

# **STANDARD TECHNICAL SPECIFICATION COVER SHEET**

**Specification No. : ENG-HV-2015**

**Specification Name : Technical Specification for 11KV Lightning Arrester (10 KA)**

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**1. SCOPE:**

This specification covers the design, manufacture, testing and supply of 12kV, 10kA, Station class-SL, (class-II) Metal Oxide Gap less Polymeric Lightning Arrester. The specific requirements are covered in the enclosed technical data sheet. Some of the parts that may have not been specifically included, but otherwise form part of the Lightning arrester as per standard practice or necessary for proper operation, will be deemed to be also included in this specification. The successful bidder shall not be eligible for any extra charges for such accessories etc. Scope also includes transportation & unloading at store / site.

**2. APPLICABLE STANDARDS:**

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IEC 60099-4	Specification for surge arrester without gap for AC System
IS 15086	Specification for Metal Oxide Gap less Lightning arresters for alternating current System
IS 6209	Method of Partial Discharge Measurement
IS 8704 & IS 731	Guide for selection of creepage distance of polymeric housing insulator.
ISO 48	Rubber, vulcanized or thermoplastic -- Determination of hardness (hardness between 10 IRHD and 100 IRHD).
IEC 60721-3-2	Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Transportation
IEC 60071	Insulation co-ordination -- Part 1 definitions, principles and rules; -- Part 2: Application Guide
IEC 60815-1	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions --Part 1: Definitions, information and general principles
IS 2629	Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
IS 2633	Methods for testing uniformity of coating of zinc coated articles
IS 4759	Hot-dip zinc coatings on structural steel and other allied products

### 3. CLIMATIC CONDITIONS:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150mm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPWODL/TPNODL/TPSODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

### 4. GENERAL TECHNICAL REQUIREMENTS:

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
1	Installation	Outdoor
2	Reference standards (Latest Amend.)	IS 15086,Part-4, IEC 60099
3	Arrester Type and Housing	Metal Oxide Gapless Cage type with Polymeric housing
4	Normal System Voltage	11 kV
5	Highest System Voltage	12 kv
6	Rated Frequency	50 Hz
7	Maximum Continuous Operating Voltage (M.C.O.V)	9.6 kV (rms)
8	Arrester Rating	12 kV (rms)
9	<b>Discharge Current</b>	
a	Nominal Discharge Current	10 kA
b	Switching impulse discharge current	0.5kA

<b>SL. NO.</b>	<b>TECHNICAL PARTICULARS (Class-SL,Class-II)</b>	<b>DESIRED VALUE</b>
10	Short Circuit rating	25 kA
11	<b>Voltage Withstand on Arrester Housing</b>	
a	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165	28kV (rms)
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)	75kV (Peak )
12	Lightning Impulse Protection Level (at 10kA)	49 kV
13	<b>Long Duration Current</b>	
a	Peak Current	75 A
b	Virtual duration of Peak T	1000 T (Micro Sec)
14	High Current impulse Operating Duty	65 kA (Peak)
15	Creepage Distance of Arrester Housing	31mm/KV (min) or 380 mm (min)
16	Partial Discharge at 1.05 times M.C.O. V	<10 pc
17	Energy Absorption capacity (KJ/KV)	>=4KJ/KV
18	Repetitive charge transfer withstand (coloumbs),Qrs	>=1.0
19	<b>Temporary over voltage (TOV)</b>	
a	1 sec	15kVp
b	10 sec	14kVp
20	<b>Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave</b>	
a	at 5kA	35kVp
b	at 10kA	38kVp
c	at 20kA	--
21	<b>Maximum switching current impulse residual voltage in kVP at 500 A</b>	21 kVp
22	Max. Cantilever Strength	12 Kg-M(minimum)
23	Total height of the arrester	To be specified by bidder
24	Total weight of the arrester	To be specified by bidder
25	No. of Metal oxide blocks in arrester	To be specified by bidder
26	Rating of individual ZnO blocks used for assembly	To be specified by bidder
27	Power Losses of the Arrester in watt	To be specified by bidder
28	Type of Mounting	Bracket type
29	Material of Insulating base	UV resistant Fire retardant DMC
30	<b>Disconnecter (optional)</b>	
a	Disconnecter connecting lead	Insulated flexible tinned plated copper braid with lugs
b	Size of Insulated Tinned copper	25 sq.mm

SL. NO.	TECHNICAL PARTICULARS (Class-SL, Class-II)	DESIRED VALUE
	braid	
c	Length of Insulated Tinned copper braid	300 mm
31	Insulating Terminal Cap	Polyolefin
32	Material of Nuts and bolts	Stainless Steel

## 5. GENERAL CONSTRUCTION:

Lighting arrestors shall be station class, zinc oxide and gapless type suitable for operation under the system conditions specified. This shall be self-supporting, structure mounting type. Each unit of arrester assembly shall be hermitically sealed, leak tested and protected against ingress of moisture and shall be individual demountable. The seal shall be properly designed and tested for operation under extreme weather conditions.

### 5.1 Assembly:

Lighting arrester shall be supplied along with the insulating base/Mounting bracket, terminal connector, insulating terminal cap (Polyolefin) and necessary hardwares. The assembly consists of a stack of metal oxide elements arranged in cage type designs. All metal parts shall be of non-rusting and non –corroding metal. Bolts, screws and pins shall be provided with lock washers. Lightning arrester construction shall be suitable to withstand seismic loading, short circuit forces, wind load, the force exerted on the arrester base and to terminal imposed by the line conductor. All similar parts, particularly removable ones, shall be interchangeable.

- a) The 12kV 10kA station class Lightning Arrester shall have L-shaped terminal clamp suitable for conductor size of 148 sqmm.
- b) Housing shall be polymeric to provide thermal dissipation of heat generated in the metal oxide elements during over voltage and line discharge. Polymeric housing shall be free from flaws affecting the mechanical and electrical strength of the arrester. Housing shall be capable to withstand the temperature rise due to the non-uniform field distribution, caused by the pollution on the surface of the housing.
- c) The arrester shall have thermal stability to withstand the heat generated from ZnO element due to continuous operating voltages and surges. It shall remain in undamaged condition, capable protective function.
- d) Arrestors shall incorporate anticontamination feature to prevent arrester failure, consequent to uneven voltage gradient across the stack in the event of contamination of the arrester insulating material. These features shall be described in detail when submitting the Bid.

Arrestors shall be capable of discharging over voltages occurring during switching of unloaded transformers, capacitors banks and long lines. No radio interferences shall be caused by the arrestors operating at the normal rated voltage.

e) Bidder shall mention energy handling capacity.

## 5.2 EARTHING TERMINALS:

Earth Terminals shall be provided with Lightning arrester.

## 5.3 MECHANICAL STRENGTH:

a) The Lightning Arrester and its base shall withstand rated mechanical terminal load and electromagnetic forces without impairing their operational reliability.

b) The Lightning Arrester shall not come out of their positions by gravity, wind pressure, vibrations or reasonable shocks.

## 5.4 DISCONNECTORS (OPTIONAL):

a) Each Individual unit of Lightning Arrester with disconnector shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire life time of the Lightning Arrester with disconnector under the specified service conditions. Disconnectors shall give the visible indication of the failed arrester. The Lightning Arrester with disconnector shall be suitable for bracket type mounting. Disconnector shall be suitable for screwing directly to LA with terminal of M10.

b) The corresponding units of Lightning Arrester with disconnector of the same rating shall be interchangeable without adversely affecting the performance. All the necessary flanges, bolts, nuts, clamps etc. required for assembly of complete Lightning Arrester with disconnector and accessories and mounting on purchaser's support structure shall be included in bidder's scope of supply. The mounting details for mounting the Lightning Arrester with disconnector on purchaser's support shall be given along with bid.

## 5.5 MOUNTING BRACKET:

a) The 12kV 10kA Distribution class Lightning Arrester shall be fixed over a mounting bracket made of UV resistance, Fire retardant DMC material.

b) The 12kV 10kA Station class Lightning Arrester shall be fixed over a mounting arrangement made of Hot dip galvanized MS material.

## 6. MARKING:

A stainless steel rating plate, of at least 1 mm thickness, shall be fitted to each Lightning Arrester in a visible position and shall carry all the information as specified in the standards. The letters on the rating plate shall be engraved black on the white/silver background. Fixing screws for outdoor use shall be of stainless steel or any other corrosion resistant metals. The Name plate shall be embossed with "PO no. with date" & "TPCODL/TPWODL/TPNODL/TPSODL",

The following information shall be mentioned on the Name Plate

- a) Continuous operating Voltage
- b) Rated Voltage
- c) Rated Frequency
- d) Nominal Discharge Current
- e) Pressure relief rated current in kA r.m.s.
- f) Manufacturer's Name
- g) Type and Identification of the complete
- h) Year/Month of Manufacture
- i) Serial Number.
- j) Warrantee/guarantee clause

#### **7. TESTS:**

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components and fittings shall also be type tested as per the relevant standards. Following tests shall necessarily be conducted on lightning arrester in addition to others specified in IS/IEC standards: -

##### **7.1 ACCEPTANCE TESTS**

- a) Measurement of Power frequency reference voltage
- b) Lightning impulse residual voltage test on complete arrester or arrester unit.
- c) Internal Partial Discharge test
- d) Visual Examination

All acceptance tests shall be witnessed by TPCODL/TPWODL/TPNODL/TPSODL / the purchaser's or his authorized representative. The above mentioned tests shall be made on 100 % of arrestors to be supplied.

##### **7.2 ROUTINE TESTS**

- a) Measurement of reference voltage test
- b) Residual Voltage Test on complete arrester
- c) Internal partial discharge test. This test shall be performed on each arrester unit. The test sample may be shielded against external partial discharges. Internal partial discharge shall not exceed 10 pC

### 7.3 TYPE TESTS

- a) Insulation withstand tests, including lightning impulse voltage withstand test
- b) Residual voltage tests, including steep current impulse residual voltage test, lightning impulse residual voltage test and switching impulse residual voltage test.
- c) Operating duty tests
- d) Long duration current impulse withstand test/Repetitive charge transfer rating, Qrs.
- e) Weather ageing test
- f) Short circuit test (low/high current)
- g) Power frequency (voltage vs Time curve)
- h) Bending moment test
- i) Hot dip Galvanizing test on exposed steel parts.
- j) Internal partial discharge test
- k) Wet power frequency voltage withstand test.
- l) Seal leak rate test
- m) Tests on arrester disconnectors- Time current characteristics (optional)

### 7.4 SPECIAL THERMAL STABILITY TEST:

The test requires additional agreement between manufacturer and purchaser prior to the commencement of arrester assembly.

### 8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA** as per relevant standard. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPWODL/TPNODL/TPSODL.

### 9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPWODL/TPNODL/TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPWODL/TPNODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPWODL/TPNODL/TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance



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with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPWODL/TPNODL/TPSODL.

Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by TPCODL/TPWODL/TPNODL/TPSODL
- c) TPCODL/TPWODL/TPNODL/TPSODL Invoice in duplicate
- d) Packing list
- e) Drawings & catalogue
- f) Guarantee / Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable).

#### **10. INSPECTION AFTER RECEIPT AT STORE:**

The material received at TPCODL/TPWODL/TPNODL/TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.

#### **11. GUARANTEE:**

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 18 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of gurantee period for any 'latent defects' if noticed by the company.

#### **12. PACKING AND TRANSPORT:**

Bidder shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site. The material should be packed in vertical position in individual box in such a way that the



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shape of rain shed does not get deformed during transportation and storage.

**13. TENDER SAMPLE:**

One sample to be submitted during technical bid submission. This shall be Non-returnable basis.

**14. QUALITY CONTROL:**

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

**15. TESTING FACILITIES:**

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

**16. MANUFACTURING FACILITIES:**

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

The successful bidder will have to submit technical compliance document and drawing as per RC line items for getting approval before mass manufacturing.

Manufacturing shall start only after getting CAT-A approved drawings or as per intimation from TPCODL/TPWODL/TPNODL/TPSODL.

**17. SPARES, ACCESSORIES AND TOOLS**

Not applicable.

**18. DRAWINGS AND DOCUMENTS:**

Following drawings and documents shall be prepared based on TPCODL/TPWODL/TPNODL/TPSODL specifications and statutory requirements and shall be submitted with the bid:

- a) Completely filled in Technical Particulars and compliance to each clause of the specification General Technical Requirements to Additional Details.
- b) Description of the equipment and all components including brochures.
- c) General Drawing arrangement of lightning arrester.
- d) Sectional drawing showing internal blocks etc.

- e) Bill of material.
- f) Experience Certificate and list.
- g) Type test certificates.
- h) List of makes of major components.
- i) Foundation plan

**Drawings / documents to be submitted after the award of the contract are as under:**

**List of Drawings/Parameters to be submitted:**

- a) Technical Parameters as asked in Specification (General Technical Particulars, General Technical Requirements, Additional Details, Fittings, Type test Reports and Routine test certificates of bought out accessories).
- b) General Arrangement Drawing of the Lightning arrester (Front view and Top view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).
- c) Sectional drawing showing the blocks arrangement.
- d) Terminal and connection drawings
- e) Type Test Certificates.
- f) Installation/ Mounting Instructions/Drawing.

**Additional Documents to be submitted:**

- a) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offer.
- b) Type test certificates of the raw materials and bought out accessories.
- c) The successful Bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing.

All the documents & drawings shall be in English language.

After the receipt of the order, the successful bidder will be required to furnish all relevant drawings/parameters/calculation to TPCODL/TPWODL/TPNODL/TPSODL for approval.

**Instruction Manuals:**

Bidder shall furnish softcopies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

**19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:**

<b>SL. NO.</b>	<b>TECHNICAL PARTICULARS (Class-SL, Class-II)</b>	<b>DESIRED VALUE</b>
1	Installation	
2	Reference standards (Latest Amend.)	
3	Arrester Type and Housing	
4	Normal System Voltage	
5	Highest System Voltage	
6	Rated Frequency	
7	Maximum Continuous Operating Voltage (M.C.O.V)	
8	Arrester Rating	
9	<b>Discharge Current</b>	
a	Nominal Discharge Current	
b	Switching impulse discharge current	
10	Short Circuit rating	
11	<b>Voltage Withstand on Arrester Housing</b>	
a	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165	
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)	
	Lightning Impulse Protection Level (at 10kA)	
13	<b>Long Duration Current</b>	
a	Peak Current	
b	Virtual duration of Peak T	
14	High Current impulse Operating Duty	
15	Creepage Distance of Arrester Housing	
16	Partial Discharge at 1.05 times M.C.O. V	
17	Energy Absorption capacity (KJ/KV)	
18	Repetitive charge transfer withstand (coloumbs), Qrs	
19	<b>Temporary over voltage (TOV)</b>	
a	1 sec	
b	10 sec	
20	<b>Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave</b>	
a	at 5kA	
b	at 10kA	
c	at 20kA	
21	<b>Maximum switching current impulse residual voltage in kVP at 500 A</b>	
22	Max. Cantilever Strength	
23	Total height of the arrester	



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<b>SL. NO.</b>	<b>TECHNICAL PARTICULARS (Class-SL, Class-II)</b>	<b>DESIRED VALUE</b>
24	Total weight of the arrester	
25	No. of Metal oxide blocks in arrester	
26	Rating of individual ZnO blocks used for assembly	
27	Power Losses of the Arrester in watt	
28	Type of Mounting	
29	Material of Insulating base	
30	<b>Disconnecter (optional)</b>	
a	Disconnecter connecting lead	
b	Size of Insulated Tinned copper braid	
c	Length of Insulated Tinned copper braid	

**20. SCHEDULE "B" DEVIATIONS:**

**(TO BE ENCLOSED WITH TECHNICAL BID)**

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

<b>SL. No</b>	<b>Clause No.</b>	<b>Details of deviation with justifications</b>

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation