating cycles for connector should be 10,000 cycles for current interruption at rated load at 35deg C ambient temperature. (Connection I disconnection every hour for 16 hours per day, 300 days per year, for 2 years' life). The temperature rise attend-of-life should be less than 30 deg C		TBD	TBD
	3.8	Protection Requirements	It needs to be mentioned that connector terminals are mounted with temperature sensors to avoid burning of connectors and safety mechanism to trigger switching off of the charging >80°C. In such situation, an appropriate signal will be sent to turn the switch/relay OFF in order to stop the charging. Once disconnected, the charging session terminates.		query	Yes
	3.13, 2	User Interface and Display Requirements:	Emergency stop switch: Location definition of this emergency switch is must.		Rephrased	2.4 Ix : To be added " Visible and easily accesible"
	3.1.4, Table 2,	Input Requirements:	Supply side AC Connector for Input: Supply side connector for EVSE should not be specified, as this is to be interfaced with the grid. In any case IEC 62196 connector is used for vehicle inlet connector.		Recommended	To be removed
	3.1.4, Table 2	Cable Requirements:	The charger unit must have separate CAN isolator due to stub length issues.		Not Recommended	
	3.1.4, Table 2	Mechanical Requirements:	IP 67 will be preferred		Not Recommended	
	3.1.4, Table 2	Protection & Safety Requirements:	Prevention of vehicle movement is function of vehicle.		Recommended	to be removed
	ANNEXB2.2	Application Layer:	29 bit is higher for current OEM's models. 11 bit is recompensed to avoid separate gateway development from OEM's		Not recommended	
	ANNEXB3.2	PGN512 MESSAGE FORMAT:	Reserve bytes can be increased to 4 bytes.		Recommended/ rephrased	To be modified

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
DHI			1) The purpose of communication of parameters like SoC is not clear. Such a communication protocol is not followed globally and it will lead to increase of cost for both the charger and vehicles. The vehicles in-built architecture already provides such information to a user.		query	SoC is a part of IEC 61851-24B and AIS 138-2 Annex B
			2) With respect to AC charging outlets (PMAa), it would be relevant to consider output power of upto 10 KW as such vehicles are available in India today. Provision and flexibility for such requirement may be kept in the proposed specifications in accordance with AIS 138		Not recommended	The scope is presently restricted upto 3.3kW
			3) In respect of DC chargers, communication between an EV and Charger (EVSE), various parameters like VIN, Battery Type, SoC, Last Charge Status etc. are suggested as mandatory. Such mandatory requirement s would call for compatible vehicles and Battery Management System architecture that will require developmental and validation efforts and hence will lead to cost escalation. Globally, there are no such requirements of the aforementioned parameters. Therefore, standard parameters from the IEC protocol for communication between EV and the charger (EVSE) only should be mandated.		Not recommended	The parameters are required for India Specific charging infrastructure, VIN to be mandatory, battery type and last charge status will be an option with charging infrastructure provider. Fault analysis is important and these parameters are needed for propoer analysis. Rephrase in document: "These parameters may or may not be used by the charging operator."

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
			4) For both AC & DC chargers, although the safety and functional requirements of chargers (and connectors) are cross referred to AIS 138 (part 1 and Part 2) , however, the report has not provided recommendations with respect to certification of such chargers and connectors to be deployed for public use. For manufacturer of chargers and connectors, this aspect needs to be addressed keeping in mind the safety perspective of vehicle users and public at large. This would also be important from the point of view of long term image of use of electric vehicles with no safety risks.		recommended	Clause for Certification to be added
			5) Considering the chargers also function on different modes with each mode having a different net energy consumption, the following type of charging are recommended for consideration: - Constant current - Constant current constant voltage Taper charging		document addresses	
			6) It is understood that the chargers are to be designed to function on the sac reading but believe sac readings can be unreliable and should not start/stop the charging process. The commutative DC kWh input could be used instead.		query	BMS takes care of the battery charging.
			7) Provision for details regarding the operation of charging lock and determination of a "fully charged" vehicle.		query	Determination of battery capacity is done by BMS. Charging mode is also decided by BMS
			8) It is good that communication of EVSE and CMS is based on OCPP. It is recommended that version 1.6 or latest version to be used, as the latest is 1.6 and 2.0 is also coming out this year.		The document adresses	OCPP1.5 is upgradable to OCPP1.6. The specification mentions to use OCCP1.5, if 1.6 is implemented, it must be compatible with OCPP1.5.

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
			9) Payment data should not be stored on the controllers of EVSEs but in CMS systems. • Storing the information in controller will lead to the need of using 1 hour UPS devices to provide energy during power loss. • This is an unnecessary cost for the EVSE if all payment transactions would be initiated and carried out in CMS systems.		The document adresses	The payment database is maintained at CMS
			10)Clause of 3 phase input connection to be divided to 3 outlets. It is recommended that the Mode 3 Type 2 connector which also provides the capability to do 3 phase charging may be used and ere are cars on the market equipped with 3 phase chargers So this will be a multipurpose solution.		Not recommended	The scope is limited to 3.3kW power 3 Phase may be considered for High voltage/power
			11)There is a reference to identifying car by VIN number and no standard is mentioned for this. Therefore ISO / IEC 15118 communication standards are recommended for this.		document addresses	VIN Number is specified as per AIS 138
			12)The charger is having safety feature & electronic controls which takes care of on/off and emergency situation so he emergency stop button & the start and stop button is not required (cost saving).		Not recommended	The committee recommends to have Start Stop and Emergency buttons for safety reasons
			13) A charging standard at 2.5 KW will be adequate for electric scooter or electric bikes, however it will be inadequate for Hybrid cars which would need a minimum of 4.0 KW (20A) or Full Electric cars which would need a minimum of 7.2 KW. Globally AC charging standards are in the range from 4.0 KW to 22.0 KW. A charging standards on global lines could use all the products &, solutions which have been already developed globally hence reducing the cost of deployment for India.		Not recommended	The scope is limited to 3.3kW power 3 Phase may be considered for High voltage/power

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
			14)A DC charger of 10.0 KW would be too small for fast charging. For Public fast charging solutions it is recommended to have OH charging range from 20.0 KW to 50.0 KW DC.		Not recommended	The scope is limited to 3.3kW power 3 Phase may be considered for High voltage/power
			15)With respect to DC chargers (upto 100 Volts), while chargers may be deployed with the proposed specifications as an immediate measure to cater to current fleet of EVs, it is important to consider evolution of the specifications like integrated AC/DC Chargers and also the prospect of PPP or Private investments in this area considering needs of current vehicles and future EVoptions.		Recommended	To be considered for future evolutions
			16) For DC fast chargers (more than 100 Volts), it would be necessary to adopt global practice of having multiple connector (as per IEC 62196)/output options (DC Fast, AC fast and AC Slow) in the same charger in order to have a cost-effective and efficient utilisation of investments into setting - up of charging infrastructure.		general comment	The suggestion is well taken for charging requirements greater than 100v. To be furthur deliberated, One can always combine AC charger and DC charger at one place as per the given standrad. There is no restriction imposed.
			17)The standards for AC and DC should be such that they are universal and promote the growth of EVs in India while reducing the driver friction and giving them a superior user experience. There should be one standard for AC which should be independent of the Charging Station Power. This means there should not be one AC standard for 3.5 kW and a different one for 7.4 kW. the same concept should hold true for DC charging as well.		Not recommended	Categorisation is done keeping availibility and demand , launch plans of EV in India which may be in phases.

Company	Section No.	Current Clause	Suggestion by Company	Reason for Change	Recommended / Not Recommended	Remarks/committee discussion on
			18)For electric vehicles IEC 60309connector is an old-style industrial connector, difficult to handle and does not provide for remote temperature sensing. Therefore, IEC 62196-2 (Type 2) connector, which is much more desirable alterative from a user's perspective, is recommended. The IEC 62196-2 (Type 2) also allows for broader set of controls (locking) and safety functions when combined with IEC 68151 & IEC 62196 specifications. Adopting these specifications eliminates the need for any external buttons 9Start(stop or E-OFF) as well as specifies protocols for most of the features asked for in the current requirement document.		Not recommended	IEC 60309 is recommended upto 3.3kW AC Charging Type 2 may be considered by comitte for High power AC Charging
			19)The IEC 62196 type 2 connector type can support their 'slow ac', 'fast ac', and other protocols.		Not recommended	IEC 60309 is recommended upto 3.3kW AC Charging Type 2 may be considered by comitte for High power AC Charging
			20) For 4-wheelers an AC charger of at least 7 kW is desirable. As batteries become bigger, anything les than 7kW may be frustrating for a EV driver. teh cost of a 7kW Ac charger (including equipment and installation) is not much more than a 3.5 kW AC charger.		Not recommended	The scope is limited to 3.3kW power

2017

6. Extract of MoM of CMVR-TSC for adoption of Bharat Public EV Charger Specifications

PUBLIC AC METERED OUTLETS AND PUBLIC DC FAST CHARGERS

Minutes of 49th Meeting of CMVR-TSC held at MoRTH, on 2nd May 2017 under the Chairmanship of Shri Abhay Damle, JS (RT) at MoRT&H, New Delhi

List of participants is attached as **Annexure-I.**

1.0 Chairman, Shri Abhay Damle (JS-RT) welcomed the members and requested Secretariat to take up the Agenda for discussion.

2.0 Confirmation of Minutes of previous meeting :

The Committee was informed that the minutes of 48th meeting of CMVR-TSC were circulated vide letter HMR/48-CMVR-TSC/A-288 dated 20th March, 2017 and that comments were received from CIRT and SIAM. The committee deliberated on the same and following decisions were taken:

i) CIRT Comments (on Para 3.0 (a) (ii)): The subject of definition of leg space specially with respect to passage in front of emergency exit to be addressed while considering the revision of Bus Body Code and that the revision will be aligned with UN R 107. Further CMVR 128 will be modified with the understanding that Buses meeting AIS-052 (Rev. 1) will be exempted from requirements under CMVR 128. Ministry will issue the notification in this regard.

ii) SIAM comments: Comments with respect to AIS-140 (Para 3.0 (b) (ii) of the minutes were accepted and the modified Para is attached as **Annexure-II**. Further comments on Limited validity Type Approval Certificate / Provision of additional quality checks during CoP (Para 13.0) were withdrawn.

With above considerations, Committee approved the minutes.

3.0 Report from AISC : Amendments to AIS for deliberation / adoption :

Secretariat informed that following amendments were approved in the 54th meeting of AISC and requested the Committee for discussion and adoption:

(i). **Amendment No. 5 to AIS-029 (Survival Space for the Protection of the Occupants of the Cab of a commercial Vehicle)** :The amendment is proposed for bringing clarity on compliance to front impact test (Test A) in AIS-029 when N1 vehicle meets AIS-096 or IS 11939 or AIS-098 frontal crash requirements.

(ii). **Amendment No. 1 to AIS-134 (3 Wheeler Occupant Safety)** : Proposed amendment is with respect to seat base height, head room, seat back height and provisions for entry of passengers from rear of the vehicle.

(iii). **Amendment No. 8 to AIS-063 (School Bus)** : The amendment is proposed for giving reference of AIS-023 for approval of seats except for parameters, width and depth, which are exclusively defined in AIS-063.

(iv). **Amendment No. 1 to AIS-125 (Part 1) (Ambulance Code)**: The amendment is proposed to include a figure specifying characteristics of test pulse required for vibration testing of stretcher.

The Committee noted the above proposals and after due deliberation adopted the above amendments.

7.0 Document for I&C Centers :

Secretariat informed that earlier committee under Shri B. Bhanot had formulated procedure and draft notification for vehicle fitness checking at Authorized Testing Stations for in-use vehicles. Chairman highlighted the need for converting the same into a Reference Document which could further be notified under CMVR. Chairman requested Shri Bhanot, to finalize the same along with Shri Priyank Bharti, Director MVL.

8.0 Registration of Mobile Truck Mounted Cranes under CMVR :

Secretariat informed that Ministry has received request from M/s TIL Limited with respect to issues faced by their customers for registration of truck mounted cranes with the road transport authority through e-Vahan. Shri Pinaki Niyogy, TIL, explained that TIL operates under the following two scenarios:

(i) Trucks are bought from OEMs and fitted with cranes on top of such trucks.

(ii) Aggregates are sourced from different suppliers and crane is built which falls under the CEV definition.

It was informed that in the first case though vehicles bought from OEMs are type approved however after the retro fitment the vehicle is not homologated again and since the vehicle has already been registered once in Vahan portal it cannot be re-registered after the retro fitment. Committee noted the information and informed Shri Niyogy, that since retro fitment is done on a type approved vehicle the characteristics of the vehicle are altered and therefore vehicle needs to be homologated first. Chairman requested TIL to review the same with Shri A. A. Badusha of ARAI and the Ministry be informed accordingly.

9.0 Specifications for Charging Station for Electric Vehicles :

Shri A. A. Deshpande, ARAI, presented the status on the subject. His presentation is attached as <u>Annexure-VI</u>. He informed that Department of Heavy Industries (DHI) has set up a committee of experts under the Chairmanship of Prof. Ashok Jhunjhunwala for the purpose of standardization of EV Chargers. He highlighted the chargers classification, viz., Bharat EV charger – AC001 and Bharat EV charger – DC001, their specifications, communication protocol and the billing / payment system. Shri Deshpande informed that test requirements for these chargers are specified in AIS-138 (Part 1 and 2).

Prof. Jhunjhunwala informed that presently Chargers are specified upto 3.3 kW (for AC Charging) only considering the present on-board charger capacity available on different type of vehicles and 100 VDC, 10/15 kW (for DC charging). Higher power AC and DC chargers will be defined in due course and that inputs will be sought from the Industry for the same. Further, he requested SIAM to share its inputs on low cost connector for 2 Wheelers. The committee approved the specification and requested to work to complete the specifications for all categories of vehicles keeping in mind technology neutrality.

10.0 New AIS and Safety Road Map of Standards for Construction Equipment Vehicles :

Shri A. A. Badusha, Convener, informed that Roadmap for implementation of safety standards for CEV was discussed and approved in the 43rd meeting of CMVR TSC, held at MoRTH, on 5th January 2015. He stated that in earlier approved notification two ISO standards, viz., ISO: 3450 (2011) and ISO: 5010 (2007), were referred which were subsequently taken up by BIS to convert to IS standards. However, due to delay in printing of the finalized draft standards, the standards are now finalized as following AIS standards. The same were discussed and approved in the 54th meeting of AISC held on 13th April 2017.