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ENCLOSURES :
DRG. NOS.: CLW/ES/3/SK-1/0307/A, **B**

TECHNICAL SPECIFICATION FOR
RESISTOR HARMONIC FILTER FOR
WAP-5 (BO-BO) 3-PHASE ELECTRIC LOCOMOTIVES.

SPECIFICATION NO: CLW/ES/3/0307

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ISSUED BY:

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ALTERATION RECORD SHEET

Alt. No	Description	Authority	Sign	Date	Remarks
A	i) Alteration record sheet no. 1/A added. ii) Resistor material specified in sheet no-06	Dy.CEE/D-I	Sd-	10.09.2014	This modification has been done with the approval of competent authority of CLW vide this office note no. ELDD/3694 Dated 16.08.2014
B	i) Deletion of short circuit test ii) Weight review at drawing No. CLW/ES/3/SK-1/0307.	---	---	---	---

Note: Specifications have been digitized and all alterations have been incorporated.

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SPECIFICATION FOR RESISTOR HARMONIC FILTER FOR WAP-5 (BO-BO)

1. SCOPE:

This specification copies to Resistor Harmonic Filter for WAP-5, 25KV, 50Hz AC Locomotives. The Scope of supply consist of Resistor Harmonic Filter along with all accessories for mounting the resister mechanically and electrically on the roof.

2. CLIMATE AND ENVIRONMENTAL CONDITION:

- 2.1 **maximum atmospheric temperature:** **in sun:** +70°C
In Shed: +55°C
- 2.2 **Humidity:** 100% saturation during rainy season
- 2.3 **Reference site condition:**
- Ambient temperature: max. 55°C min. 0°C
 - Humidity :60%
 - Altitude :1000 m above mean sea level.
 - Very heavy in certain areas, the locomotive will be designed to permit its running level at 10 KM/H in flood water level of 102 mm above rail level.
- 2.5 **Atmosphere during hot weather:** Extremely dusty and desert terrain in certain areas.
- 2.6 **Coastal areas:** Locomotive and equipment will be designed to work in coastal areas in humid and salt laden Atmosphere.
- 2.7 **Vibration:** The equipment, sub-system and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in IEC unless otherwise prescribed.

3. STANDARDS:

As per IEC-60077, 60038, 60322

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4. TECHNICAL DATA: -

4.1 General Consideration and purpose:

The type BW(i) metal tape resistor have been specially developed for use on vehicles. They have been proven over a period of many decades, for the various traction applications, as resistors for starting and braking and shunt and protection resistors furthermore they are suitable for amorous industrial applications.

These resistors are notable for the following qualities:

- Simple and rugged construction
- Easily adaptable to the electrical characteristics of a wide range of applications, thanks to the various sizes of construction and variations in detail design available.
- Low weight
- High operating safety and long working life with minimum maintenance, thanks to use of high-quality materials and large clearance.
- Suitable for roof mounting, i.e. in the open air.
- Easy checking and maintenance.

4.2 Construction:

The constructional design of the filter resistor is shown on drawing CLW/ES/3/SK-1/0307.

The resistor consists of a frame no. 1 containing 20 folds (2), and a frame no. 2 with 12 folds of tape (3). The two frames are mounted on a support (1), a grid protection covers the frames and is fixed onto the support by means of hexagon bolts (22, details "F") each fame has 3 decks of resistor tapes.

An additional 2 turns of tape are connected on top frame no. 1. This additional tape with a resistance value of 0.05 ohm (hot) allows a stage increase in the resistance value of frame no. 1 to 0.45 ohm (hot). The choice of resistance value for frame no. 1 is made according to the following drawing.

The corrugated resistor tape, with a certain pre-tension is wound in the form of meanders around ceramic insulators which are fixed with transverse rods onto the frame the elasticity due to the corrugation of the resistors tape ensures good stability of its shape, even at high temperatures.

The complete filter resistor assembly is mounted on six micaver insulators (4).

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4.3 Technical details:

4.3.1 General

Utilization:	Filter resistance
Layout diagram:	See CLW sketch CLW/ES/3/Sk-1/0307
Mounting:	Horizontally on the roof
Ambient temp.:	-25.... to + 70°C
Prescriptions:	CET Publ. 322(1970) VDE 0110/11.72

4.3.2 Characteristics of the resistor:

Ohmic value		
Frame no.-1	R(20°C)=0.439 Ω	R(θ°C)=0.45 Ω
	R(20°C)=0.388 Ω	R(θ°C)=0.40 Ω

Frame no. 02	R(20°C)=0.388 Ω	R(θ°C)=0.40 Ω
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Nominal voltage:

Of the tape in relation to the frame: 3000 V
Of the tape in relation to earth (roof): 10 000 V

Insulation voltage

Of the tape in relation to the frame: 9500 V/50Hz/1 min.
Of the tape in relation to earth(roof): 36 000 V/ 50 Hz. /1 min

Current system: AC alternating current, F= 50Hz

Number of decks per frame: 1

Number of tape folds per decks: Frame no.1 : 20+2
Frame no. 2: 12.

Section of tape: Frame no.1: 40 × 0.4 (4 tapes in parallel)
: 40 × 0.5 (2 tapes in parallel)
Frame no.1: 40 × 0.5 (2 tapes in parallel)

Power : Frame no.1: P_{DD}=20KW continuous
Frame no. 2: P_{DD}=20KW continuous

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5. TYPE TEST & ROUTINE TEST:

The type test and routine test should be done according to following standards:

i.	IEC 60038	: ICE Standard voltages
ii.	IEC 60322	: Rules of Ohmic resistors used in the power circuits of electrically power vehicles.
iii	IEC 61373	: Shocks and vibrations
iv	IEC 60077	Railway application –Electric Equipment for Rolling stock.

6. INSPECTION AND TESTING:

Sl. No.	Test Description	Type test	Routine test
i)	Check on characteristics of resistor element material,	√	
ii)	Check on rated value of resistance,	√	√
iii)	Temperature rise test,	√	
iv)	Di-electric test,	√	√
v)	Test for performance in rain,	√	
vi)	Tests for with standing vibration and shock,	√	
vii)	Hygroscopic test and	√	
viii)	Short circuit test	√	

Resistor material:

The resistor element should be nickel, chromium and iron alloy (antimagnetic) with Ni 57%-60%, Cr 14%-18%, rest Fe and traces of other elements, of M/s Krupp VDM, Germany, M/s Kanthal Sweden.

7. DIMENSION AND DRAWINGS:

- i) CLW/ES/3/SK-1/0307 Overall dimension of resistors

8. DOCUMENTS TO BE SUPPLIED BY THE TENDERER :

The tenderer shall interalia furnish the following along with the quotation:

- (i) Clause wise comments on the specification and test programme.
- (ii) Detailed drawings.
- (iii) Past experience with supporting papers (if any)
- (iv) Past test reports, (if any)
- v.

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9. TECHNICAL DOCUMENTS TO BE SUPPLIED BY THE SUPPLIER :

The following documents shall be supplied by the supplier as part of contract:

- i. (i) Type test reports.
- ii. (ii) Routine test reports along with each set.
- iii. (iii) Maintenance manual.
- iv. (iv) Detailed drawings.
- v.

10. REFERENCE

- vi. The equipment used by M/s ABB for WAG-9 locomotives
- vii. Types of resistors: i) BW40-30-2.12
- viii. ii) BW40-30-2.20
- ix. Supplier: Secheron Ltd
- x. CH-1211, Geneva 21
- xi. Case postal 116
- xii. FAX 041/22/7394361
- xiii.
- xiv. Schematic Position: 8.3

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