



- 1 Determine the cause of the breakdown**

Before fitting a new turbocharger, you must determine what has caused the breakdown of the old turbo. The problem, that caused the breakdown of the turbo, will likely also be able to damage the new turbo.
- 2 Check intake**

Check the intake system for leaks– check pipes – hoses for bends or dents that could limit the air supply. Any leaves or dirt must be cleared out. If in doubt if the air filter has been changed recently – replace it – if there is damage to the compressor wheel, you must investigate from where the object has entered – check that all parts are complete up to the air filter. Charge air hoses must also be checked for leaks, bends, and oil. Also, check and if needed clean or replace the intercooler.
- 3 Check fuel system**

Check the fuel system – if the build up of soot is excessive in the intake manifold– this could be a sign of problems with the fuel system – check the air mass sensor, EGR, injection, or possible oil consumption from the engine.
- 4 Check exhaust**

Check the DPF or catalyst for clogging. Check manifold and exhaust for tightness. Check the old turbine wheel for damage, that could be caused by debris from the engine or EGR valve, if damaged you need to find the problem, that caused it.
- 5 Check oiling**

Replace the oil feed pipe, and clean or replace the oil return pipe. Check that the crank ventilation is working properly. Check the old oil for excessive soot build up – check the oil pan for contamination with soot or metal debris from wear of crank or rod bearings. If problems are found here, they need to be taken care of before the turbo is replaced.
- 6 Check actuator**

Check the vacuum lines to the turbo for tightness and bends, that could prevent the vacuum from reaching the actuator. If the actuator is electric – please check the connector.
- 7 Change oil**

Before starting up the new turbo, change the oil and filter on the engine.
- 8 Fit new gaskets, pre oil turbo**

When installing the new turbo – make sure to use the new gaskets – observe, that some gaskets may be possible to fit in a wrong position, which will allow the gasket to partly cover the exhaust intake of the turbo, so make sure to fit in the correct position. Avoid using any liquid sealant for the oil supply – this can close the oil supply to the turbo. Make sure to use the correct torque on all parts, when reassembling, and please use the supplied start-up oil to add to the oil intake before cranking the engine. Spin the axle carefully by hand to distribute the oil. When starting up, disconnect the ignition, and engage the starter for a while to build up oil pressure. When connecting the ignition and starting up – please allow the engine to idle for a couple of minutes.

# Troubleshooting guidelines: Turbochargers - POSSIBLE ERRORS

Problem	Cause	How to identify	Why the problem occurs	Solution	Preventive actions
Oil leak	Crank ventilation not working	When lifting the dipstick – check if pressure is released	Increased pressure from the crank case is preventing oil return from the turbo	Replace PCV	Check before fitting a new turbo, that the PCV is ok
Oil leak	Oil return line blocked by use of liquid sealant	Unscrew the oil return line, check if oil is flowing back	Liquid sealant is blocking the flow of oil	Avoid using sealant	Clean surfaces, and use only gaskets to seal
Oil leak	Increased pressure in crankcase caused by engine wear	PCV working, but pressure is high	Blow by is causing too high pressure in crank case	Replace valve guides or pistons/rings as needed	Never exceed service intervals. Check for pressure in crankcase before turbo replacement
Lack of power	Lack of intake air	Clogged air filter/ damaged hoses	Air filter not changed, hoses pinched of during installation	Replace filter or hoses	Fit new air filter, inspect hoses
Lack of power	Lack of charge air	Leak between turbo and intake manifold	Wear on parts	Replace leaking parts	Check tightness before installation
Lack of power	Exhaust leaks in manifold or joints	Exhaust leaking into engine bay	Cracks in manifold, bolts not torqued	Replace manifold, torque bolts down, and replace gaskets	Check for tightness before installation, use correct torque

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Problem	Cause	How to identify	Why the problem occurs	Solution	Preventive actions
Lack of power	Blockage in DPF/ Catalyst	Black smoke, engine light on	Soot build up in exhaust	Clean/replace	Examine why the soot builds up – injection, EGR, airmass, etc.
Lack of power	Vacuum lines not tight, or bent	Actuator is not moving, or not moving enough	Lines worn or bent	Replace vacuum line	Before replacement, check tightness of lines, if they cannot hold vacuum, replace
Lack of power	Vacuum solenoid valve not working	The lines are tight, but vacuum doesn't reach the actuator	The valve is worn out	Replace the vacuum valve	Before replacement of the turbo, check, that vacuum is present at the actuator
Lack of power	EGR valve stuck open	If you unplug the EGR valve at some revs, Air-mass doesn't change on diagnostic tester	Due to soot, EGR valve is stuck in open position	Replace EGR valve	Check fuel system to avoid buildup of soot
Lack of power	MAP or Airmass sensor not working	Check with diagnostic tester, that the expected value at idle is ok	MAP or airmass sensor are failing	Replace sensor	Check Sensors before replacing the turbo
Lack of power	Intake throttle not working correctly	Check that the throttle moves freely	Throttle failing, or build up of soot	Replace or clean throttle	Check throttle before replacing the turbo

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Problem	Cause	How to identify	Why the problem occurs	Solution	Preventive actions
Lack of power	Intake manifold contaminated	Visual inspection	Buildup of soot	Replace or clean	Check fuel system to avoid buildup of soot
Black smoke	Airfilter contaminated	Visual inspection	Lack of service	Replace	If in doubt of when the filter was last replaced, replace it at turbo replacement
Black smoke	Air intake hose collapsed or restricted	Visual inspection	Damaged when working on other items	Remove restriction or replace hose	Visual inspection before replacement of turbo
Black smoke	Leak between compressor and intake	Inspection of hoses, intercooler, gaskets, manifold	Wear of parts, damaged parts	Replace or tighten clamps/gaskets/hoses as needed	See/hear/feel for any leaks
Black smoke	Intake manifold contaminated	Visual inspection	Buildup of soot	Replace or clean	Check fuel system to avoid buildup of soot
Black smoke	Damage to compressor wheels	Visual inspection	Object from airside damaged the wheel	Inspect intake – find out where the object came from and fix the problem, and install new turbo	Inspect all intake parts at replacement of turbo

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Problem	Cause	How to identify	Why the problem occurs	Solution	Preventive actions
Black smoke	Problem in fuel injectors or pump(S)	Diagnostic tester	Parts worn	Replace needed parts	Check the fuel system before fitting a new turbo
Black smoke	Problem with MAP or Airmass sensor	Check with diagnostic tester, that the expected value at idle is ok	MAP or airmass sensor are failing	Replace sensor	Check Sensors before replacing the turbo
Black smoke	Blockage in DPF/ Catalyst	Black smoke, engine light on	Soot build up in exhaust	Clean/replace	Examine why the soot builds up – injection, EGR, airmass, etc.
White/Blueish smoke	Engine oil consumption too high	Check oil consumption	Wear on pistons/rings, liners valvetrain, gaskets	Repair problem as needed	Check oil consumption before fitting a new turbo
White/Blueish smoke	Crank ventilation not working	When lifting the dipstick – check if pressure is released	Increased pressure from the crank case is preventing oil return from the turbo, and increasing consumption	Replace PCV	Check before fitting a new turbo, that the PCV is ok
White/Blueish smoke	Leak between compressor and intake	Inspection of hoses, intercooler, gaskets, manifold	Wear of parts, damaged parts	Replace or tighten clamps/gaskets/hoses as needed	See/hear/feel for any leaks

# Troubleshooting guidelines: Turbochargers - POSSIBLE ERRORS

Problem	Cause	How to identify	Why the problem occurs	Solution	Preventive actions
White/Blueish smoke	Lack of intake air	Clogged airfilter/ damaged hoses	Airfilter not changed, hoses pinched of during installation	Replace filter or hoses	Fit new airfilter, inspect hoses
White/Blueish smoke	Oil return line blocked by use of liquid sealant	Unscrew the oil return line, check if oil is flow- ing back	Liquid sealant is blocking the flow of oil	Avoid using sealant	Clean surfaces, and use only gaskets to seal
White/Blueish smoke	Residue from the old turbo	If the old turbo was leaking oil	Oil from the old turbo left in exhaust	If the amount of oil is not excessive, let it burn off	If the amount is exces- sive at disassembly, wipe it off as far as possible
Noise	Whistling noise	Compressor wheel damaged by foreign object	Visual inspection	Replace turbo	Before fitting a new turbo, make sure, that air ducts, and all in- take parts are in good shape
Noise	Leaks from intake, charge side or exhaust	Check the intake hose, charge hoses, inter- cooler, manifold, turbo & exhaust for leaks	Wear on parts, or incorrect gaskets or torque has been used	Tighten screws or re- place needed gaskets, hoses or cracked mani- fold or exhaust parts	Inspect intake, charge hoses and exhaust parts before fitting a new turbo
Noise	Metallic noise – com- pressor- or turbine- wheel damaged by foreign object	Visual inspection	Parts from intake or engine has entered the turbo and damaged the wheel	Identify where the part has come from and correct the problem, and replace the turbo	Inspect intake well before installing a new turbo. If the old turbo has damaged turbine or compressor wheel, clarify why