Cummins®

Generator Technologies

Alternators for Marine Applications

STAMFORD® | AvK®

Delivering in all environments, all the time

Like you, we understand the challenges of operating in the marine environment. And through our experience, we're able to help you determine the best course.

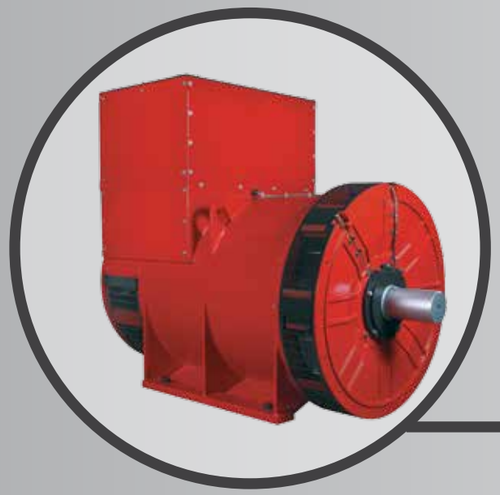
For over half a century, countless vessels have relied on the dependability of **STAMFORD** and **AvK** alternators and the technical skills from our support teams.

As an industry leader in advanced alternator design, we have a proven track record of delivering dependable products for the marine, offshore and oil and gas markets.

Through our experience, we understand the complexities and challenges you face integrating alternators and generator sets into marine vessels. Whether for shaft propulsion, auxiliary power, diesel electric propulsion, hybrid or variable speed systems, you can rely on our support to help you win in marine.

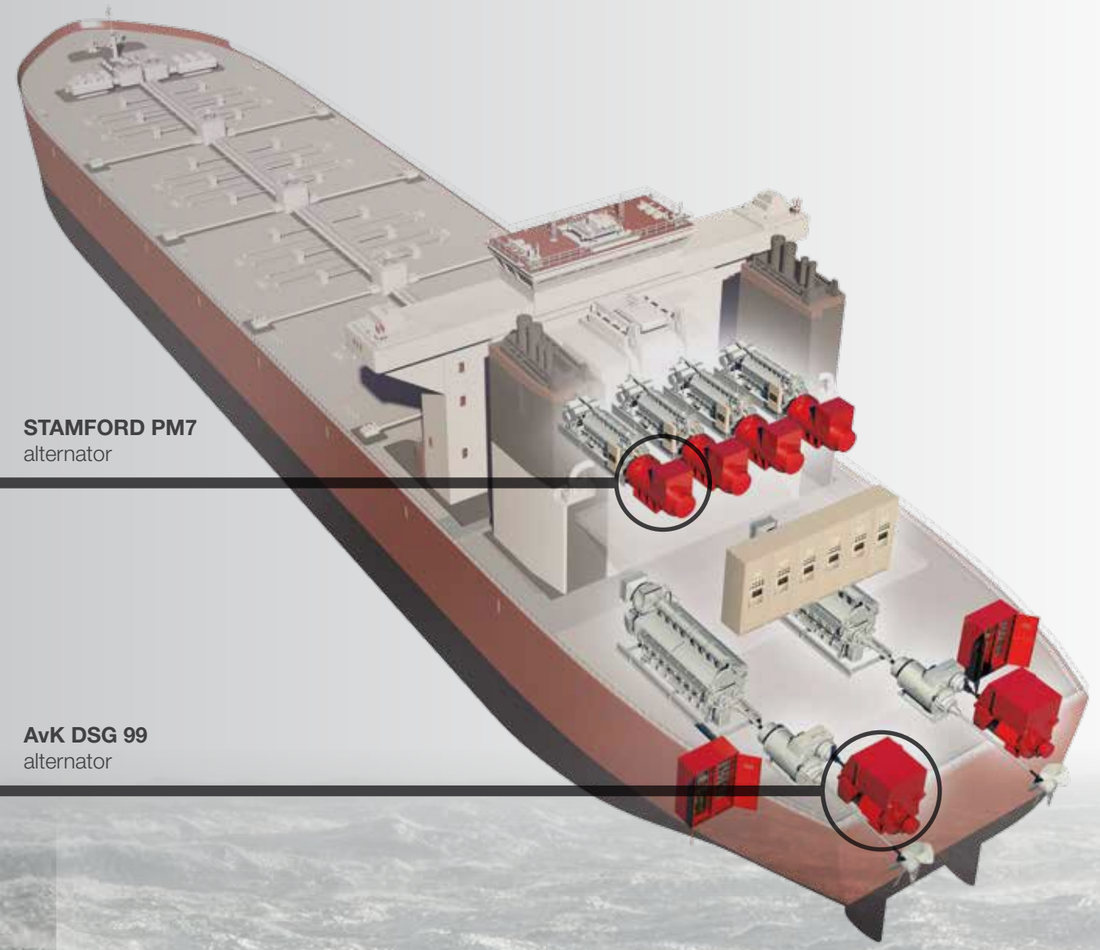
Our customers benefit from active support throughout the project life cycle - including preparation of specifications, alternator selection and sizing, installation, testing and commissioning, after sales service and maintenance.

Marine alternators designed and built by us offer efficient power generation, superior durability and longevity.



STAMFORD PM7
alternator

AvK DSG 99
alternator



STAMFORD Marine Range

High-quality, durable alternators utilising wire-wound technology for marine main power and auxiliary generator sets and shaft alternators:

- 4-6 pole / 1,000 - 1,800 rpm
- Power range: 5 – 2,000 kVA
- Voltage range: 220 – 690V at 50 & 60Hz

AvK Marine Range

Robustly engineered bar wound alternator designed to meet the challenges of the most arduous applications and environments. AvK alternators can be customised to meet specific customer needs:

- 4-10 pole / 600 - 1,800 rpm
- Power range: 1,000 - 10,000 kVA
- Voltage range: 380 – 13,800V at 50 & 60Hz

STAMFORD and **AvK** marine alternators can be found operating on vessels across all our oceans, seas and waterways.

- Diesel-electric propulsion systems
- Power Take Off (PTO) shaft alternators for economical generation of electrical power
- PTO/PTI (Power Take In) shaft alternators operating as auxiliary propulsion drive systems
- Self-starting Power Take Home (PTH) shaft alternators for emergency propulsion
- Auxiliary and onboard power supply
- Compliant to Fixed Water Based Local Application Fire Fighting Systems (FWBLAFFS)

STAMFORD® | AvK®

Marine Alternator Specifications

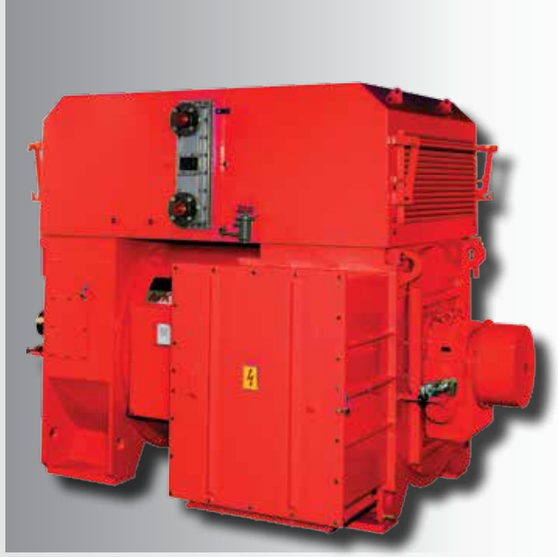
	PM0/1	UCM22	UCM27	HCM4	HCM5	DSG 62	HCM6	DSG 74	PM7	DSG 86	DSG 99	DSG 114	DSG 125	DSG 144	DIG 110	DIG 120	DIG 130	DIG 140	DIG 150	DIG 156
Poles	4	4	4	4	4	4	4	4/6/8	4	4/6/8/10	4/6/8/10	4/6/8/10	8/10	10	4/6	4/6	4/6/8	4/6/8	4/6/8	4/6/8/10
Max kVA Rating 50/60Hz	38/ 49	72/ 91	195/ 213	340/ 425	565/ 725	885/ 1065	930/ 1220	1615/ 1940	1740/ 2040	2555/ 2915	4020/ 4530	4370/ 5190	6115/ 7430	6300	1015/ 1220	1925/ 2440	3615/ 3760	4320/ 4980	6955 7610	9115/ 10340
Technology																				
Wire Wound	•	•	•	•	•		•		•											
Bar Wound						•		•		•	•	•	•	•	•	•	•	•	•	•
Voltage																				
Low	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
Medium															•	•	•	•	•	•
High															•	•	•	•	•	•
Bearings																				
Single bearing / SAE coupling disc	•	•	•	•	•		•		•											
Double bearing arrangement	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Enclosure & Cooling																				
IP23 SOLAS			•	•	•	•	•	•	•	•	•	•								
IP44 Open Ventilated						Δ	Δ	Δ	Δ	Δ	Δ	Δ			•	•	•			
IP44 Water Cooled						Δ		Δ		Δ	Δ	Δ	•	•	•	•	•	•	•	•
Air Inlet Filter		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ								
Excitation Systems																				
EBS	•																			
PMG		•	•	•	•	Δ	•	Δ	•	Δ	Δ				Δ	Δ				
Auxiliary Winding						•		•		•	•	•	•	•	•	•	•	•	•	•
Marine Application																				
Auxiliary	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
Shaft (PTO)		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Shaft (PTI)		•	•	•	•	•	•	•	•	•	•	•	•	•						
Shaft (PTH)					•	•	•	•	•	•	•	•	•	•						
DEP				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Key

• Standard

Δ Option

Marine Shaft Alternators



For main propulsion power, **STAMFORD** and **AvK** offer a comprehensive range of modular based alternators in the range 100 to 10,000 kVA, 4 to 10 pole, which can be customised to meet specific customer needs and application demands. AvK marine alternators from Cummins Generator Technologies are made of a rigid and robust steel construction, typically with form (bar) wound stator coils and flat copper rotor windings that can withstand high levels of vibrations and load variations.

With more active material, STAMFORD and AvK alternators are robustly engineered to meet the challenges of the most arduous marine environments and to integrate into a variety of marine propulsion systems.

Bakker Sliedrecht

Reference

Seven Atlantic, Diving Support Vessel

Where:

Launched at the IHC Merwede yard in Hardinxveld Giessendam, Netherlands. Operating in the North Sea based in Aberdeen, Scotland.

Specified:

6 x AvK DIG 156 alternators and

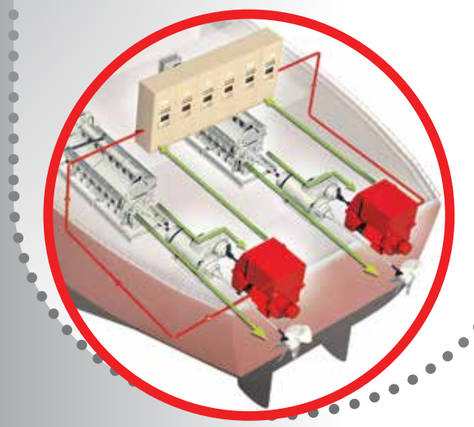
1 x AvK DSG 86 alternator

Purpose:

Diving support vessel for saturation and air diving support work

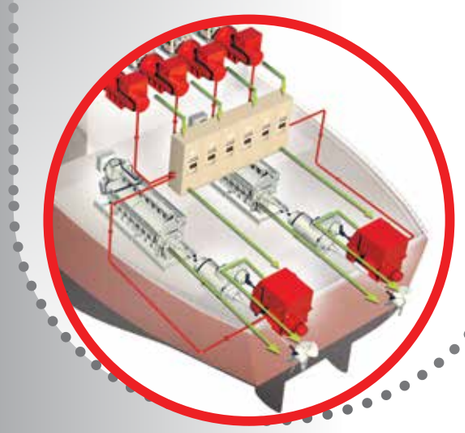
PTO - Operation as shaft alternator for boardnet supply only

- Auxiliary diesel generator sets can be stopped; reducing maintenance costs
- Boardnet powered by main diesel engine; reduces operating hours of auxiliary generator sets.



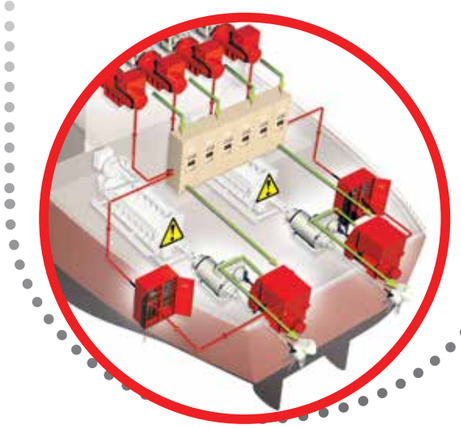
PTI - Operation as shaft motor for “booster” operation - no selfstart capability required

- Additional propulsion power available
- Smaller main engine for “normal” operation lowers main engine costs
- Shaft alternator/motor to be started as normal PTO machine



PTH - Alternator and start-up transformer (start-up system) individually engineered to customer requirements

- Redundant power in case of main engine malfunction - self start capability required
- Shaft alternator to be started by the auxiliary generator sets



Technical Considerations

- If the alternator requires a self starting capability when in motor mode (Power Take Home - PTH): What is the starting method to be employed?
- During starting the electrical machines output shaft should be completely de-coupled from gearbox or prop drive shaft on board.
- What is the mode of operation in PTH? Emergency situation only, or more regular operation, such as harbour manoeuvering?
- Are there any special requirements for bearings, due to high angles of inclination, running speed, lubrication and cooling, etc...?
- What method of cooling should be specified?

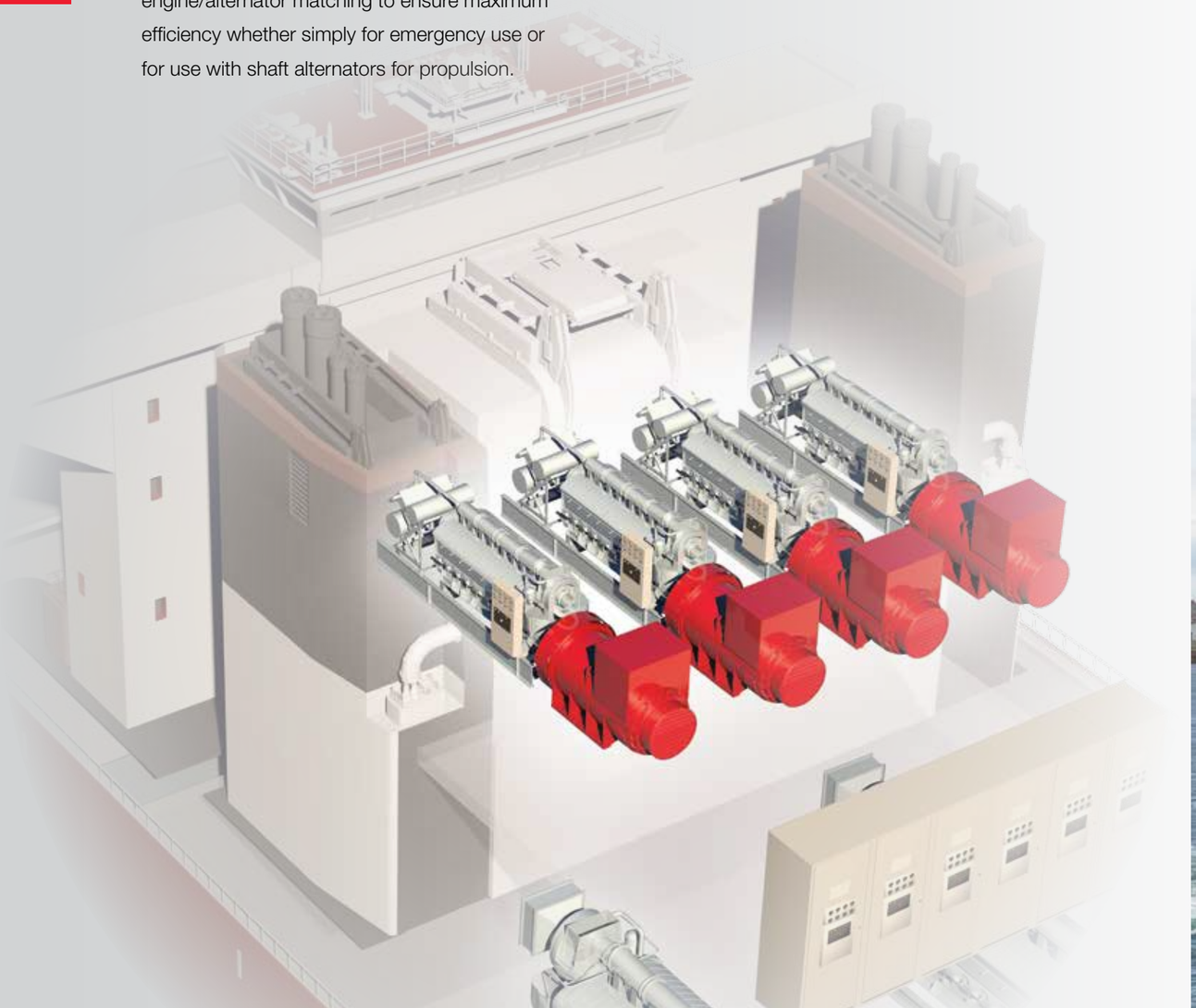
For technical assistance, please contact:
applications@cummins.com

Marine Auxiliary Alternators

For a complete line up of marine auxiliary alternators, designed specifically for applications including emergency power, ship service power, harbour power, power take home and diesel electric propulsion, the **STAMFORD** and **AvK** ranges are unbeatable.

The Difference is Experience.

For all custom generator set configurations, our team of Customer Engineers specialising in marine applications are located in strategic regional offices. We are able to assist with engine/alternator matching to ensure maximum efficiency whether simply for emergency use or for use with shaft alternators for propulsion.



The Industry Standard

Compact in design STAMFORD alternators are easy to install and maintain for marine applications. A range of single and three phase voltages are available from either 6 or 12 wire reconnectable windings. 2/3 pitch main stator and damper windings make STAMFORD also suitable for parallel operation when equipped with suitable voltage regulator and quadrature droop kit. Most alternator models are fitted with a Permanent Magnet Generator (PMG) to power the excitation system as standard. The PM0/1 range is fitted with an Excitation Boost System (EBS) to provide short circuit maintenance and improved motor starting.

Technical Considerations

- What is the duty cycle? Are the generator sets purely for emergency, or are they working in conjunction with shaft alternators to provide power for propulsion?
- It is important to understand the vessels power and propulsion system modes of operation.
- Are there any special requirements for bearings, due to high angles of inclination, running speed, lubrication and cooling, etc...?
- What method of cooling should be specified?

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Fletcher Shipping
Reference

FS Aquarius, Offshore Oil & Gas Vessel

Where:

Peterhead, Scotland

Specified:

1 x STAMFORD PM7 alternator
(replacement for failed non-STAMFORD alternator)

Purpose:

Provide support services to the oil and gas exploration and production industries

Diesel Electric Propulsion

Diesel Electric Propulsion (DEP) is not infant technology, and nor is our experience assisting customers integrate alternators and generator sets into DEP marine systems. With our expertise, global support networks and highly dependable product range, marine architects are consistently specifying **STAMFORD** and **AvK** alternators for DEP.

The global demand for Offshore Support Vessels (OSV), Platform Support Vessels (PSV) and Anchor Handling Tug Supply (AHTS) vessels incorporating DEP technology is increasing, and in response, we have developed our marine range to offer a reduction in both size and weight.

STAMFORD and AvK alternators have proven their suitability for continuous operation in the demanding offshore environment, and can operate both as auxiliaries for hotel loads and as a supply for Diesel Electric Propulsion Systems. They can handle the high currents that are seen in these high-power, low-voltage machines, and are perfectly suited to start large electrical machinery as seen on many vessels.

AvK DSG 125 and DSG 144 alternators save space and reduce capital expense

Talk to our application engineers to learn how our powerful AvK DSG 125 and 144 alternators can reduce overall footprint, with high-power, low-voltage power generation that OSVs and AHTSs require, in comparison with using a number of smaller-sized generator sets.

The AvK DSG 125 and DSG 144 are amongst the most powerful platforms in the market and are designed to be coupled to medium-speed engines of all major suppliers.

ESVAGT

Reference

ESVAGT Carpathia, Emergency Response and Rescue Vessel

Where:

Built by the ASL-Marine yard in Singapore, ESVAGT Carpathia is a diesel electric vessel operating in the North Sea

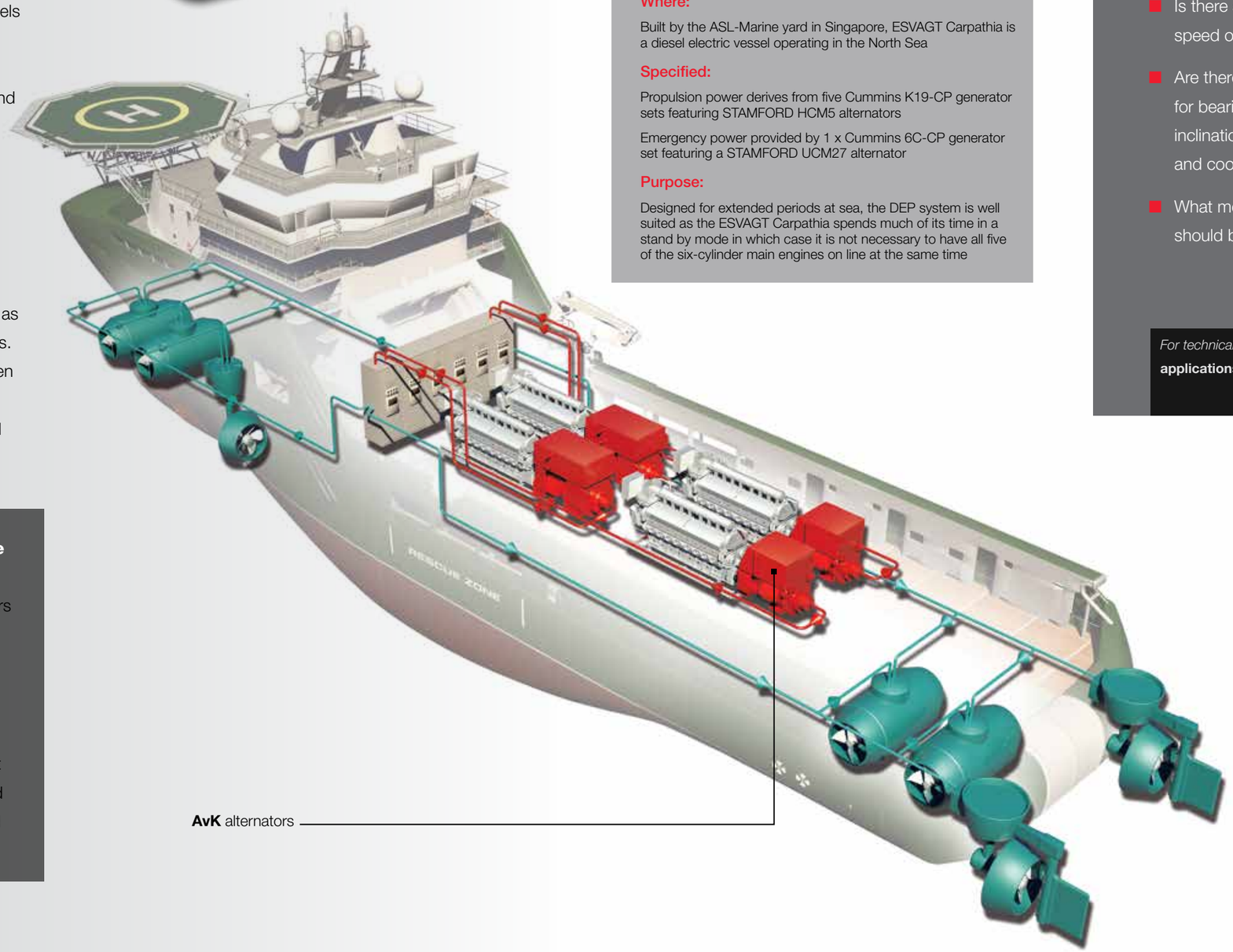
Specified:

Propulsion power derives from five Cummins K19-CP generator sets featuring STAMFORD HCM5 alternators

Emergency power provided by 1 x Cummins 6C-CP generator set featuring a STAMFORD UCM27 alternator

Purpose:

Designed for extended periods at sea, the DEP system is well suited as the ESVAGT Carpathia spends much of its time in a stand by mode in which case it is not necessary to have all five of the six-cylinder main engines on line at the same time



Technical Considerations

- Understand the electrical characteristics of the inverter loads connected to the generator sets.
- Is there a requirement for variable speed operations?
- Are there any special requirements for bearings, due to high angles of inclination, running speed, lubrication and cooling, etc...?
- What method of machine cooling should be specified?

For technical assistance, please contact:
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Hybrid Propulsion

Increasingly our customers are looking to add flexibility to marine propulsion systems through use of hybrid configurations. Hybrid propulsion packages typically deliver fuel-savings for boat operators.

Hybrid propulsion systems comprise diesel electric, diesel mechanical and a combination of hybrid drive options enabling the ship to optimise power efficiency through use of a flexible choice of operational modes.

In addition to fuel savings, exhaust emissions are also limited, making hybrid systems environmentally friendly.

A wide choice of **STAMFORD** and **AvK** alternators are available to make the most of the benefits of hybrid propulsion systems. Our expert marine application engineers can help you specify which alternators from our range will reduce capital expenditure and operating costs. We can help you design a hybrid propulsion system to optimise the need for high generating capacity at cruising speeds whilst saving on machinery volume.

Technical Considerations

- Understand the electrical characteristics of the inverter loads connected to the generator sets.
- Is there a requirement for variable speed operations?
- Are there any special requirements for bearings, due to high angles of inclination, running speed, lubrication and cooling, etc...?
- Machine cooling method and specification?

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DOF Subsea
Reference

Hybrid Marine Propulsion

Where:

Søvik, Norway

Specified:

2 x AvK DSG 144 alternators and

3 x AvK DSG 114 alternators

Purpose:

Hybrid power for the newly constructed Skandi Iceman AHTS offshore vessel

We believe that your business is worth protecting.

Businesses operating in some of the harshest environments in the world rely on genuine **STAMFORD** alternators. It's why we guarantee quality in every aspect of our business.

Visit www.genuine-stamford.com for more information

Generator Technologies

STAMFORD® | AvK®

Product Benefits

Protection and Insulation

All marine alternators for LV & MV are wire wound and conform to Class H thermal insulation. Open drip-proof enclosure protection according to IP23 is standard. Optional air inlet/outlet filters as well as higher IP protection modes can be supplied for certain models.

Standard **AvK** design is open drip-proof in accordance with IP23 SOLAS. All windings are bar-wound and conform to Class F (MV/HV alternators) or Class H (LV alternators) thermal insulation. Air inlet/outlet filters as well as higher protection up to IP55 can be supplied.

Cooling

A wide range of cooling systems are available allowing an optimum choice for operating and environmental conditions. Options include top-mounted air-to-air (IC611 + IC616) or air-to-water (IC81W) heat exchangers.

Bearings

Alternators can be equipped with either antifriction or sleeve bearings subject to load, speed and application. Sleeve bearings provided are split type to permit easy access for maintenance. Subject to frame size, speed, ambient temperature and inclination they may be auto-cooled or water-cooled, self-lubricated or force-lubricated.

Alternator Protection

STAMFORD and AvK alternators are available fully assembled with bearing and stator winding detectors (RTDs) for protection against thermal overload as standard or as an optional extra.

Rotor Construction

STAMFORD and AvK marine alternators have the salient pole rotor construction, which when combined with efficient ventilation and fan designs enables better cooling of the rotor. The rotor winding and insulation materials are selected based on product and application types to provide the customer with the best products for marine applications.

Stator Construction

The stator core assembly consists of laminated steel to reduce magnetic losses, improving product efficiency. The slots and windings are designed to provide the operator with the flexibility of using the product at a wide range of voltages. Insulation materials and winding style are chosen depending on the voltage levels and role within the marine power system.

Vacuum Pressure Impregnation

Depending on the application of the alternator, vacuum pressure impregnation (VPI) is used as the standard impregnation process on stator and rotor windings. Resin Rich is alternatively used, with both systems ensuring increased machine life and reliability through excellent dielectric properties, enhanced dimensional and mechanical stability as well as superior resistance against chemicals and/or moisture. Epoxy resin is used within the VPI process on STAMFORD and AvK alternators. Epoxy resins offers the best possible base protection on the winding.

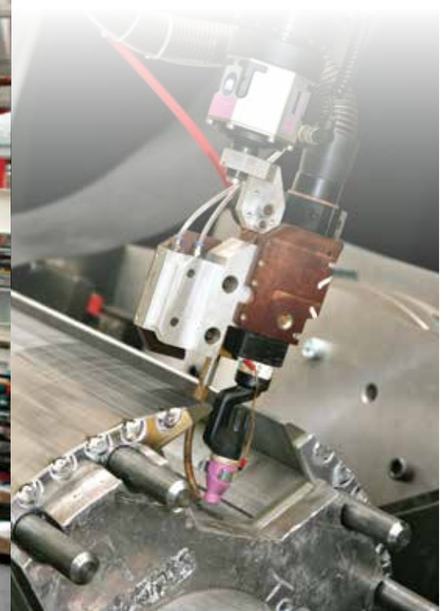
Windings

Across the STAMFORD and AvK brands, you can choose between wire wound and bar wound alternators depending on the demands of the marine application. The winding type, insulation materials and winding pitch are carefully selected to minimise losses, harmonics while offering the capability to operate at a wide range of voltages.

Automatic Voltage Regulator

A range of digital Automatic Voltage Regulators (AVRs) designed to achieve maximum performance are available to meet varying application requirements. Typical AVR features include:

- Voltage regulation in island mode (+/-0.5%)
- Reactive load sharing by static droop or cross-current compensation
- Fast PID response for high-class regulation characteristic current compensation
- U/f-characteristic for applications with:
  - Floating frequency
  - Under/over-excitation voltage protection
  - Excitation fault monitoring



Global Services

Technical Support and After Sales Service

Cummins Generator Technologies' engineers are available to provide technical information to assist in selecting the correct alternator specifications that your job demands. We continue our support through commissioning and into after-sales service and support.

Our engineers are experienced professionals trained in electrical, electronic and mechanical skills. They in turn are supported by a worldwide spares and service network.

Our Global Service Network offers:

- 24 hour response to service emergencies - 7 days a week.
- Commissioning of generators on site.
- Onsite bearing maintenance and bearing condition monitoring.
- Onsite insulation integrity checks.
- AVR and accessories set up on site.
- Trained engineers available locally, speaking local language.
- Extensive aftermarket distribution for **STAMFORD** and **AvK** genuine parts.

Marine Classification Society Approval Testing

All our manufacturing plants have witness test facilities, enabling marine classification society inspection and test.

On certain marine societies we have type approval - which avoids the need for marine inspectors to inspect every marine alternator that we manufacture, thus reducing marine inspection costs and witness testing charges for our customers. Type approval also means we can reduce our lead times.

Commissioning Support

We have technicians and engineers available to attend vessel commissioning in support of our OEM customers. Their vast experience in generator set-up can help with setting up of control system parameters and on site problem solving.

Product Training

Product familiarity will ensure maximum productivity and optimum use of the alternator. Our Customer Support department offers product training courses for engineers, operators, service and support staff. Each course is individually tailored to suit the needs of the customer, the generator set builder and the end-user.

Product familiarisation courses, with a choice of training modules, including; alternator control systems, applications, trouble-shooting, maintenance or other specific requirements, are available.

Vibration Analysis

Alternators coupled to reciprocating engines are exposed to engine induced vibrations. We use design tools to analyse the impact of linear and torsional vibrations, and work with the engine or generator set builder to validate the design of the generator set, as well as to solve end-user vibration issues. This technology is key in enabling customers to improve the innovation and reliability of new and current product designs.





Marine Classifications

STAMFORD and **AvK** alternators meet the classification requirements of all major marine societies:

- American Bureau of Shipping (ABS)
- Bureau Veritas (BV)
- China Corporation Register of Shipping (CCRS)
- China Classification Society (CCS)
- Det Norske Veritas Germanischer Lloyd (DNV GL)
- Indian Register of Shipping (IRS)
- Korean Register of Shipping (KRS)
- Lloyds Register of Shipping (LRS)
- Nippon Kaiji Kyokai (NK)
- Registro Italiano Navale (RINA)
- Russian River Register (RRR)
- Russian Maritime Register of Shipping (RMRS)
- Turkish Loydu (TL)

Details on conformance to requirements of other societies and international marine safety standards can be obtained from our sales offices.

Spare Parts

According to classification requirements spare parts can be offered separately.

Our Promise

At Cummins Generator Technologies, it's how we engage our customers every day that sets us apart. The unique combination of knowledge, dependability and innovation we bring to each customer relationship turns everyday service into excellent customer support. As a result we help our customers operate with greater efficiency, making it possible for them to compete more successfully throughout the world.

There for you™

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For Applications Support:
applications@cummins.com

For Customer Service:
service-engineers@cumminsgeneratortechnologies.com

For general enquiries:
info@cumminsgeneratortechnologies.com

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