उत्पाद मैनुअल
विद्युतीय वाहन चालकता चार्जिंग पद्धति
भाग 2 प्लग, सॉकेटआउटलेट-, वाहन कनेक्टर और वाहन के इन्लेट्स
अनुभाग 3 d.c. एवं a.c./d.c. पिन एवं कन्टैक्ट ट्यूब वाहन कप्लर के लिए संगतता एवं अंतर्विनिमेयता
अपेक्षायें आईएस 17017 (भाग 2/ अनुभाग 3): 2020 के अनुसार

PRODUCT MANUAL
Electric Vehicle Conductive Charging System
Part 2 Plugs, Socket – Outlets, Vehicle Connectors and Vehicle Inlets
Section 2 Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and contact-tube vehicle couplers according to IS 17017 (Part 2/Sec 3): 2020

यह उत्पाद नियमावली सभी क्षेत्रीय/शाखा कार्यालयों और लाइसेंसधारियों द्वारा विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन) विनियम, 2018 की योजना-I के अंतर्गत प्रमाणन के संचालन में एकरूपता और पारदर्शिता सुनिश्चित करने के लिए संदर्भ सामग्री के रूप में उपयोग की जाएगी। बीआईएस प्रमाणन प्राप्त करने के इच्छुक भावी आवेदक भी इस दस्तावेज़ का उपयोग कर सकते हैं।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations,2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification.

1.	**मानक संख्या / IS No.**	:	IS 17017 (Part 2/Sec 3): 2020
	शीर्षक / Title	:	Electric Vehicle Conductive Charging System Part 2 Plugs, Socket – Outlets, Vehicle Connectors and Vehicle Inlets Section 2 Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and contact-tube vehicle couplers
	संशोधनों की संख्या No. of amendments	:	0
2.	**नमूनाकरण दिशानिर्देश / Sampling Guidelines**		
a)	**कच्चा माल Raw material**	:	Nil. *Note: This section indicates the requirements for raw material (if specified in the IS) for which compliance is to be established during Grant of Licence/Change in Scope of Licence/Factory Surveillance.*
b)	**समूहीकरण दिशानिर्देश Grouping Guidelines**	:	Please refer **ANNEX – A**
c)	**नमूने का परिमाण Sample Quantity**	:	3 numbers
d)	**परीक्षण अनुरोध में घोषित किए जाने वाले पैरामीटर / Parameters to be Declared in Test Request**		As per scope of licence *Note: Apart from the above, any other requirements/ parameters may also be declared as per the standard, as applicable.*

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9, BAHADUR SHAH ZAFAR MARG, NEW DELHI-110002
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3.	**परीक्षण उपकरण की सूची** **List of Test Equipment**	:	Please refer **ANNEX – B**
4.	**निरीक्षण एवं परीक्षण योजना** **Scheme of Inspection and Testing**	:	Please refer **ANNEX – C**
5.	**एक दिन में संभावित परीक्षण** **Possible tests in a day**	:	1. Marking, Cl.8 2. Dimensions, Cl.9 3. Protection against Electric Shock, Cl.10 4. Size and Color of Protective Earthing Conductors, Cl.11 5. Provisions for protective earth, Cl.12 6. Terminals, Cl.13 7. Interlocks, Cl.14 8. General Construction, Cl.16 9. Construction of Plugs and Vehicle Connectors, Cl.18 10. Construction of Vehicle Inlets, Cl.19 11. Breaking Capacity, Cl.22 12. Flexible Cables and Their Connections, Cl.25 13. Mechanical Strength, Cl.26 14. Screws, Current Carrying Parts and connections, Cl.27 15. Resistance to heat, to Fire and to tracking, Cl.29 16. Corrosion and resistance to rusting, Cl.30 *Note: This section is for the guidance of BIS Certification Officers/ Technical Auditors of BIS Authorized Outside Surveillance Agencies(OSAs) during factory inspection to provide ready reference regarding the tests which can be witnessed during the inspection in the factory by the officer/ auditor.*
6.	**लाइसेंस का दायरा / Scope of the Licence:**		

"Licence is granted to use Standard Mark as per **IS 17017 (Part 2/Sec 3): 2020** with the following scope:

Name of the product	Vehicle Connector/ Vehicle Inlet - for EV Conductive Charging System
Type Reference	
Interface	d.c/ Combined Configuration AA/ Configuration FF
Rating a.c Rating for Type 2 in Configuration FF, if applicable	___ V, ___ A ___ V, ___ A, Single/ Three phase
Method of Connecting the Conductors	Re-wirable/ Non-rewirable
Serviceability	Field serviceable/ User serviceable
Locking Facilities	Lockable/ Non-lockable
Interlock Facilities	Accessories without an interlock/ Accessories with an interlock with latching device (mechanical interlock)/ Accessories with an interlock without latching device (electrical interlock)
Presence of Shutter(s)	With/ Without shutter

ANNEX -A
Grouping Guidelines

1. Manufacturer shall declare the parameters as given in scope of licence for each accessory they intend to cover in the licence.

2. Vehicle Inlets/ Vehicle Connectors are classified based on the parameters given in scope of licence.
    a) Preferred Operating Voltages: 480 V d.c., 600 V d.c., 750 V d.c., and 1000 V d.c. (up to 600 V d.c. for Configuration AA and up to 1000 V d.c. for Configuration FF)
    b) Preferred Rated Currents: As given in Clause 5.2 of IS 17017 (Part 2/ Sec 1)

3. For Grant of Licence/ Change in Scope of Licence, each accessory shall be tested.

4. The following guidelines may be applied when samples are drawn for testing as per S.No.2 above,

    i. If higher current rating is tested, lower current rating may be covered without further testing and
    ii. If higher voltage rating is tested, lower voltage rating may be covered without further testing

    provided all other parameters given in scope of licence remains the same and there is no change in the basic design and construction of the accessory. An undertaking shall be submitted by the manufacturer to this effect.

4. During the operation of the Licence, BO shall ensure that all the accessories covered in the Scope of the Licence are tested in rotation to the extent possible.

ANNEX- B

List of Test Equipments

(Indicative List, For Guidance Only)

S. No.	Test equipment	Test name with Clause reference
1	Absorbent piece of cloth soaked in water and solvent hexane / petroleum spirit, Humidity treatment chamber	Marking Durability Test (Clause 8.8)
2	Mechanical force applicator (150 N / 250 N), Thermal conditioning cabinet (55°C)	Non-Interchangeability & Force Test (Clause 9.4)
3	Jointed Standard Test Finger (Fig. 3), Low-voltage electrical contact indicator (≥ 40 V)	Live Parts Accessibility Test (Clause 10.1)
4	Shutter Test Gauge "A" (Fig. 4), Shutter Test Gauge "B" (Fig. 5), Electrical contact indicator (40 V to 50 V), Temperature cabinet (35°C)	Shutter Safety Tests (Clause 10.2)
5	AC current source (25 A, ≤ 12 V no-load), Voltage drop probe / Milliohmmeter	Earthing Path Continuity & Resistance Test (Clause 12.2)
6	High-current AC supply (300 A to 3 100 A for 4 s / 6 s), Torque wrench, Continuity indicator	Short-Time Withstand Current Test (Cl 12.3)
7	Precision steel round conductor insertability gauges (Fig. 6, 2.4 mm to 28 mm)	Conductor Insertability Test (Clause 13.2.1)
8	Flexing Test Apparatus (Fig. 7, 10 rpm rotating platen), Suspended test masses (0.4 kg to 22.7 kg)	Terminal Flexing Under Mechanical Load Test (Cl 13.3.1)
9	Smooth axial pull force apparatus (35 N to 578 N), Torque wrench	Terminal Conductor Pull-Out Test (Clause 13.3.2)
10	Actuator force test device, Electrical continuity meter, High-speed timing measurement device / timer (≤ 35 ms)	Interlock Function Tests (Clause 14.1.3 & 14.1.4)
11	Vertical separation test rig (Fig. 8), Horizontal and rotational test rig (Fig. 9A & 9B), Hardened steel test plugs (surface roughness ≤ 0.8 µm), Mass carrier and weight set (165 N to 750 N) with 5 cm drop mass mechanism	Latching & Withdrawal Force Verification (Clause 14.1.5 & 14.1.6)
12	Ventilated heating cabinet (70°C / 80°C), Weighing balance with 500 g mass, Dry coarse woven cloth	Accelerated Thermal Ageing Test (Clause 15)
13	Suspension test setup with pull force weights (based on accessory mass + cable length)	Retaining Means Pull Test (Clause 16.8)
14	Drop-Weight Apparatus (9.2 kg principal mass + 0.8 kg supplementary drop weight + 2.0 kg fixed weight), Calibrated spring scale (< 100 N)	Insertion & Withdrawal Force Limits Test (Clause 16.15)
15	Hardened steel pin gauges (4.80 mm to 11.80 mm), Force meter / weights (2.5 N to 20 N)	Minimum Contact Tube Retention Force Test (Cl 17.2.1)
16	Test plug with pin diameters (5.00 mm to 12.00 mm), Withdrawal weight carrier set (150 N to 400 N) with 5 cm drop-mass mechanism	Maximum Plug Withdrawal Force Test (Clause 17.2.2)
17	IP Category 2 dust test chamber (IP5X), Oscillating tube spray apparatus (IPX4), Water jet nozzles (IPX5/IPX6/IPX7)	Degrees of Protection (IP Code) Ingress Test (Clause 20.2)
18	Humidity Cabinet (91%–95% RH at 20°C–30°C), Saturated salt solution bath (Na_2SO_4 or KNO_3)	Humidity Resistance Treatment (Clause 20.3)
19	DC Megohmmeter / Insulation Tester (500 / 1000 V DC)	Insulation Resistance Test (Clause 21.2)
20	HV AC Dielectric Test Bench (500 V to > 2 000 V AC, 50 Hz), Conductive metal foil sheet	Dielectric High-Voltage Test (Clause 21.3)

21	Automated insertion and withdrawal machine (7.5 strokes/min), AC/DC Load Bank (cos φ = 0.8, up to 250 A), Pole selector switch "C" (Fig. 10)	Making and Breaking Circuit Test (Clause 22.2)
22	Cycling test rig (up to 10 000 operations), Electrical load bank (cos φ = 0.6 / 0.8), Lid spring mechanical cycling fixture	Mechanical & Electrical Endurance Test (Cl. 23.1 & 23.4)
23	Multiphase AC continuous current power supply (up to 400 A), Auxiliary 2 A current power supply, Temperature sensors (Thermocouples / IR / Color-changing indicators), Torque wrench	Thermal Performance / Temperature Rise Test (Cl. 24.1 & 24.2)
24	Cable Anchorage Test Apparatus (Fig. 11), Repeated pull mechanism (100 pulls at 160 N to 500 N), Torque application device (0.6 N·m to 11.0 N·m), Cable axial displacement measurement scale	Cable Anchorage Pull & Torque Test (Clause 25.3)
25	Refrigerated chamber (-30°C)	Cold Pre-conditioning (Cl 26.1)
26	Ball Impact Test Apparatus (Fig. 12) with 50.8 mm steel sphere (0.535 kg, 1 J to 4 J impact energy)	Enclosure Impact Test (Cl. 26.2)
27	Drop Test Rig (Fig. 13, 2.25 m suspension fixture at 1 m height above concrete floor)	Plug & Connector Drop Test (Clause 26.3)
28	Oscillating Flexing Test Rig (Fig. 14, 90° swiveling arm, 60 flexings/min), Suspended loading weights (20 N to 100 N)	Cable Flexing Test for Non-Rewirable Accessories (Cl 26.4)
29	Torque spanner (25 cm lever arm), Cylindrical metal test rods (20 N to 50 N force)	Cable Gland Torque Test (Clause 26.5)
30	Plug contact force applicator (75 N perpendicular push), Electrical contact indicator (40 V to 50 V)	Shutter Mechanical Force Test (Clause 26.6)
31	Thermal Shock / Temperature Change Chamber (-30°C to +100°C, 3 K/min slew rate)	Insulated End Cap Temperature Cycling (Cl 26.8)
32	Contact pin axial pull test rig (20 N or 40 N pull force)	Insulated End Cap Pull Test (Cl 26.9)
33	Calibrated torque screwdrivers and spanners (0.2 N·m to 19.0 N·m)	Mechanical Strength of Screws and Nuts (Clause 27.1)
34	Comparative tracking index (CTI/PTI) test apparatus	Proof Tracking Index Material Evaluation (Clause 28.4)
35	Heating cabinet (110°C)	Dry Heat Resistance Test (Cl 29.2)
36	Ball Pressure Apparatus (IS/IEC 60695-10-2, 5 mm steel ball fixture, 80°C / 125°C oven), Measuring optical microscope	Ball Pressure Test (Clause 29.3)
37	Glow-Wire Apparatus (IS/IEC 60695-2-11, 650°C / 850°C tip temperature), Wooden board covered with tissue paper	Glow-Wire Flammability Test (Clause 29.5)
38	PTI Test Rig (IS 2824, 175 V AC supply, Solution A automated dropping device)	Tracking Resistance Test (Clause 29.6)
39	Chemical degreasing bath, 10% Ammonium chloride aqueous solution bath, Humidity box (20°C), Drying oven (100°C)	Resistance to Rusting & Corrosion Test (Clause 30)
40	AC/DC Short-Circuit Power Supply (≥ 10 kA prospective current), Synchronous Closing Device, Adjustable Resistors / Reactors / Fault Limiting Resistor, Current and Voltage sensors, High-speed transient recorder, Fuse (F1), Ground fault copper wire	Conditional Short-Circuit Current Withstand Test (Clause 31.2 & 31.3)
41	Heavy Vehicle Wheel Crushing Rig (Automotive Tyre P225/75R15 at 2.2 bar, loading device for 5 000 N & 11 000 N at 8 km/h), Concrete testing base pad with sample clamps	Vehicle Driveover Test (Clause 33.2 & 33.3)

The above list is indicative only and may not be treated as exhaustive.

ANNEX C
Scheme of Inspection and Testing

1. QUALITY ASSURANCE PLAN

1.1 It is expected that during operation of BIS licence manufacturers will implement a Quality Assurance Plan (QAP) i.e. a plan of regular testing and in-process controls, designed to ensure that the product bearing the Standard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Assurance Plan (QAP) defining the control unit (i.e. lot/batch etc.), the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and declare the arrangement for testing i.e. whether in-house or sub-contracting/ sharing for each applicable test and submit the same to BIS Branch Office for information. The manufacturer shall comply with the QAP and maintain test records in accordance with para 2.1.

1.3 Recommended Levels of Control/ Control Unit:

1.3.1 For the guidance of manufacturers, the recommended definition of control unit is *Accessories of the same rating and design manufactured in a day shall constitute a control unit.*

1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in Table 1. Manufacturer has the discretion of declaring their own levels of control or accept the levels of control given in this document.

1.3.3 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan.

1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING

The manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard for which they may have in-house test facilities. However, there is no obligation to maintain in-house laboratory. Licensee may use alternative arrangements for tests of the production as per the declared QAP. Various alternatives are available for operation of BIS certification as given below and the relevant guidelines for availing such relaxations by the manufacturers, as amended from time to time, are to be referred:

i) Shared testing resources like common facility,

ii) Cluster based testing facility,

iii) Sub-contracting to outside laboratories which may either be:

a) BIS recognised/ empanelled laboratories, or

b) Any accredited laboratory as per ISO/IEC 17025

2.1 Test Records- The manufacturers shall maintain test records for the tests carried out (either in-house or at a sub-contracted or at shared test facility) to establish conformity of the product to the Standard for operation of licence. For the tests being subcontracted or conducted at a shared test facility, test results issued by the laboratories or test facilities, shall be made available for inspection by BIS.

3. PACKING AND MARKING

The Standard Mark as given in the Schedule of the licence shall be incorporated legibly and indelibly on each accessory provided always that the product so marked conforms to each requirement of the specification.

3.1 Packing and Marking shall be done as per Cl. 8 of IS 17017 (Part 2 / Sec 3): 2020.

3.2 **Additional Marking requirements**: The product shall also be marked with the following additional requirement on the product or its packaging:

a) "For BIS certification details please visit www.bis.gov.in"

4. REJECTION

The production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark. Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE-1

(Recommended Levels of Control by BIS- for Guidance Only)

-1-				-2-		
Test Details				**Levels of Control**		
Cl.	**Requirement**	**Test Methods**		**No. of**	**Frequency**	**Remarks**
		Clause	**Reference**	**Sample**		
8	Marking	8	IS 17017 (Part 2/ Sec 1)	1	Each Control Unit	
9	Dimensions	9 9.1	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1		
10	Protection against Electric Shock	10 10.301 10.302	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1		
11	Size and Color of Protective Earthing Conductors	11	IS 17017 (Part 2/ Sec 1)	1		
12	Provisions for protective earth	12 12.1	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1		
13	Terminals	13	IS 17017 (Part 2/ Sec 1)	1		
14	Interlocks	14 14.301	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1	Every 3 months*	
15	Resistance to ageing of rubber and thermoplastic material	15	IS 17017 (Part 2/ Sec 1)	1	Once a Year*	Please see Note 1.
16	General Construction	16 16.15	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1	Each Control Unit	
18	Construction of Plugs and Vehicle Connectors	18	IS 17017 (Part 2/ Sec 1)	1		
19	Construction of Vehicle Inlets	19	IS 17017 (Part 2/ Sec 1)	1		
20	Degrees of Protection	20.1 20.2	IS 17017 (Part 2/ Sec 1)	1	Once a Year*	
20	Degrees of Protection	20.3	IS 17017 (Part 2/ Sec 1)	1	Once a month*	
21	Insulation Resistance and Dielectric Strength	21	IS 17017 (Part 2/ Sec 1)	1	Once a month*	
22	Breaking Capacity test	22 22.3	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1	Once a month*	
23	Normal Operation test	23 23.2	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1	Once a Year*	
24	Temperature Rise test	24 24.1	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1	Once a Year*	
25	Flexible Cables and Their Connections	25 25.301	IS 17017 (Part 2/ Sec 1) IS 17017 (Part 2/ Sec 3)	1	Once a month*	
26	Mechanical Strength	26	IS 17017 (Part 2/ Sec 1)	2	Once a month*	
27	Screws, Current Carrying Parts and connections	27	IS 17017 (Part 2/ Sec 1)	1	Once a month*	
28	Creepage Distances, Clearances and distances	28	IS 17017 (Part 2/ Sec 1)	1	Once in a Year*	
29	Resistance to heat, to Fire and to tracking	29	IS 17017 (Part 2/ Sec 1)	1	Once in a Year*	Please see Note 1
30	Corrosion and resistance to rusting	30	IS 17017 (Part 2/ Sec 1)	1	Once in a Year*	

** for each type reference manufactured during the period.*

Note-1: *In addition, the test(s) shall be done whenever there is a change in the material, components or parts.*