

PROJECT	CUSTOMER	VEHICLE
X'trapolis-PRASA	PRASA	259 – M4 – VFT

RTR Vehicle Functional Static Testing TS259 M4 Report  
 GIB0000007442



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### Table of modifications

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### Internal validations

	Name	Function	Date	Signature
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### Execution Plan

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## Section 1 – Purpose / Objectives

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### 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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## Section 2 – Energy Distribution

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### 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		Mpumelelo Sithole - 529980	M4
10002	I	Initial Conditions		OK		Mpumelelo Sithole - 529980	M4
10003	I	All the Circuit Breakers should be OPEN		OK		Mpumelelo Sithole - 529980	M4
10004	I	Test bench should be connected but with no power supply		OK		Mpumelelo Sithole - 529980	M4
10005	I	NO 400Vac should be connected to the car		OK		Mpumelelo Sithole - 529980	M4
10006	A	Close Circuit Breaker 15Q3 (Normal Line)		OK		Mpumelelo Sithole - 529980	M4
10007	I	Voltage Isolation 110Vdc		OK		Mpumelelo Sithole - 529980	M4
10008	I	230Vac and 400Vac Circuit breakers		OK		Mpumelelo Sithole - 529980	M4
10009	A	Close Circuit Breaker 13Q1		OK		Mpumelelo Sithole - 529980	M4
10010	A	Close the circuit breaker 13Q3		OK		Mpumelelo Sithole - 529980	M4
10011	I	Normal and Permanent Power Supply		OK		Mpumelelo Sithole - 529980	M4
10012	I	110Vdc Permanent Train Line Apply 110Vdc on -93XT304_1 pin 4 to simulate Permanent Train Line		OK		Mpumelelo Sithole - 529980	M4
10013	A	Apply 110Vdc on the Normal Line using the external power supply		OK		Mpumelelo Sithole - 529980	M4
10014	A	Measure 110Vdc between 90XR50.X1/1 (+) and 90XR50.X2/1 (-) (intercar connector). [Normal line]		OK		Mpumelelo Sithole - 529980	M4
10015	I	Permanent Line Circuit Breakers		OK		Mpumelelo Sithole - 529980	M4
10016	A	Close Circuit Breaker 15Q4 for battery voltage above 80Vdc and close it (permanent Line)		OK		Mpumelelo Sithole - 529980	M4
10017	I	230Vac Circuit Breakers		OK		Mpumelelo Sithole - 529980	M4
10018	A	Close Circuit Breaker 13Q2		OK		Mpumelelo Sithole - 529980	M4

10019	A	Close Circuit Breaker 13Q3		OK		Mpumelelo Sithole - 529980	M4
10020	I	230Vac and 400Vac Voltage Supply		OK		Mpumelelo Sithole - 529980	M4
10021	A	Apply 400Vac to the Vehicle, either on End1 or End2		OK		Mpumelelo Sithole - 529980	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		Mpumelelo Sithole - 529980	M4
10023	R	Phase rotation between U, V, W is correct		OK		Mpumelelo Sithole - 529980	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		Mpumelelo Sithole - 529980	M4
10025	R	Phase rotation between U, V, W is correct		OK		Mpumelelo Sithole - 529980	M4
10026	A	Check 230Vac between points L and N of socket -13XT1		OK		Mpumelelo Sithole - 529980	M4
10027	R	230Vac present		OK		Mpumelelo Sithole - 529980	M4
10028	A	Check 230Vac between points L and N of socket -13XT2		OK		Mpumelelo Sithole - 529980	M4
10029	R	230Vac present		OK		Mpumelelo Sithole - 529980	M4
10030	A	Remove connector 57XP1_10		OK		Mpumelelo Sithole - 529980	M4
10031	A	Remove connector 93XP150		OK		Mpumelelo Sithole - 529980	M4
10032	A	Close circuit breaker 34Q1 and 57Q1		OK		Mpumelelo Sithole - 529980	M4
10033	A	Check 400Vac +-5% tolerance between Phases (W, V, U) on connector 57XP1_10 (10.b1,10a2,10a1)		OK		Mpumelelo Sithole - 529980	M4
10034	R	400Vac +- 5% tolerance is measured between all three phases of 57XP1_10		OK		Mpumelelo Sithole - 529980	M4
10035	A	Check 400Vac +-5% tolerance between Phases (W, V, U) on connector 93XP150 (E2, E3, E1)		OK		Mpumelelo Sithole - 529980	M4
10036	R	400Vac +- 5% tolerance is measured between all three phases on connector 93XP150		OK		Mpumelelo Sithole - 529980	M4
10037	A	Put back connector 57XP1_10		OK		Mpumelelo Sithole - 529980	M4

10038	A	Put back connector 93XP150		OK		Mpumelelo Sithole - 529980	M4
10039	A	Switch off the 400Vac power supply from the socket		OK		Mpumelelo Sithole - 529980	M4
10040	I	Auxiliary Converters Command		OK		Mpumelelo Sithole - 529980	M4
10041	A	Battery Connection Train Lines Measure continuity between END 1 90XR14 pin 30 END 2 90XP24 pin 30		OK		Mpumelelo Sithole - 529980	M4
10042	R	Both points are continuous		OK		Mpumelelo Sithole - 529980	M4
10043	A	Battery Disconnection Train Lines Measure continuity between END 1 90XR14 pin 31 END 2 90XP24 pin 31		OK		Mpumelelo Sithole - 529980	M4
10044	R	Both points are continuous		OK		Mpumelelo Sithole - 529980	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		Mpumelelo Sithole - 529980	M4
10046	R	Both points are continuous		OK		Mpumelelo Sithole - 529980	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		Goitsemodimo Kgatitswe - 526511	M4
10002	I	Initial conditions		OK		Goitsemodimo Kgatitswe - 526511	M4
10003	I	Vehicle test bench should be configured as TC1: 1. TC1 Dataplugs 2. MCE switch set to TC1		OK		Goitsemodimo Kgatitswe - 526511	M4
10004	A	110Vdc supply to the Normal Train line is ON		OK		Goitsemodimo Kgatitswe - 526511	M4
10005	I	Power Supply to the Router Switches		OK		Goitsemodimo Kgatitswe - 526511	M4
10006	I	Power supply to the 25A10 SWITCH ETHERNET (CRS1)		OK		Goitsemodimo Kgatitswe - 526511	M4
10007	A	Close Circuit Breaker 25Q10		OK		Goitsemodimo Kgatitswe - 526511	M4
10008	R	CRS1 25A10 is ON		OK		Goitsemodimo Kgatitswe - 526511	M4
10009	I	Power supply to the 25A11 SWITCH ETHERNET (CRS2)		OK		Goitsemodimo Kgatitswe - 526511	M4
10010	A	Close Circuit Breaker 25Q11		OK		Goitsemodimo Kgatitswe - 526511	M4
10011	R	CRS2 25A11 is ON		OK		Goitsemodimo Kgatitswe - 526511	M4
10012	I	Power supply to the 25A14 ETHERNET REPEATER (TBR)		OK		Goitsemodimo Kgatitswe - 526511	M4
10013	A	Close Circuit Breaker 25Q14		OK		Goitsemodimo Kgatitswe - 526511	M4
10014	R	TBR 25A14 is ON		OK		Goitsemodimo Kgatitswe - 526511	M4
10015	A	Close Circuit Breaker 25Q6		OK		Goitsemodimo Kgatitswe - 526511	M4

10016	A	Close Circuit Breaker 25Q7		OK		Goitsemodimo Kgatitswe - 526511	M4
10017	I	Ethernet Loop		OK		Goitsemodimo Kgatitswe - 526511	M4
10018	A	For each CRS, check that the Ethernet Loop LEDs are flashing		OK		Goitsemodimo Kgatitswe - 526511	M4
10019	R	CRS1 has LEDs on ports X3 and X4 flashing		OK		Goitsemodimo Kgatitswe - 526511	M4
10020	R	CRS2 has ONLY LED on port X4 flashing		OK		Goitsemodimo Kgatitswe - 526511	M4
10021	R	Check on the Test Bench DDU that all Router Switches are available on the network		OK		Goitsemodimo Kgatitswe - 526511	M4
10022	I	Power Supply to the BRIOMS		OK		Goitsemodimo Kgatitswe - 526511	M4
10023	I	Power supply to the 25A6 BRIOM 40/10 ETH 6		OK		Goitsemodimo Kgatitswe - 526511	M4
10024	R	BRIOM 25A6 is ON		OK		Goitsemodimo Kgatitswe - 526511	M4
10025	A	Check visually that ground braid is connected to BRIOM		OK		Goitsemodimo Kgatitswe - 526511	M4
10026	I	Power supply to the 25A7 BRIOM 40/10 ETH 7		OK		Goitsemodimo Kgatitswe - 526511	M4
10027	R	BRIOM 25A7 is ON		OK		Goitsemodimo Kgatitswe - 526511	M4
10028	A	Check visually that ground braid is connected to BRIOM		OK		Goitsemodimo Kgatitswe - 526511	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		Goitsemodimo Kgatitswe - 526511	M4
10002	I	Train Lines		OK		Goitsemodimo Kgatitswe - 526511	M4
10003	A	Cab Selected on Train - Train Lines Measure continuity between END1 90XR14 pin 3 END2 90XP24 pin 3		OK		Goitsemodimo Kgatitswe - 526511	M4
10004	R	Both pins are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10005	A	Cab Active TC1 Train Lines Measure continuity between END1 90XR14 pin 4 END2 90XP24 pin 4		OK		Goitsemodimo Kgatitswe - 526511	M4
10006	R	Both pins are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10007	A	Cab Active TC2 Train Lines Measure continuity between END1 90XR14 pin 5 END2 90XP24 pin 5		OK		Goitsemodimo Kgatitswe - 526511	M4
10008	R	Both pins are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10009	A	Master Key TC1 Train Lines Measure continuity between END1 90XR14 pin 17 END2 90XP24 pin 17		OK		Goitsemodimo Kgatitswe - 526511	M4
10010	R	Both pins are continuous		OK		Goitsemodimo Kgatitswe - 526511	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		Mpumelelo Sithole - 529980	M4
10002	I	Initial Conditions		OK		Mpumelelo Sithole - 529980	M4
10003	I	110Vdc Normal line is ON		OK		Mpumelelo Sithole - 529980	M4
10004	I	Cleaning Lighting Command		OK		Mpumelelo Sithole - 529980	M4
10005	A	110Vdc Permanent Train Line Apply 110V on 93XT304_1 pin 4 to simulate permanent supply		OK		Mpumelelo Sithole - 529980	M4
10006	A	Close Circuit Breaker 52Q3		OK		Mpumelelo Sithole - 529980	M4
10007	A	Close Circuit Breaker 52Q4		OK		Mpumelelo Sithole - 529980	M4
10008	A	Close Circuit Breaker 52Q5		OK		Mpumelelo Sithole - 529980	M4
10009	R	All saloon emergency lights (low intensity) are OFF on all light modules (Left + Right).		OK		Mpumelelo Sithole - 529980	M4
10010	A	Turn Cleaning Staff Lights Switch 52S6 to ON position		OK		Mpumelelo Sithole - 529980	M4
10011	R	All saloon emergency lights (low intensity) are "ON" on all light modules (Left + Right).		OK		Mpumelelo Sithole - 529980	M4
10012	A	Reset Circuit Breaker 52Q5 (Open and Close)		OK		Mpumelelo Sithole - 529980	M4
10013	A	Close Circuit Breaker 52Q1		OK		Mpumelelo Sithole - 529980	M4
10014	A	Close Circuit Breaker 52Q2		OK		Mpumelelo Sithole - 529980	M4

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10015	R	All saloon emergency lights (low intensity) are "ON" on all light modules (Left + Right).		OK		Mpumelelo Sithole - 529980	M4
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## Section 6 – PACIS System

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### 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		Mpumelelo Sithole - 529980	M4
10002	I	Initial conditions		OK		Mpumelelo Sithole - 529980	M4
10003	I	110Vdc Normal line is connected and ON		OK		Mpumelelo Sithole - 529980	M4
10004	I	Circuit Breakers		OK		Mpumelelo Sithole - 529980	M4
10005	A	Close Circuit Breaker 54Q1		OK		Mpumelelo Sithole - 529980	M4
10006	A	Close Circuit Breaker 54Q2		OK		Mpumelelo Sithole - 529980	M4
10007	A	Close Circuit Breaker 54Q10		OK		Mpumelelo Sithole - 529980	M4
10008	A	Close Circuit Breaker 54Q11		OK		Mpumelelo Sithole - 529980	M4
10009	A	Close Circuit Breaker 55Q2		OK		Mpumelelo Sithole - 529980	M4
10010	A	Close Circuit Breaker 55Q3		OK		Mpumelelo Sithole - 529980	M4
10011	R	All 'Pacis System' circuit breakers are closed		OK		Mpumelelo Sithole - 529980	M4
10012	I	Power Supply of Router Switches		OK		Mpumelelo Sithole - 529980	M4
10013	I	Ethernet Switch CRS1		OK		Mpumelelo Sithole - 529980	M4
10014	R	CRS1 is ON		OK		Mpumelelo Sithole - 529980	M4
10015	I	Ethernet Switch CRS2		OK		Mpumelelo Sithole - 529980	M4
10016	R	CRS2 is ON		OK		Mpumelelo Sithole - 529980	M4
10017	I	DPAI-1		OK		Mpumelelo Sithole - 529980	M4
10018	R	DPAI-1 is ON		OK		Mpumelelo Sithole - 529980	M4
10019	I	DPAI-2		OK		Mpumelelo Sithole - 529980	M4
10020	R	DPAI-2 is ON		OK		Mpumelelo Sithole - 529980	M4
10021	I	Lateral Display 'LAT1'		OK		Mpumelelo Sithole - 529980	M4

10022	R	The PWR (power) LED is "ON" on the Lateral Display 'LAT1'.		OK		Mpumelelo Sithole - 529980	M4
10023	I	Lateral Display 'LAT2'		OK		Mpumelelo Sithole - 529980	M4
10024	R	The PWR (power) LED is "ON" on the Lateral Display 'LAT2'.		OK		Mpumelelo Sithole - 529980	M4
10025	I	Interior Display 'INT1'		OK		Mpumelelo Sithole - 529980	M4
10026	R	The PWR (power) LED is "ON" on the Interior Display 'INT1'.		OK		Mpumelelo Sithole - 529980	M4
10027	I	Interior Display 'INT2'		OK		Mpumelelo Sithole - 529980	M4
10028	R	The PWR (power) LED is "ON" on the Interior Display 'INT2' is ON.		OK		Mpumelelo Sithole - 529980	M4
10029	I	Impedance of Loudspeaker		OK		Mpumelelo Sithole - 529980	M4
10030	I	Saloon Speakers Commanded by DPAL-1		OK		Mpumelelo Sithole - 529980	M4
10031	A	Measure the impedance connector '54XP1_X4' between pins: z32(+) and z30 (-).		OK		Mpumelelo Sithole - 529980	M4
10032	R	Impedance Result Max: $x \leq 32.00$ (Ohm)		OK	31.8	Mpumelelo Sithole - 529980	M4
10033	I	Saloon Speakers Commanded by DPAL-2		OK		Mpumelelo Sithole - 529980	M4
10034	A	Measure the impedance connector '54XP2_X4' between pins: z32(+) and z30 (-).		OK		Mpumelelo Sithole - 529980	M4
10035	R	Impedance Result Max: $x \leq 32.00$ (Ohm)		OK	30	Mpumelelo Sithole - 529980	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		Goitsemodimo Kgatitswe - 526511	M4
10002	A	ERTMS Bypass Train Lines Check continuity between END1 90XR14 pin 11 END2 90XP24 pin 11		OK		Goitsemodimo Kgatitswe - 526511	M4
10003	R	Both pins are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10004	A	Emergency Brake ERTMS 1 Train Lines Check continuity between END1 90XR14 pin 18 END2 90XP24 pin 18		OK		Goitsemodimo Kgatitswe - 526511	M4
10005	R	Both pins are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10006	I	Emergency Brake ERTMS 2 Train Lines Check continuity between END1 90XR14 pin 20 END2 90XP24 pin 20		OK		Goitsemodimo Kgatitswe - 526511	M4
10007	R	Both pins are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10008	I	Eurobalise Antenna Cable		OK		Goitsemodimo Kgatitswe - 526511	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		Goitsemodimo Kgatitswe - 526511	M4
10010	R	Eurobalise Antenna cable is correctly configured		OK		Goitsemodimo Kgatitswe - 526511	M4

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## 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		Goitsemodimo Kgatitswe - 526511	M4
10002	I	Backup Mode		OK		Goitsemodimo Kgatitswe - 526511	M4
10003	R	Points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10004	A	Check continuity on Timer 27D1 between points A4 and B3		OK		Goitsemodimo Kgatitswe - 526511	M4
10005	A	Backup Mode Train Lines Check continuity between END1 90XR15 pin23 END2 90XP25 pin 23 and 27K1 A1		OK		Goitsemodimo Kgatitswe - 526511	M4
10006	R	All points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10007	A	Check continuity between 27K1 A2 and Ground		OK		Goitsemodimo Kgatitswe - 526511	M4
10008	R	The points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10009	I	Emergency Disconnection		OK		Goitsemodimo Kgatitswe - 526511	M4
10010	A	Emergency Disconnection Train Lines Check continuity between END1 90XR15 pin24 END2 90XP25 pin 24		OK		Goitsemodimo Kgatitswe - 526511	M4
10011	R	All points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4



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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		TIVANI Angel - 542257	M4
10002	I	Initial Conditions		OK		TIVANI Angel - 542257	M4
10003	I	No PEAs are activated		OK		TIVANI Angel - 542257	M4
10004	I	110Vdc Normal power supply should be connected to the vehicle and ON		OK		TIVANI Angel - 542257	M4
10005	I	Visual Inspection		OK		TIVANI Angel - 542257	M4
10006	A	Physically and visually inspect all the Disk Break Units (DBU) and brake pads, to ensure they are securely fitted.		OK		TIVANI Angel - 542257	M4
10007	R	All the brake DBUs are correctly installed, and all the brake pads are correctly installed and locked.		OK		TIVANI Angel - 542257	M4
10008	A	Check the piping installation		OK		TIVANI Angel - 542257	M4
10009	R	All the pipes are installed on the vehicle		OK		TIVANI Angel - 542257	M4
10010	A	Check all the Passenger Emergency Alarm handles, and ensure they are connected to their respective connectors		OK		TIVANI Angel - 542257	M4
10011	R	All the PEAs are installed and connected		OK		TIVANI Angel - 542257	M4
10012	I	Train Lines		OK		TIVANI Angel - 542257	M4
10013	A	Emergency Brake Loop Train Lines Check continuity between END1 90XR24 pin 8 END2 90XP34 pin 8		OK		TIVANI Angel - 542257	M4

10014	R	Both points are continuous		OK		TIVANI Angel - 542257	M4
10015	A	Emergency Brake Loop Override Train Lines Check continuity between END1 90XR24 pin 9 END2 90XP34 pin 9		OK		TIVANI Angel - 542257	M4
10016	R	Both points are continuous		OK		TIVANI Angel - 542257	M4
10017	I	Emergency Brake Train Line Check continuity between END1 90XR25 pin 67 END2 90XP35 pin 67		OK		TIVANI Angel - 542257	M4
10018	R	Both points are continuous		OK		TIVANI Angel - 542257	M4
10019	A	PEA Loop OTDR Train Lines Check continuity between END1 90XR24 pin 10 END2 90XP34 pin 10		OK		TIVANI Angel - 542257	M4
10020	R	Both points are continuous		OK		TIVANI Angel - 542257	M4
10021	A	PEA Loop Train Lines Check continuity between END1 90XR25 pin 95 END2 90XP35 pin95		OK		TIVANI Angel - 542257	M4
10022	R	Both points are continuous		OK		TIVANI Angel - 542257	M4
10023	A	Close Circuit breaker 44Q1		OK		TIVANI Angel - 542257	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		TIVANI Angel - 542257	M4
10002	I	Initial Conditions		OK		TIVANI Angel - 542257	M4
10003	I	No air supply to the vehicle		OK		TIVANI Angel - 542257	M4
10004	I	All brake panel cocks are in normal position (not isolated)		OK		TIVANI Angel - 542257	M4
10005	I	110Vdc Normal power supply should be connected to the vehicle and ON		OK		TIVANI Angel - 542257	M4
10006	I	Follow the procedure in the document below to upload software onto the TBCU electronic. <a href="#">[16-31-51-335717_TBCU Software Upload.pdf]</a>		OK		TIVANI Angel - 542257	M4
10007	I	Power Supply		OK		TIVANI Angel - 542257	M4
10008	A	Remove the connector 10XR12_XCB2 from the propulsion box		OK		TIVANI Angel - 542257	M4
10009	A	Close Circuit Breaker 33Q1, 33Q3 and 33Q5		OK		TIVANI Angel - 542257	M4
10010	A	Check the voltage on connector 10XR12_XCB2 between pins 4 (+) and 69 (-); 4(+) and 67(-); and 5(+) and 68(-)		OK		TIVANI Angel - 542257	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		TIVANI Angel - 542257	M4
10012	A	Open Circuit Breaker 33Q1 and 33Q3, Replace connector 10XR12_XCB2 on the propulsion box, and Close Circuit breaker		OK		TIVANI Angel - 542257	M4

		33Q1 and 33Q3				
10013	A	Remove the connector -40XP2_C2_16 from pneumatic brake panel		OK	TIVANI Angel - 542257	M4
10014	A	Close Circuit Breaker 40Q1		OK	TIVANI Angel - 542257	M4
10015	A	Check the voltage on connector 40XP2_C2_16 between pins 13 (+) and 31 (-)		OK	TIVANI Angel - 542257	M4
10016	R	Battery Voltage (above 80Vdc) is measured on connector 40XP2_C2_16 between pins 13 (+) and 31 (-)		OK	TIVANI Angel - 542257	M4
10017	A	Open Circuit Breaker 40Q1, Replace connector -40XP2_C2_16 on the pneumatic brake panel, and Close Circuit breaker -40Q1		OK	TIVANI Angel - 542257	M4
10018	R	The pneumatic brake panel 40A2 is ON		OK	TIVANI Angel - 542257	M4
10019	I	Train Lines		OK	TIVANI Angel - 542257	M4
10020	A	EB Reduced Train Lines Check continuity between END1 90XR15 pin 60 END2 90XP25 pin 60		OK	TIVANI Angel - 542257	M4
10021	R	Both points are continuous		OK	TIVANI Angel - 542257	M4
10022	A	Brake Applied Train Lines Check continuity between END1 90XR15 pin 50 END2 90XP25 pin 50		OK	TIVANI Angel - 542257	M4
10023	R	Both points are continuous		OK	TIVANI Angel - 542257	M4
10024	A	Remote Isolation Train Lines Check continuity between END1 90XR15 pin 59 END2 90XP25 pin 59		OK	TIVANI Angel - 542257	M4
10025	R	Both points are continuous		OK	TIVANI Angel - 542257	M4

## Section 11 – Holding and Parking Brake

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### 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		Goitsemodimo Kgatitswe - 526511	M4
10002	I	Initial Conditions		OK		Goitsemodimo Kgatitswe - 526511	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		Goitsemodimo Kgatitswe - 526511	M4
10004	A	Check that the pressure on Test point C2.11/1 is >5bar		OK		Goitsemodimo Kgatitswe - 526511	M4
10005	I	Visual Inspection		OK		Goitsemodimo Kgatitswe - 526511	M4
10006	A	Check the installation of the manual parking brake release components (lever + cable)		OK		Goitsemodimo Kgatitswe - 526511	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		Goitsemodimo Kgatitswe - 526511	M4
10008	I	Circuit Breakers		OK		Goitsemodimo Kgatitswe - 526511	M4
10009	A	Close Circuit Breaker 33Q3		OK		Goitsemodimo Kgatitswe - 526511	M4
10010	A	Close Circuit Breaker 33Q5		OK		Goitsemodimo Kgatitswe - 526511	M4
10011	I	Parking Brake Pressure Switch		OK		Goitsemodimo Kgatitswe - 526511	M4
10012	R	Read Defined Variable [TT] (TBCU4) LI_PARK_BR_RELEASE = 1.0		OK	1	Goitsemodimo Kgatitswe - 526511	M4
10013	R	Read Defined Variable [TT] (TBCU4) LI_BRAKE_STAT = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10014	R	Read Defined Variable [TT] (MPU1) tbcu4_parkbrakerelease = 1.0		OK	1	Goitsemodimo Kgatitswe - 526511	M4
10015	R	Read Defined Variable [TT] (MPU1) tbcu4_li_pbrake_stat = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10016	A	Parking Brake Applied Train Lines Check continuity between END1 90XR15 pin 77		OK		Goitsemodimo Kgatitswe - 526511	M4

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		END2 90XP25 pin 77					
10017	R	Both points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10018	A	Remote Parking Command Train Lines Check continuity between END1 90XR15 pin 68 END2 90XP25 pin 68		OK		Goitsemodimo Kgatitswe - 526511	M4
10019	R	Both points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10020	I	Parking Brake Applied		OK		Goitsemodimo Kgatitswe - 526511	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		Goitsemodimo Kgatitswe - 526511	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		Goitsemodimo Kgatitswe - 526511	M4
10023	R	Pressure at test point C2.11/1 <4.5 Bar		OK		Goitsemodimo Kgatitswe - 526511	M4
10024	R	Read Defined Variable [TT] (TBCU4) LI_PARK_BR_RELEASE = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10025	R	Read Defined Variable [TT] (MPU1) tbcu4_parkbrakerelease = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10026	A	Return the Isolation cock C2.3.2 to OPEN position		OK		Goitsemodimo Kgatitswe - 526511	M4
10027	R	Read Defined Variable [TT] (TBCU4) LI_BRAKE_STAT = 1.0		OK	1	Goitsemodimo Kgatitswe - 526511	M4
10028	R	Read Defined Variable [TT] (MPU1) tbcu4_li_pbrake_stat = 1.0		OK	1	Goitsemodimo Kgatitswe - 526511	M4
10029	R	Read Defined Variable [TT] (TBCU4) LI_PARK_BR_DC = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10030	R	Read Defined Variable [TT] (MPU1) tbcu4_parkbrakeisoldc = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10031	R	Read Defined Variable [TT] (MPU1) li_pbk_m4parkbrakeisol = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10032	A	Position the Isolation cock C2.3.2 in CLOSE position		OK		Goitsemodimo Kgatitswe - 526511	M4

10033	R	Read Defined Variable [TT] (MPU1) li_pbk_m4parkbrakeisol = 1.0		OK	1	Goitsemodimo Kgatitswe - 526511	M4
10034	R	Read Defined Variable [TT] (TBCU4) LI_BRAKE_STAT = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10035	R	Read Defined Variable [TT] (MPU1) tbcu4_li_pbrake_stat = 0.0		OK	0	Goitsemodimo Kgatitswe - 526511	M4
10036	R	Read Defined Variable [TT] (TBCU4) LI_PARK_BR_DC = 1.0		OK	1	Goitsemodimo Kgatitswe - 526511	M4
10037	R	Read Defined Variable [TT] (MPU1) tbcu4_parkbrakeisoldc = 1.0		OK	1	Goitsemodimo Kgatitswe - 526511	M4
10038	A	Return the Isolation cock C2.3.2 to OPEN position		OK		Goitsemodimo Kgatitswe - 526511	M4



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## Section 12 – HVAC Air Conditioning

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### 12.1 Instructions list

### 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)		NE			M4
10002	I	Initial conditions		NE			M4
10003	A	Car Should be Prepared		NE			M4
10004	I	Power Supply		NE			M4
10005	A	Close Circuit Breaker 57Q1		NE			M4
10006	A	Close Circuit Breaker 57Q2		NE			M4
10007	I	HVAC Electronic Power Supply		NE			M4
10008	A	Close Circuit Breaker F1 on the HVAC Panel		NE			M4
10009	I	The HVAC electronic is ON		NE			M4
10010	A	Turn the control switch to AUTO position on the HVAC Panel		NE			M4
10011	I	Software Upload		NE			M4
10012	I	Follow the procedure in the document below to upload software onto the HVAC electronic		NE			M4
10013	A			NE			M4
10014	I	Checking 400Vac		NE			M4
10015	A	Ensure that the 400Vac Shore Supply is connected to the vehicle, else connect it		NE			M4
10016	A	Disconnect connector 57XP4_X5 and use a multimeter to measure 400Vac between phases a1, a2 and b1		NE			M4
10017	R	400Vac (+-5%) measured		NE			M4
10018	A	On the same connector, with a phasemeter, check the correct Phase Rotation between points L1- Phase a1, L2- Phase a2 and L3- Phase b1.		NE			M4

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10019	R	The phase rotation is correct between all three phases		NE		M4
10020	A	Normalize connector 57XP4_X5		NE		M4
10021	I	HVAC 50% restriction		NE		M4
10022	A	Force [TT] NRG_HvacM450Cmd = 0		NE		M4
10023	I	HVAC inhib		NE		M4
10024	A	Force [TT] (MPU1) lo_hva_m4hvacinhibr1__1 = 1		NE		M4
10025	A	Force [TT] (MPU1) lo_hva_m4hvacinhibr2__1 = 1		NE		M4
10026	R	HVAC unit turns ON and starts to work		NE		M4
10027	I	Emergency Ventilation		NE		M4
10028	A	Force [TT] (MPU1) lo_hva_m4emergventil__1 = 1		NE		M4
10029	I	All saloon HVAC units work in Ventilation mode. Not heating/cooling		NE		M4
10030	A	Connect the laptop to the HVAC maintenance software using HCU Finder and check the actual working mode of HVAC		NE		M4
10031	R	Release [TT] (MPU1) lo_hva_m4emergventil__1		NE		M4
10032	I	Forced Mode (Saloon HVAC)		NE		M4
10033	I	In the maintenance software, select the 'Forced' tab, and use the "Required working mode" drop down box to force the following modes:		NE		M4
10034	I	For the next sections, walk through the whole car and physically check (feel) that the HVAC is functioning as desired		NE		M4
10035	A	Force Ventilation mode on the Saloon HVAC		NE		M4
10036	I	Ventilation Mode		NE		M4
10037	R	All saloon HVAC units work in Ventilation mode. Not heating/cooling		NE		M4

10038	I	Cooling Mode		NE		M4
10039	A	Force Cooling mode on the Saloon HVAC		NE		M4
10040	R	All saloon HVAC units work in Cooling mode		NE		M4
10041	I	Heating Mode		NE		M4
10042	A	Force Heating mode on the Saloon HVAC		NE		M4
10043	R	All saloon HVAC units work in Heating mode		NE		M4
10044	I	Self-Test		NE		M4
10045	A	Force Self-Test on the Saloon HVAC		NE		M4
10046	R	All saloon HVAC units work according to the mode described in the "Actual working mode"		NE		M4
10047	R	The Exhaust fans are Turned OFF		NE		M4
10048	I	HVAC Faults		NE		M4
10049	A	In the maintenance software, select the "Alarms / Warnings" tab		NE		M4
10050	A	Ensure there are no active faults on the HVAC		NE		M4
10051	R	No active faults identified on the HVAC unit		NE		M4
10052	A	Release [TT] (MPU1) lo_hva_m4hvacinhibr1__1		NE		M4
10053	A	Release [TT] (MPU1) lo_hva_m4hvacinhibr2__1		NE		M4
10054	A	Release [TT] NRG_HvacM450Cmd		NE		M4
10055	I	End of Test		NE		M4

### 12.1.2 057\_HVA\_SME-HVAC\_SME

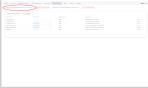
I - Information      A - Action      R - Result      NE - Not Executed

N°	Type	Instruction	File	Result status	Result value	Operator	Vehicle
10001	I	HVA_057 Air Conditioning		OK		Goitsemodimo Kgatitswe - 526511	M4
10002	I	Initial conditions		OK		Goitsemodimo Kgatitswe - 526511	M4
10003	A	Car Should be Prepared with CVS running and 400V ac available in the car		OK		Goitsemodimo Kgatitswe - 526511	M4
10004	I	HVAC AC Power Supply		OK		Goitsemodimo Kgatitswe - 526511	M4
10005	A	Close Circuit Breaker 13Q1 and 13Q5		OK		Goitsemodimo Kgatitswe - 526511	M4
10006	A	Check on the DDU if the HVAC is offline		OK		Goitsemodimo Kgatitswe - 526511	M4
10007	I	Checking 400Vac		OK		Goitsemodimo Kgatitswe - 526511	M4
10008	A	Close Circuit Breaker 57Q1		OK		Goitsemodimo Kgatitswe - 526511	M4
10009	A	Disconnect connector 57XP4_X5 and Measure 400Vac between all 3 phases which are a1- phase L1, a2- Phase L2 and b1- phase L3 of connector 57XP4_X5		OK		Goitsemodimo Kgatitswe - 526511	M4
10010	R	400Vac measured between all phases		OK		Goitsemodimo Kgatitswe - 526511	M4
10011	A	On same connector 57XP4_X5, with a phasemeter, check the correct Phase Rotation between points a1- Phase L1, a2- Phase L2 and b1- Phase L3.		OK		Goitsemodimo Kgatitswe - 526511	M4
10012	R	The phase rotation is correct between all three phases		OK		Goitsemodimo Kgatitswe - 526511	M4
10013	A	Reconnect 57XP4_X5		OK		Goitsemodimo Kgatitswe - 526511	M4
10014	I	HVAC controller power supply		OK		Goitsemodimo Kgatitswe - 526511	M4
10015	A	Close Circuit Breaker 57Q2		OK		Goitsemodimo Kgatitswe - 526511	M4
10016	A	Allow the HVAC to initialize and check on the DDU if the HVAC is online		OK		Goitsemodimo Kgatitswe - 526511	M4
10017	R	HVAC unit is online and starts to work		OK		Goitsemodimo Kgatitswe - 526511	M4
10018	I	HVAC inhib		OK		Goitsemodimo Kgatitswe - 526511	M4

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10019	A	Force [TT] (MPU1) lo_hva_m4hvacinhibr1__1 = 1.0		OK		Goitsemodimo Kgatitswe - 526511	M4
10020	A	Force [TT] (MPU1) lo_hva_m4hvacinhibr2__1 = 1.0		OK		Goitsemodimo Kgatitswe - 526511	M4
10021	I	HVAC 50% restriction		OK		Goitsemodimo Kgatitswe - 526511	M4
10022	A	Force [TT] NRG_HvacM450Cmd = 0		OK		Goitsemodimo Kgatitswe - 526511	M4
10023	I	Saloon HVAC		OK		Goitsemodimo Kgatitswe - 526511	M4
10024	I	HVAC web portal		OK		Goitsemodimo Kgatitswe - 526511	M4
10025	A	The attached document is a procedure on how to navigate around the maintenance software.		OK		Goitsemodimo Kgatitswe - 526511	M4
10026	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		OK		Goitsemodimo Kgatitswe - 526511	M4
10027	R	On status tab, Active mode is off for both cab and saloon		OK		Goitsemodimo Kgatitswe - 526511	M4
10028	A	Go to Alarms tab and clear all the alarms for saloon and cabin		OK		Goitsemodimo Kgatitswe - 526511	M4
10029	I	HVAC saloon		OK		Goitsemodimo Kgatitswe - 526511	M4
10030	I	Full "Self-test" saloon		OK		Goitsemodimo Kgatitswe - 526511	M4
10031	I	For the following tests make sure on the webHMI tab you change controller to be controlled by webHMI and not MPU		OK		Goitsemodimo Kgatitswe - 526511	M4
10032	A	Before running the full test, please click on reset test to reset the previous results.		OK		Goitsemodimo Kgatitswe - 526511	M4
10033	A	Select Full-Test on the Saloon HVAC		OK		Goitsemodimo Kgatitswe - 526511	M4
10034	R	All saloon HVAC units work according to the mode described in the "ACTIVE MODE" on the status tab		OK		Goitsemodimo Kgatitswe - 526511	M4
10035	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.		OK		Goitsemodimo Kgatitswe - 526511	M4

10036	I	Forced Mode (Saloon HVAC)		OK		Goitsemodimo Kgatitswe - 526511	M4
10037	I	During all tests Walk through the whole car and physically check (feel) that the HVAC is functioning as desired		OK		Goitsemodimo Kgatitswe - 526511	M4
10038	I	Go to maintenance tab to force the following modes		OK		Goitsemodimo Kgatitswe - 526511	M4
10039	I	Cooling Mode		OK		Goitsemodimo Kgatitswe - 526511	M4
10040	A	Select forced Cooling mode on the Saloon HVAC and let it run for 5 mins		OK		Goitsemodimo Kgatitswe - 526511	M4
10041	R	All HVAC units are cooling		OK		Goitsemodimo Kgatitswe - 526511	M4
10042	I	Heating Mode		OK		Goitsemodimo Kgatitswe - 526511	M4
10043	A	Select forced Heating mode on the Saloon HVAC and let it run for 5 mins		OK		Goitsemodimo Kgatitswe - 526511	M4
10044	R	All HVAC units are heating		OK		Goitsemodimo Kgatitswe - 526511	M4
10045	I	HVAC Faults		OK		Goitsemodimo Kgatitswe - 526511	M4
10046	A	In the maintenance software, select the "Alarms" tab		OK		Goitsemodimo Kgatitswe - 526511	M4
10047	A	Ensure there are no active faults on the HVAC for the Saloon. Use the highlighted drop down to navigate between saloon and cabin.		OK		Goitsemodimo Kgatitswe - 526511	M4
10048	R	No active faults identified on the HVAC unit		OK		Goitsemodimo Kgatitswe - 526511	M4
10049	A	Release [TT] (MPU1) lo_hva_m4hvacinhibr1__1		OK		Goitsemodimo Kgatitswe - 526511	M4
10050	A	Release [TT] (MPU1) lo_hva_m4hvacinhibr2__1		OK		Goitsemodimo Kgatitswe - 526511	M4
10051	A	Release [TT] NRG_HvacM450Cmd		OK		Goitsemodimo Kgatitswe - 526511	M4
10052	I	End of test		OK		Goitsemodimo Kgatitswe - 526511	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		Goitsemodimo Kgatitswe - 526511	M4
10002	I	Fire Detection Train Lines		OK		Goitsemodimo Kgatitswe - 526511	M4
10003	A	Fire Detection Train Lines Check continuity between END1 90XR14 pin 21 END2 90XP24 pin 21		OK		Goitsemodimo Kgatitswe - 526511	M4
10004	R	Both points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10005	I	Continuity Test		OK		Goitsemodimo Kgatitswe - 526511	M4
10006	I	The following steps are continuity tests between the two points described in each step. Use a multimeter for this test.		OK		Goitsemodimo Kgatitswe - 526511	M4
10007	A	From: [(local: +END1 -90XR13.B (pin 4))] to: [ -Inter-connector (local: +END2 -90XP23.b pin 4)]		OK		Goitsemodimo Kgatitswe - 526511	M4
10008	A	From: [(local: +END1 -90XR13.B (pin 5))] to: [ -Inter-connector (local: +END2 -90XP23.b pin 5)]		OK		Goitsemodimo Kgatitswe - 526511	M4
10009	A	From: [(local: +END1 -90XR13.A (pin 7))] to: [ -Inter-connector (local: +END2 -90XP23.a pin 7)]		OK		Goitsemodimo Kgatitswe - 526511	M4
10010	A	From: [(local: +END1 -90XR13.A (pin 8))] to: [ -Inter-connector (local: +END2 -90XP23.a pin 8)]		OK		Goitsemodimo Kgatitswe - 526511	M4

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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		Goitsemodimo Kgatitswe - 526511	M4
10002	I	Circuit Breakers and Configuration		OK		Goitsemodimo Kgatitswe - 526511	M4
10003	A	Close Circuit Breaker 33Q2		OK		Goitsemodimo Kgatitswe - 526511	M4
10004	A	Close Circuit Breaker 33Q4		OK		Goitsemodimo Kgatitswe - 526511	M4
10005	A	Close Circuit Breaker 33Q5		OK		Goitsemodimo Kgatitswe - 526511	M4
10006	I	Circuit Breaker 33Q1 and 33Q3 must be Opened		OK		Goitsemodimo Kgatitswe - 526511	M4
10007	A	110Vdc Normal Traction EL Train Line Connect the connector written M4 on 90XP15 End 2		OK		Goitsemodimo Kgatitswe - 526511	M4
10008	A	Close Circuit Breaker 33Q1		OK		Goitsemodimo Kgatitswe - 526511	M4
10009	A	Close Circuit Breaker 33Q3		OK		Goitsemodimo Kgatitswe - 526511	M4
10010	R	Read Defined Variable [TT] (TBCU4) LI_CAR_ID4 = 1.0		OK	1	Goitsemodimo Kgatitswe - 526511	M4
10011	I	The TBCU should appear on TCMS network on DDU screen		OK		Goitsemodimo Kgatitswe - 526511	M4
10012	I	Train Lines		OK		Goitsemodimo Kgatitswe - 526511	M4
10013	A	Forward Train Lines Check continuity between END1 90XR15 pin 25 END2 90XP25 pin 25		OK		Goitsemodimo Kgatitswe - 526511	M4

10014	R	Both points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10015	A	Reverse Train Lines Check continuity between END1 90XR15 pin 30 END2 90XP25 pin 30		OK		Goitsemodimo Kgatitswe - 526511	M4
10016	R	Both points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10017	A	Traction Train Lines Check continuity between END1 90XR15 pin 31 END2 90XP25 pin 31		OK		Goitsemodimo Kgatitswe - 526511	M4
10018	R	Both points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10019	A	No Brake Train Lines Check continuity between END1 90XR15 pin 32 END2 90XP25 pin 32		OK		Goitsemodimo Kgatitswe - 526511	M4
10020	R	Both points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10021	A	Traction Interlock Bypass Train Lines Check continuity between END1 90XR14 pin 6 END2 90XP24 pin 6		OK		Goitsemodimo Kgatitswe - 526511	M4
10022	R	Both points are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10023	A	Traction Interlock Train Lines Check continuity between END1 90XR15 pin 41 END2 90XP25 pin 41 and -10XP12_XCB2 pin 8		OK		Goitsemodimo Kgatitswe - 526511	M4
10024	R	All pins are continuous		OK		Goitsemodimo Kgatitswe - 526511	M4
10025	A	110Vdc Normal Traction EL Train Line Remove the connector from 90XP15 End 2		OK		Goitsemodimo Kgatitswe - 526511	M4
10026	I	Coolant Liquid		OK		Goitsemodimo Kgatitswe - 526511	M4
10027	A	Check that the coolant level is at least 1/2 of the sight glass level indicator <a href="#">[9-48-59-278432_277624_Coolant Level Check.pdf]</a>		OK		Goitsemodimo Kgatitswe - 526511	M4
10028	R	Coolant Liquid Level is OK		OK		Goitsemodimo Kgatitswe - 526511	M4



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10029	I	End of Test		OK		Goitsemodimo Kgatitswe - 526511	M4
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## Section 15 – Passenger Doors

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### 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		Mpumelelo Sithole - 529980	M4
10002	I	Initial conditions		OK		Mpumelelo Sithole - 529980	M4
10003	I	110Vdc Normal power supply is connected to the vehicle and ON		OK		Mpumelelo Sithole - 529980	M4
10004	I	Circuit Breakers		OK		Mpumelelo Sithole - 529980	M4
10005	A	Close Circuit Breaker 50Q1		OK		Mpumelelo Sithole - 529980	M4
10006	R	DCU 1 is powered ON		OK		Mpumelelo Sithole - 529980	M4
10007	R	Check on the DDU that DCU1 is online		OK		Mpumelelo Sithole - 529980	M4
10008	A	Close Circuit Breaker 50Q2		OK		Mpumelelo Sithole - 529980	M4
10009	R	DCU 2 is powered ON		OK		Mpumelelo Sithole - 529980	M4
10010	R	Check on the DDU that DCU2 is online		OK		Mpumelelo Sithole - 529980	M4
10011	A	Close Circuit Breaker 50Q3		OK		Mpumelelo Sithole - 529980	M4
10012	R	DCU 3 is powered ON		OK		Mpumelelo Sithole - 529980	M4
10013	R	Check on the DDU that DCU3 is online		OK		Mpumelelo Sithole - 529980	M4
10014	A	Close Circuit Breaker 50Q4		OK		Mpumelelo Sithole - 529980	M4
10015	R	DCU 4 is powered ON		OK		Mpumelelo Sithole - 529980	M4
10016	R	Check on the DDU that DCU4 is online		OK		Mpumelelo Sithole - 529980	M4
10017	A	Close Circuit Breaker 50Q5		OK		Mpumelelo Sithole - 529980	M4
10018	R	DCU 5 is powered ON		OK		Mpumelelo Sithole - 529980	M4
10019	R	Check on the DDU that DCU5 is online		OK		Mpumelelo Sithole - 529980	M4
10020	A	Close Circuit Breaker 50Q6		OK		Mpumelelo Sithole - 529980	M4
10021	R	DCU 6 is powered ON		OK		Mpumelelo Sithole - 529980	M4

10022	R	Check on the DDU that DCU6 is online		OK		Mpumelelo Sithole - 529980	M4
10023	A	Close Circuit Breaker 50Q7		OK		Mpumelelo Sithole - 529980	M4
10024	I	Car ID Code		OK		Mpumelelo Sithole - 529980	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		Mpumelelo Sithole - 529980	M4
10026	R	All doors are available		OK		Mpumelelo Sithole - 529980	M4
10027	I	Train Lines and Safety Loop		OK		Mpumelelo Sithole - 529980	M4
10028	A	ERTMS Auth Left Train Lines Check continuity between END1 90XR15 pin 44 END2 90XP25 pin 44		OK		Mpumelelo Sithole - 529980	M4
10029	R	Both points are continuous		OK		Mpumelelo Sithole - 529980	M4
10030	A	ERTMS Auth Right Train Lines Check continuity between END1 90XR15 pin 47 END2 90XP25 pin 47		OK		Mpumelelo Sithole - 529980	M4
10031	R	Both points are continuous		OK		Mpumelelo Sithole - 529980	M4
10032	A	Doors Open Train Lines Check continuity between END1 90XR15 pin 66 END2 90XP25 pin 66		OK		Mpumelelo Sithole - 529980	M4
10033	R	Both points are continuous		OK		Mpumelelo Sithole - 529980	M4
10034	A	Door Close Right Train Lines Check continuity between END1 90XR15 pin 78 END2 90XP25 pin 78		OK		Mpumelelo Sithole - 529980	M4
10035	A	Both points are continuous		OK		Mpumelelo Sithole - 529980	M4
10036	A	Door Close Left Train Lines Check continuity between END1 90XR15 pin 79 END2 90XP25 pin 79		OK		Mpumelelo Sithole - 529980	M4
10037	R	Both points are continuous		OK		Mpumelelo Sithole - 529980	M4

10038	A	Door Auth Left Train Lines Check continuity between END1 90XR15 pin 85 END2 90XP25 pin 85	OK	Mpumelelo Sithole - 529980	M4
10039	R	Both points are continuous	OK	Mpumelelo Sithole - 529980	M4
10040	A	Door Auth Right Train Lines Check continuity between END1 90XR15 pin 84 END2 90XP25 pin 84	OK	Mpumelelo Sithole - 529980	M4
10041	R	Both points are continuous	OK	Mpumelelo Sithole - 529980	M4
10042	A	V<3km/h Train Lines Check continuity between END1 90XR15 pin 29 END2 90XP25 pin 29	OK	Mpumelelo Sithole - 529980	M4
10043	R	Both points are continuous	OK	Mpumelelo Sithole - 529980	M4
10044	A	Door Auth Left Train Lines Check continuity between END1 90XR15 pin 85 END2 90XP25 pin 85	OK	Mpumelelo Sithole - 529980	M4
10045	R	Both points are continuous	OK	Mpumelelo Sithole - 529980	M4
10046	A	Door Auth Right Train Lines Check continuity between END1 90XR15 pin 84 END2 90XP25 pin 84	OK	Mpumelelo Sithole - 529980	M4
10047	R	Both points are continuous	OK	Mpumelelo Sithole - 529980	M4
10048	A	Safety Doors Loop Train Lines Check continuity between END1 90XR15 pin 96 END2 90XP25 pin 96	OK	Mpumelelo Sithole - 529980	M4
10049	R	Both points are continuous	OK	Mpumelelo Sithole - 529980	M4
10050	I	Left Side Doors	OK	Mpumelelo Sithole - 529980	M4
10051	A	Put the connector written M4 on 90XP15 End 2	OK	Mpumelelo Sithole - 529980	M4
10052	I	Door 1	OK	Mpumelelo Sithole - 529980	M4

10053	I	The below signals are now simulated: - Door Auth Right - Door Open Right - V<3km/h	OK		Mpumelelo Sithole - 529980	M4
10054	A	Force [TT] (MPU1) lo_dor_m4opendoorleft = 1.0	OK		Mpumelelo Sithole - 529980	M4
10055	R	Check that the door opens in 3 sec (+1/-0)	OK		Mpumelelo Sithole - 529980	M4
10056	R	Check that the GREEN leds on both sides of the door blink while the door opens [Safety Request: Prasa8-05]	OK		Mpumelelo Sithole - 529980	M4
10057	I	Door Opening Gap	OK		Mpumelelo Sithole - 529980	M4
10058	A	Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door)	OK		Mpumelelo Sithole - 529980	M4
10059	R	Door 1 gap Result Min/Max: 1390<= x <= 1410 (mm)	OK	1396	Mpumelelo Sithole - 529980	M4
10060	A	Measure the opening gap of the door. (This measurement must be done at the top of the door)	OK		Mpumelelo Sithole - 529980	M4
10061	R	Door 1 gap Result Min/Max: 1390<= x <= 1410 (mm)	OK	1398	Mpumelelo Sithole - 529980	M4
10062	A	Measure the opening gap of the door. (This measurement must be done in the middle of the door)	OK		Mpumelelo Sithole - 529980	M4
10063	R	Door 1 gap Result Min/Max: 1390<= x <= 1410 (mm)	OK	1398	Mpumelelo Sithole - 529980	M4
10064	I	Door 3	OK		Mpumelelo Sithole - 529980	M4
10065	A	Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door)	OK		Mpumelelo Sithole - 529980	M4
10066	R	Door 3 gap Result Min/Max: 1390<= x <= 1410 (mm)	OK	1394	Mpumelelo Sithole - 529980	M4
10067	A	Measure the opening gap of the door. (This measurement must be done at the top of the door)	OK		Mpumelelo Sithole - 529980	M4
10068	R	Door 3 gap Result Min/Max: 1390<= x <= 1410 (mm)	OK	1397	Mpumelelo Sithole - 529980	M4
10069	A	Measure the opening gap of the door. (This measurement must be done in the middle of the door)	OK		Mpumelelo Sithole - 529980	M4
10070	R	Door 3 gap Result Min/Max: 1390<= x <= 1410 (mm)	OK	1398	Mpumelelo Sithole - 529980	M4

10071	I	Door 5		OK		Mpumelelo Sithole - 529980	M4
10072	I	Door Opening Gap		OK		Mpumelelo Sithole - 529980	M4
10073	A	Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door)		OK		Mpumelelo Sithole - 529980	M4
10074	R	Door 5 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1395	Mpumelelo Sithole - 529980	M4
10075	A	Measure the opening gap of the door. (This measurement must be done at the top of the door)		OK		Mpumelelo Sithole - 529980	M4
10076	R	Door 5 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1396	Mpumelelo Sithole - 529980	M4
10077	A	Measure the opening gap of the door. (This measurement must be done in the middle of the door)		OK		Mpumelelo Sithole - 529980	M4
10078	R	Door 5 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1398	Mpumelelo Sithole - 529980	M4
10079	I	Right Side Doors		OK		Mpumelelo Sithole - 529980	M4
10080	I	Keep the connector 90XP15 End 2.		OK		Mpumelelo Sithole - 529980	M4
10081	I	Door 2		OK		Mpumelelo Sithole - 529980	M4
10082	A	The below signals remain simulated: - Door Auth Right - Door Open Right - V<3km/h		OK		Mpumelelo Sithole - 529980	M4
10083	A	Force [TT] (MPU1) lo_dor_m4opendoorright = 1.0		OK		Mpumelelo Sithole - 529980	M4
10084	R	Check that the door opens in 3 sec (+1/-0)		OK		Mpumelelo Sithole - 529980	M4
10085	R	Check that the GREEN leds on both sides of the door blink while the door opens [Safety Request: Prasa8-05]		OK		Mpumelelo Sithole - 529980	M4
10086	I	Door Opening Gap		OK		Mpumelelo Sithole - 529980	M4
10087	A	Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door).		OK		Mpumelelo Sithole - 529980	M4
10088	R	Door 2 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1399	Mpumelelo Sithole - 529980	M4
10089	A	Measure the opening gap of the door. (This measurement must be done at the top of the door)		OK		Mpumelelo Sithole - 529980	M4

10090	R	Door 2 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1400	Mpumelelo Sithole - 529980	M4
10091	A	Measure the opening gap of the door. (This measurement must be done in the middle of the door)		OK		Mpumelelo Sithole - 529980	M4
10092	R	Door 2 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1400	Mpumelelo Sithole - 529980	M4
10093	I	Door 4		OK		Mpumelelo Sithole - 529980	M4
10094	I	Door Opening Gap		OK		Mpumelelo Sithole - 529980	M4
10095	A	Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door)		OK		Mpumelelo Sithole - 529980	M4
10096	R	Door 4 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1397	Mpumelelo Sithole - 529980	M4
10097	A	Measure the opening gap of the door. (This measurement must be done at the top of the door)		OK		Mpumelelo Sithole - 529980	M4
10098	R	Door 4 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1399	Mpumelelo Sithole - 529980	M4
10099	A	Measure the opening gap of the door. (This measurement must be done in the middle of the door)		OK		Mpumelelo Sithole - 529980	M4
10100	R	Door 4 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1399	Mpumelelo Sithole - 529980	M4
10101	I	Door 6		OK		Mpumelelo Sithole - 529980	M4
10102	I	Door Opening Gap		OK		Mpumelelo Sithole - 529980	M4
10103	A	Measure the opening gap of the door. (This measurement must be done at the BOTTOM of the door)		OK		Mpumelelo Sithole - 529980	M4
10104	R	Door 6 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1398	Mpumelelo Sithole - 529980	M4
10105	A	Measure the opening gap of the door. (This measurement must be done at the top of the door)		OK		Mpumelelo Sithole - 529980	M4
10106	R	Door 6 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1399	Mpumelelo Sithole - 529980	M4
10107	A	Measure the opening gap of the door. (This measurement must be done in the middle of the door)		OK		Mpumelelo Sithole - 529980	M4
10108	R	Door 6 gap Result Min/Max: 1390<= x <= 1410 (mm)		OK	1399	Mpumelelo Sithole - 529980	M4
10109	I	Obstacle Detection		OK		Mpumelelo Sithole - 529980	M4

10110	A	Position an obstacle on the floor in the centre of the door closing line for all the doors		OK		Mpumelelo Sithole - 529980	M4
10111	A	Force [TT] (MPU1) lo_dor_m4opendoorright = 0		OK		Mpumelelo Sithole - 529980	M4
10112	A	Force [TT] (MPU1) lo_dor_m4opendoorleft = 0		OK		Mpumelelo Sithole - 529980	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		Mpumelelo Sithole - 529980	M4
10114	A	Safety Doors Loop Train Lines  Check continuity between END1 90XR15 pin 96 END2 90XP25 pin 96		OK		Mpumelelo Sithole - 529980	M4
10115	R	There is no continuity between the two points		OK		Mpumelelo Sithole - 529980	M4
10116	A	Force [TT] (MPU1) lo_dor_m4opendoorright = 1		OK		Mpumelelo Sithole - 529980	M4
10117	A	Force [TT] (MPU1) lo_dor_m4opendoorleft = 1		OK		Mpumelelo Sithole - 529980	M4
10118	R	The door opens fully		OK		Mpumelelo Sithole - 529980	M4
10119	A	Remove the obstacle		OK		Mpumelelo Sithole - 529980	M4
10120	A	Release [TT] (MPU1) lo_dor_m4opendoorleft		OK		Mpumelelo Sithole - 529980	M4
10121	A	Release [TT] (MPU1) lo_dor_m4opendoorright		OK		Mpumelelo Sithole - 529980	M4
10122	A	Remove the connector on 90XP15 End 2		OK		Mpumelelo Sithole - 529980	M4
10123	I	End of Test		OK		Mpumelelo Sithole - 529980	M4



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## 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		TIVANI Angel - 542257	M4
10002	I	The VFT procedures are all completed		OK		TIVANI Angel - 542257	M4
10003	I	Vehicle Normalization Check		OK		TIVANI Angel - 542257	M4
10004	R	On LV3 all Circuit Breakers are installed and secured		OK		TIVANI Angel - 542257	M4
10005	R	On LV3 all Dataplugs are installed, tightened and earth braids are fastened		OK		TIVANI Angel - 542257	M4
10006	R	On LV3 all Connectors are tightened		OK		TIVANI Angel - 542257	M4
10007	R	On LV3 there are no missing components, device, wiring or connectors.		OK		TIVANI Angel - 542257	M4
10008	R	On LV6 all Dataplugs are installed, tightened and earth braids are fastened		OK		TIVANI Angel - 542257	M4
10009	R	On LV6 all Connectors are tightened		OK		TIVANI Angel - 542257	M4
10010	R	On LV6 there are no missing components, device, wiring or connectors.		OK		TIVANI Angel - 542257	M4
10011	R	On HC Cubicle the Controller is installed and properly tightened and its connectors are tightened		OK		TIVANI Angel - 542257	M4
10012	R	All DCUs are properly installed and secured		OK		TIVANI Angel - 542257	M4
10013	R	All Internal Displays are properly installed and secured		OK		TIVANI Angel - 542257	M4
10014	R	All Light Covers are properly installed		OK		Amanda Ntuli - 526239	M4

10015	R	All Saloon Fire Detectors are properly installed and secured		OK		TIVANI Angel - 542257	M4
10016	R	All covers are normalised inside the car		OK		TIVANI Angel - 542257	M4
10017	R	On the Underframe, TBCU Agate is installed and properly tightened		OK		TIVANI Angel - 542257	M4
10018	R	On the Underframe, Speed Sensors are installed and properly tightened		OK		TIVANI Angel - 542257	M4
10019	R	On the LVB, all Circuit Breakers are installed and properly tightened		OK		TIVANI Angel - 542257	M4
10020	R	On the LVB, all Relays and Timers are installed and properly tightened		OK		TIVANI Angel - 542257	M4
10021	R	On the LVB, BRIOMs are installed and properly tightened		OK		TIVANI Angel - 542257	M4
10022	R	On the LVB there are no missing components, device, wiring or connectors.		OK		TIVANI Angel - 542257	M4
10023	R	On the Underframe, all Connectors are tightened		OK		TIVANI Angel - 542257	M4
10024	R	All underframe covers are normalised		OK		TIVANI Angel - 542257	M4
10025	R	On END1 the Octopus cables are disconnected from the car and properly stored.		OK		TIVANI Angel - 542257	M4
10026	R	On END2 the Octopus cables are disconnected from the car and properly stored.		OK		TIVANI Angel - 542257	M4
10027	R	The Test Bench is switched OFF and the Octopus cables are disconnected and properly stored		OK		TIVANI Angel - 542257	M4
10028	R	ALL P. Os of this car are closed		OK		Amanda Ntuli - 526239	M4
10029	I	End Of Test		OK		Amanda Ntuli - 526239	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		
HVAC Air Conditioning	X		
Holding and Parking Brake	X		
Fire Protection	X		
Energy Distribution	X		
Emergency Brake	X		
Cabin Control	X		

### 17.2 Tools used.

Function	Tool name	Tool number	Next Calibration date
015_NRG	NPhasemètre	Phasemeter	9/30/2025
027_ERM	Multimetro	Meter 1	8/31/2025
033_TRC	Multimetro	Meter 1	8/31/2025
040_SBK	Manometro	Manometer	8/30/2025
045_PBK	Manometro	Manometer	8/30/2025
057_HVA_SME	NPhasemètre	Phasemeter	9/30/2025
067_FSD	Multimetro	Meter 1	8/31/2025

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TS259 – M4 – VFT  
RTR Vehicle Functional Static Testing Report

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Vehicle	Equipment	Expected version	Version loaded
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