

**TECHNICAL SPECIFICATION OF POLYMER HOUSING  
33 KV LIGHTNING ARRESTOR  
(VOLTAGE CLASS SURGE ARRESTORS)**

**1.0 SCOPE:**

1.1 The specification covers the design, manufacture, shop & laboratory testing before despatch, supply delivery of 33 KV Station class heavy duty, gapless metal oxide Surge Arrestors, insulating base, clamps, complete fittings & accessories suitable for 33 KV transformers/feeders including arrester's electrode earthing.

**2.0 STANDARDS**

2.1 The design, manufacture and performance of Surge Arrestors shall comply with IS: 3070 Part-3 and other specific requirement stipulated in the specification Unless otherwise, specified, the equipment, material and processes shall conform to the latest applicable Indian/International Standards as listed hereunder:

IS: 2071-1993 (Part-1) & It's amendment thereof	:	Methods of High Voltage Testing General Definitions & Test Requirements.
IS: 2071-1974 (Part-2) It's amendment thereof	:	Test Procedures
IS: 2633-1986 It's amendment thereof	:	Methods for Testing uniformity of zinc coated Articles.
IS: 3070-1993 (Part-3) It's amendment thereof	:	Specification for surge arrester for alternating current system Metal-Oxide lightning Arrestors without gaps.
IS:4759-1996 It's amendment thereof	:	Specification for hot dip zinc coating on Structural Steel and other allied products.
IS: 5621-1980 It's amendment thereof	:	Hollow Insulators for use in Electrical Equipment.
IS: 6209-1982 It's amendment thereof	:	Methods of Partial discharge measurement.
IS: 6745-1980 It's amendment thereof	:	Methods for determination of mass of zinc coating on zinc coated iron and steel articles.
IEC:TC-37	:	Test Procedures.
ANSI/IEEE-C.62.11(1982)	:	Metal Oxide, Surge Arrester for A.C. Power Circuits.
IEE-99-4	:	Surge Arrestors.
IEC – 60099 Part-4&5	:	Metal-oxide surge arresters without gaps for A.C. systems
The housing shall conform to the degree of protection as per IP53 (IS 1394 part-I, 1993)		

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

### **3.0 GENERAL REQUIREMENT**

- 3.1 The Metal Oxide gap less Surge Arrestor without any series or shunt gap shall be suitable for protection of 33 KV power transformers, associated equipment and 33 KV lines from voltage surges resulting from natural disturbance like lightening as well as system disturbances.
- 3.2 The surge arrester shall draw negligible current at operating voltage and at the same time offer least resistance during the flow of surge current.
- 3.3 The surge arrester shall consist of non-linear resistor elements placed in series and housed in electrical grade porcelain housing/silicon polymeric of specified creepage distance.
- 3.4 The assembly shall be hermetically sealed with suitable rubber gaskets with effective sealing system arrangement to prevent ingress of moisture.
- 3.5 The surge arrester shall be provided with line suitable for ACSR 'Panther' Conductor for vertical and horizontal take off. The earth terminals shall be provided of suitable size. The groundside terminal of surge arrester shall be connected with 50x6mm- galvanized strip, one end connected to the surge arrester and second end to a separate ground electrode (Electrode type of earthing). The contractor shall also recommend the procedure which shall be followed in providing the ear thing/system to the Surge Arrestor.
- 3.6 The surge arrester shall not operate under power frequency and temporary over voltage conditions but under surge conditions, the surge arrester shall change over to the conducting mode.
- 3.7 Surge arrester 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 arrester failure.
- 3.8 The reference current of the arrester shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage.
- 3.9 The surge arrester shall be thermally stable and the contractor shall furnish a copy of thermal stability test with the bid.
- 3.10 The arrestors for 33 KV system shall be suitable for mounting on transformers as well as in the yard. The supplier shall furnish the drawing indicating the dimensions, weight etc. of the surge arrestors for the design of mounting brackets.
- 3.11 The arrester shall be capable of handling terminal energy for high surges, external pollution and transient over voltage and have low losses at operating voltage.

### **4.0 ARRESTOR HOUSING**

- 4.1 The arrester housing shall be made up of silicon polymer 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 uniform gray colour, free from blisters, burrs and other similar defects.

Arrestors shall be complete with insulating cases, fasteners for stacking units together, surge counters with leakage current meters and terminal connectors.

- 4.2 The housing shall be so coordinated that external flashover shall not occur due to application of any impulse or switching surge voltage upto the maximum design value for arrester. The arrestors shall not fail due to contamination. The 33 KV arrestors housing shall be designed for pressure relief class as given in Technical Parameters of the specification.
- 4.3 Sealed housing shall exhibit no measurable leakage.

## **5.0 TESTS**

### **5.1 Test on Surge Arrestors**

The Surge Arrestors offered shall be type tested not earlier than 5 years before the date of opening of this tender. The surge arrestors shall be subjected to routine and acceptance tests in accordance with IS: 3070(Part3)-1993, IEC 60099-Part-4&5 and any other Indian or International. In addition, the suitability of the Surge Arrestors shall also be established for the following:

- \* Residual voltage test
- \* P.D. Test
- \* Heat dissipation
- \* Insulation withstand test on Arrester Housing
- \* Lighting Impulse withstand voltage test
- \* Power frequency withstand voltage test (Wet & Dry)
- \* Operating Duty test
- \* Repetitive Charge transfer Test
- \* Power frequency voltage versus time characteristics.
- \* Accelerated ageing Test
- \* Pollution test (Weather Ageing)
- \* Galvanization Test (if applicable)
- \* Bending Moment test

#### **Tests required on Silicone Rubber (Polymer)-**

- \* Recovery of Hydrophobicity & corona Test
- \* Tracking & Erosion Test
- \* Thermogravimetric analysis (TGA) FTIR analysis
- \* Volume resistivity, Dielectric strength & Dry Arc Résistance test

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

- 5.2 The maximum residual voltages corresponding to nominal discharge current of 10KA for steep current, impulse residual voltage test, lightning impulse protection level and switching impulse level shall generally conform to Annexure-K of IEC-99-4.
- 5.3 The bidder shall furnish the copies of the type tests and the characteristics curves between the residual voltage and nominal discharge current of the offered surge arrester and power frequency voltage V/s time characteristic of the surge arrester subsequent to impulse energy consumption as per clause 6.6 of IS: 3070 (Part-3) offered along with the bid.
- 5.4 The surge arrestors housing shall also be type tested and shall be subjected to routine and acceptance tests in accordance with IS: 2071.
- 5.5 **Galvanization Test**

All Ferrous parts exposed to atmospheric condition shall have passed the type test and be subjected to routine and acceptance test in accordance with IS: 2633 & IS: 6745.

## **6.0 NAME PLATE**

6.1 The nameplate attached to the arrestors shall carry the following information: -

- \* Manufacturing Trade Mark
- \* Year of Manufacturer
- \* Rated Voltage
- \* Continuous Operation Voltage
- \* Pressure relief rated current
- \* Name of Client- PVVNL
- \* Purchase Order Number along with rate.

## **7.0 INSPECTION**

7.1 All tests and inspection shall be made in the manufacturer's works unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of placement of purchase order. The manufacturer shall afford to the inspector representing the purchaser, all reasonable facilities, without charge to satisfy him that the material being furnished is in accordance with these specifications. The purchaser reserves the right to get an component/material being used by the manufacturer of the Surge Arrestor tested from any recognized test house.

7.2 The inspection by the purchaser or his authorized representative shall not relieve the contractor of his obligation of furnishing equipment in accordance with the specifications.

## **8.0 DRAWING AND INSTRUCTION MANUALS**

Within 15 days of receipt of the order, the successful tenderer shall furnish to the purchaser the following drawings and literature for approval:

- (i) Outline dimensional drawings of Surge Arrestor and all accessories.
- (ii) Assembly drawings and weights of main component parts.
- (iii) Instructions manual
- (iv) Drawing showing details of pressure relief value
- (v) Volt-time characteristics of surge arrestors.
- (vi) Detailed dimensional drawing of polymer housing i.e. internal diameter, external diameter, thickness, height profile, creep age distance, dry arching distance etc.