| PROJECT | CUSTOMER | VEHICLE |
|---|---|---|
| **Xtrapolis-PRASA** | **PRASA** | **236 – M4 – VFT** |

# RTR Vehicle Functional Static Testing TS236 M4 Report

# GIB0000006970


| | CREATED | VERIFIED | APPROVED | DISTRIBUTION |
|---|---|---|---|---|
| **Name** | Vusumuzi ZULU | Sifiso LUKHELE | Kgomotso NKOANA | Confidentiality Category<br>*Restricted* ☐ *Project* ☐ *Normal* ☑ |
| **Date** | 20/07/2024 | 20/07/2024 | 20/07/2024 | Control Category<br>*Controlled* ☑ *Not Controlled* ☐ |
| **Signature** | | | | Language<br>**EN** |

**This report has been automatically generated from TES version 1**

## Table of modifications

| Rev | Date | Modifications Content | Writer |
|---|---|---|---|
| A0 | 20/07/2024 | Creation | Vusumuzi ZULU |

## Internal validations

| | Name | Function | Date | Signature |
|---|---|---|---|---|
| **Creator** | Vusumuzi ZULU | EPU Manager | 20/07/2024 | X<br>Vusumuzi ZULU<br>EPU Manager |
| **Verifier** | Sifiso LUKHELE | Serial Test Manager | 20/07/2024 | X<br>Sifiso LUKHELE<br>Serial Test Manager |
| **Approver** | Kgomotso NKOANA | Test Expert | 20/07/2024 | X<br>Kgomotso NKOANA<br>Test Expert |

## Execution Plan

| | |
|---|---|
| **Start Date** | 17/07/2024 |
| **End Date** | 17/07/2024 |

## Contents

## Section 1 – Purpose / Objectives

1. Energy Distribution

Ensure the distribution of 110Vdc and 400Vac through the vehicle from the battery and Auxiliary converter

2. TCMS Network

Verify the working of the TCMS network and its core elements, i.e TRS, CRS.

3. Cabin Control

Verify the cabin control functions in both normal and backup modes, their commanding of the train lines, and the TCMS response to each function.

4. Internal Lighting

Verify the working of all internal lighting functions.

5. PACIS System

Verify power supply to all PACIS network equipment.

6. Train-Ground Communication

Setup the Train-to-ground systems, and verify correct installation of the antennas by VSWR test.

7. Rescue Mode and Emergency Disconnection

The objective of this procedure is to verify the correct operation of the emergency disconnection function, as well as the correct activation of the Back-Up mode.

10. Emergency Brake

The objective of this procedure is to verify all electrical components of the Emergency braking system.

11. Service Brake

The objective of this procedure is to verify all electrical components of the Service brake system.

12. Holding and Parking Brake

The objective of this procedure is to verify all electrical components of the Parking/holding brake system.

13. Passenger Doors

The objective of this procedure is to ensure the proper operation of the train doors.

14. Air Conditioning

Verify the voltage distribution to and correct operation of the HVAC system

15. Fire protection

The objective of this procedure is to verify the configuration of the fire detection units, as well as the presence of the safety resistor in the auxiliary converter.

16. Traction and Electric Brake

The objective of this procedure is to verify all the train lines associated with the traction and electric brake systems of the train

18. Vehicle Normalization

The objective of this procedure is to ensure that all connectors, panels a8nd covers are normalized.

## Section 2 – Energy Distribution

### 2.2 Instructions list

### 2.2.1 015_NRG-Energy Distribution

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Energy Distribution (SPP=015) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Initial Conditions | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | I | All the Circuit Breakers should be OPEN | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | I | Test bench should be connected but with no power supply | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | I | NO 400Vac should be connected to the car | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | A | Close Circuit Breaker 15Q3 (Normal Line) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | I | Voltage Isolation 110Vdc | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | I | 230Vac and 400Vac Circuit breakers | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | A | Close Circuit Breaker 13Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | A | Close the circuit breaker 13Q3 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10011 | I | Normal and Permanent Power Supply | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10012 | I | 110Vdc Permanent Train Line<br>Apply 110Vdc on -93XT304_1 pin 4 to simulate Permanent Train Line | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10013 | A | Apply 110Vdc on the Normal Line using the external power supply | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10014 | A | Measure 110Vdc between 90XR50.X1/1 (+) and 90XR50.X2/1 (-) (intercar connector).<br>[Normal line] | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10015 | I | Permanent Line Circuit Breakers | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10016 | A | Close Circuit Breaker 15Q4 for battery voltage above 80Vdc and close it(permanent Line) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10017 | I | 230Vac Circuit Breakers | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10018 | A | Close Circuit Breaker 13Q2 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10019 | A | Close Circuit Breaker 13Q3 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10020 | I | 230Vac and 400Vac Voltage Supply | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10021 | A | Apply 400Vac to the Vehicle, either on End1 or End2 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10022 | A | Perform a phase rotation measurement on Connector 90XR62 between phases U(X3),V(X2),W(X1) and ensure the rotation is in the correct direction | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10023 | R | Phase rotation between U,V,W is correct | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10024 | A | Perform a phase rotation measurement on Connector 90XR52 between phases U(X1),V(X2),W(X3) and ensure the rotation is in the correct direction | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10025 | R | Phase rotation between U,V,W is correct | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10026 | A | Check 230Vac between points L and N of socket -13XT1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10027 | R | 230Vac present | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10028 | A | Check 230Vac between points L and N of socket -13XT2 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10029 | R | 230Vac present | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10030 | A | Remove connector 57XP1_10 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10031 | A | Remove connector 93XP150 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10032 | A | Close circuit breaker 34Q1 and 57Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10033 | A | Check 400Vac +-5% tolerance between Phases (W,V,U) on connector 57XP1_10 (10.b1,10a2,10a1) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10034 | R | 400Vac +- 5% tolerance is measured between all three phases of 57XP1_10 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10035 | A | Check 400Vac +-5% tolerance between Phases (W,V,U) on connector 93XP150 (E2,E3,E1) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10036 | R | 400Vac +- 5% tolerance is measured between all three phases on connector 93XP150 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10037 | A | Put back connector 57XP1_10 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10038 | A | Put back connector 93XP150 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10039 | A | Switch off the 400Vac power supply from the socket | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10040 | I | Auxiliary Converters Command | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10041 | A | Battery Connection Train Lines<br>Measure continuity between<br>END 1 90XR14 pin 30<br>END 2 90XP24 pin 30 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10042 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10043 | A | Battery Disconnection Train Lines<br>Measure continuity between<br>END 1 90XR14 pin 31<br>END 2 90XP24 pin 31 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10044 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10045 | A | IES StatusTrain Lines<br>Measure continuity between<br>END 1 90XR15 pin 61<br>END 2 90XP25 pin 61 and<br>END 1 90XR15 pin 62<br>END 2 90XP25 pin 62 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10046 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

# Section 3 – TCMS Network

## 3.2 Instructions list

### 3.2.1 025_NET-TCMS Network

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | TCMS Network (SPP=25) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10002 | I | Initial conditions | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10003 | I | Vehicle test bench should be configured as TC1:<br>1. TC1 Dataplugs<br>2. MCE switch set to TC1 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10004 | A | 110Vdc supply to the Normal Train line is ON | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10005 | I | Power Supply to the Router Switches | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10006 | I | Power supply to the 25A10 SWITCH ETHERNET (CRS1) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10007 | A | Close Circuit Breaker 25Q10 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10008 | R | CRS1 25A10 is ON | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10009 | I | Power supply to the 25A11 SWITCH ETHERNET (CRS2) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10010 | A | Close Circuit Breaker 25Q11 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10011 | R | CRS2 25A11 is ON | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10012 | I | Power supply to the 25A14 ETHERNET REPEATER (TBR) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10013 | A | Close Circuit Breaker 25Q14 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10014 | R | TBR 25A14 is ON | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10015 | A | Close Circuit Breaker 25Q6 | | OK | | Sinazo Mkhwa - 529940 | M4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10016 | A | Close Circuit Breaker 25Q7 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10017 | I | Ethernet Loop | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10018 | A | For each CRS, check that the Ethernet Loop LEDs are flashing | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10019 | R | CRS1 has LEDs on ports X3 and X4 flashing | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10020 | R | CRS2 has ONLY LED on port X4 flashing | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10021 | R | Check on the Test Bench DDU that all Router Switches are available on the network | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10022 | I | Power Supply to the BRIOMS | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10023 | I | Power supply to the 25A6 BRIOM 40/10 ETH 6 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10024 | R | BRIOM 25A6 is ON | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10025 | A | Check visually that ground braid is connected to BRIOM | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10026 | I | Power supply to the 25A7 BRIOM 40/10 ETH 7 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10027 | R | BRIOM 25A7 is ON | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10028 | A | Check visually that ground braid is connected to BRIOM | | OK | | Sinazo Mkhwa - 529940 | M4 |

# Section 4 – Cabin Control

## 4.2 Instructions list

### 4.2.1 020_CAB-Cabin Control

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Cabin Control (SPP=020) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Train Lines | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | A | Cab Selected On Train - Train Lines<br><br>Measure continuity between<br>END1 90XR14 pin 3<br>END2 90XP24 pin 3 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | R | Both pins are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | A | Cab Active TC1 Train Lines<br><br>Measure continuity between<br>END1 90XR14 pin 4<br>END2 90XP24 pin 4 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | R | Both pins are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | A | Cab Active TC2 Train Lines<br><br>Measure continuity between<br>END1 90XR14 pin 5<br>END2 90XP24 pin 5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | R | Both pins are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | A | Master Key TC1 Train Lines<br><br>Measure continuity between<br>END1 90XR14 pin 17<br>END2 90XP24 pin 17 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | R | Both pins are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

# Section 5 – Internal Lighting

## 5.2 Instructions list

### 5.2.1 052_LGT-Internal Lighting

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Internal Lighting (SPP=52) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10002 | I | Initial Conditions | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10003 | I | 110Vdc Normal line is ON | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10004 | I | Cleaning Lighting Command | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10005 | A | 110Vdc Permanent Train Line<br><br>Apply 110V on 93XT304_1 pin 4 to simulate permanent supply | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10006 | A | Close Circuit Breaker 52Q3 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10007 | A | Close Circuit Breaker 52Q4 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10008 | A | Close Circuit Breaker 52Q5 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10009 | R | All saloon emergency lights (low intensity) are OFF on all light modules (Left + Right). | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10010 | A | Turn Cleaning Staff Lights Switch 52S6 to ON position | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10011 | R | All saloon emergency lights (low intensity) are "ON" on all light modules (Left + Right). | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10012 | A | Reset Circuit Breaker 52Q5 (Open and Close) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10013 | A | Close Circuit Breaker 52Q1 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10014 | A | Close Circuit Breaker 52Q2 | | OK | | Sinazo Mkhwa - 529940 | M4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10015 | R | All saloon emergency lights (low intensity) are "ON" on all light modules (Left + Right). | | OK | | Sinazo Mkhwa - 529940 | M4 |

# Section 6 – PACIS System

## 6.2 Instructions list

### 6.2.1 054_PIS-PACIS System

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | PACIS System IO (SPP=054) | | OK | | Mlungisi Madela - 529927 | M4 |
| 10002 | I | Initial conditions | | OK | | Mlungisi Madela - 529927 | M4 |
| 10003 | I | 110Vdc Normal line is connected and ON | | OK | | Mlungisi Madela - 529927 | M4 |
| 10004 | I | Circuit Breakers | | OK | | Mlungisi Madela - 529927 | M4 |
| 10005 | A | Close Circuit Breaker 54Q1 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10006 | A | Close Circuit Breaker 54Q2 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10007 | A | Close Circuit Breaker 54Q10 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10008 | A | Close Circuit Breaker 54Q11 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10009 | A | Close Circuit Breaker 55Q2 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10010 | A | Close Circuit Breaker 55Q3 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10011 | R | All 'Pacis System' circuit breakers are closed | | OK | | Mlungisi Madela - 529927 | M4 |
| 10012 | I | Power Supply of Router Switches | | OK | | Mlungisi Madela - 529927 | M4 |
| 10013 | I | Ethernet Switch CRS1 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10014 | R | CRS1 is ON | | OK | | Mlungisi Madela - 529927 | M4 |
| 10015 | I | Ethernet Switch CRS2 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10016 | R | CRS2 is ON | | OK | | Mlungisi Madela - 529927 | M4 |
| 10017 | I | DPAI-1 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10018 | R | DPAI-1 is ON | | OK | | Mlungisi Madela - 529927 | M4 |
| 10019 | I | DPAI-2 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10020 | R | DPAI-2 is ON | | OK | | Mlungisi Madela - 529927 | M4 |
| 10021 | I | Lateral Display 'LAT1' | | OK | | Mlungisi Madela - 529927 | M4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10022 | R | The PWR (power) LED is "ON" on the Lateral Display 'LAT1'. | | OK | | Mlungisi Madela - 529927 | M4 |
| 10023 | I | Lateral Display 'LAT2' | | OK | | Mlungisi Madela - 529927 | M4 |
| 10024 | R | The PWR (power) LED is "ON" on the Lateral Display 'LAT2'. | | OK | | Mlungisi Madela - 529927 | M4 |
| 10025 | I | Interior Display 'INT1' | | OK | | Mlungisi Madela - 529927 | M4 |
| 10026 | R | The PWR (power) LED is "ON" on the Interior Display 'INT1'. | | OK | | Mlungisi Madela - 529927 | M4 |
| 10027 | I | Interior Display 'INT2' | | OK | | Mlungisi Madela - 529927 | M4 |
| 10028 | R | The PWR (power) LED is "ON" on the Interior Display 'INT2' is ON. | | OK | | Mlungisi Madela - 529927 | M4 |
| 10029 | I | Impedance of Loudspeaker | | OK | | Mlungisi Madela - 529927 | M4 |
| 10030 | I | Saloon Speakers Commanded by DPAI-1 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10031 | A | Measure the impedance connector '54XP1_X4' between pins: z32(+) and z30 (-). | | OK | | Mlungisi Madela - 529927 | M4 |
| 10032 | R | Impedance<br>Result Max : x <= 32.00 (Ohm) | | OK | 29.6 | Mlungisi Madela - 529927 | M4 |
| 10033 | I | Saloon Speakers Commanded by DPAI-2 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10034 | A | Measure the impedance connector '54XP2_X4' between pins: z32(+) and z30 (-). | | OK | | Mlungisi Madela - 529927 | M4 |
| 10035 | R | Impedance<br>Result Max : x <= 32.00 (Ohm) | | OK | 29.9 | Mlungisi Madela - 529927 | M4 |

# Section 7 – Train Ground Communication

## 7.2 Instructions list

### 7.2.1 062_ETS-ERTMS

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | ERTMS (SPP=062) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | A | ERTMS Bypass Train Lines<br><br>Check continuity between<br>END1 90XR14 pin 11<br>END2 90XP24 pin 11 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | R | Both pins are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | A | Emergency Brake ERTMS 1 Train Lines<br><br>Check continuity between<br>END1 90XR14 pin 18<br>END2 90XP24 pin 18 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | R | Both pins are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | I | Emergency Brake ERTMS 2 Train Lines<br><br>Check continuity between<br>END1 90XR14 pin 20<br>END2 90XP24 pin 20 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | R | Both pins are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | I | Eurobalise Antenna Cable | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | A | Check continuity between [Inter-car (LOCAL: +END1; Connector -90XR10) and Inter-car (LOCAL: +END2; connector -90XP20)] according to the image below. |  | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | R | Eurobalise Antenna cable is correctly configured | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

# Section 8 – Rescue Mode and Emergency Disconnection

## 8.2 Instructions list

### 8.2.1 027_ERM-Rescue Mode and Emergency Disconnection

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Rescue Mode and Emergency Disconnection (SPP=027) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Backup Mode | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | R | Points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | A | Check continuity on Timer 27D1 between points A4 and B3 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | A | Backup Mode Train Lines<br><br>Check continuity between<br>END1 90XR15 pin23<br>END2 90XP25 pin 23 and<br>27K1 A1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | R | All points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | A | Check continuity between 27K1 A2 and Ground | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | R | The points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | I | Emergency Disconnection | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | A | Emergency Disconnection Train Lines<br><br>Check continuity between<br>END1 90XR15 pin24<br>END2 90XP25 pin 24 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10011 | R | All points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

# Section 9 – Emergency Brake

## 9.2 Instructions list

### 9.2.1 044_UBK-Emergency Brake

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Emergency Brake (SPP=044) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Initial Conditions | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | I | No PEAs are activated | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | I | 110Vdc Normal power supply should be connected to the vehicle and ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | I | Visual Inspection | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | A | Physically and visually inspect all the Disk Break Units (DBU) and brake pads, to ensure they are securely fitted. |  | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | R | All the brake DBUs are correctly installed, and all the brake pads are correctly installed and locked. | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | A | Check the piping installation | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | R | All the pipes are installed on the vehicle | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | A | Check all the Passenger Emergency Alarm handles, and ensure they are connected to their respective connectors | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10011 | R | All the PEAs are installed and connected | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10012 | I | Train Lines | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10013 | A | Emergency Brake Loop Train Lines<br><br>Check continuity between<br>END1 90XR24 pin 8<br>END2 90XP34 pin 8 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10014 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10015 | A | Emergency Brake Loop Override Train Lines<br><br>Check continuity between<br>END1 90XR24 pin 9<br>END2 90XP34 pin 9 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10016 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10017 | I | Emergency Brake Train Line<br><br>Check continuity between<br>END1 90XR25 pin 67<br>END2 90XP35 pin 67 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10018 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10019 | A | PEA Loop OTDR Train Lines<br><br>Check continuity between<br>END1 90XR24 pin 10<br>END2 90XP34 pin 10 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10020 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10021 | A | PEA Loop Train Lines<br><br>Check continuity between<br>END1 90XR25 pin 95<br>END2 90XP35 pin95 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10022 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10023 | A | Close Circuit breaker 44Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

# Section 10 – Service Brake

## 10.2 Instructions list

### 10.2.1 040_SBK-Service Brake

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Service Brake (SPP=040) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Initial Conditions | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | I | No air supply to the vehicle | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | I | All brake panel cocks are in normal position (not isolated) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | I | 110Vdc Normal power supply should be connected to the vehicle and ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | I | Follow the procedure in the document below to upload software onto the TBCU electronic. | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | I | Power Supply | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | A | Remove the connector 10XR12_XCB2 from the propulsion box | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | A | Close Circuit Breaker 33Q1, 33Q3 and 33Q5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | A | Check the voltage on connector 10XR12_XCB2 between pins 4 (+) and 69 (-) ; 4(+) and 67(-); and 5(+) and 68(-) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10011 | R | Battery Voltage (above 80Vdc) is measured on connector 10XR12_XCB2 between pins 4 (+) and 69 (-) ; 4(+) and 67(-); and 5(+) and 68(-) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10012 | A | Open Circuit Breaker 33Q1 and 33Q3, Replace connector 10XR12_XCB2 on the propulsion box, and Close Circuit breaker 33Q1 and 33Q3 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10013 | A | Remove the connector -40XP2_C2_16 from pneumatic brake panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10014 | A | Close Circuit Breaker 40Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10015 | A | Check the voltage on connector 40XP2_C2_16 between pins 13 (+) and 31 (-) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10016 | R | Battery Voltage (above 80Vdc) is measured on connector 40XP2_C2_16 between pins 13 (+) and 31 (-) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10017 | A | Open Circuit Breaker 40Q1, Replace connector -40XP2_C2_16 on the pneumatic brake panel, and Close Circuit breaker -40Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10018 | R | The pneumatic brake panel 40A2 is ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10019 | I | Train Lines | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10020 | A | EB Reduced Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 60<br>END2 90XP25 pin 60 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10021 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10022 | A | Brake Applied Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 50<br>END2 90XP25 pin 50 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10023 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10024 | A | Remote Isolation Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 59<br>END2 90XP25 pin 59 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10025 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

## Section 11 – Holding and Parking Brake

### 11.2 Instructions list

### 11.2.1 045_PBK-Holding and Parking Brake

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Holding and Parking Brake (SPP_045) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Initial Conditions | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | A | Using the tools list on the side of your screen, record the serial number of the manometer that will be used during this test. | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | A | Check that the pressure on Test point C2.11/1 is >5bar | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | I | Visual Inspection | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | A | Check the installation of the manual parking brake release components (lever + cable) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | R | The lever is securely fixed (tight) and the cable is correctly attached to the bogie (there is no excess cable and all clamps are installed) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | I | Circuit Breakers | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | A | Close Circuit Breaker 33Q3 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | A | Close Circuit Breaker 33Q5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10011 | I | Parking Brake Pressure Switch | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10012 | R | Read Defined Variable [TT] (TBCU4)LI_PARK_BR_RELEASE = 1.0 | | OK | 1 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10013 | R | Read Defined Variable [TT] (TBCU4)LI_BRAKE_STAT = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10014 | R | Read Defined Variable [TT] (MPU1)tbcu4_parkbrakerelease = 1.0 | | OK | 1 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10015 | R | Read Defined Variable [TT] (MPU1)tbcu4_li_pbrake_stat = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10016 | A | Parking Brake Applied Train Lines<br><br>Check continuity between END1 90XR15 pin 77 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| | | END2 90XP25 pin 77 | | | | | |
| 10017 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10018 | A | Remote Parking Command Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 68<br>END2 90XP25 pin 68 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10019 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10020 | I | Parking Brake Applied | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10021 | I | For this section of the test, ensure that the pressure on test point C2.11/1 is ALWAYS BELOW 4.8 Bar. if it goes above, turn the Isolation cock C2.3.2 to CLOSE position to drain the air | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10022 | A | Position the Isolation cock C2.3.2 in CLOSE position. Allow the parking brake air pressure to drain to below 4.5 Bar. Use the test point C2.11/1 to verify the air pressure <4.5 Bar | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10023 | R | Pressure at test point C2.11/1 <4.5 Bar | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10024 | R | Read Defined Variable [TT] (TBCU4)LI_PARK_BR_RELEASE = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10025 | R | Read Defined Variable [TT] (MPU1)tbcu4_parkbrakerelease = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10026 | A | Return the Isolation cock C2.3.2 to OPEN position | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10027 | R | Read Defined Variable [TT] (TBCU4)LI_BRAKE_STAT = 1.0 | | OK | 1 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10028 | R | Read Defined Variable [TT] (MPU1)tbcu4_li_pbrake_stat = 1.0 | | OK | 1 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10029 | R | Read Defined Variable [TT] (TBCU4)LI_PARK_BR_DC = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10030 | R | Read Defined Variable [TT] (MPU1)tbcu4_parkbrakeisoldc = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10031 | R | Read Defined Variable [TT] (MPU1)li_pbk_m4parkbrakeisol = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10032 | A | Position the Isolation cock C2.3.2 in CLOSE position | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10033 | R | Read Defined Variable [TT] (MPU1)li_pbk_m4parkbrakeisol = 1.0 | | OK | 1 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10034 | R | Read Defined Variable [TT] (TBCU4)LI_BRAKE_STAT = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10035 | R | Read Defined Variable [TT] (MPU1)tbcu4_li_pbrake_stat = 0.0 | | OK | 0 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10036 | R | Read Defined Variable [TT] (TBCU4)LI_PARK_BR_DC = 1.0 | | OK | 1 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10037 | R | Read Defined Variable [TT] (MPU1)tbcu4_parkbrakeisoldc = 1.0 | | OK | 1 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10038 | A | Return the Isolation cock C2.3.2 to OPEN position | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

## Section 12 – Air Condition

### 12.2 Instructions list

### 12.2.1 057_HVA-HVAC_TK

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Air Conditioning (SPP=057) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Power Supply | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | A | Close Circuit Breaker 57Q2 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | A | Remove Connector 57XP1_5 from HVAC Panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr1___1 = 0.0 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr2___1 = 0.0 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | R | Check battery voltage (above 80Vdc) between points 11 and 9 of the connector 57XP1_5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr2___1 = 1.0 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | R | Check 0Vdc between points 11 and 9 of the connector 57XP1_5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr1___1 = 1.0 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10011 | R | Check 0Vdc between points 11 and 9 of the connector 57XP1_5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10012 | R | Check 0Vdc between points 10 and 9 of the connector 57XP1_5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10013 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr2___1 = 0.0 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10014 | A | Force [TT] (MPU1)lo_hva_m4emergventil___1 = 1.0 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10015 | R | Check 0Vdc between points 11 and 9 of the connector 57XP1_5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10016 | R | Check battery voltage (above 80Vdc) between points 10 and 9 of the connector 57XP1_5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10017 | A | Release [TT] (MPU1)Io_hva_m4emergventil___1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10018 | A | Release [TT] (MPU1)Io_hva_m4hvacinhibr1___1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10019 | A | Release [TT] (MPU1)Io_hva_m4hvacinhibr2___1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10020 | A | Put back the connector 57XP1_5 on the HVAC panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10021 | I | HVAC Electronic Power Supply | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10022 | A | Close Circuit Breaker F1 on the HVAC Panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10023 | A | Turn the control switch to AUTO position on the HVAC Panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10024 | R | The HVAC electronic is ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10025 | A | Open Circuit Breaker F1 on the HVAC Panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10026 | R | The HVAC electronic is OFF | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10027 | A | Close Circuit Breaker F1 on the HVAC Panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10028 | I | Software Upload | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10029 | I | Follow the procedure in the document below to upload software onto the HVAC electronic | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10030 | A | | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10031 | A | | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10032 | I | Sensor's Grade | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10033 | I | Each temperature sensor has calibrated grade information. The sensor must be setup with this information. | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10034 | A | The label with sensor grade information is found inside the HVAC frame, near the filter. Inside the train, open the ceiling filter access, rotate a damper and read the label. | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10035 | R | Sensor grade for HVAC Return Air (RAS) is: | | OK | 3 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10036 | R | Sensor grade for HVAC Duct Air (DAS) is: | | OK | 5 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10037 | R | Sensor grade for HVAC Fresh Air (FAS) is: | | OK | 4 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10038 | R | Sensor grade for HVAC Duct Air 2 (DAS2) is: | | OK | 3 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10039 | A | In the maintenance software, select the "Application settings" page and click the "Sensors" tab | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10040 | A | Enter the data found on the label for each grade. Then, click "Save settings". |  | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10041 | A | Open Circuit Breaker F1 on the HVAC Panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10042 | I | Checking 400Vac | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10043 | A | Ensure that the 400Vac Shore Supply is connected to the vehicle, else connect it | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10044 | A | Close Circuit Breaker 57Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10045 | A | Measure 400Vac (+-5%) in the Terminal Block next to the connector '57XP1_10.A / '57XP1_10.B' on the HVAC Panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10046 | R | 400Vac (+-5%) is measured between each of the phases | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10047 | A | On the HVAC Panel, with a phasemeter, check the correct Phase Rotation between points L1- Phase R, L2- Phase S and L3- Phase T. | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10048 | R | The phase rotation is correct between all three phases | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10049 | I | Saloon HVAC | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10050 | A | Close Circuit Breaker F1 on the HVAC Panel | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10051 | A | Force [TT] (MPU1)Io_hva_m4hvacinhibr2__1 = 1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10052 | A | Force [TT] (MPU1)Io_hva_m4hvacinhibr1__1 = 1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10053 | A | Force [TT] NRG_HvacM450Cmd = 0 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10054 | R | HVAC unit turns ON and starts to work | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10055 | I | Reconnect the laptop to the HVAC maintenance software using HCU Finder | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10056 | R | The Exhaust fans are Turned Off (Confirm on Forced tab that Actual exhauster speed is OFF) |  | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10057 | I | Forced Mode (Saloon HVAC) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10058 | I | To force any mode on HVAC, please follow the manual below to open the communication channel with the HVAC. Connection should be through the HVAC Electronic Device in the HC cubicle. | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10059 | I | In the maintenance software, select the 'Forced' tab, and use the "Required working mode" drop down box to force the following modes: | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10060 | I | Ventilation Mode |  | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10061 | A | Force Ventilation mode on the Saloon HVAC | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10062 | R | All saloon HVAC units work in Ventilation mode. Not heating/cooling | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10063 | R | The Exhaust fans are Turned OFF | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10064 | I | Cooling Mode | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10065 | A | Force Cooling mode on the Saloon HVAC | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10066 | R | All saloon HVAC units work in Cooling mode | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10067 | R | The Exhaust fans are Turned OFF | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10068 | I | Heating Mode | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10069 | A | Force Heating mode on the Saloon HVAC | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10070 | R | All saloon HVAC units work in Heating mode | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10071 | R | The Exhaust fans are Turned OFF | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10072 | I | Automatic Mode | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10073 | A | Force Self-Test on the Saloon HVAC | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10074 | R | All saloon HVAC units work according to the mode described in the "Actual working mode" | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10075 | R | The Exhaust fans are Turned OFF | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10076 | I | HVAC Faults | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10077 | A | Open Circuit Breaker 57Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10078 | R | All saloon HVAC units STOP working | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10079 | A | Close Circuit Breaker 57Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10080 | R | All saloon HVAC units START working | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10081 | A | In the maintenance software, select the "Alarms / Warnings" tab |  | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10082 | A | Ensure there are no active faults on the HVAC | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10083 | I | For the next sections, walk through the whole car and physically check (feel) that the HVAC is functioning as desired | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10084 | R | No active faults identified on the HVAC unit | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10085 | A | Release [TT] (MPU1)lo_hva_m4hvacinhibr1___1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10086 | A | Release [TT] (MPU1)lo_hva_m4hvacinhibr2___1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10087 | A | Release [TT] NRG_HvacM450Cmd | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10088 | I | END TEST | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

### 12.2.2 057_HVA_SME-HVAC_SME

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | HVA_057 Air Conditioning | | NE | | | M4 |
| 10002 | I | Initial conditions | | NE | | | M4 |
| 10003 | A | Car Should be Prepared with CVS running and 400V ac available in the car | | NE | | | M4 |
| 10004 | I | HVAC AC Power Supply | | NE | | | M4 |
| 10005 | A | Close Circuit Breaker 13Q1 and 13Q5 | | NE | | | M4 |
| 10006 | A | Check on the DDU if the HVAC is offline | | NE | | | M4 |
| 10007 | I | Checking 400Vac | | NE | | | M4 |
| 10008 | A | Close Circuit Breaker 57Q1 | | NE | | | M4 |
| 10009 | A | Disconnect connector 57XP4_X5 and Measure 400Vac between all 3 phases which are a1- phase R, a2- Phase S and b1- phase T of connector 57XP4_X5 | | NE | | | M4 |
| 10010 | R | 400Vac measured between all phases | | NE | | | M4 |
| 10011 | A | On same connector 57XP4_X5, with a phasemeter, check the correct Phase Rotation between points a1- Phase R, a2- Phase S and b1- Phase T. | | NE | | | M4 |
| 10012 | R | The phase rotation is correct between all three phases | | NE | | | M4 |
| 10013 | I | Saloon HVAC | | NE | | | M4 |
| 10014 | A | Close Circuit Breaker 57Q2 | | NE | | | M4 |
| 10015 | A | Allow the HVAC to initialize and check on the DDU if the HVAC is online | | NE | | | M4 |
| 10016 | R | HVAC unit is online and starts to work | | NE | | | M4 |
| 10017 | I | HVAC web portal | | NE | | | M4 |
| 10018 | A | The attached document is a procedure on how to navigate around the maintenance | | NE | | | M4 |

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|---|---|---|---|---|---|---|---|
| | | software. | | | | | |
| 10019 | I | Connect the laptop to the HVAC maintenance software using web browser. Enter the following IP address on the web browser 10.136.xxx.32<br>xxx represents the train number<br>Login: maint<br>Password: maint | | NE | | | M4 |
| 10020 | R | On status tab, Active mode is off for both cab and saloon |  | NE | | | M4 |
| 10021 | A | Go to Alarms tab and clear all the alarms for saloon and cabin | | NE | | | M4 |
| 10022 | I | HVAC inhib | | NE | | | M4 |
| 10023 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr1__1 = 1.0 | | NE | | | M4 |
| 10024 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr2__1 = 1.0 | | NE | | | M4 |
| 10025 | I | HVAC 50% restriction | | NE | | | M4 |
| 10026 | A | Force [TT] NRG_HvacM450Cmd = 0 | | NE | | | M4 |
| 10027 | I | Full "Self test" saloon | | NE | | | M4 |
| 10028 | I | For the following tests make sure on the webHMI tab you change contoller to be controlled by webHMI and not MPU |  | NE | | | M4 |
| 10029 | A | Before running the full test, please click on reset test to reset the previous results. | | NE | | | M4 |
| 10030 | A | Select Full-Test on the Saloon HVAC |  | NE | | | M4 |
| 10031 | R | All saloon HVAC units work according to the mode described in the "ACTIVE MODE" on the status tab | | NE | | | M4 |
| 10032 | R | When the test is complete, please check if the status is showing as "TEST PASS" and the test took 3 mins +/- 2 seconds for each mode. | | NE | | | M4 |
| 10033 | I | Forced Mode (Saloon HVAC) | | NE | | | M4 |
| 10034 | I | During all tests Walk through the whole car and physically check (feel) that the | | NE | | | M4 |

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|---|---|---|---|---|---|---|---|
| | | HVAC is functioning as desired | | | | | |
| 10035 | I | Go to maintenance tab to force the following modes |  | NE | | | M4 |
| 10036 | I | Cooling Mode | | NE | | | M4 |
| 10037 | A | Select forced Cooling mode on the Saloon HVAC and let it run for 5 mins | | NE | | | M4 |
| 10038 | R | All HVAC units are cooling | | NE | | | M4 |
| 10039 | I | Heating Mode | | NE | | | M4 |
| 10040 | A | Select forced Heating mode on the Saloon HVAC and let it run for 5 mins | | NE | | | M4 |
| 10041 | R | All HVAC units are heating | | NE | | | M4 |
| 10042 | I | HVAC Faults | | NE | | | M4 |
| 10043 | A | In the maintenance software, select the "Alarms" tab | | NE | | | M4 |
| 10044 | A | Ensure there are no active faults on the HVAC for the Saloon. Use the highlighted drop down to navigate between saloon and cabin. |  | NE | | | M4 |
| 10045 | R | No active faults identified on the HVAC unit | | NE | | | M4 |
| 10046 | A | Release [TT] (MPU1)lo_hva_m4hvacinhibr1___1 | | NE | | | M4 |
| 10047 | A | Release [TT] (MPU1)lo_hva_m4hvacinhibr2___1 | | NE | | | M4 |
| 10048 | A | Release [TT] NRG_HvacM450Cmd | | NE | | | M4 |
| 10049 | I | End of test | | NE | | | M4 |

# Section 13 – Fire Protection

## 13.2 Instructions list

### 13.2.1 067_FSD-Fire Protection

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Fire Protection System (SPP=067) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Fire Detection Train Lines | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | A | Fire Detection Train Lines<br><br>Check continuity between<br>END1 90XR14 pin 21<br>END2 90XP24 pin 21 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | I | Continuity Test | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | I | The following steps are continuity tests between the two points described in each step. Use a multimeter for this test. | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | A | From : [(local: +END1 -90XR13.B (pin 4))] to: [ -Inter-connector (local: +END2 -90XP23.b pin 4)] | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | A | From : [(local: +END1 -90XR13.B (pin 5))] to: [ -Inter-connector (local: +END2 -90XP23.b pin 5)] | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | A | From : [(local: +END1 -90XR13.A (pin 7))] to: [ -Inter-connector (local: +END2 -90XP23.a pin 7)] | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | A | From : [(local: +END1 -90XR13.A (pin 8))] to: [ -Inter-connector (local: +END2 -90XP23.a pin 8)] | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

# Section 14 – Traction and Electric Brake

## 14.2 Instructions list

### 14.2.1 033_TRC-Traction and Electric Brake

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Traction and Electric Brake (SPP=033) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Circuit Breakers and Configuration | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | A | Close Circuit Breaker 33Q2 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | A | Close Circuit Breaker 33Q4 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | A | Close Circuit Breaker 33Q5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | I | Circuit Breaker 33Q1 and 33Q3 must be Opened | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | I | 110Vdc Normal Traction EL Train Line<br><br>Apply bridge piece between<br>END2 90XP25 pin 49 and pin 42 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | A | Close Circuit Breaker 33Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | A | Close Circuit Breaker 33Q3 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | R | Read Defined Variable [TT]<br>(TBCU4)LI_CAR_ID4 = 1.0 | | OK | 1 | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10011 | I | The TBCU should appear on TCMS network on DDU screen | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10012 | I | Train Lines | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10013 | A | Forward Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 25<br>END2 90XP25 pin 25 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10014 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10015 | A | Reverse Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 30<br>END2 90XP25 pin 30 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10016 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10017 | A | Traction Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 31<br>END2 90XP25 pin 31 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10018 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10019 | A | No Brake Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 32<br>END2 90XP25 pin 32 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10020 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10021 | A | Traction Interlock Bypass Train Lines<br><br>Check continuity between<br>END1 90XR14 pin 6<br>END2 90XP24 pin 6 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10022 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10023 | A | Traction Interlock Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 41<br>END2 90XP25 pin 41 and<br>-10XP12_XCB2 pin 8 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10024 | R | All pins are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10025 | I | 110Vdc Normal Traction EL Train Line<br><br>Remove bridge piece on<br>END2 90XP25 pin 49 and pin 42 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10026 | I | Coolant Liquid | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10027 | A | Check that the coolant level is at least 1/2 of the sight glass level indicator | ☒ | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10028 | R | Coolant Liquid Level is OK | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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| 10029 | I | End of Test | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

## Section 15 – Passenger Doors

### 15.2 Instructions list

### 15.2.1 050_DOR-Passenger Doors

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Passenger Doors (SPP=050) | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10002 | I | Initial conditions | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10003 | I | 110Vdc Normal power supply is connected to the vehicle and ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10004 | I | Circuit Breakers | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10005 | A | Close Circuit Breaker 50Q1 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10006 | R | DCU 1 is powered ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10007 | R | Check on the DDU that DCU1 is online | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10008 | A | Close Circuit Breaker 50Q2 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10009 | R | DCU 2 is powered ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10010 | R | Check on the DDU that DCU2 is online | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10011 | A | Close Circuit Breaker 50Q3 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10012 | R | DCU 3 is powered ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10013 | R | Check on the DDU that DCU3 is online | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10014 | A | Close Circuit Breaker 50Q4 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10015 | R | DCU 4 is powered ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10016 | R | Check on the DDU that DCU4 is online | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10017 | A | Close Circuit Breaker 50Q5 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10018 | R | DCU 5 is powered ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10019 | R | Check on the DDU that DCU5 is online | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10020 | A | Close Circuit Breaker 50Q6 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10021 | R | DCU 6 is powered ON | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10022 | R | Check on the DDU that DCU6 is online | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10023 | A | Close Circuit Breaker 50Q7 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10024 | I | Car ID Code | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10025 | A | Using the DDU on the test bench, check that all the doors on M4 are available - as in the picture below |  | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10026 | R | All doors are available | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10027 | I | Train Lines and Safety Loop | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10028 | A | ERTMS Auth Left Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 44<br>END2 90XP25 pin 44 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10029 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10030 | A | ERTMS Auth Right Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 47<br>END2 90XP25 pin 47 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10031 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10032 | A | Doors Open Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 66<br>END2 90XP25 pin 66 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10033 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10034 | A | Door Close Right Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 78<br>END2 90XP25 pin 78 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10035 | A | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10036 | A | Door Close Left Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 79<br>END2 90XP25 pin 79 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10037 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |

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|---|---|---|---|---|---|---|---|
| 10038 | A | Door Auth Left Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 85<br>END2 90XP25 pin 85 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10039 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10040 | A | Door Auth Right Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 84<br>END2 90XP25 pin 84 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10041 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10042 | A | V<3km/h Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 29<br>END2 90XP25 pin 29 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10043 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10044 | A | Door Auth Left Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 85<br>END2 90XP25 pin 85 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10045 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10046 | A | Door Auth Right Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 84<br>END2 90XP25 pin 84 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10047 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10048 | A | Safety Doors Loop Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 96<br>END2 90XP25 pin 96 | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10049 | R | Both points are continuous | | OK | | Hlawulani Nick Mabundzane - 418320 | M4 |
| 10050 | I | Left Side Doors | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10051 | I | Door 1 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10052 | I | Use bridge pieces to apply voltage on the passenger door mechanism to simulate the following signals:<br>- Door Auth Left | | OK | | Sinazo Mkhwa - 529940 | M4 |

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|---|---|---|---|---|---|---|---|
| | | - V<3km/h | | | | | |
| 10053 | A | Apply bridge pieces on 50XP1_X11 between slot 2,3 and 15. | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10054 | A | Force [TT] (MPU1)Io_dor_m4opendoorleft = 1.0 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10055 | R | Check that the door opens in 3 sec (+1/-0) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10056 | R | Check that the GREEN leds on both sides of the door blink while the door opens [Safety Request: Prasa8-05] | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10057 | I | Door Opening Gap | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10058 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10059 | R | Door 1 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1398 | Sinazo Mkhwa - 529940 | M4 |
| 10060 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10061 | R | Door 1 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1401 | Sinazo Mkhwa - 529940 | M4 |
| 10062 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10063 | R | Door 1 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1400 | Sinazo Mkhwa - 529940 | M4 |
| 10064 | I | Door 3 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10065 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10066 | R | Door 3 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1400 | Sinazo Mkhwa - 529940 | M4 |
| 10067 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10068 | R | Door 3 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1406 | Sinazo Mkhwa - 529940 | M4 |
| 10069 | A | Measure the opening gap of the door. (This measurement must be done in the | | OK | | Sinazo Mkhwa - 529940 | M4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | middle of the door) | | | | | |
| 10070 | R | Door 3 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1402 | Sinazo Mkhwa - 529940 | M4 |
| 10071 | I | Door 5 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10072 | I | Door Opening Gap | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10073 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10074 | R | Door 5 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1396 | Sinazo Mkhwa - 529940 | M4 |
| 10075 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10076 | R | Door 5 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1410 | Sinazo Mkhwa - 529940 | M4 |
| 10077 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10078 | R | Door 5 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1406 | Sinazo Mkhwa - 529940 | M4 |
| 10079 | I | Right Side Doors | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10080 | I | Door 2 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10081 | A | Use bridge pieces to apply voltage on the passenger door mechanism to simulate the following signals:<br>- Door Auth Right<br>- V<3km/h | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10082 | A | Apply bridge pieces on 50XP2_X11 between slot 2,3, and 15. | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10083 | A | Force [TT]<br>(MPU1)lo_dor_m4opendoorright = 1.0 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10084 | R | Check that the door opens in 3 sec (+1/-0) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10085 | R | Check that the GREEN leds on both sides of the door blink while the door opens [Safety Request: Prasa8-05] | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10086 | I | Door Opening Gap | | OK | | Sinazo Mkhwa - 529940 | M4 |

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|---|---|---|---|---|---|---|---|
| 10087 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door). | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10088 | R | Door 2 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1396 | Sinazo Mkhwa - 529940 | M4 |
| 10089 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10090 | R | Door 2 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1410 | Sinazo Mkhwa - 529940 | M4 |
| 10091 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10092 | R | Door 2 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1406 | Sinazo Mkhwa - 529940 | M4 |
| 10093 | I | Door 4 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10094 | I | Door Opening Gap | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10095 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10096 | R | Door 4 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1392 | Sinazo Mkhwa - 529940 | M4 |
| 10097 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10098 | R | Door 4 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1408 | Sinazo Mkhwa - 529940 | M4 |
| 10099 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10100 | R | Door 4 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1396 | Sinazo Mkhwa - 529940 | M4 |
| 10101 | I | Door 6 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10102 | I | Door Opening Gap | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10103 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |

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|---|---|---|---|---|---|---|---|
| 10104 | R | Door 6 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1390 | Sinazo Mkhwa - 529940 | M4 |
| 10105 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10106 | R | Door 6 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1400 | Sinazo Mkhwa - 529940 | M4 |
| 10107 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10108 | R | Door 6 gap<br>Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1395 | Sinazo Mkhwa - 529940 | M4 |
| 10109 | I | Obstacle Detection | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10110 | A | Position an obstacle on the floor in the centre of the door closing line for all the doors | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10111 | A | Force [TT]<br>(MPU1)lo_dor_m4opendoorright = 0 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10112 | A | Force [TT]<br>(MPU1)lo_dor_m4opendoorleft = 0 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10113 | R | The doors will hit the obstacle, reopen and try to close again 3 times.<br>On the third attempt it will stop and stand ajar - free to be opened manually | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10114 | A | Safety Doors Loop Train Lines<br><br>Check continuity between<br>END1 90XR15 pin 96<br>END2 90XP25 pin 96 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10115 | R | There is no continuity between the two points | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10116 | A | Force [TT]<br>(MPU1)lo_dor_m4opendoorright = 1 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10117 | A | Force [TT]<br>(MPU1)lo_dor_m4opendoorleft = 1 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10118 | R | The door opens fully | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10119 | A | Remove the obstacle | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10120 | A | Release [TT]<br>(MPU1)lo_dor_m4opendoorleft | | OK | | Sinazo Mkhwa - 529940 | M4 |

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|---|---|---|---|---|---|---|---|
| 10121 | A | Release [TT] (MPU1)lo_dor_m4opendoorright | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10122 | A | Remove the bridge pieces on connector 50XP1_X11 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10123 | A | Remove the bridge pieces on connector 50XP2_X11 | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10124 | I | End of Test | | OK | | Sinazo Mkhwa - 529940 | M4 |

# Section 16 – Vehicle Normalization

## 16.2 Instructions list

### 16.2.1 093_NORM-Vehicle Normalization

I - Information A - Action R - Result NE - Not Executed

| N° | Type | Instruction | File | Result status | Result value | Operator | Vehicle |
|---|---|---|---|---|---|---|---|
| 10001 | I | Initial Conditions | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10002 | I | The VFT procedures are all completed | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10003 | I | Vehicle Normalization Check | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10004 | R | On LV3 all Circuit Breakers are installed and secured | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10005 | R | On LV3 all Dataplugs are installed, tightened and earth braids are fastened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10006 | R | On LV3 all Connectors are tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10007 | R | On LV3 there are no missing components, device, wiring or connectors. | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10008 | R | On LV6 all Dataplugs are installed, tightened and earth braids are fastened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10009 | R | On LV6 all Connectors are tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10010 | R | On LV6 there are no missing components, device, wiring or connectors. | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10011 | R | On HC Cubicle the Controller is installed and properly tightened and its connectors are tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10012 | R | All DCUs are properly installed and secured | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10013 | R | All Internal Displays are properly installed and secured | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10014 | R | All Light Covers are properly installed | | OK | | Sinazo Mkhwa - 529940 | M4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10015 | R | All Saloon Fire Detectors are properly installed and secured | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10016 | R | All covers are normalised inside the car | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10017 | R | On the Underframe, TBCU Agate is installed and properly tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10018 | R | On the Underframe, Speed Sensors are installed and properly tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10019 | R | On the LVB, all Circuit Breakers are installed and properly tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10020 | R | On the LVB, all Relays and Timers are installed and properly tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10021 | R | On the LVB, BRIOMs are installed and properly tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10022 | R | On the LVB there are no missing components, device, wiring or connectors. | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10023 | R | On the Underframe, all Connectors are tightened | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10024 | R | All underframe covers are normalised | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10025 | R | On END1 the Octopus cables are disconnected from the car and properly stored. | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10026 | R | On END2 the Octopus cables are disconnected from the car and properly stored. | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10027 | R | The Test Bench is switched OFF and the Octopus cables are disconnected and properly stored | | OK | | Sinazo Mkhwa - 529940 | M4 |
| 10028 | R | ALL P.Os of this car are closed | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10029 | I | End Of Test | | OK | | Paseka Ditlhakanyane - 491468 | M4 |

# Section 17 – Report summaries

## 17.2 Results status

| Test Instruction Sheet | Compliant | Incomplete | Non-compliant |
|---|---|---|---|
| Vehicle Normalization | X | | |
| Train Ground Communication | X | | |
| Traction and Electric Brake | X | | |
| TCMS Network | X | | |
| Service Brake | X | | |
| Rescue Mode and Emergency Disconnection | X | | |
| Passenger Doors | X | | |
| PACIS System | X | | |
| Internal Lighting | X | | |
| Holding and Parking Brake | X | | |
| Fire Protection | X | | |
| Energy Distribution | X | | |
| Emergency Brake | X | | |
| Cabin Control | X | | |
| Air Condition | X | | |

## 17.1 Tools used

| Function | Tool name | Tool number |
|---|---|---|
| 015_NRG | Phasemeter | Phasemeter |
| 027_ERM | Multimeter | Multimeter 4 |
| 033_TRC | Multimeter | Multimeter 3 |
| 040_SBK | Manometer | Manometer |
| 045_PBK | Manometer | Manometer |
| 057_HVA | Phasemeter | Phasemeter |
| 057_HVA_SME | Phasemeter | Phasemeter |

| | | |
|---|---|---|
| 067_FSD | Multimeter | Multimeter 2 |

| Vehicle | Equipment | Expected version | Version loaded |
|---|---|---|---|
| M4 | | | |