

| PROJECT | CUSTOMER | VEHICLE |
|-----------------|----------|----------------|
| Xtrapolis-PRASA | PRASA | 244 – M4 – VFT |

RTR Vehicle Functional Static Testing TS244 M4 Report
 GIB0000007098



| | CREATED | VERIFIED | APPROVED | DISTRIBUTION |
|------------------|-----------------------|----------------|-----------------|---|
| Name | Tshegofatso SETSHOGWE | Sifiso LUKHELE | Kgomotso NKOANA | Confidentiality Category <i>Restricted</i> <i>Project</i> <i>Normal</i> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> |
| Date | 10/09/2024 | 10/09/2024 | 10/09/2024 | Control Category <i>Controlled</i> <i>Not Controlled</i> <input checked="" type="checkbox"/> <input type="checkbox"/> |
| Signature | | | | Language EN |

This report has been automatically generated from TES version 1

Table of modifications

| Rev | Date | Modifications Content | Writer |
|-----|------------|-----------------------|-----------------------|
| A0 | 10/09/2024 | Creation | Tshegofatso SETSHOGWE |

Internal validations

| | Name | Function | Date | Signature |
|-----------------|-----------------------|---------------------|------------|--|
| Creator | Tshegofatso SETSHOGWE | EPU Manager | 10/09/2024 | X  Tshegofatso SETSHOGWE EPU Manager |
| Verifier | Sifiso LUKHELE | Serial Test Manager | 10/09/2024 | X  Sifiso LUKHELE Serial Test Manager |
| Approver | Kgomotso NKOANA | Test Expert | 10/09/2024 | X  Kgomotso NKOANA Test Expert |

Execution Plan

| | |
|-------------------|------------|
| Start Date | 29/08/2024 |
| End Date | 29/08/2024 |

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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 and covers are normalized.



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GIB0000007098
Version: A0

Emission date
10/09/2024

Section 2 – Energy Distribution

2.1 Instructions list

2.1.1 015_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 | | Philemon Milani - 484650 | M4 |
| 10002 | I | Initial Conditions | | OK | | Philemon Milani - 484650 | M4 |
| 10003 | I | All the Circuit Breakers should be OPEN | | OK | | Philemon Milani - 484650 | M4 |
| 10004 | I | Test bench should be connected but with no power supply | | OK | | Philemon Milani - 484650 | M4 |
| 10005 | I | NO 400Vac should be connected to the car | | OK | | Philemon Milani - 484650 | M4 |
| 10006 | A | Close Circuit Breaker 15Q3 (Normal Line) | | OK | | Philemon Milani - 484650 | M4 |
| 10007 | I | Voltage Isolation 110Vdc | | OK | | Philemon Milani - 484650 | M4 |
| 10008 | I | 230Vac and 400Vac Circuit breakers | | OK | | Philemon Milani - 484650 | M4 |
| 10009 | A | Close Circuit Breaker 13Q1 | | OK | | Philemon Milani - 484650 | M4 |
| 10010 | A | Close the circuit breaker 13Q3 | | OK | | Philemon Milani - 484650 | M4 |
| 10011 | I | Normal and Permanent Power Supply | | OK | | Philemon Milani - 484650 | M4 |
| 10012 | I | 110Vdc Permanent Train Line Apply 110Vdc on -93XT304_1 pin 4 to simulate Permanent Train Line | | OK | | Philemon Milani - 484650 | M4 |
| 10013 | A | Apply 110Vdc on the Normal Line using the external power supply | | OK | | Philemon Milani - 484650 | M4 |
| 10014 | A | Measure 110Vdc between 90XR50.X1/1 (+) and 90XR50.X2/1 (-) (intercar connector). [Normal line] | | OK | | Philemon Milani - 484650 | M4 |
| 10015 | I | Permanent Line Circuit Breakers | | OK | | Philemon Milani - 484650 | M4 |
| 10016 | A | Close Circuit Breaker 15Q4 for battery voltage above 80Vdc and close it(permanent Line) | | OK | | Philemon Milani - 484650 | M4 |
| 10017 | I | 230Vac Circuit Breakers | | OK | | Philemon Milani - 484650 | M4 |
| 10018 | A | Close Circuit Breaker 13Q2 | | OK | | Philemon Milani - 484650 | M4 |

| | | | | | | | |
|-------|---|---|--|----|--|--------------------------|----|
| 10019 | A | Close Circuit Breaker 13Q3 | | OK | | Philemon Milani - 484650 | M4 |
| 10020 | I | 230Vac and 400Vac Voltage Supply | | OK | | Philemon Milani - 484650 | M4 |
| 10021 | A | Apply 400Vac to the Vehicle, either on End1 or End2 | | OK | | Philemon Milani - 484650 | 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 | | Philemon Milani - 484650 | M4 |
| 10023 | R | Phase rotation between U,V,W is correct | | OK | | Philemon Milani - 484650 | 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 | | Philemon Milani - 484650 | M4 |
| 10025 | R | Phase rotation between U,V,W is correct | | OK | | Philemon Milani - 484650 | M4 |
| 10026 | A | Check 230Vac between points L and N of socket -13XT1 | | OK | | Philemon Milani - 484650 | M4 |
| 10027 | R | 230Vac present | | OK | | Philemon Milani - 484650 | M4 |
| 10028 | A | Check 230Vac between points L and N of socket -13XT2 | | OK | | Philemon Milani - 484650 | M4 |
| 10029 | R | 230Vac present | | OK | | Philemon Milani - 484650 | M4 |
| 10030 | A | Remove connector 57XP1_10 | | OK | | Philemon Milani - 484650 | M4 |
| 10031 | A | Remove connector 93XP150 | | OK | | Philemon Milani - 484650 | M4 |
| 10032 | A | Close circuit breaker 34Q1 and 57Q1 | | OK | | Philemon Milani - 484650 | M4 |
| 10033 | A | Check 400Vac +-5% tolerance between Phases (W,V,U) on connector 57XP1_10 (10.b1,10a2,10a1) | | OK | | Philemon Milani - 484650 | M4 |
| 10034 | R | 400Vac +- 5% tolerance is measured between all three phases of 57XP1_10 | | OK | | Philemon Milani - 484650 | M4 |
| 10035 | A | Check 400Vac +-5% tolerance between Phases (W,V,U) on connector 93XP150 (E2,E3,E1) | | OK | | Philemon Milani - 484650 | M4 |
| 10036 | R | 400Vac +- 5% tolerance is measured between all three phases on connector 93XP150 | | OK | | Philemon Milani - 484650 | M4 |
| 10037 | A | Put back connector 57XP1_10 | | OK | | Philemon Milani - 484650 | M4 |

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|-------|---|---|--|----|--|-----------------------------|----|
| 10038 | A | Put back connector 93XP150 | | OK | | Philemon Milani - 484650 | M4 |
| 10039 | A | Switch off the 400Vac power supply from the socket | | OK | | Philemon Milani - 484650 | M4 |
| 10040 | I | Auxiliary Converters Command | | OK | | Philemon Milani - 484650 | M4 |
| 10041 | A | Battery Connection Train Lines Measure continuity between END 1 90XR14 pin 30 END 2 90XP24 pin 30 | | OK | | Philemon Milani - 484650 | M4 |
| 10042 | R | Both points are continuous | | OK | | Philemon Milani - 484650 | M4 |
| 10043 | A | Battery Disconnection Train Lines Measure continuity between END 1 90XR14 pin 31 END 2 90XP24 pin 31 | | OK | | Philemon Milani - 484650 | M4 |
| 10044 | R | Both points are continuous | | OK | | Philemon Milani - 484650 | M4 |
| 10045 | A | IES StatusTrain Lines Measure continuity between END 1 90XR15 pin 61 END 2 90XP25 pin 61 and END 1 90XR15 pin 62 END 2 90XP25 pin 62 | | OK | | Philemon Milani - 484650 | M4 |
| 10046 | R | Both points are continuous | | OK | | Philemon Milani - 484650 | M4 |



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Section 3 – TCMS Network

3.1 Instructions list

3.1.1 025_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 | | Tebogo Mtombeni - 529938 | M4 |
| 10002 | I | Initial conditions | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10003 | I | Vehicle test bench should be configured as TC1: 1. TC1 Dataplugs 2. MCE switch set to TC1 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10004 | A | 110Vdc supply to the Normal Train line is ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10005 | I | Power Supply to the Router Switches | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10006 | I | Power supply to the 25A10 SWITCH ETHERNET (CRS1) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10007 | A | Close Circuit Breaker 25Q10 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10008 | R | CRS1 25A10 is ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10009 | I | Power supply to the 25A11 SWITCH ETHERNET (CRS2) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10010 | A | Close Circuit Breaker 25Q11 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10011 | R | CRS2 25A11 is ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10012 | I | Power supply to the 25A14 ETHERNET REPEATER (TBR) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10013 | A | Close Circuit Breaker 25Q14 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10014 | R | TBR 25A14 is ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10015 | A | Close Circuit Breaker 25Q6 | | OK | | Tebogo Mtombeni - 529938 | M4 |

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|-------|---|---|--|----|--|--------------------------|----|
| 10016 | A | Close Circuit Breaker 25Q7 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10017 | I | Ethernet Loop | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10018 | A | For each CRS, check that the Ethernet Loop LEDs are flashing | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10019 | R | CRS1 has LEDs on ports X3 and X4 flashing | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10020 | R | CRS2 has ONLY LED on port X4 flashing | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10021 | R | Check on the Test Bench DDU that all Router Switches are available on the network | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10022 | I | Power Supply to the BRIOMS | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10023 | I | Power supply to the 25A6 BRIOM 40/10 ETH 6 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10024 | R | BRIOM 25A6 is ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10025 | A | Check visually that ground braid is connected to BRIOM | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10026 | I | Power supply to the 25A7 BRIOM 40/10 ETH 7 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10027 | R | BRIOM 25A7 is ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10028 | A | Check visually that ground braid is connected to BRIOM | | OK | | Tebogo Mtombeni - 529938 | M4 |

Section 4 – Cabin Control

4.1 Instructions list

4.1.1 020_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 | | Amanda Ntuli - 526239 | M4 |
| 10002 | I | Train Lines | | OK | | Amanda Ntuli - 526239 | M4 |
| 10003 | A | Cab Selected On Train - Train Lines Measure continuity between END1 90XR14 pin 3 END2 90XP24 pin 3 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10004 | R | Both pins are continuous | | OK | | Amanda Ntuli - 526239 | M4 |
| 10005 | A | Cab Active TC1 Train Lines Measure continuity between END1 90XR14 pin 4 END2 90XP24 pin 4 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10006 | R | Both pins are continuous | | OK | | Amanda Ntuli - 526239 | M4 |
| 10007 | A | Cab Active TC2 Train Lines Measure continuity between END1 90XR14 pin 5 END2 90XP24 pin 5 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10008 | R | Both pins are continuous | | OK | | Amanda Ntuli - 526239 | M4 |
| 10009 | A | Master Key TC1 Train Lines Measure continuity between END1 90XR14 pin 17 END2 90XP24 pin 17 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10010 | R | Both pins are continuous | | OK | | Amanda Ntuli - 526239 | M4 |



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Section 5 – Internal Lighting

5.1 Instructions list

5.1.1 052_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 | | Amanda Ntuli - 526239 | M4 |
| 10002 | I | Initial Conditions | | OK | | Amanda Ntuli - 526239 | M4 |
| 10003 | I | 110Vdc Normal line is ON | | OK | | Amanda Ntuli - 526239 | M4 |
| 10004 | I | Cleaning Lighting Command | | OK | | Amanda Ntuli - 526239 | M4 |
| 10005 | A | 110Vdc Permanent Train Line Apply 110V on 93XT304_1 pin 4 to simulate permanent supply | | OK | | Amanda Ntuli - 526239 | M4 |
| 10006 | A | Close Circuit Breaker 52Q3 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10007 | A | Close Circuit Breaker 52Q4 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10008 | A | Close Circuit Breaker 52Q5 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10009 | R | All saloon emergency lights (low intensity) are OFF on all light modules (Left + Right). | | OK | | Amanda Ntuli - 526239 | M4 |
| 10010 | A | Turn Cleaning Staff Lights Switch 52S6 to ON position | | OK | | Amanda Ntuli - 526239 | M4 |
| 10011 | R | All saloon emergency lights (low intensity) are "ON" on all light modules (Left + Right). | | OK | | Amanda Ntuli - 526239 | M4 |
| 10012 | A | Reset Circuit Breaker 52Q5 (Open and Close) | | OK | | Amanda Ntuli - 526239 | M4 |
| 10013 | A | Close Circuit Breaker 52Q1 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10014 | A | Close Circuit Breaker 52Q2 | | OK | | Amanda Ntuli - 526239 | M4 |



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|-------|---|---|--|----|--|-----------------------|----|
| 10015 | R | All saloon emergency lights (low intensity) are "ON" on all light modules (Left + Right). | | OK | | Amanda Ntuli - 526239 | M4 |
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Section 6 – PACIS System

6.1 Instructions list

6.1.1 054_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 |

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|-------|---|--|--|----|------|--------------------------|----|
| 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 Result Max : x <= 32.00 (Ohm) | | OK | 29.5 | 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 Result Max : x <= 32.00 (Ohm) | | OK | 30.2 | Mlungisi Madela - 529927 | M4 |

Section 7 – Train Ground Communication

7.1 Instructions list

7.1.1 062_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 | | Tebogo Mtombeni - 529938 | M4 |
| 10002 | A | ERTMS Bypass Train Lines Check continuity between END1 90XR14 pin 11 END2 90XP24 pin 11 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10003 | R | Both pins are continuous | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10004 | A | Emergency Brake ERTMS 1 Train Lines Check continuity between END1 90XR14 pin 18 END2 90XP24 pin 18 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10005 | R | Both pins are continuous | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10006 | I | Emergency Brake ERTMS 2 Train Lines Check continuity between END1 90XR14 pin 20 END2 90XP24 pin 20 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10007 | R | Both pins are continuous | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10008 | I | Eurobalise Antenna Cable | | OK | | Tebogo Mtombeni - 529938 | 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 | | Tebogo Mtombeni - 529938 | M4 |
| 10010 | R | Eurobalise Antenna cable is correctly configured | | OK | | Tebogo Mtombeni - 529938 | M4 |



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Document Reference
GIB0000007098
Version: A0

Emission date
10/09/2024

Section 8 – Rescue Mode and Emergency Disconnection

8.1 Instructions list

8.1.1 027_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 | | Mlungisi Madela - 529927 | M4 |
| 10002 | I | Backup Mode | | OK | | Mlungisi Madela - 529927 | M4 |
| 10003 | R | Points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10004 | A | Check continuity on Timer 27D1 between points A4 and B3 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10005 | A | Backup Mode Train Lines Check continuity between END1 90XR15 pin23 END2 90XP25 pin 23 and 27K1 A1 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10006 | R | All points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10007 | A | Check continuity between 27K1 A2 and Ground | | OK | | Mlungisi Madela - 529927 | M4 |
| 10008 | R | The points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10009 | I | Emergency Disconnection | | OK | | Mlungisi Madela - 529927 | M4 |
| 10010 | A | Emergency Disconnection Train Lines Check continuity between END1 90XR15 pin24 END2 90XP25 pin 24 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10011 | R | All points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |



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| Serial Tests Report TS244 – M4 – VFT RTR Vehicle Functional Static Testing Report | Document Reference GIB0000007098 Version: A0 | Emission date 10/09/2024 |
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Section 9 – Emergency Brake

9.1 Instructions list

9.1.1 044_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 | | Amanda Ntuli - 526239 | M4 |
| 10002 | I | Initial Conditions | | OK | | Amanda Ntuli - 526239 | M4 |
| 10003 | I | No PEAs are activated | | OK | | Amanda Ntuli - 526239 | M4 |
| 10004 | I | 110Vdc Normal power supply should be connected to the vehicle and ON | | OK | | Amanda Ntuli - 526239 | M4 |
| 10005 | I | Visual Inspection | | OK | | Amanda Ntuli - 526239 | M4 |
| 10006 | A | Physically and visually inspect all the Disk Break Units (DBU) and brake pads, to ensure they are securely fitted. |  | OK | | Amanda Ntuli - 526239 | M4 |
| 10007 | R | All the brake DBUs are correctly installed, and all the brake pads are correctly installed and locked. | | OK | | Amanda Ntuli - 526239 | M4 |
| 10008 | A | Check the piping installation | | OK | | Amanda Ntuli - 526239 | M4 |
| 10009 | R | All the pipes are installed on the vehicle | | OK | | Amanda Ntuli - 526239 | M4 |
| 10010 | A | Check all the Passenger Emergency Alarm handles, and ensure they are connected to their respective connectors | | OK | | Amanda Ntuli - 526239 | M4 |
| 10011 | R | All the PEAs are installed and connected | | OK | | Amanda Ntuli - 526239 | M4 |
| 10012 | I | Train Lines | | OK | | Amanda Ntuli - 526239 | M4 |
| 10013 | A | Emergency Brake Loop Train Lines Check continuity between END1 90XR24 pin 8 END2 90XP34 pin 8 | | OK | | Amanda Ntuli - 526239 | M4 |

| | | | | | | | |
|-------|---|---|--|----|--|-----------------------|----|
| 10014 | R | Both points are continuous | | OK | | Amanda Ntuli - 526239 | M4 |
| 10015 | A | Emergency Brake Loop Override Train Lines Check continuity between END1 90XR24 pin 9 END2 90XP34 pin 9 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10016 | R | Both points are continuous | | OK | | Amanda Ntuli - 526239 | M4 |
| 10017 | I | Emergency Brake Train Line Check continuity between END1 90XR25 pin 67 END2 90XP35 pin 67 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10018 | R | Both points are continuous | | OK | | Amanda Ntuli - 526239 | M4 |
| 10019 | A | PEA Loop OTDR Train Lines Check continuity between END1 90XR24 pin 10 END2 90XP34 pin 10 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10020 | R | Both points are continuous | | OK | | Amanda Ntuli - 526239 | M4 |
| 10021 | A | PEA Loop Train Lines Check continuity between END1 90XR25 pin 95 END2 90XP35 pin95 | | OK | | Amanda Ntuli - 526239 | M4 |
| 10022 | R | Both points are continuous | | OK | | Amanda Ntuli - 526239 | M4 |
| 10023 | A | Close Circuit breaker 44Q1 | | OK | | Amanda Ntuli - 526239 | M4 |

Section 10 – Service Brake

10.1 Instructions list

10.1.1 040_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 | | Philemon Milani - 484650 | M4 |
| 10002 | I | Initial Conditions | | OK | | Philemon Milani - 484650 | M4 |
| 10003 | I | No air supply to the vehicle | | OK | | Philemon Milani - 484650 | M4 |
| 10004 | I | All brake panel cocks are in normal position (not isolated) | | OK | | Philemon Milani - 484650 | M4 |
| 10005 | I | 110Vdc Normal power supply should be connected to the vehicle and ON | | OK | | Philemon Milani - 484650 | M4 |
| 10006 | I | Follow the procedure in the document below to upload software onto the TBCU electronic. |  | OK | | Philemon Milani - 484650 | M4 |
| 10007 | I | Power Supply | | OK | | Philemon Milani - 484650 | M4 |
| 10008 | A | Remove the connector 10XR12_XCB2 from the propulsion box | | OK | | Philemon Milani - 484650 | M4 |
| 10009 | A | Close Circuit Breaker 33Q1, 33Q3 and 33Q5 | | OK | | Philemon Milani - 484650 | M4 |
| 10010 | A | Check the voltage on connector 10XR12_XCB2 between pins 4 (+) and 69 (-) ; 4(+) and 67(-); and 5(+) and 68(-) | | OK | | Philemon Milani - 484650 | 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 | | Philemon Milani - 484650 | 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 | | Philemon Milani - 484650 | M4 |

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|-------|---|---|--|----|--|--------------------------|----|
| 10013 | A | Remove the connector -40XP2_C2_16 from pneumatic brake panel | | OK | | Philemon Milani - 484650 | M4 |
| 10014 | A | Close Circuit Breaker 40Q1 | | OK | | Philemon Milani - 484650 | M4 |
| 10015 | A | Check the voltage on connector 40XP2_C2_16 between pins 13 (+) and 31 (-) | | OK | | Philemon Milani - 484650 | M4 |
| 10016 | R | Battery Voltage (above 80Vdc) is measured on connector 40XP2_C2_16 between pins 13 (+) and 31 (-) | | OK | | Philemon Milani - 484650 | M4 |
| 10017 | A | Open Circuit Breaker 40Q1, Replace connector -40XP2_C2_16 on the pneumatic brake panel, and Close Circuit breaker -40Q1 | | OK | | Philemon Milani - 484650 | M4 |
| 10018 | R | The pneumatic brake panel 40A2 is ON | | OK | | Philemon Milani - 484650 | M4 |
| 10019 | I | Train Lines | | OK | | Philemon Milani - 484650 | M4 |
| 10020 | A | EB Reduced Train Lines Check continuity between END1 90XR15 pin 60 END2 90XP25 pin 60 | | OK | | Philemon Milani - 484650 | M4 |
| 10021 | R | Both points are continuous | | OK | | Philemon Milani - 484650 | M4 |
| 10022 | A | Brake Applied Train Lines Check continuity between END1 90XR15 pin 50 END2 90XP25 pin 50 | | OK | | Philemon Milani - 484650 | M4 |
| 10023 | R | Both points are continuous | | OK | | Philemon Milani - 484650 | M4 |
| 10024 | A | Remote Isolation Train Lines Check continuity between END1 90XR15 pin 59 END2 90XP25 pin 59 | | OK | | Philemon Milani - 484650 | M4 |
| 10025 | R | Both points are continuous | | OK | | Philemon Milani - 484650 | M4 |

Section 11 – Holding and Parking Brake

11.1 Instructions list

11.1.1 045_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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10002 | I | Initial Conditions | | OK | | Sizwe Sibanyoni - 484647 | 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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10004 | A | Check that the pressure on Test point C2.11/1 is >5bar | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10005 | I | Visual Inspection | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10006 | A | Check the installation of the manual parking brake release components (lever + cable) | | OK | | Sizwe Sibanyoni - 484647 | 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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10008 | I | Circuit Breakers | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10009 | A | Close Circuit Breaker 33Q3 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10010 | A | Close Circuit Breaker 33Q5 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10011 | I | Parking Brake Pressure Switch | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10012 | R | Read Defined Variable [TT] (TBCU4)LI_PARK_BR_RELEASE = 1.0 | | OK | 1 | Sizwe Sibanyoni - 484647 | M4 |
| 10013 | R | Read Defined Variable [TT] (TBCU4)LI_BRAKE_STAT = 0.0 | | OK | 0 | Sizwe Sibanyoni - 484647 | M4 |
| 10014 | R | Read Defined Variable [TT] (MPU1)tbcu4_parkbrakerelease = 1.0 | | OK | 1 | Mlungisi Madela - 529927 | M4 |
| 10015 | R | Read Defined Variable [TT] (MPU1)tbcu4_li_pbrake_stat = 0.0 | | OK | 0 | Mlungisi Madela - 529927 | M4 |
| 10016 | A | Parking Brake Applied Train Lines Check continuity between END1 90XR15 pin 77 | | OK | | Sizwe Sibanyoni - 484647 | M4 |

| | | | | | | | |
|-------|---|---|--|----|---|-----------------------------|----|
| | | END2 90XP25 pin 77 | | | | | |
| 10017 | R | Both points are continuous | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10018 | A | Remote Parking Command Train Lines Check continuity between END1 90XR15 pin 68 END2 90XP25 pin 68 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10019 | R | Both points are continuous | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10020 | I | Parking Brake Applied | | OK | | Sizwe Sibanyoni - 484647 | 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 | | Sizwe Sibanyoni - 484647 | 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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10023 | R | Pressure at test point C2.11/1 <4.5 Bar | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10024 | R | Read Defined Variable [TT] (TBCU4)LI_PARK_BR_RELEASE = 0.0 | | OK | 0 | Mlungisi Madela - 529927 | M4 |
| 10025 | R | Read Defined Variable [TT] (MPU1)tbcu4_parkbrakerelease = 0.0 | | OK | 0 | Mlungisi Madela - 529927 | M4 |
| 10026 | A | Return the Isolation cock C2.3.2 to OPEN position | | OK | | Mlungisi Madela - 529927 | M4 |
| 10027 | R | Read Defined Variable [TT] (TBCU4)LI_BRAKE_STAT = 1.0 | | OK | 1 | Mlungisi Madela - 529927 | M4 |
| 10028 | R | Read Defined Variable [TT] (MPU1)tbcu4_li_pbrake_stat = 1.0 | | OK | 1 | Mlungisi Madela - 529927 | M4 |
| 10029 | R | Read Defined Variable [TT] (TBCU4)LI_PARK_BR_DC = 0.0 | | OK | 0 | Mlungisi Madela - 529927 | M4 |
| 10030 | R | Read Defined Variable [TT] (MPU1)tbcu4_parkbrakeisoldc = 0.0 | | OK | 0 | Mlungisi Madela - 529927 | M4 |
| 10031 | R | Read Defined Variable [TT] (MPU1)li_pbk_m4parkbrakeisol = 0.0 | | OK | 0 | Mlungisi Madela - 529927 | M4 |
| 10032 | A | Position the Isolation cock C2.3.2 in CLOSE position | | OK | | Mlungisi Madela - 529927 | M4 |

| | | | | | | | |
|-------|---|--|--|----|---|-----------------------------|----|
| 10033 | R | Read Defined Variable [TT] (MPU1)li_pbk_m4parkbrakeisol = 1.0 | | OK | 1 | Mlungisi Madela - 529927 | M4 |
| 10034 | R | Read Defined Variable [TT] (TBCU4)LI_BRAKE_STAT = 0.0 | | OK | 0 | Mlungisi Madela - 529927 | M4 |
| 10035 | R | Read Defined Variable [TT] (MPU1)tbcu4_li_pbrake_stat = 0.0 | | OK | 0 | Mlungisi Madela - 529927 | M4 |
| 10036 | R | Read Defined Variable [TT] (TBCU4)LI_PARK_BR_DC = 1.0 | | OK | 1 | Mlungisi Madela - 529927 | M4 |
| 10037 | R | Read Defined Variable [TT] (MPU1)tbcu4_parkbrakeisoldc = 1.0 | | OK | 1 | Mlungisi Madela - 529927 | M4 |
| 10038 | A | Return the Isolation cock C2.3.2 to OPEN position | | OK | | Mlungisi Madela - 529927 | M4 |



Serial Tests Report
TS244 – M4 – VFT
RTR Vehicle Functional Static Testing Report

Document Reference
GIB0000007098
Version: A0

Emission date
10/09/2024

Section 12 – Air Condition

12.1 Instructions list

12.1.2 057_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 |

| | | | | | | |
|-------|---|--|---|----|--|----|
| | | 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 xxx represents the train number Login: maint 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 controller 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 |

| | | | | | | |
|-------|---|---|---|----|--|----|
| | | 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 |

12.1.1 057_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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10002 | I | Power Supply | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10003 | A | Close Circuit Breaker 57Q2 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10004 | A | Remove Connector 57XP1_5 from HVAC Panel | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10005 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr1__1 = 0.0 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10006 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr2__1 = 0.0 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10007 | R | Check battery voltage (above 80Vdc) between points 11 and 9 of the connector 57XP1_5 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10008 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr2__1 = 1.0 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10009 | R | Check 0Vdc between points 11 and 9 of the connector 57XP1_5 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10010 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr1__1 = 1.0 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10011 | R | Check 0Vdc between points 11 and 9 of the connector 57XP1_5 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10012 | R | Check 0Vdc between points 10 and 9 of the connector 57XP1_5 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10013 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr2__1 = 0.0 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10014 | A | Force [TT] (MPU1)lo_hva_m4emergventil__1 = 1.0 | | OK | | Sizwe Sibanyoni - 484647 | M4 |

| | | | | | | | |
|-------|---|---|---|----|--|--------------------------|----|
| 10015 | R | Check 0Vdc between points 11 and 9 of the connector 57XP1_5 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10016 | R | Check battery voltage (above 80Vdc) between points 10 and 9 of the connector 57XP1_5 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10017 | A | Release [TT] (MPU1)lo_hva_m4emergventil__1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10018 | A | Release [TT] (MPU1)lo_hva_m4hvacinhibr1__1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10019 | A | Release [TT] (MPU1)lo_hva_m4hvacinhibr2__1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10020 | A | Put back the connector 57XP1_5 on the HVAC panel | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10021 | I | HVAC Electronic Power Supply | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10022 | A | Close Circuit Breaker F1 on the HVAC Panel | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10023 | A | Turn the control switch to AUTO position on the HVAC Panel | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10024 | R | The HVAC electronic is ON | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10025 | A | Open Circuit Breaker F1 on the HVAC Panel | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10026 | R | The HVAC electronic is OFF | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10027 | A | Close Circuit Breaker F1 on the HVAC Panel | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10028 | I | Software Upload | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10029 | I | Follow the procedure in the document below to upload software onto the HVAC electronic | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10030 | A | |  | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10031 | A | |  | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10032 | I | Sensor's Grade | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10033 | I | Each temperature sensor has calibrated grade information. The sensor must be setup with this information. | | OK | | Sizwe Sibanyoni - 484647 | M4 |

| | | | | | | | |
|-------|---|--|---|----|----|--------------------------|----|
| 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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10035 | R | Sensor grade for HVAC Return Air (RAS) is: | | OK | 2L | Sizwe Sibanyoni - 484647 | M4 |
| 10036 | R | Sensor grade for HVAC Duct Air (DAS) is: | | OK | 3H | Sizwe Sibanyoni - 484647 | M4 |
| 10037 | R | Sensor grade for HVAC Fresh Air (FAS) is: | | OK | 4 | Sizwe Sibanyoni - 484647 | M4 |
| 10038 | R | Sensor grade for HVAC Duct Air 2 (DAS2) is: | | OK | 4H | Sizwe Sibanyoni - 484647 | M4 |
| 10039 | A | In the maintenance software, select the "Application settings" page and click the "Sensors" tab | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10040 | A | Enter the data found on the label for each grade. Then, click "Save settings". |  | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10041 | A | Open Circuit Breaker F1 on the HVAC Panel | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10042 | I | Checking 400Vac | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10043 | A | Ensure that the 400Vac Shore Supply is connected to the vehicle, else connect it | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10044 | A | Close Circuit Breaker 57Q1 | | OK | | Sizwe Sibanyoni - 484647 | 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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10046 | R | 400Vac (+-5%) is measured between each of the phases | | OK | | Sizwe Sibanyoni - 484647 | 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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10048 | R | The phase rotation is correct between all three phases | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10049 | I | Saloon HVAC | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10050 | A | Close Circuit Breaker F1 on the HVAC Panel | | OK | | Sizwe Sibanyoni - 484647 | M4 |

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|-------|---|---|---|----|--|-----------------------------|----|
| 10051 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr2___1 = 1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10052 | A | Force [TT] (MPU1)lo_hva_m4hvacinhibr1___1 = 1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10053 | A | Force [TT] NRG_HvacM450Cmd = 0 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10054 | R | HVAC unit turns ON and starts to work | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10055 | I | Reconnect the laptop to the HVAC maintenance software using HCU Finder | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10056 | R | The Exhaust fans are Turned Off (Confirm on FORCED tab that Actual exhauster speed is OFF) |  | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10057 | I | Forced Mode (Saloon HVAC) | | OK | | Sizwe Sibanyoni - 484647 | 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 | | Sizwe Sibanyoni - 484647 | 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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10060 | I | Ventilation Mode |  | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10061 | A | Force Ventilation mode on the Saloon HVAC | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10062 | R | All saloon HVAC units work in Ventilation mode. Not heating/cooling | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10063 | R | The Exhaust fans are Turned OFF | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10064 | I | Cooling Mode | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10065 | A | Force Cooling mode on the Saloon HVAC | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10066 | R | All saloon HVAC units work in Cooling mode | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10067 | R | The Exhaust fans are Turned OFF | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10068 | I | Heating Mode | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10069 | A | Force Heating mode on the Saloon HVAC | | OK | | Sizwe Sibanyoni - 484647 | M4 |

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|-------|---|---|---|----|--|--------------------------|----|
| 10070 | R | All saloon HVAC units work in Heating mode | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10071 | R | The Exhaust fans are Turned OFF | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10072 | I | Automatic Mode | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10073 | A | Force Self-Test on the Saloon HVAC | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10074 | R | All saloon HVAC units work according to the mode described in the "Actual working mode" | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10075 | R | The Exhaust fans are Turned OFF | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10076 | I | HVAC Faults | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10077 | A | Open Circuit Breaker 57Q1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10078 | R | All saloon HVAC units STOP working | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10079 | A | Close Circuit Breaker 57Q1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10080 | R | All saloon HVAC units START working | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10081 | A | In the maintenance software, select the "Alarms / Warnings" tab |  | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10082 | A | Ensure there are no active faults on the HVAC | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10083 | I | For the next sections, walk through the whole car and physically check (feel) that the HVAC is functioning as desired | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10084 | R | No active faults identified on the HVAC unit | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10085 | A | Release [TT] (MPU1)lo_hva_m4hvacinhibr1__1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10086 | A | Release [TT] (MPU1)lo_hva_m4hvacinhibr2__1 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10087 | A | Release [TT] NRG_HvacM450Cmd | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10088 | I | END TEST | | OK | | Sizwe Sibanyoni - 484647 | M4 |



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Section 13 – Fire Protection

13.1 Instructions list

13.1.1 067_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 | | Sizwe Sibanyoni - 484647 | M4 |
| 10002 | I | Fire Detection Train Lines | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10003 | A | Fire Detection Train Lines Check continuity between END1 90XR14 pin 21 END2 90XP24 pin 21 | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10004 | R | Both points are continuous | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10005 | I | Continuity Test | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10006 | I | The following steps are continuity tests between the two points described in each step. Use a multimeter for this test. | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10007 | A | From : [(local: +END1 -90XR13.B (pin 4))] to: [-Inter-connector (local: +END2 -90XP23.b pin 4)] | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10008 | A | From : [(local: +END1 -90XR13.B (pin 5))] to: [-Inter-connector (local: +END2 -90XP23.b pin 5)] | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10009 | A | From : [(local: +END1 -90XR13.A (pin 7))] to: [-Inter-connector (local: +END2 -90XP23.a pin 7)] | | OK | | Sizwe Sibanyoni - 484647 | M4 |
| 10010 | A | From : [(local: +END1 -90XR13.A (pin 8))] to: [-Inter-connector (local: +END2 -90XP23.a pin 8)] | | OK | | Sizwe Sibanyoni - 484647 | M4 |



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GIB0000007098
Version: A0

Emission date
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Section 14 – Traction and Electric Brake

14.1 Instructions list

14.1.1 033_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 | | Mlungisi Madela - 529927 | M4 |
| 10002 | I | Circuit Breakers and Configuration | | OK | | Mlungisi Madela - 529927 | M4 |
| 10003 | A | Close Circuit Breaker 33Q2 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10004 | A | Close Circuit Breaker 33Q4 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10005 | A | Close Circuit Breaker 33Q5 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10006 | I | Circuit Breaker 33Q1 and 33Q3 must be Opened | | OK | | Mlungisi Madela - 529927 | M4 |
| 10007 | I | 110Vdc Normal Traction EL Train Line Apply bridge piece between END2 90XP25 pin 49 and pin 42 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10008 | A | Close Circuit Breaker 33Q1 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10009 | A | Close Circuit Breaker 33Q3 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10010 | R | Read Defined Variable [TT] (TBCU4)LI_CAR_ID4 = 1.0 | | OK | 1 | Mlungisi Madela - 529927 | M4 |
| 10011 | I | The TBCU should appear on TCMS network on DDU screen | | OK | | Mlungisi Madela - 529927 | M4 |
| 10012 | I | Train Lines | | OK | | Mlungisi Madela - 529927 | M4 |
| 10013 | A | Forward Train Lines Check continuity between END1 90XR15 pin 25 END2 90XP25 pin 25 | | OK | | Mlungisi Madela - 529927 | M4 |

| | | | | | | | |
|-------|---|--|---|----|--|--------------------------|----|
| 10014 | R | Both points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10015 | A | Reverse Train Lines Check continuity between END1 90XR15 pin 30 END2 90XP25 pin 30 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10016 | R | Both points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10017 | A | Traction Train Lines Check continuity between END1 90XR15 pin 31 END2 90XP25 pin 31 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10018 | R | Both points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10019 | A | No Brake Train Lines Check continuity between END1 90XR15 pin 32 END2 90XP25 pin 32 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10020 | R | Both points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10021 | A | Traction Interlock Bypass Train Lines Check continuity between END1 90XR14 pin 6 END2 90XP24 pin 6 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10022 | R | Both points are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10023 | A | Traction Interlock Train Lines Check continuity between END1 90XR15 pin 41 END2 90XP25 pin 41 and -10XP12_XCB2 pin 8 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10024 | R | All pins are continuous | | OK | | Mlungisi Madela - 529927 | M4 |
| 10025 | I | 110Vdc Normal Traction EL Train Line Remove bridge piece on END2 90XP25 pin 49 and pin 42 | | OK | | Mlungisi Madela - 529927 | M4 |
| 10026 | I | Coolant Liquid | | OK | | Mlungisi Madela - 529927 | M4 |
| 10027 | A | Check that the coolant level is at least 1/2 of the sight glass level indicator |  | OK | | Mlungisi Madela - 529927 | M4 |
| 10028 | R | Coolant Liquid Level is OK | | OK | | Mlungisi Madela - 529927 | M4 |



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| 10029 | I | End of Test | | OK | | Mlungisi Madela - 529927 | M4 |
|-------|---|-------------|--|----|--|-----------------------------|----|



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Section 15 – Passenger Doors

15.1 Instructions list

15.1.1 050_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 | | Tebogo Mtombeni - 529938 | M4 |
| 10002 | I | Initial conditions | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10003 | I | 110Vdc Normal power supply is connected to the vehicle and ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10004 | I | Circuit Breakers | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10005 | A | Close Circuit Breaker 50Q1 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10006 | R | DCU 1 is powered ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10007 | R | Check on the DDU that DCU1 is online | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10008 | A | Close Circuit Breaker 50Q2 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10009 | R | DCU 2 is powered ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10010 | R | Check on the DDU that DCU2 is online | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10011 | A | Close Circuit Breaker 50Q3 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10012 | R | DCU 3 is powered ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10013 | R | Check on the DDU that DCU3 is online | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10014 | A | Close Circuit Breaker 50Q4 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10015 | R | DCU 4 is powered ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10016 | R | Check on the DDU that DCU4 is online | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10017 | A | Close Circuit Breaker 50Q5 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10018 | R | DCU 5 is powered ON | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10019 | R | Check on the DDU that DCU5 is online | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10020 | A | Close Circuit Breaker 50Q6 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10021 | R | DCU 6 is powered ON | | OK | | Tebogo Mtombeni - 529938 | M4 |

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|-------|---|---|---|----|--|--------------------------|----|
| 10022 | R | Check on the DDU that DCU6 is online | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10023 | A | Close Circuit Breaker 50Q7 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10024 | I | Car ID Code | | OK | | Tebogo Mtombeni - 529938 | 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 | | Tebogo Mtombeni - 529938 | M4 |
| 10026 | R | All doors are available | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10027 | I | Train Lines and Safety Loop | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10028 | A | ERTMS Auth Left Train Lines Check continuity between END1 90XR15 pin 44 END2 90XP25 pin 44 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10029 | R | Both points are continuous | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10030 | A | ERTMS Auth Right Train Lines Check continuity between END1 90XR15 pin 47 END2 90XP25 pin 47 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10031 | R | Both points are continuous | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10032 | A | Doors Open Train Lines Check continuity between END1 90XR15 pin 66 END2 90XP25 pin 66 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10033 | R | Both points are continuous | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10034 | A | Door Close Right Train Lines Check continuity between END1 90XR15 pin 78 END2 90XP25 pin 78 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10035 | A | Both points are continuous | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10036 | A | Door Close Left Train Lines Check continuity between END1 90XR15 pin 79 END2 90XP25 pin 79 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10037 | R | Both points are continuous | | OK | | Tebogo Mtombeni - 529938 | M4 |

| | | | | | |
|-------|---|---|----|-----------------------------|----|
| 10038 | A | Door Auth Left Train Lines Check continuity between END1 90XR15 pin 85 END2 90XP25 pin 85 | OK | Tebogo Mtombeni - 529938 | M4 |
| 10039 | R | Both points are continuous | OK | Tebogo Mtombeni - 529938 | M4 |
| 10040 | A | Door Auth Right Train Lines Check continuity between END1 90XR15 pin 84 END2 90XP25 pin 84 | OK | Tebogo Mtombeni - 529938 | M4 |
| 10041 | R | Both points are continuous | OK | Tebogo Mtombeni - 529938 | M4 |
| 10042 | A | V<3km/h Train Lines Check continuity between END1 90XR15 pin 29 END2 90XP25 pin 29 | OK | Tebogo Mtombeni - 529938 | M4 |
| 10043 | R | Both points are continuous | OK | Tebogo Mtombeni - 529938 | M4 |
| 10044 | A | Door Auth Left Train Lines Check continuity between END1 90XR15 pin 85 END2 90XP25 pin 85 | OK | Tebogo Mtombeni - 529938 | M4 |
| 10045 | R | Both points are continuous | OK | Tebogo Mtombeni - 529938 | M4 |
| 10046 | A | Door Auth Right Train Lines Check continuity between END1 90XR15 pin 84 END2 90XP25 pin 84 | OK | Tebogo Mtombeni - 529938 | M4 |
| 10047 | R | Both points are continuous | OK | Tebogo Mtombeni - 529938 | M4 |
| 10048 | A | Safety Doors Loop Train Lines Check continuity between END1 90XR15 pin 96 END2 90XP25 pin 96 | OK | Tebogo Mtombeni - 529938 | M4 |
| 10049 | R | Both points are continuous | OK | Tebogo Mtombeni - 529938 | M4 |
| 10050 | I | Left Side Doors | OK | Tebogo Mtombeni - 529938 | M4 |
| 10051 | I | Door 1 | OK | Tebogo Mtombeni - 529938 | M4 |
| 10052 | I | Use bridge pieces to apply voltage on the passenger door mechanism to simulate the following signals: - Door Auth Left | OK | Tebogo Mtombeni - 529938 | M4 |

| | | | | | | |
|-------|---|--|----|------|--------------------------|----|
| | | - V<3km/h | | | | |
| 10053 | A | Apply bridge pieces on 50XP1_X11 between slot 2,3 and 15. | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10054 | A | Force [TT] (MPU1)lo_dor_m4opendoorleft = 1.0 | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10055 | R | Check that the door opens in 3 sec (+1/-0) | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10056 | R | Check that the GREEN leds on both sides of the door blink while the door opens [Safety Request: Prasa8-05] | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10057 | I | Door Opening Gap | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10058 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10059 | R | Door 1 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1401 | Tebogo Mtombeni - 529938 | M4 |
| 10060 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10061 | R | Door 1 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1410 | Tebogo Mtombeni - 529938 | M4 |
| 10062 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10063 | R | Door 1 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1406 | Tebogo Mtombeni - 529938 | M4 |
| 10064 | I | Door 3 | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10065 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10066 | R | Door 3 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1400 | Tebogo Mtombeni - 529938 | M4 |
| 10067 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10068 | R | Door 3 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1409 | Tebogo Mtombeni - 529938 | M4 |
| 10069 | A | Measure the opening gap of the door. (This measurement must be done in the | OK | | Tebogo Mtombeni - 529938 | M4 |

| | | | | | | | |
|-------|---|---|----|------|-----------------------------|----|--|
| | | middle of the door) | | | | | |
| 10070 | R | Door 3 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1405 | Tebogo Mtombeni - 529938 | M4 | |
| 10071 | I | Door 5 | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10072 | I | Door Opening Gap | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10073 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10074 | R | Door 5 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1402 | Tebogo Mtombeni - 529938 | M4 | |
| 10075 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10076 | R | Door 5 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1410 | Tebogo Mtombeni - 529938 | M4 | |
| 10077 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10078 | R | Door 5 gap Result Min/Max : 1390<= x <= 1410 (mm) | OK | 1405 | Tebogo Mtombeni - 529938 | M4 | |
| 10079 | I | Right Side Doors | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10080 | I | Door 2 | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10081 | A | Use bridge pieces to apply voltage on the passenger door mechanism to simulate the following signals: - Door Auth Right - V<3km/h | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10082 | A | Apply bridge pieces on 50XP2_X11 between slot 2,3, and 15. | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10083 | A | Force [TT] (MPU1)lo_dor_m4opendoorright = 1.0 | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10084 | R | Check that the door opens in 3 sec (+1/-0) | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10085 | R | Check that the GREEN leds on both sides of the door blink while the door opens [Safety Request: Prasa8-05] | OK | | Tebogo Mtombeni - 529938 | M4 | |
| 10086 | I | Door Opening Gap | OK | | Tebogo Mtombeni - 529938 | M4 | |

| | | | | | | | |
|-------|---|---|--|----|------|-----------------------------|----|
| 10087 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door). | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10088 | R | Door 2 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1400 | Tebogo Mtombeni - 529938 | M4 |
| 10089 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10090 | R | Door 2 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1408 | Tebogo Mtombeni - 529938 | M4 |
| 10091 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10092 | R | Door 2 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1404 | Tebogo Mtombeni - 529938 | M4 |
| 10093 | I | Door 4 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10094 | I | Door Opening Gap | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10095 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10096 | R | Door 4 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1390 | Tebogo Mtombeni - 529938 | M4 |
| 10097 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10098 | R | Door 4 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1408 | Tebogo Mtombeni - 529938 | M4 |
| 10099 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10100 | R | Door 4 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1404 | Tebogo Mtombeni - 529938 | M4 |
| 10101 | I | Door 6 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10102 | I | Door Opening Gap | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10103 | A | Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door) | | OK | | Tebogo Mtombeni - 529938 | M4 |

| | | | | | | | |
|-------|---|--|--|----|------|-----------------------------|----|
| 10104 | R | Door 6 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1401 | Tebogo Mtombeni - 529938 | M4 |
| 10105 | A | Measure the opening gap of the door. (This measurement must be done at the top of the door) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10106 | R | Door 6 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1409 | Tebogo Mtombeni - 529938 | M4 |
| 10107 | A | Measure the opening gap of the door. (This measurement must be done in the middle of the door) | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10108 | R | Door 6 gap Result Min/Max : 1390<= x <= 1410 (mm) | | OK | 1404 | Tebogo Mtombeni - 529938 | M4 |
| 10109 | I | Obstacle Detection | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10110 | A | Position an obstacle on the floor in the centre of the door closing line for all the doors | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10111 | A | Force [TT] (MPU1)lo_dor_m4opendoorright = 0 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10112 | A | Force [TT] (MPU1)lo_dor_m4opendoorleft = 0 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10113 | R | The doors will hit the obstacle, reopen and try to close again 3 times. On the third attempt it will stop and stand ajar - free to be opened manually | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10114 | A | Safety Doors Loop Train Lines Check continuity between END1 90XR15 pin 96 END2 90XP25 pin 96 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10115 | R | There is no continuity between the two points | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10116 | A | Force [TT] (MPU1)lo_dor_m4opendoorright = 1 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10117 | A | Force [TT] (MPU1)lo_dor_m4opendoorleft = 1 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10118 | R | The door opens fully | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10119 | A | Remove the obstacle | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10120 | A | Release [TT] (MPU1)lo_dor_m4opendoorleft | | OK | | Tebogo Mtombeni - 529938 | M4 |

| | | | | | | | |
|-------|---|--|--|----|--|-----------------------------|----|
| 10121 | A | Release [TT] (MPU1)lo_dor_m4opendoorright | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10122 | A | Remove the bridge pieces on connector 50XP1_X11 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10123 | A | Remove the bridge pieces on connector 50XP2_X11 | | OK | | Tebogo Mtombeni - 529938 | M4 |
| 10124 | I | End of Test | | OK | | Tebogo Mtombeni - 529938 | M4 |



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Document Reference
GIB0000007098
Version: A0

Emission date
10/09/2024

Section 16 – Vehicle Normalization

16.1 Instructions list

16.1.1 093_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 | | Paseka Ditlhakanyane - 491468 | M4 |
| 10002 | I | The VFT procedures are all completed | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10003 | I | Vehicle Normalization Check | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10004 | R | On LV3 all Circuit Breakers are installed and secured | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10005 | R | On LV3 all Dataplugs are installed, tightened and earth braids are fastened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10006 | R | On LV3 all Connectors are tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10007 | R | On LV3 there are no missing components, device, wiring or connectors. | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10008 | R | On LV6 all Dataplugs are installed, tightened and earth braids are fastened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10009 | R | On LV6 all Connectors are tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10010 | R | On LV6 there are no missing components, device, wiring or connectors. | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10011 | R | On HC Cubicle the Controller is installed and properly tightened and its connectors are tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10012 | R | All DCUs are properly installed and secured | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10013 | R | All Internal Displays are properly installed and secured | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10014 | R | All Light Covers are properly installed | | OK | | Paseka Ditlhakanyane - 491468 | M4 |

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| | | | | | | | |
|-------|---|--|--|----|--|-------------------------------|----|
| 10015 | R | All Saloon Fire Detectors are properly installed and secured | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10016 | R | All covers are normalised inside the car | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10017 | R | On the Underframe, TBCU Agate is installed and properly tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10018 | R | On the Underframe, Speed Sensors are installed and properly tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10019 | R | On the LVB, all Circuit Breakers are installed and properly tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10020 | R | On the LVB, all Relays and Timers are installed and properly tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10021 | R | On the LVB, BRIOMs are installed and properly tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10022 | R | On the LVB there are no missing components, device, wiring or connectors. | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10023 | R | On the Underframe, all Connectors are tightened | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10024 | R | All underframe covers are normalised | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10025 | R | On END1 the Octopus cables are disconnected from the car and properly stored. | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10026 | R | On END2 the Octopus cables are disconnected from the car and properly stored. | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10027 | R | The Test Bench is switched OFF and the Octopus cables are disconnected and properly stored | | OK | | Paseka Ditlhakanyane - 491468 | M4 |
| 10028 | R | ALL P.Os of this car are closed | | OK | | Nokuzola Mdluli - 491469 | M4 |
| 10029 | I | End Of Test | | OK | | Paseka Ditlhakanyane - 491468 | M4 |

Section 17 – Report summaries

17.1 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 | | |

17.2 Tools used

| Function | Tool name | Tool number | Next Calibration date |
|----------|-------------|-------------|-----------------------|
| 015_NRG | NPhasemètre | Phasemeter | 10/31/2024 |
| 027_ERM | Multimetro | Meter 1 | 10/31/2024 |
| 033_TRC | Multimetro | Meter 1 | 10/31/2024 |
| 040_SBK | Manometro | Manometer | 10/29/2024 |
| 045_PBK | Manometro | Manometer | 10/29/2024 |
| 057_HVA | NPhasemètre | Phasemeter | 10/31/2024 |
| 067_FSD | Multimetro | Meter 1 | 10/31/2024 |



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Document Reference
GIB0000007098
Version: A0

Emission date
10/09/2024

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