भारतीय मानक **IS 17017 (Part 2/Sec 7): 2023**

Indian Standard

इलेक्ट्रिक वाहन चालकता चार्जिंग पद्धतियाँ

भाग 2 प्लग, सॉकेट-आउटलेट, वाहन कनेक्टर्स और वाहन इनलेट्स

अनुभाग 7 ए.सी., डी.सी. और ए.सी./डी.सी पिन के लिए आयामी संगतता और इंटरचेंज क्षमता अपेक्षाएँ और संपर्क-ट्यूब वाहन कप्लर्स. ए.सी./डी. सी. सुरक्षा विद्युत पृथक्करण पर निर्भर ईवी आपूर्ति उपकरण

Electric Vehicle Conductive Charging System

Part 2 Plugs, Socket-Outlets, Vehicle Connectors and Vehicle Inlets

Section 7 Dimensional Compatibility and Interchange Ability Requirements for a.c., d.c. and a.c./d.c. Pin and Contact-Tube Vehicle Couplers Intended to be used for a.c./d.c. EV Supply Equipment where Protection Relies on Electrical Separation

ICS 43.120

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August 2023 **Price Group 8**

Electrotechnology in Mobility Sectional Committee, ETD 51

FOREWORD

This Indian Standard (Part 2/Sec 7) was adopted by the Bureau of Indian Standards, after the draft finalized by the Electrotechnology in Mobility Sectional Committee had been approved by the Electrotechnical Division Council.

This standard (Part 2/Sec 7) is part of the series of standards which covers the mechanical, electrical and performance requirements for dedicated plugs, socket outlets, vehicle connectors and vehicle inlets for interfacing between such dedicated charging equipment and the electric vehicle.

This standard is to be read in conjunction with IS 17017 (Part 2/Sec 1) : 2020.

The cross references of IEC have been modified to refer to Indian Standards whenever available. Where corresponding Indian Standards are not available, the IEC references have been retained. The committee has decided that these IEC standards are suitable to be used till equivalent/corresponding Indian Standards are published.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding of numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM

PART 2 PLUGS, SOCKET-OUTLETS, VEHICLE CONNECTORS AND VEHICLE INLETS

SECTION 7 DIMENSIONAL COMPATIBILITY AND INTERCHANGE ABILITY REQUIREMENTS FOR a.c., d.c. AND a.c./d.c. PIN AND CONTACT-TUBE VEHICLE COUPLERS INTENDED TO BE USED FOR a.c./d.c. EV SUPPLY EQUIPMENT WHERE PROTECTION RELIES ON ELECTRICAL SEPARATION

1 SCOPE

This standard (Part 2/Sec 7) is applicable to vehicle couplers with pins and contact-tubes of standardised configuration, herein also referred to as "accessories", intended for use in electric vehicle conductive charging systems which incorporate control means, with rated operating voltage:

a) up to 120 V d.c. and rated current up to 100 A; and
b) up to 240 V a.c. and rated current up to 32 A.

This standard (Part 2/Sec 7) applies to d.c. interfaces and combined a.c./d.c. interfaces of vehicle couplers specified in IS 17017 (Part 2/Sec 1) :2020, and intended for use in conductive charging systems for circuits specified in IS 17017 (Part 31).

This section of IS 17017 (Part 2/Sec 7) applies to the vehicle couplers to be used in an ambient temperature of between - 25 °C and + 55 °C.

These vehicle couplers are intended to be connected only to cables with copper or copper- alloy conductors.

Accessories covered by this standard shall be of non-rewireable type only.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

IS No.	*Title*
IS 17017	Electric vehicle conductive charging system:
(Part 2/Sec 1) : 2020	Plugs, socket- outlets, vehicle connectors and vehicle inlets — Conductive charging of electric vehicles, Section 1 General requirements
(Part 31)	a.c. or d.c. EV supply equipment for where protection relies on electrical separation. (*under prepration*)

3 TERMINOLOGIES

Clause **3** of IS 17017 (Part 2/Sec 1) shall be applicable

4 GENERAL

Clause **4** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

4.1 Replacement

4.1.1 *General Requirements*

The accessories covered by this standard shall only be used with EV supply equipment that complies with the requirements of IS 17017 (Part 31).

Accessories shall be so designed and constructed that in normal use:

a) Their performance is reliable and ensures that there is no risk and danger to the user or surroundings;
b) It is not possible to make a cord extension set [*see* **11.4**, IS 17017 (Part1) : 2018]; and
c) The plug and the vehicle connector shall not be compatible.

Compliance is checked for meeting all the relevant requirements and tests specified.

Compliance is checked by a manual test.

5 RATINGS

Clause **5** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

5.1 Preferred Rated Operating Voltage Ranges

Replacement

The preferred rated operating voltage ranges are:

a) 0 V to 30 V (signal or control purposes only);
b) 200 V a.c. to 240 V a.c; and
c) 0 V d.c.to 120 V d.c.

5.2 General

Replacement

The preferred rated currents for vehicle coupler and for cable assembly are:

a) 16 A to 20 A;
b) 30 A to 32 A;
c) 50 A (d.c. only);
d) 70 A (d.c. only); and
e) 100 A (d.c. only).

5.3 Rated Current for Signal or Control Purposes

Replacement

Rated current for signal or control purposes is 2A.

6 CONNECTIONS BETWEEN THE POWER SUPPLY AND THE ELECTRIC VEHICLE

Clause **6** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

6.1 Replacement

This clause provides a description of the physical conductive electrical interface requirements between the vehicle and the power supply for different types of interface:

a) a.c. interface;
b) d.c. interface; and
c) combined a.c. and d.c. interface.

6.2 Replacement

Clause **6.4** of IS 17017 (Part 2/Sec 1) is not applicable

6.3 Replacement

A.C. interface

The a.c. interfacecontains up to 9 (power or signal) contacts, with only one physical configuration of contact positions for single-phase.

The interfaces shall only be used with the a.c. electric vehicle charging system as described in IS 17017 (Part 31). The electrical ratings and their functions are described in Table 701.

Table 701 Overview of a.c. Interface

(*Clause* 6.3)

Sl No.	Serial Number [1)]	Symbol	U_{max}	I_{max}	Functions
			V	A	
(1)	(2)	(3)	(4)	(5)	(6)
i)	1	DC +	120 (d.c.)	100	Optional
ii)	2	DC -	120 (d.c.)	100	Optional
iii)	3	L1	240 (a.c.)	32	Live (mains 1)
iv)	4	N	240 (a.c.)	32	Neutral
v)	5	PE	Rated for fault [2)]	Rated for fault [2)]	Protective farth
vi)	6	CP	30	2	Control pilot
vii)	7	PP	30	2	Proximity pilot
viii)	8	CAN +	30	2	Communication1 + (CAN high)
ix)	9	CAN -	30	2	Communication1 - (CAN low)

[1)] Serial number is not the identification of the contact in the accessory

[2)] "Rated for fault" means "rated for the highest fault current"

6.4 Replacement

d.c. interface

The d.c. interface may contain up to 9 (power or signal) contacts, with only one physical configuration of contact positions.

The interfaces shall only be used with the d.c. electric vehicle charging system as described in IS 17017 (Part 31).

The electrical ratings and their function are described in Table 702.

Table 702 Overview of d.c. Interface

(*Clause* 6.4)

Sl No.	Serial Number [1)]	Symbol	U_{max}	I_{max}	Functions
			V	A	
(1)	(2)	(3)	(4)	(5)	(6)
i)	1	DC +	120 (d.c.)	100	DC +
ii)	2	DC -	120 (d.c.)	100	DC -
iii)	3	L1	240 (a.c.)	32	Optional
iv)	4	N	240 (a.c.)	32	Optional
v)	5	PE	Rated for fault [2)]	Rated for fault [2)]	Protective earth
vi)	6	CP	30	2	Control pilot
vii)	7	PP	30	2	Proximity pilot
viii)	8	CAN +	30	2	Communication1 + (CAN high)
ix)	9	CAN -	30	2	Communication1 - (CAN low)

[1)] Serial number is not the identification of the contact in the accessory.

[2)] "Rated for fault" means "rated for the highest fault current".

6.5 Replacement

Combined Interface:

A combined interface is made by suitably combining the interface of a.c. and d.c charging. This is achieved by providing separate a.c. and d.c. power contacts to supply either a.c. or d.c. energy to the electric vehicle.

Combined couplers shall only be used for a.c or d.c. charging with the a.c or d.c. electric vehicle charging system as specified in IS 17017 (Part 31).

The electrical ratings and their function are described in Table 703.

If the a.c. or d.c ratings of a mating connector and inlet differ, the coupler (mating pair) shall be used at the lower rating of either the vehicle connector or vehicle inlet of the mating accessory.

Table 703 Overview of Combined Interface

(*Clause* 6.5)

Sl No.	Serial number [1)]	Symbol	U_{max} V	I_{max} A	Functions
(1)	(2)	(3)	(4)	(5)	(6)
i)	1	DC +	120 (d.c.)	100	DC +
ii)	2	DC -	120 (d.c.)	100	DC -
iii)	3	L1	240 (a.c.)	32	Live (mains 1)
iv)	4	N	240 (a.c.)	32	Neutral
v)	5	PE	Rated for fault [2)]	Rated for fault [2)]	Protective earth
vi)	6	CP	30	2	Control pilot
vii)	7	PP	30	2	Proximity pilot
viii)	8	CAN+	30	2	Communication1 + (CAN high)
ix)	9	CAN-	30	2	Communication1 - (CAN low)

[1)] Serial number is not the identification of the contact in the accessory.

[2)] "Rated for fault" means "rated for the highest fault current".

7 CLASSIFICATIONS OF ACCESSORIES

Clause **7** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

7.1 Replacement

According to purpose:

a) Vehicle connectors;
b) Vehicle inlets; and
c) Cable assemblies.

7.2 Replacement

According to method of connecting the conductors:

a) Non-rewireable accessories.

7.3 Replacement

According to electrical operation:

a) Not suitable for making and breaking an electrical circuit under load.

8 MARKING

Clause **8** of IS 17017 (Part 2/Sec 1) shall be applicable.

9 DIMENSIONS

Clause **9** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

9.1Replacement

The vehicle connector and vehicle inlet shall comply with configuration shown in standard sheet 7A and standard sheet 7B.

10 PROTECTIONS AGAINST ELECTRIC SHOCK

Clause **10** of IS 17017 (Part 2/Sec 1) shall be applicable.

11 SIZE AND COLOUR OF PROTECTIVE EARTHING AND NEUTRAL CONDUCTORS

Clause **11** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

Replacement of Table 6

Table 6 Size for Conductors

(*Clauses* 11, 13.1.9, 13.2.1, 13.3.2, 16.10, 16.13, 27.1, 28.1 *and* 31.3)

Sl No.	Contact Rating Current	Flexible Cables for Plugs and Vehicle Connectors[a] Solid or Stranded Cables for Vehicle Inlets[1)]	Flexible Cables for Plugs and Vehicle Connectors[a] Solid or Stranded Cables for Vehicle Inlets[1)] AWG/MCM
	A	mm^2	
(1)	(2)	(3)	(4)
i)	2	0.5	20
ii)	16 and 20	1.0 to 2.5	18 to 14
iii)	30 and 32	2.5 to 6	14 to 10
iv)	50	6 to 10	10 to 8
v)	70	10 to 16	8 to 6
vi)	100	16 to 25	6 to 4

a) Flexible cables according to the IEC 62893 series.

b) Classification of conductors: according to IEC 60228.

c) The nominal cross-sectional areas of conductors are given in square millimetres (mm2). AWG/MCM values are considered as equivalent to mm2 for the purpose of this document.

Reference IEC 60999-1 : 1999 (Annex A), IEC 60999-2 : 2003 (Annex C).

AWG: American Wire Gauge is a system of identifying wires in which the diameters are found in geometric progression between size 36 and size 0000.

MCM: Mille Circular Mils denotes circle surface unit. 1 MCM = 0.506 7 mm2.

12 PROVISIONS FOR EARTHING

Clause **12** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

12.1 Replacement

Accessories shall be provided with a protective earthing contact and earthing terminal in case that the vehicle is connected galvanically to the mains through this accessory. Protective earthing contacts shall be directly and reliably connected to the protective earthing terminals.

If the vehicle is connected to the electric vehicle charging station with the insulating device between the vehicle and the mains (for example, insulating transformer), the vehicle is deemed not to be galvanically connected.

13 TERMINALS

Clause **13** of IS 17017 (Part 2/Sec 1) shall be applicable.

14 INTERLOCKS

Clause **14** of IS 17017 (Part 2/Sec 1) shall be applicable.

15 RESISTANCE TO AGEING OF RUBBER AND THERMOPLASTIC MATERIAL

Clause **15** of IS 17017 (Part 2/Sec 1) shall be applicable.

16 GENERAL CONSTRUCTION

Clause **16** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

16.1 Replacement of the First Paragraph by

The force to insert and withdraw a vehicle connector shall be less than 100 N. Means to facilitate easy insertion and withdrawal of the vehicle connector from the vehicle inlet may be provided. If a vehicle coupler is equipped with an assist device to reduce this force (for example, mechanical assist device), the operating force of the assist device shall be less than 100 N. Compliance is checked by inspection.

17 CONSTRUCTION OF SOCKET OUTLETS

Clause **17** of IS 17017 (Part 2/Sec 1) shall be applicable.

18 CONSTRUCTION OF PLUGS AND VEHICLE CONNECTORS

Clause **18** of IS 17017 (Part 2/Sec 1) shall be applicable.

19 CONSTRUCTION OF VEHICLE INLETS

Clause **19** of IS 17017 (Part 2/Sec 1) shall be applicable.

20 DEGREES OF PROTECTION

Clause **20** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

20.1Replacement of First Paragraph with

Accessories shall have the minimum degrees of protection as required in IS 17017 (Part 31).

21 INSULATION RESISTANCE AND DIELECTRIC STRENGTH

Clause **21** of IS 17017 (Part 2/Sec 1) shall be applicable

22 BREAKING CAPACITY

Clause **22** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

22.1 Replacement

DC accessories or DC portions of combined a.c./d.c. accessories are not required to be tested in accordance with

Clause No. **22.3** of IS 17017 (Part2/Sec 1) : 2020

23 NORMAL OPERATION

Clause **23** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

Replacement

Table 16 Normal Operation

(*Clause* 23)

Sl No.	**Rated Current,** A	**cos φ ± 0.05** [2)]	**No Load (No. of cycles)**
(1)	(2)	(3)	(4)
i)	2	0.8[1)]	10 000
ii)	16 - 20	0.6[1)]	10 000
iii)	30 - 32	0.6[1)]	10 000
iv)	50	-	10 000
v)	70	-	10 000
vi)	100	-	10 000

[1)] For an accessory provided with an interlock (for example, pilot circuit) or classified "Not suitable for making and breaking an electrical circuit under load", the number of cycles of operation under load is 50 and no-load is 10 000.

[2)] cos φ denotes lagging power factor.

24 TEMPERATURE RISE

Clause **24** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

Replacement

Table 17 Test Current and Nominal Cross-Sectional Areas of Copper Conductors for Temperature Rise Test

(*Clause* 24)

Sl No.	Rated Current	Test Current	Cross-sectional Area(s) of the Conductors Plugs, Vehicle Inlets, Vehicle Connectors	
	A	A	mm^2	AWG/MCM
(1)	(2)	(3)	(4)	(5)
i)	2	2	0.50	20
ii)	16 - 20	22	2.50	14
iii)	30 - 32	42	6.0	10
iv)	50	50	10	8
v)	70	70	16	6
vi)	100	100	25	4

25 FLEXIBLE CABLES AND THEIR CONNECTION

Clause **25** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

Replacement

Table 18 Pull Force and Torque Test Values for Cable Anchorage

(*Clause* 25)

Sl No.	Rated current	Pulling Force	Torque	Maximum Displacement
	A	N	Nm	mm
(1)	(2)	(3)	(4)	(5)
i)	16 - 20	160	0.6	2
ii)	30 - 32	200	0.7	2
iii)	50	225	1.0	2
iv)	70	240	1.2	2
v)	100	240	1.5	2

26 MECHANICAL STRENGTH

Clause **26** of IS 17017 (Part 2/Sec 1) shall be applicable.

27 SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS

Clause **27** of IS 17017 (Part 2/Sec 1) shall be applicable.

28 CREEPAGE DISTANCES, CLEARANCES AND DISTANCES

Clause **28** of IS 17017 (Part 2/Sec 1) shall be applicable.

29 RESISTANCE TO HEAT, FIRE AND TRACKING

Clause **29** of IS 17017 (Part 2/Sec 1) shall be applicable.

30 CORROSION AND RESISTANCE TO RUSTING

Clause **30** of IS 17017 (Part 2/Sec 1) shall be applicable.

31 CONDITIONAL SHORT-CIRCUIT CURRENT WITHSTAND TEST

Clause **31** of IS 17017 (Part 2/Sec 1) is not applicable

32 ELECTROMAGNETIC COMPATIBILITY

Clause **32** of IS 17017 (Part 2/Sec 1) shall be applicable.

33 VEHICLE DRIVE-OVER

Clause **33** of IS 17017 (Part 2/Sec 1) shall be applicable except following:

Replacement

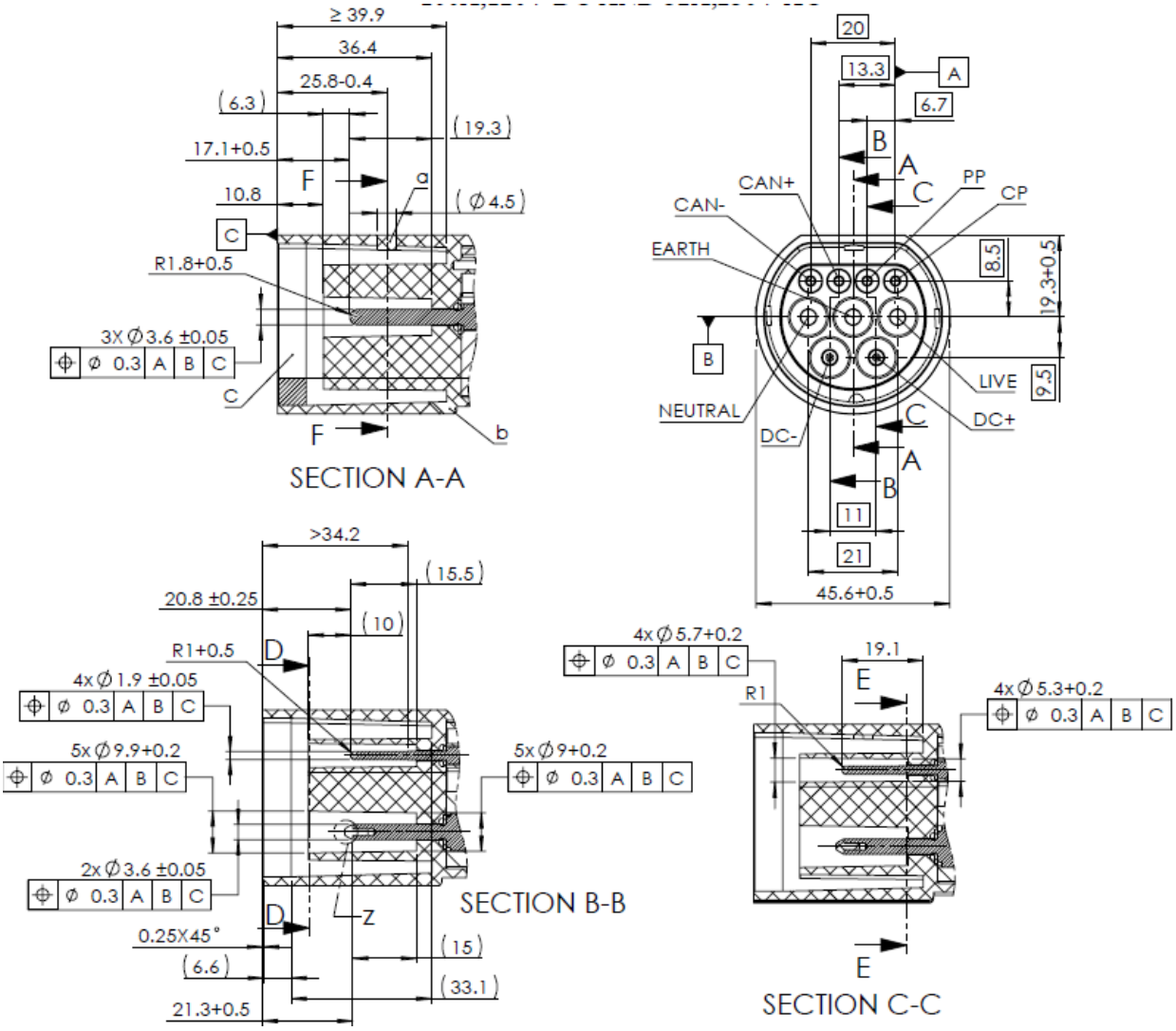
33.1 Not applicable

33.2 Not applicable

STANDARD SHEETS
STANDARD SHEET 7A

Sheet 1

VEHICLE INLET

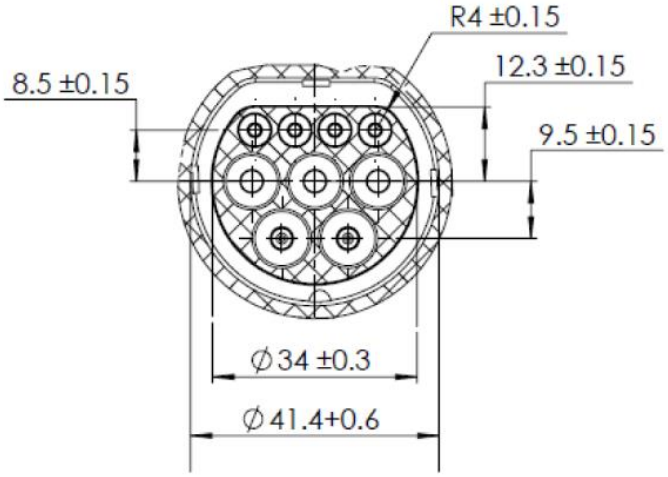


Key

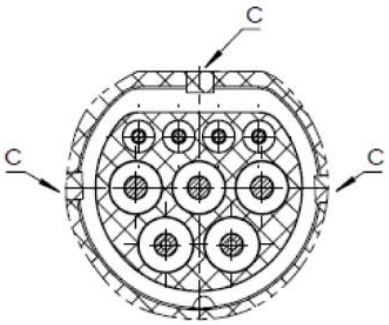
a) Latching means construction to customer decision;
b) Optional drain hole; and
c) Sealing area (Optional sealing).

NOTE — Undimensioned radii: R 0.5 mm to 0.7 mm.

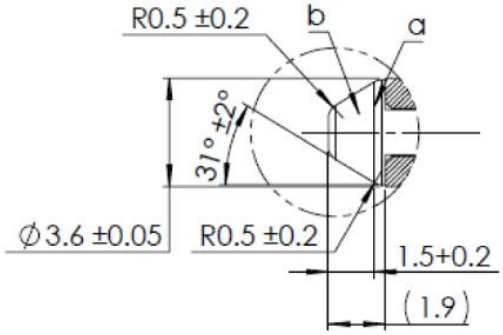
STANDARD SHEET 7A
Sheet 2 (*Continuation of Sheet* 1)



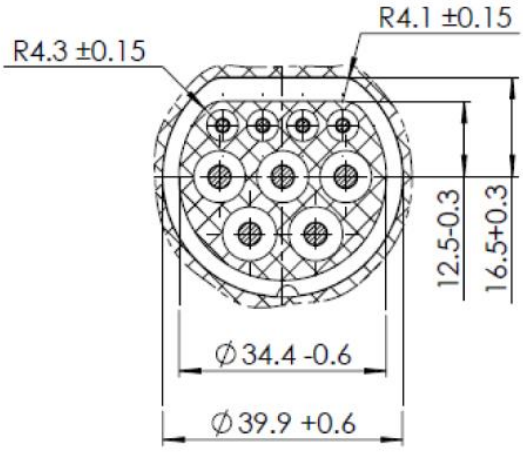
SECTION D-D



SECTION F-F



DETAIL Z



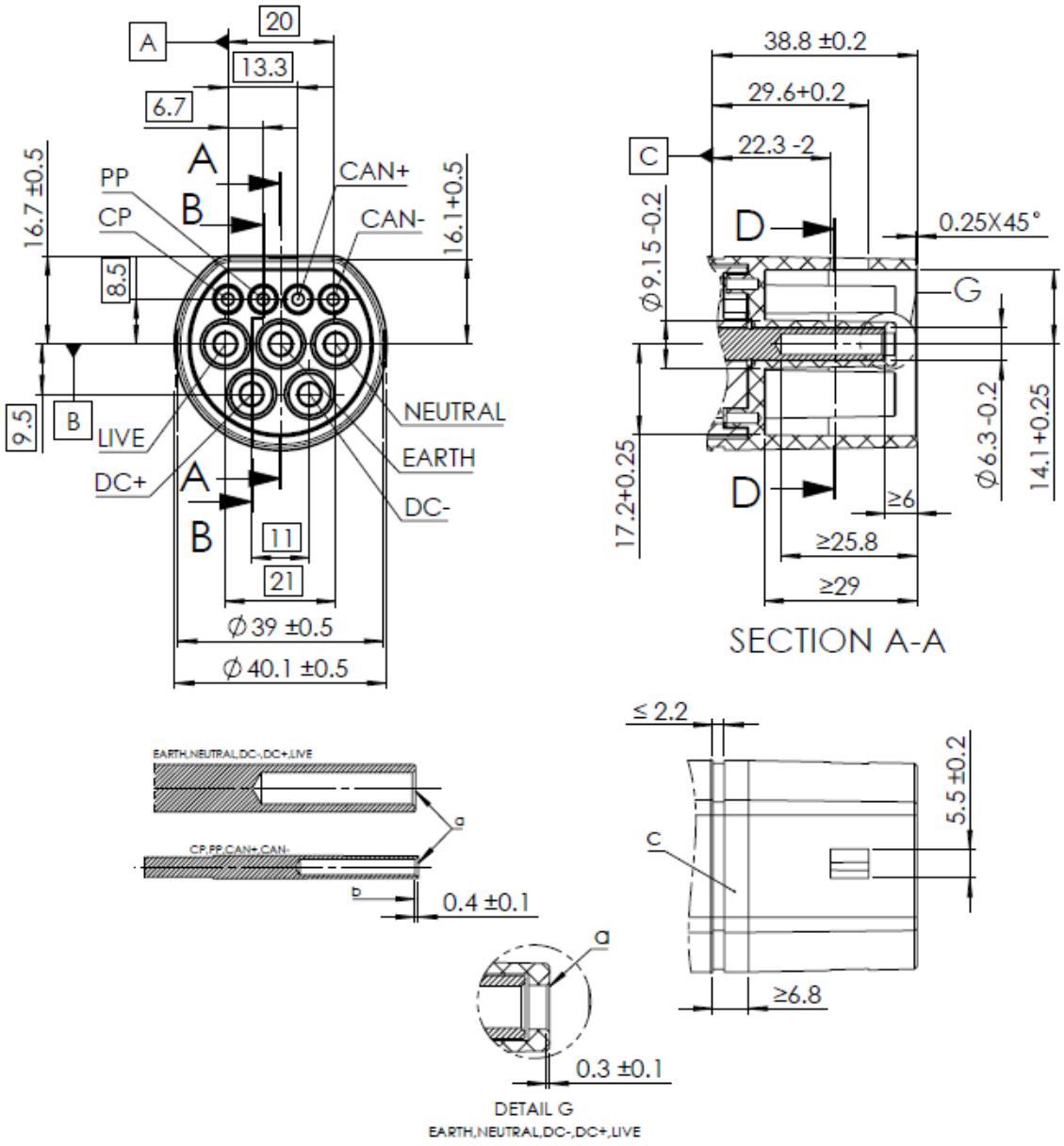
SECTION E-E

Key

a) No sharp edges acceptable at the transition resion;
b) Isolated cap; and
c) Latching means positions. At least one latchingmeans provided.

STANDARD SHEET 7B
Sheet 1

VEHICLE CONNECTOR



Key

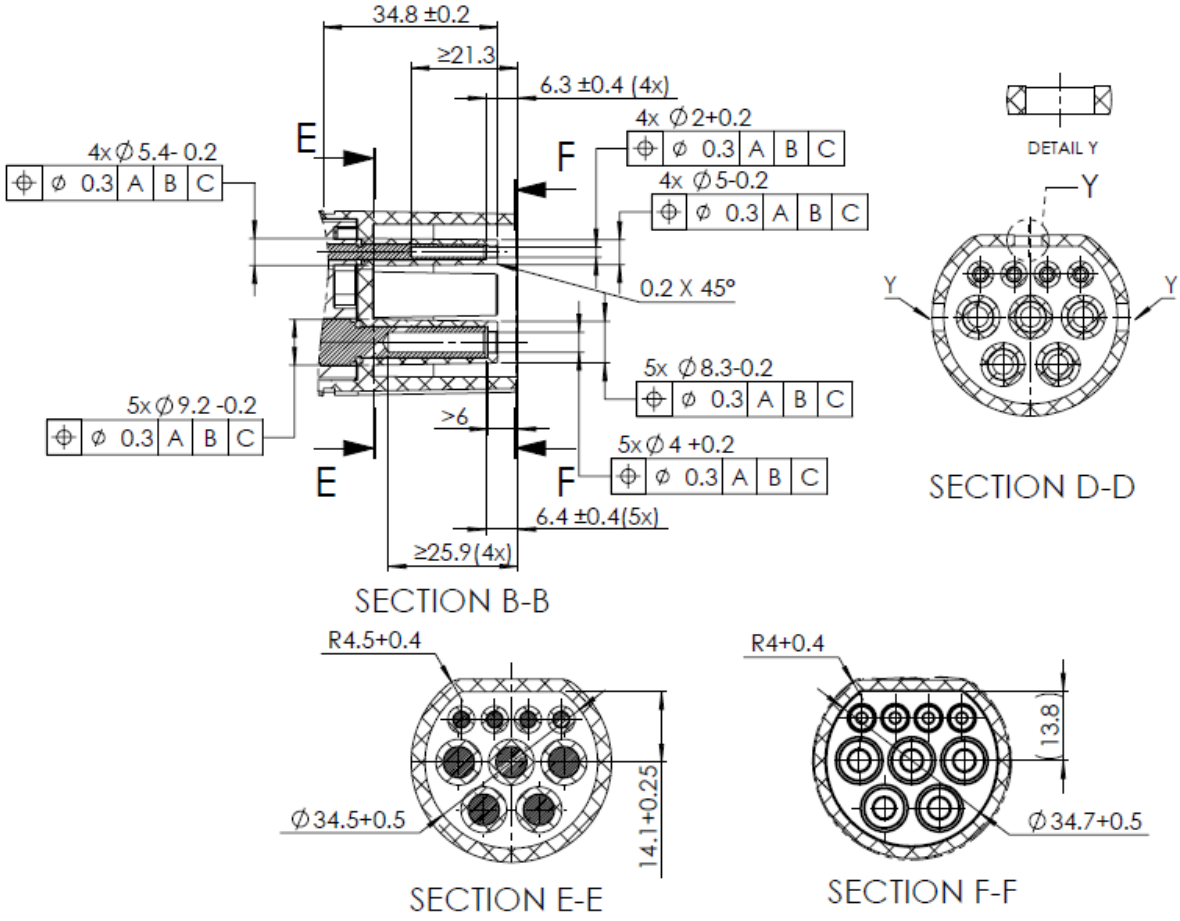
a) Tip of sleeves chamfered for easy insertion;
b) Contact points; and
c) Sealing area free of sinkage, toolcuts and ejectors.

NOTES

1 Undimensioned radii: R 0.5 mm to 0.7 mm.

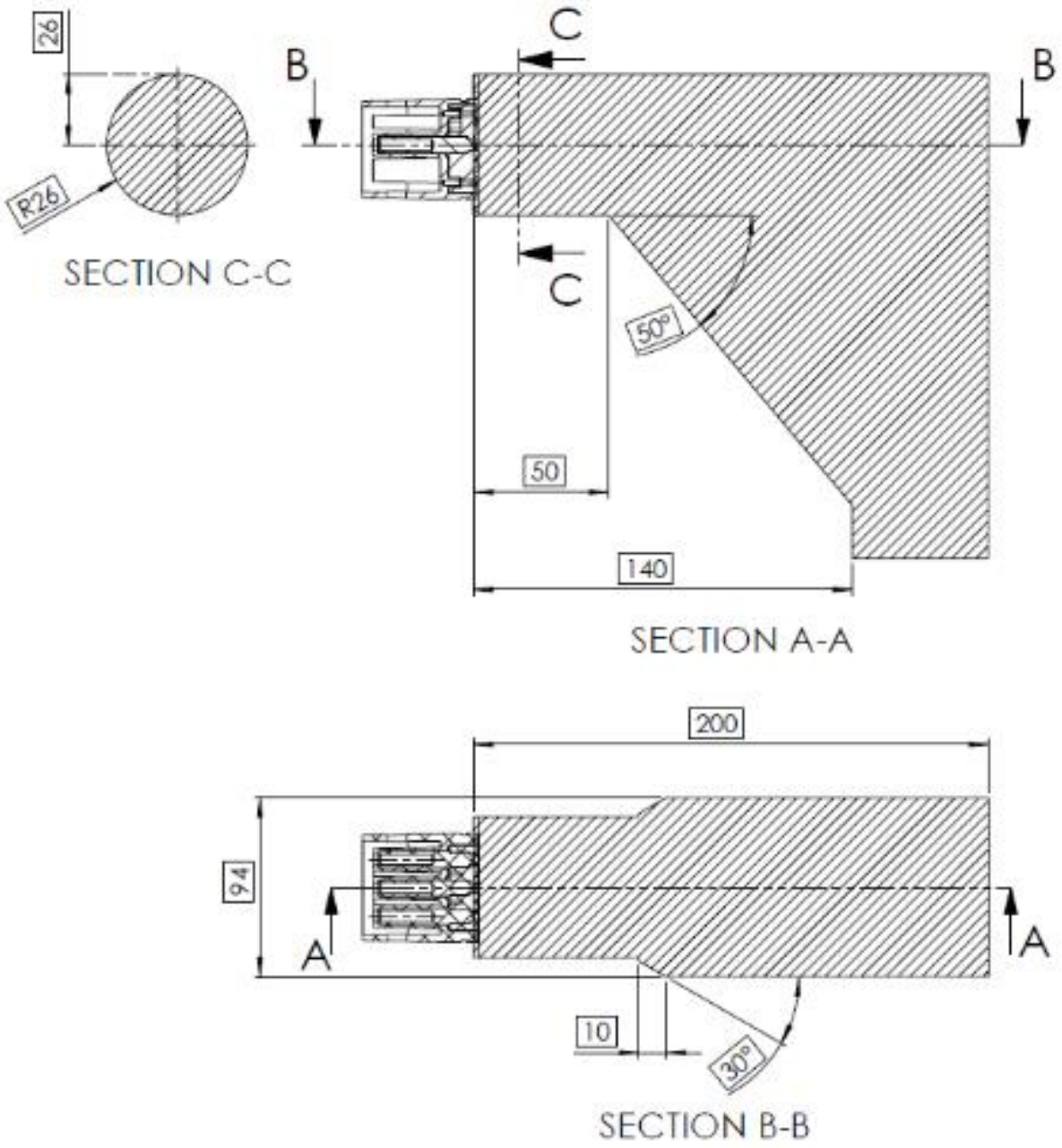
2 Surface roughness in sealing area: Ra = 0.7 µm.

STANDARD SHEET 7B
Sheet 2 (*Continuation of Sheet* 1)



NOTES — Undimensioned radii: R 0.5 mm to 0.7 mm.

STANDARD SHEET 7C
VEHICLE CONNECTOR PACKAGING ROOM



Vehicle connector body shape shall be within the shaded area

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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