

SPECIFICATION NO. CLM/ES/A-8

DRAWING NO: CLM/ES/SK-1/A-8

TOTAL SHEETS - 10

SPECIFICATION FOR 2.5 KA
1.5 KV SURGE ARRESTOR (GTFP)

FOR

25 KV SINGLE PHASE 50 C/S

ELECTRIC LOCOMOTIVES

TYPE WAG7, WAP4 & WAP6.

EFFECTIVE FROM

1999 - 2000 ONWARDS

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SPECIFICATION FOR 2.5 KA 1.5 KV
SURGE ARRESTOR FOR 25 KV
SINGLE PHASE 50 C/S
ELECTRIC LOCOMOTIVES
WAG-7, WAP-4/6.

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WEST BENGAL, INDIA
क्रमांक/NO. CLM/ES/A-8.
दिनांक/DATE: 17.2.98

1.0 SCOPE

1.1 This specification covers the manufacture and supply of 1.5 KV 2.5 KA Surge Arresters complete with mounting brackets and terminals for use in 25 KV single phase 50 cycles broad gauge electric locomotives of Indian Railways - Type WAG7, WAP4 and WAP5.

2.0 SERVICE CONDITIONS.

2.1 The surge arrester will be fitted in the H.T. compartment of the locomotives where ambient temperature varies from 0 to 6°C with maximum relative humidity of 100% at altitudes upto 1000 meters above mean sea level.

2.2 During dry weather the atmosphere is dusty.

2.3 The surge arrester and it's mounting arrangement shall be of robust design and shall withstand satisfactorily the vibrations and shocks normally encountered in service as indicated below.

Maximum vertical acceleration 1.0 g
Maximum longitudinal acceleration 3.0 g
Maximum transverse/lateral acceleration 2.0 g
('g' being acceleration due to gravity)

2.4 The vibrations are of sine wave form and the frequency of vibration is between 1 Hz and 50 Hz. The amplitude 'a' expressed in millimetres is given as a function of 'f' by equation.

$$a = 25/f \text{ for values 1 Hz to 10 Hz.}$$

$$a = 250/f^2 \text{ for values 10 Hz to 50 Hz}$$

2.5 In the direction corresponding to the longitudinal movement of the vehicles, the equipment is subjected for 2 minutes to 50 Hz vibrations of such a value that the maximum acceleration is equal to 3 g (amplitude a = 0.3 mm).

3.0 GOVERNING SPECIFICATION.

3.1 In preparing the specification assistance has been taken from the following standards/documents.

- i) IS:3070(Part-2) - 1993
- ii) IEC publication 99-4Pt.IV/1991.

SPECIFICATION FOR 2.5 KA 1.5 KV
SURGE ARRESTER FOR
25 KV SINGLE PHASE 50 C/A
ELECTRIC LOCOMOTIVES
WAG-7, WAP-4/5.

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4.0 TECHNICAL SPECIFICATION

- 4.1 The surge arrester shall be provided across the secondary power windings of the transformer employed in locomotives and shall be suitable for protection of silicon rectifiers against surge that may occur in the system either due to lightning or due to switching.
- 4.2 The arrester shall be of type non-linear metal oxide gapless having the following ratings.

I) Rated voltage - KV rms	:	1.5
ii) Continuous operating voltage - KV rms.	:	1.2
iii) Nominal discharge current 8/20 micro second KAP.	:	2.5
iv) Maximum residual voltage at nominal discharge current - KV peak	:	
a) Steep current impulse 1/20 micro second.	:	6
b) Lightning impulse 8/20 micro second.	:	5
v) Continuous current at continuous operating voltage in mA rms	:	1
vi) Operating duty High current impulse 4/10 micro second-KAP	:	25
vii) Insulation withstand at voltage -	:	
a) Lighting impulse 1.5/50 micro sec. KVP	:	14
b) power frequency for 1 minute - KV rms.	:	4.5
viii) Long duration current impulse withstand - kV/ 500 Micro sec.	:	50

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SPECIFICATION FOR 25KA1-5KV
SURGE ARRESTER FOR
25 KV SINGLE PHASE 50 C/S
ELECTRIC LOCOMOTIVES
WAG-7, WAP - 4/5.

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- 5.0 GENERAL FEATURES.
- 5.1 The surge arrester shall be designed for continuous duty in door type suitable for repeated operations.
- 5.2 The surge arrester shall be sealed in a homogeneous porcelain housing. Terminals for external connections shall be provided with bolts and nuts as per Drawing enclosed.
- 5.3 The surge arrester shall be provided with necessary safety devices to prevent damage to the arrester from any excessive internal pressure caused by unforeseen circumstances & to prevent damage to the adjacent equipments increase the arrester itself is damaged while in service.
- 5.4 All metallic & hardware parts used in the arrester shall be cadmium plated to relevent ISS.
- 5.5 The arrester shall have endobly marked on a name plate with the following informations.
- Manufacturers name.
 - Type / Serial number
 - Month and year of manufacture.
 - Maximum continious operating voltage (MCOV)
 - Rated voltage.
 - Nominal discharge current

6.0 TECHNICAL DATA AND DRAWINGS.

- 6.1 Drawing No. CIW/ES/SK-1/A-8 showing the overall dimensions of the surge arrester, is attached with this specification. Tenderer shall submit his own drawing with parameters along with the offer.
- 6.2 The tenderer shall indicate his compliance or other wise against each clause and sub clause of specifications with deviations if any. Deviations towards improvement in performance will be considered subject to furnish justification for the same.
- 6.3 The tenderer shall furnish guaranteed performance data in the proforma at Annexure 'B' enclosed, in addition to Data covered under clause 4.2 of spec.
- 6.4 Acceptance
- 7.0 The following type and routine tests shall be conducted on the surge arrester as per IEC & ISS.
- 7.1 Vibration test: This test shall be made only as a type test in accordance with Annexure-'B'. The values of rated & continuous operating voltage shall not materially vary before and after the test.
- 7.2 The following tests shall be carried out.

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SPECIFICATION FOR 2-5KA 1-5 KV
SURGE ARRESTER FOR
25 KV SINGLE PHASE 50 C/S
ELECTRIC LOCOMOTIVES
WAG-7, WAP - 4/5.

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WEST BENGAL, INDIA
क्रमांक/NO. CIW/ES/A-8.
दिनांक/DATE : 17-7-98

DESCRIPTION	IEC 99-4 ref.	Type Test	Routine Test	Acceptance Test
A. Insulation withstand on <u>arrester housing</u>	7.2.6 & 7.2.8	Yes.	No	
B. <u>Test on arrester elements.</u>				
1. Visual check including dimensions.	-	Yes.	No	
2. Lightning impulse residual voltage.	7.3.2	Yes.	No	
3. Steep current impulse residual voltage.	7.3.1	Yes.	No	
4. Rated voltage (1.2 KV for continuous & 1.5 KV for 10 sec.).	-	Yes.	No	
5. High current impulse operating duty.	7.5.4	Yes.	No	
6. Long duration current impulse withstand.	7.4.3	Yes.	No	
C. <u>Test on complete arrester.</u>				
1. Visual & dimensional verification -	-	Yes.	Yes.	
a) Creepage distance				
b) G.D. of porcelain.				
c) Overall height of arrester.				
d) Mounting hole distance.				
e) Terminals, bracket etc.				
2. Ref. Voltage.	8.1(a)	Yes.	Yes.	
3. Residual voltage.	8.1(b) & 8.2.1(b)	Nil.	Yes.	
4. Power frequency voltage V _s Time curve.	5.10	Yes.	No.	

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SPECIFICATION FOR 25KV/15KV
SURGE ARRESTER FOR
25 KV SINGLE PHASE 50 C/S
ELECTRIC LOCOMOTIVES
WAG-7, WAP -4/6.

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C. cont.	IS: 99-4 Ref.	Type Test.	Routine Test Acceptance Test
5. Partial discharge.	8.1(c) & 8.2.1(c)	Yes.	Yes.
6. Special Thermal stability.	8.2.2	No	Yes (Creepage only)
7. Leakage.	8.1 (d)	Yes.	Yes.
8. Artificial pollution	Annex-F of IEC, Annex J of IS:3070 (Part 2) 1993.	Yes.	No.
9. Temperature cycle on porcelain housing.	Annex-H of IS:3070 (Part 2) 1993.	Yes.	No
10. Porosity on porcelain	-do-	Yes.	No
11. Galvanising on metal parts.	-do-	Yes.	No
12. Weight measurement			
i) Including mounting bracket.	-	Yes.	No
ii) Excluding.	-do-	Yes.	No.

8.0 TECHNICAL DOCUMENTS.

8.1 The following documents shall be supplied by the successful tenderer.

- i) Type test report - 5 copies.
- ii) Routine test reports - 5 copies.
- iii) Maintenance manual including drawings - 20 copies.

8.2 Technical documents indicated above shall be sent directly to Dy. CEE, Chittaranjan, West Bengal, India.

9. GUARANTEE.

The supplier shall give a performance guarantee of 24 months from the date of supply on 18 months from date of commissioning on all components of the equipments.

SPECIFICATION FOR 25KA1-5KV
1.5KV SURGE ARRESTOR FOR 25KV
SINGLE-PHASE 50 C/S
ELECTRIC LOCOMOTIVES.

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CHITTARANJAN LOCOMOTIVE WORKS
WEST BENGAL, INDIA
क्रमांक/NO. *CH/EE/1-8*
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GUARANTEED PERFORMANCE DATA

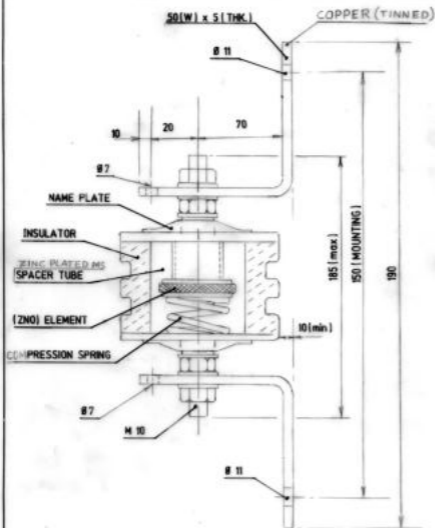
Sl.No. -----	Description -----
1.	Name of the manufacturer.
2.	Country of origin.
3.	Standard specification on which performance is based.
4.	Type and drawing No.
5.	Residual voltage lightning impulse at <ul style="list-style-type: none"> a) 0.5 times nominal discharge current. b) Nominal discharge current. c) Twice nominal discharge current.
6.	Non linear resistor disc type diameter, thickness and voltage rating.
7.	V.I. Curve of resistor element at different temperatures.

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SPECIFICATION FOR 25KA 1.5KV
1.5KV SURGE ARRESTER FOR
25KV SINGLE PHASE 50 C/S
ELECTRIC LOCOMOTIVES
WAG-7, KXSE WAP4/6

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NOTE:-

1. ALL DIMENSIONS ARE IN mm.
2. MILD STEEL COMPONENTS TO BE HOT DIP GALVANISED.

SPECIFICATION FOR 2.5KA, 15 KV
SURGE ARRESTOR FOR 25 KV
SINGLE PHASE 50 C/S ELECTRIC
LOCOMOTIVES WAG-7, WAP-4/6

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1. Test for withstanding vibration and shock

1.1 Conditions to be satisfied

The complete assembly shall be able to withstand without deteriorating the following tests:-

1.1.1 In each of the 3 directions, viz. vertical, longitudinal and transverse sustained sinusoidal vibration in the frequency ranges from 1 to 50 Hz. having amplitude given by the following equations

$$a = \frac{25}{f} \text{ for values of 'f' from 1-10 Hz.}$$

and

$$a = \frac{250}{f^2} \text{ for values of 'f' from 10-50 Hz.}$$

1.1.2 In the direction corresponding to the longitudinal movement of the vehicle, shocks producing maximum acceleration of a 3.0 g (g being the value of acceleration due to gravity)

1.2 Method of testing

The equipment is secured in a convenient position to a machine producing sinusoidal vibrations with adjustable amplitude and frequency and is then subjected to the tests described in paragraphs 1.3 to 1.5

1.3 Determination of resonant frequency

1.3.1 In order to determine the possible existence of critical frequencies producing resonance, the frequency shall be varied progressively over the whole range of 1 to 50 cycles within a time of not less than 4 minutes, the amplitude of the oscillations being that indicated as a function of the frequency.

1.3.2 If resonance is produced, the corresponding frequency shall be maintained for a few minutes in each case with the apparatus alive and check shall be made that no ill effects result on the operation of the apparatus (the dropping out of any part of the equipment, sparking at the contacts, temperature rise etc.)

1.4 Tests with sustained vibration

1.4.1 The equipment is subjected to a test with sustained vibration for a period of 20 minutes when cold and afterwards for 20 minutes when hot(1) either at the critical frequency, if any such well defined frequency has

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DR. S. S. S. (M.S.)
DY. CEE. (D)

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been established in the course of previous test(2) otherwise, at a frequency of 10 Hz.

1.4.2 In both cases, the amplitude of the vibrating table is adjusted to the value corresponding to the frequency concerned.

1.4.3 The test is considered to be satisfactory if there is no resulting damage or abnormality in operation.

1.5 Tests to simulate the effect of shunting shocks

1.5.1 In the direction corresponding to the longitudinal movement of the vehicle on which it is to be mounted, the equipment is subjected for 2 minutes to 50 Hz vibrations of such a nature that the maximum acceleration is equal to 3 g.

1.5.2 The test is considered to be satisfactory if there is no resulting damage or abnormality in operation.

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DRN.

R. Singh
DR. G. K. S. (DRN.)

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