

Group – B : Sl. No. - 1) 11 KV Distribution Class Lighting Arrestors

Technical Specifications

1. Scope of Work

The specification covers the design, manufacture, shop & laboratory testing before dispatch, supply, delivery, erection, testing & commissioning of 9 KV, static class heavy rating, gapless, metal (zinc) oxide lighting arrestors complete along with clamps, complete fitting and accessories for installation on outdoor type 11 kv switchgear, transmission lines, transformers etc.

2. Specific parameters & layout conditions

2.1 Technical Particulars

The lighting arrestors shall confirm the following standard technical requirements. The Insulation values shall be enhanced considering the altitude of operation & other atmospheric conditions.

2.1.1 System parameters

(i)	Nominal system voltage	11Kv
(ii)	Highest system voltage	12Kv
(iii)	System earthing	Effectively earthed system
(iv)	Frequency (Hz)	50
(v)	Lightning Impulse withstand Voltage (kVP)	75
(vi)	Power frequency withstand Voltage (kv rms)	28
(vii)	Arrestors duty	
	-Connection to system	Phase to earth
	-Type of equipment to be protected	KV transformers &
	Switchgear	

2.1.2 Lighting Arrestors

(i)	Type outdoor	Gapless Metal oxide –
(ii)	Arrestor rating (KV rms)	9
(iii)	Continuous Operating voltage (kV rms)	7.65
(iv)	Nominal discharge Current:	5 Rating (KA) (8x20 micro impulse shape)
(v)	Long Duration discharge class	Distribution Class
(vi)	Degree of protection:	IP 55
(vii)	Maximum residual voltage at 5 KA (KV peak) :	32
(viii)	Maximum switching lighting residual	24 Voltage (kVp) at 1Ka
(ix)	Partial discharge at 1.05 COV not greater that (PC)	50
(x)	High current impulse withstand voltage	100 at 65 kA (kVp)

2.1.3 Insulator Housing

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|-------|---|-----|
| (i) | Power frequency withstand test voltage (Wet) (kV rms) : | 28 |
| (ii) | Lighting impulse withstand / tests voltage (kVP) : | 75 |
| (iii) | Creep age distance not less than | 320 |
| (iv) | Pressure relief class | B |

2.1.4. Galvanization

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|-------|---|----------------------|
| (i) | Fabricated Steel Articles | |
| | a) 5 mm thick cover Articles: | 610 g/m ² |
| | b) Under 5 mm but not less than 2 mm thickness : | 460 g/m ² |
| | c) Under 2 mm but not less than 1.2 mm thickness: | 340 g/m ² |
| (ii) | Castings Grey Iron, malleable iron | 610 g/m ² |
| (iii) | Threaded works other than tubes & tube fittings | |
| | a) Under 10 mm dia | 300 g/m ² |
| | b) 10 mm dia & above | 270 g/m ² |

3. Rating and Functional Characteristics

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|-------|--|----------------------------|
| (i) | Nominal system voltage | 11kV |
| (ii) | Highest system voltage | 12kV |
| (iii) | System earthing | effectively earthed system |
| (iv) | Frequency (Hz) | 50 |
| (v) | Lightning Impulse withstand Voltage (kVP) : | 75 |
| (vi) | Power frequency withstand Voltage (kV rms) : | 28 |
| (vii) | Arrestor duty | |
| | - Connection to system | Phase to earth |
| | - Type of equipment to be protected | Transformers & Switchgear |

4. Performance Guarantee

The equipment along with all accessories shall be capable of performing intended duties under specified conditions. The Contractor shall guarantee the reliability and performance of the individual equipment as well as of the complete system as specified in the bid documents.

5. Design and Construction

5.1.1 Standards

- 5.1.1 The design, manufacture and performance of Lighting Arrestors shall comply with IS: 3070 part-3 and other specific requirements stipulated in the specification. Unless otherwise specified, the equipment, material and processes shall conform to the latest applicable Indian as listed hereunder :

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|--------------------------|--|
| IS: 2071-1993 (Part-1) : | Methods of High Voltage Testing General Definitions & Test Requirements. |
| IS: 2071-1974 (Part-2) : | Test Procedures |

IS: 2629-1985 :'	Recommended Practice for hot dip galvanizing on Iron & Steel.
IS: 2633-1986:	Method for Testing uniformity of coating of zinc coated articles.
IS : 3070-1993 (Part-3):	Specification for lightning arrestor for alternating current systems. Metal – Oxide lightening Arrestors without gaps.
IS : 4759-1996:	Specification for hot dip zinc coating on Structural Steel and Other allied products.
IS : 5621-1980 :	Hollow Insulators for use in Electrical Equipment.
IS : 6209-1982 :	Methods of Partial discharge measurement.
IS : 6745 :	Method for determination of mass of zinc coating on zinc coated iron and steel articles.
ANSI/IEEE-C.62.11 (1982) :	Metal oxide, Lighting Arrestor for AC Power Circuits.

5.1.2 The equipment complying with any other internationally accepted standards shall also be considered if it ensures performance equivalent to or superior to the Indian Standards.

5.1.3 General Requirement

- 5.2.1. The metal oxide gap less Lighting Arrestor without any series or shunt gap shall be suitable for protection for 11KV side of Distribution Transformers, associated equipment from voltage lightings resulting from natural disturbance like lightning as well as system disturbances.
- 5.2.2. The lighting arrestor shall draw negligible current as operating voltage and at the same time offer least resistance during the flow or lighting current.
- 5.2.3. The lighting arrestor shall consist of non-linear resistor elements placed in series and housed in electrical grade porcelain housing / silicon polymeric of specified creep age distance.
- 5.2.4. The assembly shall be hermetically sealed with suitable rubber gaskets with effective sealing system arrangement to prevent ingress of moisture.
- 5.2.5. The lighting arrestor shall be provided with line and earth terminal of suitable size. The ground side terminal of lighting arrestor shall be connected with 25x6 mm galvanized strip.
- 5.2.6. The lighting arrestor shall not operate under power frequency and temporary over voltage conditions but under lightning conditions, the lighting arrestor shall change over to the conducting mode.
- 5.2.7. The lighting arrestor shall be suitable for circuit breaker performing 0-0.3 min-Co-3-min-CO_duty over to the conducting mode.
- 5.2.8. Lighting arrestors shall have a suitable pressure relief system to avoid damage to the porcelain / silicon polymeric housing and providing path for flow of rated fault currents in the event of arrestor failure.
- 5.2.9. The reference current of the arrestor shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage.
- 5.2.10. The Lighting Arrestor shall be thermally stable and the supplier shall furnish a copy of thermal stability test along with the bid.

- 5.2.11. The arrester shall be capable of handling terminal energy for high lightings, external pollution and transient over voltage and have low losses at operating voltages.
- 5.2.12. The lighting arrester shall be provided with line and earth terminals of suitable size. The line side terminal shall be suitable for AAA conductor equivalent to ACSR weasel / rabbit conductor. Lighting counter, leakage detector (including insulating base) are not required for the lighting arrestors.

5.3 **Arrester Housing**

- 5.3.1. The arrester housing shall be made up of porcelain / silicon polymeric housing and shall be homogenous, free from laminations, cavities and other flaws of imperfections that might affect the mechanical and dielectric quality. The housing shall be of uniform brown colour, free from blisters, burrs and other similar defects. Arrestors shall be complete with insulating bases fasteners for stacking units.
- 5.3.2. The housing shall be so coordinated that external flashover shall not occur due to application of any impulse of switching lighting voltage up to the maximum design value for arrester. The arrestors shall not fail due to contamination. The 11kV arrestors housing shall be designed for pressure relief class as given in Technical Parameters of the specification.
- 5.3.3. Sealed housings shall exhibit no measurable leakage.

5.4 **Arrester Mounting**

The arrestors shall be suitable for mounting on 4 pole/2 pole structure used for pole/ plinth mounted transformer and for incoming and outgoing lines.

5.5 **Fittings & Accessories**

- 5.5.1 The lighting arrester shall be complete with insulating bases, fasteners for stacking units along with clamp & terminal connectors and inbuilt disconnector.
- 5.5.2 The terminals shall be non-magnetic, corrosion proof, robust and of adequate size and shall be so located that incoming and outgoing connections are made with minimum possible bends. The top metal cap and base of lighting arrester shall be galvanized. The line terminal shall have a built in clamping device, which can be adjusted for both horizontal and vertical take off.

6. **Drawings, Documents and Design Calculations**

Bidder to submit followings along with the bid :

- i) Sectional drawings
- ii) Mounting arrangement

7.0 **Tests**

7.1.1 **Test on Lighting Arrestors**

The lighting Arrestors offered shall be type tested from NABL accredited laboratory. Copies of test certificates shall be furnished by the bidder for scrutiny.

Routine and Acceptance tests shall be carried out in accordance with IS: 3070 (Part-3)-1993. The purchaser representative will witness the acceptance test at the works of manufacturer. The suitability of the Lighting Arrestors shall also be established from the following:

- Residual voltage test
- Reference voltage test
- P.D. test
- Sealing test
- Thermal stability

Metal oxide block shall be tested for guaranteed specific energy capability in addition to routine / acceptance test as per IEC / IS.

7.1.2 The maximum residual voltages corresponding to nominal discharge current of 5 kA for steep current, impulse residual voltage test, lightning impulse protection level and switching impulse level shall generally conform to relevant ISS.

7.1.3 The suppliers shall furnish the copies of the type tests and the characteristics curves between the residual voltage and nominal discharge current of the offered lighting arrestor and power frequency voltage v/s time characteristic of the lighting arrestor subsequent to impulse energy consumption as per clause 6.6 of IS ; 3070 (Para-3) offered along with the bid.

7.1.4 The lighting arrestor housing shall also be type tested and shall be subjected to routine and acceptance tests in accordance with IS : 2071.

7.1.5 Galvanization Test

7.1.6 Test on Lighting Arrestor Dis-connectors

The test shall be performed on lighting arrestors which are fitted with arrestor dis-connector or on the dis-connector assembly alone if its design is such as to be un-affected by the heating of adjacent parts of the arrestor in its normally installed portion in accordance with IS : 3070 (part-3).

7.7.2 Name Plate

The nameplate attached to the arrestor shall carry the following information:

- Rated Voltage
- Continuous Operation Voltage
- Normal discharge current
- Pressure relief rated current Manufacturer Trade Mark
- Name of Sub-station

- Year of Manufacture
- Name of Scheme
- Name of Client
- Purchase Order Number along with date