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निर्देश संख्या. टी आईएम/ आई /0054 रिवि. 1

MAINTENANCE INSTRUCTION No. TI/MI/0054 Rev.1

भारतीय रेलवे ट्रैक्शन सिस्टम के 25kV वैक्यूम सर्किट ब्रेकर और इंटरप्टर के रखरखाव के निर्देश

Maintenance instructions for 25kV Vacuum Circuit Breaker and Interrupter of Indian Railways Traction System

(July, 2025)

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Amendment History

Revision Number	SMI NO	Total pages	Date of Issue	Reasons for Amendment/ Revision
0	TI/MI/0054	06	08.09.2017	-
1	TI/MI/0054 (Revision 1)	08	23.07.2025	The value of Insulation Resistance of M/S Megawins make VCB & VI is updated as per their manual.

1. Scope:

This Maintenance Instruction covers the procedure for maintenance of 25kV Vacuum Circuit Breakers and Interrupters used in the Indian Railway Traction System.

2. Background:

For proper upkeep & maintenance of the Circuit Breaker and Interrupter, the existing maintenance practices are based on the ACTM and different supplier manuals. Due to repeated failures of 25kV Vacuum Circuit Breaker and Interrupters, a meeting was held at RDSO, Lucknow on 20.09.2016 between RDSO, Zonal railways, and 25kV Circuit Breaker and Interrupter manufacturers. In the meeting, it was decided that RDSO shall prepare and issue a standard Maintenance Instruction for a 25kV Vacuum Circuit Breaker and Interrupter covering all aspects of Storage, Pre-commissioning, and maintenance.

3. References:

SN	Standard
1.	AC Traction Manual- Volume II, Part-I
2.	M/s ALIND Erection and Testing Manual for Vacuum Circuit Breaker and Interrupter.
3.	M/s. BHEL Erection and Testing Manual for Vacuum Circuit Breaker and Interrupter
4.	M/s. Megawin"s Instruction manual for Circuit Breaker.

4. Storage:

4.1 The Circuit Breaker/Interrupter shall be stored in packed/supplied condition only.

4.2 The packed case should be kept on raised ground to prevent accumulation of rainwater in the storage area and submergence of units and should be covered with waterproof tarpaulins.

4.3 If the Circuit Breaker/Interrupter has been supplied in fully assembled condition (ALIND Make) the same shall be stored in assembled vertical position only.

4.4 Special care shall be taken while handling the interrupting chamber and Support Insulator.

4.5 The manufacturer manual may also be followed for additional requirements.

4.6 Vacuum Circuit Breaker/Interrupter should not be stored for long periods.

5. Pre Commissioning Tests:

The following tests shall be carried out before commissioning (energisation) of the Vacuum Circuit Breaker/Interrupter.

5.1 Vacuum Integrity of vacuum bottle shall be carried out i.e. One-minute dry power frequency withstands voltage test at 55kV/76kV/95kV (as per supplier manual).

5.2 Ensure that the interrupting chamber, Support Insulator, as well as control Cubicle, are correctly aligned.

5.3 Insulation resistance measurement using a 2.5/5kV Megger between Lower Terminal & earth and Upper Terminal & Lower Terminal. The measured values shall be as per the supplier manual.

	M/s BHEL	M/s Alind	M/s Megawin
Between open terminals	10,000 Mega ohm	5,000 Mega ohm	300 Mega ohm
Between the lower terminal to Earth	10,000 Mega ohm	5,000 Mega ohm	300 Mega ohm

5.4 Measurement of Contact resistance between upper and lower terminal. The measured values shall be as per the supplier manual.

- M/s BHEL – Max. 80 micro-ohms
- M/s ALIND- Max. 50 micro-ohms
- M/s MEGAWIN- Max. 100 micro-ohms

5.5 The AC and DC connections should be made as per the approved drawing.

5.6 Measurement of spring charging time in seconds (for spring-type mechanism).

5.7 Perform Manual Operations before energisation.

5.8 Inspection of working of interlock.

5.9 Visual Observation of Porcelain Insulator for any crack /damage.

5.10 Earthing connections have been made properly.

5.11 Check silica gel granules should be blue in colour.

5.12 The door has been properly fixed, and the door gasket is placed properly so that no moisture/vermin ingress takes place.

5.13 No foreign materials (wire, tool, etc.) are left on or inside the equipment

5.14 No moisture should be available in the control cubicle.

5.15 Ensure that the heater is in healthy condition.

5.16 Ensure that the Capacitor Tripping Device (CTD) in the Circuit Breaker cubicle has been set at 85+/- 3V.

5.17 If stored for a longer period (for more than one year), moisture may ingress in the pole unit housing so it should be specially checked for any type of moisture ingress. BHEL make units come with prefilled nitrogen at 0.5kg pressure in the pole unit.

5.18 The manufacturer manual may also be followed for additional requirements (if any).

5.19 The Measurement of open/close timing, travel, dynamic contact resistance, etc. using a circuit breaker Analyser.

5.20 Check the function of anti-pumping in Circuit Breaker.

5.21 Corresponding Isolator Interlock Operation to be checked.

6. Tools required for maintenance:

In addition to normal maintenance tools, the following special tools may also be required for the maintenance of Vacuum Circuit Breaker and Interrupters.

6.1 Circuit Breaker/Interrupter Analyser for the measurement of Timing, Travel, and Contact Resistance. RDSO vide letter no. TI/PSI/DCRM/POLICY/12 dated 17.07.2012 has circulated a tentative specification to the railway for the equipment.

6.2 2.5 kV/5kV Insulation Tester.

6.3 Electronic Multimeter to measure coil resistance and auxiliary contact resistance.

6.4 High pot tester for Power frequency withstands Voltage Test (up to 95kV).

6.5 The manufacturer specified lubricants for lubrication.

7. Maintenance Schedule:

As Each Manufacturer has a different Operating Mechanism, some of the checkpoints given in the table, will be applicable for a particular make/type only. The manufacturer's manuals shall be followed for the detailed settings.

The maintenance schedule has been categorized into monthly, yearly, and six-yearly schedules detailed below.

7.1 Monthly Schedule:

The points to be checked in the monthly inspection are tabulated below:

SN	Items to be checked	Inspection/Testing	Action Required
1.	Porcelain Insulator	Visual Inspection for any Crack/Damage/Cleanliness	The surface should be cleaned after shutting down permission
2.	Control Box	Moisture/Rainwater Condensation	On the Heater if moisture is observed.
3.	Condition of open/ close indication	Observe Visually	If the indication is not found, then check and correct it
4.	Spring Charge Indication	Observe Visually	If the indication is not found, then check and correct it
5.	Counter Reading	To be noted	
6.	Top/Bottom Terminal	Check for overheating signs over terminals	Confirm it by thermal imaging/contactless

			thermometer and tighten the terminals, if found loose after taking shutdown.
7.	Colour of Silica Gel	Check the colour of the silica gel	Replace silica gel if the colour changes from deep blue to white/pink colour.
8.	Control Voltage	Control Voltage is at the required voltage	
9.	Unusual sound	Check for any unusual sound during Electrically & Manually operation.	

7.2 **Annual Inspection:**

All the monthly inspection points shall be applicable in the yearly inspection along with the points tabulated below:

SN	Items to be checked	Inspection/Testing	Action Required
1.	Moving and sliding Parts	Check for lubricant	Lubricate if required (only supplier-recommended lubricant)
2.	Contact wear indication	Check for contact wear mark on the steel stem of the pull rod in closed condition	If the wear mark is not seen, then the contact is worn off and requires Vacuum Bottle replacement.
3.	Speed Regulator	Inspection for free movement	
4.	Reduction gear	Oil Leakage/abnormal Sound	Replace the unit if an abnormal sound is observed.
5.	Travel and Wipe characteristics	Check the value of the wipe and travel are as per manufacturer	Correct as per supplier Instruction Manual
6.	Fasteners of Motor Limit Switch and Auxiliary Switches	Tightness of the fasteners and terminal screws, split pins/snap pins etc.	Tighten /locking to be done if found loose.
7.	Tightness of Hardware	Inspect for any looseness	Tight if found loose.
8.	Pole Part of VCB and VI	The Insulation Resistance measurement shall be measured by 2.5/ 5kV Megger. It shall be as per	If found less than the supplier specified investigate the

		OEM's specified value. • Between Open Terminals (BHEL-min 5000 MΩ) (ALIND-min 5000 MΩ) (Megawin-min 300 MΩ) • Between Lower Terminal and earth (BHEL- min 5000 MΩ) (ALIND-min 5000 MΩ) (Megawin-min 300 MΩ)	insulating rod and Porcelain.
9.	Operating Coil Resistance Measurement	Resistance is below the supplier's specified limits. (M/s. BHEL-43+/-5%)	Change the coil if not under limits
10.	Closing (at 85%) and tripping (at 70% of rated Voltage i.e. 110VDC) operation Check	If not operate	Change the coil
11.	Closing Time	Should be less than 150ms (VCB), Should be less than 120ms (VI) or As per the supplier's specification.	
12.	Tripping Time	Less than 80ms (VCB). Less than 90ms (VI).	
13.	Open/Close Operation	Operate 10 electrically and 10 manually operations	
14.	Contact resistance	The contact resistance of the main contacts shall be measured by Micro Ohm Meter and shall be as per OEM's specified value M/s Megawin-Max. 100 micro-ohm. M/s BHEL-Max. 80 micro-ohm M/s ALIND- Max. 50 micro-ohm.	
15.	Anti-pumping	The functioning of Anti-pumping to be checked.	
16.	CTD	The functioning of the Capacitor tripping device is to be checked.	
17.	Interlock	Checking the interlock with DPI	
18.	Door Gasket	The door Gasket should be checked and if necessary, replaced.	

7.3 **Six Yearly Inspection**:

The entire Monthly and yearly inspection points shall be applicable in the Six Yearly inspections along with the points tabulated below:

SN	Items to be checked	Inspection/Testing	Action Required
1.	Healthiness of Vacuum Bottle/power frequency test	Equipment shall withstand 55kV/76kV/95kV power frequency voltage (as specified by supplier) applied across its contacts in open condition.	Replace the bottle if not withstand.
2.	Slow opening and closing	After all the inspection slow opening and closing shall be done.	Observe normal operation.