WÄRTSILÄ

WÄRTSILÄ 31

Wärtsilä 31 is recognised by Guinness World Records as the world's most efficient 4-stroke diesel engine

Read more at www.wartsila.com

The Wärtsilä 31 represents a new generation of medium speed engines – one designed to set a benchmark in efficiency and overall emissions performance.

This is the introduction of a 4-stroke engine which has the best fuel economy of any engine in the same class. All this, while maintaining outstanding performance across the complete operating range, allowing for flexible and efficient vessel operation. The Wärtsilä 31 may be found available in 8 to 16 cylinder configurations and has a power output ranging from 4.2 to 9.8 MW, at 720 and 750 rpm. The W31 is durable and designed to withstand longer periods between overhauls. Thus allowing vessels to increase earning potential while simultaneously cutting time and spending on drydock and maintenance.

Typical applications

The Wärtsilä 31 is designed to be suitable for a broad range of ship types and applications, such as a main propulsion engine, in diesel-electric configurations, in hybrid installations or as an auxiliary engine. It can be optimised for running either at constant speed or along a propeller curve.

In the offshore sector, the Wärtsilä 31 is a perfect solution for OSV´s and drilling or semi-submersible vessels, where operational flexibility, high-power density, long intervals between overhauls, and high levels of safety are of paramount importance. In the cruise and ferry sector, the Wärtsilä 31 represents a particularly good investment for ferry and Ro-Pax fleet operators focusing on trimming their fuel expenses while maintaining high standards in environmental performance. Within the merchant fleet, the Wärtsilä 31 is designed for application as a main engine for small to medium sized tankers, bulk carriers, and container vessels. In other vessel segments with more specialised vessels such as fishing vessels, ice breakers, wind turbine installation vessels or arctic going vessels, the Wärtsilä 31 engine is the perfect fit. When it comes to operating within extreme conditions and the stringent requirements that accompany that, the Wärtsilä 31 remains the clear engine choice.

Operational features

The modular structure of the Wärtsilä 31 brings unprecedented multi-fuel flexibility to the market. Not only is the diesel version separately optimised for heavy or light distillate fuels, but the engine is available also as a Dual-Fuel version (burning alternatively gas or diesel) and as a pure gas engine (running uniquely on gas). This represents the ultimate in engine fuel flexibility. The introduction of an advanced fuel injection system, enables the most efficient and economical use of low sulphur fuel oils (<0.1%S), making the Wärtsilä 31 especially suited for operating in emission controlled areas. The advanced UNIC engine control system, the advanced injection system, and the variable valve timing make optimal running performance achievable at any engine load. Low and part load running, as well as transient performance and load acceptance are assured without any compromise. Through the combination of state-of-the-art technology and latest engine control system the engine will perform in any condition.

Smart Maintenance – Increase in Vessel Availability

The Wärtsilä 31 is designed for long running periods of maintenance-free operation. Some added benefits of this include a significant reduction in time needed for overhaul, as well as minimizing service attention from crew. These alone result in clear operational benefits, allowing for maximizing schedule flexibility while cutting operating costs.

The shift from single parts to exchange units, such as injectors, high pressure fuel pumps and cylinder heads, enables easier and more efficient maintenance work and logistics onboard. For further optimization the Wärtsilä 31 engine is designed for utilizing power unit service concept which can significantly cut the time needed for major overhaul. The concept is based on using larger assembly units which are pre-assembled and ready for installation without need of mounting single pieces. This increases time efficiency onboard and transfers the efforts to onshore activity while the vessel can be swiftly back in operation.
The modern Wärtsilä 31 engine documentation supports easier and faster planning and maintenance work. The Operation and Maintenance

KEY BUSINESS BENEFITS:

- **Increased competitiveness and effectiveness in daily operations with real-time optimisation**
- **Improved asset and business availability and predictability with lifecycle maintenance**
- **Ensured safety of operations and instant support whenever and wherever needed optimised ship and energy efficiency**

Manual contains work cards explaining the work steps as well as the needed spare parts, tools, and time effort. In addition to a large amount of spare part kits and spare part sets, the Wärtsilä 31 spare parts catalogue also includes exchange units all supporting a smooth maintenance from start of planning until vessel is back in operation.
The engines modular design and high degree of commonality is enabling fast and efficient engine conversions. Thanks to the standardized component interfaces, engines can be converted to use different fuels, for example from diesel to gas, without any machining.
Through the design modularity the engine is future-proof and can be adopted to any fuel which is commonly available on the market.

The Wärtsilä 31 allows high efficiency and environmental prioritization throughout the entire lifecycle of the vessel

- Lowest fuel consumption over a wide operating range
- Highest cylinder power in its segment, 610 kW/cylinder
- Available in Diesel, Dual Fuel (DF) and Pure Gas (SG) versions
- Meets the IMO Tier 3 regulations when operating on gas, and with an SCR when using diesel fuel
- Supported by Wärtsilä's extensive global service network

Wärtsilä Lifecycle Solutions

Optimising Ship Lifecycle Efficiency
Ship lifecycle efficiency optimisation is a holistic process of identifying and planning value-generating activities to optimise ship performance and lower costs over the lifecycle of the vessel. It starts with analysing the true condition of the vessel. Based on this analysis, operation and maintenance can be optimised and modern technologies and standards adopted.

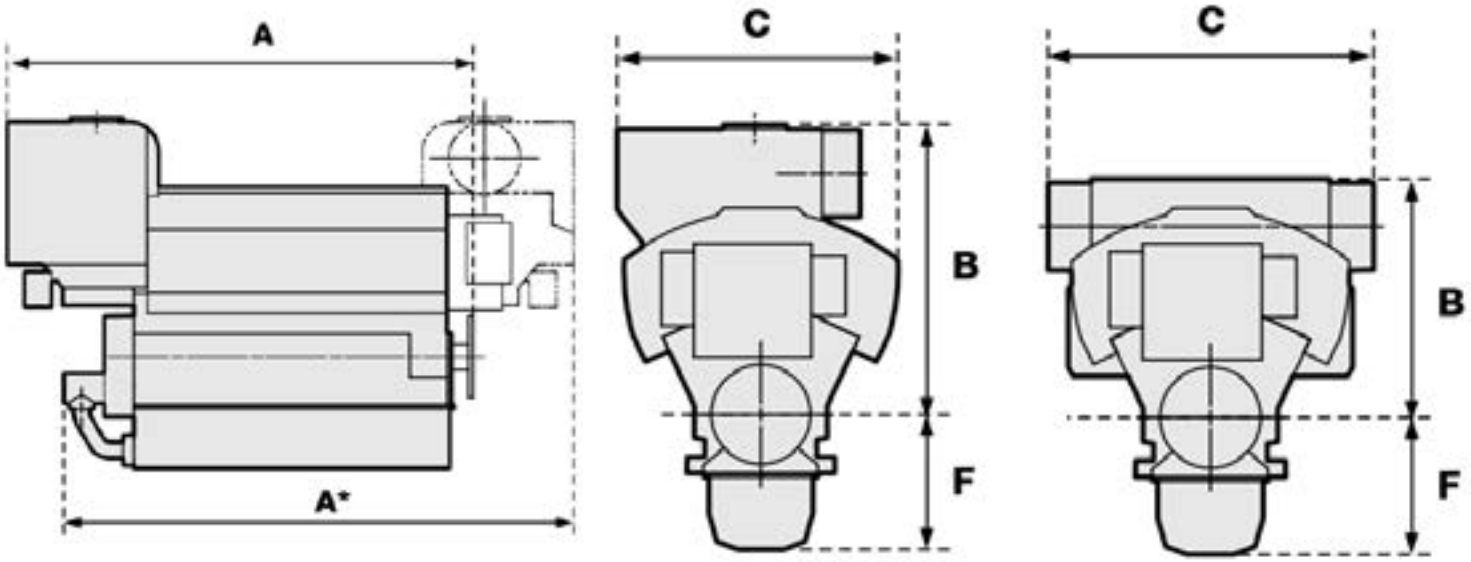
The Wärtsilä Lifecycle solutions provide optimization of the Asset addressing the specific market, customer and environmental needs during the complete lifecycle of the equipment. Wärtsilä lifecycle solutions ensure to have the most cost-efficient solution based on the digital models and optimization taking in account the real time performance of the assets. The solutions offer the highest flexibility and adaptability during the asset lifecycle.

Services enabling business growth
The digitalisation of industrial services offers new kinds of possibilities for optimising asset performance and enabling business growth for marine operators throughout the installation's lifecycle, starting from the strategic and business planning and new-building phases and continuing with the operation and maintenance as well as upgrades needed to ensure asset performance over the years. These services are based on continuous gathering and processing of data from the ship's equipment. The process of creating value from this data requires a partnership in which digital technology and analytical skills of experts are combined to achieve a common goal. There are four key value drivers that should be addressed: ship efficiency, asset availability and reliability, energy efficiency and regulatory and environmental compliance.

Wärtsilä's lifecycle solutions enhance asset performance can help business growth. They use digital innovations, advanced data analytics and global centers with experts to create a holistic approach that goes beyond maintenance and servicing. The result is a package that allows operators to focus on their core business, while Wärtsilä matches maintenance to their operations, ensuring that operations run efficiently and in accordance with regulations. The solutions are based on data acquisition systems and smart analytics by global center experts that enable prediction and onboard advisory.

Ensuring your lifecycle operations
Wärtsilä is an experienced lifecycle solution provider, with a proven track record in operation and maintenance services. Globally, more than 650 ships are covered by Wärtsilä service agreements. Wärtsilä provides lifecycle solutions for specific equipment to comprehensive and complete asset solutions. Wärtsilä's extensive global service network and efficient spare parts logistics ensure that you can focus on your core business, resting assured that your maintenance needs can be optimally met, whenever and wherever.

DIMENSIONS



DUAL FUEL

Wärtsilä 31DF		IMO Tier III	
Cylinder bore	310 mm	Fuel specification:	Fuel oil
Piston stroke	430 mm		700 cSt/50°c
Cylinder output	600 kW/cyl		7200sR1/100°F
Speed	750 rpm	ISO 8217, category ISO-F-RMK 700 ISO-F-DMA, ISO-F-DMB, ISO-F-DMZ, ULSF	
Mean effective pressure	29.6 bar		
Piston speed	10.75 m/s	Natural Gas BSEC 7350 kJ/kWh, BSGC 7140 kJ/kWh at ISO conditions	

Rated power engine type	kW
8V31	4800
10V31	6000
12V31	7200
14V31	8400
16V31	9600

Wärtsilä 31 DF						
Engine platform	A	A*	B	C	F	Weight w/o flywheel* (tons)
Wärtsilä 8V31DF	6080	6417	3251	3111	1496	57,5 t
Wärtsilä 10V31DF	6720	7057	3251	3111	1496	65,2 t
Wärtsilä 12V31DF	7682	7833	3144	3460	1546	76,5 t
Wärtsilä 14V31DF	8321	8473	3144	3460	1646	85,5 t
Wärtsilä 16V31DF	8962	9113	3144	3460	1646	93,2 t

*Indicative dry weight, TC in free end

DIESEL

Wärtsilä 31		IMO Tier II or III	
Cylinder bore	310 mm	Fuel specification:	Fuel oil
Piston stroke	430 mm		700 cSt/50°c
Cylinder output	610 kW/cyl		7200sR1/100°F
Speed	750 rpm	ISO 8217, category ISO-F-RMK 700 ISO-F-DMA, ISO-F-DMB, ISO-F-DMZ, ULSF	
Mean effective pressure	30.1 bar		
Piston speed	10.75 m/s	SFOC 167.7 g/kWh at ISO conditions	

Rated power engine type	kW
8V31	4880
10V31	6100
12V31	7320
14V31	8540
16V31	9760

Wärtsilä 31						
Engine platform	A	A*	B	C	F	Weight (Tons)
Wärtsilä 8V31	6080	6417	3251	3111	1496	57,1 t
Wärtsilä 10V31	6720	7057	3251	3111	1496	64,7 t
Wärtsilä 12V31	7682	7833	3144	3460	1546	76,0 t
Wärtsilä 14V31	8321	8473	3144	3460	1646	84,9 t
Wärtsilä 16V31	8962	9113	3144	3460	1646	92,5 t

PURE GAS

Wärtsilä 31SG		IMO Tier III
Cylinder bore	310 mm	Gas: Methane number 70
Piston stroke	430 mm	Fuel specification: Natural Gas
Cylinder output	550 kW/cyl	BSEC 7234 kJ/kWh at ISO conditions
Speed	750 rpm	
Mean effective pressure	27.1 bar	
Piston speed	10.75 m/s	

Wärtsilä 31SG	kW
8V31SG	4400
10V31SG	5500
12V31SG	6600
14V31SG	7700
16V31SG	8800

Wärtsilä 31 SG						
Engine platform	A	A*	B	C	F	Weight (Tons)
Wärtsilä 8V31SG	6080	6417	3251	3111	1496	57,5 t
Wärtsilä 10V31SG	6720	7057	3251	3111	1496	65,2 t
Wärtsilä 12V31SG	7682	7833	3144	3460	1546	76,5 t
Wärtsilä 14V31SG	8321	8473	3144	3460	1646	85,5 t
Wärtsilä 16V31SG	8962	9113	3144	3460	1646	93,2 t

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WÄRTSILÄ CORPORATION

Wärtsilä is a global leader in smart technologies and complete lifecycle solutions for the marine and energy markets. By emphasising sustainable innovation, total efficiency and data analytics, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers.

wartsila.com/marine