

*gsc/curran*

EDTS202

## SPECIFICATION FOR CABLE HEAD TERMINATION SYSTEM WITH VERTICAL RECEPTACLE 25 KV AC MEMU

### 1.0 GENERAL:

- 1.1 This specification cover the provision of cable head termination system instead existing 25 KV condenser bushing in on 25 KV single phase 50 Hz AC MEMU coaches. This system has added advantage than condenser bushing, the system has allow more working space and minimum mechanical stress encountered due to vibration and shock in rolling stock.
- 1.2 This specification cover the supply of cable head termination (suitable for current carrying capacity 300 Amps) comprising of scope of supply as per clause 2.0 and other related accessories for installation on 25 KV single phase 50 Hz AC MEMU as per RDSO spec. No. ELPS/SPEC/BL/0003 may 1993.

### 2.0 SCOPE OF SUPPLY:

Sr. No.	Description	Qty./Assy.
1	Copper conductor insulated 120 sq.mm. XLPE cable.	1(3 mtrs)
2	End termination on roof	1
3	Transformer turret Bushing with insulated flange	1
4	Vertical straight receptacle with cable adopter	1
5	1- S.S. Roof top plate with nuts & bolts. 2- Rubber gasket. 3- Rubber bush with sealing tape for cable support. 4- Cable support clamps with nuts & bolts.	1set
6	Earthing cable for transformer side	1
7	Copper flexible shunt for earthing at roof	1
8	Bushing stud	4
9	'C' type copper bushing clamp with nut & bolt	1
10	Copper flat	1
11	Cable support clamp	1
12	Arching horn ET2 (top & bottom)	1
13	Self boding tape	2 Roll
14	Silicon grease	1 pack

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### 3.0 SERVICE CONDITION :

#### 3.1 Environment conditions :

- Ambient temperature 5 to 55 deg. C
- Maximum relative humidity upto 100% during rainy season
- Altitude Maximum 1000 meters.

#### 3.2 Working Conditions:

- Train speed (Max.) 160 Kmph
- Vibration and shocks
  - a) Maximum vertical acceleration 1.0 g
  - b) Maximum lateral acceleration 0.5 g
  - c) Maximum longitudinal acceleration 3.0 g
  - d) Frequency and amplitude:-

Sinusoidal form of vibration, the frequency 'f' lies between 1 Hz and 100 Hz and their amplitude 'a' expressed in mm is given as function of 'f' by the equation:-

$$a=25/f \text{ for values of 'f' between 1 Hz and 10 Hz.}$$

$$a=250/f^2 \text{ for values of 'f' between 10 Hz. \& 100 Hz.}$$

### 4.0 GOVERNING SPECIFICATION :

Reference shall be made to following standard specification

IEC – 228 – 1978	Conductors for insulated cable.
IS – 7098 – 1985	Cross - link polyethylene insulated thermoplastic sheathed cable's specification
IEEE Std. 48 – 1975	Test procedure & requirements for high voltage alternating current cable termination.
IEC – 840 - 1988	test for power cable with extruded insulation for rated voltage above 30 KV
IS:10810-1984	Method of test for cable
IEC – 77 – 1968	Rules electric traction

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## 5.0 CONSTRUCTIONAL FEATURES :

5.1 The general arrangement of cable head termination system shall be as per drg. no. EM76020 alt nil for MEMU. The system will consist of item as per details given in clause 4.2 to 4.9 of RDSO spec.no. ELPS/SPEC/BL/0003.

## 6.0 TEST ON COMPLETE CABLE HEAD TERMINATION ARRANGEMENT :

### 6.1 TYPE TEST :

These tests to be carried out to prove conformity with the requirements of specification and general quality/design features of the cable. The test results shall be valid for a maximum period of three years. Type tests may also be repeated within this three years period if any change is introduced in the cable material of design.

### 6.2 ROUTINE TEST:

These tests shall be carried out by the manufacturer on all finished cable lengths to ensure consistency of the product. However, the purchase may carry out these tests on samples sealed at random as per the relevant specification to verify the results observed by the manufacturer.

### 6.3 ACCEPTANCE TEST:

6.3.1 The acceptance tests to be carried out on sample from a lot for purpose of acceptance of the lot. The acceptance tests once conducted on a ordered lot of the cable shall not be repeated, if the cable used in termination is from the same inspected lot. The railway in this case shall only make sure that the cable drum has been inspected earlier by some representative of Railway/Production unit/RITES. The supplier of the cable head termination arrangement shall however, ensure that the identification mark of the test on the drum is preserved by them and they will produce a copy of the acceptance test certificate as and when asked for by the users.

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6.4 All the tests mentioned in table below shall be carried out in accordance to IEC-60840

Sr. No.	Test	Type test	Routine test	Acceptance test
1	Conductor examination including resistance measurement	√	X	√
2	Measurement of thickness of insulation and sheath	√	X	√
3	Measurement of diameter	√	√	√
4	Test on insulation			
4.1	Hot set test	√	X	√
4.2	Tensile strength and elongation	√	X	√
5	Test on PVC sheath on low temp.			
5.1	Loss of mass on PVC	√	X	√
5.2	Pressure test at high temperature on sheath	√	X	√
5.3	Heat shock test for PVC sheath	√	X	√
6	Resistivity of semiconductor layers	√	X	√
7	Measurement of capacitance	√	X	√
8	Flammability test	√	X	√
9	Bending test	√	X	X
10	Tan delta measurement test	√	X	X
11	Heating cycle test	√	X	X
12	Impulse withstand test	√	X	X
13	Mechanical properties test of insulation	√	X	X
14	Shrinkage test for insulation	√	X	X
15	Partial discharge test	√	√	X
16	Voltage test	√	√	X

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**7.0 SPECIAL TEST :****7.1 TYPE TEST :**

The acceptance tests to be carried out on sample from a lot for purpose of acceptance of the lot. The acceptance tests once conducted on a ordered lot of the cable shall not be repeated, if the cable used in termination is form the same inspected lot. The railway in this case shall only make sure that the cable drum has been inspected earlier by some representative of Railway/Production unit/RITES. The supplier of the cable head termination arrangement shall however, ensure that the identification mark of the test on the drum is preserved by them and they will produce a copy of the acceptance test certificate as and when asked for by the users.

7.1.1 Wet power frequency withstand voltage test at 75 KV (RMS) as per IS:2099-1986, IEC-137-1984.

7.1.2 Impulse voltage test at 175 KV peak, as per IS:2099-1986.

7.1.3 The type test certificate approved by RDSO shall be valid for a period of five years.

**7.2 ROUTINE TEST :**

7.2.1 The cable termination when tested along with the transformer shall successfully withstand dry power frequency withstand voltage of 60KV (RMS) for one minute and impulse voltage of 150KV peak. This test shall be conducted by the transformers.

7.2.2 The cable termination shall successfully withstand dry power frequency voltage of 60KVA rms for one minute. This test shall be carried out by supplier at their works also.

**8.0 GENERAL CONDITION/APPROVAL :**

8.1 The tenderer shall offer clause wise comments on the specification either conforming the acceptance of the clause or indicate deviation there from specifically.

8.2 Normally no post tender deviation shall be accepted. Deviation if any may be advised at tender stage only.

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- 8.3 The firm should have adequate experience of design, development and manufacturing of similar equipment for rolling stock applications for the last few years.
- 8.4 Manufacturing and the testing facilities for carrying out the quality work shall be specially submitted with the tender.
- 8.5 The firm shall maintain date-wise in-house quality control records etc. for process inspection and testing, the same shall be made available to the inspecting official during type testing.
- 8.6 The following documents for the development and design of the equipment shall be prepared and got approved from CEE/RCF by the supplier before taking up prototype manufacture.
- (i) A set of drawings relating construction with complete bill of material and parts lists.
  - (ii) Type and endurance tests to be conducted on prototype to achieve the performance and life of the equipment.
  - (iii) Instructions regarding mounting of equipment.
  - (iv) Maintenance and repair instructions with information about trouble shooting.
- The supplier may also be required to attend joint reviews regarding the development of prototype unit.

**10.0 ENCLOSURE:**

10.1 EM76020 alt nil

10.2 SKEL-4384

10.3 Annexure-I

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## ANNEXURE-I

## DATA TO BE SUBMITTED BY FIRM DURING TENDRING

	CONSTRUCTION		REQUERMENTS
1.	Stranded circular compacted copper conductor		
2.	Dia over conductor (18 wires in min.)		
3.	Thickness of semiconductor screen		
4.	Thickness of XPLE Insulation		
5.	Dia over insulation		
6.	Thickness of semi conducting screen		
7.	Bedding with water swellable tape		
8.	Copper wire		
9.	Copper tape to give 25 sq.mm.		
10.	PVC sheathing		
11.	Overall dia		
12.	Approx. weight per meter		

The tolerance on dimensions wherever not specified shall be governed by IS:7098 Pt.II 1985 as applicable for its highest of voltage.

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**CORRIGENDUM No. 1 TO SPEC. NO. EDTS202**

**Specification for Cable Head Termination with Vertical Receptacle 25 KV AC  
MEMU/EMU**

The following points to be added/read as under.

1. In clause 1.2 & 5.1 the RDSO spec. No. "ELPS/SPEC/BL/0003", read as "ELPS/SPEC/BL/0003 with latest revision".
2. Turret to be supplied with **170 ID of flange** and existing mounting holes arrangement on flange to accommodate M/s PFISTERER make bushing as per RDSO letter no. EL/3.2.21, dated 08.06.2007

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