



**GUJARAT ENERGY TRANSMISSION  
CORPORATION LTD.**

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**TECHNICAL SPECIFICATIONS  
FOR**

**Gap less LIGHTNING ARRESTORS**

**GETCO/ENGG/TECH SPECI. – 11,22,33 kV LA/R2/July-23**

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## **TECHNICAL SPECIFICATION For 9, 18 & 30 kV. Metal Oxide. gapless LIGHTNING ARRESTORS**

### **1.1 SCOPE:**

- 1.1.1** This specification covers the design, manufacture, assembly testing at manufacture's works, inspection and delivery of heavy duty station class, 9,18 & 30 kV, 10 kA, Gap less type Metal oxide lightning arrestors, with all accessories, complete in all respects, confirming to modern design and practice for protection of transformers, sub-station equipment's and overhead lines. *The support structure shall be in the scope of supply if indicated in Schedule – A of respective tender.*

### **1.2 STANDARDS:**

- 1.2.1** The lightning arrestors covered by this specification shall comply with the requirements of latest, edition of IS: 3070 & IEC publication No. 60099 – 4 / 1991(Amended up to date), IS: 5621, IS: 2625, IS: 6745, IS: 2633, IS:2147 etc., except specified, otherwise in the specification.
- 1.2.2** Lightning Arrestors, meeting the requirements of any other authoritative standards which ensure equal / better quality than that as per the standards mentioned above shall, also, be acceptable. When the lightning arrestor confirms to any other standards, the salient points of difference between the standard adopted and standard given above shall be specifically brought out in the bid for each item of difference.

### **1.3 DRAWINGS :**

- 1.3.1** Drawings in hard and soft copy, in duplicate, incorporating the following particulars shall be submitted by each bidder with the offer for the purpose of preliminary study.

G. A. Drawing, showing general outline of the complete lightning arrestor with clearances from grounded object and between adjacent poles of lightning arrestor and details of class 'A' pressure relief device, surge counter, insulating base, terminal connector etc.

**1.3.2** Within commencement period, the bidder shall submit above drawings in hard copies for the purchaser's approval in triplicate.

**1.3.3** The bidder may submit any other drawing found necessary in addition to the drawings stated above.

**1.4 TYPE :**

The metal oxide type lightning arrestors shall be designed to provide maximum possible protection against lightning and switching surges. Supporting insulators, terminal connectors and other components as specified hereafter, shall be provided with arrestors.

The metal oxide type lightning arrestors shall be of class 'A' pressure relief device and long duration Class-II.

**1.5 DESCRIPTION :**

**1.5.1 Design & Construction :**

**1.5.1.1** Arrestors shall be without series gaps as per the requirement along with characteristic of elements.

**1.5.1.2** The non-linear resistor blocks shall have non-ageing characteristic and stable thermal properties. The blocks shall preferably be metalised on the flat surface for ensuring good electrical contact.

**1.5.1.3** The arrestors shall be complete with suitable grading devices, wherever necessary and shall be provided with an insulating base at the bottom. The clamps required to fix the surge counter shall have to be provided along with the surge counter. Braided flexible copper jumper shall be provided for bypassing surge counter, whenever required.

**1.5.1.4** Each individual component unit of the arrestor stack shall have its arrestor elements hermetically sealed under dry inert air and fully protected against ingress of moisture into the arrestor.

**1.5.1.5** The arrestor, when energized at rated operating voltage, shall not exhibit any visible corona, when viewed in complete darkness.

**1.5.1.6** All arrester units shall be provided with pressure relief class 'A' devices, to limit the internal arrester pressure to obviate explosion or violent shattering of porcelain housing.

**1.5.1.7 Porcelain Housing :**

The porcelain housing for the lightning arrester shall be confirming to IS: 5621 with latest amendment. All porcelain used in or with each arrester shall be manufactured by the wet process, be free from lamination, cavities or other flaws, affecting mechanical & dielectric strength and shall be vitrified properly and non-porous. The creepage distance along with external surface shall be large enough (25 mm/kV) to ensure that surface contamination which is possible under site condition will not adversely affect the performance of arrestors. Make of porcelain housing shall be GETCO approved and necessary type test reports shall be submitted for the make proposed to be used. The porcelain housing used for the lightning arrester shall be legibly & permanently marked to show the following details:

- a) Name of manufacturer with trade mark
- b) Month and year of manufacturing
- c) Batch/lot no.

**1.5.1.8 Pressure Relief Device:**

The arrestors shall be provided with efficient pressure relief device so as to check bursting of lightning arrestors, in case, excessive gas pressure is built up and in case, it loses its ability to effectively dissipate the energy due to any operation. The bidder shall submit detailed information and literature on pressure relief class 'A' device of lightning arrestors.

**1.5.1.9 Terminal Connectors :**

Each lightning arrester shall be supplied with compression type terminal connector suitable for ACSR 'PANTHER' / Dog Conductor. The bolt and nuts shall be of M12 size & of stainless steel 2 SS washer and 2 SS nuts (including lock nut) for each bolt shall be supplied. Each terminal connector shall be suitable for *through connection* / vertical / horizontal take-off. *Conductor size will be given during detailed engineering.*

**1.5.2 Galvanizing :**

All metal parts exposed to weather and likely to be subjected to corrosion, shall be hot dip galvanized as per IS: 2629 (latest edition). Bolts, Nuts and Washers shall be electro zinc plated. The conducting

parts shall have suitable current density to have satisfactory performance during service life.

### 1.5.3 Name Plate :

Each arrester shall have non-corrosive nameplate, legibly and indelibly marked and securely fixed to it. They shall be provided with the information as required by relevant standard. The words 'GETCO' shall, also, be punched on it after inspection of lightning arrester is over.

### 1.5.4 Surge Counter:

Each lightning arrestors shall be provided with a recording type surge counter and *milliamp meter* with vertical mounting. The installation of surge counter shall have practically no effect on the operation. The number of discharges recorded by the counter shall be visible through inspection window. *Connections to surge monitor cum counter shall be from the bottom only. Degree of protection for the box shall be IP-67.*

## 1.6 SYSTEM VOLTAGE :

Nominal system voltage	Highest System Voltage
11 kV	12 kV
22 kV	24 kV
33 kV	36 kV

Rated frequency – 50 Hz

### 1.6.1 Rated Arrestors Voltage :

The rated arrester voltage shall be as under:-

Nominal system voltage	Highest System Voltage
11 kV	9 kV rms
22 kV	18 kV rms
33 kV	30 kV rms

#### 1.6.1.1 Maximum Continuous operating voltage:

Nominal system voltage	Highest System Voltage
11 kV	7.65 kV rms
22 kV	15.4 kV rms
33 kV	24 kV rms

**1.6.2 Nominal Discharge Current :**

The arrester shall have a nominal discharge current of 10 kAp (8/20 micro-sec) and shall be of heavy-duty station class type with long duration Class – II.

**1.6.3 Maximum residual Voltage :**

The maximum residual voltage at nominal discharge current of 10 kAp with 8/20 micro-second current wave shall not exceed 36, 60, & 100 kVp.

**1.6.4 System Neutral Connection:** The system is an effectively earthed neutral system.**1.6.5 Out door Installation :**

All the lightning arrestors shall be suitable for outdoor installation.

**1.6.6 Altitude :**

The lightning arrestors covered in this specification will be installed at an altitude not more than 1000 meters.

**1.6.7 Special Condition :**

Maximum temperature for a few days, in a year, is likely to go to 50°C and humidity during monsoon is likely to reach the value of 100% with annual rain fall of 1150 cms, minimum wind pressure of 150 kg/sqcm. The arrestors offered must withstand these climatic conditions without deteriorating effects.

**1.6.8** The lightning arrestors shall be suitable for 1.2/50 micro-sec lightning impulse voltage and one minute power frequency withstand voltage are as follow:

Nominal system voltage	Highest System Voltage	Power frequency withstand voltage
11 kV	75 kVp	30 kV rms
22 kV	150 kVp	50 kV rms
33 kV	175 kVp	70 kV rms

**1.6.9 Impulse withstand voltage of equipment's to be protected :**

The BIL of transformer and circuit breakers is as follow:

Nominal system voltage	Highest System Voltage
11 kV	75 kVp
22 kV	150 kVp
33 kV	175 kVp



**1.6.10 Overhead Earth wire:**

Solidly grounded overhead Earth wire/s shall be provided for the sub-station and Transmission Lines.

**1.6.11 Details to be provided with technical bid for the Arrestors :**

Technical and guaranteed particulars in the Appendix – I shall be furnished with the bid. Drawings showing, dimensions, (actual figures), arrangement and clearances (actual figure) required shall, also be furnished. Bid without details against guaranteed particulars will be considered as incomplete offer. List of orders executed for specified rating of, arrestor along with performance reports for the same shall be submitted.

**1.6.12 Completeness of Equipments:**

All fittings and accessories which may not be specifically mentioned in this specification but which are useful or necessary for lightning arrestors shall be deemed to be included in the specifications and shall be furnished by the bidder without extra charges.

**1.6.13.1 Type Test:**

All the offered material shall be fully tested for following tests from NABL accredited laboratory shall be carried out in accordance with latest /amended / up to date IS/IEC. The bidder has to submit the all type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be older than TEN years. Type Test shall be valid as on the last date of submission of bid.

IMPORTANT NOTE: In case of non-submission/partial submission or type test reports of which validity is over, bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.

*The following type test reports shall be submitted with the technical bid. The offer submitted without valid type test report shall be evaluated accordingly.*

S N	List of Type test reports
	<b>Tests on metal oxide blocks</b>
1	Steep Current Impulse Residual Voltage test
2	Lightning impulse Residual voltage test
3	Switching impulse Residual voltage test
4	Long duration current impulse withstand test
5	Operating duty test - High Current Impulse operating duty test - Switching Surge Operating Duty test

<b>6</b>	P. F. voltage v/s time characteristic
<b>7</b>	Reference voltage test
<b>8</b>	Accelerated ageing test
	<b>Tests on Arrester Housing</b>
<b>9</b>	Impulse voltage withstand test on insulator
<b>10</b>	P.F. (Dry) voltage withstand test on insulator
<b>11</b>	P.F. (Wet) voltage withstand test on insulator
<b>12</b>	Bending test on assembly
	<b>Tests on Arrester</b>
<b>13</b>	Artificial pollution test
<b>14</b>	Seismic test
<b>15</b>	High current pressure relief test (High current short circuit test)
<b>16</b>	Low current pressure relief test
	<b>General</b>
<b>17</b>	STC on Terminal connector (25 kA for 3 sec)
<b>18</b>	Degree of Protection test on counter/surge monitor
<b>19</b>	Uniformity of Zinc coating

#### 1.6.13.2 Routine Test:

Routine tests shall be carried out by the successful bidder on all complete arrestors as per IS: 3070 (part – 3) / IEC recommendations. Certified copies of routine test reports shall be submitted to the purchaser for approval along with the acceptance test reports.

**The following routine test reports shall be carried out on each arrester.**

<b>S N</b>	<b>List of Routine test reports</b>
<b>1</b>	Measurement of reference voltage
<b>2</b>	Lightning Impulse Residual voltage test
<b>3</b>	Seal Leakage check test
<b>4</b>	Partial discharge test
<b>5</b>	Tests on discharge counter
<b>6</b>	Visual / Dimensional check
<b>7</b>	Special Seal leakage test for a duration of 24 hrs to check the water penetration, on any one randomly selected sample from every 50 (Fifty) or below nos. of LA offered for inspection, shall be carried out and report shall be submitted.

#### 1.6.13.3 Acceptance test:

The successful bidder shall offer each lot for inspection. The following acceptance test shall be carried out as per clause No.8.2 of IEC 60099-4(1991).

<b>SN</b>	<b>List of Acceptance test reports</b>
<b>1</b>	Power frequency voltage withstand test
<b>2</b>	Lightning Impulse residual voltage test on complete arrester / unit of arrester
<b>3</b>	Reference voltage test

<b>4</b>	<b>Seal Leakage check test</b>
<b>5</b>	Partial discharge test
<b>6</b>	Visual / Dimensional check
<b>7</b>	Special thermal stability test
<b>8</b>	Galvanization test on metal parts
<b>9</b>	Functional (operational) tests on surge monitor/counter at nominal discharge currents (a) 100 Amps with 8/20 microsecond wave shape. (b) 10 KA with 8/20 microsecond wave shape.
<b>10</b>	<b>Special Seal leakage test</b> for a duration of 24 hrs, to check the water penetration, on any one randomly selected sample from every 50 (Fifty) or below nos. of LA offered for inspection, shall be carried out and report shall be submitted.

The copy of acceptance test report along with the routine test reports shall be submitted for approval of the purchaser

#### **1.6.14 Creepage Distance :**

The lightning arrestors are required to be installed in highly polluted atmosphere. Hence the total minimum creepage distance shall be 25 mm / kV.

#### **1.6.15 Safety Device:**

Arrester shall be provided with safety device with properly designed blow off hollow device to disconnect arrester from off time in case of spark over resulting in failure of lightning arrester. No nuisance operation should occur in event of lightning arrester effectively discharging HV to earth and returning to normal system level.

#### **1.6.16** *All necessary accessories and earthing connection leads between the bottom of the Arrester and the discharge counter shall be in the supplier's scope. The discharge counter shall be so designed that the readings of discharges recorded by the counter and the readings of milliamp meter shall be clearly visible through an inspection window to a person standing on ground. The minimum height of support structure shall be such that the live part to plinth level clearance shall be maintained 3600 mm. All the Mounting bolt, Nut, washers etc shall be supplied with each LA.*

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**SIGNATURE OF BIDDER**

**APPENDIX – I****Technical and Guaranteed Technical particulars for Metal Oxide Gapless  
LIGHTNING ARRESTORS.**

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1. Name of manufacturer
  2. Type and Model
  3. Applicable IS/IEC Reference
  4. No. Of Units per phase
  - 4.1 Nos. of ZnO blocks per unit**
  5. Rated voltage KV rms
  - 5.1 System voltage**
  6. Max. continuous operating voltage KV rms
  7. Nominal discharge current KA  
(8/20 microsecond wave)
  8. High current discharge capacity KA  
(4/10 microsecond wave)
  9. Long duration discharge class.
  - 9.1 Energy Absorption in kJ/kV (2 shots)**
  10. Max. Residual voltage with KV Peak  
(8/20 microsecond wave) at:  
Lightning impulse of:
    - a) 5 KA -do-
    - b) 10 KA -do-
    - c) 20 KA -do-

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|-------------|---|-----------|
| 11.         | Steep current impulse residual voltage at 10KA with one microsecond front time. | KV peak   |
| 12.         | Switching impulse residual voltage at 500A with 30 microsecond front time.      | KV Peak   |
| 13.         | One minute PF withstand voltage of arrestor housing                             | KV rms.   |
| 14.         | 1.2/50 microsecond lightning impulse withstand voltage of arrestor housing.     | KV (Peak) |
| <b>14.a</b> | <b>Over –voltage withstand capability – KV</b>                                  |           |
|             | <b>a) 100 Seconds</b>   |           |
|             | <b>b) 10 seconds</b>  |           |
|             | <b>c) 1 second</b>  |           |
|             | <b>d) 0.1 second</b>  |           |
| 15.         | Total minimum creepage distance of arrestor                                     | (mm)      |
| 16.         | Pressure relief current / Class.  |           |
| 17.         | Resistive and capacitive currents of arrestor at continuous operating voltage.  |           |
| 18.         | Reference voltage and current   |           |
| 19.         | Cantilever strength of arrestor   |           |
| 20.         | Weight of complete unit   | Kg.       |
| 21.         | Height of complete unit from base to the line side terminal                     | mm        |
| 22.         | Minimum recommended spacing between arrestor centre to centre.                  | mm        |

23. Clearance required for grounded, equipment at various height of arrestor unit. mm
24. Whether earthing arrangement provided.  
Details shall be given.
25. Dimensional Details for Mounting flange
26. Terminal details of connecting clamp suitable for ACSR 'Panther' Conductor.
27. Details of porcelain shells :
- a) Make
  - b) Total minimum creepage (mm)
28. **Details of metal oxide block**
- Reference voltages**
- Material**
- Diameter**
- Height**
29. **Details of structure**
- Material**
- Hot dip galvanizing, zinc coating in gms/m<sup>2</sup>**
- Mounting dimensions**

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**SEAL OF THE FIRM**

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**SIGNATURE OF BIDDER**

**NOTE** : Instead of giving reference of drawing No./IS Literature etc. actual values/figures must be furnished wherever required otherwise it will be considered that details in GTP are not furnished and technical bid will be evaluated accordingly.