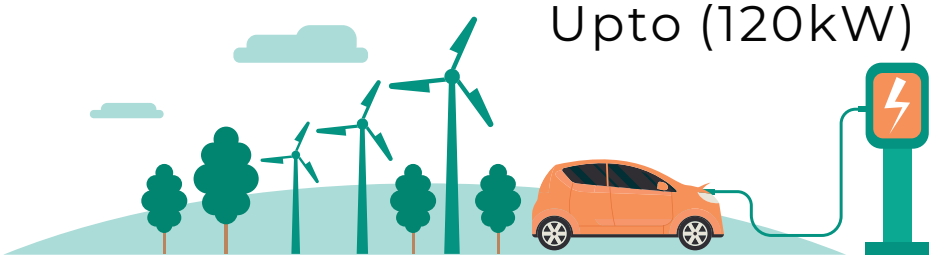
विद्युत मंत्रालय
MINISTRY OF
POWER
सत्यमेव जयते

STAR LABELING

for

DC Electric Vehicle Supply Equipment

Upto (120kW)



ELECTRIC VEHICLE SUPPLY EQUIPMENT

1. SCOPE

This schedule specifies energy labelling requirements for DC-output Electric Vehicle Supply Equipment (EVSE) as defined in IS 17017-1 for charging electric road vehicles, with output power less than or equal to 120 kW, rated supply voltage of up to 1000 V a.c. or up to 1500 V d.c., and rated output voltage up to 1500 V d.c., being manufactured, imported, or assembled for the purpose of commercial sale and installation in India.

The following products are excluded from the scope of this energy labelling schedule:

1. Wireless/Inductive EVSE
2. Equipment on the electric vehicle

1.1 In particular, this schedule specifies the following:

1. Scope
2. Reference Standard
3. Terminologies
4. Testing Parameters
5. Testing Guidelines
6. Test Report
7. Tolerance
8. Pre-Qualification Requirements
9. Rating Plan
10. Fees
11. Label Contents
12. Check Testing

2. REFERENCE STANDARD

This schedule shall be read in conjunction with the following standards for the purpose of energy labelling program.

NOTE: The latest version of these standards with all amendments are to be followed.

Table 1: Reference standards

S.No.	Reference Standard	Title of the Standard
1	**IS 17017 (Part 1)**	Electric Vehicle Conductive Charging System part 1 general requirements
2	**IS 17017 (Part 2-Sec 3)**	Electric Vehicle Conductive Charging System Part 2 Plugs, Socket, Outlets, Vehicle Connectors and Vehicle Inlets Section 3-Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and contact-tube vehicle couplers
3	**IS 17017 (Part 23)**	Electric vehicle conductive charging system part 23 d.c. Electric vehicle supply equipment
4	**IS/IEC 61683**	Photovoltaic systems - Power conditioners - Procedure for measuring efficiency
5	**IS 12360 / IEC 60038**	Voltage bands for electrical installations including preferred voltages and frequency
6	**IEC TS 61439-7**	Low-voltage switchgear and control gear assemblies - Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations
7	**CEA Regulation 2023**	'Technical Standards for Connectivity of the Distributed Generation Sources' Regulation-2023

3. TERMINOLOGIES

For the purpose of this schedule, the following definitions related to EVSE are given:

3.1 Electric Vehicle Supply Equipment (EVSE): EVSE means an element in electric vehicle charging infrastructure that supplies electric energy for recharging the battery of electric vehicles.

3.2 Operation Mode: Condition during which the EVSE equipment is performing the primary function, i.e., providing current to a connected load.

3.3 No Vehicle Mode: A condition when the equipment is connected to the power source but is physically disconnected from the vehicle.

3.4 Test Load: An artificial load such as a resistive load, an electronic load and a voltage source (for example, battery), or an actual EV shall be used during the test as specified in IS 17017-23 : 2021.

3.5 Standby Power: The electrical power consumed by EVSE when it is not performing its primary function but is in a standby mode, which may include maintaining internal configuration in a state of readiness to respond to external commands.

3.6 No Load Loss: Input power of the EVSE when its load is disconnected, or its output power is zero.

3.7 Power Conversion Efficiency: The instantaneous DC power supplied from the charger divided by the instantaneous AC power delivered to the charger.

3.8 Weighted Average Energy Efficiency(η): It is calculated as the sum of the products of each power level efficiency and related weighting coefficient.

3.9 State of Charge (SOC): SOC is the available capacity in a battery module or system. State of charge is expressed as a percentage of rated capacity.

3.10 Star Rating: The number of stars displayed on the Star label. The available stars are between a minimum of one and a maximum of five, shown in the one-star intervals. The star rating is calculated from the Star Rating Band based on weighted average energy efficiency.

3.11 Label: Any written, printed, marked, stamped or graphic matter affixed to, or appearing on the product and the packaging provided always that the product inside the packaging to which the label is thus applied conforms to every requirement of this schedule.

3.12 Label Validity: It is the label validity period of the efficiency standards provided under the star rating plan as specified in the schedule.

4. TESTING PARAMETERS

The schedule defines test parameters for calculating the Weighted Average Energy Efficiency for DC-output EVSE.

4.1 Input Power: The AC power delivered to the EVSE from the electrical grid, it is usually measured at the input terminals and expressed in Watts.

4.2 Output Power: The DC power delivered by the EVSE to the electric vehicle battery for charging, usually measured at output terminals of the EVSE and expressed in Watts.

5. TESTING GUIDELINES

5.1 Methods of Tests: The methodology and the test protocol for measurement of power conversion efficiency of EVSE have been specified in this schedule in alignment with IS 17017 series, until BIS publishes a test standard on the same. The star rating allotted under this scheme shall be based on the weighted average energy efficiency (η) of the EVSE determined as per the test procedure specified in this schedule.

5.2 Instrumentation: The instruments for measurement of voltage, current, temperature and time shall be according to IS/ISO/IEC 17025 and IEC Guide 115. These instruments include voltage and current meters, power factor meters, frequency meters, harmonics analyzers, and a power analyzer.

5.2.1 Power Meter: Power meters shall possess the following attributes:

a) Number of Channels: Minimum 4 input channels sufficient to measure all input current.

b) Crest Factor (applicable to AC-input only):

I. An available current crest factor of 3 or more at its rated range value; and

ii. Lower bound on the current range of 10 mA or less.

c) Minimum Frequency Response (applicable to AC-input only): 3.0 kHz

d) Minimum Resolution: 0.1 W for measurement values less than 100 W; 1.0 W

for measurement values greater than 100 W.

e) Accuracy: +/- 0.1% of reading PLUS +/- 0.1% of full scale

f) Measurements: Average Power (W), Power Factor (PF), Apparent Power (S), Voltage (RMS), Current (RMS), Frequency (Hz).

5.3 Test Setup:

5.3.1 Test Room: The test room shall be kept at ambient temperature from the time that testing begins, including preparation work, until the testing is completed. No additional cooling or ventilation shall be provided for the test sample unless required for safety.

5.3.2 Relative Humidity: As per IS 17017-23, all tests shall be carried out at relative humidity between 10 percent to 90 percent (without condensation).

5.3.3 Atmospheric Pressure: As per IS 17017-23, all tests shall be carried out at an atmospheric pressure between 86 kPa and 106 kPa (86 kPa).

5.3.4 Ambient Test Temperatures: The ambient temperature should be set at 27°C ± 2°C. Once the ambient temperature has been attained, the DC EVSE unit shall remain in the test chamber at the specified temperature for 15 minutes prior to power testing.

5.3.5 AC-input supply requirements: Power to the tested device shall be according to IS 12360 if designed to be supplied by a utility supply network.

a) **a.c. power frequency:** 50 Hz ± 1 Hz;

b) **a.c. power voltage:** 240/415 V ± 10 %;

c) **d.c. component on a.c. power:** the offset shall be less than 2 % of the peak value;

d) **degree of voltage unbalance on a.c. power:** shall be less than 5 %; and

e) **a.c. power waveform:** shall be sinusoidal, with a distortion factor less than 8 %.

5.3.6 Power measurement: Voltage and current measurements shall be made at the locations as shown in Figure 1. If necessary, fabricate an input wiring apparatus so that measurements can be made without modifying the EVSE input cord(s).

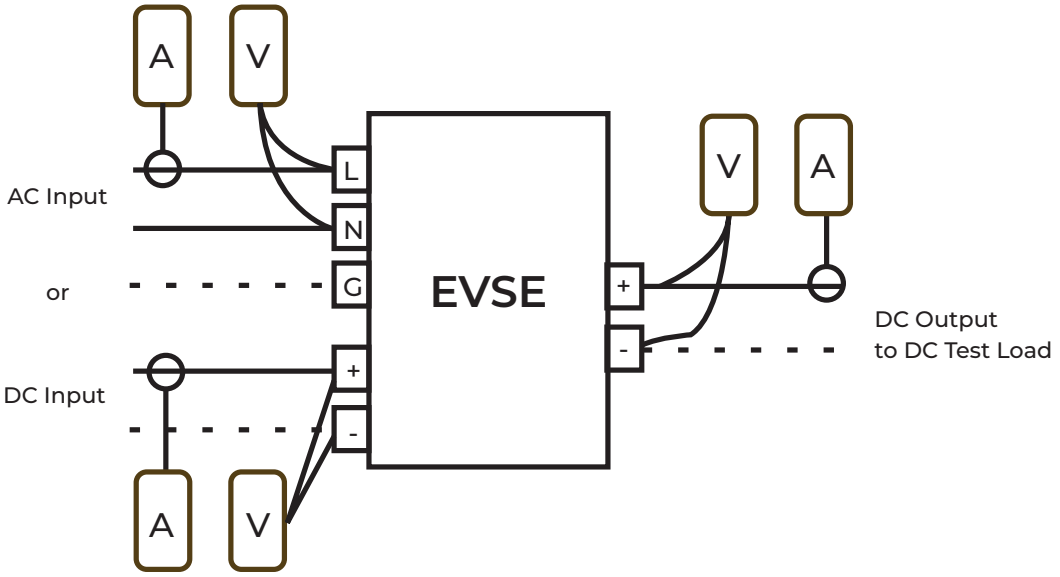


Figure : Schematic for power measurement

5.3.7 Test Load: An artificial load such as such as a resistive load, an electronic load and a voltage source (for example, battery), or an actual EV shall be used during the test as specified in IS 17017-23 : 2021.

5.4 Test Procedures:

5.4.1 Preparation: Prior to the start of testing, the DC EVSE unit shall be initialized as follows

a) Set up the DC EVSE per the instructions in the supplied product manual.

b) Connect an artificial load, such as a resistive load, an electronic load and a voltage source (for example, battery), or an actual EV.

c) Connect a four-channel power analyzer to the input and output supply.

d) Determine the maximum available output power of the DC EVSE by connecting artificial load, such as a resistive load, an electronic load and a voltage source (for example, battery), or an actual EV to communicate with the DC EVSE via the protocol defined for the connector type intended to ship with the product.

e) Provide input power to the EVSE input connection(s) as specified in Section 5.3.5 of this schedule.

f) Power on the DC EVSE unit and perform initial system configuration, as applicable.

g) Ensure the DC EVSE unit's settings are in their as-shipped configuration, unless otherwise specified in this schedule.

h) Report the test room ambient temperature (27 ± 2° C) and relative humidity (between 10 percent to 90 percent).

5.4.2 Charging Mode Efficiency: The test procedure for measuring the power conversion efficiency of DC EVSE shall be performed in the following way:

a) Set up the DC EVSE with input from a 3-phase/1-phase AC power supply and output to a test load through a test load as per section 102.2.3 of IS 17017-23.

b) Connect the necessary measuring instruments to the input and output of the DC EV charger.

c) Set the input voltage level to the rated value as per product specification.

d) Engage the load and draw load equal to Loading Condition 1 as specified in Table 2 for 5 minutes or more.

e) Record/Measure the following input parameters:

- Input voltage
- Input current
- Input power factor
- Input active power
- Input reactive power
- Input apparent power (vector sum of apparent powers of each phase)
- Input frequency
- Input harmonics
- Total active power (sum of active powers of each phase)
- Total reactive power (sum of reactive powers of each phase)
- Total apparent power (vector sum of apparent powers of each phase)
- Total harmonic distortion of voltage and current at each phase (up to min. 40th order)
- No Load Loss

f) Record/Measure the following output parameters:

- DC output voltage
- DC output current
- DC total output power
- DC output ripples (current and voltage)

- Stand by Power Loss

Table 2: Loading Conditions for EVSE under test

	Test Conditions	Example for 50 kW	Example for 60 kW	Example for 120 kW
Loading Condition 1	10% of Maximum Available Output Power ± 2% and 350 V ± 7 V	5 kW	6 kW	12 kW
Loading Condition 2	100% of Maximum Available Output Power ± 2% and 350 V ± 7 V	50 kW	60 kW	120 kW

g) Repeat the measurements for the two loading conditions in Table 2 that are less than or equal to the full current output capability of the EVSE under test in sequence of lowest output power to highest output power from Loading Condition 1 and 2 for AC-input and DC-output. If a EVSE under test cannot achieve the rated output power at the voltage listed, it shall be tested at the lowest voltage required to achieve the loading condition specified (in terms of rated output power).

5.5 Calculating Rating Parameter:

The star rating parameter for DC Output Electric Vehicle Supply Equipment shall be Weighted Average Energy Efficiency.

The loadings considered for calculating Weighted Average Energy Efficiency shall be 10% and 100% of rated output power.

The method for calculating the star rating parameter for energy labelling of DC EVSE shall be as per the following equation:

$$Eff_{AVG} = \frac{0.67 \times P_{out,10\%} + 0.33 \times P_{out,100\%}}{0.67 \times P_{in,10\%} + 0.33 \times P_{in,100\%}}$$

Where:

Eff_{AVG} is the Weighted Average Energy Efficiency.

$P_{out,10\%}$ is the **output power** measured at 10% loading at the ambient temperature.

$P_{out,100\%}$ is the **output power** measured at 100% loading at the ambient temperature.

$P_{in,10\%}$ is the **input power** measured at 10% loading at the ambient temperature.

$P_{in,100\%}$ is the **input power** measured at 100% loading at the ambient temperature.

6. TEST REPORT

Test reports will only be accepted from third-party laboratory accredited by accrediting agencies such as NABL in India or any accreditation body that is a signatory to Mutual Recognition Arrangement (MRA) with APAC and/or ILAC. The test report shall be reported in the prescribed format as provided in Annexure A of this schedule.

7. TOLERANCE LIMITS

For the purpose of rating allotment, tolerance limits shall be applicable only on measured parameters as per standard IS/IEC 61683 and the efficiency tolerance calculated at an EVSE rated output voltage to be in adherence with the following equation:

$$\text{Efficiency tolerance } (\pm) = [-0.2 * (1-\eta) * \eta] * 100$$

Where η is the declared weighted average efficiency of DC EVSE.

8. PRE-QUALIFICATION REQUIREMENTS

8.1 The DC EVSE should meet the requirement set in the standards IS 17017 part 1 or IEC 61851-1 and IS 17017 part 23 or IEC 61851-23.

8.2 The DC EVSE should meet the dimensional compatibility and interchangeability requirements for plugs set in IS 17017 (Part 2/Sec 3).

8.3 The data communication protocol used in the DC EVSE should meet the requirement set in the standard IS 17017 part 24 or IEC 61851-24.

9. RATING PLAN

The star rating parameter for the energy labelling program of DC EV Supply Equipment shall be Weighted Average Energy Efficiency (*Eff AVG*).

The thresholds of Weighted Average Energy Efficiency for energy labeling of DC EVSE with output power less than or equal to 120 kW are shown in Table 3, below:

Star Rating Plan – Voluntary Phase
(Valid from 1st April 2025 to 31st March 2027)

Table 3: Star rating plan for DC EVSE

Star Rating	**Weighted Average Energy Efficiency** *Eff AVG(%)*
1 Star	85% ≤ Eff AVG ≤ 87%
2 Star	87% < Eff AVG ≤ 90%
3 Star	90% < Eff AVG ≤ 93%
4 Star	93% < Eff AVG ≤ 96%
5 Star	Eff AVG > 96%

10. FEES

10.1 The registration fee for the BEE S&L scheme for DC EVSE is INR 1,00,000 (One Lakh Only) for manufacturers and INR 25,000 (Twenty-Five Thousand Only) for small-scale industries payable by electronic mode to the Bureau of Energy Efficiency, New Delhi. The amount is refundable.

10.2 The application fee for a new model would be INR 2,000 (Two Thousand Only) payable to BEE, New Delhi, payable in electronic mode.

10.3 The application fee payable on application for renewal of authority to affix labels is INR 1,000 (One Thousand Only), as per BEE norms.

10.4 The labelling fee for the affixation of the label on each unit sold of the registered DC EVSE model is INR 5/kW of rated output power of DC EVSE and no labelling fee would be charged for first two years after the commencement of the voluntary S&L scheme for DC EVSE.

10.5 The labelling fees shall be submitted by manufacturers through the online portal on a quarterly basis.

10.6 Label validity period would be effective from 1st April 2025, to 31st March, 2027.

11. LABEL DESIGN AND MANNER OF DISPLAY

11.1 Label Content

The content of the label shall include the following information:

1. Equipment Name: DC Charger
2. Type of Charger: Fast
3. Brand:
4. Model Name/Number:
5. Weighted Average Energy Efficiency, Eff_{AVG} (%)
6. Rated Output DC Voltage (V):
7. Maximum Output Power (kW):
8. Standby Power (W):
9. Star Rating Level:
10. Year of Manufacturing:
11. Country of Origin:
12. Label Period:

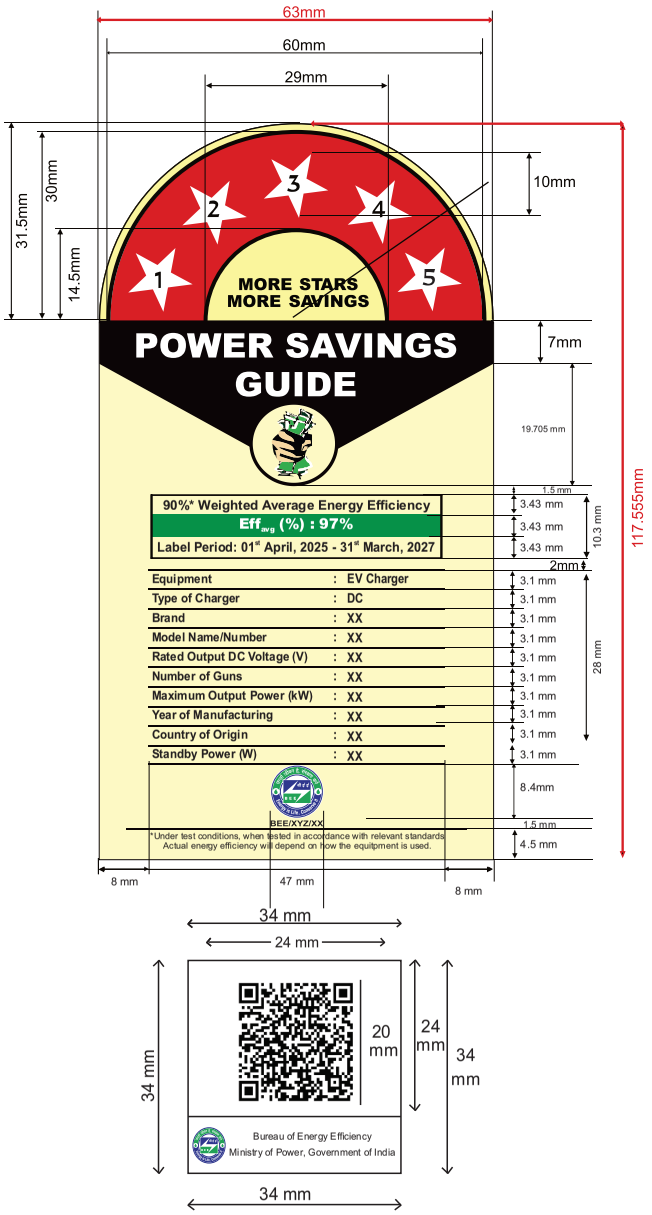
11.2 Placement of label

The placement of the label shall be at the discretion of the manufacturer, where it has clear visibility, and is not easily removable.

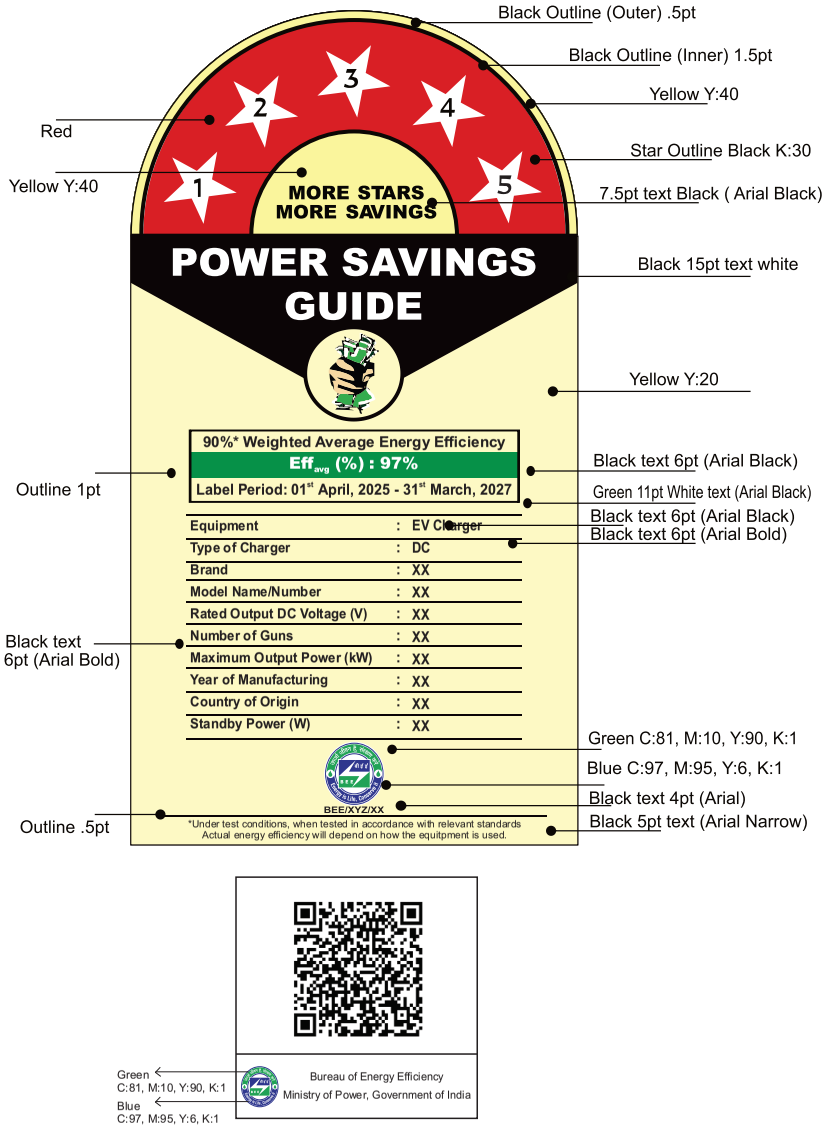
11.3 Material, Dimensions, and Shape

The label shall be made of any self-adhesive, corrosion resistant, and durable material (Aluminum anodized) and shall be cut out as per the dimensions, design, and color scheme as given in the following figures

11.5 Sample Label



11.4 Color Scheme



12. CHECK TESTING

12.1 The Bureau shall, from time to time carry out a verification process to ensure that the DC EVSE adheres to the star level and other related information displayed on its label and that it complies with the other terms and conditions of permission. All the tests shall be conducted by the BEE, SDA or its authorized representative for the purpose of verification and check testing.

12.2 For the purpose of verification, one sample will be picked up at random from the manufacturers/Authorized dealer/supplier's facility or Charge Point Operators (CPOs) by the Bureau or its authorized agency and testing shall be carried out in an independent laboratory duly accredited by the NABL.

12.3 If the sample fails, the Bureau shall draw two more samples of the model and conduct all the relevant tests specified in this schedule in the presence of authorized representatives from the manufacturer and an officer from by the BEE, SDA or its authorized representative.

12.4 If the sample fails to comply its star rating as per declared efficiency value in the second check testing as well, then BEE will direct the concerned manufacturer to downgrade the rating of the model/family of models. The concerned manufacturer would be required to bear the cost of second check testing. The manufacturer will be required to submit a fresh application with a revised energy efficiency declaration for the respective model/family of models.

ANNEXURE A

Form for reporting test results

The results of tests shall be reported as per the discussions and consultations from time to time with testing laboratories.

1. General details of the Model

Date of test:

Test report number:

Test officer:

As declared by the manufacturer:

1	**Manufacturer/Brand:**	
2	**Model Number:**	
3	**Product:**	**DC Output EVSE**
4	**Charger Type:**	**Fast/Slow**
5	**Maximum Output Current (A)**	
6	**Rated Output Voltage (V):**	
7	**Rated Output Power (kW):**	

2. Star Rating Declaration

Star Rating Parameter	Declared Value	Measured Value
Weighted Average Energy Efficiency (%):		

Applicable Star Rating (as per Schedule):

3. Efficiency Measurement of DC Charger:

S.No	Particulars	Applied Load/Current, %	
		10	100
1	Output DC Voltage (V)		
2	Output DC Current (A)		
3	Output DC Power		
4	Input RMS Voltage (V)-R		
5	Input RMS Voltage (V)-Y		
6	Input RMS Voltage (V)-B		
7	Avg. AC RMS voltage (V)		
8	Input RMS Current (A)-R		
9	Input RMS Current (A)-Y		
10	Input RMS Current (A)-B		
11	Avg. AC RMS current (A)		
12	Power factor- R		
13	Power factor- Y		
14	Power factor- B		
15	Input AC Power-R		
16	Input AC Power-Y		
17	Input AC Power-B		
18	Total AC Power		
19	Power Efficiency (%)		

S.No	Particulars	Applied Load/Current, %	
		10	100
20	Input Voltage THD (%) -R		
21	Input Voltage THD (%) -Y		
22	Input Voltage THD (%) -B		
23	Input Current THD (%)-R		
24	Input Current THD (%)-Y		
25	Input Current THD (%)-B		
26	Output Voltage Ripple (%)		
27	Output Current Ripple (%)		
28	No Load Losses (W)		
29	Standby Power Loss (W)		

4. Output and Input Power

	Output Power (P_{out}) 10% loading	Output Power (P_{out}) 100% loading	Input Power (P_{in}) 10% loading	Input Power (P_{in}) 100% loading
Measured				

5. Weighted Average Energy Efficiency

Calculated Efficiency as per Schedule	Value (%)
Weighted Average Energy Efficiency (Eff_{AVG})	

COMMITTEE COMPOSITION

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2. Shri Rahul Juyal, Sector Expert, BEE
3. Shri Keshav Murari, Project Engineer, BEE

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Notes

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