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सत्यमेव जयते

भारत सरकार GOVERNMENT OF INDIA
रेल मंत्रालय MINISTRY OF RAILWAYS

Troubleshooting Manual for Vande Bharat Trains



(VOLUME – 2)

IRCAMTECH/GWL/2023-24/Trainset/TSM/1.0

अग्रमा संRDSO
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EXCELLENCE IN MAINTENANCE

Indian Railways
Centre for Advanced Maintenance Technology

TROUBLE SHOOTING MANUAL (VOLUME -2)

Version : **1.0**



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Content in this document is compiled with the inputs provided by ICF and OEMs.

AMENDMENT AND REVISIONS

The correction slips to be issued in future for this report will be numbered as follows:
IRCAMTECH/GWL/2023-24/Trainset/TSM/1.0# XX date .....
Where “XX” is the serial number of the concerned correction slip (starting from 01 onwards).

Version	Date	Corrections	Remarks
1.0	August 2023	First Version	For chair car trainset with Medha Propulsion System.

STRUCTURE OF DOCUMENTATION

This Troubleshooting Manual provides instructions for troubleshooting different systems and equipment in the trainset. This manual may be used as a base document to frame troubleshooting guidelines for the trainset.

For ease of understanding and usability the complex trouble shooting - related information in the documentation has been divided into two volumes:

Volume - 1: Troubleshooting of 25 kV AC Three Phase Propulsion & Other related equipment for trainset.

This volume contains troubleshooting instructions for the en-route maintenance staff provided by Medha Servo Drives Pvt. Ltd. In this document troubleshooting instructions according to the fault code as displayed on the Driver Display Unit are mentioned. Schematic reference for different coaches, functional groups and their sub functional groups are provided along with location and check points for troubleshooting.

Volume - 2: Troubleshooting for various equipment / sub assembly of trainset.

This volume provides troubleshooting information for equipment / sub-assemblies of trainset coaches provided by various OEMs. The details have been taken from Vande Bharat Express Trainset (V2.0) Maintenance Manual (Volume-2, Chapter 8 – Troubleshooting) issued by CAMTECH on September 2022.

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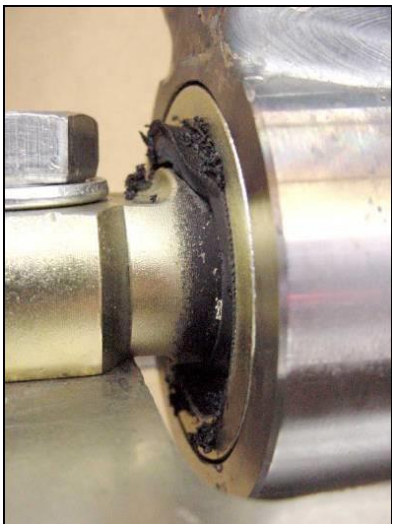
1. TROUBLESHOOTING OF SEMI-PERMANENT COUPLER (DELLNER)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Will not couple/ uncouple	Foreign material obstructing coupling/ uncoupling.	Manually remove foreign material.
	Coupling details worn/rusty.	Check socket joint kit. Replace as required
	Flanges will not catch, excessive height difference.	Lift coupler half a bit more.
Slack when coupled.	Rear nut loose.	Check rear nut. Replace as required.
	Rubber springs broken or exhausted.	Check rubber springs. Replace as required.
Cannot absorb the draft and buff loads.	Exhausted or broken Rubber springs.	Draft gear requires repair.

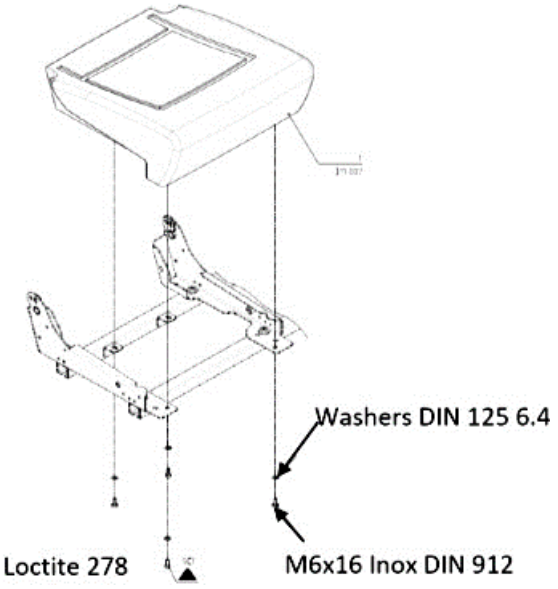
2. TROUBLESHOOTING OF DAMPER (KONI)

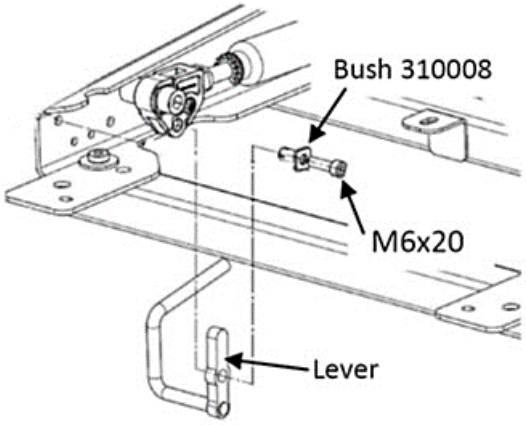
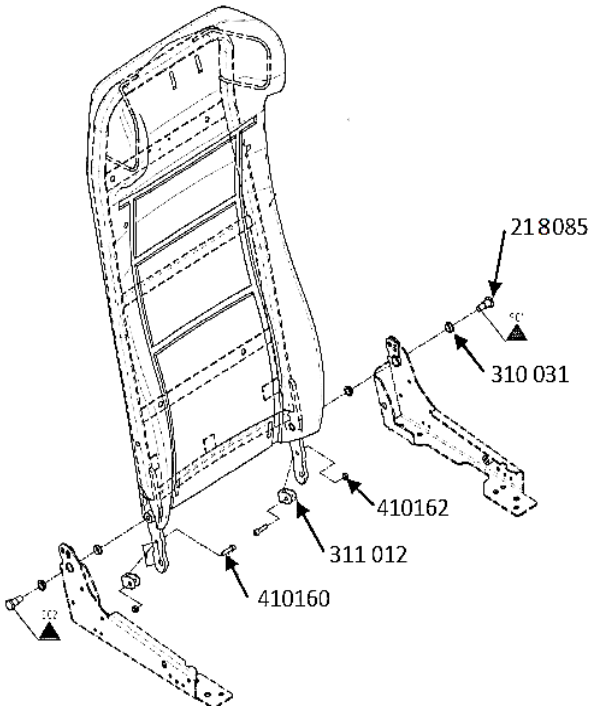
ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Dirt Accumulation	Normal contamination caused by the operating environment of the dampers is harmless. If a damper has a damp film over the whole body (including the dust cover), it is very probable that this is the result of an outside source of oil or dirt. In this case the damper can remain in service. 	No action to be taken.

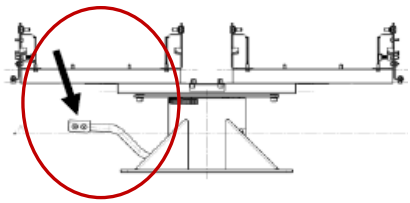
Sweating	For a long service life, it is necessary for the rod oil seal to remain lubricated. The continuous inward and outward movement of the piston rod may cause oil “sweat” from the rod oil seal. This loss of oil can be recognized by the outside of the damper being slightly moist and dirty. However, there should not be any droplets of oil clinging to the damper. A slight oil sweating will not affect the damping force and this damper may remain in service. 	No action to be taken
Oil drops	A true oil leakage becomes apparent by a damp surface, which usually covers a large part of the reservoir tube. Isolated oil drop formation is possible. When wiping the damper with a paper cloth, clear oil stains are visible. 	Replacement/ Overhaul

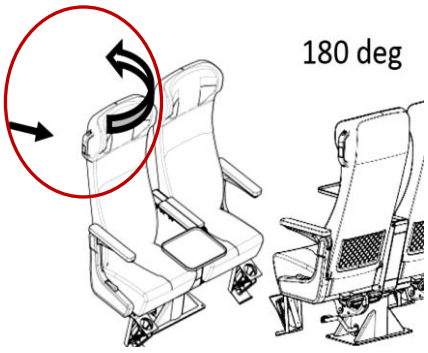
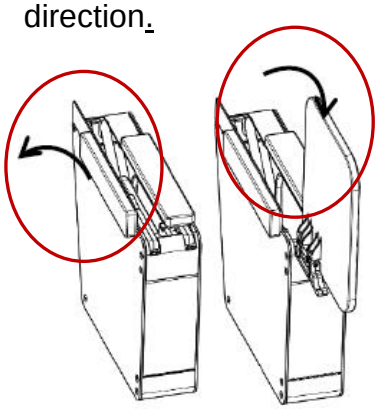
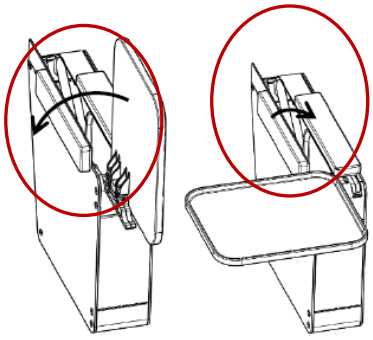
Cracks in rubber of silent block	For surface cracks 	No action required
	When depth of crack is 8 mm and above. 	Replace the attachment
De-bonding of metal and rubber.	When De-bonding of metal and rubber is Max 10% of the total rubber	Replace the attachment
Rubber deterioration	Pulverized rubber is max. 10% of the total rubber 	Replace the attachment
Creeping of rubber.	Loose collar - Only a cosmetic issue	No action required

3. TROUBLESHOOTING OF PASSENGER SEAT (STER)

ERROR / FAULT	POSSIBLE CAUSE / OBSERVATIONS	CORRECTIVE ACTION
Upholstery damaged due to wear of fabric, or due to vandalism	Train can continue operation without correction	Damaged upholstery should be replaced as soon as possible. <u>Exchange of seat cushion</u> 1. Unscrew the four screws M6x16. 2. Remove cushion. 3. Place the new cushion back. 4. Put thread locker on the tip of the screws (Loctite 278) 5. Place the four washers DIN 125 A6.4 Inox and tighten the four screw M6x16 Inox – DIN 912 to a torque of 10N.m  <u>Exchange of the seat backrest</u> 1. Remove the cushion as explained above. 2. Remove the gas spring. • Remove the bolt M6x20 8.8 DIN 912 and gas spring fixation bush 310008 • Remove the gas spring lever.

		 3. Untighten the bolt No 218 085 and disassemble the fasteners. 4. Remove backrest and replace it with the new one. 5. Place the backrest according to illustration using spare parts set: 218 085, 310 031, 410 162, 311 012, 410 160 6. Add thread locker (Loctite 278) on the tip of the screw and tighten to torque 45N 
Parts are scratched, burned, deformed, broken due to vandalism	Train can continue operation without correction. If structural damage is suspected, the parts shall not be used or operated by anyone	If after cleaning, the considered area still shows structural damage (and/ or aesthetically unacceptable traces), then replace the part.

Chair Car snack table is not levelled.	Train can continue operation without correction.	Adjust the level by following proper procedure.
Armrest doesn't lift or lower	Train can continue operation without correction. Follow the below mentioned OEM Instructions: 1. Lift the armrest 2. For second class, armrests on the gangway side are fixed and can't be lifted. 	If the armreststill can't be operated, exchange the armrest following proper procedure.
Executive class seat doesn't rotate	Train can continue operation without correction. Follow the below mentioned OEM Instructions: 1. Push the pedal down.  2. Start rotating the seat (around 15 degrees). By pushing or pulling the handle. *CAUTION: The rotation is possible only in one direction. If the seat blocks when rotating, then try the other direction.*	Exchange the corresponding part.

	3. Release the pedal. 4. Rotate the seat to 180 degrees until the mechanism locks itself. 	
Executive class seat central console table can't be opened	Train can continue operation without correction. Follow the below mentioned OEM Instructions: 1. Open the armrest. 2. Pull the table and rotate until blocked in longitudinal direction.  3. Rotate the table in lateral direction. 4. Close the armrest 	Exchange the corresponding part

4. TROUBLESHOOTING OF AUTOMATIC INTERNAL SLIDING DOOR (PRAG)

ERROR / FAULT	CORRECTIVE ACTION
When door in not opening automatically on Automatic mode (Radar / Spot Scan sensing mode)	• Push lit button provided on door leaf - Door will open and close automatically after pressing the push button. • Check the MCB2 it should be ON state in case radar is working in auto mode.
When radar sensing mode and green lit push button mode both are not working.	• Press the red colour mushroom type emergency push button located on side panel of door. The door mechanism will switch over on manual mode after pressing the emergency push button. • Pull the door leaf manually with the help of sunk in handle provided on door lead frame on the direction of opening the door. • Pull the door leaf manually with the help of sunk in handle provided on door lead frame on the direction of closing the door.

5. TROUBLESHOOTING OF AUTOMATIC INTERNAL SLIDING DOOR (NORGREN)

The 7-segment display (H401) on the controller shows the following status and error displays.

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
CODE - 1 RAM-, EEPROM-or CPU error (system error)	Motor torque-free. New start after threefold correct additional test	If necessary replace controller.
CODE - 3 Error in second switch-off stroke	Motor torque-free: New start after 5 seconds	If necessary replace controller.
CODE - 4 Motor undefined	Hold-open time extended by minimum 2s to maximum 4s	Motor needs longer rest phases.
CODE - 5 Motor undefined	Motor torque-free. New start after 30 seconds	Check wiring, if necessary replace controller or motor.
CODE - 6 Motor blocked in closing direction	Door stops and reverses	Check if an obstacle is in the door.
CODE - 7 Error pulse generator	Motor torque-free: New start after 5 seconds	Check wiring, if necessary replace controller or motor.

CODE - 8 Minimal editor is started (service button Open and Closed activated at the same time)	Motor is torque free	Door must be taken into operation by reapplying operating power.
CODE - 9 Motor over current	Motor torque-free. New start after 30 seconds	Check wiring, if necessary replace controller or motor.
CODE - A Minimal editor (power adjustment) active	Motor is torque free	Door must be taken into operation by reapplying operating power.
CODE - c Blockage at opening	Door stops and reverses	Check if an obstacle is in the door
CODE - C Minimal editor (profile adjustment) active	Motor is torque free	Door must be taken into operation by reapplying operating power.
CODE - d Door does not move during initializing run (no OPEN or CLOSED signal)	Door has stopped	Check if an obstacle is in the door.
CODE - E Motor over current-Motor torque-free.	New start after 30 seconds	Check input voltage from vehicle, if necessary replace controller.
CODE - F Motor low voltage	Door system is slower	Check input voltage from vehicle.
CODE - H Parameter verification (training run)	The door travels automatically in both directions until the training run has been finished.	Wait for end of training run.
CODE - L Current measurement error	Motor torque-free: New start after 5 seconds	If necessary replace controller.
CODE - o Function OK.	The door is outside the “Closed” position	None
CODE - P Parameter error (error in the training run)	Motor is stopped. No new automatic start	Check the door at first activation (service). If necessary replace controller
CODE - u Door is closed	The door is in the “CLOSED” position	None
CODE - U Max. door mass exceeded	Immediate new start. Can only be quit via a training run with standard parameter set	Check the door at first activation (service). If necessary replace controller.
CODE – (-) Door does not move during the initializing run and has no valid parameters	-	Perform training run for parameter verification.

6. TROUBLESHOOTING OF AUTOMATIC SINGLE LEAF PLUG DOORS (iFE)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
CODE - 7	Motor current monitoring at opening sequence was activated on a fixed number of successive opening attempts	Signal input of the door position sensor at the DCU, door drive mechanism, door movement, adjustment of the door, adjustment and wiring of the limit switch “door closed/locked” and input circuit of the DCU to be checked.
CODE - 8	Internal security relay of the DCU fails	The activation of the security relay according to the block diagram of the DCU and according to the wiring diagram has to be checked, otherwise the DCU has to be replaced.
CODE - 13	Short circuit at the output A1 of the DCU	Component connected to output A1, wiring and output of the DCU to be checked.
CODE - 14	Short circuit at the output A2 of the DCU	Component connected to output A2, wiring and output of the DCU to be checked.
CODE - 15	Short circuit at the output A3 of the DCU	Component connected to output A3, wiring and output of the DCU to be checked.
CODE - 16	Short circuit at the output A4 of the DCU	Component connected to output A4, wiring and output of the DCU to be checked.
CODE - 17	Short circuit at the output A5 of the DCU	Component connected to output A5, wiring and output of the DCU to be checked.
CODE - 19	Short circuit at the output A6 of the DCU	Component connected to output A6, wiring and output of the DCU to be checked.
CODE - 20	Short circuit at the output A7 of the DCU	Component connected to output A7, wiring and output of the DCU to be checked.
CODE - 21	Short circuit at the output A8 of the DCU	Component connected to output A8, wiring and output of the DCU to be checked.
CODE - 22	Battery backup of the diagnostic memory fails	Change the NOVRAM mounted in the DCU.

CODE - 34	Door open push button inside fails.	Door open push button, input circuit of the DCU and wiring to be checked
CODE - 42	Data bus communication fails	Door data bus cable, connectors and bus interface to be checked
CODE - 44	Door leaves the closed/locked position without permission	Mechanical adjustment of the emergency release device, adjustment of the limit switch of the emergency release device, door locking mechanism, door drive mechanism, adjustment and wiring of the limit switch “door closed/locked” and input circuit of the DCU
CODE - 48	Door open push button outside fails	Door open push button(s), input circuit of the DCU and wiring to be checked
CODE - 71	Limit switch “door 98% closed” fails	Adjustment and wiring of the limit switch “door 98% closed” and input circuit of the DCU to be checked
CODE - 124	Pressure supply missing	Pressure switch, input circuit of the DCU and wiring to be checked
CODE - 134	Signals from the VCU are faulty	Signals from the VCU, wiring, connectors and input circuit of DCU to be checked
CODE - 138	Door coding faulty	Coding of the DCU has to be checked
CODE - 225	Speed signals from the VCU are faulty	Speed signals from the VCU, wiring, connectors and input circuit of DCU to be checked
CODE - 226	Door out of service device fails	Door out of service mechanism, input circuit of the DCU and wiring to be checked
CODE - 246	Service push button on the DCU fails	Service push button of the DCU to be checked
CODE - 252	Signal from the vehicle control unit is different	Signals from the vehicle control unit, wiring, connectors and input circuit of DCU to be checked

7. TROUBLESHOOTING VACUUM BIO TOILET (EVAC)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Flush button is pushed but toilet does not flush	No power	Supply power
	No fresh water	Check water supply
	Bio-digester full	Empty Bio-digester
	No compressed air	Provide compressed air
	Flush button defective	Check cable, check flush button, replace if necessary
Water flows into toilet bowl	Water Inlet valve clogged	Remove blockage
	Pinch valve defective	Replace pinch valve
	Quick exhaust valve blocked due to frost	Defrost quick exhaust valve
	Quick exhaust valve blocked due to pollution	Clean quick exhaust valve
	Water filter clogged	Clean filter
	Liquid level guard in flush water tank defective	Contact EVAC service Remove flush water tank
Toilet bowl is not flushed sufficiently	Flush nozzles polluted	Clean flush nozzles
	Flush nozzles calcified	Decalcify flush nozzles
	Flush nozzles swivelled out of optimal position	Adjust flush nozzles

ERROR ROUTINE

CODE	CAUSE
Code 01	WWT (Bio-digester) full
Code 02	Pressure rise
Code 03	Pressure Vacuum
Code 04	Pressure detected
Code 05	Bowl full
Code 06	No water
Code 09	Inlet can`t close
Code 10	Inlet can`t open
Code 20	Flush Button Error

8. TROUBLESHOOTING PANTOGRAPH (SCHUNK)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Pantograph does not raise or lower.	Static contact force is poorly adjusted.	**CHECKUP:** Static contact force **ADJUSTMENT:** Static contact force
	Air bellow drive defective.	**CHECKUP:** Air bellow drive for damage **REPLACEMENT:** Air bellow drive
	Cable with terminals torn.	**REPLACEMENT:** Cable with terminals
	Air line defective.	**REPLACEMENT:** Air line
	Damper between base frame and lower frame defective.	**REPLACMENT:** Shock absorber
	Inner friction of pantograph too high.	**CHECKUP:** Static contact force
		CHECKUP: Pantograph for damaged components. **REPLACEMENT:** Damaged components
	Valve unit ADD responds.	**CHECKUP:** Leaking test Functional test As per OEMs instruction
Frequent interruption of current transmittal (strong arcing).	Static contact force is poorly adjusted.	**CHECKUP:** Static contact force **ADJUSTMENT:** Static contact force
	Inner friction of pantograph too high.	**CHECKUP:** Static contact force **CHECKUP:** Pantograph for damaged, especially bearings. **REPLACEMENT:** Damaged components
	Sliding strips damaged.	**REPLACEMENT:** Sliding strips (as pairs)
	Stiff pan head suspension.	**REPLACEMENT:** Rocker boxes
	Parallel guide poorly adjusted.	**ADJUSTMENT:** Turning capacity of pan head

Uneven wear of sliding strips.	Parallel guide poorly adjusted.	**ADJUSTMENT:** Turning capacity of pan head
Cable torn	Cable with terminals ungreased	**REPLACEMENT:** Cable w. terminals **GREASING:** Cable w. terminals
	Air bellow drive poorly adjusted.	**REPLACEMENT:** Cable w. terminals **ADJUSTMENT:** Air bellow drive
Air bellow drive defective.	Loosened screw connections.	**FASTEN:** Loosened screw connections
	Leaking air line.	**CHECKUP:** Leaking test **REPLACEMENT:** Air line
	Bellow cylinder leaking.	**REPLACEMENT:** Air bellow drive

9. TROUBLESHOOTING MAIN TRANSFORMER

ERROR / FAULT	IMMEDIATE ACTION	DIAGNOSTIC / CORRECTIVE ACTION
Pressure relief device tripping	• Stop Transformer / Do not reenergize Transformer. • Visual checking of Pressure relief device, bushings and tank. • Check circuit breaker tripping. • Check oil level. • Perform electrical measurements. • Perform dissolved gas analysis. • Do not reenergize without full diagnostic.	• Check if Air dryer is not blocked (disassemble it) • Electrical measurements (ratio, winding resistances, insulation resistances). • Visual checking of Pressure relief device, bushings and tank. • Perform dissolved gas analysis. • Analyse train parameters records.
Circuit breaker tripping	• Check Pressure relief device tripping, visual checking of Pressure relief device, bushings, and tank. • Check oil level. • Do not reenergize Transformer if some anomaly is detected during above checks. Perform electrical measurements • Perform dissolved gas analysis	• Electrical measurements (ratio, winding resistances, insulation resistances). • Visual checking of Pressure relief device, bushings, and tank. • Perform dissolved gas analysis. • Analyse train

		parameters records.
Current Transformer overcurrent	• Check Pressure relief device tripping, visual checking of Pressure relief device, bushings, and tank. • Check oil level. • Do not reenergize Transformer if some anomaly is detected during above checks. Perform electrical measurements. • Perform dissolved gas analysis.	• Electrical measurements (ratio, winding resistances, insulation resistances) Visual checking of Pressure relief device, bushings, and tank • Perform dissolved gas analysis Analyse train parameters records
Overtemperature tripping (temp. sensor or Thermostat)	• Reduce power, if not sufficient stop Transformer. • Check Pressure relief device tripping, visual checking of Pressure relief device, bushings, and tank. • Check oil level. • Do not reenergize Transformer if some anomaly is detected during above checks.	• Check load and other train parameters records. • Check cooling system: oil flow, air flow, and radiator cleaning. • Check temperature sensors. • Check for any oil presence in Air dryer.
Different reading from temp. sensors or Tripping of one Thermostat without tripping of lower range Thermostat	• Check temperature sensor / Thermostat and change device if necessary.	
Visual oil level too low	• Check for any leakage. • Add dry and filtered oil.	• Look for any leakage including tank, pipe, gasket assembly, air plug, cracks. • Clean suspected area, and check if oil appears again (preferably with hot oil). • When located repair leakage.

Low oil level sensor tripping	• Check for any leakage. • Add dry and filtered oil.	• Look for any leakage including tank, pipe, gasket assembly, air plug, cracks • Clean suspected area, and check oil appear again (preferably with hot oil). • When located repair leakage.
Very low oil level sensor tripping	• Stop Transformer. • Check visual oil level. Check for any leakage. • Check for consistency of sensors : low oil sensor tripping before very low level.	• Check recorded load and oil temperature (train parameters). • Perform dissolved gas analysis. • Look for any leakage including tank, pipe, gasket assembly, air plug, cracks. Clean suspected area, and check if oil appear again (preferably with hot oil). • When located repair leakage.
Oil leakage	• Check Oil level. • If very low oil level stop Transformer. Look also for other train equipment in the vicinity.	• Look for any leakage including tank, pipe, gasket assembly, air plug, cracks. • If gaskets are mounted with Vaseline lubrification and Transformer being heated, it could be sometime misinterpreted as leakage. • Clean suspected area, and check if oil appear again (preferably with hot oil). • When located repair leakage.
Oil flow stop tripping	• Stop Transformer. • Check Oil level. • Check if Pump is running. • Check for every Valves position.	• If pump is running and valves are ok, • Check Oil flow indicator contactor, if necessary change Oil flow indicator.

		• If not, Check Pump supply and windings, if necessary change the Pump.
Air dryer change of color start on opposite site of air entrance	• Check oil water content, if below limit oil needs to be dried. • Change gasket or Air dryer.	• Check for any crack on Air dryer.
Bushing color change	• Look for any loosening of connection, and correct it. • Look for any crack, if any stop Transformer.	• Check possible overheating from loosening connection or possible damage creating electrical ageing
Bushing crack	• Check for any leakage. • Contact maintenance unit for resolution.	
Abnormal noise	Try to locate area involved: • Pump • Hydraulic noise • Fans • Main tank • Some loosing equipment • Other train component	• Check there isn't any loosed equipment and correct immediately if necessary • Pump : check rotation and if necessary correct phases supply. Check bearings and replace them if necessary. • Hydraulic : try to evacuate air by air drain plugs • Fans : looks for some friction or any external part blocking fan rotation. • Check rotation and if necessary correct phases supply. Check bearings and replace if necessary. • Main tank: advise manufacturer.
Paint damage or corrosion	• Paint repair	• According to maintenance manual.

Shocks	• On bushings : replace. • On accessories : replace. • On main tank : advice manufacturer. • On flexible pipe : replace. • On auxiliary connectors : replace.	• Check for any leakage.
Physical properties of oil (water content, breakdown voltage)	• Refer to maintenance manual.	• Check Air dryer.
DGA indicating fault	• Maintenance unit to decide.	• Expert diagnostic and sampling interval.

10. TROUBLESHOOTING TRACTION MOTOR (TSA)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Engine vibrates, unusual engine noises	Engine suspension (rubber elements) defective	Carry out a visual inspection of the motor suspension. If necessary, replace the rubber elements.
	Loose screws	A screw check is necessary. It must be checked if the screws have been tightened with the correct torque. Replace broken or broken screws.
	Imbalance of Rotor	The rotor must be dismantled and the balancing must be checked. If necessary, the rotor must be rebalanced.
	Damage of bearing	Replace bearing
	Damage of coupling	Replace coupling
	Ventilator damaged or blocked	Check ventilator
Temperature in the stator is too high. (warning limit has been reached)	Cooling airline (supply or discharge) damaged or blocked	Check cooling airline (supply or discharge).
	Ventilator damaged or blocked	Check ventilator
	Protective grid on the air outlet dirty or clogged	Clean the protective grid on the air outlet
	Cooling air inlet temperature too high	Observe the allowed inlet temperature.
	Motor overload	Observe technical data

Smoke development	Bearing damage, damaged winding, temperature in stator is too high	Check the engine according to the general inspection.
Reduced drive power	Defective supply cable	Visual inspection of the supply cables. If necessary, replace them.
	Defective connection of the supply cable	Visual inspection of the terminal box.
	Defect in the power supply of the inverter	Check the functions of the inverter.
	Defective coupling	Visual inspection of the coupling.

11. TROUBLESHOOTING GEAR DRIVE (TSA)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Abnormal noise	Bearing failure or damage	Replace bearings.
	Toothing failure or damage	Replace damaged gear wheels
Smoke emission	Bearing damage	Replace bearings
Vibration or knocking when load changes	Retaining screws of the gearbox mounting are loose or spherolastic bearing is defective	Check whether retaining screws are seated firmly on the gearbox mounting and retighten if necessary. Inspect spherolastic bearing visually; replace if necessary.
	Gear coupling defective	Check and replace the gear coupling according to operating manuals of the coupling
Oil escaping on the labyrinth seals of the shafts	Oil level in Traction Gearbox too high	Check oil volume on the oil level indicator and adjust if necessary.
	Water has penetrated the Traction Gearbox (e.g., while cleaning the wheelset Traction Gearbox)	Perform oil change.
	Gearbox was tilted too much (with oil filling)	Disassemble, clean and assemble labyrinth seal parts.

Oil escaping on a locking screw	Bolt not tightened according to specifications	Tighten bolt with specified torque.
	Seals worn or defective	Replace affected seal.
Wheelset, Traction Gearbox gets too hot	Oil level in Traction Gearbox too high or too low	Check oil volume on the oil level indicator or on the dipstick and adjust if necessary.

12. TROUBLESHOOTING RMPU (AMIT ENGINEERS)

SYMPTOMS	TROUBLE SHOOTING
110V DC main MCB of RMPU Control supply 'ON', but, HVAC Unit does not work.	• Check availability of 110V DC at MCB • Check AIR.CO. Switch 'ON' status on DDU (Driver DeskUnit). • Check availability of 415V AC at MCB
Controller 'ON', But AC not working.	
No cooling	• Check AIR.CO. Switch 'ON' status on DDU (Driver DeskUnit). • Check availability of 415V AC at MCB • Check HP fault status on DDU (Driver Desk Unit).
Compressors not working	1. Check for causes of HP tripping. • Check LP fault status on DDU (Driver Desk Unit). 2. Refer clause no. 4.1.3 for causes of LP tripping. • Check supply air fan 1 or 2 thermal protection fortripping. • All measuring sensors failed. • Check working of Blower motor. • Check 415V AC, 3 Ph. Available at Compressorsterminals.
No Heating	• Check AIR.CO. Switch 'ON' status on DDU (Driver Desk Unit). • Check availability of 415V AC at MCB • Check OHP cut for tripping. In healthy condition LED indications in controller DIP-06 & DIP-28 should glow. • Refer clause no.6.2 for causes of OHP tripping. • Check supply air fan 1 or 2 thermal protection for tripping. • Check EST1 cartridge fusible link is not broken. • Check working of Blower motor. • Check 415VAC, 3 Phase available at Heater terminals.

In cooling mode Condenser motor does not work.	• Check thermal protection inside motor for tripping. In healthy condition LED indications in controller DIP-03, DIP-04, DIP-25, DIP-26 should glow. • Check supply air fans thermal protection for tripping. • All measuring sensors failed. • Check 415V AC, 3 Ph. available at Condenser motor terminals.
Supply air fan motors not working.	• Check AIR.CO. Switch 'ON' status on DDU (Driver DeskUnit). • Check availability of 415V AC at MCB • Check supply air fans thermal protection for tripping. • Check 415V AC, 3 Ph. available at Blower motor terminals.

13. TROUBLESHOOTING SALOON LIGHT (ENSAVE)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
LED array does notglow or strike.	Improper LED array fitment and soldering of it to the input point	Ensure correct terminal soldering and the fitment with LED array.
	LED array unit is defective.	Replace defective unit with working one.
	Loose wiring at led terminal and at driver unit output terminal	Replace loosened contacts at LED array and driver output terminal
	Driver unit is malfunctioning	Replace defective driver unit with working driver
Driver unit is not working	Loosed wire contacts at driver output and the input terminal.	Ensure positive wire contacts at driver and also input terminal.
	Driver unit defective.	Replace defective unit with good and working one.
	Improper LED array insertion into MCPCB board to no load condition.	Ensure LED array insertion and positive tightness of the screw.
Low Lux Level	LED array is at the end of its life.	Ensure aged LEDs over 50,000 burning hours need to be replaced.
	Dust accumulation on front diffuser.	Periodic frequency to clean the diffuser surface externally.
Dust / insect / water ingress into the luminaire housing.	Removal of end caps provided at the end sides of the luminaire housing.	Ensure end caps are repositioned after breakdown maintenance at the end sides of the luminaire housing.

14. TROUBLESHOOTING PAIL LIGHT (ENSAVE)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
LED array does not glow or strike.	Improper LED array fitment and soldering of it to the input point	Ensure correct terminal soldering and the fitment with LED array.
	LED array unit is defective.	Replace defective unit with working one.
	Loose wiring at led terminal and at driver unit output terminal.	Replace loosened contacts at LED array and driver output terminal
	Driver unit is malfunctioning.	Replace defective driver unit with working driver.
Driver unit is not working	Loosed wire contacts at driver output and the input terminal.	Ensure positive wire contacts at driver and also input terminal.
	Driver unit defective.	Replace defective unit with good and working one.
	Improper LED array insertion into MCPCB board to no load condition.	Ensure LED array insertion and positive tightness of the screw.
Low Lux Level	LED array is at the end of its life.	Ensure aged LEDs over 50,000 burning hours need to be replaced.
	Dust accumulation on front diffuser.	Periodic frequency to clean the diffuser surface externally.
Dust / insect / water ingress into the luminaire housing.	Loosed fasteners at the main diffuser frame assembly.	Ensure adequate tightening of the diffuser frame assembly fasteners

15. TROUBLESHOOTING DRIVER CAB/ GANGWAY LIGHT (ENSAVE)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
LED array does not glow or strike.	Improper LED array fitment and soldering of it to the input point	Ensure correct terminal soldering and the fitment with LED array.
	LED array unit is defective.	Replace defective unit with working one.
	Loose wiring at led terminal and at driver unit output terminal.	Replace loosened contacts at LED array and driver output terminal
	Driver unit is malfunctioning.	Replace defective driver unit with working driver.
Driver unit is not working	Loosed wire contacts at driver output and the input terminal.	Ensure positive wire contacts at driver and also input terminal.

	Driver unit defective.	Replace defective unit with good and working one.
	Improper LED array insertion into MCPCB board to no load condition.	Ensure LED array insertion and positive tightness of the screw.
Low Lux Level	LED array is at the end of its life.	Ensure aged LEDs over 50,000 burning hours need to be replaced.
	Dust accumulation on front diffuser.	Periodic frequency to clean the diffuser surface externally.
Dust / insect / water ingress into the luminaire housing.	Removal of end caps provided at the end sides of the luminaire housing.	Ensure adequate tightening of the diffuser frame assembly fasteners

16. TROUBLESHOOTING MONOBLOCK PUMP (CEC)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
Motor does not rotate	No power supply	Ensure power supply
	Over heating	Remove fan cover & Check for free rotation of motor shaft along with fan and allow the motor to cool & switch on.
	Impeller struck up	Check the impeller
Pump does not lift water	Priming not sufficient	Fill water till it flows continuously without air lock.
	Air leak in suction pipe	Use proper sealing to arrest leak or use Teflon tape at joints.
	Blocked suction pipe	Clean the suction pipe.
	Too many bends in suction pipe	Reduce the bends
	Leaking seal	Replace the seal
	Suction lift too high	Install the pump closer to water, and maintain the suction head range within 8 m.
	Air cock side leaking	Tighten the air cock, renew if required.
	Position of casing altered	Correct the position of the delivery casing at 90° vertical.

	Monobloc pump running in opposite direction.	By changing any one phase of the electrical connection the direction can be changed.
Capacity decrease	Stainer clogged; suction lift too high; inlet mouth of suction pipe insufficiently submerged.	• Clean the stainer and install the pump closer to water level. • The inlet of suction should be atleast 2 inches below water level.
	Total height higher than specified head.	Reduce the total head.
Leaking mechanical seal	Running face is damaged	Lap the running face or replace it.
Monobloc get jammed	Kept idle running for a longer time. (More than 8 hours)	Remove fan cover and rotate the shaft by hand, to ensure free rotation. The pump should be run for a few minutes at least once in two days.

17. TROUBLESHOOTING ERCU (SCHUNK)

ERROR / FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
The resistance between the grounding contact and axle or grounding contact and bearing housing is too high.	The corresponding contact surfaces on the axle and the bearing housing / gear casing are not metallically bright.	Take appropriate action to restore the contact surfaces to a metallically bright state.
The mounting screws cannot be screwed in.	The mounting thread on the axle and on the bearing housing / gear casing is not in perfect condition.	Take appropriate action to restore the mounting thread to a perfect condition.
The mounting screws cannot be fully screwed in.	The usable depth of thread is not sufficient or the screws are too long.	The usable depth of thread must match the mounting screws.
The brush guide is incorrectly aligned to the axle.	The parallelism between the front-end mounting surface on the axle to the front-end mounting surfaces of the bearing housing / gear casing must be greater than 0.1 mm.	Take appropriate action to restore the parallelism between the mounting surfaces.

18. TROUBLESHOOTING WIPER SYSTEM (HEPWORTH RAIL)

ERROR / FAULT	POSSIBLE CAUSE	TESTS AND CHECKS	CORRECTIVE ACTION
Wiper motor fails to start	On/off switch	Check position of switch	Turn switch to on position
	Voltage Level	Check supply voltage to switch.	• Replace switch. • Correct loose wiring connections. • Replace broken wires
	System Jammed	Check wiper linkage	• Release linkage. • Release wiper arm
	Defective wiper motor		Replace motor
	Defective control Box		Replace control Box
Motor shaft turns but linkage & arm remain static	Defective or loose drive crank	Check linkage for a loose drive crank	• Secure or replace drive crank. • Clean motor output shaft with wire brush before replacing.
System operates but wiper arm remains static	Wiper arm	Check for loose wiper arm connection onto drive spindle	Secure or replace wiper arm after cleaning spindle spline with wire brush.
Erratic Motor	Voltage level	Check supply voltage to wiper system	Correct voltage supply problem
	Switch		Replace faulty switch
	Wiring	Check for loose or broken wires	• Repair or replace wiring up to motor. • Replace motor if this wiring is damaged
Slow Motor Operation	Voltage Level	Check supply voltage to wiper system	Correct voltage supply problem
	On/off switch Motor		Replace faulty switch
	Bracket	Check for broken bracket	Replace defective bracket
	Linkage	Check to see if Linkage is free moving	Free linkage replace worn or damaged components

	Defective Wiper Motor		Replace Wiper Motor
Arm and blade not operating correctly or over sweep operation	Voltage level	Check supply voltage to wiper system	Correct voltage supply problem
	Linkage	Check for worn or broken linkage	Replace linkage
	Spindle	Check for excessive wear in spindle	Replace spindle
	Arm	Check that arm is not loose on spindle	Re-tighten spindle
		Check for excessive wear on arm	Replace wiper arm after cleaning spindle spline with wire brush.
	Blade	Check fixing for wear	Replace blade
		Check blade for wear	
		Check for excessive smearing on screen	
Excessive wear on blade.	Spring pressure.	Use spring balance on centre of blade clip till blade begins to lift off glass. 1.75-2.25 kg	Replace spring/arm.
Washer system not working correctly	No washer fluid from jets	Check washer fluid level in tank	Fill tank
		Check for damage to tank	Replace tank
		Check Pump is operational	Replace pump if faulty