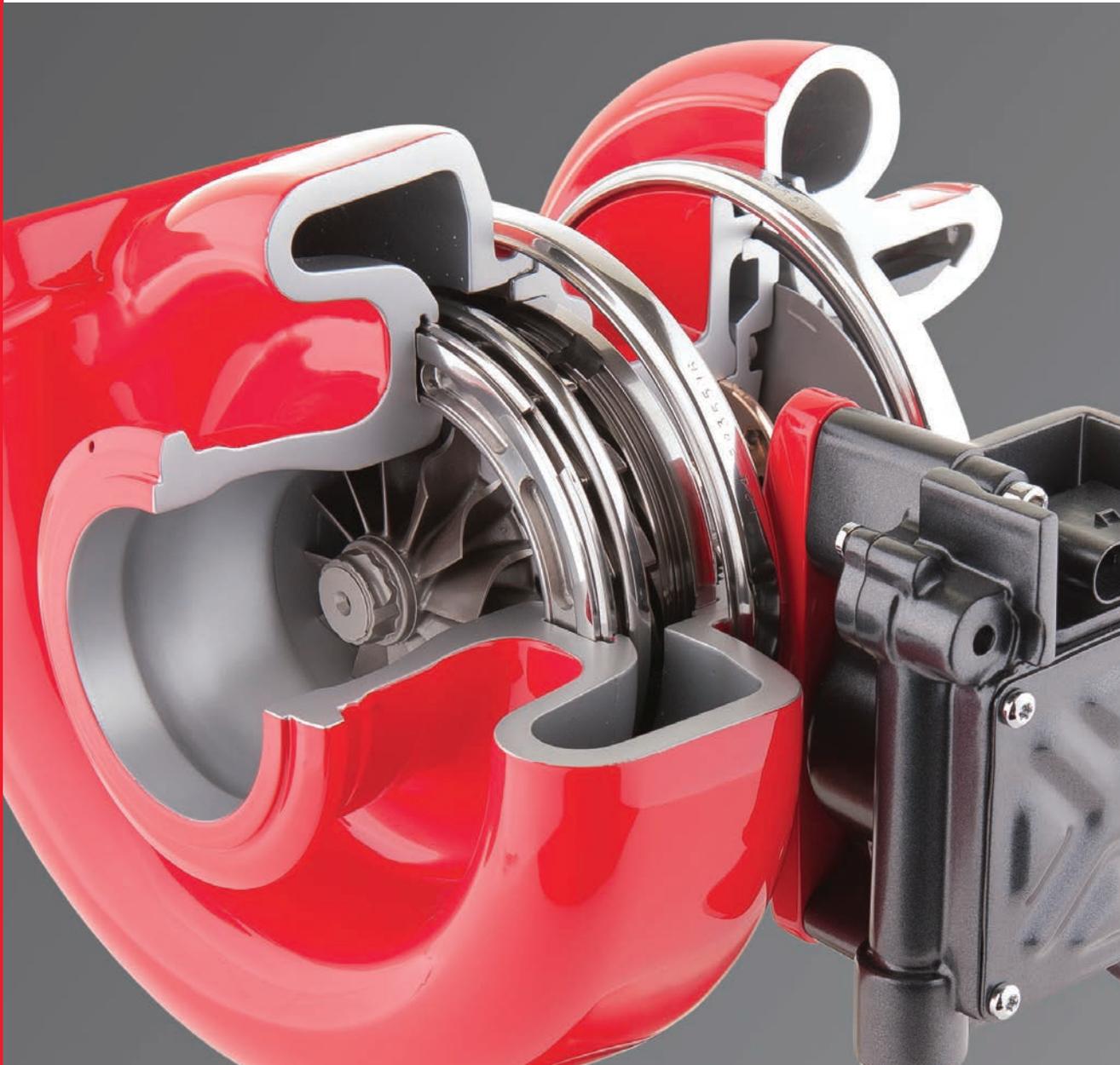




**Turbo
Technologies**

Cleaner Clearer Future –
Technology that Transforms



Next Generation Technologies

At Cummins Turbo Technologies we have been at the cutting edge of turbocharger technology for over 60 years; constantly innovating and introducing 'Industry Firsts'.

Our truly global technical and manufacturing centres ensure our continuous advances in the most efficient and durable future technologies capable of lowering engine emissions, minimising the impact on the environment and improving engine efficiency.

Next Generation HE300VG

Product Features

- 1 VG System and Actuator**
 - Cost efficient
 - Weight reduction
 - Packing improvement
- 2 Compressor Wheel Range**
 - Engine displacement 5 to 9 litres
- 3 Compressor Stage**
 - Efficiency improvement
 - Speed sensor location
- 4 Turbine Stage**
 - Efficiency improvement
 - Cost efficient
 - Weight reduction
 - Foreign Object Damage (FOD) improvement
 - High Cycle Fatigue (HCF) improvement
 - Improved transient response
- 5 Turbine Wheel Range**
 - Engine displacement 5 to 9 litres
- 6 Centre Stage**
 - Weight reduction
 - Cost efficient
 - Improved packaging
 - Angularity improvement

Customer Benefits

- Improved turbo efficiencies of up to 12% at low engine speed and 8.5% at high engine speed enabling improved fuel efficiency and reduced CO₂
- 10% lighter than current HE300VG resulting in improved fuel economy
- Reduction in materials cost
- Improved durability and performance through moving shroud VG mechanism design
- New actuator for reduced packaging and improved integration.

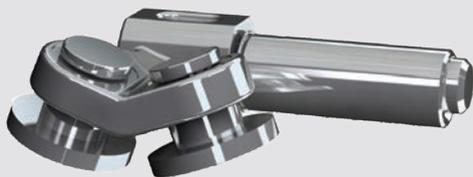


Electric Wastegate (eWG)

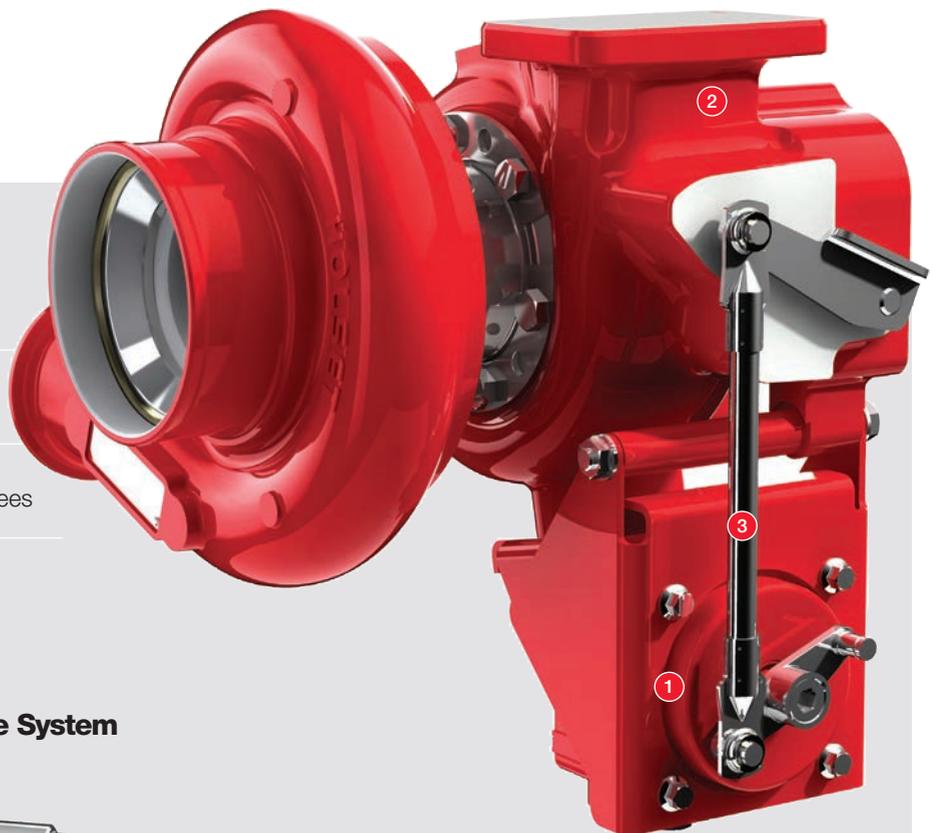
Product Features

- 1 Electric Actuator**
 - Turbine or compressor mounted
- 2 Turbine Stage**
 - Turbine inlet temps up to 850 degrees
- 3 Actuator Bracket**
 - Actuators available with and without watercooling

Available as Twin Port Wastegate System



- Allows gas to bypass the turbine wheel from both volutes on twin entry housings
- Stage flow can be increased up to 45% benefiting engine downsizing, down speeding and aftertreatment warm up
- Patented technology using an arrow head lever design:
 - Self-centering action gives good port sealing
 - Equal opening of both ports
 - Reliable, durable solution.

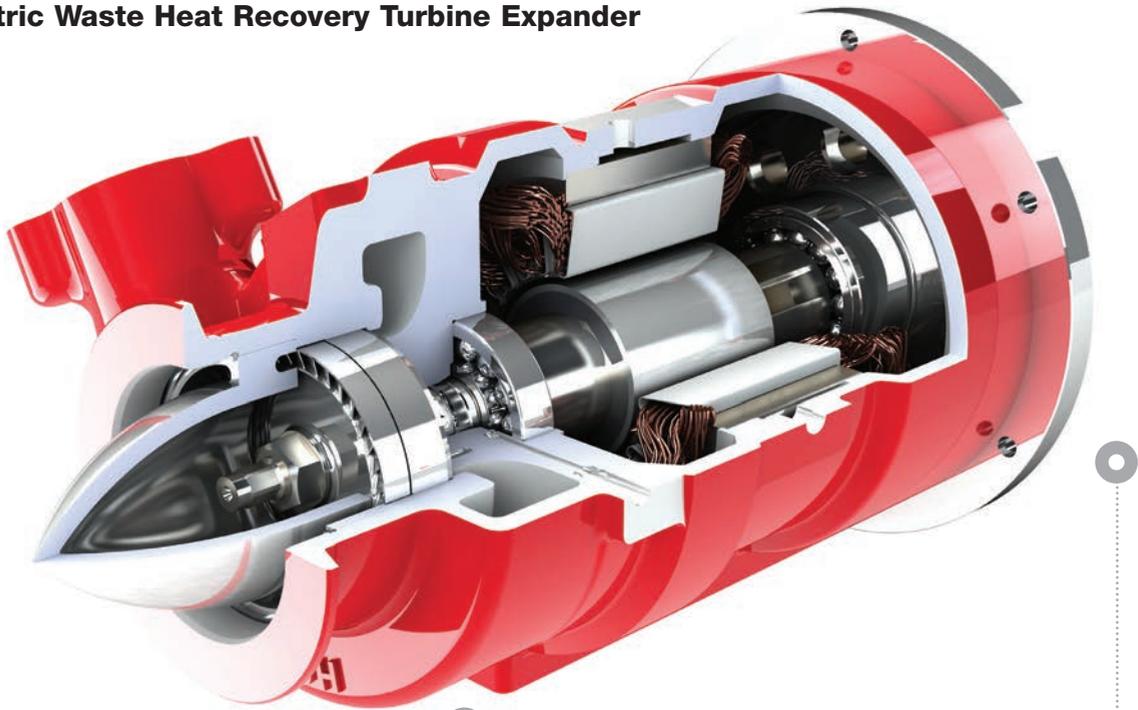


Customer Benefits of Electric WG Actuation

- Faster response and more precise control helps improve engine performance, fuel efficiency and emissions control
- Flexible electric actuator solutions for different applications
- Optimised aftertreatment operating conditions for emissions control
- Available with a patented twin port wastegate technology providing greater durability and robustness.

Technology that Transforms

Electric Waste Heat Recovery Turbine Expander



Electric Waste Heat Recovery

- Captures what would otherwise be lost energy, in the form of heat, from a number of sources onboard the vehicle and turns it into electrical (15kW_e) power
- Uses organic Rankine cycle – the working fluid is pumped to a boiler where it is evaporated, passing through an expansion device (Cummins Turbo Technologies' Electric Turbine Expander) to create work and then through a condenser where it is returned to a liquid again.

Customer Benefits of Waste Heat Recovery

- Reduces fuel consumption
- Reduced CO₂
- Supplementary ways of feeding a hybrid system with additional power.



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