32/44CR
Four-stroke diesel engine

Engineering the Future – since 1758.
MAN Diesel & Turbo
MAN Diesel & Turbo is the world’s leading designer and manufacturer of low and medium speed engines. With our range of large stationary gas and diesel engines, we are a reliable partner for power generating companies, regardless of whether the energy is fed into the power grid or destined for local supply purposes.

From fuel depot to transformer station, MAN Diesel & Turbo offers one-stop solutions. Our involvement with electrical power generators goes back to 1904 when we supplied the first ever diesel generator sets to the Kiev Tram System.

Since those early days, MAN Diesel & Turbo has never lost its technological pre-eminence in the large engine field. Likewise, our engines have never relinquished their status as the most efficient combustion engines available.

More than ever before, MAN Diesel & Turbo’s development focus is on the environmental performance of our engines. Using our unrivalled grasp of large engine technology, we aim to make our engines progressively cleaner, more powerful and more efficient.

With our absolute commitment to reducing emissions while increasing fuel efficiency and power density and our pro-active involvement in the emissions law making process, we intend to be part of the global emissions solution.
A notable reduction in NOx, CO2 and soot emissions is a strategical factor for success of modern diesel engines. Therefore it is the entire aim of MAN Diesel & Turbo to develop and use the best technologies and measures to fulfil the latest exhaust emission limits of World Bank 2007/2008.

Common rail injection
The 32/44 common rail injection system uses the latest MAN Diesel & Turbo common rail technology which allows flexible setting of injection timing, duration and pressure for each cylinder. This flexibility allows the fuel consumption and emissions of the 32/44CR to be optimised on its operating profile. Due to constant development of our safety concept the redundant high pressure pumps guarantee further operation of the engine even in the event of high pressure pump malfunction.

Miller valve timing
To reduce the temperature peaks which promote the formation of NOx, early closure of the inlet valve causes the charge air to expand and cool before start of compression. The resulting reduction in combustion temperature reduces NOx emissions.

High pressure ratio turbocharger
The use of MAN Diesel & Turbo turbochargers equipped with the latest high-efficiency compressor wheels can alleviate the NOx-SFOC trade-off. The higher pressure ratio increases the efficiency of the engine and thus compensates the increase in SFOC normally associated with lower NOx emissions. The higher pressure ratio also increases the scope for Miller valve timing.

VVT – Variable valve timing
Variable valve timing enables variations in the opening and closing of the inlet valves. It can be used to compensate the increase in SFOC associated with lower NOx emissions. VVT is an enabling technology of variable Miller valve timing. A strong Miller effect under high load operation results in an improvement in the NOx-SFOC trade-off. At low load the Miller valve timings are reduced to attain higher combustion temperatures and thus lower soot emissions.

Committed to the future
Technologies which promise the compliance with future emission limits combined with further optimised fuel consumption and new levels of power and flexibility are already under development at MAN Diesel & Turbo. With this level of commitment MAN Diesel & Turbo customers can plan with confidence.

Core technologies in-house
As well as its expertise in engine design, development and manufacture MAN Diesel & Turbo is also a leading manufacturer of the key technologies which determine the economic and ecological performance of a diesel engine:

- High-efficiency exhaust gas turbochargers
- Advanced electronic fuel injection equipment
- Electronic hardware and software for engine control, monitoring and diagnosis

Our impressive array of computer-aided design tools and one of the engine industry’s largest, best-equipped foundries allow us decisively to shorten product development, and application engineering processes. Our mastery of these engine technologies – and, the best brains in the large engine industry – are the firm foundation for:

- Low emissions
- Low operating costs
- Low life cycle costs
- Long service life

The range of technical measures employed comprises:

- Improved charge air cooling
- Enhanced turbocharging
- Miller valve timing
- Revised injection timing
- Higher compression ratios
- Low swirl inlet ports
- Variable valve timing (VVT)
Engine Specifications
Highest power in class meets high availability

The actual 32/44CR engine represents the newest technologies in the area of medium speed operated industrial sized diesel engines. By the use of electronic injection, high efficiency turbochargers, electronic hardware and variable valve timing the 32/44CR is a synthesis of the most advanced large engine technologies available.

Injection
The patented common rail injection system from MAN Diesel & Turbo is based on the following principle: High pressure pumps compress the fuel to the required pressure and deliver it to the inline accumulator units (common rail). At the accumulator units are connections for the injection valves and also the components for fuel distribution and injection control. The common rail system achieves its high level of flexibility by consistent separation of pressure generation and injection control.

Electronics
The 32/44CR is equipped with the newest generation of proven MAN Diesel & Turbo engine management system. SaCoSone breaks down all functions of modern engine management into one complete system. Through integration on the engine, it forms one unit with the drive assembly. SaCoSone offers:
- Integrated self-diagnosis functions
- Maximum reliability and availability
- Simple use and diagnosis
- Quick exchange of modules (plug in)
- Trouble-free and time-saving commissioning

Fuels
The common rail injection system of the 32/44CR was designed for operation with heavy fuel oil (HFO) in accordance with specification DIN ISO 8217 (viscosities up to 700 cSt at 50°C) and fuel temperatures up to 150°C.

Components
The 32/44CR is equipped with the newest generation of MAN Diesel & Turbo turbochargers (TCR). Based on positive experiences from the 32/40, important power unit components, such as crankshaft, conrod and piston, were optimised for increased performance. It was ensured in this way that the 600 kW/cyl. engine has the tried and tested good wear properties for which MAN Diesel & Turbo engines are wellknown throughout the world.

More output at lower fuel consumption
Development of the 32/44CR has benefited from many years of experience of industrial sized diesel engine architecture and also knowledge from detailed research and developed plans. As a result, the output of the engine was substantial increased and at the same time the fuel consumption was significantly reduced.

High efficiency turbochargers
MAN Diesel & Turbo turbochargers with increased pressure ratios compensate the shorter inlet valve opening times of the Miller cycle. This ensures that the quantity of combustion air entering the cylinder and thus engine performance and efficiency remain unaffected. Paralleling the fuel injection flexibility of common rail systems is the air management flexibility of the MAN Diesel & Turbo’s high efficiency turbocharger systems with variable output.
32/44CR – made for Power Applications

Benefits at a glance

- High efficiencies
- Compact design
- Low operating costs (SFOC, SLOC)
- Low maintenance cost
- Low exhaust emissions
- Low noise emissions
- MAN proven robustness
- Easy to operate – simple to maintain
- High reliability – long maintenance intervals
**Definitions 32/44CR**

- **Engine cycle:** Four-stroke
- **Turbocharging system:** Constant pressure
- **No. of cylinders, In-line engine:** 8, 10
- **No. of cylinders, V-engine:** 12, 16, 20
- **Bore:** 320 mm
- **Stroke:** 440 mm
- **Displacement per cylinder:** 35.4 l

**Cylinder output (MCR)**
At 750/720 rpm: 600/580 kW

**Power unit output**
Between 6,786 kWₑ and 11,700 kWₑ

**Cooling**
- Cylinder cooling: Cooling water
- Charge-air cooling (two-stage): Fresh water
- Fuel injector cooling: Cooling water

**Starting method**
- In-line and V-engine: air (turbine) starter

**Emissions**
The engines comply with the World Bank guidelines for thermal power plants.*

**Note**
The electrical power quoted depends on the make of alternator. Power and consumption values may vary according to specific configuration.

---

**Technical Data 32/44CR**

**General performance definition for diesel engines as per ISO 30461/1-2002**

- **ISO reference conditions:**
  - Air temperature: 298 K (25°C)
  - Air pressure: 1 bar
  - Fresh water temperature upstream of charge-air cooler: 298 K (25°C)
  - Relative humidity: 30%

- **No power reduction required below:**
  - Air temperature: 318 K (45°C)
  - Air pressure: 1 bar
  - Fresh water temperature upstream of charge-air cooler: 311 K (38°C)

**The consumption figures stated refer to the ISO reference values listed above and an engine type specific reference charge air temperature before cylinder of 49°C. The heat rate for diesel operation refers to fuel oil with a lower calorific value (LHV) of 42,700 kJ/kg. Consumption figures are given with a tolerance of ±5% and without engine-driven pumps. The specific lube oil consumption is specified at MCR with a tolerance of 20%.

**Specific fuel oil consumption in diesel operation:**
\[(g/kWh) = \frac{\text{heat rate} \times 1000}{\text{LHV}} \]

**Electr. GenSet heat rate at 100% load**
- **World Bank 2007/2008**: 6,793 kJ/kWh
- **World Bank 1998**

**Nominal generator efficiency**
- **V-type:** 97.5%

---

* For powerplants < 300 MWₑ
## Dimensions and Weights

V-engine: all cylinder numbers

### V-engine V32/44CR

<table>
<thead>
<tr>
<th>Engine type</th>
<th>No. of cyl.</th>
<th>A (mm)</th>
<th>B* (mm)</th>
<th>C* (mm)</th>
<th>W (mm)</th>
<th>H (mm)</th>
<th>Dry mass (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V32/44CR</td>
<td>12</td>
<td>7,055</td>
<td>4,376</td>
<td>11,431</td>
<td>4,200</td>
<td>5,000</td>
<td>117</td>
</tr>
<tr>
<td>20V32/44CR</td>
<td>20</td>
<td>9,575</td>
<td>4,376</td>
<td>13,951</td>
<td>4,260</td>
<td>5,200</td>
<td>172</td>
</tr>
</tbody>
</table>

* Depending on alternator; nominal generator efficiency: 97.0%
The PrimeServ offering
The MAN Diesel & Turbo Group offers worldwide, round-the-clock service, 365 days a year. In addition to MAN Diesel & Turbo’s service headquarters in Augsburg, Copenhagen, Frederikshavn, Saint-Nazaire, Hamburg and Stockport, service centers on all continents provide comprehensive and continuous support.

MAN Diesel & Turbo engines are renowned for their quality and durability. We are a global organization with a strong local presence, delivering exceptional field service management, tailor-made solutions, and first-class technical support.

PrimeServ provides advice and assistance to customers throughout the product lifecycle, from delivery to resale. With our far-reaching network of Service centers, we respond rapidly to customer needs. What’s more, we offer outstanding service and unrivalled technical expertise. Plus, we only use genuine spare parts – safeguarding the longevity of your engine.

PrimeServ’s aim is to provide:
- Prompt delivery of high demand OEM spare parts within 24 hours
- Fast, reliable and competent customer support
- Individually tailored O&M contracts
- Ongoing training and qualification of operators and maintainers
- Global service, open 24 hours-a-day, 365 days-a-year
- Diagnosis and troubleshooting with our high performance Online Service

World-Class Service
Marine propulsion, gensets and stationary plants