INDEPENDENT POWER TRANSMISSION OPERATOR

TNPRD/ SUBSTATION SPECIFICATION & EQUIPMENT SECTION

November 2020

SPECIFICATION No SS-134/5

20 kV METAL OXIDE SURGE ARRESTERS WITHOUT GAPS

I. SCOPE

This specification covers IPTO's requirement with regard the rated characteristics, design features and testing of. Surge Arresters for the 20KV system.

II. KEYWORDS

Arresters, Surge arresters, Lightning arresters, metal oxide resistors, surge arrester sections, surge arrester units.

III. TYPE

Metal oxide surge arresters without gaps.

IV. USE

The metal oxide surge arresters without gaps are used for the protection of 150/20kV transformers mainly against lightning surges.

V. OPERATING CONDITIONS

1.	Installation	:	Outdoors
2.	Ambient Temperature	:	Minimum: -25^{o}C Maximum: +45^{o}C
3.	Altitude	:	Up to 1000m above sea level.
4.	Other Conditions	:	Snow, ice and fog
5.	Pollution level	:	Heavy to moderate depending on location
6.	Wind speed	:	150km/h maximum
7.	Relative humidity	:	≤ 95%

VI. ELECTRICAL CHARACTERISTICS OF 20KV SYSTEM

1.	Nominal Voltage	:	20kV
2.	Maximum Operating Voltage (phase to phase)	:	21,65kV
3.	Maximum temporary over-voltage (phase to ground)	:	24kV rms
4.	Number of phases	:	3
5.	Number of conductors	:	3
6.	Rated frequency	:	50 Hz
7.	Short circuit level	:	10kA
8.	Basic impulse Insulation level (crest)	:	150kV
9.	Method of grounding (earthing).	:	The 20kV system is earthed via a 12Ω resistor

VII. HOW ARRESTER IS TO BE CONNECTED TO THE SYSTEM

Phase - to - Earth.

VIII. STANDARDS

The surge arresters shall conform to IEC- 60094-4 second edition Standard .

IX. ARRESTER REQUIRED CHARACTERISTICS

1.	Continuous Operating Voltage Uc (COV) or MCOV)	:	19,2≤Uc≤19,5kV rms
2.	Rated Voltage as defined in IEC-60099-4, Ur	:	24kV rms
3.	Rated frequency	:	50 Hz
4.	Nominal discharge current (8/20 μs)	:	10KA, peak
5.	Maximum residual voltage at switching impulse (30/60μs)		
	a. at 125A	:	≤46,5 Kv, peak
	b. at 500A(protection level)	:	≤50,5 kV, peak
6.	Maximum residual voltage at lighting impulse (8/20μs)		
	a. At 5KA	:	≤61,5 kV, peak
	b. At 10KA (lightning impulse protective level)	:	≤67 kV, peak
7.	Energy capability		
	a Line discharge class	:	2
	b Energy withstand	:	≥3,5kJ/kV (Ur)
8.	High current impulse withstand (4/10μς)	:	100KA, peak
9.	Short circuit withstand capability	:	10KA rms
10.	External housing characteristics		
	a. Insulation material of the external		

	housing	:	Silicon rubber
	b. lightning impulse voltage withstand (1,2/50μς)	:	150kV peak
	c. Power frequency voltage withstand,wet	:	50kV rms
	d. Creepage distance	:	≥600mm
	e. Shed profile	:	Normal or alternating
11.	Method of mounting	:	Base mounting, upright, vertically on a steel structure.
12.	Number of units	:	One (1)
13.	Method of molding of the silicon rubber housing on the MOV blocks	:	The SR housing shall be molded directly on the MOV blocks
14.	Internal partial discharge level	:	≤10pC at 1.05xUc

X. ADDITIONAL REQUIREMENTS

1. External housing of the Arrester

The external housing of the arrester shall be of silicon rubber, with a minimum leakage distance of 600 mm.

The silicon rubber shall be in accordance with IEC-61462 ´´Composite insulators – Hollow insulators for use in outdoor and indoor electrical equipment´´. Furthermore, the silicon rubber shall be hydrophobic and resistant to pollution and to UV radiation.

2. Terminals

Each arrester shall be equipped with a vertical rod line terminal of copper or tin- plated copper for connection to a copper tube of 30mm in diameter.
Similarly with a terminal earthing stud for connection to ground (earth).

3. Fittings

All metal fitting of the surge arresters shall be hot dip galvanized steel, unless they are from aluminum alloy or stainless steel.

4. Bolts, nuts and washers

The bolts nuts and washers which are needed for the mounting of the arrester on a steel support structure must be part of the supply.

These bolts, nuts and washers must be of hot dip galvanized steel or stainless steel.

5. Arrangement of the arrester

Multi-column arresters are not allowed.

6. Base support

The surge arrester shall be equipped with whatever is necessary so that it can be installed on a steel structure.

XI. TESTS

A. Type tests (Design tests)

The surge arresters shall be subjected to the following tests as described by IEC 60099-4 standard, clause 10

1. Insulation withstand tests on the arrester housing.
2. Residual voltage tests (on complete arrester or arrester sections).
3. Long duration current impulse withstand test (ether on complete arrester or arrester sections or resistors).
4. Short circuit tests.
5. Operating duty tests (on complete arrester or sections).
6. Test of the bending moment (on complete arrester or arrester units).
7. Internal partial discharge tests (on the longest unit)
8. Environmental tests
   Arresters which differ only in terms of their dimensions, and which are otherwise based on the same design and material, are considered to be the same type of arresters.
   The temperature cycling test does not apply to polymer (silicon rubber) arresters.
9. Seal leak rate test
10. Weather ageing test

B. Routine Tests

The following routine tests, in accordance with IEC 60099-4, clause 9: shall be conducted on all arresters of the order.

1. Measurement of reference voltage.
2. Residual voltage test either on the complete arrester or on one arrester unit or on one resistor element.
3. Internal partial discharge test (on each arrester unit).
4. Leakage test (on each unit).

C. Acceptance test

Measurement of power frequency voltage on the complete arrester at the reference current measured at the bottom of the arrester. The test shall be made on the nearest lower whole number to the cube root of the number of arresters of the order.

XII. INFORMATION WHICH MUST BE PROVIDED BY ALL BIDDERS

The bidder shall provide the following :

1. Outline drawings of the arrester itself, and its metal fittings. These drawings shall include a cross section view and a side view of the arrester and top view of the metal fittings.

2. Technical prospectus describing the offered surge arrester.

3. Bidder shall provide all the technical data requested in ATTACHMENT "A" - "Information by Seller", attached to this hereby specification.
   Incomplete submission of ATTACHMENT "A" shall constitute sufficient reason for rejection of the offer.

4. Any type test certificates for the type test listed in this hereby specification.
   Type test certificates will be accepted only if they are fully explanatory.
   In other words, if the type test certificates concern resistors or units or sections and not the arrester as whole, then the following information shall be included along with the certificates.
   a. COV (Uc) of the individual resistor or unit or section
   b. Rated voltage (Ur) of the individual resistor or unit or section
   c. Residual voltage at switching impulse at 500A of the resistor or uhit or section.
   d. Residual voltage at lightning impulse at 10KA of the resistor or unit or section
   e. Short circuit capability of the resistor or unit or section
   f. A statement that the resistor or unit or section of the certificate is used in the offered arrester.
   g. Total number of resistors or units or sections used in the offered arrester.

XIII. NAME - PLATE DATA

The following minimum information shall appear on the nameplate of non-corrosive material, permanently attached to the arrester.

1. Manufacturer's name or trade mark, type and identification of the arrester.
2. Year of the manufacture.
3. Continuous operating voltage (Vc).
4. Rated voltage (Ur).
5. Rated frequency
6. Nominal discharge current.
7. Short circuit current capability
8. Lightning impulse protective level

XIV. INFORMATION TO BE SUPPLIED BY THE SUCCESSFUL BIDDER

1. Complete outline drawings (cross view, side view, top view) of the surge arrester and top view of its metal fittings for approval (3 sets) prior to the construction of the surge arrester.
2. Drawing indicating as how the arrester is to be mounted on a steel support structure
3. Assembly instructions for the arrester itself.
4. Proposed maintenance instructions (if any).

XV. PACKAGING

The arresters shall be delivered packed in wooden robust boxes containing three (3) arresters per box.

´´ATTACHMENT A´´

20 kV METAL OXIDE SURGE ARRESTERS WITHOUT GAPS

INFORMATION BY BIDDERS

Failure to comply shall constitute sufficient reason for rejection of the offer.

1. Type of offered surge arrester : .....

2. External housing characteristics

   a. Insulation material of the external housing : .....

   b. Lightning impulse voltage withstand (1,2/50µs) : .....

   c. Power frequency voltage withstand,wet : .....

   d. Creepage distance : .....

   e. Shed profile : .....

3. Number of units of which the surge arrester consists of : .....

4. Surge arrester required characteristics
   a. Continuous operating voltage (COV) Uc: .....

   b. Rated voltage, Ur : .....

   c. Rated frequency : .....

   d. Nominal discharge current (8/20µç) : .....

   e. Maximum residual voltage at switching impulse (30/60µs)

      at 125 A : .....

      at 500A : .....

      at 1KA : .....

f. Maximum residual voltage at lightning impulse (8/20μς)

at 5 kA : .....

at 10 kA : .....

at 20 kA : .....

g. Energy capability

Line discharge class : .....

Energy withstand : .....

k. High current impulse withstand : .....

i. Short circuit withstand capability : .....

5. Is the silicon rubber external housing in accordance with IEC-61462 standard? : .....

6. Type of material, shape and dimentions of the line terminal : .....

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7. Type of material and shape of the ground (earth) terminal : .....

8. Are all metal fitting of the arrester of hot-dip galvanized steel or of aluminum alloy or stainless steel? : .....

9. Are the bolts, nuts and washers which are needed for the mounting of the arrester part of the supply? : .....

10. Are the the bolts, nuts and washers of hot dip galvanized steel or stainless steel? : .....

11. Is the silicon rubber housing molded directly to the MOV blocks? : .....

12. Temporary over-voltage capabilities of the arrester

For 1 second : .....

For 10 seconds : .....

13. Internal partial discharge level : .....

14. Bending moment of the surge arrester : .....

15. List all internal componets of the surge arrester : .....

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16. Weight of the arrester : .....

17. Indicate the size of the grounding (earthing) lead and the type of material which shall consist of . : .....

18. Maximum residual voltages at steep impulse (4/10μς)

at 5 kA : .....

at 10 kA : .....

19. Is the arrester equipted with a pressure relief diaphragm? : .....

20. Type of silicon rubber used in the proposed arrester : .....

21. Type of material of the name-plate of the arrester : .....

22. Is the offered silicon rubber hydrophobic and resistant to pollution and UV radiation? : .....

23. Is the surge arrester suitable for

upright vertical mounting on steel structure? : .....……

TECHNICAL DESCRIPTION SS-134/5/11.2020

CHANGE SHEET No.1

February 2024

The surge arresters shall conform to Standard IEC-60099-4:06/2014, third edition.