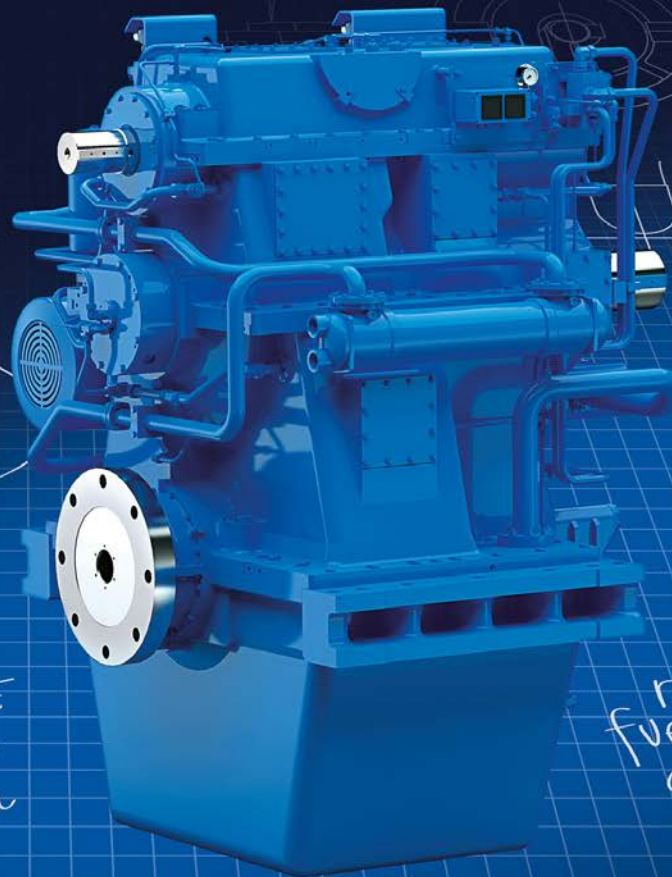


2-SPEED GEAR

ENERGY
ENVIRONMENT
ECONOMY



Two propeller speeds at constant engine speed.

Systems enabler for vessels with variable operational modes.

RELIABLE
— with low transmission losses.

Major reduction in fuel consumption and emissions.

At Wärtsilä we strive constantly to do what is best for the customer. This includes optimising the lifecycle value of their installations by offering precisely what they need; a promise we can deliver on since we provide the marine industry's most complete portfolio of products, integrated solutions and global services. By enabling operational efficiency, environmental excellence, fuel flexibility and 24/7 support, we help our customers find a shorter route to robust growth and greater profitability. This is why today Wärtsilä solutions are onboard one in every three ships worldwide.

The Wärtsilä 2-speed gear is designed to serve vessels having multiple operational modes or reduced transit speed. In particular, RoPax ferries, offshore support vessels, tug boats and fishing vessels can gain notable economic and environmental benefits.

The Wärtsilä 2-speed gear is available with a high degree of modularization in the 2 MW to 12 MW power range.

DESIGN FEATURES

As with all Wärtsilä gears, the modular design of the 2-speed gear is simple, reliable, yet compact in size for easy installation and maintenance. It offers advanced functionality with minimal technical complexity.

The Wärtsilä 2-speed gear is based on the company's proven gear technology and systems engineering. It is suitable for diesel mechanic propulsion and for a hybrid format combining diesel mechanic and diesel electric propulsion. The hybrid option enables a booster mode as well as slow steaming.



MEETING MODERN DAY OPERATING REQUIREMENTS

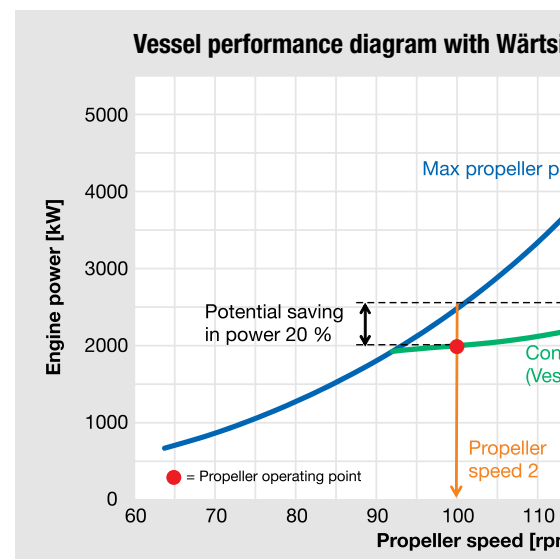
During recent years, the marine industry has been faced with economic challenges caused by high fuel costs and relatively low freight earnings. This has led to significant changes in the design criteria for modern vessels.

The main effect of these changes has been to reduce the design speed. And to make the vessel more efficient at these lower speeds, the hull lines and the bulbous bow have been optimised accordingly. The Wärtsilä 2-speed gear allows an effective use of the installed propulsion power at these lower operational speeds, without impacting the capability to use maximum power to achieve a high vessel speed.

The Wärtsilä 2-speed gear effectively compensates for the lower operational speeds by enabling two optional propeller speeds. Compared to a controllable pitch propeller combined with a single speed reduction gear, this provides an additional option for a lower vessel speed at the same nominal speed of the engine. The actual operating mode of the vessel is, therefore, always accommodated in the most efficient way possible.

KEY BENEFITS

High propulsion efficiency: The Wärtsilä 2-speed gear enables vessels that operate regularly with varying propeller loads to be designed with a propulsion system that is highly efficient. The losses from the prime mover to the controllable pitch propeller are small, and the introduction of a gear with a choice of two propeller speeds at a constant



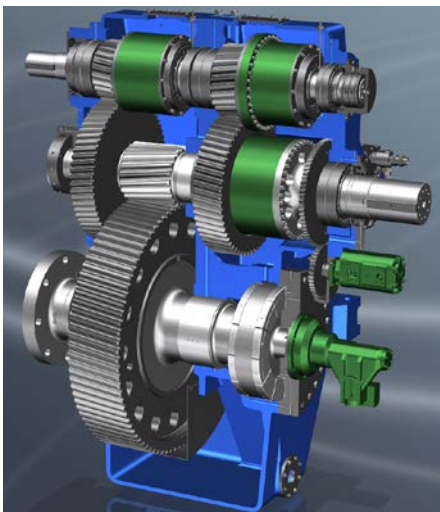
engine speed results in excellent propulsion efficiency at varying loads. Thus, by reducing the speed and increasing the pitch of the propeller, at reduced loads greater propeller efficiency is achieved.

By operating the ship's propeller at low speed when maximum vessel speed or propeller thrust is not required, fuel consumption can be reduced by as much as 20% compared to a single mechanical propulsion system. At the same time, nitrogen oxide (NO_x) and sulphur oxide (SO_x) emissions are similarly lowered.

Despite the low propeller speed, the engine speed is kept constant, thereby allowing the electric power generation from the Power Take-Off (PTO) on the gear to remain uninterrupted.

Reliability: The Wärtsilä 2-speed gear is designed for heavy duty application, with outstanding reliability as a priority feature.

The gearwheels have single helical teeth, precision ground with profile correction to



ensure good load distribution and low noise operation.

Plain bearings are used on the pinion and output shaft, and low friction bearings on the PTO shaft. The plain thrust bearings are of the tilting pad type.

The high capacity multiple-disc clutches are hydraulically operated and cooled. The system has only soft clutches to ensure shock-free engagement of the main engines and changes in propeller speed.

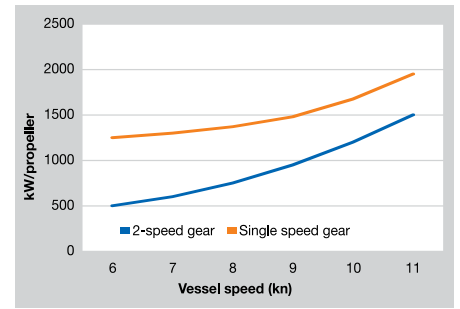
Coolers and electric pumps are built onto the gear.

Hybrid propulsion: With hybrid propulsion, the propeller is driven by either one of or both a diesel engine and an electric motor. For vessels that seldom need full propeller power, the hybrid option is ideal.

Rather than installing a too big main engine, which will mostly be running at unfavourable loads, full propeller power is achieved by using the main engine and an electric motor in parallel.

The electric motor is powered from the auxiliary engines. In other cases hybrid propulsion is used to improve propulsion efficiency at reduced vessel speeds.

For a twin screw vessel steaming at reduced speed, one main engine can power both a propeller and a shaft generator. The power from this shaft generator can be transferred to an electric motor on the other propulsion train. In this way one main engine can power both propellers. The main engine will operate at high load and high efficiency, and the propellers will operate at low speed and high efficiency.

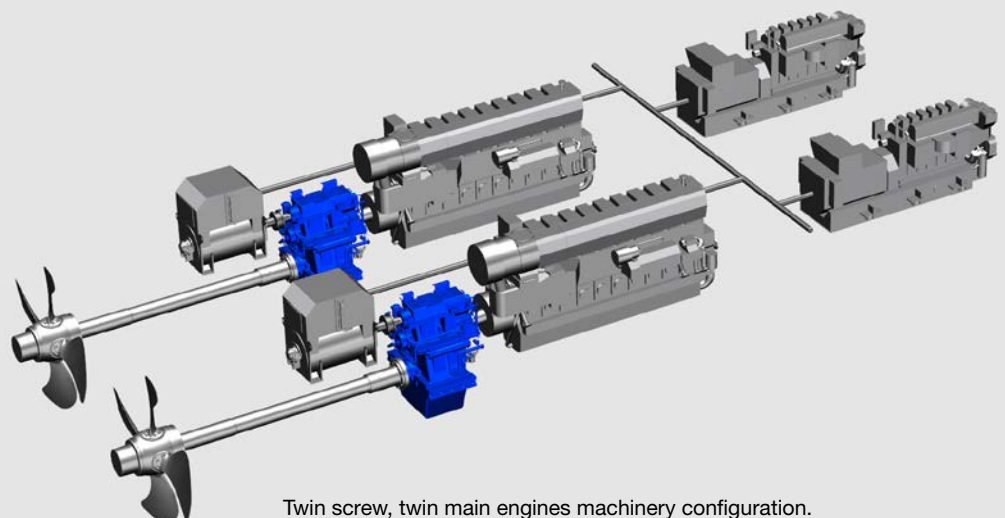
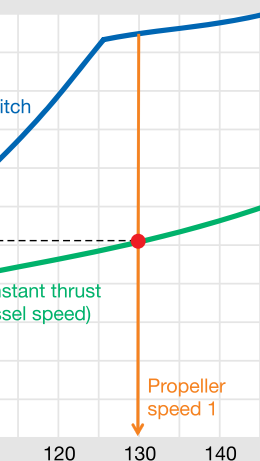


A 16000 dwt product tanker, with class notation "Redundant Propulsion System", might save more than 40 % power at 8 knots.

Redundant propulsion: Certain single screw vessels, such as product tankers and fishing vessels, might have an extra class notation for redundant propulsion in case of a main engine failure. With such a class notation, the Wärtsilä 2-speed gear has a special functionality, since the shaft generator can be used as electric motor, while the propeller runs at its lowest speed. Thanks to having a choice of two propeller speeds, the actual propulsion power needed to comply with the redundant class notation can be reduced significantly.

Reduce noise and vibration: The Wärtsilä 2-speed gear reduces noise emissions by up to 20 dB, both inside the ship and externally. This allows greater comfort for crew and passengers, while the reduced underwater radiated noise is important for fishing and seismic vessels, and is beneficial to marine life in general.

Wärtsilä 2-speed gear.



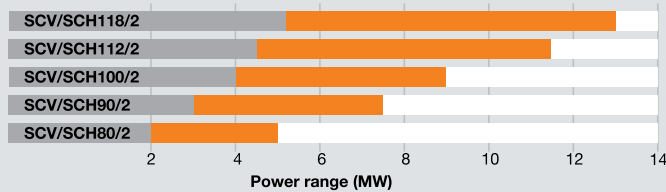
Twin screw, twin main engines machinery configuration.

” The Wärtsilä 2-speed gear is the best solution for our rescue vessel in terms of both economy and overall efficiency. This gear provides a proper balance between full speed operation and the ship’s daily operating mode, which is important because its operating profile varies.”

Sun Lu Ming, Deputy Chief Engineer of MOT Rescue & Salvage Bureau, People’s Republic of China’s Ministry of Transport



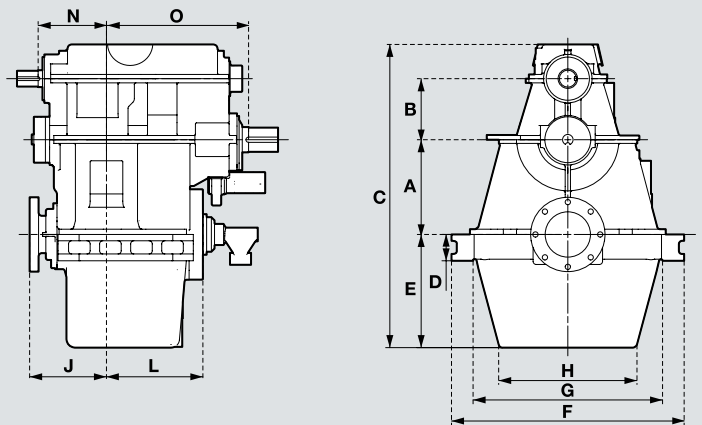
The power range for the 2-speed gear series



2-speed gears, vertical offset, dimensions

Gear type/size	A	B	C	D	E	F	G	H	J	L	N	O	Weight tonnes
SCV80/2-P54	800	540	2680	220	880	1960	1580	1150	660	800	580	1325	14
SCV90/2-P58	900	580	2760	250	1075	2210	1800	1300	730	915	650	1350	17
SCV100/2-P68	1000	680	3350	260	1100	2500	2000	1470	800	1036	915	1800	24
SCV112/2-P68	1120	680	3500	260	1200	2805	2320	1772	1500	665	900	1800	34
SCV118/2-P68	1180	700	3700	300	1200	2800	2320	1750	1520	715	1050	1800	38

SCV type, vertical offset between main engine and propeller shaft



2-speed gears, horizontal offset, dimensions

Gear type/size	A	B	C	D	E	F	G	H	J	L	N	O	Weight tonnes
SCH80/2-P54	800	540	15	220	700	2450	1050	950	660	800	580	1325	15
SCH90/2-P58	900	580	15	260	820	3000	1160	1130	730	985	650	1350	19
SCH100/2-P68	1000	680	15	260	840	3180	1870	1240	800	1036	915	1800	27
SCH112/2-P68	1120	680	15	260	950	3200	1950	1400	665	1500	1735	965	38
SCH118/2-P68	1180	700	15	300	1000	3500	1650	2000	1520	715	1050	1800	40

SCH type, horizontal offset between main engine and propeller shaft

