

# Turbo Installation Data

1. Holset Service receives many turbocharger returns that are no fault found. Before assuming the turbocharger is not performing to specification always refer to the engine diagnostic system and the fault finding chart of this manual to make all the recommended health checks.
2. It is important that intake and exhaust systems are fitted in accordance with the recommendations of the Equipment and Engine manufacturers. It is important not to overload the turbocharger by external attachments or forces.
3. The air filter must remove particles greater than 5  $\mu\text{m}$  at an efficiency of 95% and be of sufficient capacity to match the air consumption of the engine. Recommended filters should always be used with a pressure drop indicator. Intake systems must be tightened to the values specified by the Equipment and Engine manufacturers to withstand depressions up to 6.3 kPa (0.91 lbf/in<sup>2</sup>)
4. Hose and clip connections of intake manifold systems must be capable of withstanding the turbocharger pressure ratio. V-band clamps are preferred and must be used above 3:1 pressure ratio.
5. Exhaust system connections must be tightened to the values specified by the Equipment and Engine manufacturers to be capable of operating at exhaust back pressures of up to 10 kPa (1.5 lbf/in<sup>2</sup>). Subject to an extensive review by Holset and formal approval, this limit may be increased to 25 kPa (3.6 lbf/in<sup>2</sup>) if a catalytic converter is fitted. Exhaust brake applications are permitted to operate at a continuously rated pressure up to 450 kPa (65.3 lbf/in<sup>2</sup>) Holset has experience of instantaneous pressures up to 700 kPa (101.5 lbf/in<sup>2</sup>) but any application operating above 450 kPa (65.3 lbf/in<sup>2</sup>) must be referred to Holset for approval.
6. Oil should be filtered to 10  $\mu\text{m}$  with efficiency of 60% TWA (Time Weighted Average) /20  $\mu\text{m}$  with efficiency of 85% TWA. Efficiency assessed using ISO Standard 4572/SAE J 1858. Always use filters recommended by the engine manufacturer.
7. The oil quality must be as specified by the engine manufacturer and will be a minimum API - CD (MIL - L - 2104C) specification. Improvement in life can be obtained by using super high-performance diesel (SHPD) oils, particularly where extended oil drain periods are used.
8. Normal oil temperature is 95+/-5 °C (203+/-9 °F). It should not exceed 120 °C (248 °F) under any operating condition.
9. Any pre-lube oil must be clean and meet the minimum CD classification.
10. The orientation of turbine housing and bearing housing of a VG turbocharger is fixed. During installation, do not attempt to rotate these components, as it may affect the operation of the VG actuating mechanism and may void any warranty.
11. Holset permits oil drain pipes to decline at an overall angle of not less than 30 degrees below horizontal. These turbochargers require a drain pipe of 19 mm internal diameter minimum which has integrated connectors. To ensure oil drains into the engine under all operating conditions the return connection into the engine sump must not be submerged.
12. Crankcase pressure should be limited to 0.8 kPa (0.12 lbf/in<sup>2</sup>). Pressure above this level should be referred to Holset for further evaluation. Closed crankcase ventilation (CCV) systems are known to operate at elevated pressure and all applications must be referred to Holset for approval.
13. Oil pressure must show at the turbocharger oil inlet within 3 - 4 seconds of engine firing to prevent damage to turbocharger bearing system. A flexible supply pipe is recommended.
14. The minimum oil pressure when the engine is on load must be 210 kPa (30 lbf/in<sup>2</sup>). Normal maximum operating pressure is 400 kPa (58 lbf/in<sup>2</sup>) although 600 kPa (88 lbf/in<sup>2</sup>) is permitted during cold start up. Under idling conditions pressure should not fall below 70 kPa (10 lbf/in<sup>2</sup>).
15. Recommended oil flow ranges for these turbochargers are 2 - 3 litre/min at idle and 3.5 - 4.5 litre/min at maximum engine speed.
16. Recommended coolant flows for these turbochargers are 3 litre/min at idle and 14 litre/min at maximum engine speed. Coolant hose design must permit flow to increase progressively with engine speed.
17. Do not use liquid gasket substances or thread sealant as any excess can enter the turbocharger oil and coolant systems to obstruct flow.

Note:

100 kPa = 1 bar (14.5037 lbf/in<sup>2</sup> = psi).

# Installation Checklist

1. Always understand why the original turbocharger needs replacing before fitting another unit.
2. Check the turbocharger dataplate to ensure the Part No. is correct for the engine/application.
3. Check the engine exhaust, intake and aftercooler systems are clean and without obstruction i.e. free from oil, gasket pieces, dust/dirt/carbon or foreign objects.
4. Replace the oil and air filters using replacement parts specified by the equipment manufacturer.
5. Change the engine oil using the type specified by the engine manufacturer.
6. Check that the turbocharger oil inlet and drain pipes and connectors are clean, free from obstruction and will not leak under pressure. Before re-installing flexible pipes always ensure any burnt-on lacquer or other adhered material is removed from internal bores. If in doubt, always fit new pipes.
7. Check that the coolant pipes of water-cooled bearing housing applications and connectors are clean, free from obstruction and will not leak under pressure.
8. To pre-lube the turbocharger bearings, pour some clean engine oil into the oil inlet and rotate the turbocharger rotor assembly by hand.
9. Check that the exhaust manifold flange is flat and undamaged. Mount the turbocharger on the flange and check that the turbine inlet gasket fits properly without obstructing the gas passages.
10. Assemble the air intake and boost outlet connections. Check that the connections are secure and will not leak in use.
11. Check the exhaust system is fitted using the original mounting arrangement provided by the equipment manufacturer. Always re-fit any supports/brackets back in position to ensure the system is correctly supported.
12. Assemble the exhaust system to the turbine housing outlet. Check that the gasket/connection is secure and will not leak in use.
13. Assemble any coolant pipes and check that the connections are secure, without obstruction and will not leak in use.
14. Assemble the turbocharger oil inlet pipe and check that the connection is clean, secure and will not leak in use.
15. Check all clamps and fasteners are correctly tightened to the torque recommended by the equipment manufacturer.
16. Make the electrical connections between VG sensors and engine control module (ECM). Check the electrical connection between control valve and ECM.
17. Check the air connection between the vehicle auxiliary tank and control valve.
18. Connect the air pipe from the control valve to the actuator ensuring the pipe bore is clean and dry before fitment.
19. Make any ECM checks recommended by the engine manufacturer.
20. Crank the engine WITHOUT firing until engine oil flows out of the turbocharger drain flange.
21. Assemble the oil drain pipe and check that the connection is secure, without obstruction and will not leak in use.
22. Start the engine and run at idle speed for approximately 1 minute so that the oil supply system is fully operational.
23. Accelerate the engine and check that there are no leaks/obstructions of air/oil/coolant/gas under pressure.
24. Check that no hose or connection deforms under normal operation.
25. Before switching off the engine, leave it running at idle speed for at least 1 minute to cool the turbine.