Turbocharging

Exhaust-gas turbocharger with variable turbine geometry and electric actuator

**PRODUCT BENEFITS**

- Helps reduce fuel consumption and CO₂ emissions
- Supports compliance with emission standards
- Improved responsiveness for greater driving enjoyment (low-end torque)
- Outstanding longevity
- Optimum operating characteristic

1. Compressor housing
2. Compressor impeller
3. Radial bearing
4. Electric actuator
5. Turbine wheel
6. Variable turbine geometry
7. Turbine housing
8. Bearing housing
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TASK
Exhaust-gas turbocharging makes it possible to increase maximum torque and maximum engine power. Turbocharging delivers a greater mass of air into the combustion chamber, so that more fuel can be burned. Compared to naturally aspirated engines, this leads to higher power output for the same engine displacement and therefore to greater low-end torque. Conversely, a smaller engine version can be selected for a particular engine performance (known as downsizing). Downsizing reduces fuel consumption and, in turn, CO₂ emissions. This reduction is achieved mainly by a general load shift to higher load factors resulting in engine operating modes with higher efficiency.

FUNCTION
The exhaust-gas turbocharger (EGT) uses the energy from the exhaust to turbocharge the internal-combustion engine. Unlike mechanical turbocharging, the EGT does not need any mechanical drive power, thus resulting in lower fuel consumption in a direct comparison. The EGT consists of two turbo elements: an exhaust-gas turbine (wheel and housing), which absorbs the energy from the exhaust, and a compressor (impeller and housing), which compresses the intake air. Further assemblies are the core unit with rotor and bearing and the boost pressure control unit with variable turbine geometry (VTG), which uses adjustable blades to control boost pressure independently of engine speed.

TECHNICAL CHARACTERISTICS

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<th>Rotational speed measurement</th>
<th>rpm sensor</th>
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<td>Intake air compression</td>
<td>milled compressor impeller</td>
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<td>Actuator</td>
<td>electric actuator</td>
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<td>Boost pressure control</td>
<td>variable turbine geometry (VTG)</td>
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up to
140,000 rpm

The speeds the exhaust-gas turbocharger’s turbine can handle, thanks to excellent materials.

up to
750 °C

The operating temperature that the exhaust-gas turbocharger can permanently withstand.