

**ODISHA POWER TRANSMISSION CORPORATION LIMITED  
CENTRAL PROCUREMENT CELL,  
JANAPATH, BHUBANESWAR – 751022.**

**TECHNICAL SPECIFICATION**

**FOR**

**400KV, 220KV, 132KV, 33KV SURGE ARRESTER  
[POLYMER (SILICON RUBBER) HOUSING]**

**CONTENTS**

CLAUSE NO	T I T L E
1.0	SCOPE
2.0	STANDARDS
3.0	GENERAL TECHNICAL REQUIREMENTS
4.0	CONSTRUCTION
5.0	TESTS
6.0	INSPECTION
7.0	QUALITY ASSURANCE PLAN
8.0	DOCUMENTATION
9.00	PACKING & FORWARDING
10.0	QUANTITY & DELIVERY REQUIREMENT

APPENDIX – I	TECHNICAL REQUIREMENTS
--------------	------------------------

ANNEXURES	
A	GUARANTEED TECHNICAL PARTICULARS
B	CHECK – LIST
C	CALIBRATION STATUS OF TESTING EQUIPMENTS/METERS
D	CHECK-LIST TOWARDS TYPE TEST REPORT

APPENDIX – II	QUANTITY AND DELIVERY SCHEDULE
---------------	--------------------------------

# SECTION – IV

## TECHNICAL SPECIFICATION FOR SURGE ARRESTERS [POLYMER (SILICON RUBBER) HOUSING] FOR 400KV, 220KV, 132KV, 33KV SYSTEMS

### 1.0 SCOPE :

1.1 This Specification provides for the design, manufacture, inspection and testing before dispatch, packing and delivery F.O.R. (destinations) of metal oxide (gapless) Surge Arresters with discharge counters, insulating base, terminal connectors and other accessories as specified here in.

Following is the list of documents constituting this Specification. :

(i)	Technical Specification (TS)	
(ii)	Technical Requirements.	Appendix-I
(iii)	Quantity and delivery schedule.	Appendix-II
(iv)	Guaranteed Technical Particulars.	Annexure-A
(v)	Check-List.	Annexure-B
(vi)	Calibration Status of testing equipments and meters/Instruments.	Annexure-C
(vii)	Check-list towards Type Test Reports.	Annexure-D
Note: Annexure-A, B, C, & D are to be filled up by the Bidder.		

1.1 The Surge Arrester shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of offer and purchaser shall have the power to reject any work or materials, which in his judgment is not in full accordance therewith.

### 2.0 STANDARDS:-

2.1 Except to the extent modified in the Specification, the Surge Arrester shall conform to the latest editions and amendments of the standards listed hereunder.

Sl. No.	Standard Ref. No.	Title.
1	IEC-60099-4	Specification for Surge Arresters without gap for AC System.
2	IS:2147	Degree of protection, provided by enclosures for low voltage switchgear and control.
3	IS:2629	Recommended practice for hot dip galvanization of iron and steel.
4	IS:2633	Method for testing uniformity of coating on zinc coated articles.
5	IS:3070	Specification for surge arresters for alternating current system.
6	IS:5621 &IEC-621155	Specification for large hollow porcelain for use in electrical installation.
7	IEC-60-1	High-Voltage Test technique.
8	IEC-270	Partial discharge measurements.
9	IEC-99-1	Non-linear resistor type gapped arresters for a.c. systems.
10		Indian Electricity Rules, 1956.
11.	IEC-60815	Shed profile of hollow porcelain Insulator.

2.2 Surge Arresters with the requirement of other authoritative standards, which ensure equal or better quality than the standards, mentioned above shall also be acceptable. Where the equipment offered by the supplier conforms to other standards, salient points of difference between the standards adopted and the specified standards shall be clearly

brought out in the offer. Copies of the reference standards in English language shall be furnished along with the offer.

### 3.0 **GENERAL TECHNICAL REQUIREMENTS:**

- 3.1 The Surge Arrester shall conform to IEC : 60099-4 & the technical requirements as per Appendix-I and this TS.
- 3.2 The energy handling capability of each rating of Arrester offered, supported by calculations, shall be furnished with the offer. The surge arrester shall be designed for satisfactory performance under various other electrical, electromechanical, geographic & meteorological conditions.
- 3.3 The Surge Arresters shall be fitted with pressure relief devices and arc diverting paths and shall be tested as per the requirements of IEC for minimum prospective symmetrical fault current as specified in Appendix-I.
- 3.4 A grading ring shall be provided if required, (for attaining all the relevant technical parameters) on each complete Surge Arrester.

### 3.5 **PROTECTIVE LEVELS :**

Surge Arresters shall be capable of providing protection to sub-station equipments, designed for the withstand levels, given in the following table.

Sl. No.	Equipment to be Protected	Insulation level of 420KV Systems	Insulation level of 245KV Systems.	Insulation Level of 145KV Systems	Insulation Level of 36KV System
		L.I. Level (KVP)	L.I. Level (KVP)	L.I. Level (KVP)	L.I. Level (KVP)
1	Auto Transformers/ Power Transformers.	± 1300	± 950	± 650	± 170
2	Instrument Transformers.	± 1425	± 1050	± 650	± 170
3	Reactors	± 1300	± 950	± 650	± 170
4	Circuit Breakers/Isolators.				
(i)	Phase to ground.	± 1425	± 1050	± 650	± 170
(ii)	Across open contacts.	± 1425 (±240)	± 1200	±750	± 195

Surge arresters shall be suitable for the following duty cycles of circuit breakers at the following system voltages:

1.	420 KV Circuit Breaker	0-0.3 sec-co-3 min-co
2.	245 KV Circuit Breaker	0-0.3 sec-co-3 min-co
3.	145 KV Circuit Breaker	0-0.3 sec-co-3 min-co
4.	36 KV Circuit Breaker	0-0.3 sec-co-3 min-co

### 3.6 **DUTY REQUIREMENT :**

- 3.6.1 Surge Arresters shall be of heavy-duty station class and gapless type without any series or shunt gaps.
- 3.6.2 Surge Arresters shall be capable of discharging over voltages occurring during switching of un-loaded transformers, lines, capacitors and reactors.
- 3.6.3 The Surge Arresters shall be capable of discharging lightning and switching surges and temporary power frequency over-voltages.

- 3.6.4 The Surge Arresters shall be capable of discharging the energy equivalent to CLASS -3 & 4 of IEC-60099-4.
- 3.7 The reference current of the arrester shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage. The supplier shall submit values and the supporting evidence along with calculations on above.
- 3.8 Surge Arresters shall be able to withstand maximum wind load of 260 Kg./sq.m.
- 3.9 Surge Arresters shall be capable of withstanding effects of direct solar radiation.
- 3.10 Surge arresters shall be capable of spark over on severe switching Surges and multiple strokes.
- 3.11 The Surge Arrester should be adequately designed to operate satisfactorily under temporary power frequency over-voltage as given in specific technical requirements, after discharging two shots of respective long duration surges.
- 3.12 Unless otherwise brought out separately by the Bidder in the schedule of deviations, the Surge Arresters, offered shall conform to the specification scrupulously. All deviations from the specification shall be brought out in the schedule of deviations. The discrepancies between the specification and the catalogues or literature, submitted as part of the offer shall not be considered as valid deviations unless specifically brought out in the schedule of deviations.
- 3.13 420KV class surge arresters shall be capable of discharging of severe re-energisation switching surges on a 400KV, 450Km long line with surge impedance of 300ohms & capacitance of 11.986nF/Km & over voltage factor of 2.3p.u.. It shall be capable of discharging energy equivalent to class 4 of IEC for a 420 kV system on two successive operations followed immediately by 50 Hz energisation with a sequential voltage profile as specified below :
  - 650 kVp for 3 peaks
  - 575 kVp for 0.1 Second
  - 550 kVp for 1 second
  - 475 kVp for 10 seconds
- 3.14 245/145 kV class arrester shall be capable for discharging energy equivalent to class 3 of IEC for 245/145 kV system on two successive operations.

#### 4.0 **CONSTRUCTION :**

- 4.1 Non linear blocks shall be sintered metal oxide material. These shall be provided in such a way as to obtain robust construction with excellent electrical and mechanical properties even after repeated operations.
  - 4.1.1 All the units of arresters of same rating shall be inter-changeable without adversely affecting the performance.
- 4.2 The Surge Arresters shall be suitable for pedestal type mounting.
- 4.3 All the necessary flanges, bolts, nuts, clamps etc. required for assembly of complete arrester with accessories and mounting on support structure to be supplied by the purchaser, shall be included in supplier's scope of supply.
- 4.4 The drilling details for mounting the Arrester on owner's support shall be supplied by the supplier.
- 4.5 The minimum permissible separation between the Surge Arrester and any earthed object shall be indicated by the Bidder in his offer.
- 4.6 Surge Arresters shall be designed to incorporate pressure relief devices and arc diverting paths to prevent shattering of the blocks following prolonged current flow or internal flash over and providing path for flow of rated fault currents in the event of arrester failure.

- 4.7 Surge Arresters shall incorporate anti-contamination feature to prevent arrester failure, caused by uneven voltage gradient across the stack, resulting from contamination of the arrester porcelain.
- 4.8 Seals shall be provided in such a way that these are always effectively maintained even when discharging rated lightning current.
- 4.9 The heat treatment cycle details along with necessary quality checks used for individual blocks along with insulation layer, formed across each block are to be furnished. Moralized coating thickness for reduced resistance between adjacent discs is to be furnished along with the procedure for checking the same. Details of thermal stability test for current distribution of current on individual disc is to be furnished.
- 4.10 Each individual unit of Surge Arresters shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire lifetime of the arrester and under the service conditions as specified. The supplier shall furnish sectional view of the arrester showing details of sealing employed.
- 4.11 The Surge Arresters shall be suitable for hot line washing.
- 4.12 **The housing** of the Surge Arrester shall be of polymer (silicon rubber). Polymer (Silicon Rubber) Housing shall be free from lamination cavities or other flaws affecting themechanical and electrical strengths. Properties of the polymeric materials shall be specified in the offer and test reports for the same from a reputed Indian laboratory shall be submitted for approval. The rain sheds / petticoats shall be of silicon rubber and shall confirm to the properties and test reports submitted. The petticoats shall not be pre-molded push on type.
- 4.13 (a) The external insulating part of the Surge Arrester shall provide **Creepage** 31 mm/KV for saline area or 25 mm/KV for other area considering the pollution level –IV or -III as per IEC 60099-4.
- (b) The outer insulator shall be polymer conforming to IEC 61462. The outer insulator housing shall be so coordinated that external flashover will not occur due to application of any impulse or switching surge voltage upto the maximum design value for arrester.
- (c) The end fittings shall be made of corrosion proof material and preferably be nonmagnetic.
- (d) The sealing arrangement of the Surge Arrester stacks shall be done incorporating grooved flanges with the O-rings/elliptical cross-section gaskets of Neoprene or Butyl rubber.
- 4.14 **GALVANISATION, NICKEL PLATING ETC. :**
- 4.14.1 All ferrous parts exposed to atmosphere shall be hot dip galvanized as per IS: 2629, as amended from time to time. Tinned copper/brass lugs shall be used for internal wiring of discharge counter. Screws used for electrical connections shall be either made of brass or shall be nickel-plated.
- 4.14.2 Ground terminal pads and nameplate brackets shall be hot dip galvanized.
- 4.14.3 The material shall be galvanized only after completing all shop operations.
- 4.15 **ACCESSORIES AND FITTINGS :**
- 4.15.1 **Surge Counters / Monitors**
- 4.15.1.1 A self- contained Surge counter, suitably enclosed for outdoor use and requiring no auxiliary of battery supply for operation shall be provided for each unit. The surge counter shall be operated by the discharge current, passed by the surge arrester and shall be suitable for mounting on the support structure of the Arrester.
- 4.15.1.2 Surge counters shall be designed for continuous service. The reading of milliammeter and

counters shall be visible through an inspection glass panel. The surge counter shall be provided with a potential free contact rated for 220 Volt (DC) which shall close whenever a surge is recorded by the surge monitor. Necessary arrangement shall be provided for extending the contact information to SAS / RTU.

- 4.15.1.3 The cyclometer counter shall be visible through an inspection window from ground level. The counter terminals shall be robust and adequate size and shall be so located that the incoming and outgoing connections are made with minimum possible bends.
- 4.15.1.4 Internal parts shall be unaffected by atmospheric conditions at site. Surge monitor consisting of discharge counters and milliammeters should be suitable to be mounted on support structure of the arrester and should be tested for IP66 degree of protection. The surge monitor should be suitable for mounting on this standard mounting pad. All nuts, bolts, washers etc required for fixing the surge monitor shall also to be considered. Surge monitors shall be designed to allow the recording device to be read from ground level without exposing the internal parts to the atmosphere.
- 4.15.1.5 The Surge Counter shall be connected in the main earth lead from the arrester in such a manner that the direction of the earth lead is not changed or its surge impedance materially altered. A bolted link shall be provided so that the surge counter may be short circuited and removed without taking the arrester out of service.
- 4.15.1.6 All necessary accessories and earthing connection leads between the bottom of the Arrester and discharge counter shall be in the supplier's scope of supply.
- 4.15.1.7 The arrangement for Surge Monitor enclosure fixing to the structure shall be at its rear/bottom. Connection between the Surge Arrester base and Surge Monitor shall be through a 2.0 m (minimum) long insulated copper rod/strip of at least 75 sq.mm cross sectional area. The cable shall be terminated at rear/bottom side of the Surge Monitor. The gaskets of the surge monitors shall be of Neoprene, Butyl or equivalent material.

#### 4.15.2 **LEAKAGE CURRENT METERS :**

- 4.15.2.1. Leakage current meters (suitable mili-ammeter) shall be connected in the earthing path of the surge arresters to measure the resistor grading leakage current. Meters shall be designed for continuous service.
- 4.15.2.2. The ammeter shall be suitable for mounting on the support structure of the arrester. The push buttons shall be mounted such that it can be operated from the ground level.
- 4.15.3. Arresters shall be complete with insulating base having provision for bolting to flat surface of the structure.
- 4.15.4. Grading /corona rings shall be provided on each complete Arrester unit, as required, for proper voltage stress distribution.
- 4.15.5. The grounding terminals shall be suitable for accommodating purchaser's grounding connection to steel earth mat.
- 4.15.6. The Bidder has to quote unit rates of the insulting base and the surge counter separately. The purchaser reserves its option to procure insulting base and surge counter.
- 4.15.7. Clamp type terminal connector, suitable for 220KV-ACSR MOOSE Conductor, 132KV & 33KV-ACSR Zebra Conductor shall be provided having both horizontal and vertical take-off. For 400KV Surge Arrester, Terminal Connector suitable for vertical & horizontal take off ACSR twin Moose conductor shall be provided.
- 4.15.8. Two clamp type ground terminal connectors, suitable for G. I. Strip 75X10 should be provided.
- 4.15.9. All interconnecting hard wares such as nuts, bolts, spring washers etc. with 5% spares shall be supplied for different units.

4.15.10 Other standard accessories, which are specifically not mentioned, but are usually, provided with Surge Arrester of such type and rating for efficient and trouble free operation should be supplied.

4.16 **NAME PLATE:** (shall conform to the requirement of IEC incorporation the year of Manufacture)

Each single pole Arrester shall be provided with non-corrosive legible name plate, at the base bearing thereon, voltage rating of the complete pole and the number of demountable sections with the following data, indelibly marked.

- (a) ODISHA POWER TRANSMISSION CORPORATION LIMITED.
- (b) Purchase order No. & Date.
- (c) Name of device.
- (d) Manufacturer's name and trademark and identification no. of the arrester being supplied.
- (e) Year of manufacture
- (f) Rated voltage
- (g) Rated Frequency
- (h) Maximum continuous operating voltage.
- (i) Type
- (j) Nominal discharge current.
- (k) Long duration discharge class.
- (l) Pressure relief current in KA(rms)
- (m) Energy discharge capability (KJ/KV rating).

5.0 **TEST:**

5.1 **Type Tests:**

The surge Arrester offered should have been subjected to the following type tests in an independent Government approved test laboratory. The bidder shall furnish type test reports along with the offer. These tests must not have been conducted earlier than five years from the date of opening of technical bid. For any change in the design, type already type tested and the design type offered against this specification, the purchaser reserves the right to demand repetition of some or all type tests without any extra cost to OPTCL in the presence of Purchaser's representative at the cost of the supplier.

- 1. Insulation withstand tests on the arrester housing.
- 2. Residual voltage test.
  - a) Steep current impulse residual voltage test.
  - b) Lightning impulse residual voltage test.
  - c) Switching impulse residual voltage test.
- 3. Long-duration current impulse withstand test.
- 4. Operating duty test.
  - a) High-current impulse operating duty test.
  - b) Switching surge operating duty test.
- 5. Short circuit test.
- 6. Internal partial discharge test.
- 7. Bending moment test.
- 8. Environmental tests.



9. Seal leak rate test.
10. Radio interference voltage test.
11. Moisture ingress test.
12. Weather ageing test.
13. Seismic withstand test.
14. IP-66 test on surge counter.
15. Minimum current operation tests of the surge counter.
16. Maximum current withstand test of the surge counter.

5.2 **ROUTINE TESTS:** The following routine tests shall be conducted at the supplier's cost on each surge arrester and shall be submitted along with or before offering for inspection for purchaser's approval.

- (a) Measurement of reference voltage.
- (b) Residual voltage tests.
- (c) Measurement for partial discharge and contact noise.
- (d) Sealing test for units with sealed housings : Water dip test at 1.5m depth from top of Surge Arrester for 30 minutes shall be performed during assembly of Surge Arrester stacks (followed by other routine tests, i.e. P.D. Measurement, Reference Voltage, Residual Voltage & IR measurement)
- (e) Verticality check on completely assembled Surge arresters as a sample test on each lot.

5.3 **Routine Tests on Insulators :** All routine tests shall be conducted on the hollow column insulators as per IEC 62155. Polymer housing shall be tested in accordance to IEC-61462.

5.4 **Routine Test on Surge Monitors :** The Surge monitors shall also be connected in series with the test specimens during residual voltage and current impulse withstand tests to verify efficacy of the same. Additional routine/ functional tests with one 100A and 10kA current impulse (8/20 micro sec.) shall also be performed on the Surge monitor.

Surge monitors shall be routinely tested for water dip test at 1.5m for 30 minutes. No water vapors shall be visible on the monitor glass.

5.5 **ACCEPTANCE TESTS :**

The following tests, considered as acceptance tests, shall be conducted in the presence of purchasers representative for which no charges will be payable by OPTCL. The acceptance tests, whenever possible shall be conducted on the complete arrester unit. The number of samples to be subjected to acceptance test shall be decided by the purchaser at the time of actual testing.

- I) Measurement of Power Frequency Voltage at the reference current
- II) Measurement of leakage current and capacitive current at M.C.O.V
- III) Lightning Impulse Residual Voltage Test at N.D.C., 50% of N.D.C. & 200% of N.D.C
- IV) Internal ionization or Partial Discharge Tests on complete arresters/units at 1.05 times M.C.O.V
- V) Special Thermal stability test
- VI) Galvanization test on metal parts
- VII) The functional (operational) test on the Surge Counter by way of checking its operation at following nominal discharge currents:
  - (a) 100 Amps with 8/20 micro second wave shape.
  - (b) 10 KA with 8/20 micro second wave shape.
- VIII) Check of calibration of leakage current meters.



## 5.6 **Special Acceptance Test:**

- I. Thermal stability test on three sections. (IEC Clause 7.2.2).
- II. Aging test for Zinc oxide blocks as an acceptance test is to be carried out on 3 samples for 72 hours at maximum continuous over voltage (MCOV) and at a temperature of 115°C. Acceptance norm being Ir (resistive current)/watt loss shall remain or decrease at the end of 72 hrs from the value taken after 1 hour of start of test.
- III. Watt loss test.

## 6 **QUALITY ASSURANCE PLAN :**

6.1 The Bidder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection.

- (i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests, normally carried out on raw materials in presence of Bidder's representative, copies of test certificates.
- (ii) Information and copies of test certificates as in (I) above in respect of bought-out items.
- (iii) List of manufacturing facilities available.
- (iv) Level of automation, achieved and list of areas where manual processing exists.
- (v) List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspections.
- (vi) Special features provided in the equipment to make it maintenance free
- (vii) List of testing equipments, meters available with Bidder for final testing of equipment, specified and test plant limitation, if any, vis-à-vis the type, acceptance and routine tests, specified in the relevant standards and this specification. These limitations shall be very clearly brought out in the offer.
- (viii) All the testing equipments, meters etc. should have been calibrated in a Government approved laboratory. The Bidder must submit the list of testing equipments and meters test-wise as per Annexure-C of this Technical Specification.

6.2 The suppliers, within 30 days of placement of order submit the following information to the purchaser.

- (i) List of raw materials as well as bought out accessories and the names of the materials as well as bought-out accessories and the names of sub-suppliers, selected from those, furnished along with the offer.
- (ii) Type test certificates of the raw material and bought out accessories.
- (iii) Quality Assurance Plan (QAP) with hold points for the purchaser's inspection. The QAP and hold points shall be discussed between the purchaser and the supplier before the QAP is finalized.

6.3 The supplier shall submit the routine test certificates of bought out item and raw material at the time of acceptance testing of the fully assembled equipment.

## 7.0 **DOCUMENTATION :**

7.1 All drawings shall conform to relevant Indian Standard as per relevant IS. All drawings shall be in ink and suitable for microfilming.

All dimensions and data shall be in S.I. Units.

7.2 The supplier shall furnish following drawings/documents along with his offer.

- (i) General outline drawings of the complete Arrester with technical parameters.

- (ii) Drawings showing clearance from grounded and other line objects and between adjacent poles of Surge Arresters, required at various heights of Surge Arresters.
- (iii) Drawings showing details of pressure relief devices.
- (iv) Detailed drawing of discharge counters along with the wiring and schematic drawing of discharge counter and meter.
- (v) Outline drawing of insulating base.
- (vi) Details of grading rings, if used.
- (vii) Mounting details of Surge Arresters.
- (viii) Details of line terminal and ground terminals.
- (ix) Volt-time characteristics of Surge Arresters.
- (x) Details of galvanization being provided on different ferrous parts.
- (xi) The detailed dimensional drawing of porcelain Housing such as ID, OD, thickness and insulator details such as height, profile of petticoats, angle of inclination and gap between successive petticoats, total creepage distance etc.
- (xii) Cross-sectional view of the Surge Arrester Units showing all components.

**8.0 QUANTITY AND DELIVERY REQUIREMENT :**

- (i) **This is set out in Appendix – II of this specification.**
- (ii) The scope of supply shall include a supply of 2.5% extra quantity of bolts, nuts, washers, split pins, cotter pins and such other small loose items free of cost.

## **APPENDIX – I.**

### **(TECHNICAL REQUIREMENTS)**

#### **TECHNICAL REQUIREMENTS FOR METAL OXIDE (GAPLESS) SURGE ARRESTERS**

The Surge Arrester under this Specification shall conform to the parameters given below :-

		390KV	216KV	120KV	30KV
Sl. No	Particulars.	Technical Parameters	Technical Parameters.	Technical Parameters	Technical Parameters
1	Nominal system voltage (phase to phase) (KV rms).	400	220	132	33
2	Highest system voltage (phase to phase) (KV rms).	420	245	145	36
3	System Frequency (HZ).	50 ± 5 %	50 ± 5 %	50 ±5%	50 ±5%
4	System Neutral earthing.	Effectively earthed.	Effectively earthed.	Effectively earthed	Effectively earthed
5	Installation.	Outdoor.	Outdoor.	Outdoor	Outdoor
6	Class.	Station class, 20 KA, heavy duty type.	Station class, 10 KA, heavy duty type.	Station class, 10 KA, heavy duty type.	Station class, 10 KA, heavy duty type.
7	Type of construction for 20KA & 10 KA rated arrester.	Single column, single phase.	Single column, single phase.	Single column, single phase.	Single column, single phase
8	No. of phases.	Three	Three	Three	Three
9	Maximum duration of earth	3	3	3	3

	fault (Sec.)				
10	Maximum prospective symmetrical fault current at arrester location (KA rms.)	50/63 as applicable	50	40	40
11	Rated arrester voltage (KV rms)	390	216	120	30
12	Nominal discharge current (KAP) Discharge current at which insulation co ordination will be done	20 KA of 8/20 micro sec wave	10 KA of 8/20 micro-second Wave.	10 KA of 8/20 micro-second Wave.	10 KA of 8/20 micro-second Wave.
13	Minimum energy discharge capability (KJ/KV)	As per relevant ISS/IEC	As per relevant ISS/IEC	As per relevant ISS/IEC	As per relevant ISS/IEC
14	Maximum continuous operating voltage at 50°C (KV rms)	303	175	102	25
15	Maximum switching surge residual voltage (KVP)	780 at 2KA	500 at 1KA	280 at 1KA	72 at 500A
16	Maximum residual voltage at 8/20 micro second(KVP)				
	(i) 5 KA.	----	567	320	85
	(ii) 10 KA Nominal discharge current.	900 KVp	600	340	90
	(iii) 20 KA.	975 KVp	668	380	100
17	Long duration discharge class	4	3	3	3
18	High current short duration test value (KAP)(4/10 Micro-second wave).	100	100	100	100
19	Current for pressure relief test (KA-rms)	40	40	40	40
20	Minimum total creepage distance (mm).	10500 (III-Heavy) 13020 (IV-Very Heavy)	6125 (III-Heavy) 7595 (IV-Very Heavy)	3625 (III-Heavy) 4495 (IV-Very Heavy)	900 (III-Heavy) 1116 (IV-Very Heavy)
21	One minute dry and wet power frequency withstand voltage of Arrester housing (KV-rms).	630	460	275	70
22	Impulse withstand voltage of arrester housing with 1.2/50 micro-second wave (KVP). (a) Switching Impulse Voltage (Wet) (KVP)	+1425  +1050	+ 1050  700	+650  -	+170  -
23	Pressure relief class.	A	A	A	A
24	Corona extinction voltage (KV-rms).	320 min	216	-	-

25	RIV at 92 KV rms.	Less than 500 micro volts	Less than 500 micro volts.	Less than 500 micro volts.	Less than 500 micro volts
26	Partial discharge at 1.05 times continuous over-voltage.	$\leq 10\text{pC}$	$\leq 10\text{pC}$	$\leq 10\text{pC}$	$\leq 10\text{pC}$
27	Seismic acceleration.	0.3g horizontal 0.15g vertical As per IS 1893	0.3g horizontal 0.15g vertical. As per IS 1893	0.3g horizontal 0.15g vertical. As per IS 1893	0.3g horizontal 0.15g vertical As per IS 1893
28	Reference ambient temperature.	50°C	50°C	50°C	50°C
29	(a) IR at MCOV.	Less than 500 micro amperes.	Less than 500 micro amperes.	Less than 500 micro amperes.	Less than 400 micro amperes
	(b) IC at MCOV.	Less than 1500 micro amperes.	Less than 1500 micro amperes.	Less than 1500 micro amperes.	Less than 1200 micro amperes
30	a) Reference Current (mA)	1 to 5 mA	1 to 5 mA	1 to 5 mA	1 to 5 mA
	b) Reference voltage at reference current.	Greater than rated voltage.	Greater than rated voltage.	Greater than rated voltage.	Greater than rated voltage.
31	Maximum cantilever strength of the arresters (KGM) for 1 minute withstand.	350	150	150	150
32	Maximum deflection at above cantilever in mm.	200	200	200	200
33	TOV (KVP).				
	(i) 0.1 sec.	580	382	170	53
	(ii) 1.0 sec.	565	366	163	51
	(iii) 10.0 sec.	550	351	156	49
	(iv) 100.0 sec.		336	149	47

## **ANNEXURE-A**

### **GUARANTEED TECHNICAL PARTICULARS**

(To be filled in by the Bidder)

		<b><u>400 KV</u></b>	<b><u>220 KV</u></b>	<b><u>132KV</u></b>	<b><u>33KV</u></b>
1	Bidder's Name and Address.				
2	Manufacturer's Name.				
3	Manufacturer's type designation.				
4	Applicable standards.				
5	Arrester class and type.				
6	Rated Arrester Voltage (KV rms).				
7	Maximum continuous operating voltages (MCOV) at design ambient temperature (KV-rms).				
8	Nominal discharge current (8/20				

	micro second wave) (KA).				
9	Minimum discharge capability referred to rated voltage at minimum of discharge characteristics (KJ/KV).				
10	Line discharge class as per IEC.				
11	Maximum switching surge residual voltage at 1 KA (KVP) for 216KV, 120KV and for 30KV at 500A.				
12	Maximum switching surge residual voltage at 1 KA for 390KV, 216 KV.				
13	Maximum residual voltage for 8/20 micro-second current wave.				
	(a) At 50 % nominal discharge current.				
	(b) At 100 % nominal discharge current.				
	(c) At 200 % nominal discharge current.				
14	Maximum residual voltage with 1 micro-second current wave at 10 KAP (KVP).				
15	One minute power frequency (dry) & (wet) withstand voltage of arrester (KV-rms).				
16	Impulse withstand test voltage of arrester housing with 1.2/50 micro-second wave (KVP).				
17	High current short duration (4/10 micro-second impulse wave) (KAP).				
18	Low current long duration (KAP).				
19	Reference voltage and corresponding reference current of arrester (KV)(mA).				
20	Maximum internal leakage current by its rms or peak value and both resistive and capacitive component separately at				
	(a) COV (resistive/capacitive) (mA).				
	(b) 1.1 COV (resistive/capacitive) (mA).				
	(c) COV at 150°C (resistive/capacitive) (mA).				
	(d) Reference voltage (resistive/capacitive)(mA).				
21	Pressure relief class.				
22	Are the protection levels affected by pollution of external insulation.				

23	Energy absorption capability per operation of the arrester, during a switching surge discharge (KJ).				
24	Maximum amount of energy that may be despatched into the arrester during discharge assuming that discharge takes place within 1 minute period and state the switching surge current (KJ/KA).				
25	Internal pressure required to operate pressure relief device as a percentage of burst pressure of porcelain (KJ) & %.				
26	Dynamic over-voltage withstand capability (KV-rms).				
	(a) For 0.1 Second.				
	(b) For 1 Second.				
	(c) For 10 Seconds.				
	(d) For 100 Seconds.				
27	Minimum prospective symmetrical fault current (KA).				
28	Rejection rate of ZnO blocks during manufacturing and operation for the past three years (%) separately.				
	(a) 2017-2018.				
	(b) 2018-2019.				
	(c) 2019-2020.				
29	<b>ZnO DISC DATA.</b>				
	(a) Rated voltage of ZnO disc. (KV-rms).				
	(b) No. of ZnO discs in a unit (Nos.)				
	(c) No. of units of arrester (Nos.)				
	(d) Height/thickness of ZnO discs (mm).				
	(e) Diameter of ZnO disc (mm).				
30	<b>EXTERNAL INSULATION.</b>				
	(a) Type.				
	(b) Applicable standard.				
	(c)(i) Lightning Impulse withstand test voltage of housing with 1.2/50 micro sec. Wave (KVP).				
	(ii) Wet switching impulse test voltage (KVP)				
	(d) One minute power frequency withstand voltage of arrester housing KV rms.				
	[i] Dry.				
	[ii] Wet.				
	(e) Total creepage distance of				

	arrester housing (mm).				
	(f) Cantilever strength of complete arrester (Kg-m).				
31	<b>OVER ALL DIMENSIONS.</b>				
	(a) Overall Height (mm).				
	(b) Height up to top of terminal pad from mounting plane (mm).				
	(c) Material of terminal pad.				
	(d) Size of terminal pad (mm).				
	(e) Mounting dimensions and diameter of mounting holes (mm).				
	(f) Diameter of insulator (mm).				
	(g) Total weight of complete arrester (Kg.)				
32	<b>TERMINAL CONNECTOR.</b>				
	(a) Manufacturer's Name.				
	(b) Applicable standards.				
	(c) Type.				
	(d) Material of connector.				
	[i] Clamp body.				
	[ii] Bolts and Nuts.				
	[iii] Spring washers.				
	(e) Rated current (Amps.)				
	(f) Rated terminal load (kg.)				
	(g) Factor of safety.				
	(h) Minimum thickness of any part (mm).				
	(i) Weight of clamp complete with hard ware (kg.)				
	(j) Type test report as per IS enclosed.				
	(k) OGA Drawing enclosed.				
33	<b>INSULATORS.</b>				
	(a) Manufacturers Name.				
	(b) Type.				
	(c) Applicable standards.				
	(d) Height (mm).				
	(e) Diameter (top)(mm).				
	(f) Diameter (bottom) (mm).				
	(g) Total creepage distance (mm).				
	(h) Rated voltage (KV – rms).				
	(i) Power frequency withstand voltage for 1 min. dry and wet (KV - rms).				
	(j) 1.2/50 micro - second impulse withstand voltage (KVP)				
	(k) Corona Extinction voltage (KV-rms)				



	(l) Weight (kg.)				
	(m) Maximum allowable span (mm).				
	(n) Cantilever strength (Kg – m).				

## **APPENDIX – II**

### **QUANTITY AND DELIVERY SCHEDULE**

Delivery Phases	Description.	Quantity required.	Desired delivery.	Destination.
			4 (Four) months from the date of the placement of the purchase order.	Any store/site within Odisha State, same will be indicated in the purchase order/release order.

The detail delivery programme and quantity to be delivered will be intimated at the time of placement of the purchase order/issue of release order.

## **ANNEXURE – B**

### **CHECK – LIST**

- Whether calculation towards energy handling capability of the Surge Arrester furnished as per Clause No.3.2 of TS?
- Whether there is provision of Corona Grading Ring in the SA as per Clause No.3.4 and 4.15.4 of TS? ..... If not, whether justification for non-provision of the same furnished?
- Whether calculations and supporting evidence furnished to satisfy Clause No.3.7 of TS?
- Whether the heat treatment cycle details along with necessary quality checks used for individual blocks furnished as per Clause 4.9 of TS ?
- Whether sectional view of arrester showing details of sealing provided as per Clause No.4.10 of TS furnished?
- Whether S.A. is suitable for hot line washing as per Clause No.4.11 of TS?
- Whether information as per Clause No.6.1 (i) to (viii) of TS furnished?
- Whether drawings and documents as per Clause No.7.2 (i) to (xii) of TS furnished?

- 9 Whether special measures in the manufacture of Surge Arrester for operating at ambient temperature of 50°C (against 40°C as per IEC-99-4, Clause No.5.4.1) are to be taken?  
..... State the special measures in details .....

Signature of the Tenderer with Seal & Date

## **ANNEXURE –C**

### **CALIBRATION STATUS OF TESTING EQUIPMENTS AND INSTRUMENTS/METERS**

Name of the test.	Meters and equipments required for the corresponding test with range accuracy make and Sl. No.	Date of Calibration	Due date of Calibration	Name of the Calibrating Agency	Whether Calibrating Agency is Govt. Approved.	Whether documents relating to Govt. Approval of the calibrating Agency Furnished?	Whether the meters/ equipment fulfill the accuracy class as per calibration report	Whether the calibrating agency has put any limitation towards the use of the particular meter/equipment. If yes, state the limitations.	Whether green sticker or blue sticker or yellow sticker has been affixed on the body of the particular equipment /meter. State the colour of the affixed sticker.	In spite of imposed limitations, whether the particular meter/equipment can still be used? Justify its use for corresponding test(s).	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Signature of the tenderer with seal and date.

## **ANNEXURE-D**

### **CHECK LIST TOWARDS TYPE TEST REPORTS**

Name of the Type Test.	Date of Test.	Name of the Laboratory where the Test has been conducted.	Whether the Laboratory is Government Approved.	Whether the Test reports are valid as per Clause No.5.1 of T.S.	Whether the copy of Test Report in complete shape along with drawings etc. furnished or not?	Whether the Type Tested Surge Arrester fulfills the technical requirements as per TS.	If the type tested Surge Arrester does not fulfill the technical requirements as per this specification, whether the bidder agrees to conduct the particular type test again at their own cost without any financial liability to OPTCL in the presence of OPTCL's representative within the specified delivery period.	Remarks.
1	2	3	4	5	6	7	8	9

Signature of the Tenderer with seal and date