SUBMERSIBLE MOTOR ENGINEERING

Subsea Electric Motors

- Subsea Electric Motors
- Full Range of Speed Options
- All Voltages and Frequencies
- All Construction Options from Anodised Aluminium to Exotic Metal Alloys
- Extensive Electrical and Hydraulic Testing Facility
- Engineered Motor Solutions for Complex Applications

World Leaders in the Design, Manufacture, and Supply of Subsea electric motors – over 2000 motors delivered and operating

Visit out Website at: http://www.smeng.com.au

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FOREWORD

SME products have been designed and developed utilising many years of operating and service experience with submersible motors and subsea motors.

SME are a quality assured company and are certified to ISO 9001 by SGS for "Design, development, manufacture and testing of submersible subsea electric motors".

SME produce their motors under a rigorous QA procedure to ensure that all motors are supplied in a "Quality and Reliability Assured" condition. In addition to ensuring the motors are supplied in excellent condition, SME believe it is their responsibility to try to ensure that the end users get many years of reliable life from their SME motors.

We have studied the failures of many different brands of subsea motors and understand the mechanisms of failure.

Notwithsanding the high reliability of SME motors; they are all "Wet" wound and can be rewound and repaired by suitably equipped and competent companies.

At SME we try to help the end user – not just sell them a motor in a box. We offer the services of experienced commissioning engineers to go to site and ensure the motors are installed, commissioned, and protected correctly. We also offer full 24 hour service and testing facilities.

At SME we are continually working to improve the performance of our products and for this reason we reserve the right to make changes without notice to any of the data in this brochure. Please contact us direct for confirmation of any drawings dimensions or performance data.






SME SUBSEA MOTORS

SME can design and build Subsea motors to suit any requirements, due to our totally flexible design capabilities:

- Flexible External Dimensions to suit all applications.
- Dimensions to allow drop in replacement of existing units.
- Anodised aluminium, or, 316 stainless steel or more exotic materials, such as Duplex.
- Power drive to load using an output shaft with a standard coupling, or, close coupled, etc.
- Single drive shaft, or, a drive shaft at both ends, double shaft extension.

75 HP Subsea Motor fitted with Dual Hydraulic Pumps

Stainless Steel Construction 50HP Subsea Motor

330kW 6Pole 500RPM Subsea Motor fitted to Dredge Pump

SME can design and build a motor with a completely new lamination to meet special design requirements, if necessary.

SME design their motors so they do not run hot. Typical motors can run on deck for at least 10 minutes on full load, with no cooling, without overheating. The motors are designed to be compact in size and suitable for heavy-duty applications, like trenching.

If weight is important, SME can design the motor for minimum weight by utilising an aluminium construction and a hollow motor shaft, while still ensuring the motor is generously rated for full load operations. If the motor is going to drive a hydraulic pump we recommend a close-coupled arrangement to save the weight of the coupling and the coupling housing.

SME can design and build motors for all voltages from 24 volts to 6600V with 50Hz or 60Hz frequencies, or for VVF requirements. High Voltage motors can have random wound stator windings, or formed coils, depending on space and weight constraints. The winding wire for the High Voltage motors is double insulated and passes a twisted wire test at 16,000 volts and is rated up to 155 Deg.C. All windings are designed to keep 'turn to turn' voltage to a minimum. All winding materials and cables are specially selected to be suitable for use in hydraulic oils.

125HP Subsea Motor during assembly

300kW 4160V Stator Winding

In general, SME Subsea motors have low loss lamination steel (3 watts/kg), which allows for higher flux densities, and less heat, with less materials and weight.
All motors are oil filled and we recommend hydraulic oils for good lubrication characteristics in preference to electrical oil, which has better di-electric capabilities, but worse lubrication capabilities.

If motors are going to drive a water pump, SME can design the motor to take the thrust load from the pump and keep the sea water out of the motor with a single or double mechanical seal arrangement.

Small thruster motors can be designed and built for voltage/speed control, which is a relatively simple speed control system and can be built with a thrust bearing incorporated to take the thrust load from the impeller.

To ensure the integrity of the motor housing, SME does not use castings. All components are machined from solid or from extrusions. The external aluminium components are typically 6061 T6 marine grade aluminium and hard anodized to a military specification.

All ball bearings are from well know brands such as SKF, FAG, or NSK. Oil seals are high temperature and typically made from Viton. Mechanical seals are typically Burgmann.

All hardware used on SME Subsea motors is 316SS.

All fixing holes are blind. Oil in and out fittings and the stator pack-fixing bolt, if applicable are sealed with O rings.

The preferred power cable entry system for SME motors is to use an “oily tube” connected to an adaptor, which is part of an oil tight rubber gland that is fixed to the stator frame. SME do not recommend bringing the power cables through the endshields of the motor because this creates additional complications when the motors are stripped down during service, because the endshields cannot be readily removed from the stator. Subsea connectors can be offered as an alternative to the Oily Tube if requested.

SME 25HP 3000V Motor

SME 50HP motor for Subsea HPU

SME 300kW 4160V Motor

SME strongly recommend that the motors are fitted with PT100s fitted in the windings and also to the bearings. The internal motor temperatures are monitored and set up to alarm if the temperatures rise above a safe temperature. SME can also offer additional protection with a water detector. The auxiliary connections for PT100s, can be made through standard high pressure, water tight, plug and sockets as, supplied by “Subconn”, “Impulse”, and “Burton”. These are also fitted to a connection block on the stator, not on the endshield.

All finished motors are pressure tested to ensure they are “oil tight” and suitable for compensated operation down to 4000 metres.

All motors are rated for continuous operation and all prototype motors are full load performance tested at rated voltage and rated frequency to confirm their performance characteristics. All motors can be issued with a “Type Test Certificate” or even full load tested at additional cost, if required.

SME can also offer to arrange for hydraulic pumps to be set up and tested on the motors at rated voltage and frequency.

SME can offer to supply Hydraulic Power Units, “complete”, with the addition of customer specified Hydraulic Pump.

SME 200kW Subsea Motors for subsea pumping system

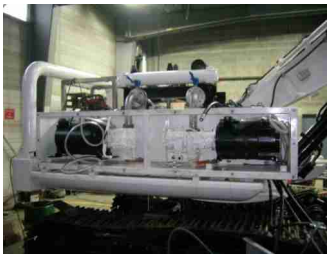
SME 50kW SS316 HPU Motor

Hydraulically Driven Subsea Pump

SME Subsea motors can be designed and built for all subsea applications, such as ROVs, Trenchers, Ploughs, Submarines and Dredges.

All brands of Subsea motor can be serviced, repaired and tested by SME. In some cases the original motors can be significantly upgraded. If you are having problems with your existing Subsea motor please contact SME – we are ready and able to provide assistance and we are very price competitive.

Typical Equipment Fitted with SME Subsea Electric Motors



APPLICATIONS

Driven equipment can include:

- Hydraulic Pumps: For ROV Hydaulic Power Units, Subsea Robotics, Thrusters, etc.
- Water Pumps: For Jetting Systems, Hull Cleaning, Trenching and Pipe and Cable Laying Equipment, Pipe Pressuriseation, Dredging, etc.
- Propellers/Impellers: For Remotely Operated Vehicle Thrusters, Manned Submarine Thrusters, Mass Flow Excavation, etc.
- Gearboxes: For Subsea Winches, Cable Tensioners and De-reelers.
- Fish Pumps

300kW SME Subsea Pump

SME Thruster Drive

Subsea Hydraulic Power Unit

MATERIALS OF CONSTRUCTION

SME can manufacture Subsea Motors in Aluminium (Grade 6061 T6), Stainless Steel(Grade 316), Duplex (SAF2205), Super Duplex (SAF2507) and other more exotic materials.

VOLTAGES

Motors are available in AC Voltages from 24V to 6600V. Motors up to 4160V in Random Wound Designs. Above 4160V motors are manufactured using a Formed Coil system. Special random wound design motors may be available above 4160V for specific applications.

SME HV Stator Winding

DEPTH RATING

All SME's Subsea Electric Motors are designed for external compensation and have been used at depths of more than 4000M. Compensation advice can be provided on request.

SPEED

Motors are available in a variety of speeds at both 50Hz and 60Hz

Synchronous speed at different numbers of poles

(Hz)	2P	4P	6P	8P	10P	12P
50	3000	1500	1000	750	600	500
60	3600	1800	1200	900	720	600

Lower speed ratings are available on application. Motors are suitable for operation using variable speed drives and SME can provide advice on variable speed drive operation if requested.

INSTRUMENTATION

SME Subsea Motors are available with a range of instrumentation not limited to;

- Bearing and Winding Temperature Monitoring
- Water Ingress Detection
- Pressure Transducer
- Resolvers and Encoders
- Tachometers

SME ROV26 330kW 6P 6600V 60Hz Motor with Encoder

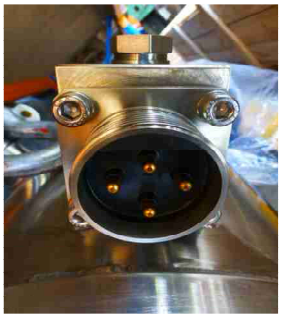
COOLING

SME Jetting Pump fitted with Thermex Cooler

Motors are generally designed to operate with no additional cooling other than the ambient water temperatures but in some cases external cooling may be required. SME can provide motors with closed loop cooling circuits or motors that are suitable for use with externally fed cooling circuits.

ELECTRICAL CONNECTIONS

SME Subsea Motors use an oily tube termination for all power connections as standard. However, appropriately sized and rated Subsea connectors can be used as an alternative, either a Bulkhead Connection on the motor, or as part of a fixed Flying Lead Termination.
Instrumentation is generally terminated using a variety of Subsea Connectors. Customers are free to specify their Connectors of choice.



HV Power Subsea Connector

Moulded Bulkhead Connector

Pressure Balanced Oil filled tube arrangement (Oily Tube)

Instrumentation Subsea Connector

MECHANICAL INTERFACE

Motors are design built to suit the application and SME can supply a broad range of interfaces from direct coupled arrangements to the use of separate coupling housings.
SHAFTS: Female and Male Spline Shafts, Internal and External Keyed Shafts,
FLANGES: NEMA, IEC, SAE, DIN Standards are all available as well as unique requirements
Motors can be provide with Double Ended Arrangements to drive multiple loads.

SME Motor fitted to Subsea Pump

SME Motor for Subsea Hydraulic Power Unit

SME Thruster Drives

MOTOR MOUNTING

Motors can be provided with various Mounting arrangements including Feet, Flanges, Brackets, or Clamping. In most cases SME can match the mounting interfaces of units being replaced to ensure ease of installation in existing equipment.
Motors can be manufactured for Horizontal or Shaft Up or Down installation.

COMPENSATION REQUIREMENTS

Motors are built to utilise external compensation. Motors are fitted with oil in and out ports as well as several bleed points to facilitate easy plumbing. Fittings can be provided with BSP, NPT or JIC and other fittings with both straight and tapered threads to provided uniformity on the installation.
There are a vast range of acceptable compensation fluids and SME can provide advice in the suitability of various oils.

Oil in/out Ports

SME MOTOR RANGE

Model	Kw Range	HP Range	Voltages	Speeds	Materials
ROV5	0.37-2kW	1/2-3HP	24-2300V	2P-4P	Alu/SS316/Exotic Alloys
ROV6	1-7.5kW	2-10HP	24-2300V	2P-4P	Alu/SS316/Exotic Alloys
ROV8	5-18.5kW	7.5-25HP	24-4160V	2P-4P	Alu/SS316/Exotic Alloys
ROV10	2-75kW	3-100HP	110-4160V	2P-4P-6P-8P	Alu/SS316/Exotic Alloys
ROV12	11-110kW	15-150HP	110-4160V	2P-4P-6P-8P	Alu/SS316/Exotic Alloys
ROV14	30-300kW	40-400HP	110-4160V	2P-4P-6P-8P	Alu/SS316/Exotic Alloys
ROV16	250-400kW	335-535HP	110-4160V	2P-4P-6P-8P	Alu/SS316/Exotic Alloys
ROV18 to ROV40	75-2000kW	100-3000HP	110-6600V	2P-4P-6P-8P and slower speeds	SS316/Exotic Alloys

The most common voltages are 3000V and 3300V.

Note: This is an indicative overview of the range of motors, however, SME is able to provide many and varied Subsea Motors outside of this range to suit specific applications. Please contact an SME representative to discuss your requirements.

SUBSEA PUMPS

SME design and manufacture a world leading range of Electric and Hydraulically Driven Subsea Pumps. These are designed to operate as Heavy Duty Jetting Pumps on Subsea Trenchers and Ploughs, Subsea Dredging and Excavation Equipment. SME Pumps are robust and reliable in the toughest environments. Our flexible design capabilities mean we can manufacture Subsea Pumps to suit most applications.

We offer a variety of Construction Materials from 316 grade Stainless Steel to Exotic Stainless Steel Alloys, with nickel aluminium bronze impellers.

SME Electrically Driven Subsea Pumps can be manufactured in all voltages from 380V through to 6600V at 50Hz or 60Hz, or for use with Variable Speed Drives.

All pump motors are designed for external compensation allowing for operation at depths as much as 4000M. The Motors can also be offered with Cooling circuits to ensure high output motors maintain minimal operating temperatures at Full Load.

Subsea Jetting Pump on Cable Plough

TESTING

SME's West Australian facility, located in Perth, provides for an extensive testing regime for repaired and overhauled motors. SME can full load test motors on our dynamometers and can also offer performance testing of complete pump/motor units in our purpose built test tank – at the specified voltage and frequency up to 6600 volts.

SME can guarantee motors that have been serviced and repaired are fit for purpose before dispatch, providing customers with complete confidence in the work prior to re-installation. All motors that are rewound by SME are subject to an immersion pressure test which is conducted in our pressure test vessel to ensure the integrity of the windings prior to assembly and load testing. Our commitment to a strict testing regime protects our clients from the risks of downtime caused by unexpected failure.

Equipment List:

- High Voltage Transformers 1000/2400/3300/4160/6600V
- High Current Voltage Regulator
- Dynamometer Load Test Equipment 300kW/2600kW
- Power Generation 350kVA/1350kVA
- 15kV Hi Pot and Surge Tester

SME Electrical Test Facility

Performance test 330kW 6P 6600V 60Hz Motor

Performance test on 50HP 3300V Motor

Subsea Pump Testing Facilities at SME

SME COMPANY PROFILE

Submersible Motor Engineering Pty Ltd is an Australian Company that designs and manufactures Submersible and Subsea Electric Motors for Global Markets. SME has the ability to design and produce specialist electric motors for complex applications, in many cases for a “1 off” requirement. SME should be the company of choice to work with to provide High Quality Engineered Solutions for your Subsea Motor requirements.

SME offers a Repair, Rewind Modification, and Technical Support Service, in Perth, and in Phoenix. Our facilities ensure that we can handle any job we are confronted with, regardless of complexity. Our purpose built testing facility ensures absolute confidence in workmanship and reliability for our clients.

When it comes to Sales and Service of Submersible and Subsea Motors, SME’s extensive range of Worldwide Locations ensures that we can provide excellent service and technical support on our own SME range of products, but also the products from all other manufacturers of Subsea Motors.

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