VEHICLE MAINTENANCE MINIMUM REQUIREMENTS – B2007

LEAD DOCUMENT / STAR CHART

DOCUMENT APPLIES TO B2007 VEHICLES ONLY

Issue 4

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Docklands Light Railway	VEHICLE MAINTENANCE MINIMUM REQUIREMENTS	VMMR B2007
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Original document issue information

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CONTENTS

1. Purpose

This document exists to support the requirements of rolling stock assets as set out in the Franchise Agreement.

1.1. DLR Vehicle Maintenance Minimum Requirements (VMMR) outline the requirements for a Maintenance Plan. They set out what maintenance needs to be performed but not how the maintenance is to be performed, unless best practice has already been established. The intervals at which maintenance must be completed are not specified either, except that some maximum limits are given and there is a requirement that the interval should be set so as to ensure continued compliance to the essential requirements. Further, as explained in MR-700, VMMR's are neither exhaustive nor prescriptive: suppliers meeting these are not guaranteed to deliver system safety or performance; suppliers may apply to vary them.

1.2. DLR VMMR focus on **output measures** (not input ones), however some **essential requirements** are specified, such as:

- critical limits / backstop on how often certain activities must be carried out e.g. bogies to be overhauled within x thousand Km, but not precisely when; and not how to group different maintenance activities together efficiently
- critical processes of how to carry out particular activities e.g. where experience has derived a best practice approach, which DLRL passes on as part of its knowledge management role, in order to mitigate known DLRL reputational risks.

1.3. DLRL VMMR's provide a baseline:

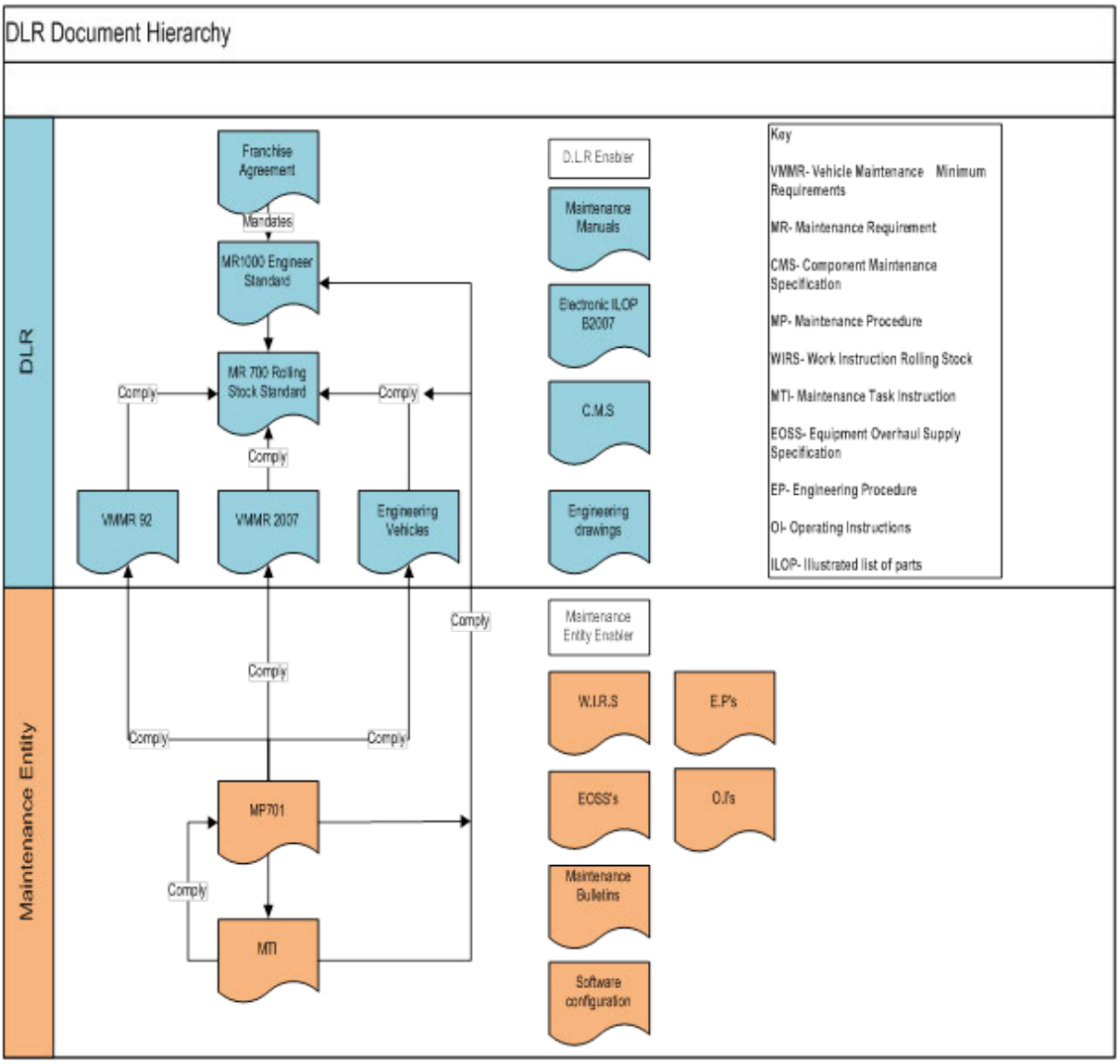
- against which DLRL audits of work done can be carried out to assess franchise compliance;
- such that related documents can be assessed for compliance (e.g. suppliers' maintenance recommendations); and
- which can be enhanced over time e.g. as best practice emerges from investigations.

2. Application

This VMMR applies to DLRL's Franchisee through the Maintenance Standard for Rolling Stock, MR700. **MR700** sets out management requirements on the franchisee, and mandates **Vehicle Maintenance Minimum Requirements** (VMMR) which set out the requirements for the Maintenance Plan, specifying what standards are to be maintained and giving limits on by when critical activities must be performed.

Each VMMR section may call up **Maintenance Specification** (MS) which are discrete self-contained documents for use by overhaul contractors, consistent with best practice (i.e. for traction motors, bogies, couplers, compressors and wheelsets). VMMR may also call up

Project Specifications (PS) which set out specifications to which the rolling stock is modified/ refurbished / upgraded.



3. Scope

This Vehicle Maintenance Minimum Requirements document applies to DLR's B2007 fleet. It specifies what minimum requirements are to be maintained (mandating CMS and referencing BT Manuals as required) and gives limits on by when critical activities must be performed (e.g. gearbox overhaul must be carried out prior to a certain number of vehicle miles run, brake pads must be renewed such that minimum limits are not exceeded in service).

Fundamentally, VMMR's specify what is to be done, with some key limits on when. They do not generally set out how maintenance is to be performed or grouped together logically into exam block cards or whether activities should be primarily scheduled by miles run or time

passed or operating hours; nor whether regimes should be balanced or cumulative; nor yet the level of granularity of maintenance by individual component.

For new vehicles, the VMMR is essentially a shell document, fundamentally referencing OEM material such as the BT Manual. The intention going forward is for the BT Manual to provide a knowledge repository, such that it is updated whenever changes are made to maintenance (or indeed, to vehicles – through Project Specifications). Records of why the change was made, together with what the pre-change situation was, should also be retained in the BT Manual. Where ''As Required'' is within the star chart documented evidence of the periodicity chosen will be required to demonstrate the decision / justification.

Each VMMR:-

- Lists MS in a star chart, specifying the limits when each overhaul is to be undertaken
- In the absence of a MS, identifies the best documentation available – typically an extract from the OEM maintenance manual, applied at the periodicity specified therein
- Specifies requirements of where data is to go in the asset management system (i.e. electronic records), even where work is undertaken according to a MS, since overhaul providers may be supply chain partners who may not have access the asset management system, whereas the Franchisee who delivers the VMMR does. See also Section 10 Records below.

4. Definitions and Abbreviations

Please see **MR1000** and **MR700** for definitions and abbreviations

5. Requirements for Light Maintenance

The requirements for maintenance are set out in the BT Maintenance Manual B2007. The maximum maintenance interval is currently specified for each maintenance activity as follows:-

F1 – 13,000 km	F3 – 54,000 km	F5 – 216,000 km	F7 – 1,080,000 km
F2 – 27,000 km	F4 – 108,000 km	F6 – 540,000 km	S – Special Interval

All periodicities are in km. A tolerance exists on each exam of 900km (an average of 3 days duty service), the tolerance is not cumulative and is applied to an exam but does not change the original drop dead position of the next exam, i.e. if the 900km tolerance is used on a an exam past the 13,500 km point the next exam is due in 13,500km minus the 900km overrun.

The period of time is specified when the activity must be carried out at regular time intervals or distances travelled, as set out in:-

- "maintenance_schedule_v_1_9_revI-Entwurf_2012-08-17.xls" which is part of BT Maintenance Manual B2007, and repeated here (pages 7 - 20 of this VMS).

6. Star Chart

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B2007 – WCV / Docklands 3

Docklands Light Railway

Working Level: R - Roof; S - Side duct; W - Workshop; I - Interior; P - Pit; F - Floor Level

Intervals: F1 - 13,500 km; F2 - 27,000 km; F3 - 54,000 km; F4 - 108,000 km; F5 - 216,000 km; F6 - 540,000 km; F7 - 1,080,000 km; S - Special Interval

Notes

x = Minimum requirement

** *Incl. lubricants and auxiliary materials*

*** *Incl. utilities and tools*

630k Assessments complete as of September 2015

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km	Supplies** / Special tools***	Remark	OEM Specification Cross Reference
General Information																
6.1	Vehicle - Complete	Visual inspection	F, P, R, I		x	x	x	x	x	x					Visual inspection for damage / corrosion and secure fastening of the mounted parts on, in and under the vehicle; determine general condition Ref: Block 5 of B2007 MTIs	Vehicle Overview
6.2	Vehicle - Sealing Joint	Visual inspection	F, P, R						x	x	x				Approximately 6 years Visual inspection of all visible sealing joints (outside), replace if necessary	
6.3	Vehicle - Sealing Joint	Visual inspection Overhaul	F, P, R								x				Every 15 years Visual inspection of all not visible sealing joints (outside), replace if necessary Decision on the scope of the visual inspection is carried out on a sample (20% of the non-visible sealing joints)	
6.4	Electric Cable	Measure	W								x			Volt meter	Every 15 years Measure insulation, protective earth and resistances	Vehicle Overview
6.5	Control and Information Wires	Measure	W								x			Volt meter	Every 15 years Measure insulation, protective earth and resistances	Vehicle Overview
E Wires																

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.6	E wires - High-Voltage Circuits and Low-Voltage Circuits	Visual inspection	I, P								x				After 1 month, connecting terminals on the high current board secure fastening	Vehicle Overview
6.7	E wires - High-Voltage Circuits and Low-Voltage Circuits	Visual inspection	I, P				x	x	x	x					Connecting terminals on the high current board for secure fastening	Vehicle Overview
6.8	EDP and FAP Electrical Connections	Check	I, P				x	x	x	x					Ensure the fast-on connections are secure Using a screwdriver check that all screwed connections are hand-tight	
Motor and Trailer Bogie																
6.9	Motor and Trailer Bogie	Inspect	P	X	x	x	x	x	x	x					General visual check, check wheelset bearing for overheating	Motor Bogie
6.10	Motor and Trailer Bogie - Primary Suspension	Inspect	P	x	x	x	x	x	x	x					Check horizontal and vertical dampers for damage, leak tightness, condition of the silent blocks and secure fastening	Motor Bogie
6.11	Motor and Trailer Bogie - Air Springs (Secondary Suspension)	Inspect	P		x	x	x	x	x	x					Check for damage, cracks in the rubber, replace if necessary	Motor Bogie
6.12	Motor and Trailer Bogie - Earthing Terminal	Inspect	P		x	x	x	x	x	x					Check for damage and ensure cables are securely fastened	Motor Bogie
6.13	Motor and Trailer Bogie – Wheels	Inspect, Measure	P	x	x	x	x	x	x	x				Template for checking tyre profile, Template for determining wheel gauge, Measuring device for checking flange profile.	Visual check of the earthing cables and the rubber blocks Measure wheel tyre profile and wheel wear Wheel flange height, flange thickness, flange width, if necessary tread re-profiling	Motor Bogie
6.14	Motor and Trailer Bogie - Hoses	Inspect	P		x	x	x	x	x	x					For damage	Motor Bogie
6.15	Motor and Trailer Bogie - Vertical Stop	Check	P				x	x	x	x					Check height adjustment, adjust if necessary	Motor Bogie
6.16	Motor and Trailer Bogie - Linkage	Inspect	P				x	x							Inspect traction rod bushes	Motor Bogie
6.16.1	Motor and Trailer Bogie – Linkage	Replace	W						x	x					Replace traction rod bushes	Motor Bogie

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.16.2	Horizontal (Lateral) Stops	Replace	W						x	x					Replace lateral stops.	Motor Bogie
6.17	Motor and Trailer Bogie - Primary Suspension	Inspect	P				x	x	x	x					Check axle bearing for damage and that it's securely mounted	Motor Bogie
6.18	Motor and Trailer Bogie - Primary Suspension	Inspect	P				x	x	x	x					For damage and loose or broken rubber parts, exchange if necessary	Motor Bogie
6.19	Motor and Trailer Bogie - Hoses	Check	P				x	x	x	x					Test for leak	Motor Bogie
6.20	Motor and Trailer Bogie - Axle Bearing	Check	W								x				After 5 years initially then at (DLRL) agreed appropriate intervals and undertake axle box bearing condition assessments with the OEM to identify the optimum overhaul interval.	Motor Bogie
6.21	Motor and Trailer Bogie - Axle Bearing	Check	P						x	x				Tectyl 506EH	Check lubrication, re-grease if necessary Re-grease at 540,000km.	Motor Bogie
6.22	Motor and Trailer Bogie - Shock Absorbers	Overhaul	W						x	x		x	x		Assess 5% (of the fleet) of horizontal and vertical shock absorbers at 900,000 km to identify the optimum overhaul interval.	Motor Bogie
6.23	Motor and Trailer Bogie	Overhaul	W							x						Motor Bogie
Motor Bogie																
6.24	Motor Bogie - Axle Bearing	Service	W							x				Tectyl 506EH	Replace grease	Motor Bogie
6.25	Motor Bogie - Slide Plate	Inspect	P							x					Check for wear	Motor Bogie
6.26	Motor Bogie - Side Sliding Pieces	Inspect, Measure	S							x					Check for damage and measure the distance between sliding piece and cradle, target measurement: 2 +0/-1 mm	Motor Bogie
6.27	Wheel Flange Lubrication	Visual inspection	F	x	x	x	x	x	x	x					Check filling condition of flange lubrication sticks	Motor Bogie
6.28	Wheel Flange Lubrication	Inspect	F	x	x	x	x	x	x	x				Tool for alignment of stick lubrication	Check for damage, check settings	Motor Bogie
6.29	Current Return Brushes	Visual inspection	F					x	x	x					Visual inspection of brush length, contact disc and pressure springs condition	Motor Bogie
Trailer Bogie																
6.30	Trailer Bogie - Ball Race Slewing Ring	Grease					x	x	x	x				Shell Alvania EP2		Trailer Bogie

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.31	Trailer Bogie - Ball Race Slewing Ring	Inspect	I						x	x		x			Check bolts, seals and tightening torques.	Trailer Bogie
6.31.1	Trailer Bogie - Ball Race Slewing Ring	Service							x						Rotate slewing ring through 90°	
6.31.2	Trailer Bogie - Ball Race Slewing Ring	Replace								x					Condition assess slewing rings from 3 vehicles to determine the next maintenance activity (1,080,000km)	
Propulsion System																
Traction Motor																
6.32	Propulsion Motor - Air Ducts	Visual inspection	P	x	x	x	x	x								Traction Motor
6.33	Propulsion Motor - Air Ducts	Clean	P				x	x							Blow out air ducts	Traction Motor
6.34	Propulsion Motor - Mounting Brackets	Visual inspection	P			x	x	x							Screw connections, compression couplings and support elements for secure fastening	Traction Motor
6.35	Propulsion Motor - Ball Bearings	Grease, visual inspection	P								x			Longtime PD2	Every 350,000 km / 4 years (which ever is first)	Traction Motor
6.36	Propulsion Motor	Overhaul	W						x	x				Lifting gear	Every 540,000 km Motor - gears: T=195 Nm Maintenance out of sync due to current return damage to original bearings, now replaced during slip coupling mod. Revised maintenance guideance required.	Traction Motor
Gearbox / Drive Coupling																
6.37	Gearbox	Visual inspection	P		x	x	x	x							Oil level, if necessary fill up	Gearbox / Drive Coupling
6.38	Gearbox	Visual inspection	P		x	x	x	x							For leaks, housing for cracks; visual inspection of the rubber-metal-parts for damage, replace if necessary	Gearbox / Drive Coupling
6.39	Gearbox	Clean	P				x	x							surrounding area of the breather, housing	Gearbox / Drive Coupling
6.40	Gearbox	Service	P								x			Mobil Synthetic Gear Oil 75W-90, LOCTITE	Oil filtration once after 2,000 km	Gearbox / Drive Coupling

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				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.41	Gearbox - Oil Sample	Service	P			x	x	x	x	x					Oil sample from gearbox to be used as a comparator for condtion. Sample reports should be stored electronically by KAD and shared with DLRL as required.	
6.42	Gearbox - Mag Plug	Service	P			x	x	x	x	x					Remove the magplug and inspect for particles Sample reports should be stored electronically by KAD and shared with DLRL as required.	
6.43	Gearbox	Service	P				x	x	x	x				Mobil Synthetic Gear Oil 75W-90, LOCTITE	Oil change	Gearbox / Drive Coupling
6.44	Gearbox - Hollow Shaft	Measure	P								x			Measuring block Alu 4kt 30x30	Once after 3 months	Gearbox / Drive Coupling
6.45	Gearbox - Hollow Shaft	Measure	P				x	x	x	x				Measuring block Alu 4kt 30x30	Measure offset	Gearbox / Drive Coupling
6.46	Gearbox	Overhaul	P						x	x					During general inspection, clean breather	Gearbox / Drive Coupling
6.47	Gearbox	Visual inspection	P									x		Colour, torque wrench	Every 720,000 km, gear teeth for wear, screws for secure fastening (activity has to be done when drive is disassembled of the bogie / vehicle because of any other reason)	Gearbox / Drive Coupling
6.48	Gearbox - Support Mount	Replace	W									x			Every 720,000 km Inc. Traction motor mount	Gearbox / Drive Coupling
6.49	Gearbox - Ball Bearings	Replace	W								x				Every 2 million km	Gearbox / Drive Coupling
6.50	Drive Coupling	Visual inspection	P		x	x	x	x						Colour, torque wrench	Check torque witness marks of the screws and nuts as well as coupling parts, if necessary, new fastening screw and nut with torque attract and colour coding renew, spacer and adapter sleeves for damage, elastic sleeves for changes to the rubber surfaces and abrasion (before cleaning the coupling)	Gearbox / Drive Coupling
6.51	Drive Coupling	Visual inspection	P				x	x							Elastic sleeves for cracks	Gearbox / Drive Coupling
6.52	Drive Coupling	Check	P								x				After 3 months check installation position	Gearbox / Drive Coupling
6.53	Drive Coupling	Check	P				x	x							Check installation position	Gearbox / Drive Coupling

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				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.54	Drive Coupling	Overhaul	P								x	x			Overhaul whenever the drive coupling is parted for overhaul of the gearbox or traction motor.	Gearbox / Drive Coupling
6.55	Drive Coupling	Replace	P								x			Hydraulic press, ruler, equipment part 1 - spacer, equipment part 2 - spacer,	Every 720,000 km / 6 years (which ever is first) Gearbox hollow shaft - coupling: T=35 Nm Spacer - part 1: T=100 Nm Oil channel seal: T=20 Nm Spacer - part 2: T=100 Nm	Gearbox / Drive Coupling
Third Rail Collector																
6.56	Third Rail Collector - Shoegear	Visual inspection	F	x	x	x	x	x							Wear check	Third Rail Collector
6.57	Third Rail Collector	Visual inspection	F	x	x	x	x	x							For damage and secure fastening including the cable, change the cable if necessary	Third Rail Collector
6.58	Third Rail Collector	Visual inspection, Function test	F		x	x	x	x	x					Gauge for setting up third rail shoegear	Check compressed air line for leakage, Function test and pressure check	Third Rail Collector
6.59	Third Rail Collector - Fusebox	Visual inspection	F		x	x	x	x							Check interior for damage, secure fastening and line for leakage	Third Rail Collector
6.60	Third Rail Collector	Visual inspection	F				x	x							Check contact shoe arm and housing for damage and secure fastening	Third Rail Collector
6.61	Third Rail Collector	Overhaul	W										x		Condition assess at 900,000 km to identify the optimum overhaul interval	Third Rail Collector
Brake System																
Brake Overview																
6.62	Brake System	Function test	F, P			x	x	x	x	x					Effect of brake equipment and Anti-Skid Test Run (G03, G05)	Brake Overview
6.63	Brake System	Function test	F, P			x	x	x	x	x					Function check of EP-brake system, spring actuated brake system and emergency brake	
6.64	Brake System	Visual inspection Function test	F,P				x	x	x	x					Check air supply and brake system for leakage, Function check.	
6.65	Brake System	Function test	F,P					x	x	x					Function check of emergency release gear, load dependent brake and air suspension system	
6.66	Brake System	Function test							x	x					After brake overhaul	Brake Overview

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
Brake Control Equipment																
6.67	Brake System - Brake Control Equipment	Service	F, P	x	x	x	x	x	x	x					Read - out diagnostic memory (B12)	Brake Control Equipment
6.68	Brake System - Brake Control Equipment	Function test	F, P			x	x	x	x	x					Manual wheel slide protection test run (B12)	Brake Control Equipment
6.69	Brake System - Brake Control Equipment	Visual inspection	F, P				x	x	x	x					Visual inspection EP - compact (B05, B06) Brake control electric plugs, general condition (B12)	Brake Control Equipment
6.70	Brake System - Brake Control Equipment	Overhaul	W								x				Every 8 years: EP-Compact (B05, B06) To be condition assessed to determine if this can be moved to the F7.	Brake Control Equipment
6.71	Brake System - Brake Control Equipment	Replace	W								x			Torque wrench, paste for elbow fittings	Every 20 years replace EB01A card Equipment frame - chassis: T=75 Nm Earthing cable: T=7 Nm EP-Compact - equipment frame: T=53 Nm	Brake Control Equipment
Mechanical Equipment																
6.72	Brake System - Brake Mechanics	Visual inspection	P	x	x	x	x	x	x	x					Check brake pads for wear including brake pad clearance (C02), brake caliper unit (C01, C03), close ballcock (B02) for inspection	Mechanical Equipment
6.73	Brake System - Brake Mechanics	Visual inspection	P	x	x	x	x	x	x	x					Brake discs for wear	Mechanical Equipment
6.74	Brake System - Remote Control	Visual inspection	P	x	x	x	x	x	x	x					C03.1	Mechanical Equipment
6.75	Brake System - Remote Control	Check, service	P, F								x				After three year trial: Overhaul on selected remote controls after not more than 2 years to determine the final overhaul interval. (C03.1)	Mechanical Equipment
6.76	Brake System - Brake Mechanics	Check	P, F				x	x	x	x					Brake caliper unit (C03) Check exhaust port for free air passage	Mechanical Equipment

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.77	Brake System - Brake Mechanics	Overhaul	P								x	x		Press-on / press-off devices, Molykote D 321 R, STABURAGS NBU 30 PTM, Glycerine, motor oil (SAE 30)	After three year trial: Overhaul on selected brake caliper units after not more than three years to determine the final overhaul interval. (C01, C03) Remote control - brake caliper unit: T=4 Nm Screw connection friction disc halves: T=550 Nm Friction disc - hub: T=80 Nm	Mechanical Equipment
Pneumatic Equipment																
Pipework																
6.78	Compressed Air Equipment - Distribution	Visual inspection	F,P	x	x	x	x	x							Hose pipes for damage	Pipework
6.79	Compressed Air Equipment - Distribution	Visual inspection	F,P	x	x	x	x	x							Ballcock (A07), Levelling valve (L07, L13), Anti-skid valve (G03, G05)	Pipework
6.80	Compressed Air Equipment - Distribution	Function test	F,P	x	x	x	x	x							Ballcock (A04.1, Z03.1) Check function by opening and closing (ease of movement), air escaping when closing the ballcock, presence of water indicates malfunctioning of air dryer.	Pipework
6.81	Compressed Air Equipment - Distribution	Visual inspection	F,P		x	x	x	x	x	x					Safety valve (A01.04, A01.05), Pressure governor (A01.51), Pressure switch (A08, A09), Ballcock (A01.53, L02, Z04), Magnet valve (W01), Check valve (Z05)	Pipework
6.82	Compressed Air Equipment - Distribution	Visual inspection	F,P			x	x	x							Overflow valve (L03, L08), Mean-pressure valve (L14)	Pipework
6.83	Compressed Air Equipment - Distribution	Visual inspection	F, P				x	x							Ballcock (B02, B03, U01, U02), Check valve (B08, B09), pressure reducing valve (B11), indicator (P01), test fitting (G04), Locking coupler (U03)	Pipework
6.84	Compressed Air Equipment - Distribution	Visual inspection	F, P				x	x	x	x					Pressure switch (B10)	Pipework
6.85	Compressed Air Equipment - Distribution	Function test	F, P				x	x							Ballcock (A01.53, A07, B02, B03, L02, U01, U02, Z04), Magnet valve (W01), indicator (P01)	Pipework
6.86	Compressed Air Equipment - Distribution	Function test	F, P					x							Overflow valve (L03, L08), Levelling valve (L07, L13)	Pipework

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				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.87	Compressed Air Equipment - Test Fitting	Visual inspection	F, P	x	x	x	x	x							L05	Pipework
6.88	Compressed Air Equipment - Test Fitting	Visual inspection	F, P			x	x	x							A01.52, B13, Z02	Pipework
6.89	Compressed Air Equipment - Test Fitting	Replace	F, P							x		x	x		A01.52, B13, L05, G04, Z02 Assess 1 vehicle at 900,000km	Pipework
6.90	Compressed Air Equipment - Safety Valve	Function test	F, P		x	x									Function testing by manual venting (A01.04, A01.05)	Pipework
6.91	Compressed Air Equipment - Safety Valve	Function test	F, P				x	x	x	x					Overall function test on test bench (A01.04, A01.05)	Pipework
6.92	Compressed Air Equipment - Distribution	Check	F, P				x	x	x	x					Pressure governor (A01.51), pressure switch (A08, A09, B10) Check pressure thresholds	Pipework
6.93	Compressed Air Equipment - Pressure Reducing Valve	Check	F, P				x	x							Check adjustment 5.5 ± 0.2 bar via test fitting on B11	Pipework
6.94	Compressed Air Equipment - Distribution	Replace	F, P, W							x		x	x		Ballcock (A01.53, A07, B02, B03, L02, U01, U02, Z04, A04.1, Z03.1), Check valve (B08, B09), Levelling valve (L07, L13), Mean-pressure valve (L14), Locking coupler (U03) Assess 1 vehicle at 900,000km	Pipework
6.94.1	Compressed Air Equipment - Distribution	Replace	F, P, W						x	x					Overflow valve (L03)	Pipework
6.95	Compressed Air Equipment - Distribution	Overhaul	F, P, W							x		x	x		Pressure reducing valve (B11), Anti-skid valve (G03, G05), indicator (P01), Overflow valve (L08), Magnet valve (W01), Check valve (Z05) Assess 1 vehicle at 900,000km	Pipework
6.96	Compressed Air Equipment – Distribution Hose Pipes	Replace	W							x		x	x		Assess 1 vehicle at 900,000km	Pipework
6.96.1	Compressed Air Equipment - Distribution Hose Pipes	Replace	W						x	x					Replace artic main res hose when working on slewing ring	
Air Reservoirs																

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.97	Compressed Air Equipment - Air Reservoir	Visual inspection	F,P				x	x	x	x					Visual inspection outside on A04, B01 , Z03	Air Reservoirs
6.98	Compressed Air Equipment - Air Reservoir	Visual inspection	F, P								x				Every 20 years: air reservoir inside and outside for condition on A04, B01, Z03	Air Reservoirs
Air Filter																
6.99	Compressed Air Equipment - Air Filter	Visual inspection	F, P				x	x							B07, L01, Z06	Air Reservoirs
6.100	Compressed Air Equipment - Air Filter	Clean	F, P					x							Remove, clean and install strainer element on B07, L01, Z06	Air Reservoirs
6.101	Compressed Air Equipment - Air Filter	Overhaul	F, P, W							x		x	x		B07, L01, Z06 Assess 1 vehicle at 900,000km	Air Reservoirs
6.101.1 .	Compressed Air Equipment - Mean-Pressure Valve	Clean	F, P				x	x							Clean exhaust port O	Air Reservoirs
Gauge																
6.102	Compressed Air Equipment - Gauge	Visual inspection	F, P				x	x								Gauge
6.103	Compressed Air Equipment - Gauge	Measure	F, P				x	x	x	x					Comparative measurement via test fitting (Z02)	Gauge
6.104	Compressed Air Equipment - Gauge	Replace as required	F, P, W												Pressure gauge and display equipment I8722/A Display - bracket: T=23 Nm Driver's cab display - housing: T=4 Nm	Gauge
Compressor																
6.105	Compressed Air Equipment - Compressor	Visual inspection		x	x	x	x	x							Visual inspection of compressed air equipment for damage, corrosion, security of fixings and the elastic mountings (spring wire shocks).	Compressor
6.106	Compressed Air Equipment - Compressor	Clean, replace, check, visual inspection	F, P			x	x	x							Clean the cooler, replace air filter element, check the air delivery and compressor pressure control	Compressor

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.107	Compressed Air Equipment - Compressor	Overhaul	W						x	x				Lifting gear, LOCTITE, red colour	Compressor and electric motor Mounting frame - undercarriage: T=210 Nm Earthing cable: T=32 Nm Mounting frame - spring element: T=23 Nm Spring element - compressor: T=80 Nm	Compressor
6.107.1	Compressor Piston Rings	Replace									x				Every 6,000 running hours	
Air Dryer Unit																
6.108	Compressed Air Equipment - Air Dryer Unit	Visual inspection	F, P	x	x	x	x	x	x	x						Air Dryer Unit
6.109	Compressed Air Equipment - Air Dryer Unit	Function test	F, P				x	x							Switchover time and venting, make sure that the regeneration air outlet is clear	Air Dryer Unit
6.110	Compressed Air Equipment - Air Dryer Unit	Replace	F, P				x	x							Desiccant cartridge	Air Dryer Unit
6.111	Compressed Air Equipment - Air Dryer Unit	Overhaul	F, P						x	x						Air Dryer Unit
	Air Supply Unit															
6.112	Compressed Air Equipment - Air Supply Unit	Visual inspection	F, P		x	x	x	x							Hose pipes (A01.10, A05, A06)	Air Dryer Unit
6.113	Compressed Air Equipment - Air Supply Unit	Overhaul	W						x	x						Air Dryer Unit
Underframe Equipment																
Battery																
6.114	Battery	Visual inspection, check	F				x	x	x	x				Digital multi-meter, insulated lifting gear, ammeter, thermometer, torque wrench with	Check condition of battery box; security of locking mechanism; check charge voltage; temperature sensor	Battery
6.115	Battery	Service	F								x				Once after 6 months fill up with water – applicable to new vehicle only.	Battery

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.116	Battery	Service					x	x	x	x				insulated sleeves, level tube, brush, ph-neutral Vaseline grease, distilled / de-mineralised water, Battery filler compatible with the B2007 batteries	Top up with water	Battery
6.116.1	Battery	Clean, check	F				x	x							Tightening torques, grease coating Connector between the cells: T=10 Nm Temperature sensor: T=3.7 ± 0.2 Nm	
6.117	Battery	Clean, check, service	F						x	x					Tightening torques, grease coating, electrical reconditioning (discharging / charging) Connector between the cells: T=10 Nm Temperature sensor: T=3.7 ± 0.2 Nm	Battery
6.118	Battery	Check	F								x				Every 3 years, cell voltages	Battery
Power Converter																
6.119	Power Converter	Visual inspection				x	x	x	x	x					Visual check for fresh-air grill, clean if necessary	Power Converter
6.120	Power Converter	Clean					x	x	x	x				Industrial vacuum cleaner	Clean interior space	Power Converter
6.121	Power Converter	Visual inspection			x	x	x	x	x	x					Visual check for interior cooling unit and cooling fins, clean if necessary	Power Converter
6.122	Power Converter - Main Fan	Visual inspection			x	x	x	x	x	x					If there is visible pollution on the fan wings the fan has to be dismounted and cleaned outside the converter	Power Converter
6.123	Power Converter	Service, visual inspection	F, P				x	x	x	x						Power Converter
6.124	Power Converter	Replace	F, P						x	x					Device fan	Power Converter
6.125	Power Converter	Replace	F, P								x				Every 8 years: main fan, DCU fastening: T=3.5 Nm Fan frame: T=15 Nm Fan guard: T=6.5 Nm Fan fastening: T=1.9 Nm	Power Converter
6.125.1	Power Converter - Contactor	Replace	F, P						x	x					Replace for overhauled item	

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.125.2	Power Converter - Contactor Relay	Replace	F, P							x		x	x		Replace for overhauled item. Condition assess 3 relays at 900,000 km to determine future overhaul / replacement	
Brake Resistor																
6.126	Brake Resistor	Clean, visual inspection	F				x	x	x	x				Industrial vacuum cleaner	Visual inspection, clean if necessary	Brake Resistor
6.127	Brake Resistor - Fan	Clean	F				x	x	x	x						Brake Resistor
6.128	Brake Resistor - Motor	Check	F				x	x	x	x					Electrical and mechanical check	Brake Resistor
6.129	Brake Resistor - Motor	Replace	W						x	x					Replace roller bearings	Brake Resistor
6.129.1	Brake Resistor	Clean	F, P						x	x					Clean brake resistors	
Auxiliary Converter																
6.130	Auxiliary Converter	Clean, visual inspection, check	F				x	x	x	x				Industrial vacuum cleaner		Auxiliary Converter
6.131	Auxiliary Converter	Replace	F						x	x					Every 6 years, main and device fans	Auxiliary Converter
6.132	Auxiliary Converter	Replace Visual Inspection	F								x			Torque wrench, LOCTITE, red colour	Every 12 years: replace electrolyte capacitors, visual check conductor boards Fastening - main fan: T=23 Nm Fastening - fan cover: T=5.5 Nm Fastening - device fan: T=2.8 Nm Electrolyte capacitor: T=9.5 Nm	Auxiliary Converter
Horn / Buzzer																
6.133	Acoustic warning system / horn and buzzer	Function test	I		x	x	x	x	x	x						Horn Buzzer
Coupler and Drawgear																
Front Coupler																
6.134	Coupler - Coupler Head	Clean	F		x	x								KALTZINK HS 300	Coarse cleaning	Front Coupler
6.135	Coupler	Visual inspection	F	x	x	x	x								For damage	Front Coupler
6.136	Coupler - Coupler Head	Check	F	x	x	x	x	x							Tension springs for damage	Front Coupler

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals									Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.137	Coupler	Visual inspection, check	F				x	x	x	x					Visual inspection of hoses for porosity, screw connections and earthing for secure fastening compressed air connections for tightness, check springs and mobility	Front Coupler
6.138	Coupler	Clean, grease	F				x	x	x	x				Coupler play gauge (type 130), gauge for checking the projection level of the E coupler, mounting hooks for tension springs; KALKZINK HS 300, AUTOL-TOP 2000, RIVOLTA GWF, LOCTITE 7063, talcum powder	Clean all of coupler incl. dryer openings; clean and grease E-coupler piston rod	Front Coupler
6.139	Coupler	Measure, adjust	F				x	x	x	x					Position of the E-head; measure central axis, centering and measure horizontal force F > 250 N Measure coupler head play and coupler shank	Front Coupler
6.140	Coupler - Coupler Head	Service	F		x	x	x	x	x	x					Corrosion protection: grease head and pins as well as guide for the protective lid	Front Coupler
6.141	Coupler - Compressed Air Connection	Replace	F					x		x					Seal	Front Coupler
6.142	Coupler - Drawgear	Adjust	F								x				In 1st year, every 3 months check adjustment of supporting springs	Front Coupler
6.143	Coupler - Drawgear	Adjust	F				x	x	x	x					Check adjustment of supporting springs	Front Coupler
6.144	Coupler	Clean, service	F	x	x	x	x	x	x	x				Oil-free compressed air, grease-free cloth, "Nozzle for HL/HBL" service kit, AUTOL-TOP 2000, corrosion protection	Clean E-coupler dry, clean and descale rubber seal, clean compressed air connection nozzles (socket and seal), bearing sleeves, sliding surfaces; service coupler head locking mechanism and rod as well as the coupler paintwork	Front Coupler
6.145	Coupler	Visual inspection, check	F	x	x	x	x	x	x	x				Autol Top 2000	Visual inspection of the shaft and the E-coupler rubber seal for damage, check the fill level of the drilled holes lower bushings with grease	Front Coupler

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals									Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.146	Coupler	Overhaul	W								x				Every 8 / 16 years Retaining screw T=110 Nm Retaining screw T=300 + 10 Nm Coupler - railcar body: T=1,054 Nm ± 10% Earthing cable:- • M 8 - 15 Nm • M 10 - 30 Nm • M 12 - 50 Nm Uncoupling cylinder - coupling: T=36 Nm ± 10% Shell-type sleeve coupling: T=145 Nm + 10% 4 couplers to be condition assessed during 2016 with a view to move overhaul to F7	Front Coupler
Articulation Area																
6.147	Articulation Area - Panels	Visual inspection	R			x	x	x	x	x					Check for damage and secure fastening of the panels, determine general condition	Articulation Area
6.148	Articulation Area - Water Intakes	Visual inspection, clean	R				x	x	x	x					Check for soiling, clean if necessary	Articulation Area
Top Joint																
6.149	Top Joint - Articulated Joint	Measure	R				x	x	x	x	x				Test the tightening torque of the springs on the end portal (T=270 Nm) and the centre console (T=120Nm) once after 1 year	Articulation Area
6.150	Top Joint - Articulated Joint	Visual inspection	R			x	x	x	x	x					Springs, shock absorbers, wiring routing, supports for damage and secure fastening	Articulation Area
6.151	Top Joint - Articulated Joint	Check, service	R			x	x	x	x	x				Mobilux EP2, Molycote Multigliss 5 in 1, Copaslip	Check shock absorbers for leakage, check play of the central sliding plate (Check the central sliding plate for wear. If width is less than 37.79 mm turn the plate once through 90°. Note this operation can only be performed once. When the sliding plate width is worn to less than 37.79 mm for a second time, the plate is to be renewed), grease the sliding member on the side recesses, cutout, adjusting screws / nuts and the roof spring bearings and roof springs / shock absorbers	Articulation Area

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
Pivot Pin																
6.152	Lower Joint - Connection Joint Portal / Cradle	Visual inspection	F, P				x	x	x	x					Pivots	Pivot Pin
Swivel Plate																
6.153	Inside Joint - Swivel Plate	Clean, service	I			x	x	x	x	x				Lifting rods, lifting eyes, Mobilux EP2 grease, motor oil, SAE 5W30	Clean roller bearings and area under cover, oil roller bearings, grease sliding surfaces and rollers	Swivel Plate
Gangway Bellows																
6.154	Gangway Bellows	Visual inspection	I, F	x	x	x	x	x	x	x				Lifting gear, cable, LOCTITE	Aluminium bellows frame, cloth, smooth connection to railcar body front, if necessary repair damage	Gangway Bellows
6.155	Gangway Bellows	Clean	I				x	x	x	x				Industrial vacuum cleaner	Gangway bellows base	Gangway Bellows
Windscreen Wiper																
6.156	Windscreen Wiper System	Measure	F								x				Once after 3 months: tightening torque of wiper arm (M10 = 36-38 Nm)	Windscreen Wiper
6.157	Windscreen Wiper System	Visual inspection, function test	F, I				x	x	x	x				Arm extraction tool, torque wrench		Windscreen Wiper
Windows																
6.158	Glazing	Visual inspection	F				x	x	x	x					Check for general damage, check sealing joints for damage	Windows
6.159	Glazing - Pane Frames	Clean	F						x	x					Clean water drain holes	Windows
6.160	Front Window - Windscreen Heating	Function test	F			x	x	x	x	x					Note: there is no information describing how to test this function.	Windows
Door System																
Passenger Door																
6.161	Passenger Doors	Visual inspection	I								x				Once after 2 weeks, check all fastening screws on mounted parts for secure fastening using the colour coding	Passenger Doors
6.162	Passenger Doors	Check	I		x	x	x	x	x	x					Safety check according to checklist. Ensure relevant door signage applied	Passenger Doors

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.163	Passenger Doors	Visual inspection	I				x	x	x						Rubber bumper on left pull arm for wear	Passenger Doors
6.164	Passenger Doors	Visual inspection, service	I, F				x	x	x	x				LOCTITE 243, sealing lacquer, spring balance, Molykote D 321 R D 321 R, Klüber Isoflex LDS 18 Spezial A, Wacker Silikonpaste P4, Klüber Barrierta L25DL, Optimolpaste	Paintwork, slide rail guide profile, stop bumper door end position open, window sealing joints for damage; service door seals, finger protection rubbers	Passenger Doors
6.165	Passenger Doors	Measure	I, F				x	x	x	x					Measure spring force of push-back spring	Passenger Doors
6.166	Passenger Doors	Inspect, clean, service	I					x		x					Shaft, drive lock	Passenger Doors
6.167	Passenger Doors	Inspect	I					x		x					Toothed segment, top rollers, bottom brushes	Passenger Doors
6.168	Passenger Doors	Replace	I							x					Connection cable	Passenger Doors
6.169	Passenger Doors	Replace	I							x					Motor, NOVRAMs, left pull arm rubber bumper Lock nuts for adjustment: T=16 Nm Motor - gearbox: T=10 Nm	Passenger Doors
6.170	Passenger Doors	Overhaul	I, W								x				Every 15 years incl. reprogramming of the door controller EPROMs	Passenger Doors
Front Door																
6.171	Front Doors	Adjust, service	I		x	x	x	x	x	x				Klüber Isoflex LDS 18 Spezial A	Adjust and grease door closers	Front Door
6.172	Front Doors	Check	I								x				Once after 2 weeks Check function and adjustment Check fastening screws for secure fastening	Front Door
6.173	Front Doors	Check	I		x	x	x	x	x	x					Check function and adjustment	Front Door
6.174	Front Doors	Check	I				x	x	x	x					Check fastening screws for secure fastening	Front Door
6.175	Front Doors	Visual inspection, service	I				x	x	x	x				Silicon gel	Visual inspection and service of seals, hinges, clean door completely, degrease door seals Function check bolt lock	Front Door
Lighting																

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
	Exterior Lighting															
6.176	Exterior Lighting	Function test	F						x	x						Exterior Lighting
Monitoring and Safety Equipment																
Public Address System																
6.177	Passenger Compartment - Passenger Talkback Units (PATU)	Function test	I		x	x	x	x	x	x						Public Address System
Closed Circuit Television																
6.178	CCTV - Recorder	Visual inspection	I				x	x	x	x					Check the functional status of the recorder	Closed Circuit Television
Emergency Equipment																
6.179	Safety Equipment - Fire Extinguishers	Visual inspection Function test	I	x	x	x	x	x	x	x					For damage, replace if necessary	Emergency Equipment
6.180	Safety Equipment - Earthing Equipment (Short Circuiting Device)	Visual inspection	F, P					x		x					For damage	Emergency Equipment
6.181	Safety Equipment - Fire Extinguishers	Replace	W								x				Every 4 years, replace extinguishing agents	Emergency Equipment
Foot Pump																
6.182	Foot Pump	Visual inspection	F, P				x	x	x	x						Emergency Equipment
6.183	Foot Pump	Function test	F, P				x	x	x	x						Emergency Equipment
6.184	Foot Pump	Visual inspection	F, P				x	x							Hose pipes (U04.2), Rapid coupling (U04.3)	Emergency Equipment
6.185	Foot Pump	Replace	F, P							x					Hose pipes (U04.2), Rapid coupling (U04.3)	Emergency Equipment
6.186	Safety Warning Labels	Visual inspection	As Required												Inspect and replace if damaged (Please note not originally on OEM manual)	
Heating and Ventilation System																

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
6.187	Heating / Ventilation	Visual inspection	I		x	x	x	x	x	x					Heating controller, roof ventilator, wall heating unit, under seat heating unit	Heating and Ventilation
6.188	Heating / Ventilation	Function test	I				x	x	x	x					Heating controller, roof ventilator, wall heating unit, under seat heating unit	Heating and Ventilation
6.189	Heating / Ventilation	Clean	I				x	x	x	x				Industrial vacuum cleaner	Under seat heating unit and heating controller outside, roof ventilator and wall heating unit inside and outside	Heating and Ventilation
6.190	Heating / Ventilation	Clean	I						x	x				Industrial vacuum cleaner	Under seat heating unit and heating unit controller inside	Heating and Ventilation
6.191	Heating / Ventilation	Replace	R, I							x				Multimeter, torque wrench, work gloves, LOCTITE, joint seal	Roof ventilator, device fan, under seat heating unit, device fan wall heating unit HKL 912 - seat bracket: T=16 Nm HKL 429 fitting: T=8.7 Nm HKL 414 fitting: T=8.7 Nm	Heating and Ventilation
Drive Control System																
VOBC																
6.192	VOBC	Inspect	I, P	x	x	x	x	x	x	x					Check component mountings, antenna, speed sensor (tacho) for secure fastening and damage	VOBC
6.193	VOBC / Cable and Connections	Inspect	I	x	x	x	x	x	x	x					For damage	VOBC
6.194	VOBC	Clean	I	x	x	x	x	x	x	x				Industrial vacuum cleaner	Clean cabinet inside	VOBC
6.195	VOBC	Check	I	x	x	x	x	x	x	x					Carry out dynamic test; read out and save data	VOBC
6.196	VOBC	Adjust	I		x	x	x	x	x	x					Check the setting of the wheel tyre diameter	VOBC
6.197	VOBC	Replace	I						x	x					Every 5 years: back-up battery RAM chip CPU (see campaign data for battery changes) + K7 Relay	VOBC
Control Element																
6.198	Passenger Compartment / EDP / FAP	Function test	I				x	x	x	x					Joystick, control elements, displays and tachometer	Control Element
6.199	Passenger Compartment - EDP / FAP	Clean, replace, grease	I								x				Every 8 years,device cleaning with a vacuum cleaner, micro-switches replace and greasing the spur gear	

Chapter no. MM	Main Assembly / Component	Maintenance Activity	Working Level	Maintenance Intervals										Supplies** / Special tools***	Remark	OEM Specification Cross Reference
				F1	F2	F3	F4	F5	F6	F7	S	Assessment 720,000km	Assessment 900,000 km			
Interior																
Equipment Cupboard																
6.200	Passenger Compartment - Equipment Cupboard	Visual inspection, clean	I				x	x	x	x				Industrial vacuum cleaner	Interior	Equipment Cupboard
6.201	Passenger Compartment - Equipment Cupboard	Function test	I				x	x	x	x					VOBC fan	Equipment Cupboard

7. Requirements for Heavy Maintenance

Overhauls for the following equipment shall take place in advance of the backstop limits set out below and the content of them will be outlined in self-contained Maintenance Specifications (MS) in order to facilitate knowledge flows along the contractual chain:-

- Wheelsets shall be overhauled in accordance with DLR-CMS 752 Maintenance Specification Wheelsets, such that they remain within all limits specified.

All components of the vehicles shall be overhauled prior to the maximum intervals between overhauls specified, generally in the 'remark' column, of:-

- "*maintenance_schedule_v_1_9_revI-Entwurf_2012-08-17.xls*" which is part of BT Maintenance Manual B2007, and repeated here (pages 7 - 20 of this VMS).

8. Requirements for One-off Modification / Refurbishment / Upgrade

No PS (Project Specifications) apply at present.

9. Transport & Storage

See *BT Manual B2007* and *DLR-ENG-SPC- MS 752 -Wheelsets*.

10. Records and Reporting

See BT Manual B2007, in addition to the requirements set out in MR-700 / MR-1000

11. Parts and Material Specifications

See BT Manual B2007 and relevant DLR Specifications (CMS and PS).

12. References and Appendices

Reference to drawings for a modification in a PS, reference to OEM manuals in a VMMR or CMS, updates to BT Manuals when a PS is applied.

VMMR's are not required to contain or reference all relevant information and are not expected to duplicate OEM material. However, they should state that all limits and processes which relate to essential requirements i.e. that impact on the purpose of DLRL's Rolling stock standards / VMMR's (see particularly section 1 Purpose above) must be explicitly defined by the Franchisee or another DLRL supply chain partner.

12.1 Reference Drawings

Drawing Number	Drawing Title	Section / Job No.

12.2 Reference Documents

Reference Number	Document Title	Section / Job No.

13. Change Log

All changes Major or Minor must be captured via the change log

VMMR B2007 Change Log				
Section	**Page**	**Reason for Change**	**Date**	**Author of Change**
	5	Document Hierarchy chart updated following review ilop & software configuration folders added.	12/04/2013	J. Glover
6.43	12	Gearbox oil sampling added at 54,000Km	24/06/2013	J. Glover
6.44	12	Gearbox mag plug particle inspection added at 54,000Km	24/06/2013	J. Glover
6.3	9	Sealing Joint visual inspection added	03/01/2014	J. Glover
6.4	9	Sealing Joint visual inspection added	03/01/2014	J. Glover
6.123	17	Power convertor visual inspection added	03/01/2014	J. Glover
6.124	17	Power convertor / main fan visual inspection added	03/01/2014	J. Glover
6.183	22	Data recorder Test download removed	03/01/2014	J. Glover

Issue 4

- Text in *italics* has been quoted from the VMMR.
- Text highlighted in YELLOW has been added
- Text that is ~~struck through~~ has been deleted

VMMR B2007 Change Log				
Section	**Page**	**Reason for Change**	**Date**	**Author of Change**
6.18.1	10	Replace traction rod bushes at F6 & F7 added as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.18.2	10	Horizontal (lateral) stops assessments added as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.33.1	11	Rotate slewing ring through 90° added as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.33.2	11	Condition assess slewing rings from 3 vehicles to determine the next maintenance activity (1,080,000km) added as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.91	15	Assess 1 vehicle at 630,000Km added as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.96	15	Through assessment changed to F7 depending further assessment required at 630,000Km added as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.96.1	15	Replace Overflow valve at F6 & F7 added, as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.98	15	Changed to F7 from F6 depending on assessment required at 630,000Km added as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.98.1	16	Replace artic hose on F6 & F7 added, as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.103	16	Assess 1 vehicle at 630,000Km as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.106	16	No longer required at F6 as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.118.1	17	Battery torques / cleaning added as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.127.1	18	Replace power convertor contactor added as agreed through CNRS 2014-61	19/01/2014	J. Glover

VMMR B2007 Change Log				
Section	**Page**	**Reason for Change**	**Date**	**Author of Change**
6.127.2	18	Replace power convertor contactor relay , depending on condition assessments at 630,000Km and 720,000Km, as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.131.1	18	Clean brake resistors as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.17	21	Door connection cable removed from F6, as agreed through CNRS 2014-61	19/01/2014	J. Glover
6.184	22	Removed from F6 and added to F5 , as agreed through CNRS 2014-61	19/01/2014	J. Glover
General		All defective hyperlinks removed.	02/08/2016	S.E. Taylor
General		General formatting changes	02/08/2016	S.E. Taylor
Section 5		900km tolerance added for maintenance periodicity	02/08/2016	
Star Chart		In the *Notes* the key for *Incl. utilities and tools* corrected from ** to ***	02/08/2016	S.E. Taylor
Star Chart		Redundant red highlighting removed from blank cells.	02/08/2016	S.E. Taylor
Star Chart		*Assessment 630,000km* column removed and *Assessment 900,000km* column added.	02/08/2016	
6.2		Maintenance periodicity changed to reflect actual maintenance. Removed from S and included in F6 and F7. Changed from *Every 3 years* to *Approximately 6 years*.	02/08/2016	S.E. Taylor
6.10		*Motor and Trailer Bogie – Shock Absorbers* changed to *Motor and Trailer Bogie – Primary Suspension.* *Check horizontal and vertical shock absorbers changed to Check horizontal and vertical dampers.*	02/08/2016	S.E. Taylor
6.20		*After 5 years initially then at (DLRL) agreed appropriate intervals and undertake axlebox bearing condition assessments with the OEM to identify the optimum overhaul interval. ~~annually, check 4 randomly selected axle bearings (of the fleet) thorough internal test by manufacturer.~~*	02/08/2016	S.E. Taylor
6.21		*~~Check 4 randomly selected axle bearings (of the fleet) thorough internal test by manufacturer.~~*	02/08/2016	S.E. Taylor

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6.22		~~*Every 540,000 km 2 randomly selected horizontal and vertical shock absorbers to be checked by the supplier. Assess 5% (of the fleet) of horizontal and vertical shock absorbers at 630,000 km.*~~ *Assess 5% (of the fleet) of horizontal and vertical shock absorbers at 900,000 km to identify the optimum overhaul interval.* Requirement added Assessment 900,000 km	02/08/2016	S.E. Taylor
6.25		Requirement removed from F6	02/08/2016	S.E. Taylor
6.26		Requirement removed from F6	02/08/2016	S.E. Taylor
6.36		*Maintenance out of sync due to current return damage to original bearings, now replaced during slip coupling mod. Revised maintenance guidance required.*	02/08/2016	S.E. Taylor
6.41		*Oil sample from gearbox to be used as a comparator for condition.* ~~*Photographic evidence of all samples are to be recorded in the AMS with time, date, gearbox location.*~~ *Sample reports should be stored electronically by KAD and shared with DLRL as required.*		S.E. Taylor
6.42		*Remove the magplug and inspect for particles Sample reports should be stored electronically by KAD and shared with DLRL as required.* ~~*Photographic evidence of all samples are to be recorded in the AMS with time, date, gearbox location.*~~		S.E. Taylor
6.50		~~*Visual inspection of the colour coding.*~~ *Check torque witness marks of the screws and nuts as well as coupling parts, if necessary, new fastening screw and nut with torque attract and colour coding renew, spacer and adapter sleeves for damage, elastic sleeves for changes to the rubber surfaces and abrasion (before cleaning the coupling)*		S.E. Taylor
6.54		*Overhaul whenever the drive coupling is parted for overhaul of the gearbox or traction motor.* ~~*During general inspection.*~~ Requirement removed from F7 and added to S		S.E. Taylor
6.61		*Condition assess at 900,000km to identify the optimum overhaul interval.* Removed requirement from F6 and F7 and added to Assessment 900,000km.		S.E. Taylor

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Section	**Page**	**Reason for Change**	**Date**	**Author of Change**
6.64		*Check air supply and brake system for leakage, Function check. ~~of current collector equipment.~~*		S.E. Taylor
6.70		*EP-Compact (B05, B06) To be condition assessed to determine if this can be moved to the F7.*		
6.89		Requirement added to Assessment 900,000km		S.E. Taylor
6.94		Requirement added to Assessment 900,000km		S.E. Taylor
6.95		Requirement added to Assessment 900,000km		S.E. Taylor
6.96		Requirement added to Assessment 900,000km		
6.101		Requirement added to Assessment 900,000km		
6.103		Requirement added to F7.		
6.104		*Replace as required*. Requirement removed from F7		
6.107.1		*Compressor Piston Rings* entire line added.		
6.115		*Once after 6 months fill up with water – applicable to new vehicle only.*		
6.116		*Top ~~fill~~ up with water*		
6.124		*~~Every 4 years: d~~Device fan* Requirement added to F6 and F4 and removed from S		
6.125		*Every 8 years: main fan~~, DCU back up battery~~*		
6.125.2		*Replace for overhauled item. Condition assess 3 relays at 900,000 km ~~and a further 3 relays at 720,000 km~~ to determine future overhaul / replacement.* Requirement added to Assessment 900,000km.		
6.131		Requirement removed from S and added to F7.		
6.146		*4 couplers to be condition assessed during 2016 with a view to move overhaul to F7.*		
6.160		*~~Note: there is no information describing how to test this function~~*		
6.176		*~~Checking condition of the reflector~~*		
6.178		*Check the functional status of the recorder ~~(the five green LEDs of fault lights)~~*		