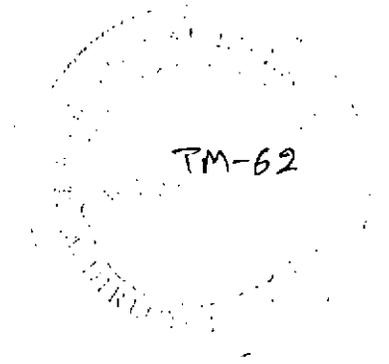


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**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**

**TROUBLE SHOOTING MANUAL  
OF  
CONTINUOUS TAMPING MACHINE  
(09-32 CSM)**

**REPORT NO. TM-62**

06590

**MARCH --2004**

**RESEARCH DESIGNS & STANDARDS ORGANIZATION  
LUCKNOW-226011**

## P\_R\_E\_F\_A\_C\_E

About 342 On-Track Machines are presently working on Indian Railways covering different works related to track maintenance and renewals. To improve utilization of these machines, it is important to reduce their downtime and repair them in the shortest possible time. In this context, need was felt to develop Trouble Shooting Manuals for different On-track Machines. The Provisional Trouble Shooting Manuals for Points and Crossing Tamping Machine (UNIMAT), Dynamic Track Stabilizer (DGS), Ballast Cleaning Machine (BCM) (Final), Point and Crossing Changing Machine (T-28), Ballast Regulating Machine (Model 56-3 & 66-4) and Shoulder Ballast Cleaning Machine (FRM-80) have already been prepared and issued. Provisional Trouble Shooting Manuals for Continuous Tamping Machine (CSM 09-32) was earlier issued vide letter no. TM/HM/15 dated 15-11-99. Necessary amendment has been made in the Final Trouble Shooting Manual of CSM from the experience and suggestions received from Railways.

It is hoped that this manual will be quite useful for field staff attending breakdown of machines. However, there is always scope for improvement for which suggestions may be sent to the undersigned.

(Surendra Kumar)  
Executive Director/TM

Lucknow.  
March 2004

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## EXPLANATORY NOTES

While preparing the trouble shooting manual of Continuous Tamping machine (CSM09-32), the terms used and their meanings are explained below:

- CHECK - Ensure a specific condition does (or does not) exist.
- INSPECT - Look for damage and defects including breakage, distortion cracks, corrosion and wear, check for leaks, security and that all items are completed.
- REPLACE - Remove old parts and substitutes with a new or overhauled or reconditioned part. Fit new or overhauled or reconditioned part in place of missing part.
- OVERHAUL - Dismantle, examine, recondition or renew parts as necessary against given specifications, reassemble, inspect and test.

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# TROUBLE SHOOTING MANUAL OF 09 -32 CONTINUOUS TAMPING MACHINE

## I. ENGINE

S. No.	Faults	Probable Causes	Remedial Actions
1.	Engine does not start	1. Emergency stop switch is pressed.  2. No fuel in the tank.  3. Shut down mechanism stuck  4. Air in fuel system.  5. Governor is stuck.  6. Misconnection of starting switch.	1. Emergency stop switch should be in release position.  2. Fill fuel in the tank.  Bleed air from fuel system in the following steps:  i) Loosen the bleed plug on the fuel filter and operate the priming pump until the fuel emerges free of bubbles. Tighten the bleed plug.  ii) Then loosen banjo plug on injection pump and operate priming pump until fuel emerges free of bubbles. Tighten the banjo plug.  3. Check the electrical supply at coil if it is ok, then lubricate the piston of shut down coil mechanism with lub oil and operate it manually. If still not working, then coil may be defective. Replace it with new one.  4. Bleed air from fuel system as explained in s.no.1,item 2 above.  5. Call in the service engineer. Governor needs repairs.  6. Check starting switch and if any misconnection is noticed, rectify it.

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S. No.	Faults	Probable Causes	Remedial Actions
		7. Valve clearance is not proper.	7. To check valve clearances, follow these steps: <ul style="list-style-type: none"> <li>i) Unscrew bolts and remove cylinder cover.</li> <li>ii) Crank engine until the inlet valve is closed. Then turn approx. ½ turn further.</li> <li>iii) The feeler gauge should pass between the valve cone end and the rocker lever with suction.</li> <li>iv) If the valve clearances need resetting, loosen the lock nut and readjust by means of the set screw.</li> <li>v) Tighten lock nut and recheck valve clearances.</li> <li>vi) Renew gasket, sealing ring and fit cylinder head cover.</li> </ul>
		8. Weak batteries.	8. Check electrolyte level in the batteries. Terminals should be clean and the charging system should be working. Over-aged batteries should be replaced.
		9. Injectors not properly functioning.	9. Remove Defective injectors and get it overhauled/calibrated or alternatively replace it with new one.
		10. Valves not seating properly.	10. i) Check the valves spring and replace the broken spring if any. ii) Lap the valves. iii) Lap the valve seat, if required.
		11. Too much fuel in engine.	11. Clean fuel return pipe.

S. No.	Faults	Probable Causes	Remedial Actions
2.	Engine stops	1. No fuel. 2. Air in the fuel system. 3. Valve clearances is not proper. 4. Governor is stuck. 5. Overheating of engine 6. Shut down circuit fails.	1. Fill fuel in the tank and follow steps as in s. no. 1, item no.2. 2. Bleed air from fuel system as explained in s. no.1, item no.2. 3. Adjust valve clearances. See s.no.1, item no.7 above. 4. Call in, the service engineer. Governor needs repairs. 5. Take remedial action as in s.no.5 below. 6. Recheck and repair the circuit.
3.	Engine misfiring	1. Dirty fuel filter. 2. No / less fuel in tank. 3. Air in fuel system. 4. Defective Injector. 5. Valve clearance is not proper. 6. Fuel injection timing not proper.	1. Check fuel filters and if necessary- i) Change fuel filter. ii) Change fuel filter elements. iii) Clean the inlet filter. 2. Fill fuel in the tank and follow step in s. no.1, item no.2. 3. Bleed air from the system. Same as s. no.1, item no.2. 4. Remove the defective injector and get it overhauled / calibrated/ replace with new one. 5 Adjust valve clearances as in s. no.1, item no.7. 6. Correct the timings or call the service engineer.

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S. No.	Faults	Probable Causes	Remedial Actions
6.	Engine knocking	<ol style="list-style-type: none"> <li>1. Incorrect Injector setting.</li> <li>2. Mechanical damage to piston/cylinder.</li> <li>3. Valve clearance is not proper.</li> <li>4. Fuel injection timing not proper.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove the faulty injector and get it reset or replace it with new one.</li> <li>2. Call in the service engineer.</li> <li>3. Adjust valve clearances, as explained in s. no.1, item no.7.</li> <li>4. Same as s. no. 3, item 6.</li> </ol>
7.	Output of the engine too low	<ol style="list-style-type: none"> <li>1. Dirty fuel filter and fuel line.</li> <li>2. Air in fuel system.</li> <li>3. Defective Injector.</li> <li>4. Valve clearances are not proper.</li> <li>5. Air filter choked.</li> <li>6. Improper compression</li> <li>7. Governor is stuck.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean fuel filter see s. no.3, item no.1.</li> <li>2. Bleed air from system as explained in s. no.1, item no.2.</li> <li>3. Remove defective injector and get it overhauled or replace it with new one.</li> <li>4. Adjust valve clearances as explained in s. no.1, item no.7.</li> <li>5. Clean air filter element and change oil.</li> <li>6. Engine needs repairs in workshop.</li> <li>7. Call in the service engineer. Governor needs repairs.</li> </ol>
8.	Oil pressure low.	<ol style="list-style-type: none"> <li>1. Dirty lube oil filter.</li> <li>2. Oil control valve not working.</li> <li>3. Dirty oil cooler</li> </ol>	<ol style="list-style-type: none"> <li>1. Relace the lube oil filter.</li> <li>2. Call the service engineer for repair of control valve.</li> <li>3. Call in the service engineer for cleaning of the oil cooler.</li> </ol>

S. No.	Faults	Probable Causes	Remedial Actions
2.	Engine stops	1. No fuel. 2. Air in the fuel system. 3. Valve clearances is not proper. 4. Governor is stuck. 5. Overheating of engine 6. Shut down circuit fails.	1. Fill fuel in the tank and follow steps as in s. no. 1, item no.2. 2. Bleed air from fuel system as explained in s. no.1, item no.2. 3. Adjust valve clearances. See s.no.1, item no.7 above. 4. Call in, the service engineer. Governor needs repairs. 5. Take remedial action as in s.no.5 below. 6. Recheck and repair the circuit.
3.	Engine misfiring	1. Dirty fuel filter. 2. No / less fuel in tank. 3. Air in fuel system. 4. Defective Injector. 5. Valve clearance is not proper. 6. Fuel injection timing not proper.	1. Check fuel filters and if necessary- i) Change fuel filter. ii) Change fuel filter elements. iii) Clean the inlet filter. 2. Fill fuel in the tank and follow step in s. no.1, item no.2. 3. Bleed air from the system. Same as s. no.1, item no.2. 4. Remove the defective injector and get it overhauled / calibrated/ replace with new one. 5. Adjust valve clearances as in s. no.1, item no.7. 6. Correct the timings or call the service engineer.

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S. No.	Faults	Probable Causes	Remedial Actions
4.	Excessive engine smoking.	1. Engine oil level too high.  2. Defective injector  3. Valve clearance is not proper.  4. Air in fuel system.  5. Clogged air cleaner.  6. Excessive carbon on cylinder head and piston.  7. Engine overloaded.	1. Check oil level. For this purpose, draw dipstick and clean with lint-free cloth. Return dipstick, wait a little until the oil has wetted the dipstick. Then remove dipstick again and check oil level.  2. Same as s.no.1, item no.9.  3. Same as s. no.1, item no.7.  4. Same as s. no.1, item no.2.  5. Clean element and change oil.  6. De-carbonise the engine.  7. Check and reduce the load.
5.	Engine running too hot.	1. Coolant level too low.  2. Defective thermostat.	1. Check coolant level and top up with coolant up to the mark in the filler neck.  2. Check thermostat as in the following steps:  i) Drain cooling water and catch it for reuse.  ii) Loosen hose clamps, pull back hoses and then remove thermostat.  iii) Heat water in container to approx. 85° C and place thermostat in it. Maintain temperature of water by agitating.

S. No.	Faults	Probable Causes	Remedial Actions
			iv) By short circuiting and radiator opening, check whether the thermostat opens fully. If not, call in the Service Engineer to fit new thermostat. Or Alternatively check temperature of coolant in radiator for functioning of thermostat.
	3. Defective water pump.		3. Call in the service engineer to check/repair water pump.
	4. V-belt for water pump needs adjustment.		4. Remove V-belt guard and check V-belt tension. To adjust, release take-up pulley mount or generator and regulate tension in the belt. Then tighten the take-up pulley. If required, replace the V-belt.
	5. Oil cooler properly not working.		5. Call service engineer for repair/ replacement of Oil Cooler.
	6. Valve clearance is not proper.		6. Adjust valve clearance as explained in s. no.1, item no.7.
	7. Air filter is choked.		7. Clean air filter.
	8. RPM of coolant fan is too low.		8. Adjust RPM of the motor to 1650. Check hydraulic system and change pump and motor if necessary.
	9. Water radiator choked.		9. Get the radiator cleaned in workshop.
	10. Radiator cap missing or worn out		10. Fit new cap.
	11. Water Hose too old.		11. Replace water hose.

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<b>S. No.</b>	<b>Faults</b>	<b>Probable Causes</b>	<b>Remedial Actions</b>
6.	Engine knocking	<ol style="list-style-type: none"> <li>1. Incorrect Injector setting.</li> <li>2. Mechanical damage to piston/cylinder.</li> <li>3. Valve clearance is not proper.</li> <li>4. Fuel injection timing not proper.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove the faulty injector and get it reset or replace it with new one.</li> <li>2. Call in the service engineer.</li> <li>3. Adjust valve clearances, as explained in s. no.1, item no.7.</li> <li>4. Same as s. no. 3, item 6.</li> </ol>
7.	Output of the engine too low	<ol style="list-style-type: none"> <li>1. Dirty fuel filter and fuel line.</li> <li>2. Air in fuel system.</li> <li>3. Defective Injector.</li> <li>4. Valve clearances are not proper.</li> <li>5. Air filter choked.</li> <li>6. Improper compression</li> <li>7. Governor is stuck.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean fuel filter see s. no.3, item no.1.</li> <li>2. Bleed air from system as explained in s. no.1, item no.2.</li> <li>3. Remove defective injector and get it overhauled or replace it with new one.</li> <li>4. Adjust valve clearances as explained in s. no.1, item no.7.</li> <li>5. Clean air filter element and change oil.</li> <li>6. Engine needs repairs in workshop.</li> <li>7. Call in the service engineer. Governor needs repairs.</li> </ol>
8.	Oil pressure low.	<ol style="list-style-type: none"> <li>1. Dirty lube oil filter.</li> <li>2. Oil control valve not working.</li> <li>3. Dirty oil cooler</li> </ol>	<ol style="list-style-type: none"> <li>1. Relace the lube oil filter.</li> <li>2. Call the service engineer for repair of control valve.</li> <li>3. Call in the service engineer for cleaning of the oil cooler.</li> </ol>

<b>S. No.</b>	<b>Faults</b>	<b>Probable Causes</b>	<b>Remedial Actions</b>
9.	Oil film present in crank case ventilation	<ol style="list-style-type: none"> <li>1. Incorrect compression.</li> <li>2. Lube oil brands.</li> </ol>	<ol style="list-style-type: none"> <li>1. Engine needs repairs in workshop.</li> <li>2. Use lube oil of proper brand and grade as recommended by the OEM.</li> </ol>
10.	Engine speed is irregular.	<ol style="list-style-type: none"> <li>1. Air in fuel system</li> <li>2. Governor is stuck.</li> </ol>	<ol style="list-style-type: none"> <li>1. Bleed air from the system as explained in s. no.1, item no.2.</li> <li>2. Call in the service engineer. Governor needs repairs.</li> </ol>
11.	Fuel consumption too high.	<ol style="list-style-type: none"> <li>1. Incorrect lube oil brand.</li> <li>2. Incorrect setting of Injector.</li> <li>3. Incorrect engine timing.</li> <li>4. Clogged air filter.</li> <li>5. Poor compression</li> </ol>	<ol style="list-style-type: none"> <li>1. Use proper grade and quality lube oil.</li> <li>2. Replace or overhaul Defective injector.</li> <li>3. Get the engine timing reset.</li> <li>4. Clean air filter.</li> <li>5. Engine needs repairs in workshop.</li> </ol>
12.	Lube oil consumption too high.	<ol style="list-style-type: none"> <li>1. Incorrect lube oil brand.</li> <li>2. Poor compression</li> <li>3. Oil filter dirty.</li> </ol>	<ol style="list-style-type: none"> <li>1. Use proper grade and quality lube oil as recommended by OEM.</li> <li>2. Engine needs repair in workshop.</li> <li>3. Replace the filter as explained in s.no.8. item no.1.</li> </ol>

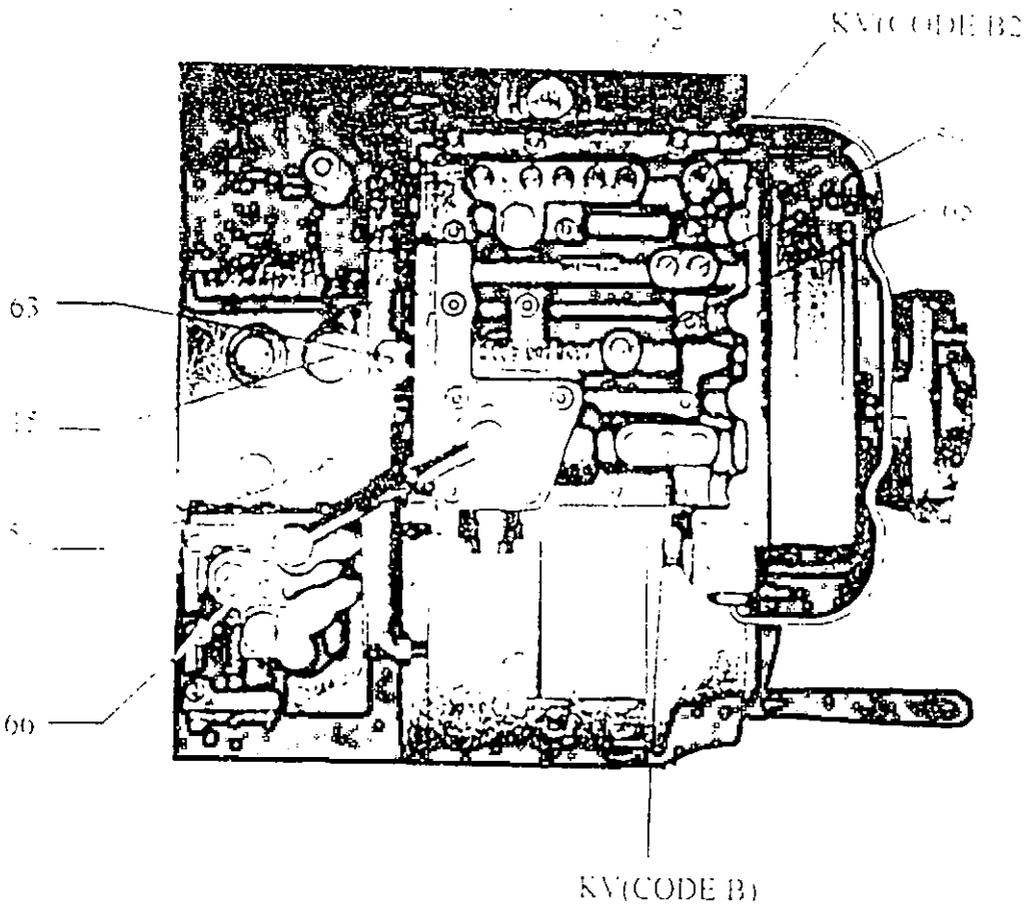
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## II. Z.F. GEAR BOX

S. No.	Fault	Probable Causes	Remedial Actions.
1.	Control Pressure too low in all speed.	<ol style="list-style-type: none"> <li>1. Pressure gauge defective.</li> <li>2. Low pressure.</li> </ol>	<p>Pressure will be checked at point 65 at normal test temperature 80°C to 100°C and 1000 rpm -</p> <ol style="list-style-type: none"> <li>1. If it is between 12 to 14 bar, pressure gauge in operator's cabin is defective. This should be replaced.</li> <li>2. If it is below 12 bar, then pressure will be checked at points 59 &amp; 60 of K/III &amp; KV. If it is 12+2 bar then, following action should be taken:-               <ol style="list-style-type: none"> <li>i) Control orifice will be checked on intermediate plates of shifter assembly for its elongation of hole which should not be more than 0.6 mm.</li> <li>ii) If (i) is OK, pressure control spool will be cleaned and inspected for its movement.</li> <li>iii) If any one of above is defective, control valve assembly will be replaced.</li> </ol> </li> <li>3. If pressure at points 59 &amp; 60 is too low (below 12 bar), following action will be taken:-               <ol style="list-style-type: none"> <li>i) Check Torque limit (Max.20 N-m) of all the Allen bolts of control valve assembly.</li> <li>ii) If it is still not OK, repair control pressure valve after dismantling the same.</li> <li>iii) Pressure filter of 25 microns need replacement.</li> <li>iv) As a last rectification step, gear pump will be replaced.</li> </ol> </li> </ol>

DETAILS OF MEASURING POINTS FOR HYDRAULIC OIL FOR ZF GEAR BOX WITH WK

The measurements have to be carried out with warm gearbox ( About 50° - 90° C )



Measuring points for hydraulic oil

Thread Connections for measuring points

- 51 - Converter inlet pressure
- 63 - Converter outlet pressure
- 65 - Control pressure
- 53 = KV
- 59 = K III ( 3/4. Speed )
- 60 = K2/4
- 62 = Lubricating pressure
- 60 = Converter direct clutch (WK)

- 51, 65, 53, 60
- 65
- 15, 16

- M12 x 1
- M14 x 1.5
- M20 x 1.5

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Temperature Measuring Points

- 68 - Converter exit

Measuring points for the bearings

- 15 = Connection to the heat exchanger
- 16 = Connection from the heat exchanger - 9 -

min nominal delivery: 55 dm<sup>3</sup> (L) / min

S. No.	Fault	Probable Causes	Remedial Actions
2.	Main pressure too low in several speeds.	<ol style="list-style-type: none"> <li>1. Pump flow is less</li> <li>2. Pressure drop at clutch.</li> <li>3. Oil tubing inside the gear box may be choked.</li> </ol>	<p>Check pressure at point 65. If it is less than 12 bar in any selected speed, then:</p> <ol style="list-style-type: none"> <li>1. Check pump flow by flow meter at 1000 rpm. It should be 40 LPM. If it is less replace the pump.</li> <li>2. Check individual clutch, where the pressure is dropping, after dismantling of gear box in workshop.</li> <li>3. Oil tubing should be cleaned/ repaired.</li> </ol>
3.	Clutch shifting time too long in all speed.	<ol style="list-style-type: none"> <li>1. Oil level too low</li> <li>2. Orifice of pressure control valve is blocked.</li> <li>3. Pressure control valve defective.</li> </ol>	<p>Check pressure build up time on point 65 by Micro Chronometer and Pressure Gauge. If it is more than 17 sec., following repair will be carried out:</p> <ol style="list-style-type: none"> <li>1. Check oil level at 40° C/1000 rpm for lower mark &amp; at 80° C/1000 rpm for upper mark and recoup it if required.</li> <li>2. Check orifice of control pressure valve. If choked, it should be cleaned.</li> <li>3. If orifice of control pressure valve is less than 0.6 mm, it needs replacement.</li> </ol>
4.	Shifting time too short	<ol style="list-style-type: none"> <li>1. Main control pressure too low.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check pressure build-up time on point no.65 (by Micro Chronometer, pressure gauge and pressure switch of Test Box H). If it is less than 1.7 sec., control orifice hole will be checked.</li> </ol>

S. No.	Fault	Probable Causes	Remedial Actions.
		2. Pressure control orifice is blocked.	2. Pressure control valve will be repaired.
		3. Pressure control valve defective.	3. Defective control valve will be replaced.
		4. Torque limit of cap screw of control valve assembly is less.	4. Torque limit of cap screws will be checked (20 Nm) on shifter assembly
5.	Temperature too high.	1. Oil level too low.	1. Oil level checking shall be carried out at 40° C & 80° C at 1000 rpm for higher and lower level. If less, it should be corrected.
		2. Oil cooler blocked.	2. Oil temperature difference at inlet and outlet of oil cooler will be checked. If 8 to 10° C difference is not available, it shows cooler needs cleaning.
		3. Converter pressure not proper.	3. If temperature difference at cooler is correct, converter inlet and outlet pressure will be checked at point 51 & 63 (Nominal value is 5-7 bar at inlet and 3-6 bar at outlet at 1000 rpm and between 80 to 100 ° C temperature). If it is OK, then it shows that vehicle is being driven in wrong speed.
		4. Converter holding valve defective.	4. If temperature in step 3 above is high, then it indicates problem in converter control valve. Repair the control valve by checking of spool & spring and change if needed.
		5. Converter relief valve defective.	5. If converter inlet and outlet pressure is low, then there may be problem in converter relief valve. Change it with new valve.

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S. No.	Faults	Probable Causes	Remedial Actions
		6. Converter sealing may be worn-out.	6. If relief valve is OK, then converter sealing should be checked and repair will be carried out after dismantling of gear box.
6.	No drive Transmission in all speed.	1. Low level of oil  2. Cardon shaft may be damaged.  3. Main pressure too low.  4. Electrical supply cut off	1. Check oil level as per s.no.3, item no.1 and recoup if required.  2. Check cardon shaft and its coupling from engine to converter. Replace/repair if damaged.  3. Check main pressure at 65 no. point. If pressure is less than 12 bar, take action as per s..no.1, item no.2.  4. If pressure at 65 no. point is 12-14 bar, current will be checked with the help of Pr.49 test kit - <ul style="list-style-type: none"> <li>i) If no current in above, 5 Amp fuse may be damaged. Replace the fuse.</li> <li>ii) If fuse is Ok, then with the help of Pr. 78 Test Kit, current on switch output will be checked. If no current is found, controller is defective. Replace the controller.</li> <li>iii) If current is found on switch, output cable may be burst which should be replaced.</li> </ul>
7.	No function in 1st & 2nd speed.	1. Cut off switch in 'ON' position.	1. Cut off switch should not be in operated condition.

S. No.	Fault	Probable Causes	Remedial Actions
		2. Current not supplied on corresponding solenoid.  3. Control valve assembly gets defective. 4. Pressure switch of brake circuit defective.  5. Solenoid defective.	2. Current at solenoids M1, M2, M3 and M5 will be checked with Pr.49 Test Kit. Prescribed current is 0.25 to 0.5 Amp.  3. If current input is OK, control valve assembly needs repairing.  4. If current on solenoids as per coding is not available, it indicate wrong coding, then pressure cut off switch will be checked by pressure 49. If there is no reaction, pressure switch of brake circuit is defective.  5. If coding is OK but signal is not coming, then change defective solenoid.
8.	Reduced Tractive Power and increased temperature	1. Converter outlet pressure too low due to defective converter relief valve.  2. Suppression speed not OK (RPM of engine should not be less than 1800).	1. Converter output pressure will be checked at point no.63. If pressure is found below 5 bar. Converter relief valve should be checked at point no.51 (inlet).  2. If pressure is found correct 12-14 bar, suppression speed will be measured by: a) Apply brake above 3 bar, b) Then put gear in 3rd speed. c) And increase the rpm upto maximum. Where the rpm needle stops, that is the suppression speed. If suppression speed is correct, solenoid selection will be checked. If suppression speed is high, diesel supply of engine and diesel filter will be checked.

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S. No.	Faults	Probable Causes	Remedial Actions
9.	Lock-up clutch not functioning.	<p>2. Hydraulic circuit may be defective.</p> <p>Lock-up clutch pressure too low/no pressure due to -</p> <p>1. Lock-up clutch may be defective.</p> <p>2. Inductive transmitter may be defective.</p> <p>3. Solenoid M5 may be defective.</p>	<p>2. Hydraulic working will be checked if no defect is found in item 1 above.</p> <p>Check lock-up clutch pressure at measuring point 66.</p> <p>1. If pressure is correct i.e. 12+2 bar then lock-up clutch have mechanical defect. Torque converter will need repair at workshop.</p> <p>2. If there is no pressure at point 66, signal will be checked by pressure 49/Pr 78A. If there is no signal, check inductive transmitter and cable harness.</p> <p>3. If signal test (3) is OK, solenoid M5 is defective and need to be replaced.</p>

### III. TAMPING UNIT

S. No.	Faults	Probable Causes	Remedial Actions
1.	Tamping unit not going down	<ol style="list-style-type: none"> <li>1. Tamping unit lock not open</li> <li>2. Unlocking indication limit switch not functioning properly.</li> <li>3. No system pressure.</li> <li>4. Defective proportional valve.</li> <li>5. No supply on proportional valve when tamping pedal is pressed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Ensure that the lock is properly open</li> <li>2. For proper functioning of limit switch input indication X5A for LH &amp; X5B for RH should not appears on programme panel. If input is indicated, then limit switch is defective and should be replaced.</li> <li>3. If no system pressure, check delivery from 38 x 22 hydraulic pump. If delivery is OK, check non return valve, unloader valve, and safety valve. Replace the defective one.</li> <li>4a) Check the supply on proportional valve coupler with tamping pedal pressed. If it is found there and still unit does not operate, proportional valve is defective. Replace defective proportional valve.</li> <li>b) Operate proportional valve manually if unit operates, the proportional valve is OK and the problem is in solenoid coil. Replace the coil or complete proportional valve.</li> <li>5.               <ol style="list-style-type: none"> <li>i) Visually examine the lock, limit switch, transducer fork and chord wire of the transducer. If no defect is noticed, follow steps as in item (ii) below:</li> <li>ii) Check deflection on galvanometer 18G3 of program panel with switch on position 1 for LH and position 2 for RH and do as follows -:</li> </ol> </li> </ol>

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S. No.	Faults	Probable Causes	Remedial Actions
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- a) If there is no deflection, check supply of 24V and 12 V on program panel. Ensure supply of 24V and 12 V.
- b) If supply voltage is Ok, check output voltage +15V & + 10V of PCB EK813 SV (10U5). If output is not proper, replace PCB EK813 SV (10U5)
- c) If output voltage is OK, check for output signal Q10 for LH & Q11 for RH. If output signal is OK, check relay Re 1, Re2 and Re5 respectively of PCB EK16. Replace defective relays. Check for fuse of EK16 and replace it if defective.
- d) If output signal Q10 and Q11 is not OK, check the following:
  - Check switch for tamping system X19 in 'ON' position (Input signal X19 should come on programme panel).
  - Tamping switch X10 should be in 'ON' position (Input signal X10 should come on programme panel).
  - Check input signal X13 and X14. If no input signal, check tamping depth transducer for slipped fork, broken chord wire or defective potentiometer.
- e) Output signal from depth transducer of both tamping unit is not synchronizing (difference more). If difference is more than 100mm, either X13 or X14 will not come). To operate both, the difference should be less than 100mm.

S. No.	Faults	Probable Causes	Remedial Actions
2.	Tamping unit not going up for unlocking	1. No system pressure.  2. Tamping unit Up & Dn movement hydraulic cylinder piston defective or piston rod broken.  3. Defective proportional valve.  4. No supply on proportional valve.	f) Check switch X3E, tamping without lining should not be pressed (Input X3E should not come). g) If all the above conditions are fulfilled and still Q10 and Q11 is not coming, replace PCB EK16  1. If no system pressure, check 38X22 system pump, unloader valve, non-return valve and safety valve. Replace defective ones.  2. Replace broken piston rod assembly or replace cylinder.  3. Operate proportional valve manually. If unit is not lifted up, proportional valve is defective. Replace proportional valve. If proportional valve is OK, check for supply on proportional valve.  4. Check switch X19 in Up position (Input signal X19 should come on programme panel).
3.	Tamping unit is not going up during tamping operation (Tamping unit remains in down position).	1. No system pressure.  2. Piston rod or piston broken (Tamping unit UP & Dn).	1. Check system pressure. If system pressure is not there, check 38X22 system pump, unloader valve, non-return valve and relief valve. Replace defective ones.  2. Replace piston rod assembly or complete cylinder.

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S. No.	Faults	Probable Causes	Remedial Actions
		3. Defective proportional valve.	3. Operate proportional valve manually. If the unit is not lifting up, proportional valve is defective and replace it. If proportional valve is OK, check supply on proportional valve.
	4. No supply on proportional valve.		<p>4. Check deflection on galvanometer 18G3 at position 1 for LH &amp; position 2 for RH. If no deflection</p> <p>i) Check and ensure supply voltage 24V &amp; 12V on program panel.</p> <p>ii) If supply voltage is OK, check output voltage of PCB EK813 SV (10U5) for <math>\pm 15</math> and <math>\pm 10V</math>. If not proper, replace PCB EK813.</p> <p>iii) Check output signal Q10 for LH and Q11 for RH. These should not come.</p> <p>iv) If Q10 and Q11 appears, check -</p> <p>a) Signal Q0D – X0D. This should come.</p> <p>b) If Q0D – X0D is not coming, check input signal X27 or X28 (X27 for continuous working mode and X28 for step by step working mode).</p> <p>c) Check Q01-X01. This should come, indicating that squeezing has been completed. If Q01 - X01 is not coming, check -----</p> <ul style="list-style-type: none"> <li>• Input signal X17 for LH &amp; X18 for RH. If no input signal, check depth transducer for slipped fork, broken chord or defective potentiometer.</li> <li>• Check signal Q69 – X69, If no signal, setting of squeezing time is defective or timer chord defective. Adjust timer chord or replace chord.</li> </ul>

S. No.	Faults	Probable Causes	Remedial Actions
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**Note:** Before checking various other points, it is advisable to visually examine tamping unit Up & Dn cylinder, transducer fork, transducer chord, potentiometer and potentiometer connection because these are the most common failures.

4.	Machine not moving forward in working drive.	<ul style="list-style-type: none"> <li>i) No charge pressure.</li> <li>ii) Suction filter clogged.</li> <li>iii) Charge pump shaft may be broken</li> <li>iv) Adjustment of relief valve wrong.</li> <li>v) No working drive pressure. (Working pedal pressed).</li> <li>vi) Defective variable output pump.</li> <li>vii) Excessive leakage through working drive motor.</li> <li>viii) Reduction gearbox shaft broken and motor running freely.</li> <li>ix) Axial piston pump proportional valve defective.</li> </ul>	<ul style="list-style-type: none"> <li>d) If all the above points are OK but still Q10 or Q11 is not coming, PCB EK16 is defective. Replace PCB EK16.</li> <li>i) Charge pressure should be 30 bar.</li> <li>ii) Replace suction filter.</li> <li>iii) Replace charge pump.</li> <li>iv) Adjust relief valve. Replace relief valve, if required.</li> <li>v) Ensure charge pressure.</li> <li>vi) Replace variable output pump.</li> <li>vii) Repair /replace working drive motor.</li> <li>viii) Replace broken gearbox shaft.</li> <li>ix) If any of the above problem does not exist, operate the proportional valve of axial piston pump. If pressure is shown, proportional valve and pump is OK. If no pressure is shown, replace axial piston pump. If proportional valve is OK, check supply on proportional valve with working pedal pressed.</li> </ul>
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06603

S. No.	Faults	Probable Causes	Remedial Actions
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**Note:** While manually operating the proportional valve, care should be taken to safe guard from injury if the machine moves.

x) No supply on proportional valve with drive pedal pressed.

x) Check output from galvanometer 18G2 on program panel at position 4. If no deflection, check power supply 24V and 12V and ensure they are proper. If 24V and 12V supply is OK, check output voltage  $\pm 15V$  and  $\pm 10V$  of PCB EK 813 SV(6U7).

If not OK, replace PCB EK 813. If output from PCB EK 813 is OK, check output from PCB VT3005, (terminal 6 – 8 for forward and terminal 6 – 7 for reverse). If no output, PCB VT3005 is defective. Replace PCB VT 3005.

xi) No deflection on galvanometer

xi) If there is no deflection on galvanometer, check signal Q04-X04

a) If signal is not coming

- Check X37 or X38  
(Continuous drive X38, step by step X37)
- Check input signal Q63-X63 i.e. tamping units are in middle or up position
- Satellite in rear position – limit switch X22 defective. Input signal X22 should not come.

b) If Q04 – X04 is OK, still no galvanometer current -

- Check replay 18U1(B) (Relay EL.T.277). Replace defective relay.
- Check relay QL.137 (ELT.7002.S4) behind panel B7. Replace defective relay.

xii) PCB EK 319 may be defective.

xii) Replace PCB EK319.

S. No.	Faults	Probable Causes	Remedial Actions
5.	Machine not moving in reverse direction.	<p>xiii) Longitudinal transducer may be defective</p> <p>xiv) Satellite zero position is not adjusted</p> <p>No deflection on galvanometer 18G2 of program panel with switch on position-4.</p>	<p>xiii) Longitudinal transducer to be repaired for</p> <ul style="list-style-type: none"> <li>• Defective potentiometer, gear slipped, broken spring or chord wire broken.</li> </ul> <p>xiv) Zero position of satellite (satellite locked in front position) should be adjustment at +8V on terminal 6d of PCB EK24.</p> <p>Check signal Q09 – X09. If no signal</p> <ul style="list-style-type: none"> <li>• Check X37 or X38 switch and signal X37 or X38 on program panel.</li> <li>• Check input signal X23 for (reverse joystick).</li> <li>• Check input signal X13 and X14 indicating tamping unit is in middle or Up position.</li> <li>• Output signal Q83, indicates that machine moving in reverse direction.</li> <li>• No signal X30 indicates, auto working switch is off.</li> <li>• Check output signal Q42. If Q42 is OK, check relay 18U1(C) (EL.T.277). Replace defective relay.</li> <li>• Check relay QL37 (EL.T.7002.S4) behind B7 panel. Replace defective relay.</li> </ul> <p>If all the above conditions are OK, replace PCB EK319.</p>
6.	Satellite forward movement failed	1. No system pressure	1. Check system pump, unloader valve and safety valve for proper functioning. Replace defective ones.

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S. No.	Faults	Probable Causes	Remedial Actions
		2. Proportional valve defective	2. Operate proportional valve manually. Feel the outlet pipe. If surge is not felt, valve is defective.
		3. Satellite motor defective.	3. If proportional valve is OK, remove satellite drive motor from reduction gearbox, operate proportional valve manually. If motor rotates, motor is Ok. If not, replace satellite motor.
		4. Defective planetary gearbox.	4. Replace the planetary gearbox.
		5. Defective bye-pass valve	5. Replace the defective bye-pass valve.
		6. Satellite drive axle not engaged properly.	6. Ensure satellite drive axle is engaged properly.
		7. Satellite gearbox pinion, gear or shaft damaged.	7. Replace pinion, shaft or gear of satellite gearbox as required.
		8. No supply on satellite drive proportional valve.	<p>8 i) Check deflection on galvanometer 18G3 (at position-3).</p> <ul style="list-style-type: none"> <li>• If no deflection, check power supply 24V and 12 V and ensure proper power supply.</li> <li>• If power supply is proper, check output <math>\pm 15V</math> and <math>\pm 10V</math> on PCB EK813 SV (10U5)</li> </ul> <p>ii) If output is correct, check signal Q61 – X61 If output is not correct –</p> <ul style="list-style-type: none"> <li>• Check input signal X12 by joy stick for forward movement or X11 by pedal drive. If either of the signal comes, X0F should come.</li> <li>• Signal 6F should not come. If 6F signal is coming, check whether tamping units are in middle or in upper position.</li> </ul> <p>iii) If Q61 – X61 is OK –</p>

S. No.	Faults	Probable Causes	Remedial Actions
			<p>Check relays Re1, Re2, Re5 and Re6 (ELT.663) of PCB EK24. Replace defective relays.</p> <p>iv) If all the above conditions are OK and still no supply to proportional valve, replace PCB EK24.</p>
7.	Satellite movement reverse failed	No proportional current.	<p>1. Check output QL.36</p> <p>If signal is OK check relay QL.36 (ELT.7002.S4 of B7 Panel).</p> <p>Replace defective relay.</p> <p>2. If no signal at QL36 – Check input signal X34 for satellite reverse by joystick.</p> <p>3. Signal 0B should not come. If signal 0B comes, check position of tamping unit middle or upper position.</p>
8.	Manual lining not functioning.	<p>1. No system pressure</p> <p>2. Bye pass valve is inoperative.</p> <p>3. No servo current – no deflection on galvanometer 18G2 (at position-3).</p>	<p>1. Ensure system pressure.</p> <p>2. Check relay Re7 (EL.T.7002.S4) of PCB EK 349. Replace defective relay.</p> <p>3. Operate switch for manual lining. Either X3B or X3C should come on programme panel.</p> <p>If still no current, check Re5 for left side and Re6 for right side movement on PCB EK349. If defective, replace relays.</p>

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S. No.	Faults	Probable Causes	Remedial Actions
9.	Lining automatic not working.	1. No system pressure.  2. No servo current indication on Galvanometer 18G2 (at position-3) even if lining indicator is showing deflection.	1. Ensure system pressure.  2. Check servo valve plug for loose connection. Check power supply 24V and 12V on program panel. If OK, check $\pm 15V$ and $\pm 10V$ on PCB EK813 (10U4). If defective, replace PCB EK813. If $\pm 15V$ and $\pm 10V$ is not available, lining indicator will not show deflection. Check signal Q05 on program panel - <ul style="list-style-type: none"> <li>• If Q05 is not coming, check Q0B-X0B is coming or tamping unit attained below middle position.</li> <li>• For Q0B-X0B, X15 &amp; X16 input signal should come.</li> <li>• X15 and X16 will come when relay Re.3 of EK16 of LHS &amp; RHS is operated. (Tamping unit below middle position). If X15 and X16 is not indicated, check relay Re3. Replace defective relay Re3.</li> </ul> If Q05 is not coming- Check signal Q0A. If not, check switch for auto-lining is either not operated or defective. Replace defective switch.  Signal for sensor lifting/ lining circuit X24 (LHS), X25 (RHS) not coming- Sensor out of position or defective. Replace defective sensor or by-pass switch. If by-passed, X2F should indicate.

S. No.	Faults	Probable Causes	Remedial Actions
		3. No lining indication.  4. No supply to bye-pass valve.	If Q05 is OK and still no servo current, PCB EK349 or EK290 is defective. Replace defective PCB. 3. Check power supply 24V and 12V. If OK, check PCB EK813 for $\pm 15$ V and $\pm 10$ V. If PCB 813 (10U4) is OK, check output from lining transducer, measuring transducer and digital potentiometer. 4. If servo current is showing on program panel and no supply for bye-pass valve, check relay Re7 (EL.T.7002 S4) on PCB EK349. Replace defective relay.
10.	Lifting and lowering unit not lifting up by manual operation.	1. No system pressure. 2. No 24V supply on program panel. 3. Up position switch defective. 4. No supply to bye-pass valve 5. Servo valve defective	1. Ensure system pressure. 2. Ensure 24V supply on program panel. 3. By operation of Up position switch, indication Q1C for LHS & Q1D for RHS should come. <ul style="list-style-type: none"> <li>• Q16 &amp; Q17 indicating down position should not come.</li> </ul> Check relay Re3 for up position and Re4 for down position of PCB EK347. Blocking valve indication. <ul style="list-style-type: none"> <li>• QL34 when LHS unit is not going up.</li> <li>• QL35 when RHS unit is not going up.</li> </ul> 4. Check signal QL2E for LHS and QL2F for RHS. 5. If servo current is showing on galvanometer 18G2 for respective sides and bypass indication is coming and still the unit is not lifted up, servo valve is defective. Replace servo valve.

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S. No.	Faults	Probable Causes	Remedial Actions
11	Automatic lifting system not functioning.	1. No system pressure.  2. No servo current on Galvanometer 18G2 (position 1 for LH & 2 for RH).	1. Ensure system pressure.  2. <ul style="list-style-type: none"> <li>i) Servo plug loose, Correct it.</li> <li>ii) Check power supply 24V &amp; 12V on program panel. If OK, check output voltage <math>\pm 15V</math> &amp; <math>\pm 10V</math> of PCB EK813 SV (6U4). If no output, replace PCB EK 813 SV(6U4).</li> <li>iii) Check signal Q06 – X06 for LHS and Q07 – X07 for RHS. If no signal, then follow the steps as below-               <ul style="list-style-type: none"> <li>• Front bogie is lowered and limit switch is operated, check limit switch. Replace if defective.</li> <li>• Rear bogie is lowered and limit switch is operated, check limit switch. Replace if defective.</li> <li>• Sensor X24 for LHS and X25 for RHS of lifting unit is defective or not properly positioned over rail. If defective, replace sensor or bye-pass, using switch on operating panel.</li> <li>• Automatic levelling switch X2E in "ON" position but signal X2E is not coming. It means switch X2E is defective. Replace it.</li> <li>• If Over-lifting limitation signal X32 &amp; X33 is coming. Reset ON/OFF switch on EK347.</li> </ul> </li> </ul>

S. No.	Faults	Probable Causes	Remedial Action
		3. Defective PCB EK-347.	3. Signal Q06 – X06 & Q07-X07 is OK, still no lift - PCB EK347 is defective and to be replaced.
		4. Servo current available, bye-pass operated and tamping unit below middle position, still no lifting.	4. Servo valve is defective, replace it.

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#### IV. HYDRAULIC PUMP

S. No.	Faults	Probable Causes	Remedial Action
1.	Pump not delivering oil.	1. Pump driven in wrong direction (at the time of new pump fitment, this problem may occur).	1. Check the pump rotation by hand priming. Pour the hydraulic oil into inlet port and rotate the shaft. See whether the oil is delivering through outlet port or not. If not, change the rotation according to the engine shaft rotation.
		2. Oil level too low in the reservoir (if oil level is very low, aeration may take place and pump will not deliver oil).	2. Check oil level in reservoir. It should be above minimum mark. If necessary, recoup the oil.
		3. Intake filter/pipe choked.	3. Clean or replace filter for proper flow of oil.
		4. Air leaks in pump intake joints.	4. Pour hydraulic oil on intake joints and on observing abnormal sound, tighten the intake joint as required.
		5. Broken pump shaft or rotor.	5. Replace the broken shaft or rotor. Also align the prime mover shaft
		6. Pump speed too slow. (The delivery rate of discharge is prescribed at a certain rpm of engine. If engine speed become less than ideal speed, it may affect the proper suction of oil).	6. Pump should run at prescribed speed. Engine rpm should be checked.

S. No.	Faults	Probable Causes	Remedial Action
		7. Dirty suction filter.	7. Replace the filter.
		8. Faulty suction valve.	8. Repair or change the valve.
		9. Air in system.	9. Discharge air from the system.
		10. Pump drive inoperative.	10.i) Replace the broken pump shaft. ii) Replace the sheared spline. iii) Change defective coupling.
		11. Clutch out of adjustment.	11. Adjust clutch.
		12. Pump is damaged.	12. Replace with new one.
2.	Pump makes noise	Aeration.	1i) Fill the reservoir with the oil up-to required level to prevent aeration. ii) Check all connections on inlet side of pump and pour hydraulic oil over suspected leak. If noise stops, leakage has been found,. Fill hydraulic tank to the full mark. iii) Check condition of pump shaft seal. Change, if required.
		2. Intake line or suction filter partly clogged.	2. Clean or replace the filter or line.
		3. Pump running too fast.	3. Reduce speed up to prescribed limit.
		4. Coupling misaligned (Due to this, bearing may get damaged, there will be a play at shaft, abnormal sound will be observed).	4. Realign the pump shaft and prime mover shaft.
		5. Reservoir not vented properly.	5. Air breather screening element should be cleaned.
		6. Suction Filter too small in size.	6. Replace by proper size of filter.
		7. Air leaks at pump intake pipe joints and air drawn through inlet line.	7. Take action as explained in s.no.1, item no. 4.

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S. No.	Faults	Probable Causes	Remedial Action
		8. Oil viscosity too high. (In cold climate, oil viscosity becomes high so no free flow will take place and cavitation will occur).	8. Start the engine for few minutes to warm-up the hydraulic oil used in machine for proper flow. Use only proper grade of oil.
		9. Cavitation.	9. i) Check condition of suction filter and return line filters. Clean or change as necessary. ii) Check clogging of inlet line. Clean or change as necessary. iii) Check loose fittings on suction lines. Tighten, if required. iv) Clean hydraulic tank breather.
		10. Shaft seal leaks.	10. Replace the seal.
		11. Foams in oil.	11. Vent the system.
		12. Casing leaks.	12. First tighten bolts, then check for cracks and sealing.
		13. Vane spring broken.	13. Change spring.
		14. Any part of pump defective.	14. Replace defective parts.
		15. Pump mounting bolts are loose.	15. Check mounting alignment. Tighten bolts uniformly.
		16. Foreign bodies in suction line.	16. Remove foreign bodies, if need flush the system.
		17. System dirty.	17. Flush the system
		18. Sharp bends in suction line.	18. Eliminate or reduce the bends in suction line.
		19. Oil temperature too high.	19. Check the hydraulic circuit. Oil cooler may be ineffective. Rectify the failure
		20. Boost pump failed.	20. Check boost pump and repair if required.
		21. Vibration in system	21. Check unusual occurrence in the system
		22. Pump worn or damaged.	22. Pump should be overhauled or replaced.

S. No.	Faults	Probable Causes	Remedial Action
3	Pump overheats	<ol style="list-style-type: none"> <li>1. Wrong oil grade.</li> <li>2. Oil speed in system too high.</li> <li>3. Oil level too low.</li> <li>4. Pump rotor groove worn out.</li> <li>5. Radial or axial loading too high.</li> <li>6. Initial speed rises.</li> <li>7. Inadequate cooling.</li> <li>8. Cooling system is dirty.</li> <li>9. Differential pressure too low.</li> <li>10. Pressure too high.</li> <li>11. Wrong type of pressure valve.</li> <li>12. Wrong seal size.</li> <li>13. Filter dirty or too small.</li> <li>14. Pump running speed high.</li> <li>15. Cavitation.</li> <li>16. Foams in oil.</li> <li>17. Venting dirty.</li> <li>18. System contaminated.</li> <li>19. Sharp bends in suction line.</li> <li>20. Boost pump failed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill oil as recommended.</li> <li>2. Install pipes of proper size.</li> <li>3. Fill the oil up to safe level.</li> <li>4. Change the worn out parts.</li> <li>5. Loading should be restricted to prescribed limit to acceptable amount, check alignment limit.</li> <li>6. Check max, pressure, if needed replace with larger capacity and install pipes of nominal bore.</li> <li>7. Increase cooling capacity.</li> <li>8. Clean the cooling system.</li> <li>9. Increase pressure setting of relief valve.</li> <li>10. Reduce pressure setting.</li> <li>11. Replace by appropriate type of valve.</li> <li>12. Replace by suitable size of seals.</li> <li>13. Clean filter or replace by larger type.</li> <li>14. Reduce speed.</li> <li>15. Bleed the system.</li> <li>16. Vent the system.</li> <li>17. Clean the vents.</li> <li>18. Flush the system.</li> <li>19. Eliminate bends or at least reduce them.</li> <li>20. Check bolt pump and repair as required.</li> </ol>
4.	Pump develops no pressure	<ol style="list-style-type: none"> <li>1. Wrong pressure setting.</li> <li>2. Pressure valve spool stuck.</li> </ol>	<ol style="list-style-type: none"> <li>1. Modify the pressure setting.</li> <li>2. Repair/Replace the valve.</li> </ol>

06609

S. No.	Faults	Probable Causes	Remedial Action
		3. Leakage in system.	3. Replace defective parts.
		4. Pump shaft broken.	4. Replace shaft.
		5. System contaminated.	5. Flush system completely .
		6. Improper gaskets and seal.	6. Replace seals and gaskets.
5.	Speed loss on pump.	1. Inlet pressure too low.	1. Increase pressure.
		2. Outlet pressure too high.	2. Check system pressure.
		3. Port plate does not make contact.	3. Dismantle the pump and repair as required.
		4. Oil temperature too high.	4. Check circuit.
6.	Pump does not work.	1. Pressure too low.	1. Increase pressure setting.
		2. 'O' Ring on port plate defective.	2. Replace 'O' Ring.
		3. Inadequate oil.	3. Repair pump or change for adequate delivery.
		4. Too much play in the shaft.	4. Replace bearing.
7.	Hydraulic oil overheated.	1. System pressure is too high.	1. Adjust the pressure to the required limit.
		2. Dirty oil	2. Clean or change filters and strainers.
		3. Oil level is low.	3. Fill up the oil to the upper mark.
		4. Hydraulic oil of incorrect viscosity.	4. Check oil for proper viscosity. If, change of oil is required, flush the entire system and change filter before adding fresh oil.
		5. Faulty cooling system.	5. Check oil cooler for trash on outside cooling surfaces. Clean with air pressure, or steam pressure.
		6. Hydraulic oil by passing internally due to worn pump, valve, motor and cylinder.	6. Overhaul or replace faulty components.

S. No.	Faults	Probable Causes	Remedial Action
8.	Bearing failure.	<ol style="list-style-type: none"> <li>1. Chips or other contaminants in bearing.</li> <li>2. Coupling misaligned.</li> <li>3. Inadequate lubrication.</li> <li>4. Pump running too fast.</li> <li>5. Excessive or shock loads. (Excessive loads due to operating pressure may damage the bearing).</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace bearings and check intrusion of contaminants.</li> <li>2. Align prime mover shaft and pump.</li> <li>3. Lubricate system properly.</li> <li>4. Adjust speed of prime mover.</li> <li>5. Reduce operating pressure.</li> </ol>

05610

## V. HYDRAULIC RELIEF VALVE

S. No.	Faults	Probable Causes	Remedial Actions
1.	Erratic pressure.	<ol style="list-style-type: none"> <li>1. Foreign material in the oil.</li> <li>2. Worn poppet valve or seat. (oil from pilot stage will go to tank due to worn poppet valve or seat and pressure will drop).</li> <li>3. Piston sticking in main body.</li> </ol>	<ol style="list-style-type: none"> <li>1. Drain the oil, clean the tank and refill with clean oil.</li> <li>2. Replace poppet valve or seat as required.</li> <li>3. Clean piston after dismantling. Check free movement after re-assembling.</li> </ol>
2.	Low pressure or no pressure.	<ol style="list-style-type: none"> <li>1. Valve improperly adjusted.</li> <li>2. Vent connection is open (at the time of starting the work, if vent remain open, then oil will go to the tank and no pressure will develop).</li> <li>3. Balance hole in main piston choked.</li> <li>4. Poppet in cover not seating. (So, oil will continuously go to tank line and pressure will drop).</li> <li>5. Broken or weak spring (oil will push the poppet easily and go to tank. So pressure will drop).</li> <li>6. Dirt, chip etc keeps valve partially open.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust valve by adjusting knob to proper pressure setting.</li> <li>2. Plug the vent connection.</li> <li>3. Remove piston and clean the orifice. Clean the tank and replace hydraulic oil.</li> <li>4. Check the poppet condition. If required, replace it.</li> <li>5. Replace the spring and again set the pressure with adjusting knob.</li> <li>6. Clean the complete valve.</li> </ol>

S. No.	Faults	Probable Causes	Remedial Actions
3.	Excessive noise or chatter.	<ol style="list-style-type: none"> <li>1. High oil velocity through valve.</li> <li>2. Distorted control spring.</li> <li>3. Worn poppet or seat in cover.</li> <li>4. Vent line too long.</li> <li>5. Valve pressure setting too close to that of another valve in circuit.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check valve flow rating. Replace with larger valve, if necessary.</li> <li>2. Replace spring.</li> <li>3. Replace poppet or seat.</li> <li>4. Replace restrictions e.g. needle valve or orifice. Plug in vent line next to the relief valve.</li> <li>5. Set relief valve pressure atleast 150 PSI higher than other valves in circuit.</li> </ol>
4.	Valve do not function	<ol style="list-style-type: none"> <li>1. Spool sticks.</li> <li>2. Water condensation in system.</li> <li>3. Oil temperature too high.</li> <li>4. Oil speed too high.</li> <li>5. Internal leakage.</li> <li>6. Tank line under high pressure.</li> <li>7. Control line dirty.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean stuck spool.</li> <li>2. Check condensed water.</li> <li>3. Check the function of oil cooler and clean the radiator fins.</li> <li>4. Check speed of the pump.</li> <li>5. Prevent leakage.</li> <li>6. Check pressure in tank line.</li> <li>7. Clean lines properly.</li> </ol>
5.	Valve heating over-	<ol style="list-style-type: none"> <li>1. System pressure too high.</li> <li>2. Dirt in the system.</li> <li>3. Spool sticks.</li> <li>4. Spool defective</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust spring pressure.</li> <li>2. Clean the system.</li> <li>3. Check and clean spool.</li> <li>4. Check and replace spool, if defective.</li> </ol>

06611

## VI. HYDRAULIC UNLOADER VALVE

S. No.	Faults	Probable Causes	Remedial Actions
1.	Low or no pressure.	<ol style="list-style-type: none"> <li>1. Orifice of main piston choked.</li> <li>2. Vent connection open to tank.</li> <li>3. Safety valve at zero setting</li> <li>4. Broken or weak spring</li> <li>5. Worn ball or seat.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean the orifice.</li> <li>2. Plug the vent connection.</li> <li>3. Set the safety valve at proper pressure.</li> <li>4. Replace the spring.</li> <li>5. Replace the ball or seat.</li> </ol>
2.	Fails to completely unload pump.	<ol style="list-style-type: none"> <li>1. Valve pressure setting too high.</li> <li>2. Valve spool binding in body.</li> <li>3. Incorrect assembly.</li> <li>4. Nil or low nitrogen pressure in the accumulator.</li> <li>5. Punctured bladder.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set valve at proper pressure.</li> <li>2. Clean the spool and oil in the tank.</li> <li>3. Assemble as per proper drawing.</li> <li>4. Check pressure and recharge the accumulator ( 80 to 85 bar).</li> <li>5. Change the bladder.</li> </ol>

## VII. HYDRAULIC MOTOR

S. No.	Faults	Probable Causes	Remedial Action
1.	Motor makes loud Noise.	<ol style="list-style-type: none"> <li>1. Vane spring broken.</li> <li>2. Shaft seal leaks.</li> <li>3. Casing leaks.</li> <li>4. Oil temperature too high.</li> <li>5. Motor parts defective.</li> <li>6. Aeration.</li> <li>7. Intake line or suction filter partly clogged.</li> <li>8. Motor running too fast.</li> <li>9. Coupling misaligned (Due to this, bearing may get damaged, there will be a play at shaft, abnormal sound will be observed).</li> <li>10. Air leaks at motor intake pipe joints and air drawn through inlet line.</li> <li>11. Oil viscosity too high. (In cold climate, oil viscosity becomes high so no free flow will take place and cavitation will occur).</li> </ol>	<ol style="list-style-type: none"> <li>1. Change the spring.</li> <li>2. Replace the seal.</li> <li>3. First tighten bolts, then check for cracks and sealing.</li> <li>4. Check cooling circuits.</li> <li>5. Replace defective parts. Tighten bolts uniformly.</li> <li>6.i) Fill the reservoir with the oil up-to required level to prevent aeration. ii) Check all connections on inlet side of motor and pour hydraulic oil over suspected leak. If noise stops, leakage has been found, Fill hydraulic tank to the full mark. iii) Check condition of motor shaft seal. Change, if required.</li> <li>7. Clean or replace the filter or line.</li> <li>8. Reduce speed up to prescribed limit.</li> <li>9. Realign the motor shaft.</li> <li>10. Take action as explained in s.no.1, item no. 4.</li> <li>11. Start the engine for few minutes to warm-up the hydraulic oil used in machine for proper flow. Use only proper grade of oil.</li> </ol>

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S. No.	Faults	Probable Causes	Remedial Action
		12. Cavitation.	12.i) Check condition of suction filter and return line filters. Clean or change as necessary. ii) Check clogging of inlet line. Clean or change as necessary. iii) Check loose fittings on suction lines. Tighten, if required. iv) Clean hydraulic tank breather.
		13. Foams in oil.	13. Vent the system.
		14. Casing leaks.	14. First tighten bolts, then check for cracks and sealing.
		15. Motor stressed.	15. Check mounting alignment. Tighten bolts uniformly.
		16. Foreign bodies in suction line.	16. Remove foreign bodies, if need flush the system.
		17. System dirty.	17. Flush the system.
		18. Sharp bends in suction line.	18. Eliminate or reduce the bends in suction line.
		19. Motor worn or damaged.	19. Motor should be overhauled or replaced.
2.	Motor overheats	1. Wrong oil grade. 2. Oil speed in system too high. 3. Motor rotor groove worn out. 4. Radial or axial loading too high. 5. Initial speed rises	1. Fill oil as recommended. 2. Install pipes of proper size. 3. Change motor parts. 4. Limit to acceptable amount, check alignment limit. 5. Check max, pressure, if needed replace with larger capacity and install pipes of nominal bore.

S. No.	Faults	Probable Causes	Remedial Action
		6. Inadequate cooling. 7. Cooling system is dirty.	6. Increase cooling capacity 7. Clean the cooling system.
		8. Differential pressure too low. 9. Pressure too high. 10. Wrong type of pressure valve. 11. Wrong seal size. 12. Motor running speed high. 13. Cavitation. 14. Oil foams. 15. Venting dirty. 16. System contaminated. 17. Sharp bends in suction line. 18. Motor is of under capacity	8. Increase pressure setting of relief valve. 9. Reduce pressure setting. 10. Replace by appropriate type of valve. 11. Replace by suitable seals. 12. Reduce speed. 13. Bleed the system 14. Vent the system. 15. Clean the vents. 16. Flush the system. 17. Eliminate bends or at least reduce them. 18. Install motor of proper capacity
3.	Speed loss on motor.	1. Inlet pressure too low. 2. Motor parts defective. 3. Oil temperature too high 4. Out let pressure too high 5. Port plate does not make contacts.	1. Increase pressure by resetting relief valve. 2. Change defective parts. 3. Check cooling circuit Hydraulic oil cooler may be defective . 4. Check the system pressure. 5. Dismantle the motor and repair as per requirement.

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## VIII. HOSE ASSEMBLY

S. No.	Faults	Probable Causes	Remedial Actions
1.	The hose has burst on examination after stripping back the cover of the wire reinforcement reveals random broken wires in the entire length of the hose.	This indicates high frequency pressure impulse condition. SAE impulse test requirements are as under: (a) For a double wire braid reinforcement are 2,00,000 cycles of 133% of recommended working pressure. (b) For a four spiral wrapped reinforcement (100R-9) are 3,00,000 cycles at 133% maximum operating pressure at +200°F (93° C).	If the extrapolated impulses in a system amount to over a million in a relatively short time a spiral reinforced hose would be the better choice.
2.	The hose has burst, but there is no indication of multiple broken wires in the entire length of the hose. The hose may have burst in more than one place.	This would indicate that the pressure has exceeded the minimum burst strength of the hose.	Either a stronger hose is needed or the hydraulic circuit has a mal-function which is causing unusually high pressure conditions.
3.	Hose has burst. An examination indicates the wire braid is rusted and the cover has been cut, abraded or deteriorated badly.	The primary function of the cover is to protect the reinforcement. Elements that may destroy or remove the hose covers are: 1. Abrasion. 2. Cutting 3. Battery Acid. 4. Chemical Cleaning Solutions. 5. Heat. 6. Extreme Cold.	Once the cover protection is gone, the wire reinforcement is susceptible to attack from moisture or other corrosive matter. hence take care of item no. 1 to 6 of para 3 mentioned in probable causes.

S. No.	Faults	Probable Causes	Remedial Actions
4.	Hose appears to be flattened out in one or two areas and appears to be kinked. It has burst in this area and also appears to be twisted.	Torquing of a hydraulic control hose will tear off the reinforcement layers and allow the hose to burst through the enlarged gaps between the braided plaits of wire strands.	Use swivel fittings or joints to be sure that there is no twisting force on a hydraulic hose.
5.	Fitting blew off at the end of the hose.	It may be due to the wrong fitting has been put on the hose. In the case of a crimped fitting the wrong machine setting may have been used resulting in over or under-crimping.	Check manufacturer's instructions. The hose should be installed with enough slack to compensate for the possible 4% shortening that may occur when the hose is pressurized. Recheck the manufacturer's specification and part nos.
6.	The hose fitting has been pulled out of the hose. The hose has been considerably stretched out in length.	The fitting may have been fixed improperly to the hose. 1. This may not be high pressure application hose. 2. Insufficient support of the hose. It is essential to support very long lengths of hose, especially if they are vertical.	The fitting should be fixed properly. 1. Use the hose as per the pressure of fluid line. 2. All the hoses should be supported by clamping the same at proper distance giving sufficient slacks between two clamps to make up for the possible 4% shortening that could take place when the hose is pressurised.

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## General Safety Notes

- The machine has to be operated as per existing Indian Railways rules and regulations.
- The safety of yourself and other people is a most important consideration in the operation and maintenance of the machine.
- Remember, the machine is a working unit, carrying delicate instruments. Therefore the machine should not be driven at excessive speed over bad track or turnouts.
- Always keep your eyes open for other men working close to the Machine.
- Do not forget to look out for signals, switches and track obstructions.
- Remember to make sure that all protection equipment and safety devices are in place on the machine and in working order especially when it is being driven from site to site.
- Always keep the machine clean. Excessive oil or grease on the machine can cause you to slip and fall and is also a potential fire hazard.
- Always lock the machine before you leave. Make sure that the machine is protected in accordance with railways regulations.
- Whenever you have the opportunity while waiting to get out on a job, do some of the smaller maintenance jobs such as tightening loose nuts and bolts and cleaning the machine.
- Do not permit unauthorized persons to operate the machine.
- It is prohibited to use exposed light or fire on or near the machine.
- Whenever there is work in tamping unit, the units have to be locked and whenever maintenance work involves, such as tightening of cardan shaft bolts, hand brake should be applied.
- Do not tow the machine if the final drive is engaged.

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