

Polaris



The first LNG-powered icebreaker in the world

Polaris represents a new generation of icebreakers. It is the world's first icebreaker powered by liquefied natural gas (LNG). The use of both LNG and low sulphur diesel reduces the vessel's emissions significantly, making it also the most environmentally friendly diesel-electric icebreaker ever built.

Polaris is built and delivered by **Arctech**.
Building began on March 4th 2015,
at the Helsinki Shipyard.

The concept design for
the icebreaker was
developed by **Aker Arctic**.

Polaris is powered by **Wärtsilä's** dual-fuel
engines operating on LNG and low sulphur
diesel fuel.



Polaris will be a part of
Arctia's versatile fleet of
icebreakers.

The steel construction, special
outfitting, oil recovery, interior
and deck outfitting design and
specifications were carried out by **ILS**.

The built-in oil recovery system delivered by
Lamor Corporation has a recovery capacity
of 1 015 m³ with a rate of 200 m³/h.

Technical specifications

Length	110 m
Breadth maximum	24 m
Operational draught	8 m
Displacement	10 961 t
Installed power	22 MW
Propulsion power	19 MW
Speed	18 kn
Speed at 1.2 m ice	6 kn
Bollard pull	214 tn
Oil recovery capacity	1 015 m ³ with a rate of 200 m ³ /h
Crew	16
Endurance	30 days
Nationality	Finland
Classification	Lloyd's Register

Technical specifications and innovations for the icebreaker are based on the requirements for year-round seaborne transport as defined by the **FTA**.

Polaris is the latest piece of evidence of the **Finnish Marine Industries'** ability to build vessels for the Arctic region.

The vessel's main task is fairway icebreaking on the Baltic Sea, which means assisting merchant vessels to and from Baltic Sea ports in wintertime. In addition, Polaris can perform oil spill response operations, emergency towing and rescue operations on the open sea all year round. The unique vessel has been designed for the most demanding icebreaking conditions on the Baltic Sea. The special hull form and propulsion arrangement minimize ice resistance and maximize the icebreaking capacity.

Polaris begins its service at a historical time. In 2017, Finland celebrates its 100 years as an independent nation. The theme for Finland's centenary year, "Together", is also an appropriate term for describing the design and building process of Polaris. It is the result of world-famous Finnish know-how in designing, building and operating heavy icebreakers.

Arctia's premier polar class icebreaker Polaris is engineered for 50 years of service life and it is operated by a crew of 16 seafarers with solid Arctic experience. Arctia maintains the competence and expertise of its personnel through continuous training.

Icebreaker Polaris is co-financed by the European Union's TEN-T programme.

The propulsion system is based on Azipod propulsion provided by **ABB**.





Efficient icebreaking with Azipod propulsion from ABB

The Polaris propulsion system is based on an efficient Azipod® propulsion and it applies a novel three propulsion unit concept, in which one 6 MW unit is located at the bow and two 6.5 MW units at the stern. Polaris is the first icebreaker with an Azipod unit at the bow and the new system will considerably enhance the vessel's maneuverability and icebreaking capability.

In addition to the Azipod system, ABB provided frequency converters for the propulsion and an electric power plant including two 6 500 kVA and two 4 850 kVA generators, a 3.3 kV main switchboard and two ship supply transformers, as well as remote control and remote diagnostic systems. The well proven electric power plant and propulsion concept ensures reliable and high efficiency operation both in ice-breaking and other duties.



The Polaris propulsion system is based on Azipod propulsion, improving icebreaking performance.

Aker Arctic

The first LNG-powered icebreaker in the world from Aker Arctic

Aker Arctic's main responsibility was the development of the concept design. The company started the evaluation of Polaris in 2012, by conducting a study of the available technologies. The study included, for example, an evaluation of the suitability of LNG machinery for icebreakers. In 2013, FTA formulated a technical framework for the design tender. After signing the design contract, Aker Arctic evaluated the different vessel concepts, and the three azi-

moth thruster version (two in stern, one in bow) was finally selected as a basis for the new building project. The vessel concept was then jointly developed by FTA, Aker Arctic and ILS.

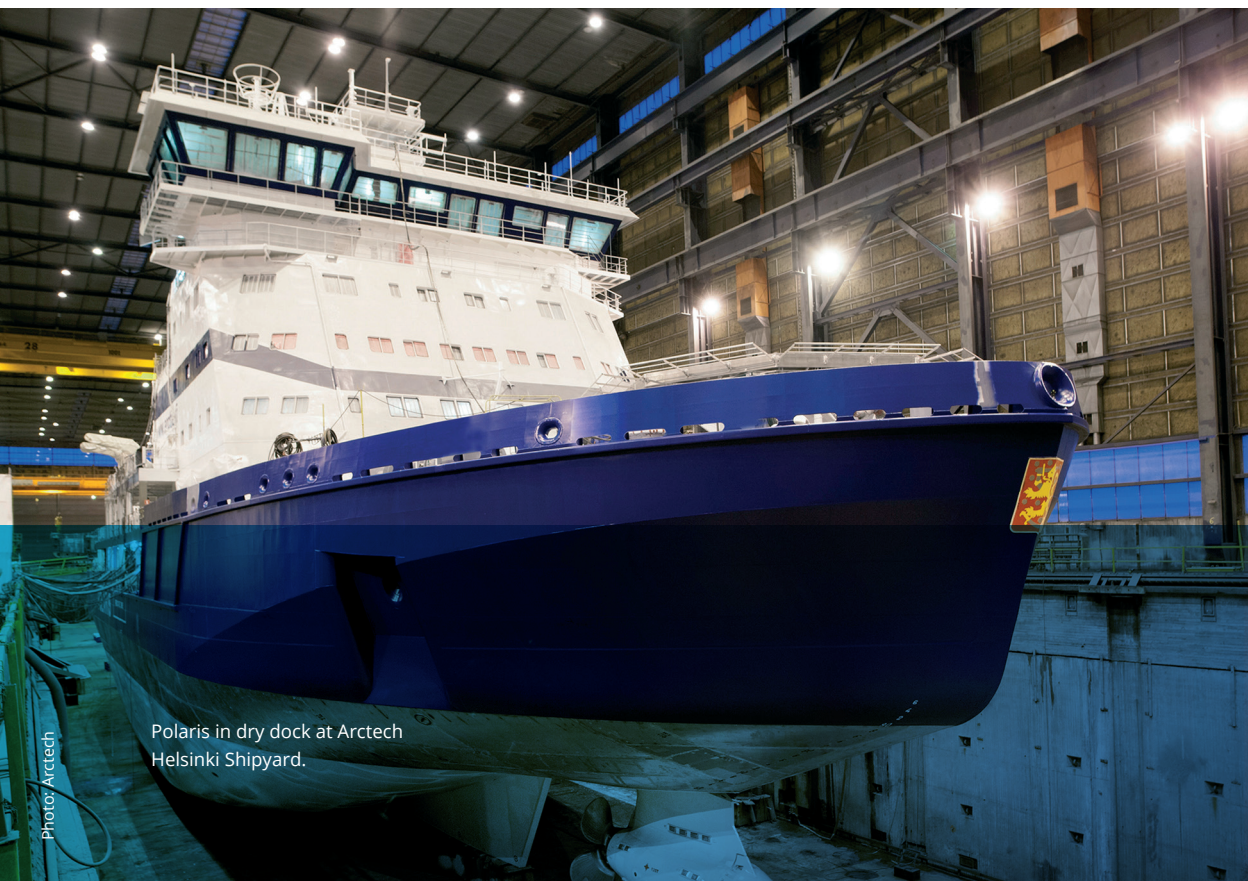
Other responsibility areas of Aker Arctic included hull form development, layout design, power and performance, ice model tests, propulsion arrangement and dual fuel machinery, as well as hull ice strengthening.



A CFD analysis was carried out to minimize open water resistance while keeping good icebreaking abilities.

Arctech Helsinki Shipyard started building Polaris, the first LNG-powered icebreaker of the world, on March 4th 2015, commemorating the 150th anniversary of the Helsinki Shipyard. Arctech was responsible for the vessel's design on both basic and detailed level, sourcing of equipment and components, outfitting, commissioning, as well as testing and delivery.

Arctech has a long experience in building icebreakers and icebreaking vessels. The next generation icebreaker Polaris is an important part of the shipyard's reference list, which covers the majority of icebreakers operating around the world.



Polaris in dry dock at Arctech Helsinki Shipyard.



Owner and operator of Polaris

Polaris will join one of the strongest icebreaker fleets in the world under Arctia, a limited company that continues the 125-year-old Finnish icebreaking tradition. Arctia provides icebreaking services and specialized multipurpose vessel services in polar areas. The company has experience from both the Northern Sea Route and the Northwest Passage, as well as offshore operations in the Arctic. Arctia's offshore services include ice management, pipe and cable laying, towing, research sup-

port, service work for production platforms, and the installation and maintenance of underwater structures.

Polaris is the eighth heavy icebreaker in the company's versatile fleet. Designed for demanding icebreaking operations in the Baltic Sea and fitted for oil recovery and emergency towing, Polaris will further improve Arctia's capabilities as a reliable maritime partner in harsh conditions.



Polaris is designed to operate in challenging conditions of the Baltic Sea.

The Finnish Transport Agency supervised the design and building processes of Polaris

The technical specifications and innovations of the icebreaker Polaris are based on the requirements for year-round sea-borne transport as defined by the Finnish Transport Agency (FTA). The FTA supervised the design and building processes of Polaris that made full use of the expertise of the Finnish maritime cluster. The building process is co-financed by the EU, through the WINMOS programme.

FTA is the responsible authority for safeguarding winter traffic to and from all Finnish winter ports, on the coasts of both the Baltic Sea and Lake Saimaa. The FTA handles public office duties and all procurement associated with winter navigation and traffic assistance. The FTA is also tasked with the national coordination of winter navigation operative tasks, development and guidance.

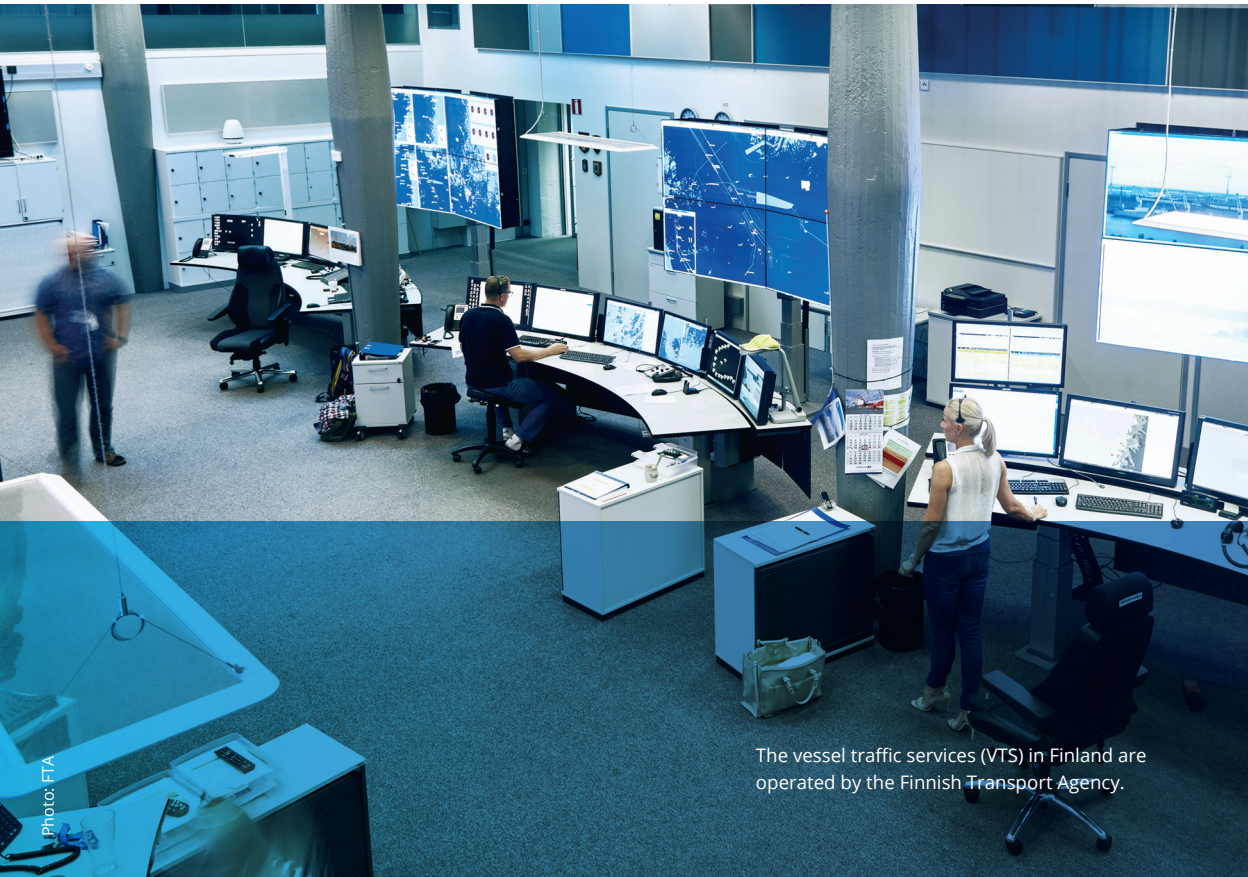


Photo: FTA

The vessel traffic services (VTS) in Finland are operated by the Finnish Transport Agency.



Over a hundred years of experience in building state-of-the-art icebreakers

The Finnish Marine Industries has built icebreakers for over a century: 60 percent of the world's icebreakers are made in Finland. Polaris is the latest proof of Finnish operators' extraordinary ability to integrate sustainable, high tech systems and equipment to a vessel made for harsh climates.

The Finnish Marine Industries has greatly benefited from the Baltic Sea, which has proven its worth as a testing place for Arctic conditions. Long-term R&D&I and heavy in-

vestments in marine technology, together with the unique co-operation network between the industry and authorities have brought Finland a leading role in energy efficient, safe and environmentally sound marine solutions. Today, the Finnish Marine Industries consists of nearly 900 companies, including high technology maritime solution providers, leading marine equipment manufacturers, turn-key suppliers, designers, software and system providers as well as shipbuilding, ship repair and offshore yards.



Designers constitute an important part of ship-building.



The Finnish Marine Industries is a forerunner in digitalization.

Photos: Elomatic

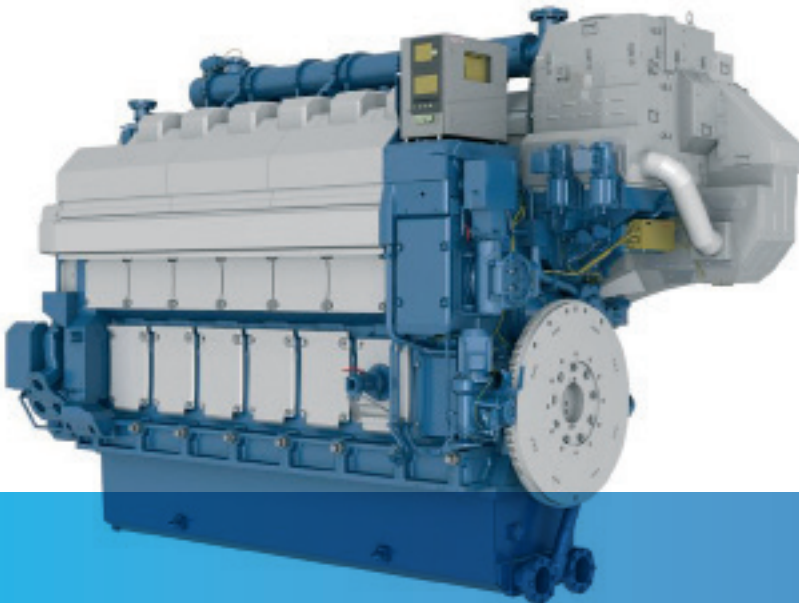


Polaris is powered by Wärtsilä's dual-fuel engines operating on LNG and low sulphur diesel fuel

Polaris is powered by Wärtsilä's dual-fuel engines capable of operating on both liquefied natural gas (LNG) and low sulphur diesel fuel. By enabling LNG to be used as the engine fuel, both exhaust emissions and fuel costs are notably reduced, making Polaris the most environmentally friendly icebreaker ever built.

Wärtsilä's industry leading track record in dual-fuel engine technology and the engines' impressive power output per cylinder were crucial factors when choosing con-

tract partners. For Polaris, Wärtsilä provided one 8-cylinder Wärtsilä 20DF, two 9-cylinder Wärtsilä 34DF, and two 12-cylinder Wärtsilä 34DF engines. Additionally, Wärtsilä has a five-year maintenance contract for all engines and generators including spare parts, remote online support, CBM monitoring and training services.



Dual fuel engine capability enables ships to be operated on either conventional liquid marine fuels or LNG. The switch between fuels can be made seamlessly without loss of power or speed.



Polaris is a modern representative of Finnish icebreaker design

ILS participated in the conceptual design of Polaris, with a focus on steel construction, special outfitting, oil recovery, interior and deck outfitting design and specifications. Furthermore, the open water model tests for the hull form carried out at the Technical Research Centre of Finland (VTT) belonged to ILS's scope of work.

The special hull form and the engine and propulsion arrangements make Polaris the world's most environmentally friendly diesel-electric icebreaker.



Photo: Arctech



The provider of the oil-recovery system

Lamor delivered the in-built oil recovery system, which enables Polaris to collect 200 m³ oil per hour even in harsh weather and ice conditions. The system is equipped with Lamor cargo pumps that are able to handle very viscous products. Lamor is a global leader in oil spill response and environmental solutions for a wide range of scenarios and climatic conditions.

The oil recovery system represents the latest technology in winterization features.



Photo: Lamor



Photo: FTA

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Power at Sea

