

The Wärtsilä 31

The world's most efficient
4-stroke engine





The Wärtsilä 31 sets a benchmark for medium-speed engines in efficiency and overall emissions performance, offering the best fuel economy of any 4-stroke engine in its class across the complete operating range. It is available in 8 to 16 cylinder configurations with a power output from 4.2 to 10.4 MW at 720 and 750 rpm. This robust, reliable engine can withstand long intervals between overhauls, maximising vessel profitability and reducing maintenance cost and effort.

Optimised efficiency for a wide range of applications

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

The Wärtsilä 31 represents a particularly good investment for passenger (RoPax) ferry operators who want to cut fuel costs and emissions. In the offshore sector, the Wärtsilä 31 is ideal for offshore supply vessels and drilling or semi-submersible vessels, where operational flexibility, high

power density, long intervals between overhauls and high levels of safety are paramount. It is also well suited to specialised ships such as fishing vessels, icebreakers, other ice-going vessels and wind turbine installation vessels as it can be flexibly optimised for extreme conditions with stringent requirements and high demands on efficiency.

Operational features

The engine's modular structure enables outstanding multi-fuel flexibility. The diesel version is optimised for heavy or light distillate fuels, and the engine is also available in both dual fuel and pure gas configurations.



KEY BENEFITS

- Record-breaking efficiency
- Low fuel consumption over a wide operating range
- High cylinder power, up to 650 kW/cylinder
- Fuel flexible – available in diesel, dual fuel (DF) and pure gas (SG) versions
- Meets IMO Tier 3 regulations when operating on gas, or with an SCR when using diesel fuel
- Ultra-low emissions option for dual fuel engines



Optimal performance at any engine load

The diesel and dual fuel versions feature an advanced fuel injection system that enables the efficient use of low sulphur fuel oils (<0.1%S), making the Wärtsilä 31 especially suited for operating in emission control areas (ECAs). Combined with the advanced UNIC engine control system and variable valve timing, this enables optimal performance at any engine load.

Exceptionally low emissions

With its ultra-low emissions when running on LNG in gas mode, the Wärtsilä 31DF represents a new era for medium-bore dual fuel engines. Its record-breaking efficiency makes it a powerful tool in the drive to decarbonise shipping. Innovative and highly efficient combustion can enable significant reductions in methane slip and almost completely eliminate NOx emissions.

Smart maintenance for increased vessel availability

The Wärtsilä 31 is designed for long periods of maintenance-free operation and faster overhauls, maximising

a vessel's availability while cutting operating costs. Compact exchange units including injectors, high-pressure fuel pumps and cylinder heads enable smooth and efficient maintenance work and logistics onboard. The Wärtsilä 31 also benefits from our power unit service concept, which can significantly cut the time needed for a major overhaul. The concept is based on using pre-assembled units that are delivered ready to install.

The engine's modular design and high degree of commonality also makes fuel conversion faster and easier. Thanks to the standardised component interfaces the engine can be converted, for example from diesel to gas, without any machining.

Expert support to improve efficiency and reduce downtime

Digitalisation and connectivity make it possible to predict potential anomalies and address them before they affect engine performance. Available as part of a Wärtsilä Lifecycle Agreement, Wärtsilä Expert Insight is a predictive maintenance service that combines artificial intelligence (AI) techniques and advanced diagnostics with Wärtsilä's OEM expertise to identify anomalous behaviour.

The service proactively identifies and highlights potential failures and early indications of equipment deterioration that cause vessels to run less efficiently. Experts at one of Wärtsilä's ten Expertise Centres around the world can employ their



OEM knowledge to confirm what is going on and provide clear recommendations to the vessel's crew on how to deal with the issue. With a Lifecycle Agreement from Wärtsilä you can benefit from expert support around-the-clock, wherever your vessel is operating. Your agreement can include data-driven dynamic maintenance planning to help optimise the time between overhauls and ensure that maintenance is performed only when needed. You can also take advantage of performance guarantees for KPIs such as vessel uptime, fuel savings or emission reduction depending on your strategic and operational priorities.



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Diesel

Wärtsilä 31	
Cylinder bore	310 mm
Piston stroke	430 mm
Engine speed	720 / 750 rpm
Cylinder output	630 / 650 kW/cyl
Mean effective pressure	32.4 / 32.0 bar
Piston speed	10.3 / 10.8 m/s

Wärtsilä 31	
Emission standard	IMO Tier III IMO Tier II w/o SCR
SFOC* (g/kWh)	169.4
Fuel specification	Fuel oil. ISO 8217 category ISO-F-RMK 700 ISO-FDMA, ISO-F-DMB, ISO-F-DMZ, ULSF
Fuel oil viscosity (cSt/50 °C)	700
Additional features	Smart Heat Recovery, ArcticPac

Engine dimensions (mm) and weights (tonnes)						
Engine type	A	A*	B	C	F	Weight **
8V31	6121	6417	3251	3127	1496	57.5
10V31	6761	7057	3251	3127	1496	65.6
12V31	7688	7833	3144	3460	1546	77.2
14V31	8328	8473	3144	3460	1646	85.1
16V31	8968	9113	3144	3460	1646	92.5

Dual Fuel

Wärtsilä 31DF	
Cylinder bore	310 mm
Piston stroke	430 mm
Engine speed	720 / 750 rpm
Cylinder output	580 / 600 kW/cyl
Mean effective pressure	29.8 / 29.6 bar
Piston speed	10.3 / 10.8 m/s

Wärtsilä 31DF	
Emission standard	IMO Tier III IMO Tier II in diesel w/o SCR
BSEC* (kJ/kWh)	7350 (gas mode)
SFOC* (g/kWh)	176.5 (diesel mode)
Gas fuel specification	Natural gas Methane number 74
Fuel specification	Fuel oil. ISO 8217 category ISO-F-RMK 700 ISO-FDMA, ISO-F-DMB, ISO-F-DMZ, ULSF
Fuel oil viscosity (cSt/50 °C)	700
Additional features	EnviroPac, Smart Heat Recovery, ArcticPac

Engine dimensions (mm) and weights (tonnes)						
Engine type	A	A*	B	C	F	Weight **
8V31DF	6121	6417	3251	3127	1496	57.9
10V31DF	6761	7057	3251	3127	1496	66.1
12V31DF	7688	7833	3144	3460	1546	77.8
14V31DF	8328	8473	3144	3460	1646	85.7
16V31DF	8968	9113	3144	3460	1646	93.2

Pure Gas

Wärtsilä 31SG	
Cylinder bore	310 mm
Piston stroke	430 mm
Engine speed	720 / 750 rpm
Cylinder output	530 / 550 kW/cyl
Mean effective pressure	27.2 / 27.1 bar

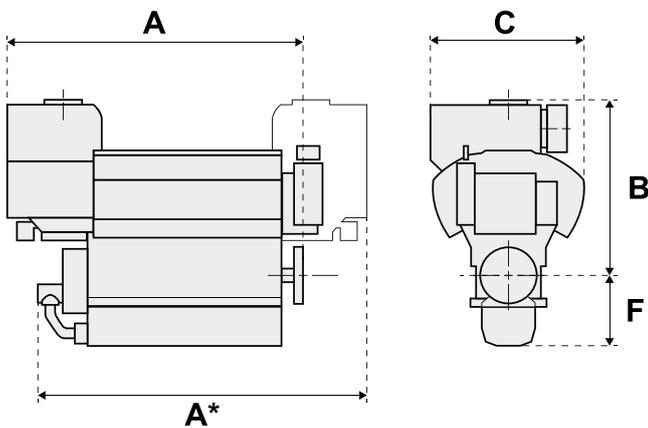
Wärtsilä 31SG	
Piston speed	10.3 / 10.8 m/s
Emission standard	IMO Tier III
BSEC* (kJ/kWh)	7350
Fuel specification	Natural gas
Methane number	70

Engine dimensions (mm) and weights (tonnes)						
Engine type	A	A*	B	C	F	Weight**
8V31SG	6121	6417	3251	3127	1496	57.9
10V31SG	6761	7057	3251	3127	1496	66.1
12V31SG	7688	7833	3144	3460	1546	77.8
14V31SG	8328	8473	3144	3460	1646	85.7
16V31SG	8968	9113	3144	3460	1646	93.2

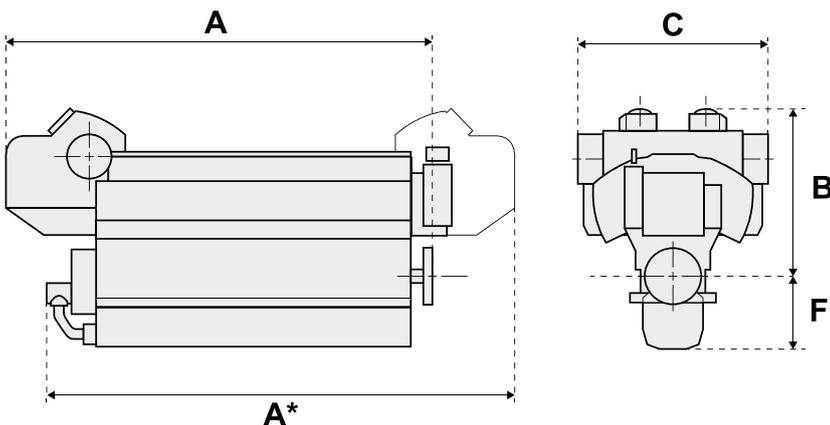
*Given at 85% load, 720 rpm. According to ISO 15550:2002(E), Lower calorific value 42 700 kJ/kg for diesel/pilot fuel and 49 700 kJ/kg for gas fuel. With engine driven pumps (two cooling water pumps, one lubricating oil pump). Tolerance 5%.

**Without flywheel, Indicative dry weight, TC in free end

Dimensions 8V and 10V



Dimensions 12V, 14V and 16V



Wärtsilä Marine Power leads the industry in its journey towards a decarbonised and sustainable future.

Build your success on Wärtsilä's broad portfolio of engines, propulsion systems, hybrid technology and integrated powertrain systems. These building blocks offer you efficiency, reliability, safety and world-class environmental performance.

The offering includes performance-based agreements and lifecycle solutions as well as an unrivalled global network of maritime expertise.

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