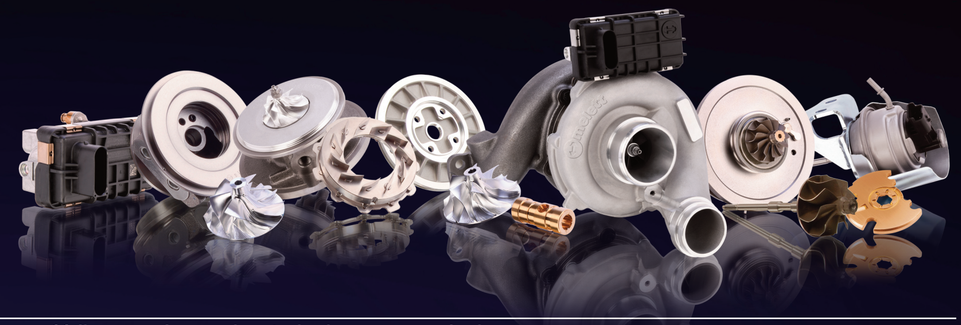
TURBOCHARGER FAILURE MATRIX



CAUSE OF PROBLEM	Black exhaust smoke	Compressor wheel damaged	Low boost pressure	Excessive engine oil consumption	Blue exhaust smoke	High boost pressure	Turbocharger noisy	Engine lacks power	Engine stalls under acceleration	Turbocharger - Cyclic sound	Oil leak from compressor seal	Oil leak from turbine seal	Turbo fault warning 'limp' mode	Turbo fault warning	Damaged turbine wheel	SOLUTION
Foreign object damage to blades on compressor or turbine	↔	↔	↔	↔	↔		↔	↔		↔	↔	↔			↔	Find and correct cause of failure, repair or replace turbocharger as required
Lack of oil to turbocharger		↔	↔				↔	↔		↔					↔	Replace oil feed pipe, check oil pump and repair or replace turbocharger as required
Air filter - Blocked or dirty	↔		↔	↔	↔		↔	↔		↔	↔					Replace air filter
Obstruction and/or blockage in the oil return pipe				↔	↔						↔	↔				Remove obstruction or replace pipe as required
Sludge or coking of the turbocharger Bearing housing				↔	↔						↔	↔				Change oil and oil filter, overhaul or replace turbocharger as required (check oil feed pipe for blockages)
Worn engine bores, liners or piston rings (blowby)	↔		↔	↔				↔			↔	↔				(Cylinder leakage test) Refer to engine manufacturer's manual and repair engine as required
Internal engine problems (such as valves, pistons etc.)	↔		↔	↔	↔		↔	↔		↔	↔	↔			↔	(Cylinder leakage test) Refer to engine manufacturer's manual and repair engine as required
Compressor wheel and/or diffuser vanes layered with dirt or oil deposits	↔		↔	↔	↔		↔	↔		↔	↔	↔				Find and correct source of unfiltered air, check breather system for source of oil deposits. Turbocharger may need overhauling
Turbocharger bearings damaged or worn	↔	↔	↔	↔	↔		↔	↔		↔	↔	↔			↔	Find and correct cause of failure, repair or replace turbocharger as required
Turbine housing cracked, gaskets missing, blown or loose			↔				↔	↔		↔						Replace or repair defective/damaged parts as required
Obstruction and/or blockage in hose from air filter to compressor housing inlet	↔		↔	↔	↔		↔	↔		↔	↔					Remove obstruction and/or replace damaged parts as required
Obstruction and/or blockage in hose from compressor outlet to inlet manifold			↔				↔	↔		↔						Remove obstruction and/or replace damaged parts as required
Obstructed and/or blocked inlet manifold			↔				↔	↔		↔						Refer to engine manufacturer's manual and remove obstruction
Leaks in air hose from air filter to compressor inlet	↔	↔	↔				↔	↔		↔						Correct leak by replacing seals, tighten fasteners or replace hose as required
Leaks in air hose from compressor outlet to intercooler/inlet manifold	↔	↔	↔	↔	↔		↔	↔		↔					↔	Correct leak by replacing seals, tighten fasteners or replace hose as required
Air leak between inlet manifold and cylinder head flange	↔		↔	↔	↔		↔	↔		↔						Refer to engine manufacturer's manual and replace gaskets and/or tighten fasteners as required
Obstruction and/or blockage in exhaust manifold	↔		↔	↔	↔		↔	↔		↔	↔					Refer to engine manufacturer's manual and remove obstruction
Exhaust system restricted or catalytic converter blocked	↔		↔			↔		↔	↔		↔					Remove obstruction or replace faulty components as required
Exhaust gas leak between exhaust manifold and cylinder head			↔				↔	↔		↔	↔					Refer to engine manufacturer's manual and replace gaskets and/or tighten fasteners as required
Exhaust gas leak from turbine inlet to joint of exhaust manifold	↔		↔				↔	↔		↔	↔					Replace gaskets and/or tighten fasteners as required
Exhaust gas leak from downpipe after the turbine outlet							↔			↔	↔					Replace gasket, downpipe or repair as required
Obstruction in engine crankcase vent and/or breather system				↔	↔						↔	↔				Refer to engine manufacturer's manual, clear obstruction and/or replace filter
Fuel system defective or incorrectly adjusted	↔		↔	↔		↔		↔	↔						↔	Refer to engine manufacturer's manual, replace or adjust faulty components as required
Engine camshaft timing incorrect	↔		↔				↔									Refer to engine manufacturer's manual, replace worn parts and/or check timing as required
Wastegate on turbocharger restricted or seized	↔	↔	↔			↔	↔	↔	↔	↔					↔	Check wastegate valve and actuator operation
Ignition cut out switch activated due to excessive boost pressure		↔	↔			↔	↔	↔	↔	↔					↔	Check wastegate valve and actuator operation, also check for leaks in pressure hose to actuator, replace faulty parts as required
Piston rings worn (defective sealing)	↔			↔							↔	↔				Repair or replace turbocharger as required
Vane blockage (soot/carbon) on variable geometry turbo	↔						↔									Find and correct cause of carbon build up on vanes, replace parts/turbocharger if required
ECU or fuelling fault													↔			Check ECU fault codes and/or fuel system
Possible engine performance upgrade or 'chipped' ECU														↔		Revert to standard engine/ECU settings, replace turbocharger if required

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