



Holset Turbochargers

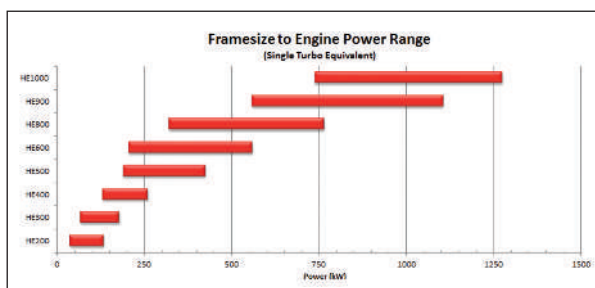




...It's got to be Holset

Holset Turbochargers

Holset Turbochargers are synonymous with turbomachinery and air handling excellence across the globe. Engineered and manufactured by Cummins Turbo Technologies, Holset Turbochargers have set the standard for turbocharger technology and design in the mid-range and heavy-duty diesel engine market for over 60 years. And with the introduction of our Holset 200 series, the Holset range now includes light-duty turbochargers and extends our range from high horsepower and heavy-duty all the way down to serving the light-duty diesel engine market.



What makes a Holset Turbocharger?

Cummins Turbo Technologies takes a collaborative approach with key OEMs worldwide to develop optimum solutions for a wide range of vehicles and applications. Through these longstanding OEM relationships, and as an autonomous unit of the Cummins organisation, we have developed a detailed knowledge of engines and their interaction with the turbocharger.

This invaluable commercial experience means that Holset Turbochargers are developed as a critical component for each application. Our specialist engineering teams lead a comprehensive design process and undertake rigorous testing and analysis to ensure the highest standard of product quality, safety and superior performance.

Why turbocharge?

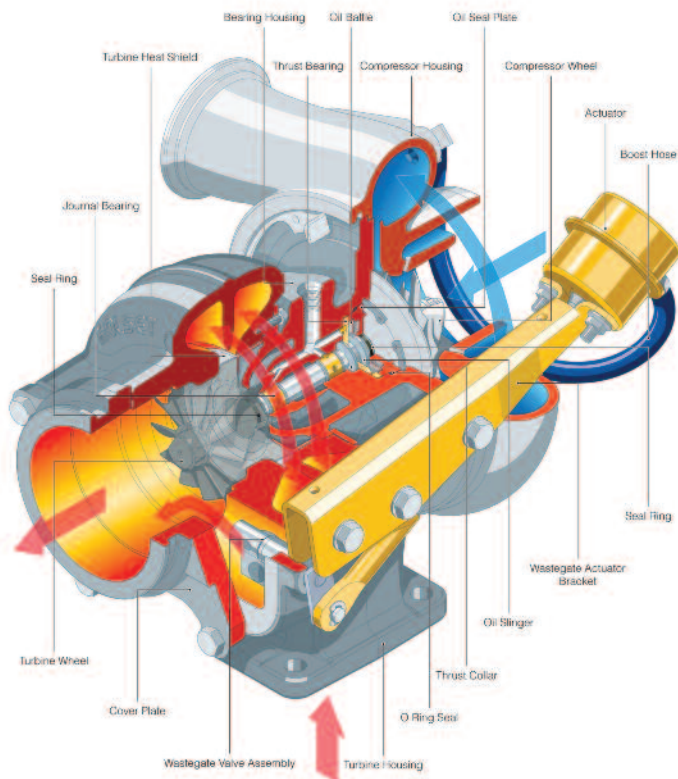
An engine is designed to burn a fuel-air mixture to produce mechanical energy. The mechanical energy then moves pistons up and down to create the rotary motion that turns the wheels of a vehicle. The more mechanical energy, the more power the engine can produce.

A significant difference between a turbocharged diesel engine and a traditional naturally aspirated gasoline engine is that the air entering a diesel engine is compressed before the fuel is injected. This is where the turbocharger is critical to the power output and efficiency of the diesel engine. It is the job of the turbocharger to compress more air flowing into the engine's cylinder. When air is compressed the oxygen molecules are packed closer together. This increase in air means that more fuel can be added for the same size naturally aspirated engine. This generates increased mechanical

power and overall efficiency improvement of the combustion process. Therefore, the engine size can be reduced for a turbocharged engine leading to better packaging, weight saving benefits and overall improved fuel economy, as well as reduced emissions.

Although turbocharging is a relatively simple concept, the turbocharger is critical to the operation of the diesel engine and therefore requires a highly engineered component. Our extensive experience in turbocharging technology and knowledge of engines combines for world-class design and manufacture of Holset Turbochargers, renowned for their durability, high standard of safety, and reliable performance that your engine demands.





How does a turbocharger work?

A turbocharger is made up of two main sections: **the turbine** and **the compressor**. The turbine consists of the **turbine wheel** and the **turbine housing**. It is the job of the turbine housing to guide the **exhaust gas** into the turbine wheel. The energy from the exhaust gas turns the turbine wheel, and the gas then exits the turbine housing through an exhaust outlet area.

The compressor also consists of two parts: the **compressor wheel** and

the **compressor housing**. The compressor's mode of action is opposite that of the turbine. The compressor wheel is attached to the turbine by a forged steel shaft, and as the turbine turns the compressor wheel, the high-velocity spinning draws in air and compresses it. The compressor housing then converts the high-velocity, low-pressure air stream into a high-pressure, low-velocity air stream through a process called **diffusion**. The compressed air is pushed into the engine, allowing the engine to burn more fuel to produce more power.



What is Wastegate Turbocharging?

Wastegate turbocharging provides a simple but effective way to control the turbocharger speed and boost pressure, improving boost capability at low engine speeds.

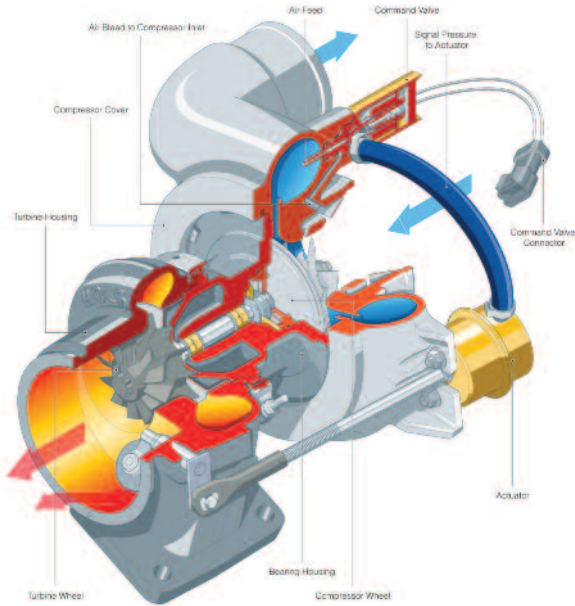
The size of the turbine housing must be chosen to ensure maximum turbocharger speed is not exceeded. This means that at lower engine speeds, the boost pressure is lower than required. If a smaller turbine housing is fitted, a higher boost pressure could be achieved from the compressor at each engine running condition. However, this causes the turbocharger to exceed the maximum allowable speed as engine speed increases, risking a catastrophic failure of the turbocharger, engine or both.

A wastegate turbocharger uses a small turbine to provide good boost at low engine speeds, but the turbocharger speed is controlled to a safe level with a wastegate valve.

How does it work?

When the desired boost pressure is reached, the wastegate valve opens to allow a percentage of the exhaust gas to bypass the turbine wheel and go directly to the exhaust pipe. This controls the speed of the turbine so the turbocharger can provide a higher boost pressure even when the engine is operating at low engine speeds.

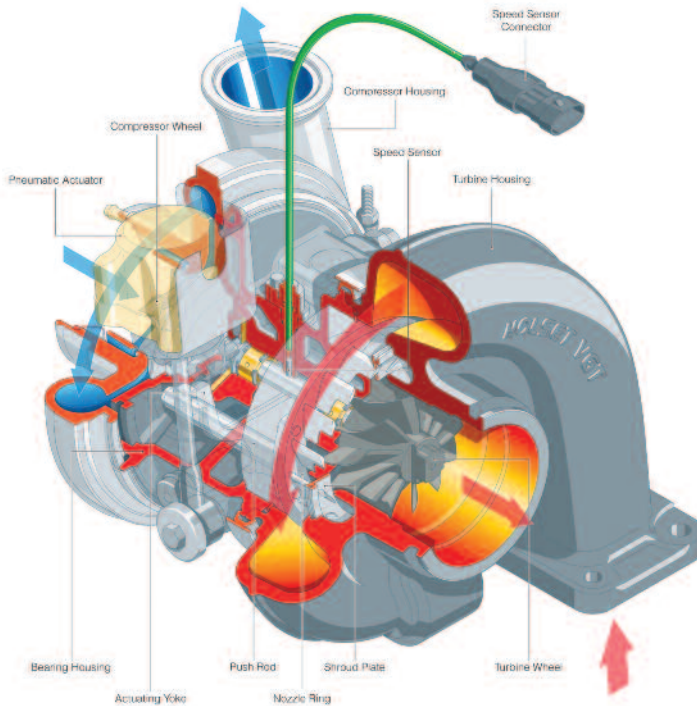




What is Variable Geometry Turbocharging?

The key to turbocharging is maximising and controlling the boost pressure over as wide a field of engine operation as possible. Variable geometry (VG) turbocharger technology provides sufficient energy to drive the compressor at the desired boost level wherever the engine is in its operating range. The control of boost pressure is achieved by varying the area of a nozzle, which is a set of guide vanes that control the flow of the exhaust gas through the turbine.

Conventional designs pivot the vanes to create different nozzle areas. The patented Holset VGT™ is unique because the vanes slide axially rather than pivot. This design has fewer wear sites, which improves the durability and reliability of the technology, essential for today's commercial diesel applications. In fact, Cummins Turbo Technologies' Holset VGT was the first successful VG technology on a commercial application, and we continue to be the only manufacturer to provide sliding nozzle technology.



Benefits of Holset VGT™

- **Good transient response** – Achieve the OEMs' intended driveability and response from the application and be confident in its performance
- **Improved fuel economy** – Reduce running costs
- **Increased useful engine operating speed range** – Maximise the boost across engine running range and reduce gear shifts
- **Enhanced compression brake capability** – Slow down quicker and reduce effort on application's wheel brakes
- **Proven durability and reliability** – Reduce down time for repair/replacements
- **Helps control Exhaust Gas Recirculation (EGR)** – Meet emissions regulations.

Engineered for Performance

Cummins Turbo Technologies addresses the extreme conditions a turbocharger faces with precision engineering and the selection of the right materials to ensure the reliable functioning, performance and ongoing safety of Holset Turbochargers.

Durability

The nature of highly cyclic applications, such as buses and refuse collection trucks, require the turbocharger to use durable components. For these applications, Holset Turbochargers are made with titanium impellers which are less prone to fatigue failure and make Holset Turbochargers as reliable and robust as possible for the demanding conditions these applications face.

Highly cyclic applications also mean high boost temperatures. Cummins Turbo Technologies uses cast-iron compressor covers to make Holset Turbochargers robust and durable, as well as making for a safer engine component.



Fit for purpose

Cummins Turbo Technologies' heritage and expertise means Holset Turbochargers are designed and manufactured with the experience to select the materials needed for the best possible performance for each application. By working closely with OEMs, we really understand the application and the conditions it will work under. This experience results in selecting materials that are application-specific, while providing the best possible value.



Through every step of the engineering and manufacturing process, Holset Turbochargers are designed to deliver optimum performance. But it doesn't stop there. We have a dedicated Aftermarket Engineering Support team where assistance is provided to customers by our engineers. Visit **www.holsetaftermarket.com** for more information.

Also, to make sure you get the intended functionality and performance from a Holset Turbocharger, Cummins Turbo Technologies works alongside carefully selected Authorised Holset Distributors. Visit your authorised distributor to ensure you receive genuine Holset parts and the intended value and performance your Holset Turbocharger can deliver.

**To find your nearest Authorised
Holset Distributor visit
www.holsetaftermarket.com**

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