# भारतीय रेल
# Indian Railways

## पटियाला रेलइंजन कारख़ाना, पटियाला
## Patiala Locomotive Works, Patiala


# LOCO TESTING & DISPATCH REPORT OF IGBT BASED 3 PHASE ELECTRIC LOCOMOTIVE

| | |
|---|---|
| **LOCO NO. :** | **39409** |
| **TYPE:** | **WAP-7** |
| **RAILWAY SHED:** | **ER/HWHE** |
| **PROPULSION SYSTEM:** | **MEDHA** |
| **HOTEL LOAD:** | **AAL** |
| **DATE OF DISPATCH:** | **30.10.2024** |

## लोको निर्माण रिकार्ड

# पटियाला रेलइंजिन कारख़ाना, पटियाला

# Patiala Locomotive Works, Patiala

**LOCO NO. – 39409**
**RAILWAY/SHED: ER/HWHE**
**DOD: Oct-2024**

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PATIALA LOCOMOTIVE WORKS, PATIALA

Testing & Commissioning Format For 3-Phase Locomotive fitted with IGBT based Traction Converter, Auxiliary Converter and TCN based VCU

Locomotive No.: 39409 -MEDHA
Type of Locomotive: WAP-7/WAG-9HC


## 1.0 Continuity *Test of the cables*

### *1.1 Continuity Test of Traction Circuit Cables*

As per cable list given in Para 1.3 of document no. 3 EHX 410 124, check the continuity with continuity tester and megger each cable to be connected between following equipment with 1000V megger.

| From | To | Continuity (OK/Not OK) | Prescribed Megger Value (min) | Measured Megger Value |
|---|---|---|---|---|
| Filter Cubicle | Transformer | OK | 100 MΩ | 900 MΩ |
| Filter Cubicle | Terminal Box of Harmonic Filter Resistor (Roof) | OK | 100 MΩ | 750 MΩ |
| Filter Cubicle | Earthing Choke | OK | 100 MΩ | 900 MΩ |
| Earthing Choke | Earth Return Brushes | OK | 100 MΩ | 800 MΩ |
| Transformer | Power Converter 1 | OK | 100 MΩ | 700 MΩ |
| Transformer | Power Converter 2 | OK | 100 MΩ | 850 MΩ |
| Power Converter 1 | TM1, TM2, TM3 | OK | 100 MΩ | 750 MΩ |
| Power Converter 2 | TM4, TM5, TM6 | OK | 100 MΩ | 650 MΩ |
| Earth | Power Converter 1 | OK | 100 MΩ | 800 MΩ |
| Earth | Power Converter 2 | OK | 100 MΩ | 700 MΩ |

### *1.2 Continuity Test of Auxiliary Circuit Cables*

As per cable list given in Para 1.4 of document no. 3 EHX 410 124, check the continuity with continuity meter and megger each cable to be connected between following equipment with the help of 1000V megger.

Signature of the JE/SSE/Harness

Signature of the JE/SSE/Loco Cabling

## PATIALA LOCOMOTIVE WORKS, PATIALA

### Testing & Commissioning Format For 3-Phase Locomotive fitted with IGBT based Traction Converter, Auxiliary Converter and TCN based VCU

Locomotive No.: 39409 Type of Locomotive: WAP-7/WAG-9HC



| From | To | Continuity(OK/ Not OK) | Prescribed Megger Value (min) | Measured Megger Value |
|---|---|---|---|---|
| Transformer | BUR1 | OK | 100 MΩ | 700MΩ |
| Transformer | BUR2 | OK | 100 MΩ | 700 MΩ |
| Transformer | BUR3 | OK | 100 MΩ | 500 MΩ |
| Earth | BUR1 | OK | 100 MΩ | 600 MΩ |
| Earth | BUR2 | OK | 100 MΩ | 800 MΩ |
| Earth | BUR3 | OK | 100 MΩ | 600 MΩ |
| BUR1 | HB1 | OK | 100 MΩ | 500 MΩ |
| BUR2 | HB2 | OK | 100 MΩ | 600 MΩ |
| HB1 | HB2 | OK | 100 MΩ | 700 MΩ |
| HB1 | TM Blower 1 | OK | 100 MΩ | 600 MΩ |
| HB1 | TM Scavenge Blower 1 | OK | 100 MΩ | 700 MΩ |
| HB1 | Oil Cooling Unit 1 | OK | 100 MΩ | 600 MΩ |
| HB1 | Compressor 1 | OK | 100 MΩ | 700 MΩ |
| HB1 | TFP Oil Pump 1 | OK | 100 MΩ | 600 MΩ |
| HB1 | Converter Coolant Pump 1 | OK | 100 MΩ | 600 MΩ |
| HB1 | MR Blower 1 | OK | 100 MΩ | 700 MΩ |
| HB1 | MR Scavenge Blower 1 | OK | 100 MΩ | 600 MΩ |
| HB1 | Cab1 | OK | 100 MΩ | 700 MΩ |
| Cab1 | Cab Heater 1 | OK | 100 MΩ | 600 MΩ |
| HB2 | TM Blower 2 | OK | 100 MΩ | 500 MΩ |
| HB2 | TM Scavenge Blower 2 | OK | 100 MΩ | 600 MΩ |
| HB2 | Oil Cooling Unit 2 | OK | 100 MΩ | 600 MΩ |
| HB2 | Compressor 2 | OK | 100 MΩ | 700 MΩ |
| HB2 | TFP Oil Pump 2 | OK | 100 MΩ | 600 MΩ |
| HB2 | Converter Coolant Pump 2 | OK | 100 MΩ | 600 MΩ |
| HB2 | MR Blower 2 | OK | 100 MΩ | 700 MΩ |
| HB2 | MR Scavenge Blower 2 | OK | 100 MΩ | 500 MΩ |
| HB2 | Cab2 | OK | 100 MΩ | 600 MΩ |
| Cab2 | Cab Heater 2 | OK | 100 MΩ | 700 MΩ |

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### 1.3 *Continuity Test of Battery Circuit Cables*

Check continuity of following cables as per Para 2.3 of document no. 3 EHX 610 299

| From | To | Condition | Continuity (OK/Not OK) |
|---|---|---|---|
| Battery (wire no 2093) | Circuit breakers 110-2, 112.1-1, 310.4-1 | By opening and closing MCB 112 | OK |
| MCB 110 | Connector 50.X7-1 | By opening and closing MCB 110 | OK |
| Battery (Wire no. 2052) | Connector 50.X7-2 | ---- | OK |
| SB2 (Wire no 2050) | Connector 50.X7-3 | ---- | OK |

| | | |
|---|---|---|
| Close the MCB 112, 110, 112.1, and 310.4 and measure the resistance of battery wires 2093, 2052, 2050 with respect to the loco earth. | Prescribed value > 0.5 MΩ | Measured Value 6 MΩ |
| Measure the resistance between 2093 & 2052, 2093 & 2050, 2052 & 2050 | Prescribed value: > 50 MΩ | Measured Value 60 MΩ |

Commission the indoor lighting of the locomotive as per Sheet No 7A & 7B.

### 1.4 *Continuity Test of Screened Control Circuit Cables*

Check the continuity and isolation of the screen cable of the following circuits with the help of sheet no. mentioned against each as per document no. 3 EHX 610 299.

| Screened control circuit cables for | Corresponding Sheet Nos. | Continuity & Isolation (OK/Not OK) |
|---|---|---|
| Battery voltage measurement | 04B | OK |
| Memotel circuit of cab1 &2 | 10A | OK |
| Memotel speed sensor | 10A | OK |
| Primary voltage detection | 01A, 12A | OK |
| Brake controller cab-1 & 2 | 06F, 06G | OK |

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| | | |
|---|---|---|
| Master controller cab-1 &2 | 08C, 08D | OK |
| TE/BE meter bogie-1 & 2 | 08E, 08F | OK |
| Terminal fault indication cab-1 & 2 | 09F | OK |
| Brake pipe pressure actual BE electric | 06H | OK |
| Primary current sensors | 12B, 12F | OK |
| Harmonic filter current sensors | 12B, 12F | OK |
| Auxiliary current sensors | 12B, 12F | OK |
| Oil circuit transformer bogie 1 | 12E, 12I | OK |
| Magnetization current | 12C, 12G | OK |
| Traction motor speed sensors (2 nos.) and temperature sensors (1 no.) of TM-1 | 12D | OK |
| Traction motor speed sensors (2nos) and temperature sensors (1 no.) of TM-2 | 12D | OK |
| Traction motor speed sensors (2nos) and temperature sensors (1 no.) of TM-3 | 12D | OK |
| Traction motor speed sensors (2 nos.) and temperature sensors (1 no.) of TM-4 | 12H | OK |
| Traction motor speed sensors (2nos) and temperature sensors (1 no.) of TM-5 | 12H | OK |
| Traction motor speed sensors (2nos) and temperature sensors (1 no.) of TM-6 | 12H | OK |
| Train Bus cab 1 & 2 (Wire U13A& U13B to earthing resistance= 10KΩ± ± 10%) | 13A | OK |
| UIC line | 13B | OK |
| Connection FLG1-Box TB | 13A | OK |

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### Testing & Commissioning Format For 3-Phase Locomotive fitted with IGBT based Traction Converter, Auxiliary Converter and TCN based VCU

Locomotive No.: 39409 Type of Locomotive: WAP-7/WAG-9HC



### 2.0 Low Tension test

#### 2.1 Measurement of resistor in OHMS (Ω)

Measure the resistances of the load resistors for primary voltage transformer, load resistors for primary current transformer and Resistor harmonic filter as per Para 3.2 of the document no. 3 EHX 610 279.

| Name of the resistor | Prescribed value | Measured value |
|---|---|---|
| Load resistor for primary voltage transformer (Pos. 74.2). | 3.9KΩ ± 10% | 3.9KΩ |
| Resister to maximum current relay. | 1Ω ± 10% | 1Ω |
| Load resistor for primary current transformer (Pos. 6.11). | 3.3 Ω ± 10% | 3.3Ω |
| Resistance harmonic filter (Pos 8.3). Variation allowed ± 10% | WAP7 | WAP7 |
| Between wire 5 & 6 | 0.2 Ω | 0.2Ω |
| Between wire 6 & 7 | 0.2 Ω | 0.2Ω |
| Between wire 5 & 7 | 0.4 Ω | 0.4Ω |
| For train bus, line U13A to earthing. | 10 kΩ± 10% | 10.0KΩ |
| For train bus, line U13B to earthing. | 10 kΩ ± 10% | 9.99KΩ |
| Insulation resistance of High Voltage Cable from the top of the roof to the earth (by1000 V megger). | 200 MΩ | 300MΩ |
| Resistance measurement earth return brushes Pos. 10/1. | ≤0.3 Ω | 0.28Ω |
| Resistance measurement earth return brushes Pos. 10/2. | ≤0.3 Ω | 0.28Ω |
| Resistance measurement earth return brushes Pos. 10/3. | ≤0.3 Ω | 0.29Ω |
| Resistance measurement earth return brushes Pos. 10/4. | ≤0.3 Ω | 0.29Ω |
| Earthing resistance (earth fault detection) Harmonic Filter –I; Pos. 8.61. | 2.2 kΩ± 10% | 2.2KΩ |
| Earthing resistance (earth fault detection) Harmonic Filter –II; Pos 8.62. | 2.7 kΩ± 10% | 2.7KΩ |
| Earthing resistance (earth fault detection) Aux. Converter; Pos. 90.3. | 3.9 kΩ ± 10% | 3.9KΩ |
| Earthing resistance (earth fault detection) 415/110V; Pos. 90.41. | 1.8 kΩ± 10% | 1.8KΩ |
| Earthing resistance (earth fault detection) control circuit; Pos. 90.7. | 390Ω ± 10% | 390Ω |
| Earthing resistance (earth fault detection) Hotel load; Pos. 37.1*(in case of WAP5).* | 3.3 kΩ± 10% | NA |
| Resistance for headlight dimmer; Pos. 332.3. | 10Ω ± 10% | 10Ω |

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Note:

**Make sure that the earthing brush device don't make direct contact with the axle housing, earth connection must go by brushes.**

**2.2 *Check Points***

| Items to be checked | Remarks |
|---|---|
| Check whether all the earthing connection in roof and machine room as mentioned in sheet no. 22A is done properly or not. These earthing connections must be flexible and should be marked yellow & green | checked OK |
| Check whether all the earthing connection between loco body and bogie is done properly or not. These cables must be flexible having correct length and cross section | checked OK |

**2.3 *Low Tension Test Battery Circuits (without control electronics)***

These tests are done with the help of the special type test loop boxes as per procedure given in Para 3.6 of the document no. 3 EHX 610 279

| Name of the test | Schematic used. | Remarks |
|---|---|---|
| Test 24V supply | Sheet 04F and other linked sheets | checked OK |
| Test 48V supply | Sheet 04F & sheets of group 09 | Fan supply to be checked. OK |
| Test traction control | Sheets of Group 08. | OK |
| Test power supply bus stations. | Sheets of Group 09. | Fan supply to be checked. OK |
| Test control main apparatus | Sheets of Group 05. | OK |
| Test earth fault detection battery circuit by making artificial earth fault to test the earth fault detection | Sheet 04C | OK |
| Test control Pneumatic devices | Sheets of Group 06 | OK |
| Test lighting control | Sheets of Group 07 | OK |
| Pretest speedometer | Sheets of Group 10 | OK |
| Pretest vigilance control and fire system | Sheets of Group 11 | OK |
| Power supply train bus | Sheets of Group 13 | OK |

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### Testing & Commissioning Format For 3-Phase Locomotive fitted with IGBT based Traction Converter, Auxiliary Converter and TCN based VCU

**Locomotive No.:** 39409 **Type of Locomotive: WAP-7/WAG-9HC**



**3.0** ***Downloading of Software***

| *3.1 Check Points.* | *Yes/No* |
|---|---|
| Check that all the cards are physically present in the bus stations and all the plugs are connected. | Yes |
| Check that all the fibre optic cables are correctly connected to the bus stations. | Yes |
| Make sure that **control electronics off relay** is not energized i.e. disconnect Sub-D 411.LG and loco is set up in simulation mode. | Yes |
| Check that battery power is on and all the MCBs (Pos. 127.*) in SB1 &SB2 are on | Yes |

***3.2 Download Software***

The software of Traction converter, Auxiliary converter and VCU should be done by commissioning engineer of the firm in presence of supervisor. Correct software version of the propulsion equipment to be ensured and noted:

| | |
|---|---|
| Traction converter-1 software version: | 1.09 |
| Traction converter-2 software version: | 1.09 |
| Auxiliary converter-1 software version: | 1.04 |
| Auxiliary converter-2 software version: | 1.04 |
| Auxiliary converter-3 software version: | 1.04 |
| Vehicle control unit -1 software version: | 3.0 |
| Vehicle control unit -2 software version: | 3.0 |

**3.3** ***Analogue Signal Checking***

Check for the following analogue signals with the help of diagnostic tool connected with loco.

| **Description** | **Signal name** | **Prescribed value** | **Measured Value** |
|---|---|---|---|
| Brake pipe pressure | FLG2;01--_01XPrAutoBkLn | 100% (= 5 Kg/cm2) | OK |
| Actual BE electric | FLG2; AMSB_0201- Wpn BEdem | 100% (= 10V) | OK |
| **TE/BE at 'o' position** from both cab | FLG1; AMSB_0101- Xang Trans<br>FLG2; AMSB_0101- Xang Trans | Between 9% and 11 % | 10% |
| **TE/BE at 'TE maximal'** position from both cab | FLG1; AMSB_0101- Xang Trans<br>FLG2; AMSB_0101- Xang Trans | Between 99 % and 101 % | 100% |
| **TE/BE at 'TE minimal'** position from both cab | FLG1; AMSB_0101- Xang Trans<br>FLG2; AMSB_0101- Xang Trans | Between 20 % and 25 % | 24% |

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| | | | |
|---|---|---|---|
| **TE/BE at 'BE maximal'** position from both cab | FLG1; AMSB_0101-XangTrans<br>FLG2; AMSB_0101-XangTrans | Between 99% and 101% | 100% |
| **TE/BE at 'BE Minimal'** position from both cab | FLG1; AMSB_0101-XangTrans<br>FLG2; AMSB_0101-XangTrans | Between 20% and 25% | 25 |
| **TE/BE at '1/3'position** in TE and BE mode in both cab. | HBB1; AMS_0101-LT/BDEM>1/3<br>HBB2; AMS_0101-LT/BDEM>1/3 | Between 42 and 44% | 44% |
| **TE/BE at '1/3'position** in TE and BE mode in both cab. | HBB1; AMS_0101-LT/BDEM>2/3<br>HBB2; AMS_0101-LT/BDEM>2/3 | Between 72 and 74% | 74% |
| Both temperature sensor of TM1 | SLG1; AMSB_0106-XAtmp1Mot | Between 10% to 11.7% depending upon ambient temperature 0°C to 40°C | 16°C |
| Both temperature sensor of TM2 | SLG1; AMSB_0106-Xatmp2Mot | Between 10% to 11.7% depending upon ambient temperature 0°C to 40°C | 15°C |
| Both temperature sensor of TM3 | SLG1; AMSB_0106-Xatmp3Mot | Between 10% to 11.7% depending upon ambient temperature 0°C to 40°C | 15°C |
| Both temperature sensor of TM4 | SLG2; AMSB_0106-XAtmp1Mot | Between 10% to 11.7% depending upon ambient temperature 0°C to 40°C | 15.5°C |
| Both temperature sensor of TM5 | SLG2; AMSB_0106-Xatmp2Mot | Between 10% to 11.7% depending upon ambient temperature 0°C to 40°C | 16°C |
| Both temperature sensor of TM6 | SLG2; AMSB_0106-Xatmp3Mot | Between 10% to 11.7% depending upon ambient temperature 0°C to 40°C | 16°C |

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### 3.4 *Functional test in simulation mode*

Conduct the following functional tests in simulation mode as per Para 5.5 of document no.3EHX 610 281. through the Diagnostic tool/laptop :

| Test Function | Result desired in sequence | Result obtained |
|---|---|---|
| Emergency shutdown through emergency stop switch 244 | VCB must open.<br>Panto must lower. | Checked ok |
| Shut Down through cab activation switch to OFF position | VCB must open.<br>Panto must lower. | Checked ok |
| Converter and filter contactor operation with both Power Converters during Start Up. | FB contactor 8.41 is closed.<br>**By moving reverser handle:**<br>• Converter pre-charging contactor 12.3 must close after few seconds.<br>• Converter contactor 12.4 must close.<br>• Converter re-charging contactor 12.3 must opens.<br>**By increasing TE/BE throttle:**<br>• FB contactor 8.41 must open.<br>• FB contactor 8.2 must close.<br>• FB contactor 8.1 must close. | Checked ok |
| Converter and filter contactor operation with both Power Converters during Shut Down. | **Bring TE/BE to O .**<br>Bring the cab activation key to "O"<br>• VCB must open.<br>• Panto must lower.<br>• Converter contactor 12.4 must open.<br>• FB contactor 8.1 must open.<br>• FB contactors 8.41 must close.<br>• FB contactor 8.2 must remain closed. | Checked ok |

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| | | |
|---|---|---|
| Contactor filter adaptation by isolating any bogie | Isolate any one bogie through bogie cut out switch. Wait for self-test of the loco.<br>• Check that FB contactor 8.1 is open.<br>• Check that FB contactor 8.2 is open.<br>After raising panto, closing VCB, and setting TE/BE<br>• FB contactor 8.1 closes.<br>• FB contactor 8.2 remains open. | checked ok |
| Test earth fault detection battery circuit positive & negative | By connecting wire 2050 to earth, create earth fault negative potential.<br>• message for earth fault<br>• By connecting wire 2095 to earth, create earth fault positive potential.<br>• message for earth fault | checked ok |
| Test fire system. Create a smoke in the machine room near the FDU. Watch for activation of alarm. | When smoke sensor-1 gets activated then<br>• Alarm triggers and fault message priority 2 appears on screen.<br>When both smoke sensor 1+2 gets activated then<br>• A fault message priority 1 appears on screen and lamp LSF1 glow.<br>• Start/Running interlock occurs and TE/BE becomes to 0. | checked ok |
| Time, date & loco number | Ensure correct date time and Loco number. | ok |

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## 4.0 *Sensor Test and Converter Test*

### 4.1 *Test wiring main Transformer Circuits*

Apply $198V_p/140V_{RMS}$ to the primary winding of the transformer (at 1u; wire no. 2 at surge arrestor and at 1v; wire no. 100 at earthing choke). Measure the output voltage and compare the phase of the following of the transformers.

| Output Winding nos. | Description of winding. | Prescribed Output Voltage & Polarity with input supply. | Measured output | Measured polarity |
|---|---|---|---|---|
| $2U_1$ & $2V_1$ | For line converter bogie 1 between cable 801A-804A | $10.05V_p$ and same polarity | 10.04Vp | OK |
| $2U_4$ & $2V_4$ | For line converter bogie 1 between cable 811A-814A | $10.05V_p$ and same polarity | 10.05Vp | OK |
| $2U_2$ & $2V_2$ | For line converter bogie 2 between cable 801B-804B | $10.05V_p$ and same polarity | 10.05Vp | OK |
| $2U_3$ & $2V_3$ | For line converter bogie 2 between cable 811B-814B | $10.05V_p$ and same polarity | 10.04Vp | OK |
| $2U_B$ & $2V_B$ | For aux. converter 1 between cable 1103-1117 (in HB1) For Aux converter 2 between cable 1103-1117 (in HB2) | $7.9V_p$, $5.6V_{RMS}$ and same polarity. | 7.8Vp 5.5VRMS | OK |
| $2U_F$ & $2V_F$ | For harmonic filter between cable 4-12 (in FB) | $9.12V_p$, $6.45V_{RMS}$ and same polarity. | 9.10Vp 6.44VRMS | OK |

### 4.2 *Test wiring auxiliary transformer 1000V/415V-110V (pos. 67)*

Apply $141V_p$ / $100V_{RMS}$ to input of the auxiliary transformer at cable no 1203 –1117 and measure the output at

| Description of wire no. | Prescribed Output Voltage & Polarity with input supply. | Measured output | Measured polarity |
|---|---|---|---|
| Cable no. 1218 - 1200 | $58.7V_p$, $41.5V_{RMS}$ and opposite polarity. | 58.6Vp 41.5VRMS | OK |
| Cable no. 1218 – 6500 | $15.5V_p$, $11.0V_{RMS}$ and opposite polarity. | 15.5Vp 11.0VRMS | OK |

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### *4.3 Primary Voltage Transformer*

Apply $250V_{eff}/350V_p$ by variac to roof wire 1 and any wire 0 and measure the magnitude and polarity of the output of the primary voltage transformer for both bogies as per the procedure specified and suggested by the traction converter manufacturer. Primary voltage measurement converters (Pos. 224.1/*) & catenary voltmeter (Pos. 74/*)

This test is to be done for each converter.

Activate cab in driving mode and supply $200V_{RMS}$ through variac to wire no 1501 and 1502. Monitor the following parameters through Diagnostic tool and in catenary voltmeter.

| Signal name | Prescribed value in catenary voltmeter | Prescribed value in Micview | Monitored value in catenary voltmeter | Monitored value in SR diagnostic tool |
|---|---|---|---|---|
| SLG1_G 87-XUPrim | 25kV | 250% | 25KV | 250% |
| SLG2_G 87-XUPrim | 25 kV | 250% | 25KV | 250% |

Decrease the supply voltage below 140 $V_{RMS}$. VCB must open at this voltage. In this case the readings in Diagnostic Tool and catenary voltmeter will be as follows.

| Signal name | Prescribed value in catenary voltmeter | Prescribed value in Micview | Monitored value in catenary voltmeter | Monitored value in SR diagnostic tool |
|---|---|---|---|---|
| SLG1_G 87-XUPrim | 17kV | 170% | 17KV | 170% |
| SLG2_G 87-XUPrim | 17 kV | 170% | 17KV | 170% |

Reactivate VCB to on by increasing this voltage to 175% (17.5 kV).

Increase the supply to 240 $V_{RMS}$ through variac. VCB must open at this voltage, In this case the readings in **diagnostic tool** and catenary voltmeter will be as follows:

| Signal name | Prescribed value in catenary voltmeter | Prescribed value in Micview | Monitored value in catenary voltmeter | Monitored value in SR diagnostic tool |
|---|---|---|---|---|
| SLG1_G 87-XUPrim | 30kV | 300% | 30KV | 300% |
| SLG2_G 87-XUPrim | 30 kV | 300% | 30KV | 300% |

Reactivate VCB to on by decreasing this voltage to 290% (29 kV).

**Signature of the JE/SSE/Loco Testing**

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### *4.4 Minimum voltage relay (Pos. 86)*

Functionality test:

| Minimum voltage relay (Pos. 86) must be adjusted to approx 68% | |
|---|---|
| Activate loco in cooling mode. Check Power supply of 48V to minimum voltage relay. Disconnect primary voltage transformer (wire no. 1511 and 1512) from load resistor (Pos. 74.2) and connect variac to wire no. 1501 and 1502. Supply $200V_{RMS}$ through variac. In this case; *Minimum voltage relay (Pos. 86) picks up* | (Yes/No) |
| Try to activate the cab in driving mode: *Contactor 218 do not close; the control electronics is not be working.* | (Yes/No) |
| Turn off the variac : *Contactor 218 closes; the control electronics is be working* | (Yes/No) |
| Test Under Voltage Protection; | |
| Activate the cab in cooling mode; Raise panto; Supply $200V_{RMS}$ through variac to wire no. 1501 & 1502; Close the VCB; Interrupt the supply voltage *The VCB goes off after 2 second time delay.* | (Yes/No) |
| Again supply $200V_{RMS}$ through variac to wire no. 1501 & 1502; Decrease the supply voltage below $140V_{RMS} \pm 4V$; Fine tune the minimum voltage relay so that VCB opens. | (Yes/No) |

### *4.5 Maximum current relay (Pos. 78)*

| Disconnect wire 1521 & 1522 of primary current transformer; Connect variac to wire 1521 &1522 (including the resistor at Pos. 6.11); Put loco in simulation for driving mode; Open $R_3 - R_4$ on contact 136.3; Close VCB; supply $3.6A_{RMS}$ at the open wire 1521; Tune the drum of the maximum current relay Pos. 78 for correct over current value; | |
|---|---|
| *VCB opens with Priority 1 fault message on display.* | (Yes/No) |
| Keep contact $R_3 - R_4$ of 136.3 closed; Close VCB; Tune the resistor 78.1 for the current of $7.0A_{RMS}$ /$9.9A_p$ at the open wire 1521; | |
| *VCB opens with Priority 1 fault message on display.* | (Yes/No) |

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**Testing & Commissioning Format For 3-Phase Locomotive fitted with IGBT based Traction Converter, Auxiliary Converter and TCN based VCU**

**Locomotive No.:** 38409 **Type of Locomotive: WAP-7/WAG-9HC**



***4.6 Test current sensors***

| Name of the sensor | Description of the test | Prescribed value | Set/Measured value |
|---|---|---|---|
| Primary return current sensor (Test-1,Pos.6.2/1 & 6.2/2) | Activate cab in driving mode supply 10A. Measure the current through **diagnostic tool** or measuring print. | (Variation allowed is ± 10%) | — |
| Primary return current sensor (Test-2, Pos.6.2/1 & 6.2/2) | Supply 90mA$_{DC}$ to the test winding of sensor through connector 415.AA/1or 2 pin no. 7(+) & 8(-) | — | — |
| | Supply 297mA$_{DC}$ to the test winding of sensor through connector 415.AA/1or 2 pin no. 7(+) & 8(-) | — | 298mA |
| Auxiliary winding current sensor (Pos. 42.3/1 & 42.3/2) | Supply 90mA$_{DC}$ to the test winding of sensor through connector 415.AC/1or 2 pin no. 7(+) & 8(-) | — | — |
| | Supply 333mA$_{DC}$ to the test winding of sensor through connector 415.AC/1 or 2 pin no. 7(+) & 8(-) | — | 336mA |
| Harmonic filter current sensors (Pos.8.5/1 &8.5/2) | Supply 90mA$_{DC}$ to the test winding of sensor through connector 415.AE/1or 2 pin no. 7(+) & 8(-) | — | — |
| | Supply 342mA$_{DC}$ to the test winding of sensor through connector 415.AE/1or 2 pin no. 7(+) & 8(-) | — | 346mA |
| Hotel load current sensors (Pos. 33/1 & 33/2) | Switch on hotel load. Supply 90mA$_{DC}$ to the test winding of sensor through connector 415.AG/1or 2 pin no. 7(+) & 8(-) | — | — |
| | Supply 1242mA$_{DC}$ to the test winding of sensor through connector 415.AG/1or 2 pin no. 7(+) & 8(-) | — | 1248mA |

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### 4.7 *Test DC Link Voltage Sensors (Pos 15.6/*)*

This test is to be done by the commissioning engineer of the firm if required.

### 4.8 *Verification of Converter Protection Circuits (Hardware limits) -*

This test is to be done as per para 6.17 of the document no. 3EHX 610 282 for both the converters.

| Protection circuits | Limit on which shutdown should take place | Measured limit |
|---|---|---|
| Current sensors (Pos 18.2/1, 18.2/2, 18.2/3, 18.4/4, 18.5/1, 18.5/2, 18.5/3) for Power Converter 1 | Increase the current quickly in the test winding of the current sensors, VCB will off at 2.52A with priority 1 fault for each sensor. | For 18.2/1= OK<br>For 18.2/2=<br>For 18.2/3=<br>For 18.4/4=<br>For 18.5/1=<br>For 18.5/2=<br>For 18.5/3= |
| Current sensors (Pos 18.2/1, 18.2/2, 18.2/3, 18.4/4, 18.5/1, 18.5/2, 18.5/3) for Power Converter 2 | Increase the current quickly in the test winding of the current sensors, VCB will off at 2.52A with priority 1 fault for each sensor. | For 18.2/1= OK<br>For 8.2/2=<br>For 18.2/3=<br>For 18.4/4=<br>For 18.5/1=<br>For 18.5/2=<br>For 18.5/3= |
| Fibre optic failure In Power Converter1 | Remove one of the orange fibre optic plugs on traction converter. VCB should trip | OK |
| Fibre optic failure In Power Converter2 | Remove one of the orange fibre optic plugs on traction converter. VCB should trip | OK |

### 4.9 *Sequence of BUR contactors*

The sequence of operation of BUR contactors for 'ALL BUR OK' BUR 1 out BUR 2 out and BUR 3 out condition has to be verified by putting the Loco in driving mode (VCB should not be closed) and isolating the BURs one by one. In these condition following will be the contactor sequence.

| Status | 52/1 | 52/2 | 52/3 | 52/4 | 52/5 | 52.4/1 | 52.4/2 | 52.5/1 | 52.5/2 |
|---|---|---|---|---|---|---|---|---|---|
| **Al BUR OK** | Close | Open | Close | Open | Close | Open | Close | Close | Open |
| **BUR1 off** | Close | Open | Close | Close | Open | Close | Open | Open | Close |
| **BUR2 off** | Open | Open | Close | Close | Close | Close | Open | Open | Close |
| **BUR3 off** | Open | Close | Open | Close | Close | Close | Open | Open | Close |

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**Monitored contactor sequence**

| Status | 52/1 | 52/2 | 52/3 | 52/4 | 52/5 | 52.4/1 | 52.4/2 | 52.5/1 | 52.5/2 |
|---|---|---|---|---|---|---|---|---|---|
| AI BUR OK | close | open | close | open | close | open | close | close | open |
| BUR1 off | close | open | close | close | open | close | open | open | close |
| BUR2 off | open | open | close | close | close | close | open | open | close |
| BUR3 off | open | close | open | close | close | close | open | open | close |

## 5.0 *Commissioning with High Voltage*

### 5.1 *Check List*

| Items to be checked | Yes/No |
|---|---|
| Fibre optic cables connected correctly. | Yes |
| No rubbish in machine room, on the roof, under the loco. | Yes |
| All the electronic Sub-D and connectors connected | Yes |
| All the MCBs of the HB1 & HB2 open. | Yes |
| All the three fuses 40/* of the auxiliary converters | Yes |
| The fuse of the 415/110V auxiliary circuit (in HB1) open. | Yes |
| Roof to roof earthing and roof to cab earthing done | Yes |
| Fixing, connection and earthing in the surge arrestor done correctly. | Yes |
| Connection in all the traction motors done correctly. | Yes |
| All the bogie body connection and earthing connection done correctly. | Yes |
| Pulse generator (Pos. 94.1) connection done correctly. | Yes |
| All the oil cocks of the gate valve of the transformer in open condition. | Yes |
| All covers on Aux & Power converters, Filter block, HB1, HB2 fitted | Yes |
| KABA key interlocking system. | Yes |

### 5.2 *Safety test main circuit breaker*

Prepare to switch off the catenary supply during the first charging of the locomotive in case of any unexpected behavior of the electrical component of the loco. Charge the loco for the first time by closing BLDJ switch. The VCB will trip after certain time as no oil/coolant pumps are running yet.

Perform the following safety test of main circuit breaker through both the cabs of the locomotive.

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| Name of the test | Description of the test | Expected result | Monitored result |
|---|---|---|---|
| Emergency stop in cooling mode | Raise panto in cooling mode. Put the brake controller into RUN position. Close the VCB. Push emergency stop button 244. | VCB must open. Panto must lower. Emergency brake will be applied. | Checked OK |
| Emergency stop in driving mode | Raise panto in driving mode in. Put the brake controller into RUN position. Close the VCB. Push emergency stop button 244. | VCB must open. Panto must lower. Emergency brake will be applied. | Checked OK |
| Under voltage protection in cooling mode | Raise panto in cooling mode. Close the VCB. Switch off the supply of catenary by isolator | VCB must open. | Checked OK |
| Under voltage protection in driving mode | Raise panto in driving mode. Close the VCB. Switch off the supply of catenary by isolator | VCB must open with diagnostic message that catenary voltage out of limits | Checked OK |
| Shut down in cooling mode. | Raise panto in cooling mode. Close the VCB. Bring the BL-**key in O** position. | VCB must open. Panto must lower. | Checked OK |
| Shutdown in driving mode | Raise panto in driving mode. Close the VCB. Bring the BL-**key in O** position. | VCB must open. Panto must lower. | Checked OK |
| Interlocking pantograph-VCB in cooling mode | Raise panto in cooling mode. Close the VCB. Lower the pantograph by ZPT | VCB must open. | Checked OK |
| Interlocking pantograph-VCB in driving mode | Raise panto in driving mode. Close the VCB. Lower the pantograph by ZPT | VCB must open. | Checked OK |

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### 5.3 *Auxiliary Converter Commissioning*

Switch on the high voltage supply and set up the loco in driving mode. Raise the panto. Close the VCB. Check that there is no earth fault in the auxiliary circuit, Switch off the VCB. Lower the panto. Create the earth fault in auxiliary circuit by making connection between wire no 1117(in HB2 cubicle) and earth. After 3 minutes a diagnostic message will come that "Earth fault auxiliary circuit."

**5.3.1 Running *test of 3 ph. auxiliary equipments***
Switch on the 3 ph. auxiliary equipment one by one. Check the direction of rotation of each auxiliary machine and measure the continuous current and starting current drawn by them.

| Name of the auxiliary machine | Typical phase current | Measured continuous phase current | Measured starting phase current |
|---|---|---|---|
| Oil pump transformer 1 | 9.8 amps | 12.0 | 14.0 |
| Oil pump transformer 2 | 9.8 amps | 12.2 | 14.5 |
| Coolant pump converter 1 | 19.6 amps | 4.1 | 6.4 |
| Coolant pump converter 2 | 19.6 amps | 4.0 | 7.0 |
| Oil cooling blower unit 1 | 40.0 amps | 36.0 | 85.0 |
| Oil cooling blower unit 2 | 40.0 amps | 35.0 | 87.0 |
| Traction motor blower 1 | 34.0 amps | 36.0 | 120.0 |
| Traction motor blower 2 | 34.0 amps | 37.0 | 135.0 |
| Sc. Blower to Traction motor blower 1 | 6.0 amps | 3.2 | 10.0 |
| Sc. Blower to Traction motor blower 1 | 6.0 amps | 3.0 | 9.5 |
| Compressor 1 | 25 amps at 0 kg/ $cm^2$ 40 amps at 10 kg/ $cm^2$ | 32.0 | 70.0 |
| Compressor 2 | 25 amps at 0 kg/ $cm^2$ 40 amps at 10 kg/ $cm^2$ | 31.0 | 68.0 |

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***5.3.2 Performance of Auxiliary Converters***

Measure the performance of the auxiliary converters through software and record it.

***BUR1 (Condition: Switch off all the load of BUR 1)- to be filled by commissioning engineer of the firm.***

| Signal name | Description of the signal | Prescribed value | Monitored value | Value under Limit (Yes/No) |
|---|---|---|---|---|
| BUR1 7303 XUUN | Input voltage to BUR1 | 75% (10%=125V) | 1001V | Yes |
| BUR1 7303 XUUZ1 | DC link voltage of BUR1 | 60% (10%=100V) | 636V | Yes |
| BUR1 7303 XUIZ1 | DC link current of BUR1 | 0% (10%=50A) | 1Amp | Yes |

***BUR2 (Condition: Switch off all the load of BUR 2, Battery Charger on) to be filled by commissioning engineer of the firm.***

| Signal name | Description of the signal | Prescribed value by the firm | Monitored value | Value under Limit (Yes/No) |
|---|---|---|---|---|
| BUR2 7303-XUUN | Input voltage to BUR2 | 75% (10%=125V) | 1002V | Yes |
| BUR2 7303-XUUZ1 | DC link voltage of BUR2 | 60% (10%=100V) | 637 | Yes |
| BUR2 7303-XUIZ 1 | DC link current of BUR2 | 1% (10%=50A)* | 7Amp | Yes |
| BUR2 7303-XUILG | Current battery charger of BUR2 | 3% (10%=100A)* | 2.1Amp | Yes |
| BUR2 7303-XUIB1 | Current battery of BUR2 | 1.5%(10%=100A)* | 1.1Amp | Yes |
| BUR2 7303 –XUUB | Voltage battery of BUR2 | 110%(10%=10V) | 110V | Yes |

* Readings are dependent upon charging condition of the battery.

***BUR3 (Condition: Switch off all the load of BUR 3, Battery Charger on) to be filled by commissioning engineer of the firm.***

| Signal name | Description of the signal | Prescribed set value by the firm | Monitored value | Value under limit (Yes/No) |
|---|---|---|---|---|
| BUR3 7303-XUUN | Input voltage to BUR3 | 75% (10%=125V | 1000V | Yes |
| BUR3 7303-XUUZ1 | DC link voltage of BUR3 | 60% (10%=100V) | 637V | Yes |
| BUR3 7303-XUIZ 1 | DC link current of BUR3 | 1% (10%=50A)* | 7Amp | Yes |
| BUR3 7303-XUILG | Current battery charger of BUR 3 | 3% (10%=100A)* | 2.1Amp | Yes |
| BUR3 7303-XUIB1 | Current battery of BUR 3 | 1.5%(10%=100A)* | 1.1Amp | Yes |
| BUR3 7303-XUUB | Voltage battery of BUR 3 | 110%(10%=10V) | 110V | Yes |

* Readings are dependent upon charging condition of the battery.

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***5.3.3 Performance of BURs when one BUR goes out***

When any one BUR goes out then rest of the two BURs should take the load of all the auxiliaries at ventilation leve1 3 of the locomotive.

| Condition of BURs | Loads on BUR1 | Loads in BUR2 | Loads in BUR3 |
|---|---|---|---|
| All BURs OK | Oil Cooling unit 1&2 | TM blower1&2, TFP oil pump 1&2, SR coolant pump 1&2. | Compressor 1&2, Battery charger and TM Scavenger blower 1&2 |
| BUR 1 out | ------ | Oil Cooling unit 1&2, TM blower1&2, TM Scavenger blower 1&2 | Compressor 1&2,TFP oil pump 1&2, SR coolant pump 1&2 and Battery charger. |
| BUR 2 out | Oil Cooling unit 1&2, TM blower 1&2, TM Scavenger blower 1&2 | ------- | Compressor 1&2, TFP oil pump 1&2, SR coolant pump 1&2 and Battery charger. |
| BUR 3 out | Oil Cooling unit 1&2, TM blower1&2, TM Scavenger blower 1&2 | Compressor 1&2, TFP oil pump 1&2, SR coolant pump 1&2 and Battery charger. | ------- |

Checked OK

***5.4 Auxiliary circuit 415/110***

For checking earth fault detection, make a connection between wire no. 1218 and vehicle body. On switching on VCB, Earth fault relay 89.5 must pick up and after 3 minutes a message will come in the Diagnostic display that Earth Fault 415/110V Circuit

Switch on the 1 ph. auxiliary equipment one by one. Check the direction of rotation of each auxiliary machine and measure the continuous current and starting current drawn by them.

| Name of the auxiliary machine | Typical phase current | Measured phase current | Measured starting current |
|---|---|---|---|
| Machine room blower 1 | 15.0 amps* | 4.8 | 12.0 |
| Machine room blower 2 | 15.0 amps* | 4.7 | 13.0 |
| Sc. Blower to MR blower 1 | 1.3 amps | 1.6 | 4.3 |
| Sc. Blower to MR blower 2 | 1.3 amps | 1.5 | 4.0 |
| Ventilator cab heater 1 | 1.1 amps | 1.7 | 2.3 |
| Ventilator cab heater 2 | 1.1 amps | 1.7 | 2.3 |
| Cab heater 1 | 4.8 amps | 5.6 | 6.0 |
| Cab heater 2 | 4.8 amps | 5.6 | 6.0 |

* For indigenous MR blowers.

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### 5.5 *Hotel load circuit (Not applicable for WAG-9HC)*

For WAP-7 locomotive with Hotel load converter refer to **Annexure-HLC**

### 5.6 *Traction Converter Commissioning*

**This test is carried out in association with Firm.**

Traction converter commissioning is being done one at a time. For testing Converter 1, switch off the traction converter 2 by switch bogie cut out switch 154. For testing Converter 2, switch off the traction converter 2 by switch bogie cut out switch 154. Isolate the harmonic filter also by switch 160. Start up the loco by one converter. Follow the functionality tests.

***For Converter 1***

| Test Function | Results desired | Result obtained |
|---|---|---|
| Measurement of charging and pre-charging and charging of DC Link of Converter 1 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Measurement of discharging of DC Link of Converter 1 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Earth fault detection on positive potential of DC Link of Converter 1 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Earth fault detection on negative potential of DC Link of Converter 1 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Earth fault detection on AC part of the traction circuit of Converter 1 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Pulsing of line converter of Converter 1 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Pulsing of drive converter of Converter 1 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |

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***For Converter 2***

| Test Function | Results desired in sequence | Result obtained |
|---|---|---|
| Measurement of charging and pre-charging and charging of DC Link of Converter 2 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Measurement of discharging of DC Link of Converter 2 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Earth fault detection on positive potential of DC Link of Converter 2. | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Earth fault detection on negative potential of DC Link of Converter 2. | Traction converter manufacturer to declare the successful operation and demonstrate the same to the supervisor/v | Checked OK |
| Earth fault detection on AC part of the traction circuit of Converter 2. | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Pulsing of line converter of Converter 2. | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |
| Pulsing of drive converter of Converter 2 | Traction converter manufacturer to declare the successful operation and demonstrate the same to the PLW supervisor. | Checked OK |

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### 5.7 *Test protective shutdown SR*

| Test Function | Results desired in sequence | Result obtained |
|---|---|---|
| Measurement of protective shutdown by Converter 1 electronics. | Start up the loco with both the converter. Raise panto. Close VCB. Move Reverser handle to forward or reverse. Remove one of the orange fibre optic feedback cable from converter 1Check that converter 1 electronics produces a protective shut down.<br>• VCB goes off<br>• Priority 1 fault mesg. on DDU appears<br>***Disturbance in Converter 1*** | Checked |
| Measurement of protective shutdown by Converter 2 electronics. | Start up the loco with both the converter. Raise panto. Close VCB. Move Reverser handle to forward or reverse. Remove one of the orange fibre optic feedback cable from converter 2. Check that converter 2 electronics produces a protective shut down.<br>• VCB goes off<br>• Priority 1 fault mesg. on diagnostic display appears<br>***Disturbance in Converter 2*** | Checked |

### 5.8 *Test Harmonic Filter*

Switch on the filter by switch 160

| Test Function | Results desired in sequence | Result obtained |
|---|---|---|
| Measurement of filter currents | Start up the loco with both the converter. Raise panto. Close VCB. Move Reverser handle to forward or reverse. Apply a small value of TE/BE by moving the throttle.<br>• FB contactor 8.41 must open. | Checked |

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| | | |
|---|---|---|
| | • FB contactor 8.2 must close.<br>• FB contactor 8.1 must close<br>• Check the filter current in diagnostic laptop<br>**Bring the TE/BE throttle to O**<br>Switch off the VCB<br>• FB contactor 8.1must open.<br>• FB discharging contactor 8.41 must close<br>• Check the filter current in diagnostic laptop | Checked Ok |
| Test earth fault detection harmonic filter circuit. | Make a connection between wire no. 12 and vehicle body. Start up the loco. Close VCB.<br>• Earth fault relay 89.6 must pick up.<br>• Diagnostic message comes that - ***Earth fault in harmonic filter circuit*** | Checked Ok |
| Test traction motor speed sensors for both bogie in both cabs | Traction converter manufacturer to declare the successful operation and demonstrate the same to the supervisor/ PLW | Ok |

5.9 ***Test important components of the locomotive***

| **Items to be tested** | **Description of the test** | **Monitored value/remarks** |
|---|---|---|
| Speedometer | VCU converter manufacturer to declare the successful operation and demonstrate the same to the supervisor/ PLW | Checked Ok |
| Time delay module of MR blower | The time after which the starting capacitor for MR blower should go off the circuit should be set to 10-12 seconds | Checked Ok |
| Ni-Cd battery voltage | At full charge, the battery voltage should be 110V DC. | Checked Ok |
| Flasher light | From both cab flasher light should blink at least 65 times in one minute. | Checked Ok |
| Head light | Head light should glow from both cabs by operating ZLPRD. Dimmer operation of headlight should also occur by operating the switch ZLPRD. | Checked Ok |

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| | | |
|---|---|---|
| Marker light | Both front and tail marker light should glow from both the cabs | Checked OK |
| Cab Light | Cab light should glow in both the cabs by operating the switch ZLC | Checked OK |
| Spot lights | Both Drivers and Asst. Drivers Spot light should glow in both cabs by operating ZLDD | Checked OK |
| Instrument lights | Instrument light should glow from both cab by operating the switch ZLI | Checked OK |
| Illuminated Push button | All illuminated push buttons should glow during the operation | Checked OK |
| Contact pressure of the high rating contactors | The contact pressure of FB contactors (8.1, 8.2) is to be measured<br>**Criteria:**<br>*The minimum contact pressure is 54 to 66 Newton.* | For contactor 8.1:<br>For contactor 8.2: OK |
| Crew Fan | All crew fans should work properly when VCB of the loco is switched on. The airflow from each cab fan is to be measured.<br>**Criteria:**<br>*The minimum flow of air of cab fan should be 25 $m^3$/minute* | Cab 1 LHS:<br>Cab 1 RHS:<br>Cab 2 LHS:<br>Cab 2 RHS: OK |

***6.0** Running **Trial of the locomotive***

| SN | Description of the items to be seen during trail run | Action which should take place | Remarks |
|---|---|---|---|
| 1 | Cab activation in driving mode | No fault message should appear on the diagnostic panel of the loco. | Checked OK |
| | Loco charging | Loco to be charged and all auxiliaries should run. No fault message to appear on the diagnostic panel of the loco. Raise MR pressure to 10 Kg/$cm^2$, BP to 5 Kg/$cm^2$, FP to 6 Kg/$cm^2$. | Checked OK |
| 3. | Check function of Emergency push stop. | This switch is active only in activated cab. By pushing this switch VCB should open & pantograph should be lowered. | Checked OK |
| 4. | Check function of BPCS. | • Beyond 5 kmph, press BPCS, the speed of loco should be constant.<br>• BPCS action should be cancelled by moving TE/BE throttle, by dropping BP below 4.75 Kg/$cm^2$, by pressing BPCS again. | Checked OK |
| 5. | Check train parting operation of the Locomotive. | Operate the emergency cock to drop the BP Pressure LSAF should glow. | Checked OK |

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| | | | |
|---|---|---|---|
| 6. | Check vigilance operation of the locomotive | Set the speed more than 1.5 kmph and ensure that brakes are released i.e. BC < 1 Kg/cm$^2$.<br>For 60 seconds do not press vigilance foot switch or sanding foots switch or TE/BE throttle or BPVG switch then<br>• Buzzer should start buzzing.<br>• LSVW should glow continuously.<br>Do not acknowledge the alarm through BPVG or vigilance foot switch further for 8 seconds then:-<br>• Emergency brake should be applied automatically.<br>• VCB should be switched off.<br>Resetting of this penalty brake is possible only after 32 seconds by bringing TE/BE throttle to 0 and acknowledge BPVR and press & release vigilance foot switch. | Checked Ok |
| 7. | Check start/run interlock | • At low pressure of MR (< 5.6 Kg/cm$^2$).<br>• With park brake in applied condition.<br>• With direct loco brake applied (BP< 4.75Kg/cm$^2$).<br>• With automatic train brake applied (BP<4.75Kg/cm$^2$).<br>• With emergency cock (BP < 4.75 Kg/cm$^2$). | Checked Ok<br>N/A<br>Checked Ok |
| 8. | Check traction interlock | Switch of the brake electronics. The Tractive /Braking effort should ramp down, VCB should open and BP reduces rapidly. | Checked Ok |
| 9. | Check regenerative braking. | Bring the TE/BE throttle to BE side. Loco speed should start reducing. | Checked Ok |
| 10. | Check for BUR redundancy test at ventilation level 1 & 3 of loco operation | In the event of failure of one BUR, rest of the two BURs can take the load of all the auxiliaries. For this switch off one BUR.<br>Auxiliaries should be catered by rest of two BURs.<br>Switch off the 2 BURs; loco should trip in this case. | Checked Ok |
| 11. | Check the power converter isolation test | Create disturbance in power converter by switching off the electronics. VCB should open and converter should get isolated and traction is possible with another power converter. | Checked Ok |

**Signature of the JE/SSE/Loco Testing**

PATIALA LOCOMOTIVE WORKS, PATIALA

Testing & Commissioning Format For 3-Phase Locomotive fitted with IGBT based Traction Converter, Auxiliary Converter and TCN based VCU

Locomotive No.: 39409 Type of Locomotive: WAP-7/WAG-9HC



## 7.0 Final check list to be verified at the time of Loco dispatch

Condition /Operations of the following items are to be checked:

| SN | Item | Cab-1 | Cab-2 | Remarks |
|---|---|---|---|---|
| 1 | Head lights | OK | OK | |
| 2 | Marker Red | OK | OK | |
| 3 | Marker White | OK | OK | |
| 4 | Cab Lights | OK | OK | |
| 5 | Dr Spot Light | OK | OK | |
| 6 | Asst Dr Spot Light | OK | OK | Head Wocker on |
| 7 | Flasher Light | OK | OK | |
| 8 | Instrument Lights | OK | OK | |
| 9 | Corridor Light | OK | OK | |
| 10 | Cab Fans | OK | OK | |
| 11 | Cab Heater/Blowers | OK | OK | |
| 12 | All Cab Signal Lamps Panel 'A' | OK | OK | |

Signature of the JE/SSE/Loco Testing

## PATIALA LOCOMOTIVE WORKS, PATIALA

## Testing & Commissioning Format for 2x500KVA IGBT based Hotel Load Converter for 3-phase Electric Locomotives

Locomotive No.: 39409



Type of Locomotive: WAP7

Make of Hotel Load Converter: AAL

Details of Equipment: -

| Equipment | Sl. No | Equipment | Sl. No |
|---|---|---|---|
| HLC1 | 0824030129 | IV Coupler CAB1 ALP | — |
| HLC2 | 0824030130 | IV Coupler CAB1 LP | — |
| Converter-1 | 0824030129 | IV Coupler CAB2 ALP | — |
| Converter-2 | 0824030130 | IV Coupler CAB2 LP | — |
| UIC Coupler for Hotel Load Converter (353.3/2 CAB2) | — | UIC Coupler for Hotel Load Converter (353.3/3 CAB1) | — |

1. **Polarity test of Hotel Load Winding:**

Apply 198 /140 to the primary winding of the transformer (at 1U; wire no. 2 at surge arrestor and at 1V; wire no. 100 at earthing choke). Measure the output voltage and compare the phase of the following of the transformer.

| Output Winding Nos. | Description of winding | Prescribed Output Voltage &Polarity with input supply | Measured Output | Measured Polarity |
|---|---|---|---|---|
| 2UH1 & 2VH1 | For Hotel load between cable 91- 94 | 5.9 ,4.2 and same polarity | OK | OK |
| 2UH2 & 2VH2 | For Hotel load between cable 91A- 94A | 5.9 ,4.2 and same polarity | OK | OK |

Signature of the JE/SSE/Loco Testing

2. **Visual Inspection:**

**Fitment of Units and Earthing to Sub-assemblies**

Verify the following Equipments Fitment and grounding cables are connected to Locomotive body.

| Sl. No. | Equipment Name | Unit Fitment (Yes/No) | Provision of Earthing (Yes/No) |
|---|---|---|---|
| 1 | HLC1 | Yes | Yes |
| 2 | HLC2 | Yes | Yes |
| 3 | Output Contactor unit1 HLC1 | Yes | Yes |
| 4 | Output Contactor unit2 HLC2 | Yes | Yes |
| 5 | IV Coupler CAB1 ALP | Yes | Yes |
| 6 | IV Coupler CAB1 LP | Yes | Yes |
| 7 | IV Coupler CAB2 ALP | Yes | Yes |
| 8 | IV Coupler CAB2 LP | Yes | Yes |
| 9 | UIC Coupler for Hotel Load Converter (353.3/3 CAB1) | Yes | Yes |
| 10 | UIC Coupler for Hotel Load Converter (353.3/2 CAB2) | Yes | Yes |
| 11 | CT (LEM sensor) under HLC1 | Yes | Yes |
| 12 | CT(LEM sensor) under HLC2 | Yes | Yes |

**Signature of the JE/SSE/Loco Testing**

## 3. Cable Routing and Laying

### 3.1 Control cable routing and layout

Verify the connections, tightness and cable routing of the following Control cable.

| Sl. No. | Cables Details | Performed (Yes/No) |
|---|---|---|
| 1 | From Wago SB1 to HLC1 are connected as per wiring format | Yes |
| 2 | From SB1 to UIC Coupler Hotel Load Converter (353.3/3 CAB2) through Bayonet connector XK22HL:01(22pin)is connected as per wiring format | Yes |
| 3 | From SB1 wago(XF22S:01/53) to IV coupler CAB1 ALP are connected as per wiring format | yes |
| 4 | From SB1 wago(XF22S:01/54) to IV coupler CAB1 LP are connected as per wiring format | yes |
| 5 | From Wago SB2 to HLC2 are connected as per wiring format | yes |
| 6 | From SB2 to UIC Coupler Hotel Load Converter (353.3/2 CAB2) through Bayonet connector XK77HL:02 (22 pin) is connected as per wiring format | yes |
| 7 | From SB2 wago (XF77S:01/53) to IV coupler CAB2 ALP are connected as per wiring format | yes |
| 8 | From SB2 wago (XF77S:01/54) to IV coupler CAB2 LP are connected as per wiring format | yes |
| 9 | From HLC1 to Contactor unit 1 through 4 Core Cable are connected as per wiring format | yes |
| 10 | From HLC2 to Contactor unit 2 through 4 Core Cable are connected as per wiring format | yes |
| 11 | From SB to VCU are connected as per wiring format | yes |
| 12 | From CT (HLC1 LEM sensor) to SR1 are connected as per wiring format | yes |
| 13 | From CT (HLC2 LEM sensor) to SR2 are connected as per wiring format | yes |

**Signature of the JE/SSE/Loco Testing**

### 3.2 Power cable routing and layout

Verify the connections, tightness and cable routing of the following Power cable.

| Sl. No. | Cables Details | Performed Yes/No) |
|---|---|---|
| 1 | From Transformer to HLC1(2UH1 & 2VH1) are connected as per wiring format | yes |
| 2 | From Transformer to HLC2(2UH2 &2VH2) are connected as per wiring format | yes |
| 3 | From HLC1 to Output Contactor unit1 are connected as per wiring format | yes |
| 4 | From HLC 2 to Output Contactor unit 2 are connected as per wiring format | yes |
| 5 | From Output Contactor unit 1 to IV Coupler CAB1 ALP and IV Coupler CAB2ALP through Junction box are connected as per wiring format | yes |
| 6 | From Output Contactor unit 2 to IV Coupler CAB2 LP and IV Coupler CAB1 LP through Junction box are connected as per wiring format | yes |

### 4. Continuity test:

Check the continuity test for the External connections made to Equipments.

**Note:** This continuity test should be done before power ON the Locomotive Battery.

### 4.1 Control cable continuity

| Sl. No. | Cables Details | Performed (Yes/No) |
|---|---|---|
| 1 | From Wago SB1 to HLC1 are connected as per wiring format | yes |
| 2 | From SB1 to UIC Coupler Hotel Load Converter (353.3/3 CAB2) through Bayonet connector XK22HL:01(22pin)is connected as per wiring format | Yes |
| 3 | From SB1 wago(XF22S:01/53) to IV coupler CAB1 ALP are connected as per wiring format | Yes |
| 4 | From SB1 wago(XF22S:01/54) to IV coupler CAB1 LP are connected as per wiring format | yes |
| 5 | From Wago SB2 to HLC2 are connected as per wiring format | Yes |
| 6 | From SB2 to UIC Coupler Hotel Load Converter (353.3/2 CAB2) through Bayonet connector XK77HL:02(22pin) is connected as per wiring format | Yes |
| 7 | From SB2 wago (XF77S:01/53) to IV coupler CAB2 ALP are connected as per wiring format | Yes |
| 8 | From SB2 wago(XF77S:01/54) to IV coupler CAB2 LP are connected as per wiring format | Yes |
| 9 | From HLC1 to Contactor unit 1 through 4 Core Cable are connected as per wiring format | Yes |
| 10 | From HLC2 to Contactor unit 2 through 4 Core Cable are connected as per wiring format | yes |
| 11 | From SB to VCU are connected as per wiring format | yes |
| 12 | From HLC1 LEM sensor to SR1 are connected as per wiring format | yes |
| 13 | From HLC2 LEM sensor to SR2 are connected as per wiring format | yes |

**Signature of the JE/SSE/Loco Testing**

### 4.2 Power cable continuity

These cables continuity should be checked before mounting of converter in the locomotive.

| Sl. No. | Cables Details | Performed (Yes/No) |
|---|---|---|
| 1 | From Transformer to HLC1(2UH1 & 2VH1) are connected as per wiring format | yes |
| 2 | From Transformer to HLC2(2UH2 &2VH2) are connected as per wiring format | yes |
| 3 | From HLC1 to Output Contactor unit1 are connected as per wiring format | yes |
| 4 | From HLC 2 to Output Contactor unit 2 are connected as per wiring format | yes |
| 5 | From Output Contactor unit 1 to IV Coupler CAB1 ALP and IV Coupler CAB2ALP through Junction box are connected as per wiring format | yes |
| 6 | From Output Contactor unit 2 to IV Coupler CAB1 LP and IV Coupler CAB2 LP through Junction box are connected as per wiring format | yes. |

### 5. Battery power ON

***Tests* Supply Voltages**

Remove all Control cable connectors (Analog and Digital Input/output connectors) from HLC1, HLC2. While Switch ON Battery supply observe is there any MCBs tripping. Wait for one or two minutes after switching ON Circuit breaker(MCB1) and observe for any overheating symptoms like smell, smoke, temperature etc. from the wire bunches. If any such symptoms are noticed, there might be a short circuit in the wire bunch. Check up once again continuity wherever suspected. After that check the Voltage levels at all equipments connectors as mentioned below.

| Test Details | Acceptance | Observations |
|---|---|---|
| Voltage Level at HLC1 :<br>I. Between wago terminal XF22S:03/54 and XF22S:03/58<br>II. Between wago terminal XF22S:03/53 and XF22S:03/58 | ~110VDC | Ok |
| Voltage Level at HLC2 :<br>I. Between wago terminal XF77S:03/52 and XF77S:03/56<br>II. Between wago terminal XF77S:03/51 and XF77S:03/56 | ~110VDC | Ok |

**Note:** After Above tests switch off the Power and restore all removed connectors and once again switch ON the 110 V Supply and ensure that no MCB tripping due to abnormality.

**Signature of the JE/SSE/Loco Testing**

## 6. Converter operation (ON/OFF) test

Power supply is directly available to the Hotel Load Converter via Hotel Load Converter winding (2UH1-2VH1) and (2UH2-2VH2). As soon as BLDJ is closed power will be available to the Hotel Load Converter. Connect the test jig of Hotel Load Converter to the UIC and IV Coupler. Charge the locomotive and switch on the BLHO, LSHO indication should glow. Hotel Load Converter screen will show message "waiting for ON command". One by one Hotel Load Converter can be switched on by test jig. Finally both the Hotel Load Converter should be turned out simultaneously. Observe the flow of air from the air duct, this will ensure that Hotel Load Converter is ON. Both the Hotel Load Converters are ON, then voltage and frequency should be measured as per the table below:-

**Converters should run without any irregularities.**

| Hotel Load Converter 1 | | | |
|---|---|---|---|
| Output Voltage | | | Output Frequency (Hz) |
| U-V | V-W | U-W | |
| OK | OK | OK | OK |

| Hotel Load Converter 2 | | | |
|---|---|---|---|
| Output Voltage | | | Output Frequency (Hz) |
| U-V | V-W | U-W | |
| OK | OK | OK | OK |

## 7. Earth Fault Test

**7.1 Input Earth Fault:**-Ground the input terminal of the Hotel Load Converter using a proper resistance and then turn on the Hotel Load Converter. The converter should trip with the message "Input earth fault".

**7.2 Output Earth Fault:**-Ground the output terminal of the Hotel Load Converter using a proper resistance and then turn on the Hotel Load Converter. The converter should trip with the message "Output earth fault".

**Note:** These to be done for the both the converters (HLC1 and HLC2) separately.

**Signature of the JE/SSE/Loco Testing**

## Status of RDSO modifications

LOCO NO: 39409

| Sn | Modification No. | Description | Remarks |
|---|---|---|---|
| 1. | RDSO/2008/EL/MS/0357 Rev.'0' Dt 20.02.08 | Modification in control circuit of Flasher Light and Head Light of three phase electric locomotives. | Ok/Not Ok |
| 2. | RDSO/2009/EL/MS/0377 Rev.'0' Dt 22.04.09 | Modification to voltage sensing circuit in electric locomotives. | Ok/Not Ok |
| 3. | RDSO/2010/EL/MS/0390 Rev.'0' Dt 31.12.10 | Paralleling of interlocks of EP contactors and Relays of three phase locomotives to improve reliability. | Ok/Not Ok |
| 4. | RDSO/2011/EL/MS/0399 Rev.'0' Dt 08.08.11 | Removal of interlocks of control circuit contactors no. 126 from MCPA circuit. | Ok/Not Ok |
| 5. | RDSO/2011/EL/MS/0400 Rev.'0' Dt 10.08.11 | Modification sheet for shifting the termination of $GKW, 1.8 KV, 70 sq mm cables and 2x2.5 sq mm cables housed in lower portion of HB2 panel and provision of Synthetic resin bonded glass fiber sheet for three phase locomotives. | Ok/Not Ok |
| 6. | RDSO/2011/EL/MS/0401 Rev.'0' Dt 10.08.11 | Modification sheet for relaying of cables in HB-2 panel of three phase locomotives to avoid fire hazards. | Ok/Not Ok |
| 7. | RDSO/2011/EL/MS/0403 Rev.'0' Dt 30.11.11 | Auto switching of machine room/corridor lights to avoid draining of batteries in three phase electric locomotives. | Ok/Not Ok |
| 8. | RDSO/2012/EL/MS/0408 Rev.'0' | Modification of terminal connection of heater cum blower assembly. | Ok/Not Ok |
| 9. | RDSO/2012/EL/MS/0411 Rev.'1' dated 02.11.12 | Modification sheet to avoid simultaneous switching ON of White and Red marker light in three phase electric locomotives. | Ok/Not Ok |
| 10. | RDSO/2012/EL/MS/0413 Rev.'1' Dt 25.04.16 | Paralleling of interlocks of EP contactors and auxiliary contactors of three phase locomotives to improve reliability. | Ok/Not Ok |
| 11. | RDSO/2012/EL/MS/0419 Rev.'0' Dt 20.12.12 | Modification sheet to provide rubber sealing gasket in Master Controller of three phase locomotives. | Ok/Not Ok |
| 12. | RDSO/2013/EL/MS/0420 Rev.'0' Dt 23.01.13 | Modification sheet to provide mechanical locking arrangement in Primary Over Current Relay of three phase locomotives. | Ok/Not Ok |
| 13. | RDSO/2013/EL/MS/0425 Rev.'0' Dt 22.05.13 | Modification sheet for improving illumination of head light in dimmer mode in three phase electric locomotives. | Ok/Not Ok |
| 14. | RDSO/2013/EL/MS/0426 Rev.'0' Dt 18.07.13 | Modification sheet of Bogie isolation rotary switch in three phase electric locomotives. | Ok/Not Ok |
| 15. | RDSO/2013/EL/MS/0427 Rev.'0' Dt 23.10.13 | Modification sheet for MCP control in three phase electric locomotives. | Ok/Not Ok |
| 16. | RDSO/2013/EL/MS/0428 Rev.'0' Dt 10.12.13 | Modification sheet for relocation of earth fault relays for harmonic filter and hotel load along with its resistors in three phase electric locomotives. | Ok/Not Ok |
| 17. | RDSO/2014/EL/MS/0432 Rev.'0' Dt 12.03.14 | Removal of shorting link provided at c-d terminal of over current relay of three phase electric locomotives. | Ok/Not Ok |
| 18 | RDSO/2017/EL/MS/0464 Rev.'0' Dt 25.09.17 | Provision of Auxiliary interlock for monitoring of Harmonic filter ON (8.1)/adoption (8.2) Contactor in GTO/IGBT locomotives. | Ok/Not Ok |
| 19. | RDSO/2017/EL/MS/0467 Rev.'0' Dt 07.12.17 | Modification in blocking diodes to improve reliability in three phase electric locomotives. | Ok/Not Ok |
| 20 | RDSO/2018/EL/MS/0475 Rev.'0' | Modification in existing Control Electronics (CE) resetting scheme of 3 phase electric locomotives. | Ok/Not Ok |
| 21 | RDSO/2019/EL/MS/0477 Rev.'0' Dt 18.09.19 | Implementation of push pull scheme. | Ok/Not Ok |

Signature of JE/SSE/ECS

PLW/PATIALA Loco No.: 39409

## PNEUMATIC TEST PARAMETERS OF 3-PHASE ELECTRIC LOCOMOTIVES

(As per DG/RDSO/LKO's letter No.-EL/3.2.19/3phase, dated-29.03.2012)

| SN | Parameters | Reference | Value | Result |
|---|---|---|---|---|
| | **Brake Panel: Faiveley** | | | |
| **1.0** | **Auxiliary Air supply system (Pantograph & VCB)** | | | |
| 1.1 | Ensure, Air is completely vented from pantograph Reservoir (Ensure Panto gauge reading is Zero) | | | 0 |
| 1.2 | Turn On BL Key. Now MCPA starts. Record pressure Build up time (8.0 kg/cm2) | | 60 sec. (Max.) | 58 |
| 1.3 | Auxiliary compressor safety Valve 23F setting | Faiveley Doc. No. DMTS-014-1, 8 CLW's check sheet no. F60.812 Version 2 | 8.5±0.25kg/cm2 - | 8.55 |
| 1.4 | Check VCB Pressure Switch Setting | CLW's check sheet no. F60.812 Version 2 | Opens 4.5±0.15 kg/cm2, closes 5.5±0.15 kg/cm2 | 4.5 Kg/cm2<br>5.5 Kg/cm2 |
| 1.5 | Set pantograph Selector Switch is in Auto, Open pan-1&2 Isolating Cocks & KABA cock by Key (KABA Key) | | | |
| 1.6 | Set Cab-1 Pan UP in Panel A. | | Observed Pan-2 Rises. | OK |
| 1.7 | Close Pan-2 isolating Cock<br>Open Pan -2 isolating Cock | | Panto-2 Falls Down<br>Panto-2 Rises | OK |
| 1.8 | Record Pantograph Rise time | | 06 to 10 seconds | 7 Sec |
| 1.9 | Record Pantograph Lowering Time | | 06 to 10 seconds | 9 Sec |
| 1.10 | Panto line air leakage | | 0.7 kg/cm2 in 5 Min. | 0.2 kg/cm2 in 5 Min. |
| 1.11 | High Reach Panto emergency test and reset. | | -NA- | -NA- |
| 2.0 | **Main Air Supply System** | | | |
| 2.1 | Ensure, Air is completely vented from locomotive. Drain out all the reservoirs by opening the drain cocks and then closed drain cocks. MR air pressure build up time by each compressor from 0 to 10 kg/cm2.<br>i) with 1750 LPM compressor<br>ii) with 1450 LPM compressor | Theoretical calculation and test performed by Railways. | i) 7 mins Max.<br>ii) 8.5 mins Max. | 6 min. & 40 sec. |
| 2.2 | Drain air below MR 8 kg/cm2 to start both the compressors | | Check Starting of both compressors | ok |
| 2.3 | Drain air from main reservoir up to 7 kg/cm2. Start compressors, Check pressure build time of individual compressor from 8 kg/cm2 to 9 kg/cm2 | | 30 Sec. (Max) | CP1-27 Sec<br>CP2-27 Sec |
| 2.4 | Check Low MR Pressure Switch Setting (37) | D&M test spec. MM3882 & MM3946 | Closes at 6.40±0.15 kg/cm2 Opens at 5.60±0.15kg/cm2 | 6.45 Kg/cm2<br>5.55 Kg/cm2 |
| 2.5 | Check compressor Pressure Switch RGCP setting (35) | D&M test spec. MM3882 & MM3946 | Opens at 10±0.20 kg/cm2, Closes at 8±0.20 kg/cm2 | 10.0 Kg/cm2<br>8.1 Kg/cm2 |
| 2.6 | Run both the compressors Record Pressure build up time | Trial results | 3.5 Minutes Max. | 3.3 minute |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 2.7 | Check unloader valve operation time | | | | Approx. 12 Sec. | 10 sec |
| 2.8 | Check Auto Drain Valve functioning (124 & 87) | | | | Operates when Compressor starts | ok |
| 2.9 | Check CP-I delivery safety valve setting (10/1). Run CP Direct by BLCP. | | | D&M test spec. MM3882 & MM3946 | 11.50±0.35 kg/cm2 | 11.50 Kg/cm2 |
| 2.10 | Check CP-2 delivery safety valve setting (10/2). Run CP direct by BLCP | | | D&M test spec. MM3882 & MM3946 | 11.50±0.35 kg/cm2 | 11.50 Kg/cm2 |
| 2.11 | Switch 'OFF' the compressors and ensure that the safety valve to reset at pressure 1.2 kg/cm2 less than opening pressure. | | | D&M test spec. MM3882 & MM3946 | | |
| 2.12 | BP Pressure: Switch 'OFF' compressor, Drain MR Pressure by drain cock of 1" Main Reservoir, Start Compressor, check setting pressure of Duplex Check Valve 92F. | | | CLW's check sheet no. F60.812 Version 2 | 5.0±0.10kg/cm2 | 5.0 Kg/cm2 |
| 2.13 | FP pressure:<br>Fit Test Gauge in Test point 107F FPTP. Open isolate cock 136F. Check pressure in Gauge. | | | CLW's check sheet no. F60.812 Version 2 | 6.0±0.20kg/cm2 | 6.0 Kg/cm2 |
| **3.0** | **Air Dryer Operation** | | | | | |
| 3.1 | Open Drain Cock 90 of 2nd MR to start Compressor, leave open for Test Check Air Dryer Towers to change. | | | | Tower to change every minute | ok |
| 3.2 | Check Purge Air Stops from Air Dryer at Compressor stops | | | | | |
| 3.3 | Check condition of humidity indicator | | | | Blue | Blue |
| **4.0** | **Main Reservoir Leakage Test** | | | | | |
| 4.1 | Put Auto Brake (A-9) in full service, Check MR Pressure air leakage from both cabs. | | | D&M test spec. MM3882 & MM3946 | Should be less than 1 kg/cm2 in 15 minutes | 0.20 Kg/cm2 in 15 minutes |
| 4.2 | Check BP Air leakage (isolate BP charging cock-70) | | | D&M test spec. MM3882 & MM3946 | 0.15 kg/cm2 in 5 minutes | 0.10 Kg/cm2 in 5 minutes |
| **5.0** | **Brake Test (Automatic Brake operation)** | | | | | |
| 5.1 | Record Brake Pipe & Brake Cylinder pressure at Each Step | | | | | |
| | Check proportionality of Auto Brake system | | | CLW's check sheet no. F60.812 Version 2 | | |
| | Auto controller position | | | BC (WAG-9 & WAG-7) Kg/cm2 | | BC (WAP-5) Kg/cm2 | |
| | | BP Pressure kg/cm2 | | Value | Result | Value | Result |
| | Run | 5±0.1 | **5.05 Kg/cm2** | 0.00 | 0.00 Kg/ cm2 | 0.00 | - |
| | Initial | 4.60±0.1 | **4.6 Kg/cm2** | 0.40±0.1 | 0.35Kg/ cm2 | 0.75±0.15 | - |
| | Full service | 3.35±0.2 | **3.4 Kg/cm2** | 2.50±0.1 | 2.5Kg/ cm2 | 5.15±0.30 | - |
| | Emergency | Less than 0.3 | **0.25 Kg/cm2** | 2.50±0.1 | 2.5Kg/ cm2 | 5.15±0.30 | - |

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| | | | | |
|---|---|---|---|---|
| 5.2 | Record time to BP pressure drop to 3.5 kg/cm2 Ensure Automatic Brake Controller handle is Full Service from Run | D&M test spec. MM3882 & MM3946 | 8±2 sec. | 8 Sec |
| 5.3 | Operate Asst. Driver Emergency Cock, | D&M test spec. MM3882 & MM3946 | BP pressure falls to Below 2.5 kg/cm2 | OK |
| 5.4 | Check brake Pipe Pressure Switch 69F operates | CLW's check sheet no. F60.812 Version 2 | Closes at BP 4.05- 4.35 kg/cm2<br>Opens at BP 2.85- 3.15 kg/cm2 | 4.25Kg/cm2<br>3.10Kg/cm2 |
| 5.5 | Move Auto Brake Controller handle from Running to Emergency BC filling time from 0.4 kg/cm2 i.e. 95% of Max. BC developed<br>WAP5 – BC 5.15 ± 0.3 kg/cm2 apply time<br>**WAP7 - BC 2.50 ± 0.1 kg/cm2**<br>WAG9 - BC 2.50 ± 0.1 kg/cm2 | D&M test spec. MM3882 & MM3946 | 4±1 sec.<br>**7.5±1.5 sec.**<br>21±3 sec. | **8.0 sec** |
| 5.6 | Move Auto Brake Controller handle to full service and BP pressure 3.5 kg/cm2. Move Brake controller to Running position BC Release time to fall BC Pressure up to 0.4 kg/cm2 i.e. 95% of Max. BC developed<br>BC release Time<br>**WAP7**<br>WAG9 | D&M test spec. MM3882 & MM3946 | **17.5±2.5 sec.**<br>52±7.5 sec. | **18.0 sec.** |
| 5.7 | Move Auto Brake Controller handle to Release, Check BP Pressure Steady at 5.5±0.2 kg/cm2 time. | CLW's check sheet no. F60.812 Version 2 | 60 to 80 Sec. | 75 Sec |
| 5.8 | Auto Brake capacity test : The capacity of the A9 valve in released condition must conform to certain limit in order to ensure compensation for air leakage in the train without interfering with the automatic functioning of brake.<br>* Allow The MR pressure to build up to maximum stipulated limit.<br>* Close brake pipe angle cock and charge brake pipe to 5 kg/cm2 by A-9 (Automatic brake controlling) at run position.<br>* Couple 7.5 dia leak hole to the brake hose pipe of locomotive. Open the angle cock for brake pipe.<br>The test shall be carried out with all the compressors in working condition. | RDSO Motive power Directorate report no. MP Guide No. 11 July, 1999 Rev.1 | BP pressure should not fall below 4.0 kg/cm2 with in 60 Sec. | 4.65 Kg/cm2 |
| 5.9 | Keep Auto Brake Controller (A-9) in Full Service. Press Driver End paddle Switch (PVEF) | | BC comes to '0' | **0** |
| **6.0** | **Direct Brake (SA-9)** | | | |
| 6.1 | Apply Direct Brake in Full Check BC pressure<br>WAG9/**WAP7**<br>WAP5 | CLW's check sheet no. F60.812 Version 2 | **3.5±0.20 kg/cm2**<br>5.15±0.3 kg/cm2 | 3.5 Kg/cm2 |
| 6.2 | Apply Direct Brake, Record Brake Cylinder charging time | D&M test spec. MM3882 & MM3946 | 8 sec. (Max.) | 7 Sec |

**PLW/PATIALA**

**Loco No.: 39409**

| | | | | |
|---|---|---|---|---|
| 6.3 | Check Direct Brake Pressure switch 59 (F) | D&M test spec. MM3882 & MM3946 | 0.20±0.1 kg/cm2 | 0.20 kg/cm2 |
| 6.4 | Release direct brake & BC Release time to fall BC pressure up to 0.4 kg/cm2 | | 10 -15 Sec. | 12 Sec |
| **7.0** | **Modified System Software (only for CCB)** | RDSO letter no. EL/3.2.19/3-phase (CCB), dtd 30.01.2023 | -NA- | -NA- |
| 7.1 | Bail-off de-activated during emergency by any means | | | |
| 7.2 | DPWCS and Non-DPWCS mode enabled | | Multi Loco | Presently not happening in PLW |
| 7.3 | TCAS and Non-TCAS mode enabled | | Not Yet Launched | |
| 7.4 | Penalty brake application deactivated for Fault code 113 (FC 113) and CCB health signal will not drop to avoid loco detention/failure. The Brake Electronics Failure "message will not generate on DDS. | | Pressure Setting Needed is12 kg/sqcm causing mismatching with standard Pr Setting | |
| 7.5 | CCB health signal logic revised (Now will remain high) for penalty condition occurring with FC 108 due to wrong operation/not affecting operation/ Not a CCB Fault (i.e Both controllers selected as LEAD etc) The Brake electronic failure message will not generate on DDS | | | |
| 7.6 | CCB health signal logic for FC 102 (In case of BC request from VCU is more than 90 %-above 9V DC) is changed i.e CCB health signal will not drop for FC 102 which will avoid loco detention/failure. The brake electronic failure message will not generate on DDS. | | Could not performed by M/s Knorr | Presently Not happening in PLW |
| 7.7 | Booting time for CCB with TCAS/TPM/PTWS/DPWCS mode 15-20 sec. However, in case of absence of either one or both system booting time subsequently increased to 40-50 sec. | | | |
| **8.0** | **Sanding Equipment** | | | |
| 8.1 | Check Isolating Cock-134F is in open position. Press sander paddle Switch. (To confirm EP valves Operates) | | Sand on Rail | Ok |
| **9.0** | **Test Vigilance equipment : As per D&M test specification** | | | Ok |

SAMSHER SINGH BIST

Digitally signed by SAMSHER SINGH BIST
Date: 2025.01.27 16:06:54 +05'30'

**Signature of SSE/Shop**

39409

| Roof compnent Cab-1 & Cab-2 | | | | | | |
|---|---|---|---|---|---|---|
| **S.NO.** | **DESCRIPTION** | **PL NO.** | **QPL/Nos.** | **SUPPLIER** | **Sr.No.** | **Warranty** |
| 1 | Pantograph | 25880068 | 2 | Contransys | 15556-10/24, 15561-10/24 | As per PO/IRS Conditions |
| 2 | Servo Motor | 25880068 | 2 | Contransys | 15547-10/24,15555-10/24 | |
| 3 | Air Intake Filter Assembly | 29480103 | 2 | AFI | AFI/OC/546A-06/24, AFI/OC/555A-06/24 | |
| 4 | Insulator Panto Mounting | 29810127 | 8 | BHEL | 06-2024, 07-2024, 08-2024 | |
| | **Middle roof Component** | | | | | |
| 5 | High Voltage Bushing | 29731021 | 1 | Safe System India Ltd | MFG/08/2024/HVB-65 | |
| 6 | Voltage Transformer | 29695028 | 1 | ELIXIR Engineering | 15612409001 | |
| 7 | Vaccum Circuit Breaker | 25712202 | 1 | SCHNEIDER | 226609873-39N2-JUNE/24 | |
| 8 | Insulator Roof Line | 29810139 | 9 | BHEL | 10-2023, 01-2024, 02-2024 | |
| 9 | Harmonic Filter | 29650033 | 1 | TELEMA | TEPL/RHF/009/2024/411 | |
| 10 | Earthing Switch | 29700073 | 1 | PATRA&CHANDA | PCE/SL.No. 81 M/Y - 4/2024 | |
| 11 | Surge Aresster | 29750052 | 2 | C G POWER | 55144-2023, 55146-2023 | |
| | **Air Brake Components** | | | | | |
| 12 | Air Compressor (A,B) | 29511008 | 2 | ELGI | EXFS 923440 A , EXFS 923436 B | |
| 13 | Air Dryer | 29162051 | 1 | TRIDENT | LD2-08-0509-24 | |
| 14 | Auxillary Compressor | 25513000 | 1 | ELGI | BXES 109226 | |
| 15 | Air Brake Panel | 29180016 | 1 | Faiveley | Sep 24-55-WAG9-3635 | |
| 16 | Controller (A,B) | 29180016 | 2 | Faiveley | G 24-012 A , G24-019 B | |
| 17 | Break Up Valve | 29162026 | 2 | Faiveley | | |
| 18 | Wiper Motor | | 4 | Auto Industry | | |

SAMSHER SINGH BIST

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Date: 2025.01.24 17:12:21 +05'30'

**SSE/ABS**

**PLW/PTA**

ELECTRIC LOCO HISTORY SHEET (ECS)

**ELECTRIC LOCO NO: 39409 RLY: ER SHED: HWHE PROPULSION SYSTEM: MEDHA HOTEL LOAD CONVERTER: AAL**

**LIST OF ITEMS FITTED BY ECS**

| SN | DESCRIPTION OF ITEM | ITEM PL NO. | ITEM SR. NO CAB-1/CAB-2 | | MAKE/SUPPLIER |
|---|---|---|---|---|---|
| 1 | LED Based Flasher Light Cab I & II | 29612937 | 4490/4494 | | POWER TECH |
| 2 | Led Marker Light Cab I & II | 29612925 | 4283/4247/4219/4236 | | KEPCO |
| 3 | Cab Heater Cab I & II | 29170011 | 2502/2585 | | TOPGRIP |
| 4 | Crew Fan Cab I & II | 29470080 | 24070084/24070060/24070171/24070180 | | KAPSONS |
| 5 | Master Controller Cab I | 29860015 | 7067 | | WOAMA |
| 6 | Master Controller Cab II | | 7044 | | |
| 7 | Complete Panel A Cab I & II | 29170564 | 1432 | 1447 | KONTACT |
| 8 | Complete Panel C Cab I & II | 29170539 | 3311 | 3323 | KEPCO/MEDHA |
| 9 | Complete Panel D Cab I & II | 29170564 | 1398 | 1395 | KONTACT |
| **10** | **Complete Cubicle- F Panel Cab I & II** | 29178162 | AALN/08/2024/09/CFP7/084 | AALN/08/2024/06/CFP7/081 | AAL |
| 11 | Speed Ind.& Rec. System | 29200040 | 5718/5057 | | MEDHA |
| 12 | Battery (Ni- Cd) | 29680025 | 11415-11440 | | SAFT URJA |
| 13 | Set of Harnessed Cable Complete | 29600418 | | | PPS INTERNATIONAL |
| 14 | Transformer Oil Pressure Sensor (Cab-1) (pressure sensor oil circuit transformer) | 29500047 | TGIC/RE/0042 Oct-24 | TGIC/RE/0046 Oct-24 | TOPGRIP |
| 15 | Transformer Oil Pressure Sensor (Cab-2) | | TGIC/RE/0038 Oct-24 | TGIC/RE/0048 Oct-24 | |
| 16 | Transformer Oil Temperature Sensor (Cab-1)(temperature sensor oil circuit transformer) | 29500035 | BG/TFP/7591 May-2024 | | BG INDUSTRIES |
| 17 | Transformer Oil Temperature Sensor (Cab-2) | | BG/TFP/7700 Jun-2024 | | |
| 18 | Roof mounted Air Conditioner I | 29811028 | SSK/0011 | | ESS ESS KAY |
| 19 | Roof mounted Air Conditioner II | | SSK/0005 | | |
| 20. | RTIS(Real time information system) | | India rail navigator | | Aventel Ltd., India |
| | | | Power supply module | | |
| | | | Rail MSS Terminal | | |

P.L.W. प.ल.क.

SSE/ECS

JE/ECS

## PATIALA LOCOMOTIVE WORKS, PATIALA

### LOCO NO :- 39409/WAP-7/ER/HWHE

| S.N. | Equipment | PL No. | Equipment Serial No. | | Make | |
|---|---|---|---|---|---|---|
| 1 | Complete Shell Assembly with piping | 29171064 | Sr. 04/13, 10/2024 | | SELVOC | |
| 2 | Side Buffer Assly Both Side Cab I | 29130050 | NOT VISIBLE, 04/24 | NOT VISIBLE, 08/24 | AEU | AEU |
| 3 | Side Buffer Assly Both Side Cab II | | NOT VISIBLE, 09/24 | 14, 09/24 | AEU | AEU |
| 4 | CBC Cab I & II | 29130037 | 3710, 10/23 | 3727, 06/24 | FAS | FAS |
| 5 | Hand Brake | | 08/24- 17680 | | Modified Mechwel | |
| 6 | Set of Secondry Helical Spring | 29045034<br>29041041 | | | GBD | |
| 7 | Battery Boxes (both side) | 29680013 | 148, 09/24 | 145, 09/24 | D R STEEL | D R ST |
| 8 | Traction Bar Bogie I | | 5385, 08/24 | | TEW | |
| 9 | Traction Bar Bogie II | | 5407, 08/24 | | TEW | |
| 10 | Centre Pivot Housing in Shell Bogie I side | 29100057 | 8054, 09/24 | | TEW | |
| 11 | Centre Pivot Housing in Shell Bogie II side | | 8059, 09/24 | | TEW | |
| 12 | Elastic Ring in Front in Shell Bogie I side | 29100010 | 197, 07/24 | | AVADH | |
| 13 | Elastic Ring in Front in Shell Bogie II side | | 230, 07/24 | | AVADH | |
| 14 | Main Transformer | 29731008 for WAG 9<br>29731057 for WAP-7 | HRL-77-09-24-10644-016, 2024 | | HRL | |
| 15 | Oil Cooling Radiator I | 29470031 | G-24-70, 07/24 | | BANCO PRODUCTS | |
| 16 | Oil Cooling Radiator II | | G-24-72, 07/24 | | BANCO PRODUCTS | |
| 17 | Main Compressor I with Motor | 29511008 | EXFS 923436, 09/24 | | ELGi | |
| 18 | Main Compressor II with Motor | | EXFS 923440, 09/24 | | ELGi | |
| 19 | Transformer Oil Cooling Pump I | | 5621, 05/24 | | SAMAL HARAND | |
| 20 | Transformer Oil Cooling Pump II | | 5672, 05/24 | | SAMAL HARAND | |
| 21 | Oil Cooling Blower OCB I | 29470043 | FMT/24-25/336, 09/24 | | FORCE MOTION TECHNO | |
| 22 | Oil Cooling Blower OCB II | | FMT/24-25/334, 09/24 | | FORCE MOTION TECHNO | |
| 23 | TM Blower I | 29440075 | 10/24, ME/TMB/M-032-24 | | MECEN ENGG | |
| 24 | TM Blower II | | 10/24, ME/TMB/M-039-24 | | MECEN ENGG | |
| 25 | Machine Room Blower I | 29440105 | 09/24, AC-57447, CGLXGCM10628 | | ACCEL | |
| 26 | Machine Room Blower II | | 09/24, AC-57451, CGLXGCM10635 | | ACCEL | |
| 27 | Machine Room Scavenging Blower I | 29440129 | 07/24, D25-6562, CF25/D6934 | | SAMAL HARAND PVT LT | |
| 28 | Machine Room Scavenging Blower II | | 07/24, D25-6547, CF25/D6919 | | SAMAL HARAND PVT LT | |
| 29 | TM Scavenging Blower Motor I | 29440117 | 09/24, D30-7935, CF30/D8224 | | SAMAL HARAND PVT LT | |
| 30 | TM Scavenging Blower Motor II | | 09/24, D30-7909, CF30/D8193 | | SAMAL HARAND PVT LT | |
| 31 | Traction Convertor I | 29741075 | 5780, 10/24 | | MEDHA | |
| 32 | Traction Convertor II | | 5779, 10/24 | | | |
| 33 | Vehicle Control Unit I | | 3947 | | | |
| 34 | Vehicle Control Unit II | | 3947 | | | |
| 35 | Aux. Converter Box I (BUR 1) | | 3966, 10/24 | | | |
| 36 | Aux. Converter Box 2 (BUR 2 + 3) | | 3966, 10/24 | | | |
| 37 | Axillary Control Cubical HB-1 | 29176645 | SLHB10012407316 | | STESALIT LTD | |
| 38 | Axillary Control Cubical HB-2 | 29176657 | SLHB20012407168 | | STESALIT LTD | |
| 39 | Complete Control Cubicle SB-1 | 29176669 | SLSB10012407477 | | STESALIT LTD | |
| 40 | Complete Control Cubicle SB-2 | 29178174 | SB2/2024/G/0321/1223 | | HIND RECTIFIERS LTD | |
| 41 | Filter Cubical (FB) (COMPLETE FILTER | 29480140 | KPL/CFC/2407/63 | | KAPATRONICS PVT LTD | |
| 42 | Driver Seats | 29171131 | PLW B.No. 218, 10/24-118, 148, 149, 139 | | ABI | |
| 43 | Hotel Load Converter I | 29741087 | 0824030130, 08/24 | | AUTOMETERS ALLAINCE PV | |
| 44 | Hotel Load Converter II | | 0824030129, 08/24 | | AUTOMETERS ALLAINCE PV | |
| 45 | Transformer oil steel pipes | 29230044 | RANSAL PIPES | | | |
| 46 | Hotel Load Contactor I | | 0824030130, 08/24 | | AUTOMETERS ALLAINCE PV | |
| 47 | Hotel Load Contactor II | | 0824030129, 08/24 | | AUTOMETERS ALLAINCE PV | |
| 48 | Conservator Tank Breather Silica Gel | 29731057 | 24-7293, 24-7248 | | YOGYA ENETRPRISES LT | |
| 49 | Ballast Assembly ( only for WAG-9) | 29170163 | | | | |
| 50 | Head Light | 29611908 | 1048, 0767 | | ENSAVE | |
| 51 | IV COUPLER | | 11586/57, 11586/66, 11586/73,11586/61 | | S.INTERNATIONAL | |

NAME Shubham Sharma
SSE/LAS

NAME Karan Singh
JE/LAS/

NAME Ankit
JE/LAS/UF

पी. एल. डब्ल्यू
P.L.W

पटियाला रेलइंजन कारखाना, पटियाला

**PATIALA LOCOMOTIVE WORKS, PATIALA**

**ELECTRIC LOCO CHECK SHEET**

**LOCO NO:** 39409 **Rly:** ER **Shed:** HWHE

| S. No. | ITEM TO BE CHECKED | Specified Value | Observed Value |
|---|---|---|---|
| 1.1 | Check proper Fitment of Hotel Load Converter & its output contactor. | OK | O/K |
| 1.2 | Check proper Fitment of MR Blower 1 & 2, MR Scavenging Blower 1 & 2, TM Blower 1 & 2, TMB Scavenging Blower 1 & 2.<br>TM scavenging blower 1 & 2 & Oil Cooling unit. | OK | O/K |
| 1.3 | Check proper of Fitment of oil cooling unit (OCU). | OK | O/K |
| 1.4 | Check proper Fitment of HB 1 & 2 and its respected lower part on its position. | OK | O/K |
| 1.5 | Check proper Fitment of FB panel on its position. | OK | O/K |
| 1.6 | Check proper Fitment of assembled SB1 & SB2 panel. | OK | O/K |
| 1.7 | Check proper Fitment of Auxiliary converter 1, 2 & 3-(BUR-1, 2 & 3). | OK | O/K |
| 1.8 | Check proper Fitment of Traction converter 1 & 2 (SR-1 & 2). | OK | O/K |
| 1.9 | Check proper fitment, torquing & Locking of Main Transformer bolt. | OK | O/K |
| 1.10 | Check proper fitment of Main compressor both side with the compressor safety wire rope. | OK | O/K |
| 1.11 | Check proper resting of Secondary Helical Springs between Bogie & Shell body. | OK | O/K |
| 1.12 | Check proper fitment of Bogie Body Safety Chains. | OK | O/K |
| 1.13 | Check proper fitment of Cow catcher. | OK | O/K |
| 1.14 | Check coolant level in SR 1 & 2 Expansion Tank. | OK | O/K |
| 1.15 | Check Transformer Oil Level in both conservators Tank (Breather Tank). | OK | O/K |
| 1.16 | Check proper fitment and maintain required gaps from Loco Shell Body of all metallic pipes to avoid any damage during online working of Locomotives. | OK | O/K |
| 1.17 | Check proper fitment of both battery box. | OK | O/K |
| 1.18 | Check for any gap between Main Transformer mounting base & Loco Shell. | OK | O/K |
| 1.19 | Check proper fitment of Push Pull rod its bolt torquing and fitment of fixing cable.<br>As per Drg No 1209-01-113-001 | OK | O/K |
| 1.20 | Secondary Vertical and Lateral Clearance on leveled track at the time of Loco Dispatch.<br>*ELRS/TC/ 0082 (Rev 1) dated 17.09.2015* | Vertical-Std :35-60 mm<br>Lateral Std-45-50 mm | CAB-1: LP 50, ALP 40 / CAB-2: LP 47, ALP 48<br>60, 60, 67, 36 |
| 1.21 | Buffer height: Range **(1090, +15,-5)**<br>**Drg No IB031-02002.** | 1085-1105 mm | FRONT: L/S 1093, R/S 1093<br>REAR: L/S 1098, R/S 1100 |
| 1.22 | Buffer Length: Range (641 mm + 3 to 10 mm with buffer face)<br>**Drg No-SK.DL-3430.** | 641 mm | FRONT: L/S 647, R/S 644<br>REAR: L/S 649, R/S 649 |
| 1.23 | Height of Rail Guard. (114 mm + 5 mm,-12 mm).<br>***As per RDSO Pamphlet Important Bogie Clearances of Electric Locomotives.*** | 114 mm + 5 mm,-12 mm | FRONT: L/S 113, R/S 115<br>REAR: L/S 115, R/S 115 |
| 1.24 | CBC Height: Range (**1090, +15,-5**)<br>**Drg No- IB031-02002.** | 1090, +15 -5 mm | FRONT: 1095<br>REAR: 1095 |

| (Signature of SSE/Elect. Loco ) | (Signature of /JE/Elect Loco) | (Signature of JE/UF) |
|---|---|---|
| NAME SHUBHAM SHARMA | NAME Karan Singh | NAME ANKIT UPPAL |
| DATE 30/10/24 | DATE 30/10/24 | DATE 30/10/24 |

# **Loco No.** 39409

## 1. BOGIE FRAME:

| BOGIE | FRAME NO | Make | PL No. | PO No. & dt. | Warranty Period |
|---|---|---|---|---|---|
| FRONT | SL-205 | ECBT | 29101104 | 102221 | As per PO/IRS conditions |
| REAR | SL-207 | ECBT | 29101104 | 102221 | |

## 2. Hydraulic Dampers (PL No.29040140 ) Make: KONI/KONI

## 3. AXLES:

| AXLE POSITION NO | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| MAKE/ S.NO | PLW 27454 | PLW 27209 | PLW 26941 | PLW 26923 | PLW 27226 | PLW 26717 |
| Ultrasonic Testing | OK | OK | OK | OK | OK | OK |

## 4. WHEEL DISCS NO. AND TYPE & BULL GEAR

| AXLE POSITION NO | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| GEAR END | EOH5-32 | 31020 | EOI2-72 | EOI0-024 | EOG7-072 | ENE0-073 |
| Make | IMPORTED | DP | IMPORTED | IMPORTED | IMPORTED | IMPORTED |
| FREE END | EOH0-62 | 30659 | EOH4-01 | EOH8-040 | EOH5-043 | EOH4-025 |
| Make | IMPORTED | DP | IMPORTED | IMPORTED | IMPORTED | IMPORTED |
| Bull Gear No. | 5551 | 23-M-16132 | 23-M-12143 | 5617 | 23-M-10173 | 5593 |
| Bull Gear Make | GGAG | KPCL | KPCL | GGAG | KPCL | GGAG |

## 5. AXLE ROLLER BEARING (CRU) **(PL No. 29010020, Warranty: As per PO/IRS conditions )**

| AXLE POSITION NO | | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Gear End | MAKE | NBC | NBC | NBC | NBC | NBC | NBC |
| | PO NO. & dt | 02875 | 02875 | 02875 | 02875 | 02875 | 02875 |
| Free End | MAKE | NBC | NBC | NBC | NBC | NBC | NBC |
| | PO NO. & dt | 02875 | 02875 | 02875 | 02875 | 02875 | 02875 |

## 6. WHEEL DISC PRESSING PRESSURE IN KN: (SPECIFIED 80-105 T)

| AXLE POSITION NO | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| BULL GEAR END | 785 KN | 855 KN | 813 KN | 1010 KN | 852 KN | 994 KN |
| FREE END | 828 KN | 827 KN | 794 KN | 857 KN | 1002 KN | 996 KN |

# **Loco No.** 39409

**7. DIAMETER AFTER PROFILE TURNING: SPECIFIED 1092 + 5 mm – 0 mm**

| AXLE POSITION NO | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| DIA IN mm GE | 1092.5 | 1092.5 | 1092.5 | 1092.5 | 1092.5 | 1092.5 |
| DIA IN mm FE | | | | | | |
| WHEEL PROFILE GAUGE (1596±0.5mm) | OK | OK | OK | OK | OK | OK |

**8. SUSPENSION TUBE & ITS TAPER ROLLER BEARING:**

| AXLE POSITION NO | | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| S.T. PL 29100288 | MAKE | KM | KM | IN | KPE | IN | IN |
| GE Brg. PL 29030110 | MAKE | FAG | FAG | FAG | FAG | FAG | FAG |
| FE Brg. PL 29030110 | MAKE | FAG | FAG | FAG | FAG | FAG | FAG |

**9. GEAR CASE (PL No. 29030018) & BACKLASH:**

| AXLE POSITION NO | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| MAKE | KM | KPE | KPE | KM | KPE | KPE |
| BACKLASH (0.254 – 0.458mm) | 0.280 | 0.280 | 0.275 | 0.265 | 0.300 | 0.275 |

**10 A/BOX TO BOGIE FRAME LATERAL CLEARANCES** (SPECIFIED 15.0 to 19.0mm):

| AXLE POSITION NO | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| RIGHT SIDE | 16.36 | 16.74 | 15.48 | 15.98 | 18.11 | 15.71 |
| LEFT SIDE | 15.65 | 17.90 | 17.25 | 16.43 | 15.94 | 16.51 |

**11. TRACTION MOTOR: (PL No.29942007, Warranty: As per PO/IRS conditions)**

| AXLE POSITION NO | MAKE | PO No. & date | S. NO. |
|---|---|---|---|
| 1 | SAINI | 101654 | 202122403 |
| 2 | SAINI | 101654 | 202032403 |
| 3 | TMS | - | PLW-2946 |
| 4 | DR | 102509 | DR48/0624C0027 |
| 5 | TMS | - | PLW-2970 |
| 6 | TMS | - | PLW-2936 |

SSE/ Bogie Shop

## TOP 13 COSTLIEST ITEMS OF WAP-7 LOCO WITH WARRANTY CONDITIONS AS PER TENDERS

| S No | PL No | DESCRIPTION | Warranty Period |
|---|---|---|---|
| 1 | 29741075 | IGBT BASED 3-PHASE DRIVE PROPULSION EQUIPMENT | 60 months after commissioning or 72 months from date of supply whichever earlier as per special conditions given by CLW |
| 2 | 29741087 | 2X500KVA IGBT Based Hotel Load Converter to CLW Specn. no. CLW/ES/3/IGBT/0490 aLT.D (REV.1) issued on December,2017 | As per clause no. 3.1.6 of CLW SPECN. NO. CLW/ES/3/IGBT/0490 ALT.D REV.1 ISSUED ON DEC-2017. [60 months after commissioning or 72 months from date of supply whichever earlier] |
| 3 | 29731057 | MAIN TRANSFORMER 7775 KVA TYPE LOT 7500 FOR WAP7 3- PHASE ELECTRIC LOCOMOTIVE TO CLW SPECN NO.CLW/ES/3/0660/C | AS PER IRS CONDITIONS OF CONTRACT [i.e. 30 MONTHS FROM THE DATE OF SUPPLY OR 24 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER] WILL BE APPLICABLE. |
| 4 | 29171064 | COMPLETE SHELL ASSLY (PIPED & PAINTED) FOR WAP-7 LOCO TO CLW SPEC. NO. CLW/MS/3/152 ALT-8 | AS PER IRS CONDITIONS-30 MONTHS FROM THE DATE OF SUPPLY OR 24 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER. |
| 5 | 29600418 | SET OF HARNESSED CABLE FOR 3-PHASE ELECTRIC LOCOMOTIVES TO CLW SPECN. NO. CLW/ES/03/646 ALT-NIL WITH DMW REQUIREMENT OF HARNESSED CABLE FOR WAP-7, ALT-A1 DATED 27/11/2018. | As per clause no.9 of CLW Specn. CLW/ES/3/0458 & Clause No.10 of CLW Specn.-CLW/ES/3/0459. [18 months after commissioning or 20 months from date of supply for single core & 18 months after commissioning or 24 months from date of supply for multi core] |

| | | | |
|---|---|---|---|
| 6 | 29180016 | BRAKE CONTROL SYSTEM INCLUDING DRIVER'S VIGILANCE CONTROL DEVICE TO SET LIST NO.EL29180016. | As per specification no. CLW/MS/3/001 Alt. 16 i.e. the manufacturer is required to guarantee that the brakevalves/equipment work satisfactorily for a period of five (5) years after commissioning. Any equipment/part which failsduring the guarantee period shall be replaced free of cost by the manufacturer. The replaced components shallfurther be under warranty for five (5) years from the date of their fitment and should the replaced components proveunsatisfactory in service, they shall be replaced by modified and improved components by the supplier free of cost. |
| | | | |
| 7 | 29480140 | COMPLETE FILTER CUBICLE ALONG WITH ALL EQUIPMENTS AND CABLING TO DRG./SPEC NO. [1] CLW/ES/3/0193 ALT-F OR LATEST AND CLW DRG. NO. 1209-15-143-004 ALT-10 AND PART DRG./SPEC NO AS PER ANNEXURE-A ATTACHED. | AS PER IRS CONDITIONS OF CONTRACT [i.e. 30 MONTHS FROM THE DATE OF SUPPLY OR 24 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER] WILL BE APPLICABLE. |
| | | | |
| 8 | 29942007 | 3-PHASE ASYNCHRONOUS TRACTION MOTOR (RESISTANCE RING MECHANICALLY INTERLOCKED TO END PLATE DESIGN ROTOR, SCHEME-II), TYPE 6FRA-6068 FOR WAP-7 ELECTRIC LOCO WITHOUT ACTIVE SPEED SENSOR TO SPECIFICATION NO. 4TMS.096.081 ALT-2 AND STR NO. CLW/2008/3PHTM/STR/0001. | AS PER IRS CONDITIONS OF CONTRACT [i.e. 30 MONTHS FROM THE DATE OF SUPPLY OR 24 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER] WILL BE APPLICABLE. |
| | | | |

| | | | |
|---|---|---|---|
| 9 | 29105146 | Bogie Frame Complete for WAP-7 for 3 Phase Co Co Locomotive to CLW specification No. CLW/MS/3/Bogie/003 alt-1 and CLW Drg.No.1209.01.112-202 Alt-Nil | As per clause 16 of Spec.No.CLW/MS/3/Bogie/003 Alt-1. [60 months after commissioning or 72 months from date of supply] |
| | | | |
| 10 | 29171192 | COMPLETE AUXILIARY CUBICLE HB2 ALONG WITH ALL EQUIPMENTS AND CABLING TO CLW SPEC.NO.CLW/ES/3/0192 ALT-E OR LATEST FOR WAP7 LOCO WITH HOTEL LOAD WITH BARE CUBICLE AS PER CLW SPEC.NO.CLW/MS/3/155 ALT-NIL. | AS PER IRS CONDITIONS OF CONTRACT [i.e. 30 MONTHS FROM THE DATE OF SUPPLY OR 24 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER] WILL BE APPLICABLE. |
| | | | |
| 11 | 29171210 | COMPLETE CONTROL CUBICLE SB2 ALONG WITH ALL EQUIPMENTS AND CABLING (EXCLUDING CONTROL ELECTRONICS) TO CLW SPECN. NO. CLW/ES/3/0195/A ALT-H OR LATEST FOR WAP7 LOCO WITH HOTEL LOAD | AS PER IRS CONDITIONS OF CONTRACT [i.e. 30 MONTHS FROM THE DATE OF SUPPLY OR 24 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER] WILL BE APPLICABLE. |
| | | | |
| 12 | 29171209 | COMPLETE CONTROL CUBICLE SB1 (PUSH PULL SCHEME COMPLIANT) ALONG WITH ALL EQUIPMENTS AND CABLING (EXCLUDING CONTROL ELECTRONICS) TO CLW SPECN. NO. CLW/ES/3/0194 ALT-G OR LATEST FOR WAP7 LOCO WITH HOTEL LOAD | AS PER IRS CONDITIONS OF CONTRACT [i.e. 30 MONTHS FROM THE DATE OF SUPPLY OR 24 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER] WILL BE APPLICABLE. |
| | | | |
| 13 | 29171180 | COMPLETE AUXILIARY CUBICLE HB1 ALONG WITH ALL EQUIPMENTS AND CABLING TO CLW SPEC.NO.CLW/ES/3/0191 ALT-D OR LATEST FOR WAP7 LOCO WITH HOTEL LOAD WITH BARE CUBICLE AS PER CLW SPEC.NO.CLW/MS/3/155 ALT-NIL. | AS PER IRS CONDITIONS OF CONTRACT [i.e. 30 MONTHS FROM THE DATE OF SUPPLY OR 24 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER] WILL BE APPLICABLE. |

भारत सरकार
GOVERNMENT OF INDIA
रेल मंत्रालय
MINISTRY OF RAILWAYS
पटियाला रेलइंजन कारखाना
PATIALA LOCOMOTIVE WORKS

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PATIALA, 147003, INDIA

आज़ादी का अमृत महोत्सव

(An ISO 9001, ISO 14001, ISO 45001 & ISO 50001, 5S & Green Building certified Organization)

**No. PLW/M/ECS/Tech/Kavach** **Date: As signed**

**(Through Mail)**

**Sr. Div. Electrical Engineer,**
**Electric Loco Shed, Howrah.**

**Email: srdeetrshwh@gmail.com**

**Sub:- Fitment of KAVACH in three Phase Electric Loco. No. 39409 WAP-7.**
**Ref:- (i). Director General Stds./Electrical/RDSO letter no. EL/0.1.3/3 dated 21.08.2023.**
**(ii).Director General Stds./Electrical/RDSO letter no. EL/0.1.3/3 dated 26.09.2023**

In ref. to the above letter's Loco No. 39409 has been dispatched with fittings for implementation of KAVACH system in locomotive at home shed in Zonal Railway. This Loco was dispatched to ELS/HWH/ER on 11.12.2024. The details of fittings are attached as Annexure-A (pneumatic fittings), Annexure-B (Kavach equipment mounting Brackets) & Annexure-C (Wago with harnessed lay out).

This is for your information & necessary action please.

14.1.25
(निशांत बंसीवाल)
उप मुख्य विद्युत अभियंता/लोको

**प्रतिलिपि:-**

**CEE/Loco & CEE/D&Q, CMM, CELE/ER:-** for kind information please
**Dy CME/Design, Dy. CMM/Depot:** for information & necessary action please
**WM/LAS, AWM/LFS&ABS, WM/ECS:** for necessary action please

Annexure-A

Loco No. 39409

| SN | PL No | Description of item | Qty. |
|---|---|---|---|
| 1 | 29163341 | ISOLATING COCK 3/8" (FEMALE) LEGRIS TYPE WITH VENT | 04 nos. |
| | | ISOLATING COCK 3/8" (FEMALE) LEGRIS TYPE WITHOUT VENT | 02 nos. |
| 2 | 29611994 | TEE UNION 3/8"X3/8"X3/8" BRASS FITTINGS | 02 nos. |
| | | MALE CONNECTORS 3/8" TUBE OD X 3/8" BSPT, BRASS FITTINGS | 09 nos. |
| | | MALE CONNECTORS 1/2" TUBE OD X 1/2" BSPT, BRASS FITTINGS | 06 nos. |
| | | FEMALE CONNECTORS (NYLON TUBE) DIA 6 TUBE X 3/8" BSPP BRASS FITTINGS | 01 no. |
| | | MALE CONNECTOR (NYLON TUBE) DIA 6 TUBE X 3/8" BSPP BRASS FITTINGS | 03 nos |
| | | FEMALE TEE 3/8" BSPP – BRASS | 06 nos |
| | | HEX PLUG -3/8" BSPT – BRASS | 02 nos |
| | | FEMALE TEE 1/2" BSPP – BRASS | 04 nos |
| | | HEX NIPPLE 3/8X3/8" BSPT – BRASS | 04 nos |
| | | RED HEX NIPPLE 3/8X1/2" BSPT - BRASS | 02 nos |
| | | HEX PLUG – 1/2" BSPT – BRASS | 04 nos |
| | | MALE ELBOW CONNECTORS 3/8" TUBE OD X 3/8) BSPT. BRASS FITTINGS | 02 nos |
| 3 | 29170114 | Copper Tube OD 9.52mm (3/8" ) X 1.245 Mm W.T X 6 Mtr | 1.2Mtr |

AWM/ABS & LFS

SSE/G/ABS

पी.एल.डब्ल्यू

P. L. W

Loco No. 39409

**Annexure-B**

| SN | PL No. | Description of item | Quantity |
|---|---|---|---|
| 1. | 29611945 | Mounting bracket arrangement provided for RF Antenna on the roof top of both driver cabs. | 04 nos. |
| 2. | | Mounting bracket arrangement provided for GPS/GSM Antenna on the roof top of both driver cabs. | 02 nos. |
| 3. | | Protection Guards for RFID reader provided behind the cattle guards of both side. | 04 nos. |
| 4. | | Inspection door with latch provided on the both driver desk covers (LP side) in each cab to access isolation cock. | 02 nos. |
| 5. | | Cable Entry Plate fitted for routing of cable with RF Antenna & GPS/GSM Antenna bracket. | 06 nos. |
| 6. | - | WAGO bracket fitted in Machine room at back side of SB-1. | 01 no. |
| 7. | - | One circular hole of 80 mm dia. provided in each cabs on LP side behind the driver desk toward the wall for routing of OCIP (DMI) cables. | 02 nos. |
| 8. | - | 80 mm holes provided on TM1 and TM6 Junction box inspection cover hole for drawing of RFID reader cables. | 02 nos. |
| 9. | - | DIN Rail fitted inside the driver desk (LP Side) | 02 nos. |

AWM/ABS&LPS

SSE/G/LFS

**Annexure-C**

| SN | PL No. | Description of item | Quantity |
|---|---|---|---|
| 1. | 42310301 | Flexible conduit size 25mm$^2$ provided for RF-1, 2 & GPS Antenna cable layout from CAB-1&2 to Machine room. | 06 meter |
| 2. | 29611982 | Wago terminals in CAB-1&2 (25 nos. in each CAB). | 50 nos. |
| 3. | 29611982 | Wago terminal in Machine room at back side of SB-1. | 75 nos. |
| 4. | - | Harness provided from KAVACH SB to SB-1 | 07 wires |
| 5. | - | Harness provided from KAVACH SB to SB-2 | 05 wires |
| 6. | - | Harness provided from KAVACH SB to Pneumatic Panel | 12 wires |
| 7. | - | Harness provided from KAVACH SB to CAB-1 | 24 wires |
| 8. | - | Harness provided from KAVACH SB to CAB-2 | 16 wires |

AWM/ECS

SSE/G/ECS