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SPECIFICATION FOR HIGH CAPACITY INTER VEHICULAR COUPLER UNIT (500 AMPS. RATING) FOR EOG TYPE AC COACHES/POWER CARS/ LOCOS

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RDSO/PE/SPEC/AC/0177 (Rev.02)-2013

S. No.	Date of amendment	Revision	Reason
1	29.11.2021	1	Change of the material of socket housing assembly from aluminum to stainless steel & revised the some drgs for use in locomotives.
	24.10.2024	2	New jumper for loco to loco connection for HOG Supply

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APPROVED

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SPECIFICATION FOR HIGH CAPACITY INTER VEHICULAR (IV) COUPLER UNIT (500 AMPS. RATING)FOR EOG TYPE AC COACHES/POWER CARS/ LOCOMOTIVES

FOREWARD

At present Rajdhani/Shatabdi trains are working on End on Generation (EOG) system. Power generated in the power car at the ends of the rake is fed to each coach of the rake through inter vehicular coupler. The existing Inter Vehicular (IV) couplers used in LHB AC Coaches (Rajdhani/shatabdi trains) are rated for 400 Amps, which is suitable for 18-19 LHB coaches. For rake having 24 number LHB AC coaches, there is need to enhance the current carrying capacity of the inter vehicular couplerup to 500 Amps. Therefore, it has been decided to develop high capacity Inter Vehicular Coupler for use in LHB type rake having 24 numbers EOG type coaches.

Most of the Electric loco shed of Zonal Railways have reported the failures of breakage of socket of the IV coupler (500 Amp) fitted in Electric Loco. Failures are of mainly related to breakage of Aluminum housing flashing and locking of coupler pins, lever tie bow gap, etc, which affects the reliability of HOG operations.

Western Railway has reported the failures of Inter Vehicular (IV) couplers of WAP7 locos provided with Hotel Load Converters (HLC), in which it is mentioned that the failures in IV couplers are mainly attributed to breakage of body/base of IV coupler and damage of phase pins. Western Railway has suggested that the Aluminum cast housing to Grade 4600 confirming to IS 617 as per RDSO's specification no. RDSO/PE/SPEC/AC/0177-2013(Rev-0) needs a material quality review for better performance.

Therefore, keeping in view of high failure of socket assembly due to breakage of Aluminum housing, flashing and locking of coupler pins, lever tie bow gap, etc used in loco has been reviewed. This specification has been revised keeping the change in the material of socket assembly from Aluminum casting to Stainless steel.

Further, it was observed that for loco to loco connection for HOG supply, there is a need of jumper plug cable. Therefore, trial with special jumper plug with oblique entry of cables was conducted in Locomotive of Electric Loco shed, Vadodara on the running trains.

After trial, it was observed that IV Coupler was normal and no rubbing & hitting mark noticed. Therefore, specification has been revised to include oblique entry of cable at jumper plug for Loco to Loco Connection.

1.0 SCOPE

1.1 This specification covers the design, manufacture and test requirement of IV coupler unit for EOG type AC coaches/locos for transmission of 3 phase, 5 wires, 750 V, 50 Hz power supply from power car to individual coaches.

1.2 SCOPE OF SUPPLY

The scope of supply for each IV coupler unit shall include the following unless otherwise stipulated in the tender:

A) For coaches and Power cars

1	Jumper plug assembly	2 Nos.
2	Coupling socket assembly	2 Nos.
3	Dummy socket assembly	2 Nos.
4	Jumper cable duly crimped with each jumper plug and covered with flexible polyamide conduits and its fittings.	2.6 meters
5	Jumper cables duly crimped with each coupler socket	400 mm

B) For Loco side

1	Coupling socket assembly for loco	4 Nos
2	Jumper cables duly crimped with each coupler socket	1 meter or suitable length

C) For Loco to Connection

1	Jumper cables with plug on both side of suitable length	1 Nos

2.0 GOVERNING SPECIFICATION

2.1 The IV coupler unit shall, unless otherwise Specified here in, conform to the Indian Standards Specification/IEC recommendations as indicated below and the Indian Electricity rules, wherever applicable.

In case, there is any revision/amendment to these specifications/ rules/recommendations, the latest version shall be applicable.

S.N	Standards	Description
1	ASTM A351/Gr-CF8	Specification for stainless steel casting
2	IS: 319	Free cutting leaded brass bars, rods and sections
3	IS: 613	Copper rods & bars for electrical purposes
4	IS: 617	Cast Aluminum & its alloys ingots and casting for general engineering purpose.
5.	IS:4454(IV) and IS:7906(I) and (II)	Cold rolled springs (stainless spring steel wires grade 2)
6	AISI-304	Specification for Stainless steel Bars & section
7.	IEC 60947-1 2004	Specification for low voltage switchgear and control gear – part 1 General rules.
8.	IEC: 60529-1	Classification of degree of protection provided by enclosures.
9.	UIC: 532	Electric power supply for trains taken from the train vehicle
10.	UIC: 554-1	Power supply to electrical equipments on stationary railway vehicles from local mains system

		or another source of energy at 220 V or 380 V, 50 Hz
11.	DIN EN 15085-2-2008	Welding of Railway vehicles Part – 2: Qualification of manufacturer of welded rolling stock materials, Quality Assurance.
12.	EIA 364E-2008/IEC 60352	Method 2009.1 - Cable pull out
13.	EIA 364E-2008/IEC 60352	Method 2014 - Contact engagement and separation force
14.	RDSO/PE/SPEC/AC/0138-2009(Rev-1) or latest	Flexible polyamide conduits with its accessories.
15.	ELRS/SPEC/ELC/0019 (Rev-4)-Feb-2018 or (latest)	Electron beam cable

2.2 Any deviation from this specification proposed by the firm, aimed to improve upon the performance, utility and reliability /efficiency of the equipment will be given due consideration, provided full particulars of the deviations with justification are furnished.

3.0 BASIC GENERAL REQUIREMENTS AND SERVICE CONDITIONS

3.1. The IV coupler unit shall be suitable for rugged service normally to be met within Railway Rolling Stock, where coaches/locos are expected to run up to a maximum speed of 200 kmph in varying climatic conditions existing throughout India as under:-

Ambient	-4 to 55deg C
Average ambient	35 deg. C
Train speed	200 Km/h
Relative Humidity	Upto98%
Altitude	Max 1200 m above sea level
Atmosphere	Extremely dusty and desert weather. The dust contents in the air may reach as high value as 1.6 mg/cubic meter.
Annual rain fall	Very heavy in certain areas: between 1750 to 6250 mm.
Coastal area	The equipment shall be designed to work in humid salt laden and corrosive atmosphere. The maximum values of the condition shall be as under : Maximum pH value 8.5 Sulphate 7 mg/liter Max. concentration of chlorine 6 mg/liter Max. conductivity 130 micro siemens/cm
Shocks and Vibration	The IV coupler shall withstand satisfactorily vibrations and shocks normally encountered in service as indicated below: a) Max. vertical acceleration - 3.0 g b) Max. lateral acceleration - 3.0 g c) Max. longitudinal acceleration - 3.0 g ('g' being the value of acceleration due to gravity)

3.2. The supplier shall be fully responsible for ensuring that all equipments forming part of the supply are entirely fit for purpose and no part of this specification shall in any way remove or reduce this obligation in this respect. In addition, it is the supplier's responsibility to under write the complete IV coupler unit design and ensure that it is compatible with, and will, in no way, compromise, the design and performance of IV coupler unit of this supply.

3.3 The supplier shall provide "In the field" service support during the guarantee period."

3.4 The supplier shall supply any purpose built or special tools or equipment that may be necessary for the correct operation, servicing, testing or installation of the IV coupler unit.

3.5 The supplier will provide assistance, both material and technical, in the development of the system as a whole to ensure that when this IV coupler unit is installed as part of the integrated vehicle system the performance of the unit meets or exceeds the requirements specified.

3.6 Should the IV coupler unit fail to achieve these requirements, then the unit shall be modified at the supplier's expense and within a time scale to be agreed with purchaser/consignee/RDSO.

4.0 DESIGN AND TECHNICAL REQUIREMENTS

4.1 The mounting dimensions of Jumper plug assembly, Coupling socket assembly and (Dummy) socket assembly of the coupler shall generally confirm to RCF drawing no. LW71301 alt a, LW71300 alt nil , LW 71302 alt nil respectively. The dimensions of other parts like insulating base, design of pin contact & socket contact, circular ribs around contact pin holes of plug assembly and sub-assemblies shall be approved at design stage. The jumper plug assembly shall be in one piece.

For locomotives, socket housing shall be of stainless steel casting along with some associateds drgs has been revised as per following RDSO's drawing:

- RDSO's drawing no. RDSO/PE/SK/AC/0226-2021 (Rev-0) for Socket assembly for locomotives.
- RDSO's drawing no. RDSO/PE/SK/AC/0227-2021 (Rev-0) of hinged cover for socket assembly for locomotives.
- RDSO's drawing no.RDSO/PE/SK/AC/0228-2021 (Rev-0) of complete ratchet assembly for locomotives.
- RDSO's drawing no. RDSO/PE/SK/AC/0235-2021 (Rev-0) of sealing ring gasket for locomotives .
- All the other relevant Drgs of Socket assembly for locomotives will remain same.

For Loco to Loco Connection on HOG Supply.

4.1.1 The jumper Plug of IV Coupler for loco to Loco connection shall be with oblique entry of cables to avoid infringement of Jumper plug cable with hinged cover of Socket housing.

4.1.2 The jumper plug for loco to loco connection shall be as per RDSO's drawing no. RDSO/PE/SK/AC/0253- (Rev-0)-2024.

4.2 Insulating base for jumper plug shall be modified by providing circular rib of 2mm height and thickness around each contact pins hole on mating surface area to increase creepage distance as per drawing no. LW71304 Alt “c”.

4.3 There shall be 5mm collar in the upper half of socket housing assembly as per drawing no. LW71306 Alt “b” for coach and for locos as per RDSO’s drawing no. RDSO/PE/SK/AC/0226-2021 (Rev-0).

4.4 The hinged cover for socket assembly shall as per drawing no. LW71309 Alt “a” & for locos as per RDSO’s drawing no. RDSO/PE/SK/AC/0227-2021 (Rev-0) and blind socket housing shall be as per drawing no. LW71341 Alt “b”.

4.5 The jumper plug housing shall be as per drawing no. LW71380 alt nil.

4.6 The fixed/mobile contact pins shall be rated for a continuous current rating as detailed below :

Phase (R, Y, B)	500 AMPS at 0.8 P.F, 750 V, 50 Hz.
Neutral (N)	400 Amps at 0.8 P.F, 750 V, 50 Hz.
Earth pin (E)	260 Amps at 0.8 P.F., 750 V, 50 Hz.
Control pins (C1&C2)	25 Amps at 0.8 P.F., 750 V, 50 Hz.

Above current ratings are taken at 50ºC ambient temperature.

4.7 The terminal connections on jumper plug unit and coupling unit shall be of crimping type suitable for the appropriate sizes of cables. Heat shrinkable polyolefin sleeves or similar insulating material shall be provided over the terminations of each core of cable to prevent any accidental contact between the adjacent terminals.

4.8 The complete coupler assembly shall have IP protection IP65 as per IEC 60529(latest version).

4.9 There shall be a provision of bus bar on the cover of coupling socket for shorting of control contacts (C1 & C2) when they are not in use.

4.10 The dummy socket shall be used when plug is not connected between coach to coach and shall have terminals for control contacts shorted with the help of 4 mm² electron beam cable. The electron beam cable shall be as per RDSO specification ELRS/SPEC/ELC/0019 (Rev- 4)-Feb-2018 or latest. Suitable locking arrangement shall be provided so that the plug does not come out due to its own weight and vibration.

4.11 Locking arrangement shall be provided on the IV coupler socket and dummy socket so the inserter/extractor ratchet arrangement does not disengage due to its own weight (including inter connecting cables) and vibration encountered in service during running of the train.

4.12 The design of the coupler unit shall be of waterproof construction and when the jumper plug and coupling socket are coupled together they shall be completely water tight so that water does not find access to the internal assembly. The coupler assembly shall be provided with fire retardant high quality neoprene / EPDM gasket between the

mating surfaces to avoid water ingress. It shall be ensured that in any circumstances, neoprene/EPDM rubber gasket between the mating surfaces could not come out.

4.13 Plug pin contact and socket contact shall be of self-adjusting type, so that they align themselves to establish a firm contact between pins & socket tube by providing multi point contacts. The displacement, loosening and extraction of the spring shall be checked after 500 mating cycles.

4.14 With a view to ensure interchangeability, all parts shall strictly conform to the requirement of the detail drawing of each component prepared by the firm and duly approved by RDSO so that the corresponding part of one coupler unit can be assembled in any other make coupler unit and shall also apply to manufacture of the component spares for all sub-assemblies of the coupler unit.

4.15 The insulating material shall have the fire/flammability retardant property of V0 when tested as per UL94. The manufacturer shall submit the certificate from any NABL approved laboratory.

4.16 Necessary partition/bridges shall be made in jumper plug and coupling socket. The insulating barriers shall be moulded with main insulating base in one single piece. Firm shall submit the detailed drawing during prototype testing to the inspecting official.

4.17 Cable shall be crimped at minimum 4 points in plug pins & socket tubes, so that possibilities of loosening of cable & presence of air may be eliminated during service. The arrangement to escape air from the tube & pins shall be provided.

4.18 The cables shall be crimped on both plug pins and socket tubes. The crimping socket shall be of appropriate size to match the cables. A heat shrinkable, fire retardant polyteflin sleeve shall be provided covering some portion of lugs and cables.

4.19 There shall be a suitable guide in plug and socket to ensure its mating in one direction only.

4.20 Notching of size 20 x 20 x4mm shall be provided on the screw side of the pins to lock with the slot provided in insulation base and thus prevent the rotation of the pins during assembly. This shall be as per RCF drawing no. LW 71303 Alt-b, LW 71304 Alt-c, LW 71316 Alt-b, LW 71318 Alt-b, LW 71337 Alt-b.

4.21 Stainless steel fasteners as per SS 304 shall be provided to prevent from corrosion & rusting.

4.22 The coupler unit shall have seven (7) pin contacts in the plug pin and corresponding seven (7) socket pin contacts in the socket.

4.23 The identification, size & length of jumper cable shall be as under:

S. N	Circuit/identification	Cable size in mm²	Length of jumper cable on plug side	Length of jumper cable on socket side
1.	R – Phase	150	2.6 meters	400 millimeters
2.	Y – Phase	150	2.6 meters	400 millimeters

3.	B – Phase	150	2.6 meters	400 millimeters
4.	N - Neutral	95	2.6 meters	400 millimeters
5.	E – Earth	70	2.6 meters	400 millimeters
6	Body earth	35	10”	8”
7.	C-1 Control	4.0	2.6 meters	400 millimeters
8.	C-2 Control	4.0	2.6 meters	400 millimeters

The jumper cables shall be electron beam cables as per RDSO specification ELRS/SPEC/ELC/0019 (Rev 4.)-Feb-2018 or latest.

4.24 Fire retardant, halogen free polyamide flexible conduit along with their accessories shall be used. The flexible polyamide conduit and its accessories shall confirm to RDSO/PE/SPEC/AC/0138-2009(Rev-1) or latest.

4.25 Terminals for phases, neutral, earth & control shall be suitably marked with legible letters (R, Y, B, N, E, C1 & C2) corresponding to the letter (1, 2, 3, 4, 5E, 7 & 10) on the insulating base in prescribed color.

4.26 The tip diameter of fixed contact pin C1 & C2 shall be as per drawing LW 71338Alt ‘a’.

4.27 The drawing for mobile contacts, fixed contacts and insulator blocks shall be as per LW 71316 Alt-b and LW 71318Alt-b, and the material of the flexible braided wire shall be suitable for 500Amps current rating at 50ºC ambient temperature.

5.0 MATERIAL OF COMPONENTS

5.1 The fixed and mobile contacts shall be made of tough pitch copper as per IS: 613 with silver cadmium oxide tips. The material of the spring inside the mobile contacts shall be SS 304 with CF-8 grade. The pin contact and socket contact shall be made of copper with silver plating. The thickness of plating shall not be less than 1.0 microns. All pins shall be silver plated for atmoshpheric protection from moisture and oxidation.

5.2 The control pins contact shall be made of brass as per IS:319 with silver plating having thickness of 1.0 microns.

5.3 The housing of jumper plug, coupling socket and dummy socket along with covers shall be protected against rust by giving suitable anti-corrosive and anti-rust treatment with epoxy based powder to shade No. 632 (DA gray) of M/s Nerolac or equivalent to meet the service condition as specified in clause 3.0. Before the application of primer, all the surfaces shall be thoroughly cleaned repeatedly with cleaning agent to ensure removal of rust and greasiness etc. The detailed process to clean surfaces shall be furnished by the firm.

5.5 The compression springs must withstand minimum 1 million load cycles.

5.6 A compression spring should be preferably designed buckle proof.

5.7 The load test shall be in accordance clause no. 7.1 of IS: 7906(part-II) and compression test as per clause no.7 of IS: 7906(part-I).

5.8 The coupler socket, plug housing, dummy socket housing and their covers shall be made of die cast Aluminum grade 4600 confirming to IS: 617. Firm will submit the material conformity to the specification along with its test report from any NABL accredited laboratory during prototype inspection. If any other material is used for housing of IV coupler, it shall be require prior approval of RDSO. Firm shall submit the comparative technical justification to RDSO for approval. Coupling socket housing for locos shall be made of stainless steel with Grade CF-8 as per ASTM A 351.

5.9 The assembly of coupler unit shall be provided with an inserter/extractor ratchet arrangement to enable insertion and extraction of the coupler plug

5.10 The complete ratchet assembly shall be made of stainless steel (SS304) as per RCF drawing no. LW 71330 Alt "a" for coaches and as per RDSO's drawing no. RDSO/PE/SK/AC/0228-2021 (Rev-0) for locomotives.

5.11 The insulating base plate shall be of FRP/SMC materials and properties of FRP/SMC components or any other insulating material suitable for withstanding continuous temperature of 50ºC above the ambient at full load shall be furnished to RDSO.

5.12 The cleating for securing of feeder cables in plug housing assembly shall be of fire retardant high quality neoprene / EPDM gasket with UL 94 V0 (drawing no.LW 71374 Alt nil).

5.13 The material of the 'O' ring of the mating surface between socket and plug shall be neoprene/EPDM with UL 94 V0.

5.14 The complete material used in IV coupler shall be of fire retardant properties.

5.15 The material of the contacts confirming to the specifications and relevant latest standards shall be submitted by the firm.

6.0 MARKING:

6.1 The IV coupler assembly shall be marked with the following information at suitable location.

Make/rating
Serial No.
Month and year of manufacture
Specification No.

7.0 TESTS

7.1 **Type test:**

7.1.1 Only after the detail drawings & the design of coupler and its accessories have been approved and the clearance given to this effect, the manufacturer shall take up the manufacture of the prototype. It is to be clearly understood that any changes, required to be done in the prototype or any additional tests other than specified herein are required to be conducted on the prototype unit or its components, they shall be done expeditiously. During the process of manufacture of the equipment, if the purchaser so

desires, he may conduct/repeat any of the routine or additional tests to satisfy himself that the quality of the module being manufactured is of the required standards.

7.1.2 The test protocol indicating relevant clause of the test, condition of the test, specified value and observed value of the parameter for IV coupler shall be submitted by the firm before offering the sample for testing.

7.1.3 The type tests shall be carried out by RDSO representative on prototype unit either totally or in part under the following conditions without any additional cost:

- A manufacturer undertakes to manufacture for the first time as per this specification
- An important change in the designof equipment has been introduced.
- Specification is modified necessitating re-designing of equipment.
- Unsatisfactory performance reported by user Railways.
- Resumption of production after an interruption of more than two years.

7.1.4 RDSO may conduct surprise checks on manufacturing process and quality control along with any of the tests to ensure quality of product and its conformance to RDSO's specification.

7.1.5 The suitability of the IV coupler unit shall be ascertained by inspection & bench test at the firm's premises, that in stationary coach/locos and service trial of the coach/locos.

7.1.6 The tests shall be carried out at the works of the manufacturer or a reputed testing laboratory in presence of Indian Railway representative on the prototype unit of the IV coupler unit as per the relevant governing specifications. Manufacturer shall have all possible necessary arrangement for testing of IV coupler.

7.2 **Routine test:**

7.2.1 Routine tests are to be carried out on each unit to verify that properties & design of the product are in the line to those measured during type test. Proper documentation of routine tests results shall be made available by the firm and will be produced before the inspecting official on demand.

7.3 Acceptance test:

7.3.1 Every unit of Inter Vehicle coupler shall be subjected to acceptance tests as given in clause no. 7.4 or sample picked up by inspecting official at manufacturer's works nominated by purchaser/RDSO.

7.3.2 Manufacturer, on demand by inspecting official shall produce the internal/routine test report carried out by manufacturer.

7.3.3 All the tests shall be carried out at firms premises and manufacturer's cost. Inspecting official shall witness the test on each unit. A copy of these internal tests conducted by the firm shall be supplied to the inspecting/purchasing authority. Not withstanding above RDSO reserves the right to have these equipments also tested as per the specification and mentioned standards at any reputed house in India at firm's cost.

7.4 Test description

S.N.	Description of test	Cl No.	Type test	Routine test	Accept-ance test
1.	Dimensional and visual inspection	7.4.1	Yes	Yes	Yes
2.	Milivolt test (Voltage drop test)	7.4.2	Yes	Yes	Yes
3.	Temperature rise test	7.4.3	Yes	Yes	--
4.	Insulation resistance test	7.4.4	Yes	Yes	Yes
5.	High voltage test	7.4.5	Yes	Yes	Yes
6.	Cable pull out	7.4.6	Yes	-	**---**
7.	Test on spring	7 and 7.1 of IS:7906(I) &(II)	Yes	-	Yes
8.	Contact pressure test for individual fixed/mobile contacts	7.4.7	Yes	-	-
9.	Mating cycle test	7.4.8	Yes	-	-
10.	Salt fog test	7.4.9	Yes	-	-
11.	Clearance & creepage distance test	7.4.10	Yes	-	-
12.	Degree of protection test	7.4.11	Yes	-	Yes*****
13	Endurance test	7.4.12	Yes	-	-
14.	Test for withstanding shock & vibration	7.4.13	Yes	-	-

* Tests to be done on annually basis from NABL accredited lab.

NOTE:

1. Testing/measuring instruments shall be duly calibrated fromany NABL recognized laboratory and shall be furnished during type test.
2. Acceptance tests to be conducted on 5% unit of the lot offered, subject to minimum 2 sets.

7.4.1 Dimensional and visual inspection

The coupler assembly and its components shall be inspected visually and the dimensions shall be measured and recorded as per the relevant drawings approved by RDSO. The castings shall be free from cracks, blow holes and shall have smooth finish. Firm shall also submit the detailed chemical report of the chemical analysis of the material confirming to the specification from reputed govt /NABL accredited lab.

7.4.2 Milivolt drop test

The Milivolt drop shall be measured across the terminals by passing the rated current when the steady state condition is achieved. The steady state condition is reached when last 3 consecutive readings are approximately constant. The Milivolt drop between two contacts should not be more than 45 Milivolt.

7.4.3 **Temperature rise test**

This test shall be conducted with all the cable connected to their respective terminals and lug inserted in socket tube and alternating current of the value shown in the table shall be passed through phase, neutral, earth & control pins for a period of three hours at an ambient temperature of 50ºC. Firm shall create the facility to maintain the ambient of 50 ºC. The temperature rise of the terminals shall not exceed 50ºC, when measured with thermocouple or any other means (such as laser thermometer etc).

S.N	Nomenclature of contact	Test current(Amp)
1	Phase	650
2	Neutral	520
3	Earth	340
4	Control	32

7.4.4 **Insulation Resistance (IR) test**

The insulation resistance shall be measured by 1500 V,DCmegger. The insulation resistance shall be measured in the following combinations:

- Between all live poles connected together and earth & housing.
- Between each live pole (inclusive of earth & neutral) and housing.
- Between live pole as R-Y,Y-B,R-B,R-E,R-N etc.

In each case, the IR shall not be less than 100 M Ω before HV and after HV test.

7.4.5 **High voltage (HV) test**

High voltage test shall be conducted by applying test voltage and the combination between different poles as mentioned below in table.

S.N	Description	Test voltage	Duration
1.	Phase to phase	4.5 KV	One minute
2.	Phase to neutral	4.5 KV	One minute
3.	Phase to earth	4.5 KV	One minute
4.	Phase to control	2.5 KV	One minute
5.	Control to earth	2.5 KV	One minute
6.	Control to control	2.5 KV	One minute

The IR value recorded after the test shall not be less than 100 MΩ.

7.4.6 Cable pull – out test

Cable pull out test shall be conducted as per EIA 364E-2008/IEC 60352-2 to determine the axial tensile load.

7.4.7 Contact pressure test for individual fixed/mobile contacts

The contact pressure test shall be conducted on the pins by applying a force on the pins longitudinally and measuring the deflection of compression in the springs. The

pressure exerted and deflection thus resulted shall not be more than the values indicated below:-

S.N	Pressure/load/weight on the pin	Maximum deflection
1.	12kg	5.0 mm
2.	18 kg	7.0 mm

7.4.8 **Mating cycle test**

A) for Coach & Power car
In this test, 500 cycles of surface mating shall be carried out by connecting and disconnecting the plug and socket of IV coupler. After completing 500 cycles, the coupler shall be subjected to IR test, HV test, contact engagement & separation force test andMillivolt test as per relevant Para's of this specification.

B) For Locomotives
In this test, 1000 cycles of surface mating shall be carried out by connecting and disconnecting the plug and socket of IV coupler at 50°C. After completing 1000 cycles, the coupler shall be subjected to IR test, HV test, contact engagement & separation force test and Millivolt test as per relevant Para's of this specification.

7.4.9 **Salt fog test**

The complete unit is subjected to pass 96 hours salt fog test as per ASTM 117 B/IEC 60512-11-6.

7.4.10 **Clearance & creepage distance test**

The Clearance &creepage distance shall be measured between various parts as mentioned in annexure – A. The creepage distance shall be as per pollution degree 4, material group II (Table XV), whereas the clearance shall be as per class A, pollution degree 4 (Table XIII) specified in IEC 60947 -1.

7.4.11 **Degree of protection test**

Degree of protection for the complete unit shall be got tested by the firm from any NABL recognized laboratory as per IEC 60529 conforming to IP-65. The test results shall be submitted at the time of prototype testing. This test shall be conducted after vibration withstanding test and test to simulate the effect of shunting shock, specified in clauses 7.4.13 & 7.4.14.

7.4.12 **Endurance test**

The endurance test shall be conducted on the complete unit when the plug and socket are connected together and an alternating current of 500 Amps, having sine wave form of 50 Hz, shall be applied for a period of minimum 10 hrs (for Coaches & Power Cars) and 24 hours for locomotives only at an ambient temperature of 50ºC. After completion of the test, the contact tips shall be checked visually for any sign of pitted contact tip and contact resistance.

7.4.13 **Test for withstanding shock and vibration**

Test for withstanding vibration for the complete unit shall be got tested by the firm either in-house or from any Govt. /NABL accredited laboratory as per IEC 61373 location 'O' cat. 1, class 'A' as mentioned in Annexure –C of IEC 61373.The test results shall be submitted at the time of prototype testing.The 18 shocks (three positive and three negative in each of the three orthogonal planes) shall be applied to the equipment as per clause No.10.6 of IEC 61373.

8.0 TECHNICAL DATA

8.1 The technical information as per Annexure A "Questionnaire on offer of IV Coupler" complete in all respect should be furnished before prototype test.

8.2 The firm shall indicate its compliance or otherwise against each clause and sub-clause of the technical specification and submit before prototype test.

8.3 The manufacturer shall also supply the following drawings in CAD software:

a) Dimensional drawings of complete plug and socket assembly along with ratchet assembly.

b) Component drawings in line with RCF drawings enclosed with specifications along with the material and specification.

c) One set of the following documents will be supplied with every 50 units:-

i) Operating and trouble-shooting manual.
ii) Parts illustrated catalogue-indicating sources.

9.0 Manufacturer's responsibility

The manufacturer's responsibility will extend to the following:

9.1 The supplier shall supply the detailed instructions for proper installation of the equipment on Rolling stock. For this purpose, the supplier shall depute his engineers/supervisors to purchaser's site during installation of the equipment.

9.2 The supplier shall be responsible for commissioning, testing and field trials of the equipment in service and depute team of engineers/supervisors for this purpose during developmental stage.

9.3 The supplier shall be responsible for carrying out improvements and modifications at his own expense on all the equipments supplied, provided such modifications/improvements are decided to be necessary for meeting the requirements of reliability, performance and safety etc., jointly by manufacturer and purchaser.

9.4 For the purpose of technical decisions on improvements/ modifications etc. on equipment, the final authority from the purchaser's side will be RDSO.

10.0 Warranty period and liability

The supplier/manufacturer shall be responsible for any damage to the products due to defective design, materials and workmanship for a period as per Indian Railway stores (IRS) condition of contract.

11.0 **Infringement of patent right**

Indian Railways shall not be responsible for infringement of patent rights arising due to similarity in design manufacturing process, use of similar components in the design & development of this item and any other factor notmentioned herein which may cause such a dispute. The entire responsibility to settle any such disputes/matters lieswith the manufacturer/ supplier.

Details / design/documents given by them are not infringing any IPR and they are responsible in absolute and fullmeasure instead of railways for any such violations. Data, specifications and other IP as generated out of interactionwith railways shall not be unilaterally used without the consent of RDSO and right of Railways / RDSO on such IP isacceptable to them.

12.0 **Schedule of Technical Requirement (STR)**

12.1 Firm intended to manufacture and supply of IV coupler to Indian railway should have all the manufacturing& testing facilities as per RDSO's STR No. RDSO/PE/AC/STR/0033-2011(Rev-0) or latest.

13.0 Maintenance Manual

13.1 Firm will submit the general maintenance recommendations on maintenance requirement of the unit, which should contain periodicity, work content and justification for each maintenance requirement. Firm will also submit the catalogue indicating sources during prototype test.

14.0 Enclosures

a) Annexure A: Questionnaire on offer for IV coupler.
b) Drawing of jumper plug assembly LW 71301 Alt "a"
c) Drawing of Coupling socket assembly LW 71300 Alt "nil"
d) Drawing of blind socket assembly LW 71302 Alt "nil"
e) Drawing of jumper plug housing LW 71380 Alt "nil".
f) Drawing of insulating base for jumper plug LW71304 Alt "c".
g) Drawing of socket housing assembly LW71306 Alt "b"
h) Drawing of hinged cover for socket assembly LW71309 Alt "a"
i) Drawing of blind socket housing no. LW71341 Alt "b".
j) Drwaing of socket housing for locomotives RDSO/PE/SK/AC/0226-2021 (Rev-0).
k) Drawing of hinged cover for socket assembly for locomotives RDSO/PE/SK/AC/0227-2021 (Rev-0).
l) Drawing of complete ratchet assembly for locomotives RDSO/PE/SK/AC/0228-2021 (Rev-0) .
m) Drawing of sealing ring gasket for locomotives RDSO/PE/SK/AC/0235-2021 (Rev-0).

ANNEXURE – A

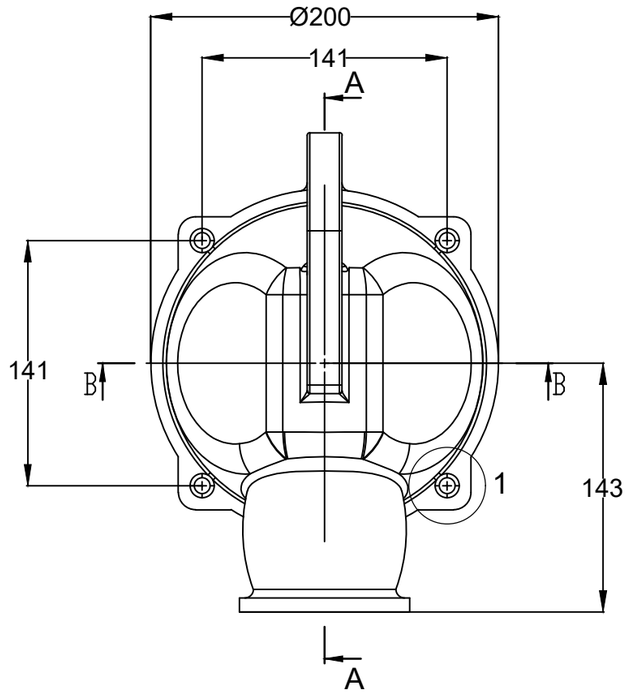
QUESTIONNAIRE ON OFFER FOR IV COUPLER FOR LHB EOG TYPE AC COACHES
(To be furnished by the firm at the time of prototype testing)

S.No.	Description	To be furnished by the firm
1.	Manufacturer's name & Address	
2	Model/Type	
3.	Rating a) Voltage b) Current c) Power factor	
4.	Temperature rise at rated current	
5.	Cable pull out	
6.	Material and parameters of the spring	
7.	Mating cycle	
8.	Weight a) Plug assembly b) Socket assembly c) Blind Socket assembly d) Total wt.of Plug, socket & blind socket with cables e) Socket assembly for locomotives	
9.	Materials along with relevant specification & drawing a) Plug assembly b) Socket assembly c) Ratchet assembly d) Blind Socket assembly e) Fixed contact pin f) socket Tube g) Control pin h) Socket assembly for locomotives i) Ratchet assembly for locomotives	
10.	Degree of protection for complete coupler unit	

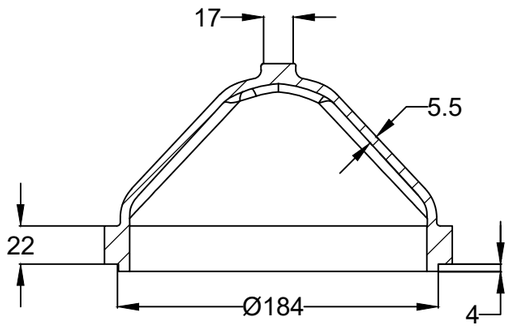
Note: All the columns shall be filled in along with the relevant documents, drawings, specifications and other details.

DISTRIBUTION

CHIEF ELECTRICAL LOCO/ SERVICE/ DESIGN ENGINEER:	
1	Northern Railway, Baroda House, New Delhi – 110 001.
2	Central Railway, II Floor, Parcel office, CST Mumbai –500 001.
3	Eastern Railway, Fairlie Place, Kolkata – 700 001.
4	South Eastern Railway, Garden Reach, Kolkata – 700 043
5	Southern Railway, Park Town, Chennai – 600 003.
6	Western Railway, Churchgate, Mumbai – 500 020.
7	South Central Railway, Rail Nilayam, Secunderabad – 500 371.
8	East Central Railway, DighiDistt- Vaishali, Hajipur Bihar- 844 101.
9	North Central Railway, Subedarganj, Allahabad- 211 001.
10	South Western Railway, 1st Floor, DRM Office, Hubli 580 020
11	South East Central Railway, Bilaspur.495004
12	North East Frontier Railway, Maligaon, Guwahati – 781001
13	North Eastern Railway, Gorakhpur – 273001
14	North Western Railway, Jaipur – 302006
15	West Central Railway, Jabalpur – 482001
16	East Coast Railway, Bhuvneshwar, Orrisa – 751016
17	Konkan Railway, BelapurBhavan, Sector-11, Belapur, Mumbai –500614
18	Metro Railway, 33 /1 J.L. Nehru road, Kolkata- 700071
19	Integral coach factory, Perambur, Chennai – 600038
20	Rail Coach Factory, Kapurthala (Punjab) – 144 602
21	Rail Coach Factory, Lalganj, Bareilly (U.P) – 144 602
CHIEF WORKS MANAGER:	
1	Matunga Workshop, Central Railway, Mumbai 500 019.
2	Liluah Workshop, Eastern Railway, Howrah
3	C&W Workshop , Northern Railway, Alambagh, Lucknow-226 05
4	C & W Workshop,N. Rly., Jagdhari – 135 002
5	Mechanical Workshop, NER, Gorakhpur – 273 012
6	Carraige Workshop, Southern Railway, Perambur, Ayanavaram, Chennai–600023.
7	SCR, Lallagudda Workshop, Lallaguda, Secunderabad - 500017
8	Carriage Workshop, Western Railway, Lower Parel, Mumbai-500013
9	CRWS, W. C. Railway, Nishatpura, Bhopal-462010
10	Carriage Workshop, NW Rly,. Ajmer - 305001
11	Carriage Repair Workshop, Gadag Road, SWR, Hubli – 580 020
12	Carriage Workshop, S.W. Railway, Mysore Vishwanath.
13	Carriage Workshop, SE Rly., Kharagpur - 721301
14	New Bongaigaon , Railway Workshop, Dangtal, Distt. Bongaigaon, Assam-783380
15	Carriage and Wagon Workshop, N. C. Rly., Jhansi – 248003
16	Carriage and Wagon Workshop, WC Rly., Kota - 325002
17	Carriage and Wagon Workshop, Eeastern Rly., Liluha - 711204
18	Carriage and Wagon Workshop, W. Rly., Pratap Nagar, Vadodara - 390004
19	Carriage and Wagon Workshop, N Rly., Amritsar - 143001
20	Central Workshop, Goldenrock, S. Rly., Trichi - 620004
OTHERS:	
1	Director, IRIEEN, Nasik Road (Maharashtra). - 422101
2	Senior Professor (Elect.), Railway Staff College, Lalbaug, Vadodara. - 390004
3	Director, IRCAMTECH, Maharajpur, Gwalior – 474 020.



TOP VIEW



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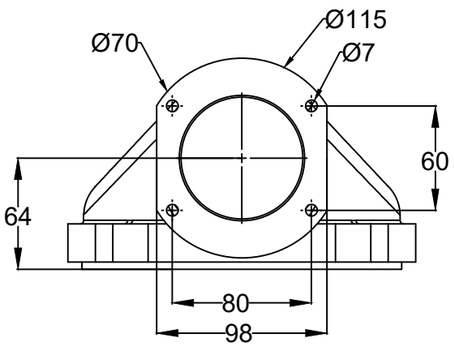
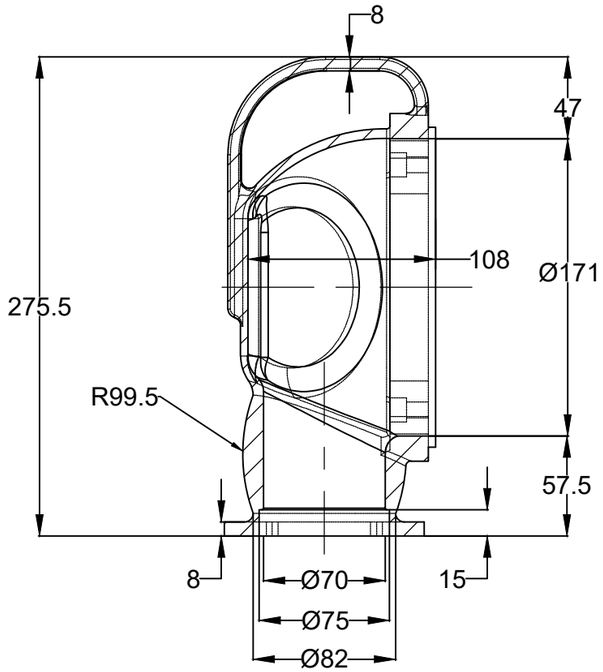


FRONT VIEW



SECTION A-A
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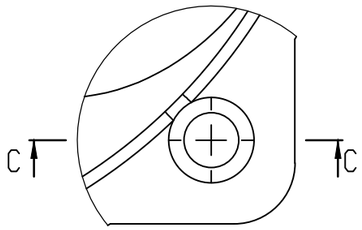

DETAIL 1
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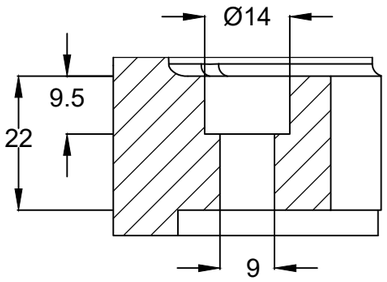

SECTION C-C
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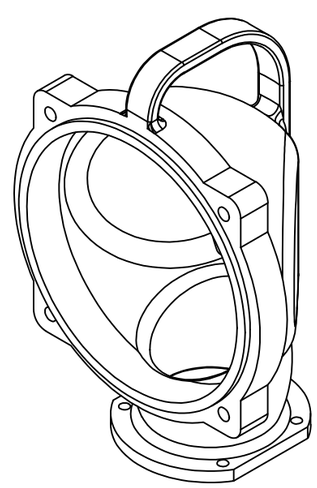

ISO VIEW

Date	
Checked by	
Drawn by	

NOTE : - 1. ALL DIMENSIONS IN MM.

STATUS	ALT./ REV.	REF. No.	REVISED DESCRIPTION	APPD.	STATUS	DATE

1	JUMPER PLUG HOUSING	2	NIL	IS-617, GR-4600	ALUMINIUM
ITEM	DISCRIPTION & DIMENSIONS	QPASSLY	DETAIL DRG.	MATL.& SPEC.	REMARKS
	REF. DRG. No.		SCALE : NTS	APPROVED	FOR DG
	JUMPER PLUG HOUSING FOR LOCO TO LOCO CONNECTION FOR HOG SUPPLY				FIRST ISSUED
					SUPERSEEDS REV.0
	RDSO/PE/SKAC/0253 (Rev-0)-2024				SUPERSEEDED BY