TURBO CHARGER POWER SOLUTIONS

A GUIDE TO MAXIMUM ENGINE PERFORMANCE

Engineering the Future – since 1758.
MAN Diesel & Turbo
POWERING THE WORLD — RESPONSIBLY
MAN Diesel & Turbo is the world’s leading provider of large-bore diesel engines and turbomachinery. Our portfolio includes four-stroke and two-stroke engines for marine and stationary applications, turbochargers and propellers, gas and steam turbines, compressors and chemical reactors. In fact, around 50 percent of all global ocean-going trade is today powered by MAN engines.

Moreover, we have a long and successful track record in the development of exhaust gas turbochargers for low-, medium- and high-speed diesel and gas engines. Drawing on its unrivalled expertise in the design and manufacture of this crucial engine component, MAN Diesel & Turbo can offer you world-leading technology — that helps you maximize the efficiency of your operations.
SIMPPLICITY
KEEPING LIFE SIMPLE

MAN Diesel & Turbo turbochargers are designed to deliver peak performance throughout their working lives – under some of the harshest conditions encountered anywhere in the world. This is achieved by combining three elements: simplicity, flexibility and reliability.

For example, we develop and build our turbochargers to make installation, operation, servicing and maintenance as easy and efficient as possible. This reduces your initial capital investment and results in lower lifecycle costs.
MAN TCR turbochargers were created to address the very special challenges faced by HFO, MDO, biofuel and gas engines. Products are available for the entire engine power range, from 350 kW to 7 MW per turbocharger.

MAN TCR turbochargers are IMO Tier III compliant, and represent a robust, versatile modular platform – suitable for a wide variety of high-, medium- and low-speed engine applications.
THE SPECIALIST PERFORMER
The latest generation of MAN TCR turbochargers offers reduced size and weight while delivering greater efficiency, performance and reliability. Advanced materials ensure extended overhaul intervals, easier maintenance and a longer life.

Benefits
- Modular design
  Fulfill all relevant engine-side requirements
- Easy to maintain and service
  Maintenance can be carried out with standard tools
- Variable turbine area optionally available
  Airflow through MAN TCR turbochargers can be controlled by MAN VTA technology
- Condition-based component maintenance
  Parts are replaced on the basis of component condition, increasing component life and lowering costs
- Easy installation
  Compact, pipeless design ensures easy installation

Applications
- Marine Propulsion
- Marine GenSets
- Power Generation
- Excavators
- Mining
- Off-road Vehicles
- Locomotives
- Mechanical Drives
MAN TCA turbochargers are suitable for four-stroke and two-stroke gas, diesel and dual-fuel engines in applications ranging from 3 MW up to 30 MW output per turbocharger.

Using fewer parts than any other generation of MAN axial turbochargers has reduced maintenance and service times, ensuring lower lifecycle costs. MAN TCA turbochargers meet all the latest environmental emissions standards.
POWER AND RELIABILITY IN ONE
MAN TCA turbochargers are high-performance solutions characterized by ease of maintenance and long overhaul intervals. Modular design and a reduced number of components, suitable for all fuels and gases, have contributed to outstanding lifecycle costs. MAN TCA turbochargers are compliant with IMO Tier II and III.

Benefits
- Long intervals between overhauls and long component life
- Condition-based component maintenance
  Parts are replaced on the basis of component condition, increasing component life and reducing costs
- Easy to maintain and service
  Maintenance can be carried out with standard tools
- Variable turbine area optionally available
  Airflow through MAN TCA turbochargers can be controlled by VTA technology

Applications

MARINE PROPULSION  POWER GENERATION
MAN ECOCHARGE two-stage turbocharging is suitable for high- and medium-speed engines of all fuel types in applications for all engine power ranges.

Extremely high efficiencies and pressure ratios enable increased power density and allow improvements to key engine parameters. For example, it is possible to use a smaller engine for the same required power output, or to achieve lower NOx emissions and lower specific fuel oil consumption (SFOC).
KINDER TO THE ENVIRONMENT
As a compact two-stage unit, the MAN ECOCHARGE delivers outstanding turbocharging efficiency. A variety of product types and sizes are available, ensuring the perfect turbocharger-to-engine fit. Higher scavenging air pressure and efficiencies allow improved Miller timing, enabling compliance with IMO Tier III emission legislation.

Benefits

- Lower specific fuel oil consumption (SFOC)
  Increased turbocharging efficiency for reduced SFOC

- Lower exhaust emissions (NOₓ)
  Higher scavenging air pressures of up to 10.5 bar allow improved Miller timing for lower NOₓ emissions

- Compact design
  Integrated and modular design reduces the overall dimensions of the MAN ECOCHARGE unit

- Improved dynamic response
  Smaller high-pressure stage turbocharger, with reduced mass inertia, for improved dynamic response

Applications

- MARINE PROPULSION
- MARINE GENSETS
- POWER GENERATION
- EXCAVATORS
- MINING
- OFF-ROAD VEHICLES
- LOCOMOTIVES
- MECHANICAL DRIVES
The EGR blower MAN ETB is suitable for exhaust gas recirculation (EGR) engines of all fuel types in all application ranges.

Specifically designed for EGR systems, the MAN ETB’s active control plays an important role in enabling these systems to reach IMO Tier III emission standards. The required EGR operating conditions are achieved by using a high-speed electric motor directly coupled to the compressor wheel and controlled by a frequency converter.
ROBUST
IMO TIER III
PERFORMANCE
Low consumption

Improved thermodynamic efficiencies allow extremely low energy consumption.

High durability

All materials have been designed for highly corrosive atmospheres.

The MAN ETB features a highly efficient blower wheel, optimized for low pressure ratios. The materials used are designed to withstand corrosive agents. High blower availability and variable speed operation ensure IMO Tier III compliance in emission controlled areas (ECAs).

Benefits

- Low consumption
  Improved thermodynamic efficiencies allow extremely low energy consumption
- High durability
  All materials have been designed for highly corrosive atmospheres
- Smart control for stable EGR flow
  EGR flow is controlled by a high-speed electric motor. The MAN ETB is integrated into the engine control system.

Applications

MARINE PROPULSION
STRIKING THE RIGHT BALANCE

Maximum efficiency is rarely achieved by deploying the most powerful solution available. The answer is to precisely identify your goals, and how to achieve them — and to then apply knowledge and experience to strike the right balance between cost and function.

MAN turbocharger technology enables exceptional flexibility when striving to find the perfect blend of performance and energy efficiency. Aligning turbocharger specifications with engine-side requirements plays a key role.

But it is not about the maximum possible product ratings. It is about the best fit. We have a comprehensive product portfolio, and are proven experts in precisely matching the right turbocharger to the engine.
Flexible air and fuel management are key to meeting the emissions legislation of the future while increasing engine performance and reducing specific fuel oil consumption (SFOC). In heavy fuel oil applications, MAN VTA (variable turbine area) technology has a powerful and positive role to play.

The MAN VTA system can be optionally fitted to both MAN TCA and MAN TCR turbochargers. It enables the charge air volume to be precisely matched to the quantity of injected fuel across all points of an engine’s load and speed range. The result is increased engine efficiency, reduced SFOC, lower HC and CO₂ emissions and improved engine response.
RELIABILITY
PROVEN PERFORMANCE

As a global leader in pioneering turbocharger technology, we have built our reputation on the quality, efficiency and reliability of our products. Today, the average MAN turbocharger is capable of running continuously for up to 30,000 operating hours between overhauls. That is more than five whole operating years. We extensively test all our turbochargers before they are launched, ensuring that you enjoy the highest standards of safety and reliability.

When a ship is battling through a Force 10 gale, the last thing the crew wants to worry about is the turbochargers. With MAN, they will not need to. Over the last 80 years, MAN and our licensees have built and installed around 60,000 turbochargers. And the experience and knowledge we acquire flows into our continuous improvement processes.
MAN PrimeServ

MAN PrimeServ is the service brand of MAN Diesel & Turbo. Through its network of more than 100 service centers worldwide, MAN PrimeServ offers 24/7 service around the globe – always ensuring proximity to its customers. Its range of services includes extensive support, individual consulting and OEM spare parts as well as maintenance, repairs of engines and machinery and comprehensive service agreements tailored to individual needs. A broad range of retrofits and upgrades ensure state-of-the-art technology for machines already in operation. By implementing cutting-edge digital technology, MAN PrimeServ enables customers to optimize their equipment’s performance and maximize availability and uses remote connections to analyze live data and provide quick solutions. Customers receive extensive training in MAN PrimeServ academies around the world.

We also offer retrofits and upgrades, bringing engines and turbochargers already in operation up to the very latest standards of performance and efficiency. Harnessing the latest digital technology, we help you to maximize the performance and availability of your MAN equipment by means of real-time data analytics, remote support and rapid solutions. Moreover, we offer an extensive range of training courses at MAN PrimeServ academies around the world.
MAN PrimeServ professionals can help you to significantly improve engine performance, extend engine life, and lower emissions and operating costs. We can also rematch or modify existing turbochargers or upgrade them to the latest MAN VTA technology.

**Benefits**
- Reduced exhaust gas temperatures
- Increased availability of spare parts
- Improved engine output
- Enhanced operational engine performance
- Lower specific fuel oil consumption (SFOC)
- Reduced downtime and longer engine life
- Longer intervals between overhauls
MAN PrimeServ

To ensure that you gain maximum value from your investment in MAN Diesel & Turbo turbochargers, we offer comprehensive training at MAN PrimeServ Academies. These are designed to give crew members and service engineers the professional skills they need to operate and maintain our products safely and efficiently, minimizing downtime and lifecycle cost.

We currently have 13 MAN PrimeServ Academies in nine countries across four continents. Training can be provided in English or your local language.
Technical Data

**MAN TCR Turbocharger Application Ranges**

<table>
<thead>
<tr>
<th>Type</th>
<th>Supercharged Engine Output</th>
<th>Max. Permissible Speed</th>
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<tbody>
<tr>
<td></td>
<td>Two-stroke</td>
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<td>MAN TCR22</td>
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<td>6,850</td>
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</tbody>
</table>

Specific air consumption (le) 7.0 kg/kWh 6.5 kg/kWh
## MAN TCA Turbocharger Application Ranges

<table>
<thead>
<tr>
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<tbody>
<tr>
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</table>

Specific air consumption (le) 7.0 kg/kWh 6.5 kg/kWh
THE HEART OF YOUR ENGINE...

AN INTERACTIVE EXPERIENCE
Download our MAN Brochure Store app from the AppStore. Use its exciting interactive features to explore our complete range of products and services. Suitable for iPhone or iPad.

EXPLORE OUR LATEST NEWS VIA AN APP
DieselFacts brings you the most recent news from the world of two-stroke and four-stroke engines, including the latest technical papers, in-depth features and videos.
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