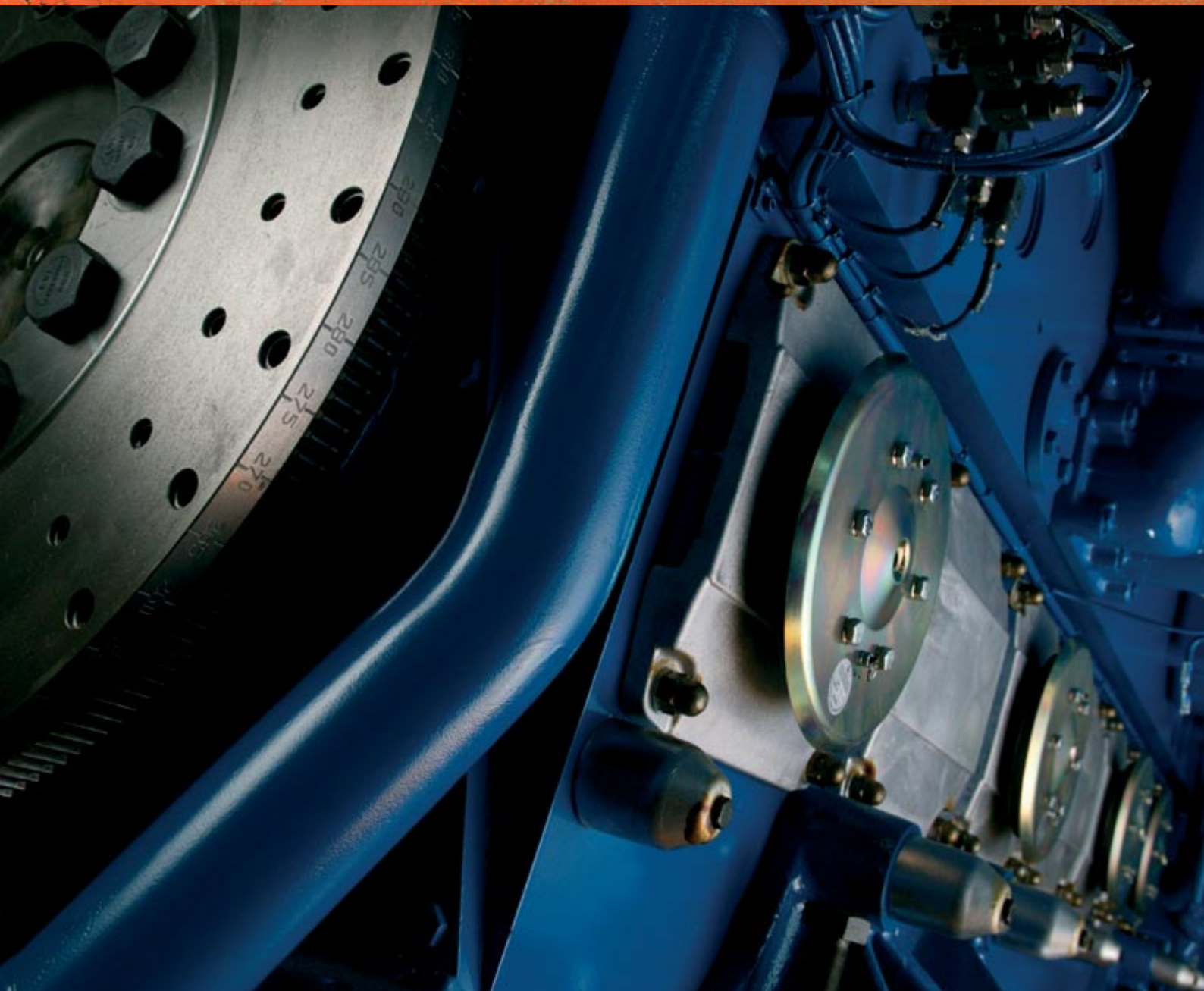
WÄRTSILÄ

WÄRTSILÄ 26

TECHNOLOGY REVIEW




WÄRTSILÄ

WÄRTSILÄ 26

TECHNOLOGY REVIEW

This is a brief guide to the technical features and advantages of the Wärtsilä 26 engine.

Dredger Daniel Laval is equipped with two Wärtsilä 9L26 engines.

Fishing vessel Nordoytrål is equipped with a Wärtsilä 12V26 engine.

Dry cargo vessel Morgenstond is equipped with a Wärtsilä 9L26 engine.

Naval vessel De Zeven Provincien is equipped with two Wärtsilä 16V26 engines.

Semi-submersible platform Thunder Horse PDQ is equipped with a Wärtsilä 12V200 engine, two 6L20 engines, two 18V26 engines and two 18V32 LNE engines.

DESIGN PHILOSOPHY

Wärtsilä engine designs are based on generations of know-how combined with innovations in response to customer needs. They are also fully optimized for today's flexible manufacturing methods.

The WÄRTSILÄ® 26 engine offers the following core values:

- Easy space-saving installation
- Easy to install
- High availability
- Environmental friendliness
- Low operating costs.

The Wärtsilä 26 was developed in response to a need in the market for a new engine in the 260 mm cylinder bore class. The Wärtsilä 26 represents the latest technical advances,

combining fuel economy and low emission rates with high fuel versatility. The shortest and lowest engine in its class, the Wärtsilä 26 requires minimum space in the engine room.

Wärtsilä works in close co-operation with its customers when conducting field tests and monitoring selected test components. This has resulted in satisfied customers: 720 engines have been manufactured or are on order since the new design in 1996.

With fewer parts, lower maintenance requirements, low fuel consumption, less emissions, and the ability to run reliably on a variety of fuels, the Wärtsilä 26 is unquestionably the state-of-the-art in marine propulsion.

LOW NO_X COMBUSTION

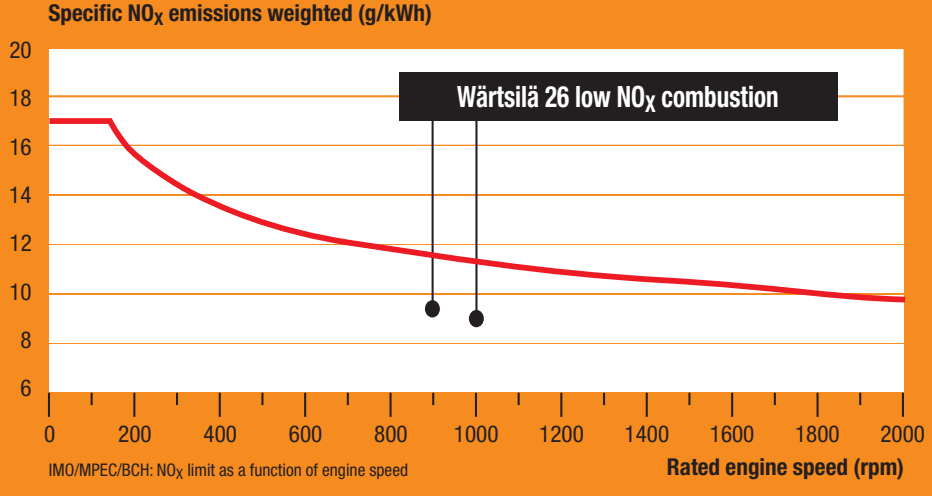
IMO NO_X COMPLIANCE

Any hydrocarbon fuel can be burned provided the fuel temperature is right and there is sufficient oxygen. However, the way it is burned has a great effect on the engine's thermal efficiency and exhaust emissions, particularly NO_X formation. The Wärtsilä 26 has been developed to perform with the optimum load acceptance and efficiency, while keeping emission levels substantially below the limits set by the IMO (International Maritime Organization). The engine is delivered with an EIAPP (Engine International Air Pollution Prevention) Statement of Compliance as well as a Technical File listing the parts that influence NO_X formation to enable correct identification of these parts.

The combustion is optimized by means of a:

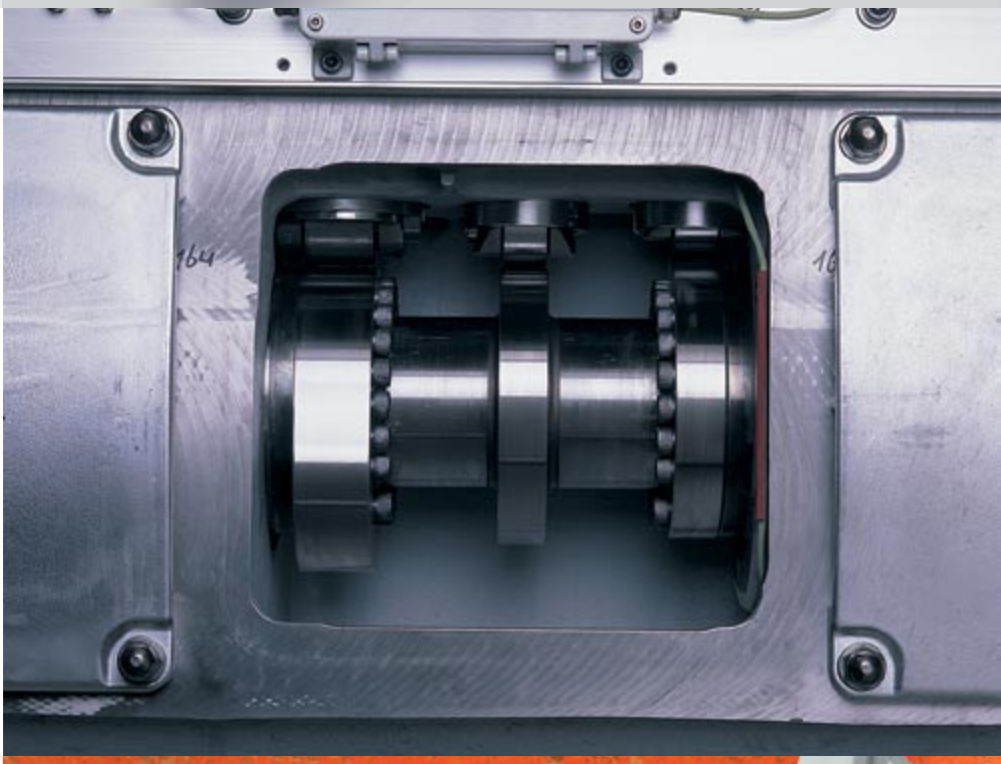
- High compression ratio that ensures a higher combustion air temperature to reduce the ignition delay, and a
- High fuel injection pressure for short injection duration, making the combustion take place at the optimal point with respect to efficiency and reduction of NO_X.

IMO NO_X LIMIT FOR NEW ENGINES



PISTON AND PISTON RINGS

The piston design consists of a forged steel crown and nodular cast iron skirt with pressurized skirt lubrication. The three-ring pack comprises two ceramic chromium-plated compression rings and an oil distributor ring. This ring pack ensures optimum pressure distribution and reduces lubricating oil consumption. The combustion chamber ensures efficient combustion at all loads, while the component temperatures are kept low.

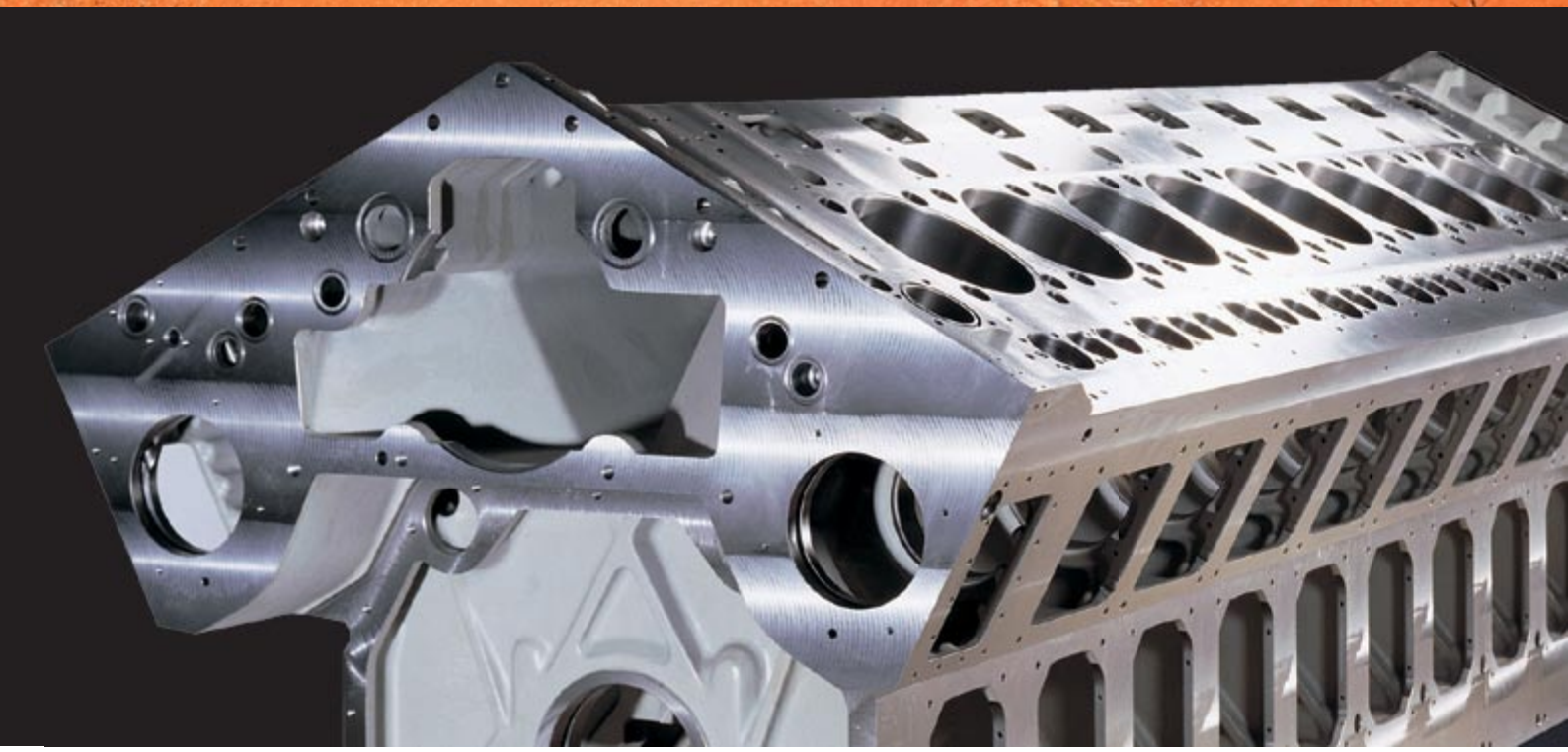


CONNECTING ROD

The connecting rod has a horizontally-split bottom end to obtain minimal length and high rigidity. It has only one single drilled hole, without plugs, for the flow of lubricating oil to the piston, securing oil supply under all circumstances without risk of leakage.

CAMSHAFT

The camshaft is composed of individual single-cylinder units with bolted flange connections to separate journals. The flanges are formed by cams, allowing maximum rigidity for the fuel cam loads. Valve tappets are built into modules integrated in the engine block, which ensures easy maintenance and reliable operation.



MAIN BEARING

The geometry of the main bearing creates an oil film thickness which greatly exceeds the safety margins set by the bearing manufacturers, in accordance with the 'Thick Pad' philosophy of Wärtsilä. The studs and nuts of the bearing caps are hydraulically tensioned.

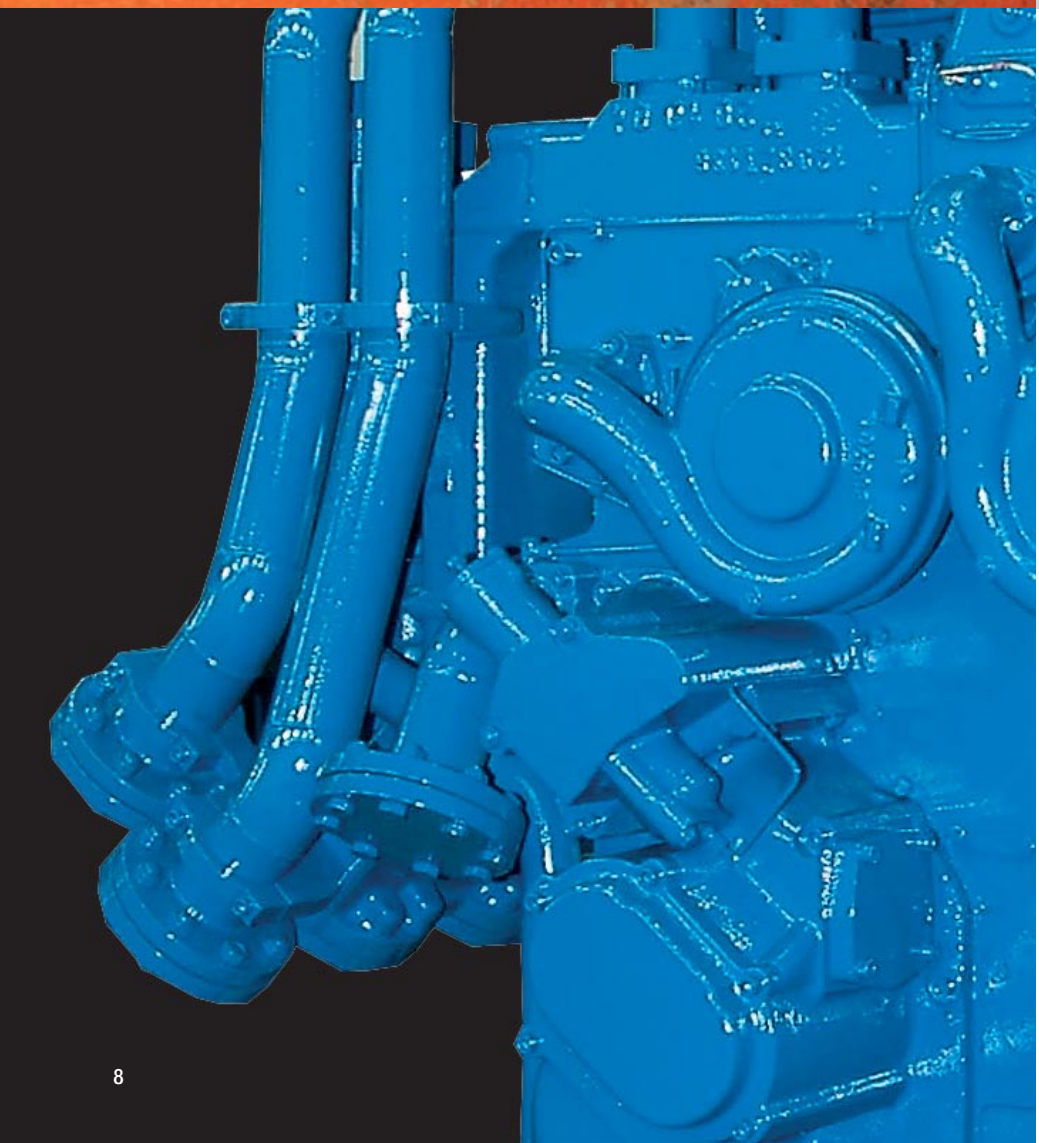
CRANKSHAFT

Special attention has been given to optimizing the various geometrical characteristics, such as cylinder distance, to achieve a space-saving solution. Three-dimensional finite-element analysis has been used to achieve the optimal result with maximum overall rigidity and moderate bearing loads. All criteria of the classification societies are met with large margins. The engine can be delivered with a 100% power take-off shaft at the free end.

ENGINE BLOCK AND FOUNDATION

The combination of design elements such as underslung crankshaft, integral air receiver, short cylinder distances, and material choice has resulted in a very rigid engine block.

The camshaft bearing environment forms an integral part of the engine block, contributing to its overall stiffness and taking the large forces caused by actuation of the fuel pumps. Bolted-on engine feet facilitate installation in all kinds of seating arrangements, including resilient mounting.



CYLINDER LINER WITH ANTI-POLISHING RING

Flanged liner with tangential water flow, and symmetrically supported at the top. Anti-polishing ring removes the carbon from the top land of the piston, thereby preventing liner polishing. This system results in a drastic reduction of cylinder wear, lower lubricating oil consumption and a clean piston.

CYLINDER HEAD

The use of four cylinder head studs offers easy access for maintenance, while requiring less space. Rigidity of the cylinder head design ensures adequate and uniform sealing between cylinder head and liner.

Rigidity of the flame plate prohibits deformation of the valve seat environment. The thick flame bottom has drilled cooling water passages to prevent thermal stresses. Low thermal loads and careful selection of valve and seat material result in excellent valve reliability.

FUEL SYSTEM

Fuel feed and return lines are integrated in the fuel pump housing. This results in fewer pipe connections and therefore high reliability. Shielded high-pressure lines and the 'hot box' design contribute to safety, especially in heavy fuel operation. The pressure pulses in the low-pressure system are very low.

FUEL INJECTION SYSTEM

The Wärtsilä 26 fuel injection system achieves the optimum fuel spray pattern and droplet size. Proper dimensioning of the camshaft, camshaft bearings and rollers ensures long lifetimes and low maintenance costs.

ENGINE-DRIVEN PUMPS

Engine-driven lubricating oil and cooling water pumps are an integral part of the engine.

All pumps are located on the free end of the engine, allowing easy connection to the ancillary systems. Using engine-driven pumps reduces the total investment costs for the shipowner.

AIR INTAKE AND EXHAUST SYSTEM

Turbochargers are designed for high compression ratios and high efficiencies at all loads. The charge air receiver is designed for minimum pressure variation and good engine 'breathing'. The exhaust system has a flow-optimized design. Its modular construction ensures easy assembly.

Insulation is provided by insulating panels which are easily removable for inspection.

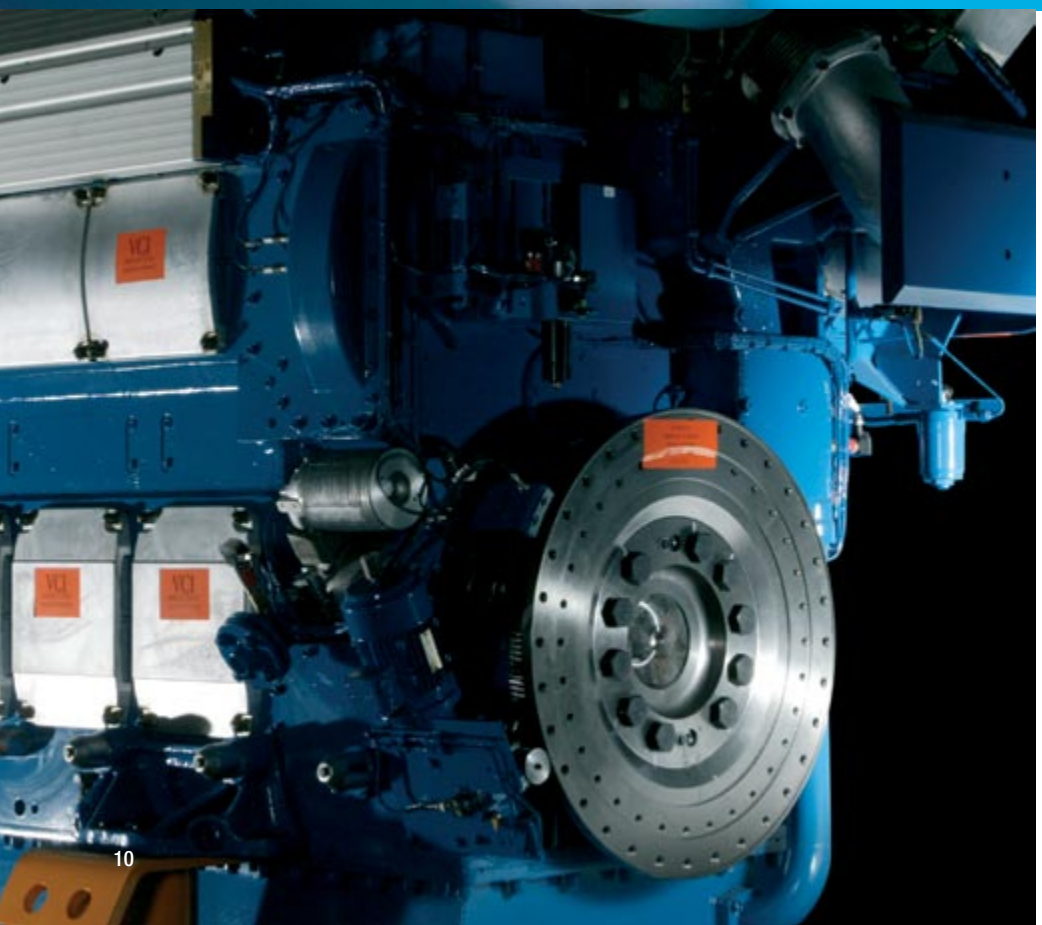
The V-engine is equipped with a two-stage charge air cooler to maximize the heat to be recovered. The charge air cooler is housed in a multifunctional casting which also incorporates the turbocharger support.

AUTOMATION SYSTEM

The engine is equipped with a scaleable engine automation system:

- The basic version (UNIC C1) consists of a hardwired system containing sensors, switches and handles the basic engine safeties.
- The extended automation system (UNIC C2) is a complete electronic engine control system including speed governing functions.

The two systems differ in the way signals are handled and in the amount of functionality covered by the system. Both systems include all start and stop related functions. The advanced control system generates alarms and load reduction requests when set point values are exceeded and has speed governing unit integrated. In the basic automation system these functionalities must be foreseen in the external system.



MAINTENANCE

The design features of the engine facilitate direct access to the vital parts. This cuts the time needed for maintenance. Other key aspects of easy maintenance include:

- Minimized number of parts by combining several functionalities in the same componenet
- Hydraulic tensioning of the studs for the cylinder head, connecting rod and main bearings
- Automatic lubricating oil filter
- Easy removal of the cylinder head.

Main assembly shop for Wärtsilä 26 engines in Trieste, Italy.

WÄRTSILÄ 26

MAIN TECHNICAL DATA

Cylinder bore	260 mm
Piston stroke	320 mm
Speed	900 - 1 000 rpm
Mean effective pressure	24.3 - 23.0 bar
Piston speed	9.6 - 10.7 m/s
Voltage	0.4 – 13.8 kV
Alternator efficiency	0.95 – 0.96
Fuel specification:	
Fuel oil	730 cSt/50°C
	7200 sR1/100°F
	ISO 8217, category ISO-F-RMK 700
	SFOC 186-192 g/kWh
	at ISO condition ± 5% tolerance

Rated power: Propulsion engines

	Output in kW/bhp at 900 rpm		Output in kW/bhp at 1 000 rpm	
Engine type	kW	bhp	kW	bhp
6L26	1 950	2 651	2 040	2 774
8L26	2 600	3 535	2 720	3 698
9L26	2 925	3 977	3 060	4 160
12V26	3 900	5 303	4 080	5 547
16V26	5 200	7 070	5 440	7 396

Principal engine dimensions (mm) and weights (tonnes)

Engine type	A*	A	B*	B	C*	C
W6L26	4 251	4 111	1 882	1 801	1 912	1 883
W8L26	5 156	4 939	2 020	1 825	1 912	1 979
W9L26	5 546	5 329	2 020	1 825	1 912	1 979
W12V26	5 218	4 968	2 074	2 074	2 453	2 453
W16V26	6 223	5 973	2 151	2 151	2 489	2 489

	D	F dry sump	F wet sump	Weight dry sump	Weight wet sump
W6L26	2 430	N.y.a.	950	17.0	17.2
W8L26	2 430	N.y.a.	950	21.6	21.9
W9L26	2 430	N.y.a.	950	23.3	23.6
W12V26	2 060	800	1 110	28.7	29.0
W16V26	2 060	800	1 110	36.1	37.9

** Turbocharger at flywheel end.*

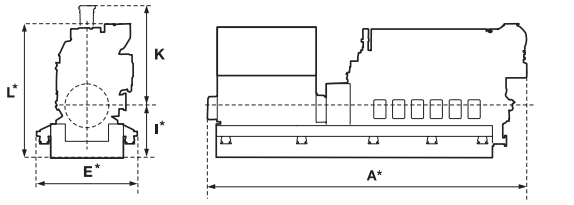
Rated power: Generating sets

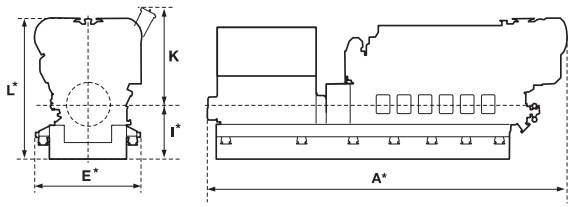
	Output at 900 rpm/60 Hz		Output at 1000 rpm/50Hz	
Engine type	kW	kWe	kW	kWe
6L26	1 950	1 882	2 040	1 969
8L26	2 600	2 509	2 720	2 625
9L26	2 925	2 823	3 060	2 953
12V26	3 900	3 764	4 080	3 937
16V26	5 200	5 018	5 440	5 250

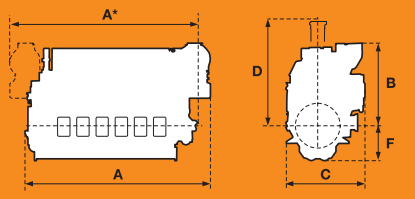
Principal generating set dimensions (mm) and weights (tonnes)

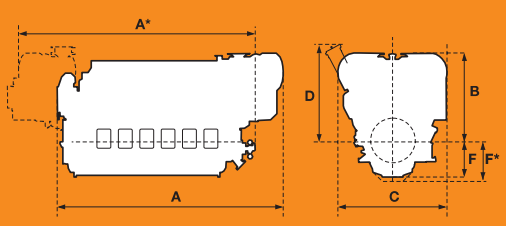
Engine type	A	A*	C	L	Weight**
6L26	7 345	6 546	2 300	73 020	37.7
8L26	8 243	8 167	2 300	3 125	42.9
9L26	8 853	8 731	2 300	3 125	47.5
12V26	8 353	N.A.	2 984	3 634	59.3
16V26	9 752	N.A.	2 990	3 711	68.8

Gen. output based on generator efficiency of 96.5%.
** Turbocharger at flywheel end. **Dependent on generator type and size.*









Wärtsilä Finland Oy
P.O.Box 252, FI-65101 Vaasa, Finland • Tel. +358 10 709 0000 • Fax +358 6 356 7188

Wärtsilä enhances the business of its customers by providing them with complete lifecycle power solutions. When creating better and environmentally compatible technologies, Wärtsilä focuses on the marine and energy markets with products and solutions as well as services.

Through innovative products and services, Wärtsilä sets out to be the most valued business partner of all its customers. This is achieved by the dedication of more than 13,000 professionals manning 130 Wärtsilä locations in close to 70 countries around the world.

WARTSILA.COM

12.2006 / Bock's Office / Waasa Graphics