QUADRO DRIVE®

THE NEXT GENERATION MARINE DRIVES

LIQUID COOLED FOUR QUADRANT DRIVE POWER RATING UP TO 5000kW FREQUENCY DRIVES FOR MARINE APPLICATIONS

EXCELLENCE IN ELECTRIC

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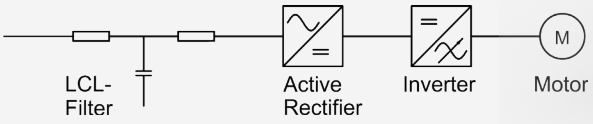
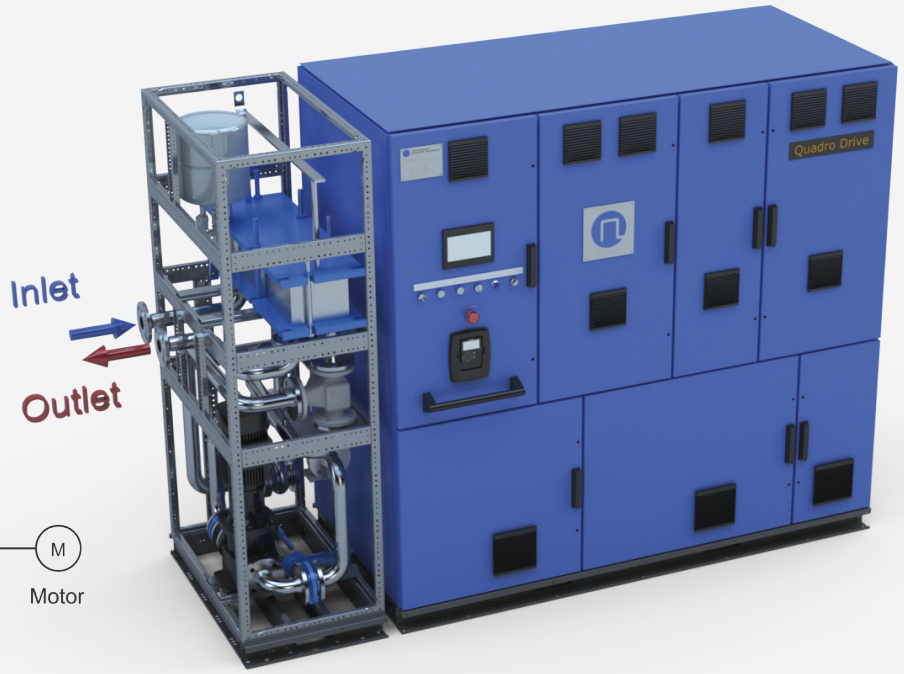
NES – Quadro Drive®

Liquid Cooled Four Quadrant Drive
Designed for Marine Applications
Power rating up to 5000kW.



Topology of the NES Quadro Drive®.



Quadro Drive®

The Quadro Drive® is specially designed for ship installation and meant to set the standard of next generation propulsion converters. There is no need for a large transformer, so the installation will be easier and less expensive.

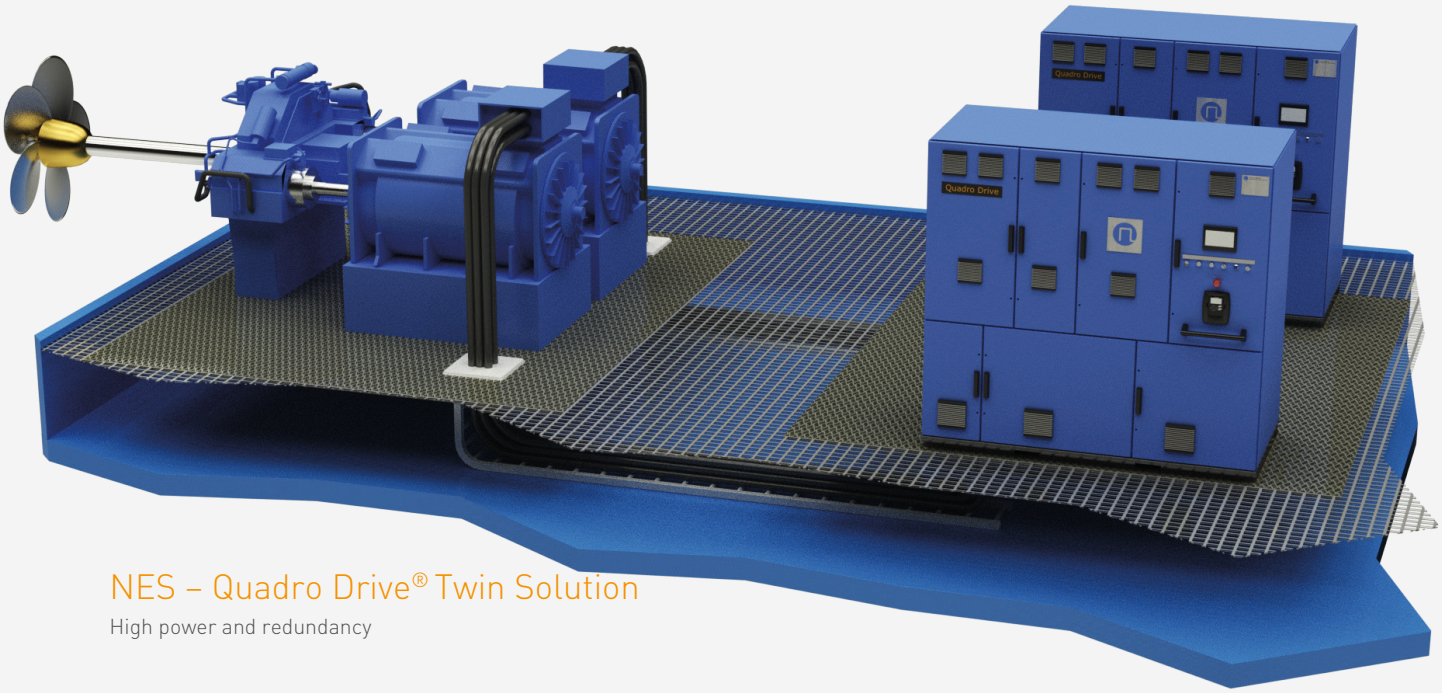
The Active Rectifier yields the possibility of regenerating the energy from the propeller and shaft back to the grid. The power factor is always unity, so the grid's capability is fully utilized. The result is a flexible and dynamic propulsion system, focusing on a high performance energy chain from the diesel motor to the propeller's thrust.

A modular based system is the cornerstone of the Quadro Drive®. This gives possibilities for interchangeable parts, and an option of derating the drive if one module fails so the vessel can avoid off-hire time.

Extremely fast torque reduction to avoid black out on the ship. This solution ensures safe operation of the vessel for DP2 and DP3 requirements.

Features:

- No need for transformer. Only one unit to install.
- Separate connection sections yields possibility of connecting all cables without opening the converter. Dust and particle ingress is therefore greatly reduced.
- A "green" converter, saving energy by line breaking.
- Full utilization of the response in the diesel generator sets, yielding a highly dynamic system.
- Complete internal control, enables the drive to operate as a single drive unit.
- Flexible cooling system, where space can be a problem.
- Rapid electrical installation and commissioning with innovative cabinet design.
- Interface for propellers, DP system, thruster control, and joystick systems are standardized.
- Interface available: all common fieldbuses including Modbus, Profibus, and hard-wired.
- LCL filter reduces line current harmonics
- Pure active power from the grid (unity power factor)
- Inverter for motor is equipped with Advanced Vector Control.
- Control of integrated freshwater heat exchanger system and internal anti-condensation of cabinet.
- Power Control Mode for transit operation, to ensure a constant power outtake from diesel generator sets. This excludes power fluctuations related to sea / weather conditions.
- Speed Control Mode for Dynamic Position Operation or Maneuvering.
- Alarm and indication presentation both locally on the touch screen panel and on the IAS system.



NES – Quadro Drive® Twin Solution

High power and redundancy

Twin in - Single out

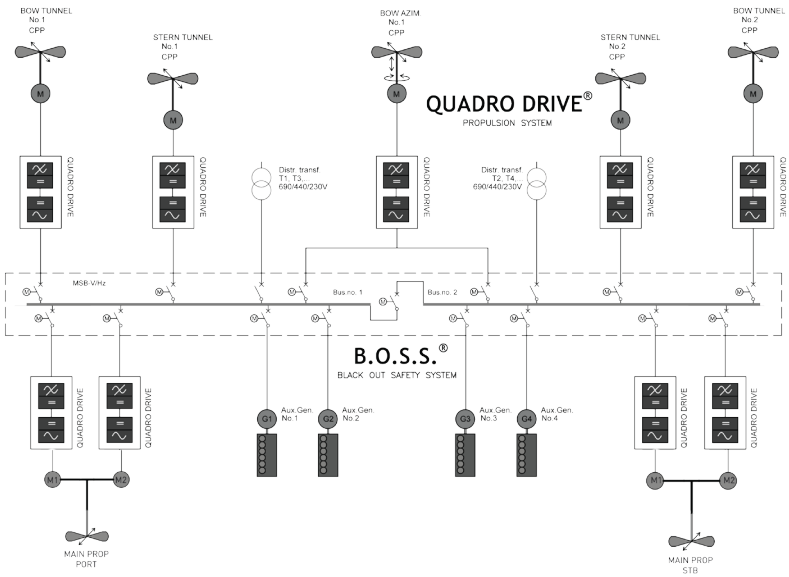
The arrangement of the electric propulsion system features a high level of reliability since each electric motor is supplied through its own Quadro Drive and its associated control system.

The propulsion system`s redundancy and the reliability of our converters improve safety.

Redundant main propulsion drives provide adequate power for the ship to operate safely if a malfunction occurs.

Features:

- A high level of reliability and redundancy
- High propulsion power
- Service friendly
- Excellent flexibility
- Improves safety



READ ONLINE

450V 60Hz / 400V 50Hz			Power	Power
QUADRO DRIVE®			[kW]	[kW]
Active Front End			≤ 1500	≤ 2500
Dimensions and weight	Height	[mm]	1998	2188
	Width	[mm]	2093	4183
	Depth	[mm]	1011	1201
	Weight	[kg]	1820	3750
Max. Current	Supply	[A]	≤ 2200	≤ 4000
	Motor	[A]	≤ 2400	≤ 4200
Heat losses from drive.	To water	[kW]	≤ 65	≤ 120
	To air	[kW]	≤ 12	≤ 22
Water temp.	Min-Max.	[°C]	28-38	28-38

690V 50/60Hz			Type 1	Type 2	Type 3	Type 4
QUADRO DRIVE®			[kW]	[kW]	[kW]	[kW]
Active Front End			≤ 1600	≤ 3000	≤ 4300	≤ 5000
Dimensions and weight	Height	[mm]	1998	2188	2200	2200
	Width	[mm]	2093	4183	6000	8000
	Depth	[mm]	1011	1201	1180	1180
	Weight	[kg]	1820	3750	6500	7800
Max. Current	Supply	[A]	≤ 1500	≤ 2820	↙ 4000	≤ 5300
	Motor	[A]	≤ 1680	≤ 3130	≤ 4400	≤ 5800
Heat losses from drive.	To water	[kW]	≤ 70	≤ 135	≤ 194	≤ 270
	To air	[kW]	≤ 13	≤ 24	≤ 35	≤ 44
Water temp.	Min-Max.	[°C]	28-38	28-38	28-38	28-38

	450V 60Hz / 400V 50 Hz	690V 50/60Hz
Mains connection	U_{IN}	U_{IN}
3-phase supply voltage	U_{IN} = 380 – 500 v +/- 10%	U_{IN} = 525– 690 v +/- 10%
Frequency	f_{IN} = 45...66 Hz	f_{IN} = 45...66 Hz
Power factor	PF=1,0	PF=1,0
Efficiency		
At nominal power	97%	97%
THD	< 2%	< 2%
Motor Connection		
Motor type	Induction or synchronous	Induction or synchronous
3-phase output voltage	0... U_{IN} V	0... U_{IN} V
Frequency control	0...± 320 Hz	0...± 320 Hz
Field weakening point	8...320 Hz	8...320 Hz
Switching frequency	1,5-3,6 kHz	1,5-3,6 kHz
Motor control software	Rotor Flux Oriented Vector Control	Rotor Flux Oriented Vector Control
Torque Control	Open loop/ Closed loop	Open loop/ Closed loop
Torque step raise time	< 5 ms / < 5 ms	< 5 ms / < 5 ms
Speed control	Open loop/ Closed loop	Open loop/ Closed loop
Static accuracy	10% of motor slip/ 0.01% of the nominal speed	10% of motor slip/0.01% of the nominal speed
Enclosure		
Degree of protection	IP 44	IP 44
Control wiring and cable ducts	Flame-retardant, Halogen free	Flame-retardant, Halogen free
Colour	RAL 5012	RAL 5012
Environmental limits		
Ambient temperature	0...45°C	0...45°C
Relative humidity	5..96%, no condensation	5..96%, no condensation
Liquid cooling		
Allowed cooling agent	Drinking water/glycol	Drinking water/glycol
Water/Glycol concentration	80/20	80/20

Subject to change without notice.

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