

ENGINEERING
TOMORROW

Danfoss

Marine and Offshore

Expand your efficiency horizons
with powerful VLT[®] and VACON[®] drive
and grid systems

**Total
range**

for Marine and
Offshore needs

drives.danfoss.com

VLT[®] | VACON[®]



Single port of call

No matter what your motor control question, you can find the answer at Danfoss Drives. Obtain the optimum AC drive for the job, whatever the application is on board the ship. With a global presence and more than 40 years of experience, Danfoss Drives offers a complete low voltage portfolio of VLT® and VACON® drives for marine and offshore needs, coupled with access to expert advice and a comprehensive range, from low to high power.

Sharing

- Support for you to invent vessel-wide drive or grid systems
- Dimensioning and selection tools
- Professional advice in locations around the globe
- Experience and information about existing installations

Inventing

- Modules, components and functionalities to suit any application on board
- Liquid-cooled or back-channel air-cooled drives
- Customer-specific fit using the best software development methods
- Constantly developing new technology capability in vessel construction

Engineering

- Total of nine marine certifications
- Drive modules up to 5.3 MW
- Long lifetime, robust performance and highly efficient equipment
- IP55 and IP66 drives suitable for engine rooms, designed for ambient temperatures up to 55 °C*

*derating may apply



Established in 1864, DNV is an independent foundation with the objective of safeguarding life, property and the environment.



KR is a world-leading, technical advisor to the maritime industry. About 70 flag administrations have authorized KR to conduct statutory surveys on their behalf.



The Lloyd's Register Group is an organization that works to enhance safety and to approve assets and systems at sea, on land and in the air.



Since its founding in 1862, the American Bureau of Shipping (ABS), a New York not-for-profit corporation, has been committed to setting standards for safety and excellence as one of the world's leading ship classification societies.



Founded in 1956, China Classification Society (CCS) is the only specialized organization of China to provide classification services. CCS aims to provide services for the shipping, shipbuilding, offshore exploitation and related manufacturing industries and marine insurance.



A classification society, the Russian Register, was established on 31 December 1913. Now its name is the Russian Maritime Register of Shipping (RS). Since 1969 RS has been a member of the International Association of Classification Societies (IACS).



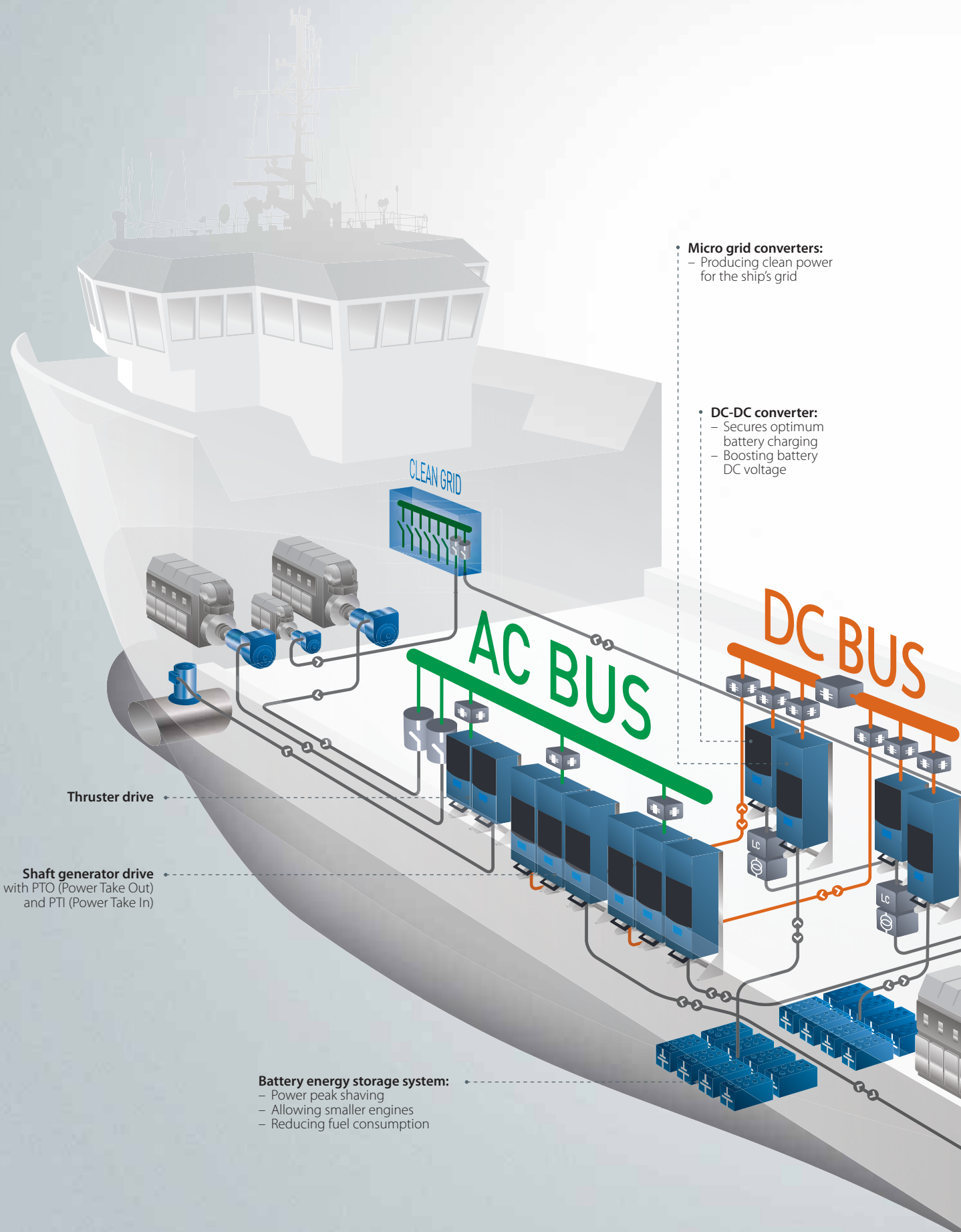
Founded in 1828, Bureau Veritas was one of the first classification societies and a founding member of IACS (International Association of Classification Societies in the world).



The Rina Group's main activity areas are ship classification, certification and advanced services to industry.



Class NK (Nippon Kaiji Kyokai) is a Japanese ship classification society dedicated to ensuring the safety of life and property at sea, and the prevention of pollution of the marine environment.



• **Micro grid converters:**
 – Producing clean power for the ship's grid

• **DC-DC converter:**
 – Secures optimum battery charging
 – Boosting battery DC voltage

Thruster drive

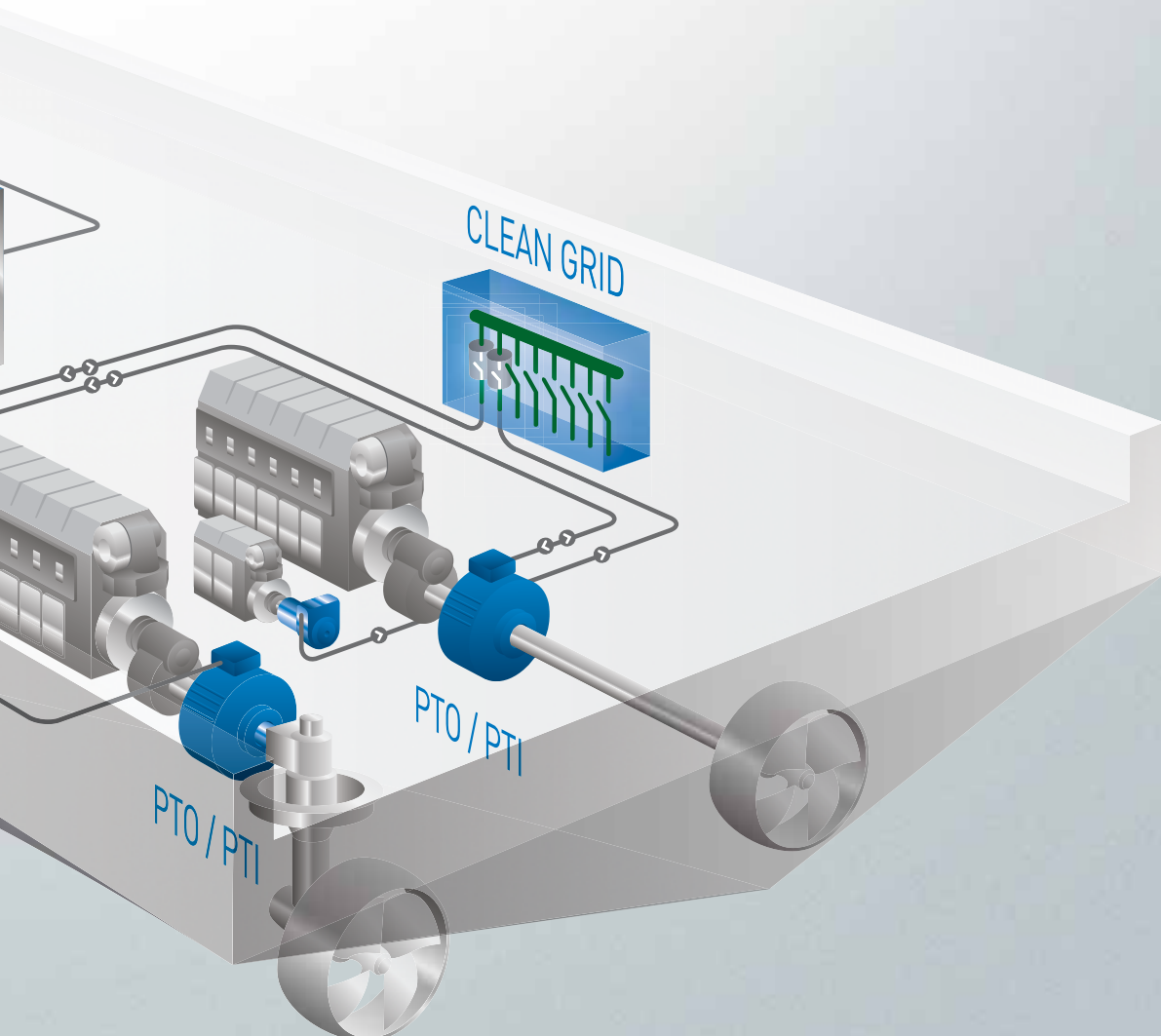
Shaft generator drive with PTO (Power Take Out) and PTI (Power Take In)

Battery energy storage system:
 – Power peak shaving
 – Allowing smaller engines
 – Reducing fuel consumption

Vessel-wide systems

Sea-going vessels are equipped with complex systems where all functionalities are integrated via an AC and/or DC bus. Therefore when optimizing performance and efficiency, it is never enough to consider individual components in isolation. We help you to assess the total impact and make informed choices on that basis.

In every corner of the ship, from the engine room to the ventilation system, from the cargo deck to the accommodation quarters, we consider the big picture. Then we can give concrete advice on the specific motor controls to optimize performance of the thruster, pump, winch, compressor or fan. No matter what the application, we are there to help you improve efficiency, safety and reliability.



The modular VLT® technology platform adapted to your requirements

VLT® AutomationDrive, VLT® HVAC Drive and VLT® AQUA Drive are all built on a modular platform allowing for highly customized drives mass produced, tested, and delivered from the factory.

Upgrades and further options dedicated to the marine industry are a matter of plug-and-play. Once you know one, you know them all.



1 Display options

Danfoss drives' renowned removable Local Control Panel (LCP) has an improved user interface. Choose between 27 built-in languages (including Chinese) or have it customized with your own. Languages can be changed by the user.

2 Hot pluggable LCP

The LCP can be plugged in or unplugged during operation. Settings are easily transferred via the control panel from one drive to another or from a PC with MCT 10 set-up software.

3 Integrated manual

The info button makes the printed manual virtually redundant. Users have been involved throughout development to ensure optimum overall functionality of the drive. The user group has significantly influenced the design and functionality of the LCP.

The Automatic Motor Adaptation (AMA), the Quick Set-Up menu and the large graphic display make commissioning and operation a breeze.

4 I/O options

The general purpose I/O, relay and thermistor, expands the flexibility of the drives.

5 Control terminals

Specially developed removable spring-loaded cage clamps add to reliability and facilitate easy commissioning and service.

6 24 V supply

A 24 V supply keeps the VLT® drives logically "alive" in situations when the AC power supply is removed.

7 RFI filter suitable for IT-grids

Danfoss drives are suitable for IT-grids as standard due to selectable RFI filter switch.

8 Modular construction and ease of maintenance

All components are easily accessible from the front of the drive, allowing for ease of maintenance and side-by-side mounting of drives. The drives are constructed to a modular design allowing for the easy replacement of modular sub-assemblies.

9 Programmable options

Freely programmable Motion Control Option for user-specific control algorithms and programs allows the integration of PLC programs.

10 Ruggedized printed circuit boards

Drives for maritime use are ruggedized to withstand vibration levels and the conformal coated to withstand salt mist test. Meets IEC 60721-3-3 Class 3C3.

11 Back-channel cooling

The unique design uses a back-channel to pass cooling-air over heat sinks. This design allows 85-90% of the heat losses to be exhausted directly outside of the enclosure with minimal air passing through the electronics area. This reduces temperature rise and contamination of the electronic components for improved reliability and increased functional life.

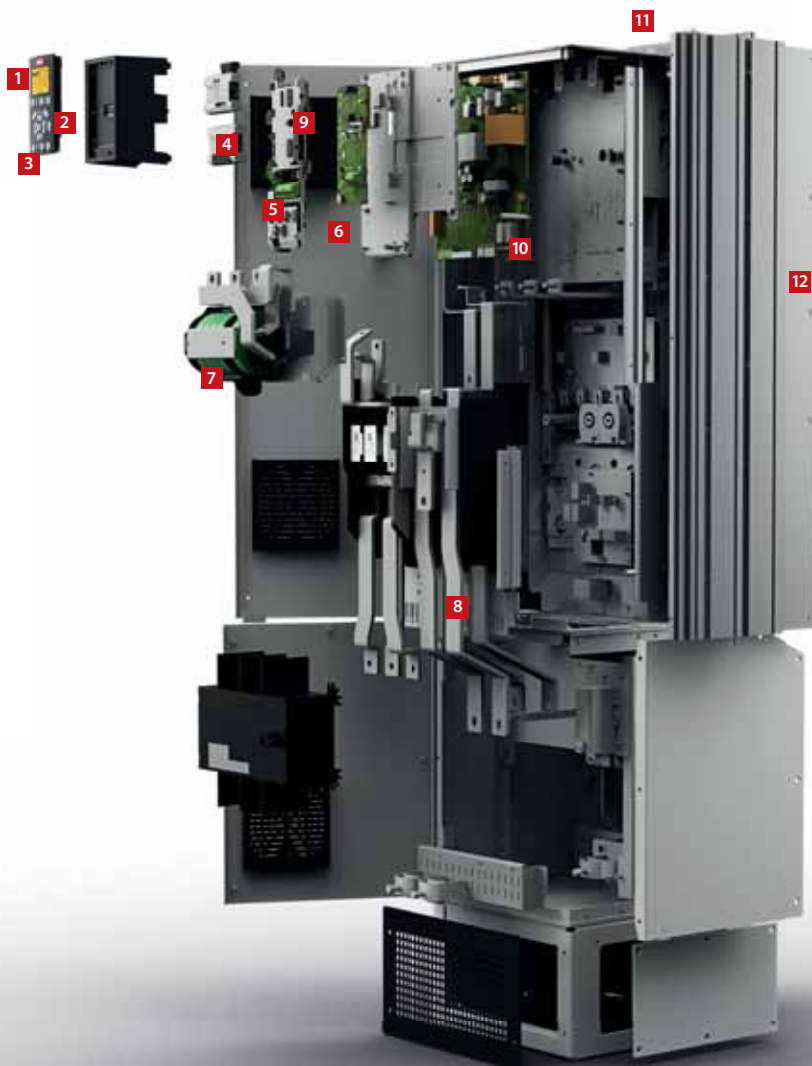
12 Enclosure

The drive meets relevant requirements for all possible installation conditions. Enclosure class IP00/chassis, IP20/chassis. IP21/NEMA 1, IP54/55/NEMA 12 or IP66/NEMA 4X.

VL[®] Motion Control Tool MCT 10

software provides easy configuration via pc, and provides a comprehensive overview of all the drives in a system of any size. It adds a new level of flexibility in configuration, monitoring and troubleshooting.

MCT 10 is a Windows-based engineering tool, enabling data exchange over a traditional RS485 interface, fieldbus (PROFIBUS, Ethernet, and more) or via USB. Use of MCT 10 reduces the risk of incorrect configuration, and facilitates rapid troubleshooting. It is an especially useful tool for documenting and recording as-commissioned settings for each AC drive on board.



Enclosure size D, IP54

Options and features for ultimate performance

Fieldbus options

Options for serial bus communication are delivered ready to plug and play: PROFIBUS, EtherNet/IP, DeviceNet, CANopen, and more.

ATEX-approved

An ATEX-approved thermistor option is available for VLT® AutomationDrive rendering the drive capable of providing sole protection for an EExd motor within the installation. The only action required is to connect the PTC thermistor to the drive, for a significant reduction in costs.

Safety

VLT® drives can be ordered with Safe Torque Off (STO) functionality according to ISO 13849-1:2006

Performance Level (PL) "d" and Category 3, as well as SIL 2 according to IEC 61508 and IEC 62061. This feature prevents the drive from starting unintentionally.

Harmonic suppression

Integrated DC chokes ensure very low harmonic disturbance of the power supply according to IEC-1000-3-2. This design eliminates the need for external chokes.

Smart Logic Control

Smart Logic Control is integrated into the VLT® drive. With this feature, you can make the drive react effectively to inputs and events, and often replace PLCs.

PELV

All VLT® drives comply to the PELV (Protective Extra Low Voltage) requirements and are surge-proof in accordance with VDE 0160. Inputs and outputs are electrically isolated.

Up to 150 meters between the drive and the motor

The basic design of VLT® drives allows for up to 150 meters of shielded motor cable – without disturbing other electronic equipment. This allows the VLT® drive to be installed in a central control room.

Type approvals



Optimized for reliability and stability

Ruggedized for ultimate maritime protection

In order to reduce the potential negative effects of vibration, the drives have been 'ruggedized'. It is a process that ensures that critical components on the PCB have increased protection, significantly reducing the risk of malfunction while at sea.

The printed circuit boards in the drives are also all coated in accordance with IEC 60721-3-3 class 3C3, providing additional protection against moisture and dust.

690 V drives

Danfoss can provide a complete range of 690 V drives from 1.1 kW to 1.4 MW. The drives are among the smallest in the market.

Reliable operation at engine room temperatures up to 55 °C

VLT® drives can operate at full load in engine rooms with 50°C temperature and 55 °C at reduced power close to, for example, pumps and thrusters. There is no need for installation in air-conditioned control rooms with long motor cables.

Spark-free design

The VLT® drives conform to the Limited Explosion Risk requirements in The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways, as they do not create any sparks during normal operation and the temperature does not exceed 200 °C.

Down to 12 months payback time

Drive-controlled sea-water-cooling pumps reduce energy consumption significantly. Usually the payback time is less than one year.

Adapt pump flow rate to actual cooling demand

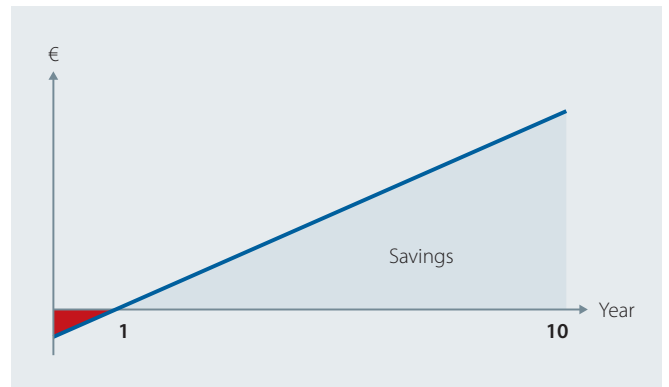
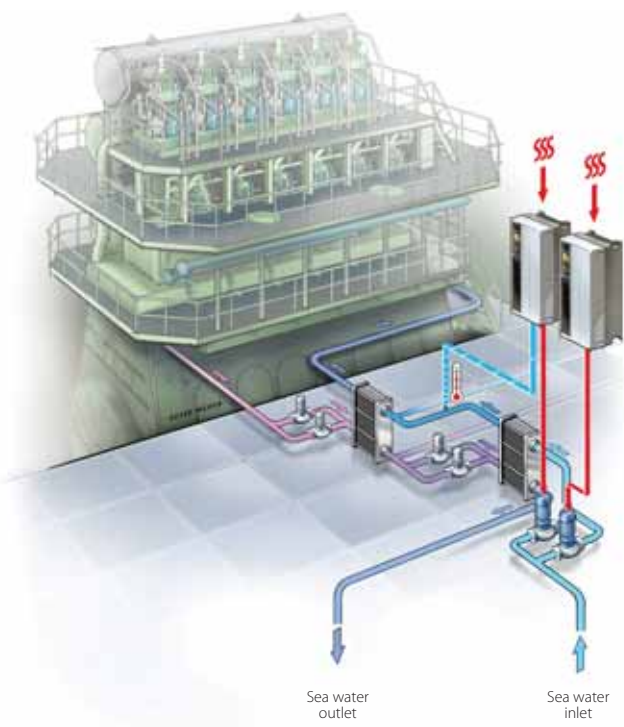
Ship cooling systems are designed for 100% load at 32 °C water temperature, regardless of the actual water temperature.

Given the fact that not all ships sail in equatorial waters or at maximum speed, the maximum cooling capacity is only rarely needed.

This makes it possible to achieve significant energy savings by allowing pumps to be controlled by a drive that constantly adapts the pump flow rate to the demand at any given time.

Reduce running costs

Once installed, VLT® drives instantly have a positive impact on running costs. A kWh of electric energy typically costs about € 0.1 at sea. Lowering the average energy consumption of this single application from 75 kW to 14 kW equals 366,000 kWh per year.



Potential savings – example

Design sea water temperature	32 °C
Average sea water temperature	20 °C
Running hours (year)	6000
Cost per kWh	€ 0.1
Standard system	75 kW = 450,000 kWh per year
Optimized system	14 kW = 84,000 kWh per year
Savings	80%
Annual savings	36,600 €
Installed cost of VLT® system	32,000 €
Payback time	Less than 12 months





VACON® AC drives deliver precision and clean power

When the most demanding requirements for flexibility, robustness, compactness and service-friendliness apply, turn to the high-precision VACON® NXP range.

Alternatively, for more standard situations, the VACON® 100 range of AC drives exceeds expectations, being easy to use and allowing you to do much more than you would expect from a standard drive.

Quick set-up

Easy commissioning tools ensure a hassle-free set-up whatever the application. Easy diagnostics with help in plain text is provided for each parameter, signal and fault.

- Startup Wizard – for fast setup of basic pump or fan applications
- PID Mini-Wizard – for easy commissioning of internal PID Controller
- Multi-Pump Wizard – for easy commissioning of Multi-Pump system
- Fire Mode Wizard – for easy commissioning of Fire Mode function

Ethernet connectivity

There is no need to purchase additional communication tools, since the integrated Ethernet connectivity allows remote drive access for monitoring, configuring and troubleshooting.

- Ethernet protocols such as PROFINET IO, EtherNet/IP™ and Modbus TCP are available for all NXP drives. New Ethernet protocols are being continuously developed.

User-friendly keypad

The user interface is intuitive to use. You will enjoy the keypad's well-structured menu system that allows for fast commissioning and trouble-free operation.

VACON® NXP family

- Removable panel with plug-in connection
- Graphical and textual keypad with multiple language support
- Text display multi-monitoring function
- Parameter back-up and copy function with the panel's internal memory
- The start-up wizard ensures a hassle-free set up. Choose the language, application type and main parameters during the first power up.

VACON® 100 family

- Graphical and textual keypad with multiple language support
- 9 signals can be monitored at the same time on a single multi-monitor page which is configurable to 9, 6 or 4 signals
- 3-color LED status indication on the control unit
- Trend display for two signals at the same time

Safe Torque Off, Safe Stop 1

Safe Torque Off (STO) prevents the AC drive from generating torque on the motor shaft and prevents unintentional start-ups. The function also corresponds to an uncontrolled stop in accordance with stop category 0, EN 60204-1.

Safe Stop 1 (SS1) initiates the motor deceleration and initiates the STO function after an application-specific time delay. The function also corresponds to a controlled stop in accordance with stop category 1, EN 60204-1.

Integrated STO and SS1 safety options have several advantages over standard safety technology using electromechanical switchgear. For example, separate components and the efforts required to wire and service them are no longer necessary, but the required level of safety at work is maintained.



ATEX-certified thermistor input

Certified and compliant with the European ATEX directive 94/9/EC, the integrated thermistor input is specially designed for the temperature supervision of motors that are placed in areas:

- In which potentially explosive gas, vapor, mist or air mixtures are present
- With combustible dust

If over-heating is detected, the drive immediately stops feeding energy to the motor. As no external components are needed, the cabling is minimized, improving reliability and saving on both space and costs.

Features for VACON® NXP family:

DC cooling fans

VACON® NXP high-performance air-cooled products are equipped with DC fans. This design significantly increases the reliability and lifetime of the fan, also fulfilling the ERP2015 directive on decreasing fan losses. Likewise, the DC-DC supply board component ratings fulfill industrial requirement levels.

Built-in expansion slots

Connect additional I/O, fieldbus and functional safety boards to the VACON® NXP family of drives, using five built-in expansion slots.

Conformal coating

To increase performance and durability, conformal coated circuit boards are standard for VACON® NXP family power modules (FR7 – FR14). The coated boards offer reliable protection against dust and moisture, and extend the lifetime of the drive and critical components.

VACON® DriveSynch

To facilitate design for redundancy when paralleling high-power liquid-cooled drives from the VACON® NXP family, use the VACON® DriveSynch control concept. This control concept allows a motor to be controlled by two to four power units each of 100-1500 kW. VACON® DriveSynch is suitable for controlling single and multi-winding AC motors, and is especially relevant for marine and offshore applications, providing a high degree of redundancy and system safety.

Features for VACON® 100 family:

Drive customizer

Drives in the VACON® 100 family are able to adapt to almost any function requiring I/O and control logic. The drive customizer function features a wide array of logical and numerical function blocks that can combine and extend standard drive functionalities, ensuring specific user requirements are met. The drive customizer does not require any special tools or training, while a fully graphical configuration can be performed using the VACON® Live configuration tool. Configurations can be copied using VACON® Live as part of the normal parameter list.



MAERSK

MALU 998 007 8 45RT

AQUALIFE

MALU 998 225 7 45RT

MALU 998 316 45RT



Marine references

A.P. Moller-Maersk

The A.P. Moller-Maersk Group is a worldwide conglomerate with operations in some 130 countries. The company owns the world's largest container shipping fleet, including the 20 Triple-E class vessels, the largest and most efficient of their kind.

Danfoss Drives is an approved supplier of drives and is on the official maker's list. VLT® drives have been chosen for a wide range of motor-control applications for the vessels, helping them achieve the A.P. Moller-Maersk Triple-E goals of Economy of scale, Energy efficiency and Environmental improvement.

On the Maersk platform supply vessels and oil tankers that provide quality services to the global oil and gas industry, VLT® drives provide reliable control of essential equipment. VLT® drives are also used to control the variable speed of the refrigeration compressor in the thousands of Maersk Container Industry reefers that carry perishable foods from continent to continent in perfect condition.





Ulstein Verft

Ulstein Verft AS is one of the world's foremost suppliers of advanced vessels; primarily anchor handling tug supply vessels, platform supply vessels and specialized and multifunctional vessels.

The shipyard serves as the Ulstein Group's development base for the detailed design and assembly of capital and equipment intensive specialized vessels and is the group's most important expertise base for carrying out projects.



Alewijnse Marine Systems

Alewijnse Marine Systems is part of the Alewijnse group with over 1000 employees globally.

Alewijnse has a long tradition in maritime technology as a full system integrator, providing technical services and innovative electrical engineering solutions that are both efficient and environmentally friendly.



Viking River Cruises

Viking River Cruises is the world's largest river cruise line, offering cruises along the rivers of Europe, Russia, China, South-East Asia and Egypt.

The vessels' diesel-electric propulsion system is based solely on synchronous and/or asynchronous generators and propulsion motors driven by an AC drive.

The VACON® NXP Common DC Bus solution was the first of its kind to be installed on these vessel types. This solution is already implemented on

board 52 of Viking River Cruises' vessels, making it the world's largest installed base on this vessel type.

VACON® drives and grid converter technologies:

- Reduce fuel consumption and CO₂, NO_x and SO_x emission levels significantly
- Improve maneuverability
- Reduce maintenance costs
- Improve comfort by reducing noise and vibration



Dutch Thruster Group

The Dutch Thruster Group decided to speed-regulate the thrusters using Danfoss drives, instead of a traditional solution with a fixed-speed e-motor and variable pitch propeller or a hydraulic driven system.

“An AC drive can adjust exactly to the power needed without compromising the efficiency. Compared to fixed-speed systems, a staggering 20% power consumption is saved on system losses.”

Edy Vos, general manager and project leader, Dutch Thruster Group



Rolls-Royce steering gear

Rolls-Royce supplies a complete range of rotary vane steering gear suitable for all sizes of ships. Rolls-Royce steering gears have been manufactured for more than 50 years with more than 25,000 units delivered.

Frequency-controlled pumps are used for the SR- and SV-series of steering gear, torque 16 to 850 kNm. This system utilizes a reversible hydraulic pump and motor together with a drive for changing the speed and direction of the pump. This gives smooth start and stop of the steering gear and enables a precise analog control system.



Johnson Controls Marine

Johnson Controls Marine & Navy is a global supplier of maritime refrigeration plants and HVAC systems. With more than 100 years of experience in the marine market, Johnson Controls Marine & Navy is among the world's most experienced and leading suppliers to the marine and offshore market.



SAACKE

SAACKE develops and produces reliable, environmentally friendly and energy-efficient firing plants for industrial processes, marine and offshore plants. With more than 80 years' experience, the company's 1000 employees are specialists in burners and system solutions for industrial processes, including marine boilers and water heaters. SAACKE is based in Bremen, Germany.



FAYARD A/S

FAYARD A/S is a modern shipyard located in Denmark, performing repair, maintenance and upgrade of all types of maritime vessels. About 25 large VACON® AC drives optimize energy consumption and performance on the site. Three portable shore supply systems based on VACON® NXC drives replaced diesel generators, in the period 2010 to 2013.

"With a payback time of less than two months, the shore power supply systems are some of the best investments we have made in recent years."

Jesper Gravesen, Electrical Supervisor at FAYARD A/S



AIDA Cruises

AIDA Cruises is Germany's largest cruise line. The ships of the AIDA fleet are dedicated to the German market and renowned for their young and casual style in combination with a high quality of service. AIDA Cruises is a member of the Carnival Group – the world's largest cruise shipping company.



Colfax Fluid Handling

As a member of the Colfax Corporation, Colfax Fluid Handling has been producing pumps since 1860, making it Germany's oldest pump manufacturer. In addition to the company's global R&D, production and sales and service organizations, Colfax Fluid Handling is also represented by approximately 100 subsidiaries and partner companies in many European countries, the United States, China, India, Egypt and South Africa.



Global Marine Engineering

Global Marine Engineering B.V. is a Netherlands-based company that specializes in the development and production of tunnel and azipod thrusters.

Havyard MMC

Havyard MMC makes fish handling and refrigeration concepts for the fishing- and fish-farming industry, as well as industrial refrigeration. Havyard MMC provides innovative solutions from the fish swimming in the sea until the fish are ready for the end consumer.

Chilled fish handling with care has the highest importance when Havyard MMC strives to be the market specialist.



Dampskibsselskabet NORDEN A/S

Dampskibsselskabet NORDEN A/S has retrofitted Danfoss VLT® drives on seawater cooling pumps on more than 20 tank- and bulk vessels that adapt the pump's flow rate to the actual demand needed. This has reduced the company's energy consumption significantly.

"We save up to 30,000 USD per year on each vessel with drives. And we have used Danfoss' setup on all new vessels based on our experiences with the retrofit solution."

Martin Meldgaard, fleet manager for producttanker vessels at Dampskibsselskabet NORDEN A/S.

Marine applications



Shore supply

Shore supply

Ships consume a large amount of fuel to power their on-board electrical grids during port stays. Burning fuel in sensitive port areas is also a significant source of local air pollution.

The obvious solution is to connect the ships to the on-shore electrical grid during berthing but the difference in frequency and voltage is a challenge.

Most ocean-going ships have a 60 Hz grid, whereas the power supply in most of the world outside the Americas is 50 Hz.

Shore supply systems convert the 50 Hz shore power to the ship's power system, and synchronize the voltage and frequency to the ship's electrical grid, with a smooth changeover. VACON® micro grid power conversion functionality ensures:

- Timely compliance with ever-more-stringent air quality regulations, for example MARPOL Annex VI Emission Control Areas and European Council Directive 2005/33/EC
- No contribution to local harbor air pollution. A large proportion of the shore power in the relevant countries is generated from renewable and non-fossil sources.
- Clean power supply, free of harmonic distortion, for protection of the on-board grid
- Very high system efficiency and low standby losses.

Power generation

Power sources on board are diverse, ranging from the shaft and main generators, to recuperation from waste energy such as exhaust gases, and the newer energy forms, solar and wind power.

No matter what the combination of power sources on board, power conversion ensures the correct voltage and frequency, and a clean supply free of harmonic distortion. Here VACON® drives are instrumental in optimizing power generation by:

- Regulating power generation to meet the load required
- Facilitating a high degree of redundancy and system safety
- Operating in compliance with the IT grid.

Hybridization

Hybrid vessels run from two or more power sources, usually with integrated energy storage in the form of batteries or super capacitors. This is one of the areas where you can draw on our best-in-class experience in developing new technological capabilities.

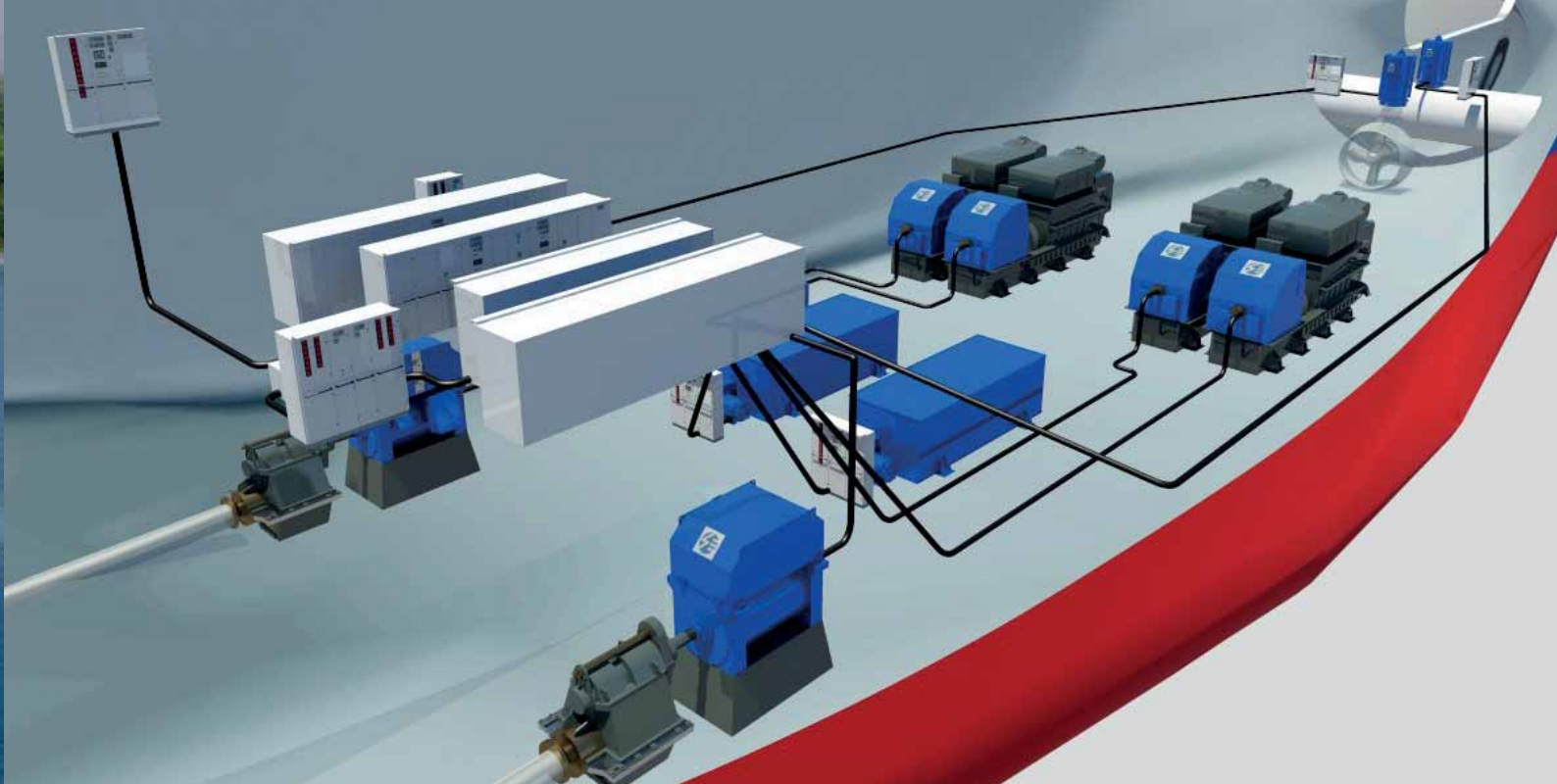
Using multi-source energy to power vessels is 20-30% more efficient than using traditional oil fuel. Tap into enormous flexibility with dynamic control, by optimizing for energy or power consumption. Then use the vessel as you want. Stop the diesel engine, run on battery, then start the engine again.

The benefits are:

- Reduced emissions
- Lower operating costs, due to lower fuel consumption
- Improved long-term efficiency of the power supply system

For optimal power conversion at the battery interface, use VACON® drives:

- To convert the battery DC voltage to on-board AC grid voltage
- To convert battery DC power to on-board DC grid power



Shaft generator

Shaft generator PTI/PTO

Fully optimize the main engine of the ship using power take in/power take out (PTI/PTO) technology. PTI/PTO makes the most of excess power generated elsewhere on the ship to contribute to the main propulsion. Variable speed control of the shaft generator coupled to the main engine shaft ensures these power contributions are used best.

When the shaft generator is optimized with VACON® AC drives featuring micro grid power conversion technology, the vessel benefits from:

- The speed of the engines can be optimized to the actual load demand. Up to 30% fuel savings, reduced CO₂ and NO_x emissions

- Allowing floating shaft generator frequency and voltage while maintaining nominal voltage and frequency in the electrical network of the ship
- Optimized PTO or PTI operation of the shaft generator
- Continuous parallel operation between the shaft generator and auxiliary generator sets

In order to further optimize the propulsion system, operate in combinatory mode. This mode of operation combines variable speed and variable pitch of the propeller.

Main propulsion

Electric propulsion provides a great deal of freedom in ship design, and ships can be designed much more efficiently without

the traditional limits on equipment layout, due to mechanical restrictions (for example, the main engines having to be aligned to and in the vicinity of the propeller shafts). When the propeller is controlled by a VLT® or VACON® drive, the power available to rotate the propeller can be contained with lighter and less robust mechanical constructions than would otherwise be needed with a constant power transmission. Due to its inflexibility, a constant power transmission produces excessive mechanical stress. This in turn means the vessel is cheaper to construct. The structure is also lighter.

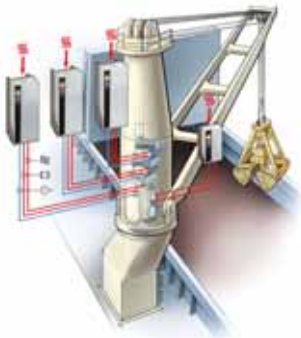
With electric propulsion:

- The power can be supplied by any number of generators, which enables high redundancy.

- The motor + drive combination consumes energy only when the azimuth thruster is actively turned
- The environment benefits from lower fuel consumption and exhaust gas emission levels

Electric propulsion is a good platform for the next phase of development – hybridization.

Marine applications



Crane

VLT® and VACON® drive control of cranes provides higher availability and productivity, compared to traditional hydraulic cranes. By using a drive, owners avoid overheating in the hydraulic oil system and typically benefit from a 15% shorter cycle time, due to faster movements.

The result is an environmentally friendly and efficient system characterized by:

- Elimination of hydraulic fluid leakages
- Only marginal losses in standby mode
- High efficiency during normal operation

Refrigeration compressors

Screw compressors controlled by a VLT® or VACON® drive typically use 15% less energy than traditional screw compressors with slide valve control only.

Optimized start/stop cycles reduce wear and tear on the compressor. Drive-controlled reciprocating and scroll compressors have higher COP at part loads. VLT® drives are particularly suitable for controlling scroll compressors.

Separators

VLT® and VACON® control enables reliable operation of bilge water, fuel conditioning and oil centrifuge separators.

The AC drive ensures smooth acceleration that protects both the gearbox and high-speed bowl bearings.

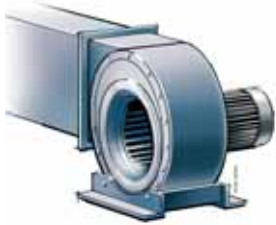
Control by the AC drive provides tolerance against discharge shock loads. In the event of power failure the drive can catch the spinning separator on the fly, and brake it without needing resistors.

Pumps

VLT® and VACON® drives control the pump to match actual process need, leading to reduced energy consumption. Reducing the speed by 20% reduces the power consumption by 50%.

As well as saving energy, these AC drives also protect the pump in many different marine applications. Pump-dedicated features include built-in PID controllers, dry pump detection, flying start, sleep mode, cascade control, end of curve, and flow compensation.

Due to increasingly stringent exhaust emission limits, scrubbers are frequently installed. They act as SO_x abatement devices on the main and auxiliary engines and boilers, using water as a medium for sulfur absorption. Optimization of water pumps for these scrubbers is the ideal task for VLT® and VACON® drives. Other typical application areas: ballast water, bilge water, circulation, cargo, firefighting, feeding pumps, lubrication, and sea water pumps.



Fan and ventilation

Load-dependent capacity control and Automatic Energy Optimization save energy and reduce audible noise in ventilation systems in engine rooms, galleys, thruster rooms, cargo, pump rooms, defroster systems, dehumidifiers and cargo-room refrigeration. In the event of fire, the fans will maintain smoke extraction under all conditions running in fire mode.



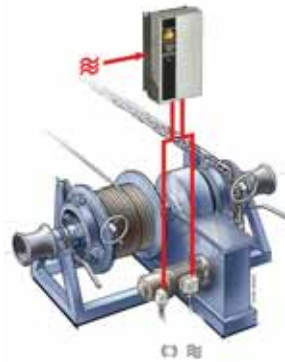
Thrusters

VLT® and VACON® drives' high torque capabilities and their fast and accurate performance provide precise maneuverability in all seas.

VLT® or VACON® drive-controlled variable speed propellers with fixed pitch are typically 20-30% more energy efficient than fixed-speed variable-pitch propellers – which waste approximately 20% of the power at zero thrust.

Frequency-controlled variable-speed propellers use 50% less energy than hydraulic variable-speed propellers. The need for special motor preheat function eliminates an anti-condensation heater.

Electrically-steered thrusters, gives more accurate control and responds more quickly than a hydraulic steering system. A minimum of two parallel motors and drives are always in use. If one combination stops, the steering system continues to operate.



Winch

Compared to hydraulic systems, electrical motors controlled by a VLT® or VACON® drive provide substantial energy savings, low noise operation and no risk of hydraulic oil leaks. Drives enable excellent speed and tension control and load sharing with several motors driving the same winch.

Advanced mechanical brake control eases stress on both gear and brake, while automatic DC hold preheating keeps the motor dry in standby mode. Robust open-loop control eliminates the need for fragile encoders in open deck environments. To enhance reliability, use highly dynamic active heave compensation functionality, which actively lifts the cargo.



Steering gear

With variable-speed control, it is possible to achieve accurate rudder positioning, enabling a precise analog control system. In rotary-vane steering gear with reversible hydraulic pumps, use a VLT® or VACON® drive to change speed and direction, saving energy by only running when the vessel is changing course.

AC drives for marine applications

VLT® drives have proved their worth in demanding applications all over the world, for decades. They also offer distinct advantages in marine applications.

VLT® AutomationDrive

The VLT® AutomationDrive FC 302 is a single drive concept that covers the entire range of marine applications. Designed to provide control, stability and efficiency, the drive ensures that applications such as thrusters, winches, hoists and steering gear function reliably in all conditions.

Featuring high torque, capabilities with overload as high as 160%, the VLT® AutomationDrive always takes firm grip on its application. Often, the strength of the drive will enable owners to eliminate other components.

VLT® HVAC Drive

Reduce energy consumption and increase energy efficiency in HVAC applications. VLT® HVAC Drive FC 102 provides precise and intelligent control of on-board pumps, fans and compressors.

All functions are built into the drive upon delivery and save space while enabling easy installation. The integrated Automatic Energy Optimizer function can save an additional 5-15% more energy through advanced control of the application in question. Due to the fact that the drive supports a wide range of HVAC protocols, the VLT® HVAC Drive reduces the need for extra gateway solutions.

VLT® AQUA Drive

Optimized for on-board, water and wastewater applications the VLT® AQUA Drive FC 202 provides optimized, energy-saving operation of pumps and fans.

Featuring dedicated pump features, such as auto tuning of PI controllers, the drive monitors and learns how the system reacts to corrections made by the drive, so precise and stable operation is achieved quickly.



Products

	VLT® HVAC Drive FC 102		VLT® AQUA Drive FC 202		VLT® Automation Drive FC 302		T2 200 – 240 V					T4 380 – 480 V T5 380 – 500 V					T7 525 – 690 V							
	kW		kW		kW																			
	NO ¹		NO ¹	HO ²	NO ¹	HO ²	IP20	IP21	IP54	IP55	IP66	IP00	IP20	IP21	IP54	IP55	IP66	IP00	IP20	IP21	IP54	IP55	IP66	
PK25			0.25		PK25	0.25																		
PK37			0.37		PK37	0.37																		
PK55			0.55		PK55	0.55																		
PK75			0.75		PK75	0.75	A2	A2		A4/A5	A4/A5													
P1K1	1.1		1.1		P1K1	1.1						A2	A2		A4/A5	A4/A5								
P1K5	1.5		1.5		P1K5	1.5																		
P2K2	2.2		2.2		P2K2	2.2																		
P3K0	3		3		P3K0	3	A3	A3		A5	A5								A3	A3				
P3K7	3.7		3.7		P3K7	3.7																		
P4K0	4		4		P4K0	4						A2	A2		A5	A5								
P5K5	5.5	5.5	3.7				B3	B1		B1	B1													
P7K5	7.5	7.5	5.5		P5K5	7.5	5.5					A3	A3		A5	A5								
P11K	11	11	7.5		P7K5	11	7.5																	
P15K	15	15	11		P11K	15	11	B4	B2		B2	B2												
P18K	18	18.5	15		P15K	18.5	15																	
P22K	22	22	18.5		P18K	22	18.5																	
P30K	30	30	22		P22K	30	22	C3	C1		C1	C1							B4	B2			B2	B2
P37K	37	37	30		P30K	37	30																	
P45K	45	45	37		P37K	45	37	C4	C2		C2	C2												
P55K	55	55	45		P45K	55	45																	
P75K/ N75K*	75	75	55		P55K/ N55K*	75	55																	
P90K/ N90K*	90	90	75		P75K/ N75K*	90	75																	
N110	110	110	90		N90	110	90												D3h	D1h/ D5h/ D6h	D1h/ D5h/ D6h			
N132	132	132	110		N110	132	110																	
N160	160	160	132		N132	160	132																	
N200	200	200	160		N160	200	160																	
N250	250	250	200		N200	250	200																	
N315	315	315	250		N250	315	250																	
N400*	400	400	315		N315*	400	315																	
P355	355	355	400		P315	355	315																	
P400	400	400	355		P355	400	355				E2		E1	E1										
P450	450	450	400		P400**	450	400																	
P500*	500	500	450		P400*	500	400																	
P500	500	500	450		P450	500	450**																	
P560	560	560	500		P500	560	500							F1/F3	F1/F3									
P630	630	630	560		P560	630	560																	
P710	710	710	630		P630	710	630																	
P800	800	800	710		P710	800	710																	
P1M0**	1000	1000	900		P800**	1000	800							F2/F4	F2/F4									
P900	900	900	800		P800*	900	800																	
P1M0*	1000	1000	900		P900	1000	900																	
P1M2	1200	1200	1000		P1M0	1200	1000																	
P1M4	1400	1400	1200		P1M2	1400	1200																	

¹ Normal overload
² High overload
* @ 690 V
** @ 400 V

Note:
T4/T5: All ratings @ 400 V
T7: All ratings @ 690 V

- IP00/Chassis
- IP20/Chassis
- IP21/Type 1
- IP21 with upgrade kit – available in US only
- IP54/Type 12
- IP55/Type 12
- IP66/NEMA 4X

Dimensions [mm]

	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	D1h	D2h	D3h	D4h	E1	E2	F1	F2	F3	F4
H	268	390	420	480	650	399	520	680	770	550	660	901	1107	909	1122	2000	1547	2280	2280	2280	2280	
W	90	130	200	242	165	230	308	370	308	370	325	420	250	350	600	585	1400	1804	1997	2401		
D	205	175	200	260	249	242	310	335	333	378	375	494	498	607	607	607	607	607	607	607		
H+	375				475	670			755	950												
W+	90	130			165	255			329	391												

Note: H and W dimensions are with back-plate. H+ and W+ are with IP upgrade kit. D-frame dimensions are without options (extended versions).
(For more information please see the High Power Selection Guide DKDD.PB.404.A1.02)

AC drives for marine applications

VACON® 100 INDUSTRIAL

The VACON® 100 INDUSTRIAL serves a wide range of industrial applications. It is easy to integrate into systems and easy to adapt to different needs.

Easy integration

Integrated RS485 and Ethernet interfaces support all major industrial protocols. Save on extra cards – and use the same drive no matter what the protocol required.

Easy adaptation

Built-in PLC functionality enables you to create new functionality in the drive. The VACON® CUSTOMIZER facilitates smaller logic adaptations for special needs or retrofit situations.

High availability

Enjoy enhanced reliability due to long-life DC link capacitors which are electrolytic-free, using plastic foil technology.

Performance is ensured even after many years of storage.

VACON® 100 FLOW

Dedicated functionality helps you to improve flow control in industrial applications.

Dedicated flow control

In addition to general convenient usability and systems support functions, VACON® 100 FLOW provides specific flow-control functions to enhance pump and fan performance and protect pipes and equipment.

Connectivity included

No extra parts are required for connection to the leading industrial fieldbus systems, thanks to on-board RS485 and Ethernet interfaces as standard.

Run high-efficiency motors

Select the most efficient motor for your task, with the ability to run the new high-efficiency motor technologies, such as permanent magnet and synchronous reluctance motors.



AC drive type	Low overload VACON® FLOW, VACON® INDUSTRIAL		High overload VACON® INDUSTRIAL		Enclosure size
	Motor shaft power		Motor shaft power		
	230 V 40°C [kW]	230 V 40°C NEC [HP]	230 V 50°C [kW]	230 V NEC 50°C [HP]	
Mains voltage 208-240 V, 50/60 Hz					
VACON 0100-3L-0003-2-xxxx	0.55	0.75	0.37	0.5	MR4
VACON 0100-3L-0004-2-xxxx	0.75	1	0.55	0.75	
VACON 0100-3L-0007-2-xxxx	1.1	1.5	0.75	1	
VACON 0100-3L-0008-2-xxxx	1.5	2	1.1	1.5	
VACON 0100-3L-0011-2-xxxx	2.2	3	1.5	2	
VACON 0100-3L-0012-2-xxxx	3	4	2.2	3	
VACON 0100-3L-0018-2-xxxx	4	5	3	4	
VACON 0100-3L-0024-2-xxxx	5.5	7.5	4	5	MR5
VACON 0100-3L-0031-2-xxxx	7.5	10	5.5	7.5	
VACON 0100-3L-0048-2-xxxx	11	15	7.5	10	MR6
VACON 0100-3L-0062-2-xxxx	15	20	11	15	
VACON 0100-3L-0075-2-xxxx	18.5	25	15	20	MR7
VACON 0100-3L-0088-2-xxxx	22	30	18.5	25	
VACON 0100-3L-0105-2-xxxx	30	40	22	30	MR8
VACON 0100-3L-0140-2-xxxx	37	50	30	40	
VACON 0100-3L-0170-2-xxxx	45	60	37	50	MR9
VACON 0100-3L-0205-2-xxxx	55	75	45	60	
VACON 0100-3L-0261-2-xxxx	75	100	55	75	
VACON 0100-3L-0310-2-xxxx	90	125	75	100	

AC drive type	Low overload VACON® FLOW, VACON® INDUSTRIAL		High overload VACON® INDUSTRIAL		Enclosure size
	Motor shaft power		Motor shaft power		
	400 V 40°C [kW]	480 V NEC/NEMA 40°C [HP]	400 V 50°C [kW]	480 V NEC/NEMA 50°C [HP]	
Mains voltage 380-500 V, 50/60 Hz					
VACON 0100-3L-0003-5-xxxx	1.1	1.5	0.75	1.0	MR4
VACON 0100-3L-0004-5-xxxx	1.5	2.0	1.1	1.5	
VACON 0100-3L-0005-5-xxxx	2.2	3.0	1.5	2.0	
VACON 0100-3L-0008-5-xxxx	3	4.0	2.2	3.0	
VACON 0100-3L-0009-5-xxxx	4	5.0	3	4.0	
VACON 0100-3L-0012-5-xxxx	5.5	7.5	4	5.0	
VACON 0100-3L-0016-5-xxxx	7.5	10.0	5.5	7.5	
VACON 0100-3L-0023-5-xxxx	11	15.0	7.5	10.0	MR5
VACON 0100-3L-0031-5-xxxx	15	20.0	11	15.0	MR6
VACON 0100-3L-0038-5-xxxx	18.5	25.0	15	20.0	
VACON 0100-3L-0046-5-xxxx	22	30.0	18.5	25.0	MR7
VACON 0100-3L-0061-5-xxxx	30	40.0	22	30.0	
VACON 0100-3L-0072-5-xxxx	37	50	30	40	MR8
VACON 0100-3L-0087-5-xxxx	45	60	37	50	
VACON 0100-3L-0105-5-xxxx	55	75	45	60	MR9
VACON 0100-3L-0140-5-xxxx	75	100	55	75	
VACON 0100-3L-0170-5-xxxx	90	125	75	100	MR10
VACON 0100-3L-0205-5-xxxx	110	150	90	125	
VACON 0100-3L-0261-5-xxxx	132	200	110	150	MR12
VACON 0100-3L-0310-5-xxxx	160	250	132	200	
VACON 0100-3L-0385-5-xxxx	200	300	160	250	
VACON 0100-3L-0460-5-xxxx	250	350	200	300	
VACON 0100-3L-0520-5-xxxx	250	450	250	350	
VACON 0100-3L-0590-5-xxxx	315	500	250	450	
VACON 0100-3L-0650-5-xxxx	355	500	315	500	
VACON 0100-3L-0730-5-xxxx	400	600	355	500	
VACON 0100-3L-0820-5-xxxx	450	700	400	600	
VACON 0100-3L-0920-5-xxxx	500	800	450	700	
VACON 0100-3L-1040-5-xxxx	560	900	500	800	
VACON 0100-3L-1180-5-xxxx	630	1000	500	800	

AC drive type	Low overload VACON® FLOW, VACON® INDUSTRIAL		High overload VACON® INDUSTRIAL		Enclosure size
	Motor shaft power		Motor shaft power		
	690 V 40°C [kW]	600 V NEC/NEMA 40°C [HP]	690 V 50°C [kW]	600 V NEC/NEMA 50°C [HP]	
Mains voltage 525-600 V, 50/60 Hz					
VACON 0100-3L-0007-7-xxxx	5.5	5	4	3	MR6
VACON 0100-3L-0010-7-xxxx	7.5	7.5	5.5	5	
VACON 0100-3L-0013-7-xxxx	11	10	7.5	7.5	
VACON 0100-3L-0018-7-xxxx	15	15	11	10	
VACON 0100-3L-0022-7-xxxx	18.5	20	15	15	
VACON 0100-3L-0027-7-xxxx	22	25	18.5	20	
VACON 0100-3L-0034-7-xxxx	30	30	22	25	
VACON 0100-3L-0041-7-xxxx	37	40	30	30	
VACON 0100-3L-0052-7-xxxx	45	50	37	40	MR7
VACON 0100-3L-0062-7-xxxx	55	60	45	50	MR8
VACON 0100-3L-0080-7-xxxx	75	75	55	60	
VACON 0100-3L-0100-7-xxxx	90	100	75	75	MR9
VACON 0100-3L-0125-7-xxxx	110	125	90	100	
VACON 0100-3L-0144-7-xxxx	132	150	110	125	MR10
VACON 0100-3L-0170-7-xxxx	160	150	132	150	
VACON 0100-3L-0208-7-xxxx	200	200	160	150	MR12
VACON 0100-3L-0261-7-xxxx	250	250	200	200	
VACON 0100-3L-0325-7-xxxx	315	300	250	250	
VACON 0100-3L-0385-7-xxxx	355	400	315	300	
VACON 0100-3L-0416-7-xxxx	400	450	355	300	
VACON 0100-3L-0460-7-xxxx	450	450	400	400	
VACON 0100-3L-0520-7-xxxx	500	500	450	450	
VACON 0100-3L-0590-7-xxxx	560	600	500	500	
VACON 0100-3L-0650-7-xxxx	630	650	560	600	
VACON 0100-3L-0750-7-xxxx	710	700	630	650	
VACON 0100-3L-0820-7-xxxx	800	800	630	650	

Dimensions

Enclosure size	IP21 and IP54		IP00		Enclosed drive IP21 and IP54	
	W x H x D		W x H x D		W x H x D	
	mm	inch	mm	inch	mm	inch
MR4	128 x 328 x 190	5.04 x 12.91x7.48				
MR5	144 x 419 x 214	5.67 x 16.5 x 8.43				
MR6	195 x 557 x 229	7.68 x 21.93 x 9.02				
MR7	237 x 645 x 259	10.2 x 25.98 x 10.2				
MR8	290 x 996 x 343	11.42 x 39.21 x 13.5	290 x 794 x 343	11.42 x 31.26 x 13.5	406 x 2100 x 600	16.0 x 82.7 x 23.6
MR9	480 x 1150 x 365	18.9 x 45.28 x 14.37	480 x 840.5 x 365	18.9 x 33.09 x 14.37	606 x 2100 x 600	23.9 x 82.7 x 23.6
MR10			506 x 980 x 525**	19.92 x 38.58 x 20.67**	606 x 2100 x 600	23.9 x 82.7 x 23.6
MR12			2 x (506 x 980 x 525)**	2 x (19.92 x 38.58 x 20.67)**	1212 x 2100 x 600	47.7 x 82.7 x 23.6
MM4*	190.7 x 315.3 x 213.8	7.51 x 12.41 x 8.42				
MM5*	232.6 x 267.4 x 230.8	9.16 x 14.46 x 9.08				
MM6*	349.5 x 499.8 x 254.2	13.76 x 19.68 x 10				

* Depth with panel
** Without extension box

AC drives for marine applications

VACON® NXP Air Cooled

With a wide power range, the VACON® NXP Air Cooled drive is the ideal drive for enhanced performance for marine and offshore applications.

Top performance

With VACON® NXP control flexibility, you obtain maximum motor control performance combined with easy usability.

Fully configurable I/O and fieldbuses cater for any connectivity need. Fast drive-to-drive communication gives you the flexibility of load sharing and paralleling of power units.

High-power units are available in 6-pulse and 12-pulse versions.

Extremely flexible

Adapt the drive to many diverse usage requirements by loading the VACON® application software that best suits your needs. Built-in PLC functionality enables you to create new functionality in the drive.

VACON® NXC Air Cooled Enclosed

The VACON® NXC Air Cooled Enclosed Drive comprises a VACON® NXP drive which is cabinet-mounted, factory-tested and certified.

Easy to configure

Choose between a wide range of control and power options when ordering.

Select 6-pulse or 12-pulse supply compatibility as required. System integrators and panel builders will benefit from easy integration ability, pre-tested cabinet solutions and many control benefits.

Safety first

Ensure safe and easy installation by choosing this enclosed drive, which is delivered pre-mounted in its own cabinet, fully factory-tested and certified. It is internally protected against unintentional human contact.

Access to the control equipment is easy and safe, due to the dedicated control compartment located at the front of the cabinet.



VACON® NXP wall-mounted

AC drive type	Motor shaft power				Enclosure size
	230 V / 400 V / 690 V				
	10% overload P [kW]	10% overload NEC/ NEMA P [HP]	50% overload P [kW]	50% overload NEC/ NEMA P [HP]	
Mains voltage 208-240 V, 50/60 Hz, 3[~]					
NXP 0003 2 A 2 H 1 S S S	0.55	0.75	0.37	0.5	FR4
NXP 0004 2 A 2 H 1 S S S	0.75	1	0.55	0.75	
NXP 0007 2 A 2 H 1 S S S	1.1	1.5	0.75	1	
NXP 0008 2 A 2 H 1 S S S	1.5	2	1.1	1.5	
NXP 0011 2 A 2 H 1 S S S	2.2	3	1.5	2	
NXP 0012 2 A 2 H 1 S S S	3	4	2.2	3	
NXP 0017 2 A 2 H 1 S S S	4	5	3	4	FR5
NXP 0025 2 A 2 H 1 S S S	5.5	7.5	4	5	
NXP 0031 2 A 2 H 1 S S S	7.5	10	5.5	7.5	
NXP 0048 2 A 2 H 1 S S S	11	15	7.5	10	FR6
NXP 0061 2 A 2 H 1 S S S	15	20	11	15	
NXP 0075 2 A 2 H 0 S S S	22	30	15	20	FR7
NXP 0088 2 A 2 H 0 S S S	22	30	22	25	
NXP 0114 2 A 2 H 0 S S S	30	40	22	30	FR8
NXP 0140 2 A 2 H 0 S S S	37	50	30	40	
NXP 0170 2 A 2 H 0 S S S	45	60	37	50	
NXP 0205 2 A 2 H 0 S S S	55	75	45	60	FR9
NXP 0261 2 A 2 H 0 S S F	75	100	55	75	
NXP 0300 2 A 2 H 0 S S F	90	125	75	100	
Mains voltage 380-500 V, 50/60 Hz, 3[~]					
NXP 0003 5 A 2 H 1 S S S	1.1	1.5	0.75	1.0	FR4
NXP 0004 5 A 2 H 1 S S S	1.5	2.0	1.1	1.5	
NXP 0005 5 A 2 H 1 S S S	2.2	3.0	1.5	2.0	
NXP 0007 5 A 2 H 1 S S S	3	4.0	2.2	3.0	
NXP 0009 5 A 2 H 1 S S S	4	5.0	3	4.0	
NXP 0012 5 A 2 H 1 S S S	5.5	7.5	4	5.0	FR5
NXP 0016 5 A 2 H 1 S S S	7.5	10.0	5.5	7.5	
NXP 0022 5 A 2 H 1 S S S	11	15.0	7.5	10.0	
NXP 0031 5 A 2 H 1 S S S	15	20.0	11	15.0	FR6
NXP 0038 5 A 2 H 1 S S S	18.5	25.0	15	20.0	
NXP 0045 5 A 2 H 1 S S S	22	30.0	18.5	25.0	FR7
NXP 0061 5 A 2 H 1 S S S	30	40.0	22	30.0	
NXP 0072 5 A 2 H 0 S S S	37	50	30	40	FR8
NXP 0087 5 A 2 H 0 S S S	45	60	37	50	
NXP 0105 5 A 2 H 0 S S S	55	75	45	60	FR9
NXP 0140 5 A 2 H 0 S S S	75	100	55	75	
NXP 0168 5 A 2 H 0 S S S	90	125	75	100	
NXP 0205 5 A 2 H 0 S S S	110	150	90	125	FR9
NXP 0261 5 A 2 H 0 S S F	132	200	110	150	
NXP 0300 5 A 2 H 0 S S F	160	250	132	200	
Mains voltage 525-690 V, 50/60 Hz, 3[~]					
NXP 0004 6 A 2 L 0 S S S	3	4.0	2.2	3.0	FR6
NXP 0005 6 A 2 L 0 S S S	4	5.0	3	4.0	
NXP 0007 6 A 2 L 0 S S S	5.5	7.5	4	5.0	
NXP 0010 6 A 2 L 0 S S S	7.5	10.0	5.5	7.5	
NXP 0013 6 A 2 L 0 S S S	11	15.0	7.5	10.0	
NXP 0018 6 A 2 L 0 S S S	15	20.0	11	15.0	FR7
NXP 0022 6 A 2 L 0 S S S	18.5	25.0	15	20.0	
NXP 0027 6 A 2 L 0 S S S	22	30.0	18.5	25.0	
NXP 0034 6 A 2 L 0 S S S	30	40.0	22	30.0	FR8
NXP 0041 6 A 2 L 0 S S S	37.5	50.2	30	40	
NXP 0052 6 A 2 L 0 S S S	45	60	37.5	50.2	FR9
NXP 0062 6 A 2 L 0 S S S	55	75	45	60	
NXP 0080 6 A 2 L 0 S S S	75	100	55	75	FR9
NXP 0100 6 A 2 L 0 S S S	90	125	75	100	
NXP 0125 6 A 2 L 0 S S F	110	150	90	125	
NXP 0144 6 A 2 L 0 S S F	132	200	110	150	FR9
NXP 0170 6 A 2 L 0 S S F	160	250	132	200	
NXP 0208 6 A 2 L 0 S S F	200	300	160	250	

Dimensions

Enclosure size	Height		Width		Depth	
	mm	inch	mm	inch	mm	inch
FR4	327	12.87	128	5.04	190	7.48
FR5	419	16.5	144	5.67	214	8.43
FR6	558	21.97	195	7.68	237	9.33
FR7	630	24.8	237	9.33	257	10.12
FR8	758	29.88	291	11.47	344	13.54
FR9	1150	45.28	480	18.9	362	14.25
FR10	2018	79.45	595	23.43	602	23.70
FR11	2018	79.45	794	31.26	602	23.70
FR12	2275	89.57	1206	47.48	605	23.82
FR13	2275	89.57	1406	55.35	605	23.82
FR14	2275	89.57	2406 2806	94.72 110.47	605	23.82

VACON® NXP drive module

AC drive type	Motor shaft power				Enclosure size
	400 V / 690 V				
	10% overload P [kW]	10% overload NEC/ NEMA P [HP]	50% overload P [HP]	50% overload NEC/ NEMA P [HP]	
Mains voltage 380-500 V, 50/60 Hz, 3[~]					
NXP 0385 5 A 0 N 0 S S A	200	268.1	160	214.5	FR10
NXP 0460 5 A 0 N 0 S S A	250	335.1	200	268.1	
NXP 0520 5 A 0 N 0 S S A	250	335.1	250	335.1	
NXP 0590 5 A 0 N 0 S S A	315	422.3	250	335.1	
NXP 0650 5 A 0 N 0 S S A	355	475.9	315	422.3	
NXP 0730 5 A 0 N 0 S S A	400	536.2	355	475.9	FR11
NXP 0820 5 A 0 N 0 S S A	450	603.2	400	536.2	
NXP 0920 5 A 0 N 0 S S A	500	670.2	450	603.2	
NXP 1030 5 A 0 N 0 S S A	560	750.7	500	670.2	FR12
NXP 1150 5 A 0 N 0 S S F	630	844.5	560	750.7	
NXP 1300 5 A 0 N 0 S S F ¹⁾	710	951.7	630	844.5	FR13
NXP 1450 5 A 0 N 0 S S F ¹⁾	800	1072	710	951.7	
NXP 1770 5 A 0 N 0 S S F	1000	1340.5	900	1206	FR14
NXP 2150 5 A 0 N 0 S S F	1200	1608.6	1100	1474.5	
Mains voltage 525-690 V, 50/60 Hz, 3[~]					
NXP 261 6 A 0 N 0 S S A	250	335.1	200	268.1	FR10
NXP 325 6 A 0 N 0 S S A	315	422.3	250	335.1	
NXP 385 6 A 0 N 0 S S A	355	475.9	315	422.3	
NXP 416 6 A 0 N 0 S S A*	400	536.2	315	422.3	
NXP 460 6 A 0 N 0 S S A	450	603.2	355	475.9	
NXP 502 6 A 0 N 0 S S A	500	670.2	450	603.2	FR11
NXP 590 6 A 0 N 0 S S A*	560	750.7	500	670.2	
NXP 650 6 A 0 N 0 S S A	630	844.5	560	750.7	
NXP 750 6 A 0 N 0 S S A	710	951.7	630	844.5	FR12
NXP 820 6 A 0 N 0 S S A*	800	1072	630	951.7	
NXP 920 6 A 0 N 0 S S F	900	1206	800	1072	FR13
NXP 1030 6 A 0 N 0 S S F	1000	1340.5	900	1206	
NXP 1180 6 A 0 N 0 S S F*	1150	1541.6	1000	1340.5	FR14
NXP 1500 6 A 0 N 0 S S F ²⁾	1500	2010.7	1300	1742.6	
NXP 1900 6 A 0 N 0 S S F	1800	2412.9	1500	2010.7	
NXP 2250 6 A 0 N 0 S S F*	2000	2680	1800	2412.9	

* Max. ambient temperature of +35°C

1) 12-pulse units, 4 x (497 x 449 x 249/130)

2) 12-pulse units, 2 x (354 x 319 x 230/53 kg)

VACON® NXP standalone

AC drive type	Motor shaft power				Enclosure size
	400 V / 690 V				
	10% overload P [kW]	10% overload NEC/ NEMA P [HP]	50% overload P [kW]	50% overload NEC/ NEMA P [HP]	
Mains voltage 380-500 V, 50/60 Hz, 3[~]					
NXP 0385 5 A 2 L 0 S S A	200	268.1	160	214.5	FR10
NXP 0460 5 A 2 L 0 S S A	250	335.1	200	268.1	
NXP 0520 5 A 2 L 0 S S A	250	335.1	250	335.1	
NXP 0590 5 A 2 L 0 S S A	315	422.3	250	335.1	
NXP 0650 5 A 2 L 0 S S A	355	475.9	315	422.3	
NXP 0730 5 A 2 L 0 S S A	400	536.2	355	475.9	FR11
NXP 0820 5 A 2 L 0 S S A	450	603.2	400	536.2	
NXP 0920 5 A 2 L 0 S S A	500	670.2	450	603.2	
NXP 1030 5 A 2 L 0 S S A	560	750.7	500	670.2	FR12
NXP 1150 5 A 2 L 0 S S A	630	844.5	560	750.7	
NXP 1300 5 A 2 L 0 S S A ¹⁾	710	951.7	630	844.5	FR13
NXP 1450 5 A 2 L 0 S S A ¹⁾	800	1072	710	951.7	
NXP 1770 5 A 2 L 0 S S A	1000	1340.5	900	1206	FR14
NXP 2150 5 A 2 L 0 S S A	1200	1608.6	1100	1474.5	
Mains voltage 525-690 V, 50/60 Hz, 3[~]					
NXP 261 6 A 2 L 0 S S A	250	335.1	200	268.1	FR10
NXP 325 6 A 2 L 0 S S A	315	422.3	250	335.1	
NXP 385 6 A 2 L 0 S S A	355	475.9	315	422.3	
NXP 416 6 A 2 L 0 S S A*	400	536.2	315	422.3	
NXP 460 6 A 2 L 0 S S A	450	603.2	355	475.9	
NXP 502 6 A 2 L 0 S S A	500	670.2	450	603.2	FR11
NXP 590 6 A 2 L 0 S S A*	560	750.7	500	670.2	

* Max. ambient temperature of +35°C

AC drives for marine applications

VACON® NXC Low Harmonic

With a built-in active filter, the VACON® NXC Low Harmonic drive is the ideal choice for the most demanding power quality requirements.

Harmonics compliance

There is no need for additional harmonics mitigation, since the drive already complies with regulatory standards and requirements for power quality in electrical networks.

Save infrastructure costs

The low total current distortion (THDi) of the supply power contributes to a considerably lower supply current. As a result, the dimensions of fuses, supply cables and supply transformers can be kept optimal. And, as there's no need to oversize cables and transformers, you can achieve up to 30% savings on network infrastructure costs in both new and retrofit projects.

VACON® NXA Liquid Cooled AFE

Featuring active front end (AFE) technology, VACON® NXA Liquid Cooled AFE is ideal for a wide range of applications where there is a need for energy regeneration.

Regenerative braking

The most significant benefits come when the drive is used with applications with a braking need – such as cranes. The braking energy can be fed back to the mains to be effectively used elsewhere.

Clean power

Enjoy the benefits of a clean power supply, with virtually harmonics-free input current. AFE technology reduces the THDi to less than 5%.



VACON® NXC Low Harmonic

AC drive type	Motor shaft power				Enclosure size
	400 V/ 690 V				
	10% overload P [kW]	10% overload NEC/ NEMA P [HP]	50% overload P [kW]	50% overload NEC/ NEMA P [HP]	
Mains voltage 380-500 V, 50/60 Hz					
NXC 0261 5 A 2 L 0 RSF	132	176.9	110	147.5	AF9
NXC 0300 5 A 2 L 0 RSF	160	214.5	132	176.9	
NXC 0385 5 A 2 L 0 RSF	200	268	160	214.5	
NXC 0460 5 A 2 L 0 RSF	250	335	200	268	AF10
NXC 0520 5 A 2 L 0 RSF	250	335	250	335	
NXC 0650 5 A 2 L 0 RSF	355	475.9	315	422	AF12
NXC 0730 5 A 2 L 0 RSF	400	536	355	475.9	
NXC 0820 5 A 2 L 0 RSF	450	603	400	536	
NXC 0920 5 A 2 L 0 RSF	500	670	450	603	
NXC 1030 5 A 2 L 0 RSF	560	750.7	500	670	
NXC 1150 5 A 2 L 0 RSF	630	844.5	560	750.7	AF13
NXC 1300 5 A 2 L 0 RSF	710	951.7	630	844.5	
NXC 1450 5 A 2 L 0 RSF	800	1072	710	951.7	AF14
NXC 1770 5 A 2 L 0 RSF	1000	1340.5	900	1206	
NXC 2150 5 A 2 L 0 RSF	1200	1608.6	1100	1474.5	
NXC 2700 5 A 2 L 0 RSF	1500	2010.7	1200	1608.6	
Mains voltage 525-690 V, 50/60 Hz					
NXC 0125 6 A 2 L 0 RSF	110	147.5	90	120.6	AF9
NXC 0144 6 A 2 L 0 RSF	132	176.9	110	147.5	
NXC 0170 6 A 2 L 0 RSF	160	214.5	132	176.9	
NXC 0208 6 A 2 L 0 RSF*	200	268	160	214.5	AF10
NXC 0261 6 A 2 L 0 RSF	250	335	200	268	
NXC 0325 6 A 2 L 0 RSF	315	422	250	335	AF12
NXC 0385 6 A 2 L 0 RSF	355	475.9	315	422	
NXC 0416 6 A 2 L 0 RSF*	400	536	315	422	
NXC 0460 6 A 2 L 0 RSF	450	603	355	475.9	
NXC 0502 6 A 2 L 0 RSF	500	670	450	603	
NXC 0590 6 A 2 L 0 RSF	560	750.7	500	670	AF13
NXC 0650 6 A 2 L 0 RSF	630	844.5	560	750.7	
NXC 0750 6 A 2 L 0 RSF	710	951.7	630	844.5	AF14
NXC 0820 6 A 2 L 0 RSF*	750	1005.4	650	871	
NXC 0920 6 A 2 L 0 RSF	900	1206	800	1072	
NXC 1030 6 A 2 L 0 RSF	1000	1340.5	900	1206	
NXC 1180 6 A 2 L 0 RSF*	1150	1541.6	1000	1340.5	
NXC 1500 6 A 2 L 0 RSF	1500	2010.7	1300	1742.6	
NXC 1900 6 A 2 L 0 RSF	1800	2412.9	1500	2010.7	
NXC 2250 6 A 2 L 0 RSF*	2000	2680	1800	2412.9	

*Max. ambient temperature of +35°C

VACON® NXA Liquid Cooled AFE

AC drive type	DC power				Enclosure size
	400 VAC mains I _{th} [kW]	500 VAC mains I _{th} [kW]	400 VAC mains I _L [kW]	500 VAC mains I _L [kW]	
DC bus voltage 465-800 VDC					
NXA01685A0T02WS	113	142	103	129	CH5
NXA02055A0T02WS	138	173	125	157	
NXA02615A0T02WS	176	220	160	200	CH61
NXA03005A0T02WF	202	253	184	230	
NXA03855A0T02WF	259	324	236	295	CH62
NXA04605A0T02WF	310	388	282	352	
NXA05205A0T02WF	350	438	319	398	
NXA05905A0T02WF	398	497	361	452	
NXA06505A0T02WF	438	548	398	498	
NXA07305A0T02WF	492	615	448	559	CH63
NXA08205A0T02WF	553	691	502	628	
NXA09205A0T02WF	620	775	563	704	CH64
NXA10305A0T02WF	694	868	631	789	
NXA11505A0T02WF	775	969	704	880	
NXA13705A0T02WF	923	1154	839	1049	
NXA16405A0T02WF	1105	1382	1005	1256	
NXA20605A0T02WF	1388	1736	1262	1578	
NXA23005A0T02WF	1550	1938	1409	1762	

AC drive type	DC power				Enclosure size
	525 VAC mains I _{th} [kW]	690 VAC mains I _{th} [kW]	525 VAC mains I _L [kW]	690 VAC mains I _L [kW]	
DC bus voltage 640-1100 VDC¹⁾					
NXA01706A0T02WF	150	198	137	180	CH61
NXA02086A0T02WF	184	242	167	220	
NXA02616A0T02WF	231	303	210	276	CH62
NXA03256A0T02WF	287	378	261	343	
NXA03856A0T02WF	341	448	310	407	
NXA04166A0T02WF	368	484	334	439	
NXA04606A0T02WF	407	535	370	486	
NXA05026A0T02WF	444	584	403	530	CH63
NXA05906A0T02WF	522	686	474	623	
NXA06506A0T02WF	575	756	523	687	CH64
NXA07506A0T02WF	663	872	603	793	
NXA08206A0T02WF	725	953	659	866	
NXA09206A0T02WF	814	1070	740	972	
NXA10306A0T02WF	911	1197	828	1088	
NXA11806A0T02WF	1044	1372	949	1247	
NXA13006A0T02WF	1150	1511	1046	1374	
NXA15006A0T02WF	1327	1744	1207	1586	
NXA17006A0T02WF	1504	1976	1367	1796	

¹⁾ DC bus voltage 640-1200 VDC for wide range voltage version (NX_8)

Dimensions VACON® NXC Low Harmonic

Enclosure size	Height		Width		Depth		Weight	
	mm	inch	mm	inch	mm	inch	kg	lb
AF9	2275	89.57	1006	39.61	605	23.82	680	1499.14
	2275	89.57	1006	39.61	605	23.82	680	1499.14
AF10	2275	89.57	1006	39.61	605	23.82	700	1543.24
	2275	89.57	1006	39.61	605	23.82	700	1543.24
AF12	2275	89.57	2006	78.98	605	23.82	1400	3086.47
	2275	89.57	2006	78.98	605	23.82	1400	3086.47
	2275	89.57	2006	78.98	605	23.82	1400	3086.47
	2275	89.57	2006	78.98	605	23.82	1400	3086.47
	2275	89.57	2006	78.98	605	23.82	1400	3086.47
AF13	2275	89.57	2206	86.85	605	23.82	1950	4299.01
	2275	89.57	2206	86.85	605	23.82	1950	4299.01
AF14	2275	89.57	4406	173.46	605	23.82	3900	8598.03
	2275	89.57	4406	173.46	605	23.82	3900	8598.03

Dimensions VACON® NXA Liquid Cooled AFE

Enclosure size	W x H x D [mm]
CH5	246 x 553 x 264
CH61	246 x 658 x 374
CH62	246 x 658 x 374
CH63	505 x 923 x 375
CH64	746 x 923 x 375

AC drives for marine applications

VACON® NXP Liquid Cooled

This dedicated liquid-cooled drive is well-suited to applications where air quality is critical, space is limited, and efficient heat transfer is required.

Compact

No need for air ducts or large fans, combined with a more compact

enclosure, mean you achieve a high power density in your installation – and virtually silent operation.

Achieve cost savings

Save on both investment and operating costs, since there is no need for large air-conditioning systems to remove heat. Achieve maximum uptime, because the drive operates reliably

even in demanding conditions. There is no need for air filtering in dusty conditions.

Highest control flexibility

The drive utilizes the full VACON® NXP family control functionality to achieve modularity and scalability in your application.

VACON® NXP Liquid Cooled AC drives, 6-pulse and 12-pulse, mains voltage 400-500 VAC

AC drive type 6-pulse	AC drive type 12-pulse	Motor shaft power		Enclosure size
		Optimum motor at I _{th} (400 V) [kW]	Optimum motor at I _{th} (500 V) [kW]	
NXP00165A0N1SWS		7.5	11	CH3
NXP00225A0N1SWS		11	15	
NXP00315A0N1SWS		15	18.5	
NXP00385A0N1SWS		18.5	22	
NXP00455A0N1SWS		22	30	
NXP00615A0N1SWS		30	37	CH4
NXP00725A0N0SWS		37	45	
NXP00875A0N0SWS		45	55	
NXP01055A0N0SWS		55	75	
NXP01405A0N0SWS		75	90	
NXP01685A0N0SWS		90	110	CH5
NXP02055A0N0SWS		110	132	
NXP02615A0N0SWS		132	160	CH61
NXP03005A0N0SWF		160	200	
NXP03855A0N0SWF		200	250	CH72
NXP04605A0N0SWF	NXP04605A0N0TWF	250	315	
NXP05205A0N0SWF	NXP05205A0N0TWF	250	355	CH72
NXP05905A0N0SWF	NXP05905A0N0TWF	315	400	
NXP06505A0N0SWF	NXP06505A0N0TWF	355	450	CH63
NXP07305A0N0SWF	NXP07305A0N0TWF	400	500	
NXP08205A0N0SWF		450	560	CH63
NXP09205A0N0SWF		500	600	
NXP10305A0N0SWF		560	700	CH74
NXP11505A0N0SWF		600	750	
NXP13705A0N0SWF	NXP13705A0N0TWF	700	900	CH74
NXP16405A0N0SWF	NXP16405A0N0TWF	900	1100	
NXP20605A0N0SWF	NXP20605A0N0TWF	1100	1400	2 x CH74
NXP23005A0N0SWF		1250	1500	
NXP24705A0N0SWF	NXP24705A0N0TWF	1300	1600	2 x CH74
NXP29505A0N0SWF	NXP29505A0N0TWF	1550	1950	
NXP37105A0N0SWF	NXP37105A0N0TWF	1950	2450	4 x CH74
NXP41405A0N0SWF	NXP41405A0N0TWF	2150	2700	
2 x NXP24705A0N0SWF	2 x NXP24705A0N0TWF	2450	3050	4 x CH74
2 x NXP29505A0N0SWF	2 x NXP29505A0N0TWF	2900	3600	
2 x NXP37105A0N0SWF	2 x NXP37105A0N0TWF	3600	4500	4 x CH74
2 x NXP41405A0N0SWF	2 x NXP41405A0N0TWF	4100	5150	

VACON® NXP Liquid Cooled AC drives, 6-pulse and 12-pulse, mains voltage 525-690 VAC

AC drive type 6-pulse	AC drive type 12-pulse	Motor shaft power		Enclosure size
		Optimum motor at I _{th} (525 V) [kW]	Optimum motor at I _{th} (690 V) [kW]	
NXP01706A0T0SWF		110	160	CH61
NXP02086A0T0SWF		132	200	
NXP02616A0T0SWF		160	250	
NXP03256A0T0SWF	NXP03256A0T0TWF	200	300	CH72
NXP03856A0T0SWF	NXP03856A0T0TWF	250	355	
NXP04166A0T0SWF	NXP04166A0T0TWF	250	355	
NXP04606A0T0SWF	NXP04606A0T0TWF	300	400	
NXP05026A0T0SWF	NXP05026A0T0TWF	355	450	
NXP05906A0T0SWF		400	560	CH63
NXP06506A0T0SWF		450	600	
NXP07506A0T0SWF		500	700	CH74
NXP08206A0T0SWF	NXP08206A0T0TWF	560	800	
NXP09206A0T0SWF	NXP09206A0T0TWF	650	850	CH74
NXP10306A0T0SWF	NXP10306A0T0TWF	700	1000	
NXP11806A0T0SWF	NXP11806A0T0TWF	800	1100	CH74
NXP13006A0T0SWF	NXP13006A0T0TWF	900	1200	
NXP15006A0T0SWF	NXP15006A0T0TWF	1050	1400	2 x CH74
NXP17006A0T0SWF	NXP17006A0T0TWF	1150	1550	
NXP18506A0T0SWF	NXP18506A0T0TWF	1250	1650	4 x CH74
NXP21206A0T0SWF	NXP21206A0T0TWF	1450	1900	
NXP23406A0T0SWF	NXP23406A0T0TWF	1600	2100	4 x CH74
NXP27006A0T0SWF	NXP27006A0T0TWF	1850	2450	
NXP31006A0T0SWF	NXP31006A0T0TWF	2150	2800	4 x CH74
2 x NXP18506A0T0SWF	2 x NXP18506A0T0TWF	2400	3150	
2 x NXP21206A0T0SWF	2 x NXP21206A0T0TWF	2750	3600	4 x CH74
2 x NXP23406A0T0SWF	2 x NXP23406A0T0TWF	3050	3950	
2 x NXP27006A0T0SWF	2 x NXP27006A0T0TWF	3500	4600	4 x CH74
2 x NXP31006A0T0SWF	2 x NXP31006A0T0TWF	4050	5300	

I_{th} = Thermal maximum continuous RMS current. Perform dimensioning according to this current if the process does not require any overloadability or the process does not include any load variation or margin for overloadability.

I_L = Low overloadability current. Allows +10% load variation. 10% exceeding can be continuous.

I_H = High overloadability current. Allows +50% load variation. 50% exceeding can be continuous.

All values with cosφ = 0.83 and efficiency = 97%

*) c = Power loss into coolant; a = power loss into air; T = total power loss; power losses of input chokes not included. All power losses obtained using max. supply voltage, I_{th} and switching frequency of 3.6 kHz and Closed Loop control mode. All power losses are worst-case losses.

If some other mains voltage is used, apply the formula $P = \sqrt{3} \times U_n \times I_n \times \cos\phi \times \text{eff}\%$ to calculate the NX Liquid-Cooled drive output power.

The enclosure class for all NX liquid-cooled drives is IP00.

If the motor is continuously run at frequencies below 5 Hz (besides start and stop ramps), pay attention to the drive dimensioning for low frequencies, that is, maximum $I = 0.66 \cdot I_{th}$, or choose drive according to I_H. It is recommended to check the rating with your distributor or Danfoss Drives.

Drive overrating may also be necessary if the process requires high starting torque.



VACON® NXP Liquid Cooled inverter units, DC bus voltage 465-800 VDC

AC drive type	Motor shaft power		Enclosure size
	Optimum motor at I _{th} (540 VDC) [kW]	Optimum motor at I _{th} (675 VDC) [kW]	
NXP00165A0T1IWS	7,5	11	CH3
NXP00225A0T1IWS	11	15	
NXP00315A0T1IWS	15	18,5	
NXP00385A0T1IWS	18,5	22	
NXP00455A0T1IWS	22	30	
NXP00615A0T1IWS	30	37	CH4
NXP00725A0T0IWS	37	45	
NXP00875A0T0IWS	45	55	
NXP01055A0T0IWS	55	75	
NXP01405A0T0IWS	75	90	
NXP01685A0T0IWS	90	110	CH5
NXP02055A0T0IWS	110	132	
NXP02615A0T0IWS	132	160	CH61
NXP03005A0T0IWF	160	200	
NXP03855A0T0IWF	200	250	CH62
NXP04605A0T0IWF	250	315	
NXP05205A0T0IWF	250	355	
NXP05905A0T0IWF	315	400	
NXP06505A0T0IWF	355	450	
NXP07305A0T0IWF	400	500	CH63
NXP08205A0T0IWF	450	560	
NXP09205A0T0IWF	500	600	CH64
NXP10305A0T0IWF	560	700	
NXP11505A0T0IWF	600	750	
NXP13705A0T0IWF	700	900	
NXP16405A0T0IWF	900	1100	
NXP20605A0T0IWF	1100	1400	2 x CH64
NXP23005A0T0IWF	1250	1500	
NXP24705A0T0IWF	1300	1600	
NXP29505A0T0IWF	1550	1950	
NXP37105A0T0IWF	1950	2450	
NXP41405A0T0IWF	2150	2700	4 x CH64
2 x NXP24705A0T0IWF	2450	3050	
2 x NXP29505A0T0IWF	2900	3600	
2 x NXP37105A0T0IWF	3600	4500	
2 x NXP41405A0T0IWF	4100	5150	

The voltage classes for the inverter units used in the tables above have been defined as follows:
 Input 540 VDC = Rectified 400 VAC supply
 Input 675 VDC = Rectified 500 VAC supply

VACON® NXP Liquid Cooled inverter units, DC bus voltage 640-1100 VDC ¹⁾

AC drive type	Motor shaft power		Enclosure size
	Optimum motor at I _{th} (710 VDC) [kW]	Optimum motor at I _{th} (930 VDC) [kW]	
NXP01706A0T0IWF	110	160	CH61
NXP02086A0T0IWF	132	200	
NXP02616A0T0IWF	160	250	
NXP03256A0T0IWF	200	300	CH62
NXP03856A0T0IWF	250	355	
NXP04166A0T0IWF	250	355	
NXP04606A0T0IWF	300	400	
NXP05026A0T0IWF	355	450	
NXP05906A0T0IWF	400	560	CH63
NXP06506A0T0IWF	450	600	
NXP07506A0T0IWF	500	700	CH64
NXP08206A0T0IWF	560	800	
NXP09206A0T0IWF	650	850	
NXP10306A0T0IWF	700	1000	
NXP11806A0T0IWF	800	1100	
NXP13006A0T0IWF	900	1200	2 x CH64
NXP15006A0T0IWF	1050	1400	
NXP17006A0T0IWF	1150	1550	
NXP18506A0T0IWF	1250	1650	
NXP21206A0T0IWF	1450	1900	
NXP23406A0T0IWF	1600	2100	4 x CH64
NXP27006A0T0IWF	1850	2450	
NXP31006A0T0IWF	2150	2800	
2 x NXP18506A0T0IWF	2400	3150	
2 x NXP21206A0T0IWF	2750	3600	
2 x NXP23406A0T0IWF	3050	3950	
2 x NXP27006A0T0IWF	3500	4600	
2 x NXP31006A0T0IWF	4050	5300	

¹⁾ High power 525-690V AFE, INU and BCU units available as wide voltage range version (NX_8 models) with DC bus voltage 640-1200 VDC. The units are ordered with the nominal mains voltage code 8 instead of 6 as for the standard version.

The following additional requirements applies to the wide voltage version:

- Output filter with an inductance of at least 0.7% needed
- External 24VDC supply for the control unit

The voltage classes for the inverter units used in the tables above have been defined as follows:

Input 710 VDC = Rectified 525 VAC supply
 Input 930 VDC = Rectified 690 VAC supply

VACON® NXP Liquid Cooled enclosed drive

AC drive type	Electrical output power		Enclosure size
	Motor at I _{th} (525 VAC) [kW]	Motor at I _{th} (690 VAC) [kW]	
0820_6	560	800	CH64
0920_6	650	850	
1030_6	700	1000	
1180_6	800	1100	
1300_6	900	1200	
1500_6	1000	1400	
1700_6	1150	1550	

Dimensions [mm]

Frae size	W x H x D [mm]
CH3	
CH4	
CH5	246 x 553 x 264
CH61	246 x 658 x 374
CH62	246 x 658 x 374
CH63	505 x 923 x 375
CH64	746 x 923 x 375
CH72	
CH74	

VACON® options for Liquid Cooled NXP Heat exchangers

Product code	Description
HXM-M-120-N-S	Heat exchanger unit stand; up to 120 kW, 360 l/min; Stainless steel piping, 2-pump
HXM-M-300-N-S	Heat exchanger unit stand; up to 300 kW, 900 l/min; Stainless steel piping, 2-pump
HXM-R-120-N-S	Heat exchanger unit installed into Rittal TS8 cabinet; up to 120 kW, 360 l/min; Stainless steel piping, 2-pump
HXM-R-300-N-S	Heat exchanger unit installed into Rittal TS8 cabinet; up to 300 kW, 900 l/min; Stainless steel piping, 2-pump
HXM-V-120-N-S	Heat exchanger unit installed into VEDA cabinet; up to 120 kW, 360 l/min; Stainless steel piping, 2-pump

AC drives for marine applications

VACON® NXP System Drive

The VACON® NXP System Drive provides a strong package, comprising the complete offering for enclosed common DC systems, supplied consistently and quickly.

Simplicity in your project

Using pre-designed sections enables a short engineering lead time. The systems are fully documented, and adaptable to the specifics of your project for easy implementation.

Reliability is key

You can rest assured that performance is absolutely reliable, with verified and tested solutions that combine VACON® AC drives, DC bus components and options.

Easy serviceability

Enjoy easy access with design for fast service. Safety is a priority with internal touch protection and high power busbar sections in separate compartments. Any problem which arises is contained, and does not cause widespread failure.

VACON® NXP Grid Converter

This range of air- and liquid-cooled drives is specifically designed for energy storage and marine energy management applications.

Reliable grid

By creating and maintaining a stable electrical power grid, a reliable grid is assured in all applications.

The VACON® NXP Grid Converter provides a reliable shore supply for ships in harbor, meaning no need to run on-board generators.

Save on fuel and emissions

Fuel savings and reduced emissions are the immediate benefits achieved by eliminating generators.



VACON® NXP Grid Converter 465-800 VDC, type open, liquid-cooled, EMC Class T

Product code	DC power				Enclosure size
	400 VAC mains	500 VAC mains	400 VAC mains	500 VAC mains	
	I_{Th} [kW]	I_{Th} [kW]	I_L [kW]	I_L [kW]	
NXA02615A0T02WVA1A2000000+MASG	176	220	160	200	CH5
NXA03855A0T02WGA1A2000000+MASG	259	324	236	295	CH61
NXA05205A0T02WGA1A2000000+MASG	350	438	319	398	CH62
NXA07305A0T02WGA1A2000000+MASG	492	615	448	559	CH63
NXA09205A0T02WGA1A2000000+MASG	620	775	563	704	
NXA11505A0T02WGA1A2000000+MASG	775	969	704	880	CH64
NXA16405A0T02WGA1A2000000+MASG	1105	1382	1005	1256	
NXA23005A0T02WGA1A2000000+MASG	1550	1938	1409	1762	

VACON® NXP Grid Converter 640-(1200)* IP00, liquid-cooled, EMC Class T

Product code	DC power				Enclosure size
	525 VAC mains	690 VAC mains	525 VAC mains	690 VAC mains	
	I_{Th} [kW]	I_{Th} [kW]	I_L [kW]	I_L [kW]	
NXA02616A0T02WGA1A2000000+MASG	231	303	210	276	CH61
NXA03856A0T02WGA1A2000000+MASG	341	448	310	407	CH62
NXA05026A0T02WGA1A2000000+MASG	444	584	403	530	CH63
NXA07506A0T02WGA1A2000000+MASG	663	872	603	793	
NXA11806A0T02WGA1A2000000+MASG	1044	1372	949	1247	CH64
NXA15006A0T02WGA1A2000000+MASG	1327	1744	1207	1586	
NXA17006A0T02WGA1A2000000+MASG	1504	1976	1367	1796	

* With voltage class 8

I_{Th} = Thermal maximum continuous RMS current. Perform dimensioning according to this current if the process does not require any overloadability or the process does not include any load variation or margin for overloadability.

I_L = Low overloadability current. Allows +10% load variation. 10% exceeding can be continuous.

I_H = High overloadability current. Allows +50% load variation. 50% exceeding can be continuous.

All values with $\cos\phi = 0.83$ and efficiency = 97%

*) c = Power loss into coolant; a = power loss into air; T = total power loss; power losses of input chokes not included. All power losses obtained using max. supply voltage, I_{Th} and switching frequency of 3.6 kHz and Closed Loop control mode. All power losses are worst-case losses.

If some other mains voltage is used, apply the formula $P = \sqrt{3} \times U_n \times I_n \times \cos\phi \times \text{eff}$ to calculate the NX Liquid-Cooled drive output power.

The enclosure class for all NX liquid-cooled drives is IP00.

If the motor is continuously run at frequencies below 5 Hz (besides start and stop ramps), pay attention to the drive dimensioning for low frequencies, that is, maximum $I = 0.66 \times I_{Th}$, or choose drive according to I_H . It is recommended to check the rating with your distributor or Danfoss Drives.

Drive overrating may also be necessary if the process requires high starting torque.

VACON® NXP Grid Converter 380-500 V, IP00 air-cooled, EMC Class T

Product code	Low overload 110% / 40°C		High overload 150% / 40°C		DC power		Enclosure size
	I_{L-cont} [A]	$I_{1 min}$ [A]	I_{H-cont} [A]	$I_{1 min}$ [A]	400 VAC mains P_{L-cont} [kW]	500 VAC mains P_{L-cont} [kW]	
	NXA02615A0T02SGA1A2000000+MASG	261	287	205	308	176	
NXA04605A0T02SGA1A2000000+MASG	460	506	385	578	310	388	F110
NXA13005A0T02SGA1A2000000+MASG	1300	1430	1150	1725	876	1092	F113

VACON® NXP Grid Converter 525-690 V, IP00, air-cooled, EMC Class T

Product code	Low overload 110% / 40°C		High overload 150% / 40°C		DC power		Enclosure size
	I_{L-cont} [A]	$I_{1 min}$ [A]	I_{H-cont} [A]	$I_{1 min}$ [A]	600 VAC mains P_{L-cont} [kW]		
	NXA01706A0T02SGA1A2000000+MASG	170	187	144	216	198	
NXA03256A0T02SGA1A2000000+MASG	325	358	261	392	378		F110
NXA10306A0T02SGA1A2000000+MASG	1030	1133	920	1380	1195		F113

Dimensions [mm]

Enclosure size	IP00
	W x H x D [mm]
CH5	246 x 553 x 264
CH61	246 x 658 x 374
CH62	246 x 658 x 374
CH63	505 x 923 x 375
CH64	746 x 923 x 375
F19 – TypeOpen	239 x 1030 x 372
F110 – TypeOpen	239 x 1032 x 552
F113 – TypeOpen	708 x 1032 x 553



Certified solutions to control harmonics

- Advanced active filters
- Advanced harmonic filters
- Low harmonic drives
- 12-pulse drives
- Active front end drives

Adverse effects of harmonics

- Limitations on supply and network utilization
- Increased transformer, motor and cable heating
- Reduced equipment lifetime
- Costly equipment downtime
- Control system malfunctions
- Pulsating and reduced motor torque
- Audible noise

Harmonics mitigation

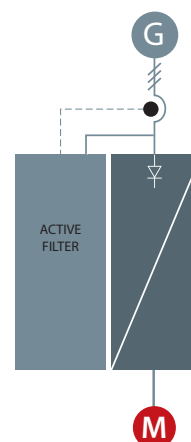
While AC drives increase precision, save energy and extend application lifetime, they also introduce harmonic currents to the on-board grid. If not kept under control, this can affect the performance and reliability of generators and other equipment and, ultimately, compromise safety.

Danfoss offers harmonic mitigation solutions to comply with the regulations imposed by marine certification bodies, which state that harmonics must be kept to 5 or 8% total harmonic voltage distortion (THDv) on the main busbar.

Danfoss has developed a wide range of mitigation solutions which can help restore weak networks, increase network capacity, and meet compact retrofit demands – or secure sensitive environments.

Low harmonic drives

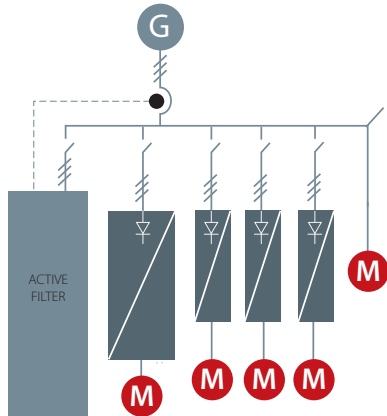
The VLT® and VACON® low harmonic drives continuously regulate the network and load conditions without affecting the connected motor. The drives combine the well-known performance and reliability of standard VLT® and VACON® drives with an Advanced Active Filter. The result is a powerful, motor-friendly solution that provides the highest possible harmonic mitigation with total harmonic current distortion (THDi) of maximum 5%.



Advanced active filters

Advanced active filters identify harmonic distortion from non-linear loads and inject counter-phase harmonic and reactive currents into the AC line to cancel out the distortion. The result is distortion levels of no more than 5% THDi. The optimal sinusoidal waveform of the AC power is restored and the power factor of the system is re-established at 1.

Advanced active filters follow the same design principles as all our other drives. The modular platform provides high energy efficiency, user-friendly operation, efficient cooling and high enclosure ratings.

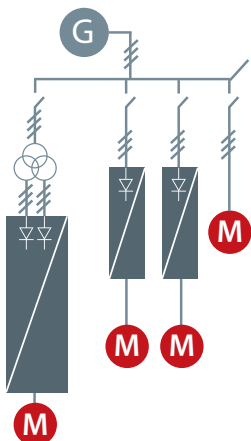


12-pulse drives

A robust and cost-effective harmonic solution for the higher power range, the Danfoss 12-pulse drive variants offer reduced harmonics for demanding industry applications above 250 kW.

VLT® and VACON® 12-pulse drives are high efficiency AC drives which are built with the same modular design as the popular 6-pulse drives. The 12-pulse variant is available with similar drive options and accessories and can be configured according to your specific needs.

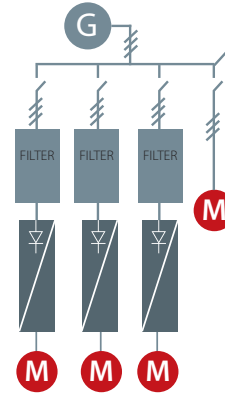
The VLT® and VACON® 12-pulse drives provide harmonic reduction without adding capacitive or inductive components which often require network analysis to avoid potential system resonance problems.



Advanced harmonic filters

The Danfoss harmonic filters are specially designed to be connected in front of a VLT® or VACON® drive, and ensure that the harmonic current distortion generated back to the mains is reduced to a minimum.

Easy commissioning saves installation costs, and due to the maintenance-free design, running expenses for the units are eliminated.



Active front-end drives

The clear advantage of active front-end (AFE) drives is that any back power generated can be used by other equipment on the vessel. This adds to the overall fuel saving and reduces costs in running equipment.

An AFE system is a regenerative power converter located at the front end of a common DC bus drive line-up, and is suitable in applications where:

- Low harmonics are required
- The frequency inverter load is up to 100% of the total generator capacity

The AFE system comprises two identical inverters with a common DC bus. There is one motor inverter and one supply inverter. The supply inverter works together with a tuned sinus filter, and the current distortion (THDi) at the supply is about 3-4%.

When an AFE system is installed, then the motor voltage can be increased above that of the network, because adjustment of the DC link voltage is enabled. Any excessive energy can be returned to the network as clean (active) power, rather than reactive power, which only produces heat.



We know Marine and Offshore

Working in the challenging world of the maritime and offshore industries, you demand a supplier who contributes to improving efficiency, safety and reliability while reducing total cost of ownership. Danfoss is a single supplier who delivers on all these criteria – and more.

For over 30 years, we have worked to make the marine industry safer and more efficient, by building and consolidating successful relationships with:

- Ship owner-operators
- Shipyards
- System integrators
- OEMs
- Naval design engineers
- Naval architects

Represented in all major marine hubs with full marine certification and global service, Danfoss is committed to creating a sustainable, competitive future for the marine industry.



VLT® and VACON® drives

Maximum uptime and efficiency

VLT® and VACON® drives are designed and built for maximum uptime and robust performance, which is critical in the marine business, where repair and maintenance must be kept to a minimum. Our drives have the highest number of class type approvals – from nine authorities. This gives you the best possible choice when selecting drives for your marine application.



High Pressure Pumps

Ultra-low energy consumption

Rugged construction

Danfoss' dedicated high-pressure pumps are built on decades of development experience to provide exceptional efficiency and reliability in seawater reverse osmosis applications. Small in size and unsurpassed in engineering quality, the Danfoss range of APP pumps is at the heart of more than 15,000 seawater reverse osmosis systems throughout the world.



Industrial Refrigeration

Precise temperature control

and zero corrosion

The fishery industry requires fast, efficient and durable refrigeration solutions, both when at sea and during on-shore processing. Danfoss offers a wide range of stainless steel components for the fishery industry. These components make design easy, reduce maintenance, and lower operating costs, even at high pressure and in demanding marine conditions.



Industrial Automation

Increased efficiency throughout the entire ship

With a solid 30 years' marine expertise in control and monitoring solutions, Danfoss Industrial Automation offers the widest product portfolio in the market. With our core technologies based on temperature and pressure sensors, switches and fluid controls, all our products are designed to maximize system efficiency, increase safety and create savings throughout the entire ship.



Danfoss IXA

Energy optimization and end emission gas measurements

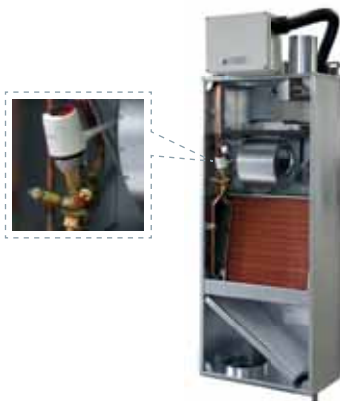
Helping the marine industry keep ahead of the challenges posed by energy optimization and gas emission is the driving force behind IXA's sensors and systems. Extremely robust, our sensors enable you to precisely and continuously measure climate parameters and environmentally harmful gases. These data provide valuable input for energy optimization.



Danfoss Semco A/S

Leaders in marine firefighting

At sea, safety is paramount. With over 50 years of experience in designing and installing water mist, CO₂ and foam systems, Danfoss Semco is a global leader in delivering total solutions for certified fixed firefighting systems.



Hydronic Balancing and Control

Save fuel and installation costs and increase passenger comfort

Pressure-independent balancing and control valves ensure that the precise amount of cooling reaches passenger cabin fan coils and air handling units. Their linear control characteristic enables stable flow modulation to match demand, radically reducing energy used by chillers and pumps while providing higher comfort for passengers. No other HVAC solution is as efficient.



Electric Heating

High comfort level at lowest energy consumption

Danfoss electric heating systems ensure a high comfort level for passengers in their cabins and bathrooms on board. The electric heating systems are designed with intelligence to ensure the lowest possible energy consumption.

Danfoss supplies heating cables with 20 years' full warranty and thermostats with 5 years' full warranty. This means you can enjoy optimum performance with high reliability that's virtually maintenance-free.



Power Solutions

Powerful hydraulics for highest efficiency and minimum downtime

When hydraulics and electronic controls are preferred, Danfoss Power Solutions offers the highest quality products and systems expertise to match your customers' demands. The broad portfolio includes rugged PVG load-sensing proportional valves for enhanced design flexibility and safety, powerful H1 axial piston pumps and bent axis motors for improved reliability and efficiency, and easy system integration and control with PLUS+1° microcontrollers and software. With Danfoss hydraulic marine solutions, you get the best of quality and a minimum of downtime.

Danfoss products are **everywhere on the ship** – improving **efficiency, safety** and **reliability**

Cargo deck

- Firefighting systems
- VLT® and VACON® drives
- Pressure and temperature sensors and controls
- Hydraulic valves and motors

Accommodation

- Control valves for air-conditioning
- Firefighting systems
- VLT® and VACON® drives
- Floor-heating systems

Winches

- VLT® and VACON® drives
- Hydraulic valves, motors and control systems



Engine room

- VLT® and VACON® drives
- Pressure and temperature sensors and controls
- IXA emission sensors
- Fluid controls
- Firefighting systems
- Hydraulic pumps, valves and motors

Utilities

- High-pressure pumps
- VLT® and VACON® drives
- Pressure and temperature sensors and controls
- Fluid controls
- Refrigeration controls
- Firefighting systems

Thrusters

- VLT® and VACON® drives
- Pressure and temperature sensors and controls
- Firefighting systems
- Hydraulic valves and motors

For further information please visit www.marine.danfoss.com