Electricity Distribution

nationalgrid

Company Directive

ENGINEERING SPECIFICATION
EE SPEC: 84/2

Relating to Surge Arresters

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Implementation Date: **November 2017**

Approved by

Policy Manager

Date: 24 November 2017

All references to Western Power Distribution or WPD must be read as National Grid Electricity Distribution or NGED

IMPLEMENTATION PLAN

Introduction

This document defines the surge arresters to be used within WPD and provides a standard with which the Purchasing section can go out to tender with.

Main Changes

Whilst these are being used extensively across WPD, this revision brings in a requirement for the a cable to surge arrestor to overhead line adaptor plate and earthing pins this facilitates the ability to separate all three components very easily and a position that CME's can be installed.

This version also brings in a requirement for prospective suppliers of arrestors to provide all relevant information in a uniform way.

Impact of Changes

Where new 11 & 33kV pole mounted cable terminations are installed a cable adaptor plate should be fitted between the cable / surge arrestors and overhead line.

Implementation Actions

Team managers should brief all relevant staff of the cable adaptor plate and where required if they are not already set up the cable adaptor plates and earthing pins have already been set up at central stores and at many satellite stores, if you do not stock the

Prospective suppliers should provide relevant information relating to their products in accordance with Section 7 and Appendix B.

Implementation Timetable

This policy can be implemented with immediate effect.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
17/11/2017	• Section 2 Year of publication removed so as to keep version of BSEN 60099-4 current. • Clause 3.3 amended to remove reference to stainless steel extension piece as this has been superseded by the earthing pins included in section 7 and Appendix A. • Clause 3.6 amended to bring in requirements of pull strength and a requirement for 66kV arrestors to be able to cope with the loading expected in a horizontal formation. • New clause 3.11 included which requires that all Stainless steel fixing studs and nuts, must be of different grades of stainless steel and be coated in an anti-galling coating. • Clause 4.2 Creepage requirements added to table and note explaining that U_r requirements are aligned to the 10s TOV capability. • New section 6 included which outlines the requirements for surge arrester adaptor plates and earthing pins. • New section 7 included which outlines the requirements for the provision of information by suppliers • Appendix A amended to bring in a GA drawing showing how the cable adaptor and earthing pins should be fitted between the UG cable, surge arrestor and OH line also included are drawings for the surge arrestor adaptor plate and earthing pins. • Appendix B included which introduces a requirement for the supplier to provide technical detail. • Subsequent Appendices re-referenced.	Mike Chapman
14/11/2013	1. Introduction of Clause 3.10 – design and construction parameters of blocks within the arrestor. 2. Clause 4.2 - Move from Class 1 to Class 2 arrestors in the SW & W. 3. Clause 5.3 – Addition to routine testing to undertake partial discharge testing.	Mike Chapman

1.0 INTRODUCTION

This document specifies surge arresters for use on the distribution system.

2.0 REFERENCES

BS EN 60099-4: Surge Arresters - Metal-oxide surge arresters without gaps or a.c. systems.

IEC 815:1986, Guide for the selection of insulators in polluted conditions.

3.0 GENERAL REQUIREMENTS

3.1 Arresters shall comply with the requirements of BS EN 60099-4. All values and terms in this document are as defined in BS EN 60099-4.

3.2 Arrester end caps shall be designed and manufactured to be weather proof and resistant to corrosion when either copper or aluminium conductor and fittings are connected to the arrester.

3.3 Up to and including 42 kV rating, in accordance with Appendix A WPD drawing no. O4754 arrester end fittings shall comprise M12 studs, each fitted with 2 nuts 2 spring washers and 2 flat washers of stainless steel or other metals which will not corrode, or cause corrosion of either aluminium or copper lugs. Studs shall be at least 45 mm long.

3.4 At 66 and 132 kV, arresters shall be provided with a pedestal mount with M12 or M16 bolt or clamp for earth connection, and a line end with stainless steel cap and 30 mm diameter pin unless other requirements are stated in the project specification.

3.5 Arresters shall have polymeric covering and insulator sheds, and be suitable for operation in areas subject to Pollution Level IV as specified in BS EN 60099-4, with a minimum creepage length of 31 mm/kV for the rated voltage (U_r) specified unless otherwise agreed.

Silicon rubber is the preferred insulator material and the housing should be moulded in place, (MIP), i.e. direct chemical bond between housing and core. Other materials will be considered and service history of such materials and arresters taken into account.

3.6 Up to and including 42 kV rating, arresters shall withstand a cantilever load of 350Nm, torsion strength of 50Nm and pull strength of 1kN without distress, and be suitable for use as cantilever support insulators in cable termination assemblies.

At 66 & 132kV rating, arresters shall be suitable for base mounting, or inclined mounting from vertical to 90^o for 66kV, 45^o for 132 and to withstand foreseeable weather loads on the arrester and a 4 m jumper of 20 mm diameter.

3.7 Up to and including 42 kV rating, arresters shall be a single column type.

At 66 and 132 kV rating, units may be single column (preferred) or "series parallel" types.

3.8 Insulated bases, disconnectors and pulse counters are not required.

3.9 Suppliers shall quote height, weight, creepage length and cantilever strength with any tender.

3.10 Arrestors shall be designed and constructed such that the metal oxide blocks within the column fit flush with one another and are held together under compression so as to avoid the possibility of air gaps or substances appearing between the individual blocks e.g. caged design.

3.11 All Stainless steel fixing studs and nuts, must be of different grades of stainless steel and be coated in an anti-galling coating, the supplier should provide details of this at time of tender.

4.0 ELECTRICAL CHARACTERISTICS

4.1 Arresters shall be suitable for operation on 3 phase systems in which the neutral is earthed either solidly, through a resistance or reactance of low value, or through an arc suppression coil.

4.2 Surge arresters shall meet the following requirements:-

Rated Voltage U_r, kV rms.*	**Max continuous operating voltage, U_c, kV rms.**	**Nominal discharge Current, kA.**	**Impulse Withstand Current, KA.**	**Line Discharge Class.**	**Residual Volts U_{res}, 10 kA 8/20µs wave, kV crest.**	**Creepage Length (min 31mm per Ur kV)**
15	≥ 12	10	≥ 65	2	≤ 50	465
36	≥ 29	10	100	2	≤ 110	1116
42	≥ 34	10	100	2	≤ 130	1302
66	≥ 52	10	100	3	≤ 200	2046
132	≥ 92	10	100	3	≤ 326	4092

* This is the 10s TOV withstand voltage as defined in IEC 60099-4

4.3 The supplier shall quote test results for U_c and U_{res} together with the other characteristics requested in the 'Technical Data Schedule in Appendix B including the following characteristics of the arrester with any tender:-

- Temporary over voltage capability for 1 second, kV r.m.s.
- U_{res}, kV crest, for 30/60 μs wave, 500 A impulse.
- U_{res}, kV crest, for steep current impulse (1/20 μs), 10 kA impulse.

5.0 ROUTINE AND ACCEPTANCE TESTS

5.1 Routine tests in accordance with clause 8.1 of BS EN 60099-4 shall be performed on all units supplied.

5.2 Acceptance tests in accordance with clause 8.2.1 of BS EN 60099-4 shall be performed on all 66 and 132 kV units supplied.

5.3 Until agreed in writing with WPD in addition to the routine testing identified in 5.1 above, partial discharge testing shall be carried out at phase to earth voltage.

6.0 CABLE ADAPTOR PLATES AND EARTHING PINS

6.1 The Surge arrester adaptor plate is used for connecting 11kv or 33kv underground cable to the overhead line via the surge arrester. It shall be manufactured from nickel plated copper for brass, copper or aluminium lugs.

6.2 Centre hole is M16, washer is required to pack out hole for M12 bolts.

6.3 Earthing pins shall be fabricated from brass the 11kV having a 12mm diameter and the 33kV having a 16mm diameter.

6.4 See Appendix A for General arrangement Drawings and component diagrams.

7.0 PROVISION OF INFORMATION

Suppliers shall:-

7.1 Provide the samples as requested.

7.2 Review the requirements of this specification and

- Provide the Technical Data on the sheet marked 'Technical Data Schedule' contained in Appendix B.

- Clearly identify on the 'Non Conformity from this Specification sheet' contained in Appendix B', if not why products do not meet these requirements.

- Where a supplier is unable to supply a particular item this should be clearly indicated on the 'Technical Data Schedule' contained in Appendix B'.

7.3 Provide all drawings, data sheets and type test reports specific to all their products and as required by Appendix B – 'Type Test Conformance Declaration'.

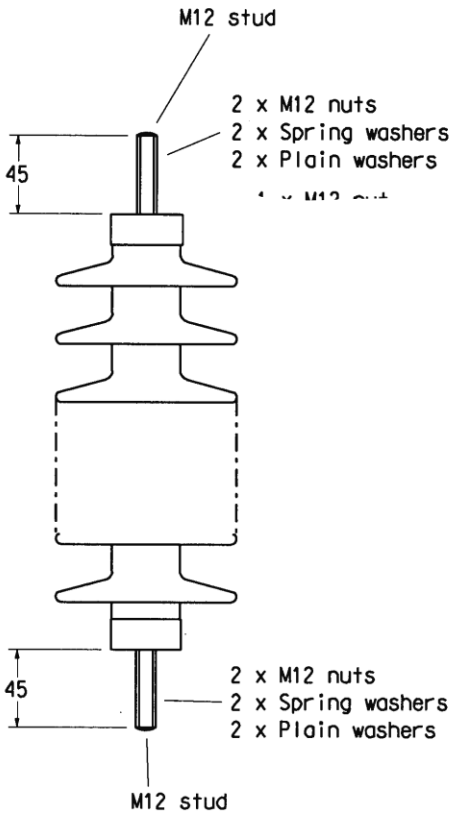
7.4 Provide details on how products are marked.

7.5 Provide details of how traceability is assure.

7.6 Provide a list of UK references of companies together with contact details where they have supplied more than 100 pcs of an item range within the last three years.

7.7 Provide details of any warrantee for the items supplied and what this covers.

All dimensions are in millimetres



SURGE DIVERTER

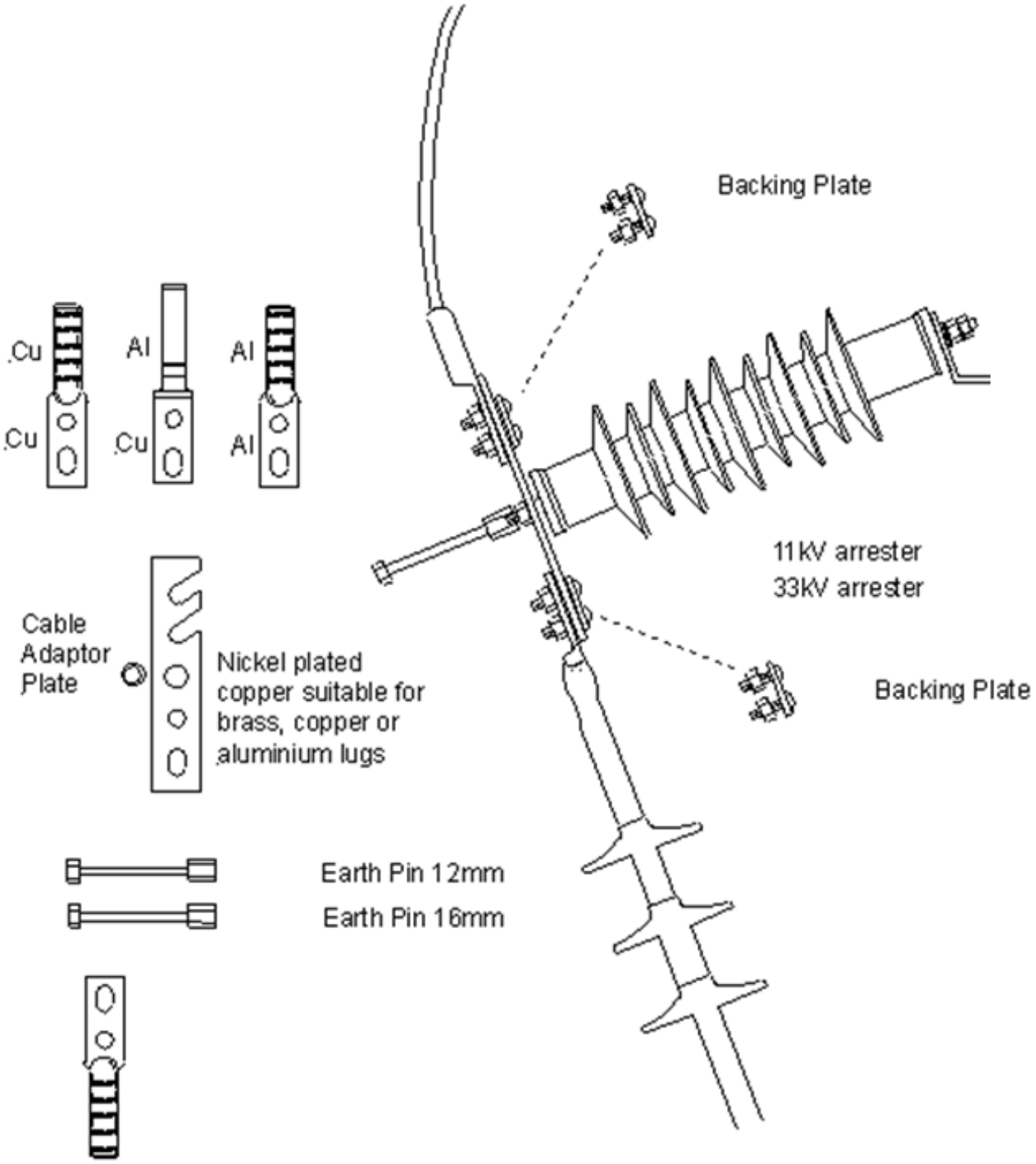
NOTES:-

1. All studs, nuts and washers to be stainless steel.
2. Supplier to advise what end caps are made of. Stainless steel preferred.
3. Supplier to advise creepage distance and type of insulating material used.

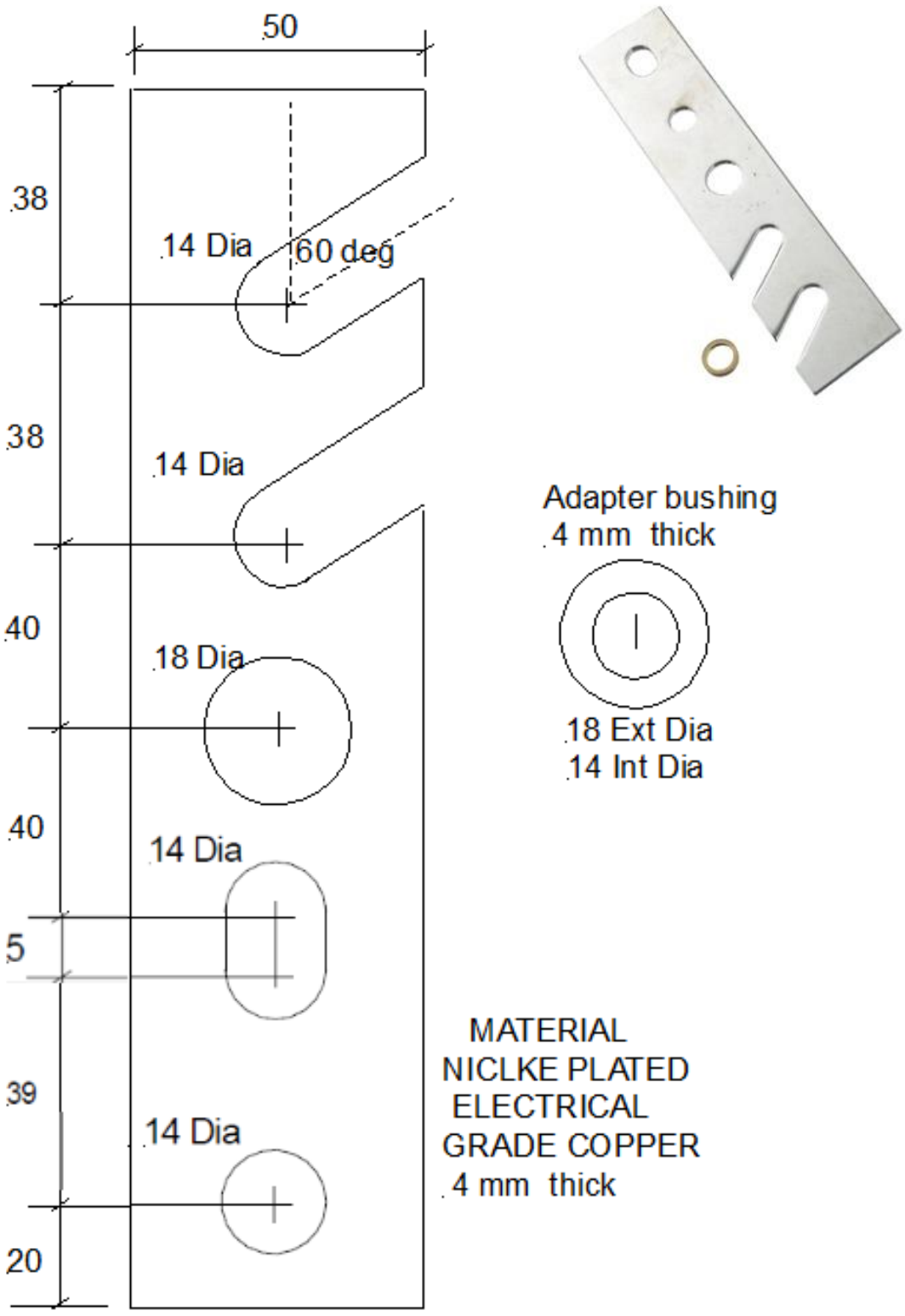
OG/68/4688

Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE	WESTERN POWER DISTRIBUTION Design Department. Avonbank, Feeder Road, Bristol BS2 0TB Tel: 0117 933 2000 Fax: 0117 933 2001.	WESTERN POWER DISTRIBUTION
Drawn	M.J.N.	07.03		
Checked				
Approved			Title 33 & 11kV SURGE DIVERTER MOUNTING DIMENSIONS	Drg. No. 04754 / Rev No 0
SCALE	CaD			



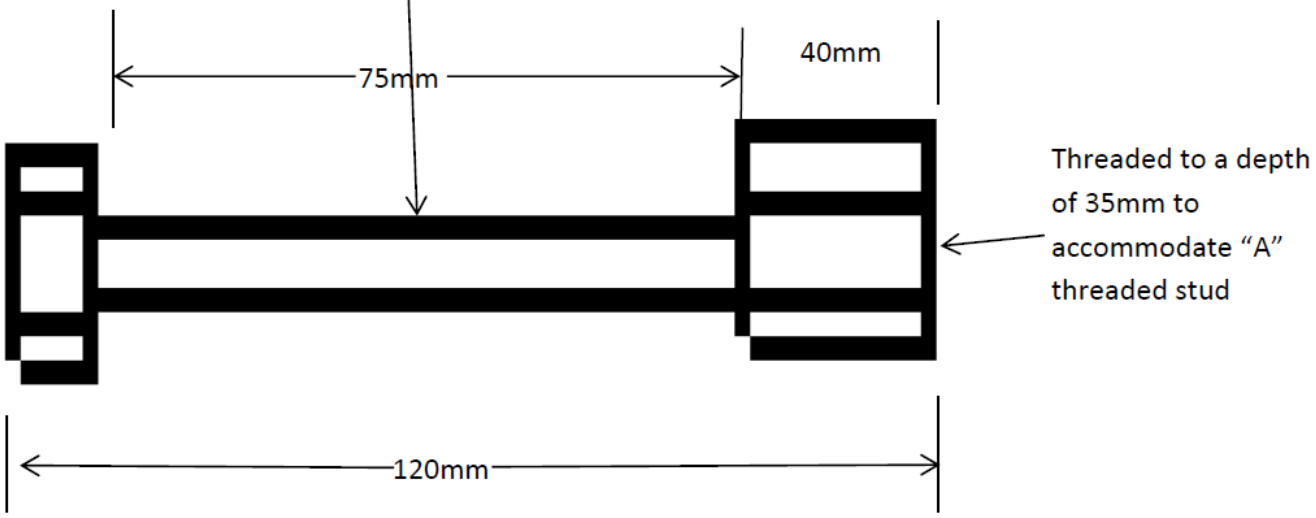
General Arrangement Drawing for Surge Arrestor Adaptor Plate and Earthing Pins



Adaptor Plate for Cable Pole Termination

Item Code - 50415

V (kV)	Diameter	'A' Female thread	Item Code
11	12mm	M12	50416
33	16mm	M12	50417



11 & 33kV Surge Arrestor Earthing Pin

APPENDIX B

TECHNICAL DATA SCHEDULE

		15kV	33kV	42kV	66kV	132kV	Unit
1.	Manufacturer						
1.a	Location of manufacture of varistors						
1.b	Location of manufacture of cores and arrester						
2.	Arrester Type or Designation						
3.	Arrester Continuous Operating Voltage U_c						kV rms
4.	Arrester Rated Voltage U_r						kV rms
5.	Nominal Discharge Current I_n						kA
6.	Line Discharge Class						
7.	High Current Discharge Current 4/10 µs						kA
8.	Long Duration Current Amplitude						***A***
9.	Long Duration Current Duration						***s***
9.a	Long duration energy						(kJ/kV Uc)
10.	Rated Short Circuit Current I_{sc}						kA
10.a	Short circuit test method						
11.	Pull Strength, (as per IEC 99-4, clause10.8.13)						N
12.	Cantilever Strength(as per IEC 99-4, clause10.8.13 and 10.8.9)						Nm
13.	Torque strength(as per IEC 99-4, clause10.8.13)						Nm
14.	Total Height of Arrester						mm
15.	Creepage Length, (31mm / U_r kV)						mm
16.	Flashover Distance						mm
17.	Steep lightning Impulse 1/20 µs Withstand Level						kV
18.	Wet Power Frequency Withstand Level						kV
19.	Housing Type						

20.	Housing Material						
21.	Colour of Housing						
22.	Manufacturer of moulded Housing						
23.	Void-free Design (state)						yes/no
24.	Mould in place construction						yes
25.	Reference Current						mÂ
26.	Reference Voltage Range Kv (min / max)						kV
27.	Max. Partial Discharge Level						pC
28.	TOV Curve enclosed						yes
28a	1s TOV 3s TOV 10s TOV						kV kV kV
29.	Maximum Residual Voltage of Arrester for: Lightning Current Impulse 8/20 µs at 5 kA 10 kA 20 kA Steep Lightning Current Impulse 1/20 µs at Nominal Discharge Current I_n Switching Current Impulse 30/60 µs at: 125 A 500 A						 kV kV kV kV kV kV
30.	What treatment of terminals is used to prevent corrosion?						
31.	Weight						kg
32.	Are different grades of stainless steel and what anti-friction coating has been applied?						

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TYPE TEST CONFORMANCE DECLARATION

SCHEDULE OF TYPE TESTS						
Product Description						
Product Type						
Test	**Reference**	**Test Report No.**	**Test Date**	**Compliance (Yes, No, N/A)**		
				Item (1)	**Procedure (2)**	**Witness (3)**
Rated short-duration power-frequency withstand voltage	kV					
Rated lightning impulse voltage	kV					
Rated switching impulse withstand voltage	kV					
Variant						
Highest voltage for operating equipment	Um in kV					
Mains voltage						
Rated voltage	Ur in kV					
Continuous voltage	Uc in kV					
10 second voltage	kV					
Max. residual voltage for 1 kA (30/60µs)	kV					
Max. residual voltage for 1 kA (8/20µs)	kV					
Max. residual voltage for 10 kA (8/20µs)	kV					
Rated discharge current (8/20µs)	kA					
High-current impulse (4/10µs)	kA					
Long-duration discharge current (2000 µs square wave)	A					
Line discharge class						
Short-circuit current strength 0.2 s at relief pressure	kA					
Energy absorption capacity at 60°	in kJ per kV Ur					

NON CONFORMITY FROM THIS SPECIFICATION

The Tender will be deemed to be compliant with this specification except to the extent those deviations are stated in this schedule. All departures from this specification shall be listed below by the Tenderer.

Clause No.	Details of non- compliance or departures from this specification

APPENDIX C

SUPERSEDED DOCUMENTATION

This document supersedes EE SPEC: 84/1 dated July 2013 which must be withdrawn.

APPENDIX D

ASSOCIATED DOCUMENTATION

BS EN 60099-4 Surge Arresters – Part 4, Metal oxide surge arresters without gaps for a.c. systems.

APPENDIX E

KEY WORDS

Lightning, Arrester.