



भारत सरकार  
रेल मंत्रालय

**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**

डीजल इलेक्ट्रिक लोकोमोटिव (एलको) के लिए इलेक्ट्रोप्यूमेटिक /  
इलेक्ट्रोमैग्नेटिक कान्ट्रैक्टर्स और पॉवर ब्रेक स्विच / रिवर्सर के लिए  
विशिष्ट एवं टेस्ट शेड्यूल

**Specification and test schedule for Electro  
pneumatic/Electro magnetic contactors and Power Brake  
Switch / Reverser for diesel-electric locomotive (ALCO)**

विशिष्ट संख्या एम.पी.0.04.00.08 (संशो.-01)  
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*Specification and test schedule of Electro Magnetic / electro Pneumatic Power contactors and switch gears for Diesel Electric locomotives (ALCO)*

## 1.0 SCOPE

This specification covers the design and test procedures of

| <b>Eqpt</b>                        | <b>Drg. No./Part No.</b>                        |
|------------------------------------|---|
| Electro Pneumatic Contactor (EPC)  | DLW drawing No. EL/PT/0630 / Part No. 12141008. |
| 6-motor reverser (REV)             | EL/PT/0649 /Part No. 12310372                   |
| 6-motor power brake switch BKT     | EL/PT/0648 (Alt R4) Part No. 12310300           |
| Fuel pump contactor (FPC)          | EL/PT/0629 /Part No.12141033                    |
| Cranking contactor (CK1/CK2/CK3)   | EL/PT/0641, part No. 12140510                   |
| Generator field contactor (GFC)    | EL/PT/0640/part No. 12145439                    |
| Field shunting contactor (FSC)     | EL/PT/0614, part No. 12140491                   |
| Radiator fan contactor (RFC/R1/R2) | EL/PT/0638, part No. 12140235                   |
| Cranking control contactor (CKC)   | EL/PT/0639, part No. 12141100                   |

## 2.0 TECHNICAL REQUIREMENTS

- i. Climatic and environmental conditions as per clause No. 4 of Specification No. ELRS/SPEC/SI/0015, Oct 2001.
- ii. Clearances and creepage distances shall be as per IEC: 60255-5 (2000-12).
- iii. Manufacturers shall get their part/modified part drawings approved by RDSO.
- iv. Clearances and creepage distances shall be as per IEC: 60255-5 (2000-12).
- v. Hard wares used shall be of standard quality and zinc plated and shall be procured from reputed sources.
- vi. Insulation materials for terminals, arms, blow out coil and other components shall be FR4 class or higher.
- vii. Springs shall be procured from M/s. Stumpp Schuele & Somappa Pvt Ltd., Bangalore or BCC springs, Aurangabad.
- viii. Material of Interlock springs shall be beryllium copper or ASTM630/455 (S.S).

## 3.0 TESTS

The general guidelines for this test shall be as per clause Nos.12.3 to 12.9 of spec no. ELRS/SPEC/SI/0015, Oct 2001. Tests listed from Sr. No. 3.1 to 3.5 shall be conducted during routine test and all during type test.

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3.1 Dimensional and performance parameters as per the drawings.

3.2 Air Tightness Test for EP contactor and 6M BKT/Reverser

The coil of MV is energized and shall be connected to a one-liter vessel charged at pressure of 4.9 kg/ cm<sup>2</sup>, the pressure shall not fall below 4.41 kg/cm<sup>2</sup> in 4 minute.

3.3 Di-Electric Test at 50 HZ for one min and leakage current observed shall be less than 10 m A.

| <b>Eqpt.</b>              | <b>Volt and Between</b>   |
|---------------------------|---|
| EPC                       | 4.5KV - main contacts<br>2KV- Interlocks & MV<br>2KV- interlocks & MV shorted together and earth<br>2KV-contacts of interlocks<br>2KV- interlocks and MV shorted together and main contact shorted together<br>5.6KV-between main contact shorted together and earth shorted with MV and interlocks |
| 6M BKT/Rev                | 5.75 KV Main Contact & Frame<br>2 KV Frame & all live parts connected together (with Main Contact Closed)<br>2 KV Terminals of both side, terminals shorted together on each side (Main Contact Open)<br>2 KV all Control & Aux. Circuit  |
| FPC                       | 3.5KV main contacts of contactors<br>2KV coil and magnet frame  |
| CK1/CK2<br>CK3/GF/<br>FSC | 3.5KV main contacts of contactor<br>2 KV coil & magnet frame<br>2 KV interlocks and coil shorted together and earth<br>2 KV contacts of interlocks<br>2 KV interlocks and coil shorted together & main contacts shorted together<br>4.5KV shorted main contact and shorted interlocks, coil & earth |

3.4 Checking of Mechanical Operation:

The Contactor shall be operated 40 times and parameters shall be recorded before and after test at each voltage.

| <b>Eqpt.</b>  | <b>Test Conditions</b>   | <b>Parameters</b>  |
|---------------|--|--|
| EPC & BKT/REV | 82, 74 and 48 volts at two pressures 4.9 & 3.85 kg/cm <sup>2</sup> . | Main contact gap<br>Main contact over travel<br>Auxiliary contact gap of all contacts<br>Main contact initial knuckling pressure |

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|             |     |  |
|-------------|-----|--|
|             |     | Auxiliary contact pressure of all contacts |
| FP          | 48V | do   |
| CK1/CK2/CK3 | 24V | do   |
| GF          | 36V | do   |

**3.5 Mechanical Endurance Test**

The test shall be conducted at the rate of minimum 45 cycles of operations per minute and at 4.9 kg/cm<sup>2</sup> air pressure (where applicable).

| Description     | Coil voltage/<br>Air pressure | Cycles of Operations (million) | Remarks   |
|-----------------|-------------------------------|--------------------------------|---|
| EP contactor    | 72V                           | 1.0                            | Main contacts/auxiliary contacts pressure and gap shall be recorded before the commencement, at intervals of 0.01million, .02million,0.1million and after the completion of the test. |
| 6M BKT/Reverser | 72V                           | 0.1                            |   |
| Cranking/FSC    | 36                            | 0.2                            |   |
| GF              | 72                            | 1.0                            |   |
| FPC             | 72                            | 0.2                            |   |
| RFC(R1/R2)/CKC  | 72                            | 1.0                            |   |

**3.6 Breaking and Making Capacity & Duration Test**

The test shall be conducted 180 times at a interval of 2 minutes on main contacts/auxiliary contacts (as applicable) at corresponding rated current and a time constant of 10-15 m S of. Waveforms observed before and after the test on oscilloscope are to be plotted.

After completion of tests, contact tips shall be checked for erosion/ deformity (appreciable), if any.

**3.7 Shock and Vibration Test as per as per clause 10.2.11 of IEC 60571**

**3.8 Milli Volt Drop Test**

The test shall be conducted at rated current. The values obtained shall be near to values specified in respective drawings.

**3.9 Temperature Rise Test**

This test shall be carried out in accordance with clause-8.3.2 of IEC-60077-1at rated current. Value of current shall be measured & recorded at an interval of 30 minutes till it gets stabilized.

**Temperature rise limit**

| Locations of Component | Temperature rise limit °C |
|------------------------|---------------------------|
| Copper bar             | 60                        |
| Flexible connection    | 75                        |

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|  |    |
|--|----|
| Copper tungsten contact tips                     | 60 |
| Copper coil                                      | 90 |
| Coil (connected across 36V)<br>Resistance method | 80 |

**3.10 Inspection and weighing of the equipment after type tests**

At the end of the tests following parameters shall be checked and it shall be ensured that variation in the parameters observed from original values should be in the tolerance  $\pm 5\%$ .

- a. Contact Pressure
- b. Contact Gap
- c. Contact Alignment
- d. Weigh the contactor
- e. Contact impression obtained with carbon paper minimum 80%

**Note:** components shall be interchangeable with the Contactors in use.

**3.11** Type tests shall normally be carried out before execution of the first development order. In addition, RDSO may require to conduct fresh type test, should a need arise based on performance feedback.

**4.0 DOCUMENTS:** As per clause Nos.13 of spec no. ELRS/SPEC/SI/0015, Oct 2001.

**5.0 PACKAGING**

The equipment should be packed as per specification no. WDG4/EL/PS/9.

**6.0 WARRANTY:** As Per IRS condition