



NAVAL DEFENCE



LEROY-SOMER™

**Energy production
and conversion with drive systems**

Nidec
All for dreams

Reliable and effective solutions for Navy

Leroy-Somer designs & manufactures Alternators, Drive Systems and Conversion Systems in a global footprint.

MARINE GLOBAL LEADER

Thanks to their numerous developments and achievements, Leroy-Somer teams have capitalized on their vast expertise within this domain, allowing them to answer the needs with respect to specification, design, manufacture and validation.

Continuous investments in research and development confirm Leroy-Somer as a specialist in alternators for energy supply and electric motors, controlled by power electronics on various types of combat and military ships and submarines.

CERTIFICATIONS

 <p>Lloyd's Register Lloyd's Register of Shipping</p>	 <p>American Bureau of Shipping</p>	 <p>NIPPON KAIJY KYOKAI</p>	 <p>BUREAU VERITAS</p>	 <p>Det Norske Veritas</p>	 <p>Germanischer Lloyd's</p>
 <p>Polish Register of Shipping</p>	 <p>Korean Register of Shipping</p>	 <p>Registro Italiano Navale</p>	 <p>RS</p>	 <p>China Classification Society</p>	 <p>Coast guard Steam ship TP 127</p>

AN INNOVATIVE PARTNER



Low noise & vibrations

1965



Anti-shocks and discreet induction motors
for submarines



Compactness

1975



Motors with high power-to-weight ratio 25kg = 100kw
for torpedo propulsion



Detection

1980



Shock resistant,
non magnetic motors for sensitive auxiliaries



Safety

1990



Safety alternators
for emergency energy production



Energy management

1995



Discreet induction MNR
motors combined with a frequency converter

Flexibility

2003



Frequency converters qualified
and adapted to the Navy specifications

Optimized propulsion

2015



PTI/PTO
(Power take-in/Power take-off)

Comprehensive dedicated solutions

Leroy-Somer has established a group of multi skilled engineers dedicated to Naval Defence activities. This resource guarantees the global management of projects with the direct involvement of the Research and Development department.

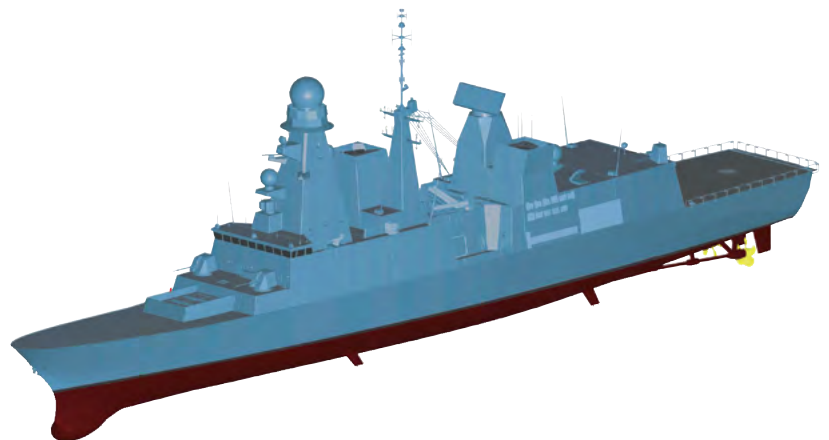
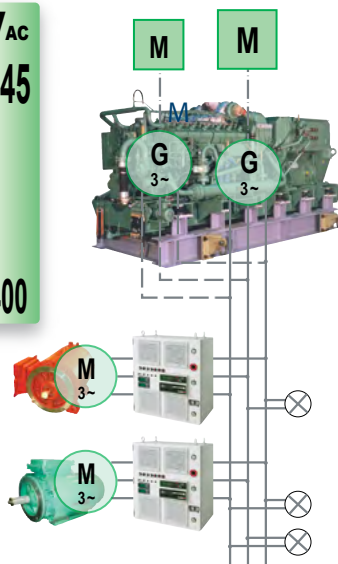
Leroy-Somer clients are assisted throughout the feasibility study up to the commissioning of the equipment covering also the material qualification, staff training and obsolescence management.

Leroy-Somer is an expert in comprehensive solutions combining motors and converters. This guarantees you optimized performance and reliability of the system.

SURFACE SHIPS

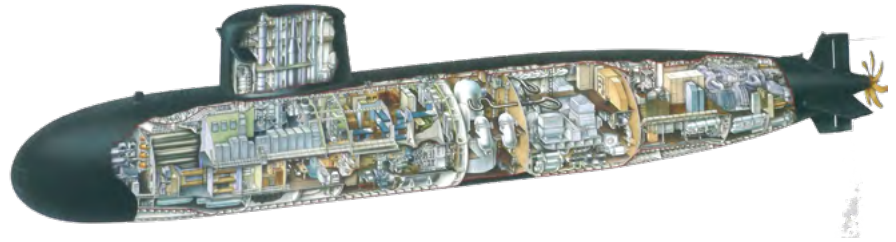
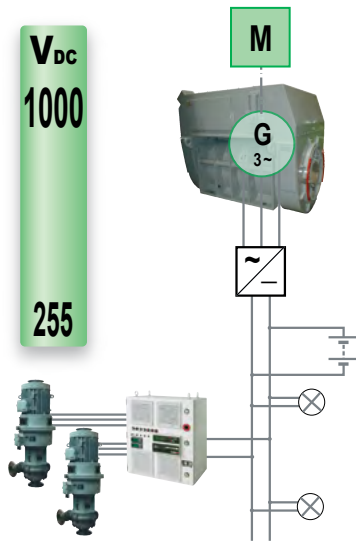
50 / 60 Hz

V_{AC}
445
400



- Electric Power Generation
- Energy and Frequency conversion
- Auxiliaries
- Propulsion

SUBMARINES



- Electric Power Generation
- Energy conversion
- Auxiliaries
- Propulsion
- Weapons handling

INFRASTRUCTURE AND SHIPYARDS

50 / 60 Hz

V_{AC}
15 k
200



- Electric Power Generation
- AC/DC rectifiers, DC/AC inverters
- Frequency converters
- Test bench:
 - Static load
 - Dynamic load

Alternators and drive systems for Naval Defence

ALTERNATORS / 1 to 16 MWe

There are special requirements concerning on-board energy production for combat or military ships. Leroy-Somer has designed a special range of Navy alternators producing electric energy for on-board power or electric propulsion power. Main features are:

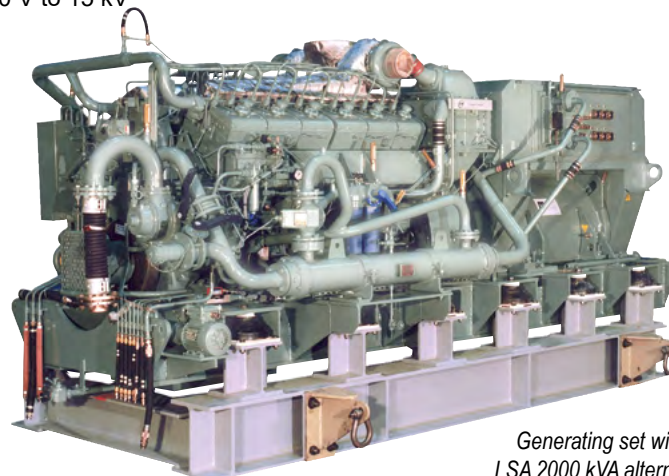
- Low noise and vibration levels
- 10g residual acceleration
- IP44 enclosed, IP54 in option
- Direct seawater cooling
- Insulation class H for low and medium voltage
- Antifriction or sleeve bearings
- Excellent transient response
- Electrical design complying with the STANAG 1008 standard
- Analog or digital voltage regulator

Available range

- Speed: 4 to 18 poles
- Power: 1 to 16 MWe
- Voltage: from 380 V to 15 kV



LSA 938 kVA alternator



Generating set with
LSA 2000 kVA alternator

with the courtesy of Wartsila

POWER ELECTRONICS / 5 to 2500 A

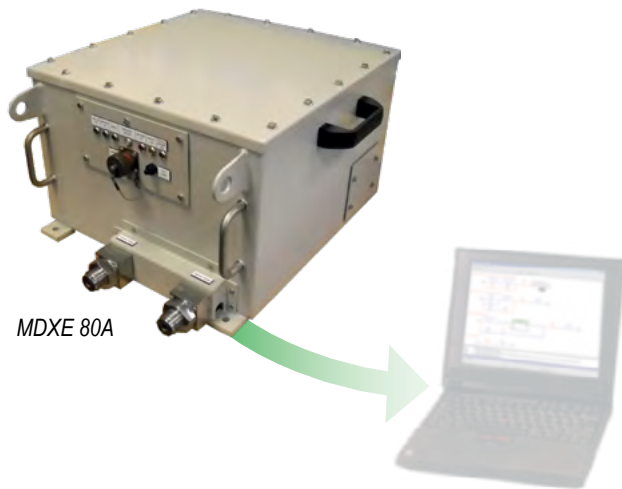
Leroy-Somer offers a new range of electronic converters adapted for naval defence.

Flexibility

- Chassis or cubicle solutions
- Protection index up to IP55
- Adaptation to grid
 - AC 50 / 60 Hz, 230 to 500 V
 - Continuous 255 to 504 V

Performances

- Low noise & vibration levels
 - High chopping frequency
 - Water or air cooling
- Electromagnetic environment
 - Immunity : specially adapted EMC filter
 - Design requirements for mechanics and electronics
 - Complies with military standards (GAM EG 13, STANAG 4437, MIL STD 461 C)
- Shock resistance (15g) and vibration resistance
- Grid
 - Shock resistance to manoeuvres 1100 Volts 3 ms
 - Immunity from micro power cuts



MDXE 80A



MDXE 250A

Safety

- Automatic testing at each power up
 - Components (Control board, power board, inverter and rectifier, transformer, etc ...)
 - Detection (motor short circuit ...)
- Immediate recording of main data preceding an eventual shutdown

Communication

- Specially adapted software
 - Configuration (transfer and recording)
 - Supervision
 - Diagnostics
- Main fieldbus (Modbus, Ethernet ...)

Expertise

- Product qualification using prototypes (testing and calculations.....)
- Associated logistics documentation
- MTBF and MTTR optimisation

MOTORS / 0.55 to 750 kW

The range of Leroy-Somer electric motors is adapted to combat conditions and to the different types of ships.

- Guaranteed electric performance
- Shock resistant up to 168g (level II)
- Vibration resistant
- Low noise and vibration emissions
- Low electromagnetic emissions (EMC)
- Designed for use with electronic speed variation
- Reliability and long life expectancy
- Safety motors for high temperatures and hazardous atmospheres
- Drowned rotors and stators



MNI



MNN



MNR



MNRHS

Ranges ¹	MNR	MNN	MNI	Non magnetic
Power	0.5 to 55 kW	0.5 to 55 kW	0.5 to 55 kW	2 to 55 kW
Special range	up to 110 kW	up to 750 kW	up to 750 kW	-
Shock resistant (STANAG 4-141 and 4-150)	120 g level I 168 g level II	15 g level I 21 g level II	15 g level I 21 g level II	15 g level I 21 g level II
Low noise and vibration emissions (MIL STD 1474 D and 740 2)	+++	++	+	++
Electrical characteristics	STANAG 1008-8	STANAG 1008-8	STANAG 1008-8	STANAG 1008-8
EMC	STANAG 4437-2	STANAG 4437-2	STANAG 4437-2	STANAG 4437-2

¹ Leroy-Somer also offers a range of induction motors with aluminium housing up to 90kW compliant with Def Stan 08-120 and 08-123 standards.



Support throughout the ship's life cycle

LONG LIFE EXPECTANCY

Ships are in operation for long periods of time, often longer than the usual life expectancy of the industrial components.

Leroy-Somer includes this fundamental requirement in its product design and manufacture.

- Modular construction compliant with the highest manufacturing standards
- Integration of the manufacturing process
- Long life expectancy of the different ranges
- Crew training
- Logistical support and associated services



These measures help minimise the risk of obsolescence and also facilitate its management.

MAIN REFERENCES



Aircraft carrier

- Charles De Gaulle
- Principe de Asturias
- Andréa Doria



Frigates

- Lafayette
- Bravo
- Sawari II
- Delta
- Horizon
- HMS Océan



- T23 - T45
- F100 - F310
- FREMM

Submarines

- Agosta 90B
- Scorpène
- SNLE NG
- SNLE/SNA (MCO)
- Barracuda



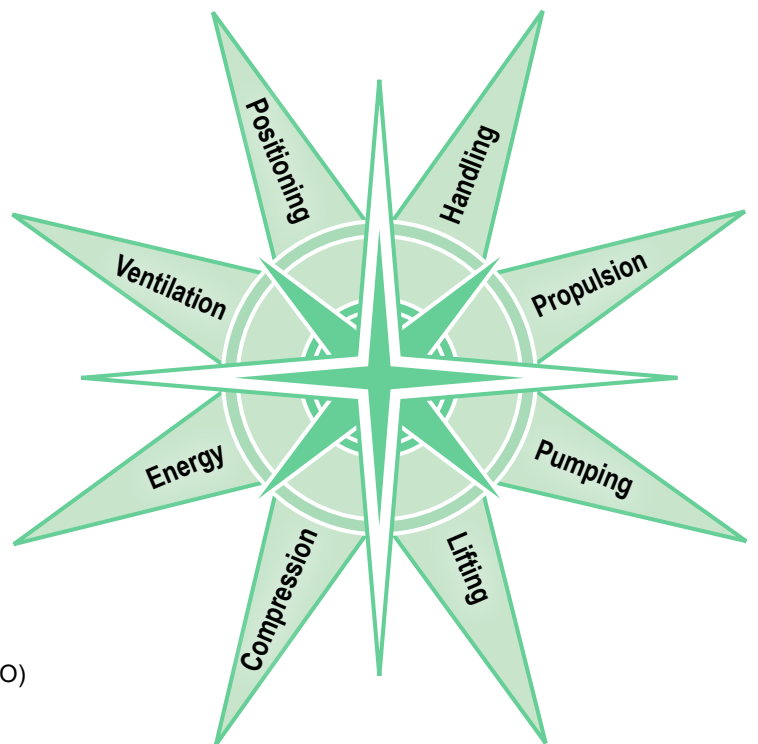
Projection and command ships

- Mistral
- Tonnerre
- Sirocco



Corvettes

- Gowind



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Nidec
All for dreams

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