variable turbos. Manufacturer's Remanufactured brand new or Original reputation, BTM only supplies To protect your business

vehicle's individual ECU. totally compatible with the original manufacturer, and rebuilt and calibrated by the Each one is 100% OE, expertly OMX exchange programme. **EURDOS ENFOUGH OUF EXCLUSIVE** Manufacturer's Remanufactured turbos, and a range of Original we offer both OE brand new they're dismantled. That's why vital calibration the moment highly complex and lose their Variable turbine turbos are

.UDE rurbo having its own ECU. engine management system, with electronic control governed by the or nozzle. Most modern units use regulate the position of the vanes bressure or vacuum actuators to Early variable turbine turbos used



achieve a given power output. to nee smaller engine packages to and allows vehicle manufacturers economy, enhances engine braking operating range, improves fuel response across a wider engine of engine speeds. This improves boost level across the widest range and airflow, to provide the desired efficient use of exhaust gas energy is running. This allows more the turbine stage while the engine vanes or a moving nozzle to alter variable turbine turbos use moving Depending on the manufacturer,



bertormance at all engine speeds. characteristics to improve engine Variable turbine turbos adapt turbo

low and high engine speeds. compromise in performance between their housings, with an inevitable turbine and compressor wheels and determined by the design of the of airflow into the engine is In conventional turbos, the amount

vehicle's ECU. are fully compatible with the to the original specification and are built using 100% OE parts turbos. Remanufactured units remanufactured wastegate BTM supplies brand new or

maintaining maximum power output. better engine response and yet still wheel can safely be smaller, giving In a wastegated turbo, the turbine



go straight out through the exhaust. gas to bypass the turbine wheel and opens allowing the excess exhaust a preset maximum level, a valve As soon as the pressure reaches wastegate to control boost pressure. some turbos are also fitted with a engine. To prevent this happening,

• The turbo experts for over 40 years.

• Over 18,000 turbos in stock for next day delivery.

• Oil feed pipes available for recommended applications. The turbocharger people

• 2 year warranty on all turbos.



it can overspeed and overboost the However, at higher engine speeds, response at low engine speeds. A small turbine will give a good



Turbos with wastegates

does not leak into either compressor pressures, and help ensure that oil turbo's extreme temperatures and specially designed to cope with the normal engine oil seals, they are are unique oil seals. Totally unlike At both ends of the bearing housing

or turbine nousings.

saixə al se əulayar ən

Exhaust gas drives

Buil notsi

is compressed as the blades spin at

Air is drawn into the compressor

(360,000 rpm).

is powered by the spinning turbine.

housing by the compressor wheel and

the turbine by a forged steel shaft, and

The compressor wheel is connected to

rotate at up to 6,000 revs per second

At full speed, the turbine wheel can

more gas passes through the turbine

wheel spins. With the engine at idle,

the turbine spins at minimal speed. As

housing, the turbine rotates faster.

for these oil films are critical. bearing and housing. The clearances of oil between bearing and shaft and The journal bearings float on a film

away heat generated by the turbine. The oil also acts as a coolant taking Journal bearings and thrust system. into the bearing housing, to the engine. The oil is fed under pressure housing, lubricated by oil from the and compressor runs in a bearing The forged shaft linking the turbine

cool the hot, high pressure air. Intercooler, which uses air or water to through a Charge Air Cooler or power – so it is usually passed its density decreases, which reduces 200°C. As air temperature increases, temperature, but leaves at up to Air enters the compressor at ambient

high pressure air at the outlet. pressure air stream into low velocity, converts the high velocity, lowhigh velocity. The compressor housing

determines how fast the turbine The speed and load of the engine

Compressor Wheel

Ambient air pulled i

Bearing Housing

Thrust Bearing

'buisnou pue are needed for the turbine wheel special high temperature materials can reach 950°C, which means that outlet. Exhaust gas temperatures and leaves through the exhaust turbine housing, turns the turbine The exhaust gas enters via the

the turbo, providing vital lubrication. compressing it. Oil passes through the compressor pulling in air and

Turbochargers are now

commonplace on diesel and petrol

engines, with around 20 million

market each year. As emissions

some stage, these turbos will need replacing. The increasing

demand for replacement turbos

opportunity, and BTN Turbo should

BTN Turbo is the largest independent

supplying new and remanufactured

turbo distributor in the world,

represents a valuable profit

be your first choice.

legislation gets tougher, many more engines will be turbocharged. At

turbos entering the European

it drives the turbine, which turns As exhaust gas exits the engine manifold and the exhaust pipe. system between the exhaust The turbo is mounted in the exhaust

energy from the exhaust gas. The turbo is driven by the waste by a shaft supported on bearings. turbine and compressor, connected of a millimetre. It comprises a tolerances of thousandths piece of engineering built to highly efficient, complex In practice, the turbo is a



and cutting emissions. reducing fuel consumption improving performance, power more efficiently – air, the engine can generate air into the engine. With more hot air pump that forces more In theory a turbo is simply a

How turbochargers work

Variable turbine turbos



How turbochargers work.

Everything you need to know about turbochargers

We explain the fundamentals of turbocharging, using illustrations and clear, easy to understand descriptions.

How to diagnose faults.

It's vital to know why the turbo failed before you fit a replacement. We reveal the three turbo killers and explain the

How to identify and order the right replacement.

Save time, money and hassle by getting the right replacement turbo, first time. We tell you which details you should look for and how to order.

How to fit a turbo.

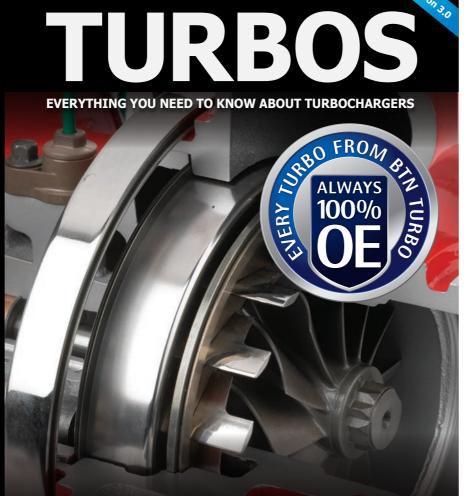
Ensure a straightforward installation by following our step-by-step guide, with every key stage clearly explained.

Order your BTN turbo from your local factor

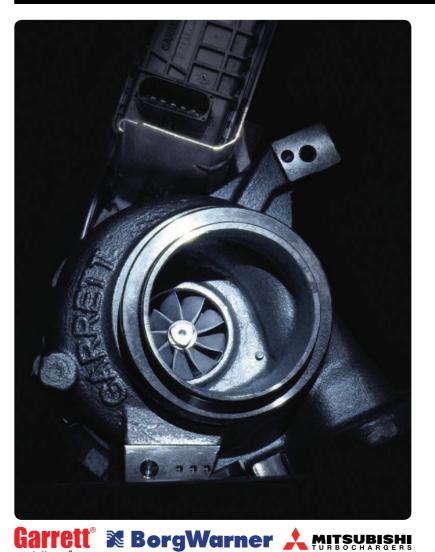


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Turbochargers - an opportunity for profit



turbos for over 40 years. BTN is the UK's only turbo supplier with distribution rights to all the major manufacturers: Garrett, BorgWarner, Mitsubishi, Holset and IHI, covering virtually all car, truck and marine turbo applications. We also supply a wide range of turbos for agricultural and plant applications.

All turbos supplied by BTN are 100% OE (Original Equipment), to perform exactly as the vehicle manufacturer intended. We sell brand new first fit OE turbos

straight from the turbo manufacturers' production lines, and our range of Original Manufacturer's Remanufactured turbos.

Available through our exclusive OMX exchange programme, these remanufactured turbos are rebuilt and calibrated by the original manufacturer, on the original production lines. They offer significant savings compared to the equivalent brand new unit.

We also remanufacture commercial turbos using OE parts, again ensuring they are 100% OE.

With over 18,000 turbos in stock. we are the preferred supplier to all major factors across the UK.

98% of turbos from BTN include a FitKit, with fitting instructions, studs, gaskets and an oil-filled injector to help prime and protect the turbo.

BTN Turbo is exacting, conscientious and dependable – qualities that should reassure you and will help you build a strong relationship with







Fault diagnosis - Is it the turbo?

Low power, or excessive noise or smoke are often blamed on the turbo. A diagnostic fault code may only point to the area where the problem lies. Investigate further, to identify and cure the real cause. The turbocharger is not a simple replacement part - it's an integral part of the engine's air, fuel, cooling and oil systems.

A blocked filter or intercooler, obstructions, splits in any hoses or pipes, or even using non-OE spec parts, can cause problems and lead to turbo failure. So it's essential to

check all of these systems before

modified it won't provide the turbo with the correct amount of energy, so the turbo can't perform properly or may fail prematurely.

Even simply overfilling the engine and damage the turbo – or suggest

If you're in doubt and would like our expert advice, call the BTN Turbo helpline on

01895 466663

Other causes of damage

Occasionally other reasons – such as poor driving habits – can result in turbo failure, so it is also worth considering these causes.

- Prolonged engine idling can create a vacuum within the turbine, leading to failure of the oil seals.
- Hard acceleration from cold will not give the oil time to circulate, causing oil starvation to the turbo and engine bearings.
- Hot engine shutdown can cause

you replace the turbo.

If the engine is worn or has been

oil can over-pressurise the system there's a turbo problem.

carbon build-up within the turbo, leading to bearing failure. It's essential to let a hot turbo engine

idle for at least three minutes

temperature inside the turbo.

before turning it off, to reduce the

• Misuse, such as revving the engine beyond its safe limit, can cause overspeeding which pushes the turbo beyond the parameters where lubrication can protect it, and overboosting which damages

the engine.

Turbocharger fault finding guide

IE STALLS DURING ACCELERATION		Z Z		94	ĸ	IE SEAL	эме, мос		with the turbo itself.	of turbos fail due to a manufacturing fault
		CONSUMPTION		URBOCHARGE	ESSOR SEAL		3 OR 'LIMP HO	(2)	 95% of turbo failures are because of problems foreign object damage. 	
	ENGINE LACKS POWER BLACK EXHAUST SMOKE	EXCESSIVE ENGINE OIL	BLUE EXHAUST SMOKE	TURBOCHARGER NOISY CYCLIC SOUND FROM TURBOCHARGER	OIL LEAK FROM COMPRESSOR SEAL	LEAK FROM TURBINE	TURBO FAULT WARNING OR'LIMP HOME' MOD	TURBO FAULT WARNING	BEFORE YOU FIT A NEW TURBO, FIND O TO FAIL OR YOU RISK THE REPLACEME	
ENGI	ENGINE	EXCE	BLUE	TURB CYCL	OILL	OILL	TURB	TURB	CAUSE	REMEDY BTN Turbo Helpline +44 (0) 1895 46660
	• •	•	•		•				Clogged air filter element	Replace element according to engine manufacturers recommendations
	•	•	•	• •	•				Obstructed air intake duct to turbo compressor	Remove obstruction or replace damaged parts as required
	• •			•					Obstructed air outlet duct from compressor to intake manifold	Remove obstruction or replace damaged parts as required
	• •			•					Obstructed intake manifold	Refer to engine manufacturers manual & remove obstruction
				•					Air leak in duct from air cleaner to compressor	Correct leak by replacing seals or tightening fasteners as required
	• •	•	•	•					Air leak in duct from compressor to intake manifold	Correct leak by replacing seals or tightening fasteners as required
	• •	•	•	•					Air leak at intake manifold to engine joint	Refer to manufacturers manual & replace gaskets or tighten fasteners as required
	• •	•	•	•	•				Obstruction in exhaust manifold	Refer to engine manufacturers manual & remove obstruction
	• •				•				Restricted exhaust system	Remove obstruction or replace faulty components as required
	• •			•	•				Gas leak in exhaust manifolds to engine joint	Refer to manufacturers manual & replace gaskets or tighten fasteners as required
	• •			•	•				Gas leak in turbine inlet to exhaust manifold joint	Replace gasket or tighten fasteners as required
				•					Gas leak in ducting after the turbine outlet	Refer to engine manufacturers manual & repair leak
		•	•		•	•			Obstructed turbocharger oil drain line	Remove obstruction or replace line as required
		•	•		•	•			Obstructed engine crankcase vent	Refer to engine manufacturers manual, clear obstruction
		•	•		•	•			Turbocharger centre housing sludged or coked	Change engine oil & oil filter, overhaul or replace turbo as required
	• •								Fuel system defective or maladjusted	Refer to engine manufacturers manual - replace or adjust faulty component(s) as required
	• •								Engine camshaft timing incorrect	Refer to engine manufacturers manual & replace worn parts
	• •	•	•		•	•			Worn engine piston rings or liners (blowby)	Refer to engine manufacturers manual & repair engine as required
	• •	•	•		•	•			Internal engine problem (valves, pistons)	Refer to engine manufacturers manual & repair engine as required
	• •	•	•	•	•	•			Dirt caked on compressor wheel and/or diffuser vanes	Clean using a Non-Caustic cleaner & Soft Brush. Find & Correct source of unfiltered air and change engine oil & oil filter
	• •	•	•	•	•	•			Damaged turbocharger	Find the correct cause of failure, replace turbocharger as required
	•								Turbocharger wastegate malfunction	Check wastegate and actuator operation
•									High boost pressure, triggering ignition cut out switch	Check wastegate and actuator operation. Replace faulty parts as required
							•		ECU or fuelling fault	Check ECU fault codes and/or fuel system
	• •								Vane blockage on variable turbine geometry turbo	Find and correct cause of carbon build up on vanes, replace turbocharger as required
								•	Possible engine performance upgrade or 'chipped' ECU?	Revert to standard engine/ECU settings, replace turbo if required

■ Turbochargers are very reliable: less than 1% of turbos fail due to a manufacturing fault

The three turbo killers

Turbo failure is a reasonably rare event – the problem usually lies elsewhere with the engine. More than 95% of failures are caused by the three 'turbo killers' of oil starvation, oil contamination and foreign object damage.



In the vast majority of cases, the problems are oil-related. Therefore, it's vital to check the lubrication system before you replace the turbo.

Oil starvation can be caused by insufficient lubricant reaching the turbo, usually because of blocked or leaking oil pipes, or lack of oil priming when the turbo was fitted.

Oil contamination can be caused by not changing the oil and filter at the correct service interval, by fuel or water in the oil, or by using an incorrect lubricant.



As a turbo operates at up to 6,000 revs per second, up to 950°C and to very fine tolerances, lubrication is critical. Running a turbo without oil for five seconds is as harmful as running an engine without oil for five minutes.



Even a very small foreign object can cause considerable damage to turbine or compressor blades. Foreign objects can enter the turbo due to careless maintenance, leaks in the air intake system or fragments from a failed turbo which have not been flushed through.

How to replace a turbo

1. Identify the right unit

Making sure you correctly identify the turbo will save you the time, trouble and expense caused by receiving an incorrect unit.

Just by checking the vehicle's registration number, we can identify the correct replacement turbo with more than 90% accuracy. However, the best way to be sure you receive the correct turbo from your motor factor, is to check the nameplate or label on the failed turbo. You may need to remove the turbo from the vehicle to see the plate clearly.

The nameplate should tell you at least one of the following:

- the turbo model
- the turbo manufacturer's part number
- the vehicle manufacturer's part number.

Please note when ordering, that the vehicle manufacturer may have installed a different turbo at the beginning or end of the production run. Turbo manufacturers are also constantly improving designs and materials. You can be sure that BTN Turbo will supply you the latest available version.

If you're in doubt and would like our expert advice, call BTN Turbo on **01895 466666**.

If you can't provide your motor factor with these details, then give them as much information as you can about the application; engine make, size and HP; vehicle's year of registration and any other facts you think may be relevant.

Remember, fitting the wrong turbo can invalidate its warranty.

2. Installation

Replacing a turbocharger is a straightforward job for any competent fitter. But remember, the turbo is an integral part of the air, fuel, cooling and oil systems. So check these systems are performing correctly, with the right fluid levels and no leaks or blockages, and replace any failed or suspect parts

It's vital to do this before replacing the turbo, or you risk the replacement turbo failing too.

with OE parts.

Make sure you follow the instructions included with your BTN turbo -

failing to do this could result in turbo or engine damage, and could void the warranty.

> Check the air intake pipes and the exhaust manifold to make sure they are free from contaminated and loose material, so no dirt or debris gets into the turbo openings.

Check the oil inlet and oil drain pipes are clean and free from obstructions, internal carbon and sludge. Clean or replace if necessary.

Renew the engine oil and filter, remembering to prime the filter. Use only OE standard parts and the specified oil. Do not overfill with oil

- it may over-pressurise the system, leading to turbo oil seal failure.

Check the exhaust mounting flange is flat and free from cracks and carbon debris, and the studs are in good condition. Check the casting is not cracked on the outside or breaking up internally. If in doubt, replace with a new part.

Now mount the turbo on the exhaust flange, checking the turbine gasket fits correctly to give a gas-tight seal.

Never use a liquid gasket product when fitting a turbo, as it may enter the turbo openings. Use only new OE specification gaskets.

Connect the oil drain pipe. Prime the turbo by filling the oil feed hole with clean engine oil, using the oil-filled injector supplied in the FitKit that



came with your BTN turbo. Rotate the rotor assembly by hand, to ensure the oil protects the bearings. Lack of oil priming during fitting, and incorrect starting procedure, can cause premature turbo failure.

Connect all other external fittings to the turbo.

Make sure the engine oil

circulates and the turbo is thoroughly lubricated before it operates under load – for example by disconnecting the ignition system or fuel supply, so the engine turns over on the starter motor without firing up. Check that

the oil pressure warning light goes out. Reconnect the ignition or fuel supply and fire up the engine. Run it at a fast idle while you check there are no diagnostic fault codes, or oil, air,

exhaust gas or fuel leaks.

If your turbo has a wastegate or is a variable turbine turbo, it will have been pre-set at the factory to suit your vehicle. Don't attempt to adjust it. This will compromise performance and void the warranty.

The replacement turbo should now provide long and reliable service.



- Every turbo from BTN Turbo is 100% OE brand new, first fit OEM or remanufactured by the Original Manufacturer available through our OMX exchange programme.
- Every turbo is identical to the original turbo, so 100% compatible with the vehicle's ECU.
- Savings of up to 40% on our remanufactured turbos.
- 18,000 turbos in stock for next day delivery.
- The best advice, with 40 years of turbo experience.
- Two year warranty on all turbos.
- · Free FitKit included.







