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**Electric SubSea Thruster and Propulsor Systems...**

*Designed for all types of Rov’s, Auv’s and Manned Submersibles*

SubSea Propulsion introduces AC/DC Electric Thruster Systems designed to provide any remotely operated sub-sea vehicle, autonomous underwater vehicle or a manned submersible, maximum Power and Maneuverability…with Silent and Reliable operation....

**“Thruster Systems that Whispers”**

Thruster units are compact, lightweight, efficient … silent … and ruggedly designed for the New Generation of Electrical Work Class Vehicles.

**Series SCE & SSE**

Engtek SubSea Systems – A Division of Engtek Manoeuvera Systems Pte Ltd introduces a new series of - Light Weight - Electric Thruster Systems using Light Weight Nozzle Technology and designed to provide any remotely operated vehicle, autonomous underwater vehicle or a manned submersible with maximum Maneuverability, Silent and Reliable operation....

**Fast Control of Magnitude - With Direction of Thrust**

Silent - Robust - Ruthlessly Reliable

<table>
<thead>
<tr>
<th>Model</th>
<th>Power Range</th>
<th>Input Power</th>
<th>Bollard</th>
<th>Weight (Lbs)</th>
<th>Feedback mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hp</td>
<td>Kw</td>
<td>Volts</td>
<td>Lbs</td>
<td>Air</td>
</tr>
<tr>
<td>SCE 025</td>
<td>1/4</td>
<td>.19</td>
<td>48 to</td>
<td>1.8</td>
<td>12.0</td>
</tr>
<tr>
<td>SCE 030</td>
<td>1/3</td>
<td>.25</td>
<td>80</td>
<td>2.4</td>
<td>16.0</td>
</tr>
<tr>
<td>SCE 050</td>
<td>1/2</td>
<td>.37</td>
<td>1 80</td>
<td>3.0</td>
<td>24.0</td>
</tr>
</tbody>
</table>

*Depth of Operation is 300 meters without pressure compensation. Controller is an integral part to the thruster assembly. For greater depth of operation please contact engineering – other dc voltages available*

- **SSE 100**  
  - 1.0  
  - .75  
  - 140  
  - 3.4  
  - 42.5  
  - 19.3  
  - 10.5  
  - 7.9  
  - Sensor less Controller to be located in a one (1) atmosphere housing available as optional or customer furnished –

- **SSE 200**  
  - 2.0  
  - 1.49  
  - 600  
  - 11.8  
  - 150.0  
  - 68.2  
  - 18.5  
  - 13.9  

- **SSE 500**  
  - 5.0  
  - 3.73  
  - V dc  
  - 15.2  
  - 215.0  
  - 97.0  
  - 24.0  
  - 16.5  

- **SSE 800**  
  - 8.0  
  - 5.97  
  - V dc  
  - 22.0  
  - 340.0  
  - 154.5  
  - 34.5  
  - 24.0  

- **SSE 1200**  
  - 12.0  
  - 8.95  
  - 18.5  
  - 510.0  
  - 231.8  
  - 48.5  
  - 33.0  

- **SSE 1500**  
  - 15.0  
  - 11.9  
  - 21.0  
  - 637.5  
  - 290.0  
  - 60.5  
  - 42.0  

- **SSE 2000**  
  - 20.0  
  - 14.9  
  - 27.5  
  - 850.0  
  - 386.0  
  - 72.0  
  - 52.5  
  - Motor Controllers ac/dc

*Full ocean depth oil filled/pressure compensated- other voltages available*
SubSea Electric Thrusters

**Designed for Rov's, Auv's & other subsea applications.**

All models feature DC brushless rare earth motors for maximum reliability and power. Standard voltages are shown. Voltages from 48-600 dc volts are available on some models. For Models SSE100 to SSE2000 AC input voltage options are 140 to 600 Vac. Models SCE025, SCE030 & SCE050 feature power & control electronics housed within motor case for maximum reliability & simplified installation. Models SSE100 to SSE2000 utilize a sensorless feedback motor controller. The Motor Control Modules are normally mounted in a customer or our one atmosphere housing. Housings rated upto 6000 meter ocean depth are available. Up to 6 modules can be mounted inside one (1) housing and furnished complete with power and communication connectors of our or client design and manufacture. Also furnished is a water intrusion alarm as well as serial communications to a customer furnished control system.

- All Models feature a Carbon-Fiber Propeller, designed for bi-directional rotation with Kort nozzles for high bollard thrust & open water efficiency. Clockwise & counterclockwise rotation propellers available for all models.

- Models SCE025 to SCE050 rated to 300 meter depth - 1500 meter, 3000 meter and full ocean depth ratings (with oil filled housings) also available. Models SSE100 to SSE2000 rated for full ocean operation with pressure compensators.

Direct e-motor drives with no planetary gear reduction units resulting in “Silent” and “Reliable” operation with lightweight & compact designs at competitive pricing. Custom configurations include alternate voltages, subsea connectors, power ratings, mountings & depth ratings, etc.

The **SSE and CRT Series** is a “unique” series of **Subsea Electric Thruster Systems**, designed with a dc brushless electric motor incorporated as an integral part of the thruster hub. Units come complete with Nozzle, mounting brackets and are offered from .25 to 30 horsepower.

The electric motor is built **inside** the thruster pod and therefore extremely lightweight and compact. The design speed of the propeller averages 28 meters/sec or less, offering efficient and silent operation. Depending on the Model Series, either a 5 or 7 bladed propeller is used (low blade frequency). The thruster systems are pressure compensated and operational to all ocean depths. All thruster pod assemblies can be manufactured from nylon, stainless steel or aluminum with all attaching hardware either 316 stainless steel or aluminum (hard anodized).
Propeller shafts are made of high strength stainless steel, and contain anti-friction tapered roller bearings.

An efficient and compact dc brushless, rare earth magnetic electric motor designed as part of the thruster hub. This motor has variable horsepower (constant torque) characteristics. The electric motor has optimum running clearances and balance to assure sustained high efficiency over the life of the motor. The inertia of rotating parts is low... parts are symmetrical, providing dynamic balance free of vibration.

**Kort Type Nozzles**... for increased thrust efficiency. The thruster systems are complete with Nozzle profile inlets and outlets with mounting hardware. The nozzle configuration used shall be...

Type 37 Nozzle - Smoothly flared both fore and aft, the Type 37 Nozzle gives the best performance in applications requiring both forward and reverse thrust. Even though there is a slight decrease in forward thrust compared to the type 19A & 19B nozzle configurations, an overall gain of 20 to 30% in the Bollard thrust over an open propeller is normal.

The SubSea Electric Thruster pod design incorporates a silicon carbide rotary shaft seal arrangement that keeps oil from leaking out of the thruster and ensures positive sealing preventing ocean water intrusion. The sealing arrangement is easily removed for cleaning or replacement, with out removal of the thruster unit from the ROV.

**Thruster Control Assemblies:**

SubSea Propulsion provides **Thruster Control Modules (TCM)** housed within a one (1) Atmosphere Housing. Three ratings are available, upto 3000M, 6000M or full ocean depth. The Thruster Control Modules are available for the full series of Thruster Systems offered by SubSea Propulsion and supplied as standard for 4, 6 and 8 thruster control units. More control units are available as optional. Each TCM incorporates a water ingress and temperature sensor for reassurance. Each control module is mounted to a heat sink with internal seawater cooling passages. One (1) main power subsea connector, one (1) subsea connector for full thruster control and monitoring and connectors for each individual thruster unit.

Pressure ratings available in a 3000 meter, 6000 m, or full ocean depth
Introduction

The SubSea AC/DC Electric Thruster Assembly incorporates all the power electronics and control building blocks required to precisely control the permanent magnet brushless thruster motor. Each section of the drive has been carefully engineered for utility, ruggedness, and performance in a wide range of operating conditions.

As a whole, they form a flexible, reliable motor drive platform for the SubSea Thruster Electric Series

SubSea Propulsion Modules

Designed for Manned Vehicles/Navy SDV’s and ASDS applications

SubSea Electric Propulsion Modules are designed to be used on a manned submersible vehicle. The Drive System consists of brushless motors, feedback devices and control electronics housed to permit submerged operation in water. The unit uses dual redundant (2) motors on a common shaft, two feedback devices and two sets of Motor Controls, sensors and electronics in a single integrated housing – complete “get home capability”. The unit will accept nominal 150 Vdc input power and a speed control command to provide shaft output at the commanded rotational speed.

SubSea Propulsion Modules

20 Hp (15Kw), 150 Vdc brushless electric motor / Controller assembly. Designed and manufactured for the SDV (Delivered for the Dolphin Class Swimmer Delivery Vehicle) program. Motor has dual 10 Hp windings + controllers in case of failure.

The MCs reads the position and speed of the shaft using resolvers, close the speed loop and provide motor commutation. The MCs returns status information such as propeller speed (RPM) and Built-In-Test (BIT) results through analog (or digital) with discrete interfaces or optionally using an RS-422 serial interface.

The system is configured such that should one motor or controller fail, the unit shall remain functional with reduced available shaft power.
<table>
<thead>
<tr>
<th>Model Number</th>
<th>Power Hp</th>
<th>Power Kw</th>
<th>Developed Thrust Lbs-f</th>
<th>Developed Thrust Kgs-f</th>
<th>RPM</th>
<th>Motor Bus Voltage</th>
<th>Control Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPM10</td>
<td>10</td>
<td>7.5</td>
<td>420</td>
<td>190</td>
<td>420</td>
<td>150vdc</td>
<td>28vdc</td>
</tr>
<tr>
<td>SPM20</td>
<td>20</td>
<td>15.0</td>
<td>880</td>
<td>400</td>
<td>300</td>
<td>150vdc</td>
<td>28vdc</td>
</tr>
<tr>
<td>SPM35</td>
<td>35</td>
<td>26.0</td>
<td>1575</td>
<td>715</td>
<td>280</td>
<td>150vdc</td>
<td>28vdc</td>
</tr>
<tr>
<td>SPM50</td>
<td>50</td>
<td>37.5</td>
<td>2250</td>
<td>1,022</td>
<td>240</td>
<td>150vdc</td>
<td>28vdc</td>
</tr>
<tr>
<td>SPM75</td>
<td>75</td>
<td>56.0</td>
<td>3600</td>
<td>1,636</td>
<td>180</td>
<td>150vdc</td>
<td>28vdc</td>
</tr>
</tbody>
</table>

Power will be provided to the (MCs) as 150vdc for motorbus and nominal 28vdc for control electronics.

Dual Propeller - Counter Rotation Propulsion Modules for Stealth “Silent” Operation.

Approximately 18% more thrust and …the counter rotation design assures that no gyroscopic moments are transferred to the vehicle. Very fast response times are assured with "Silent and Vibration Free Operation”.

SubSea Steerable Propulsion Modules providing port/starboard and descend/ascend 30°-0°-30° elevation & steering control...

Electric Podded Propulsors with Nozzle Assemblies

“Fixed and Steerable Configurations” designed for Manned Submersibles and Tourist Submarine applications.

A “Unique” Series of Electric Propulsors incorporating a brushless dc electric motor as an integral part of the thruster hub. Introducing “Silent Propulsion Systems” that are, efficient, compact and lightweight using carbon-fiber propeller technology. The drives utilize variable speed motor controllers. The thruster pod ratios are idealized for maximum flow conditions.

The “Podded Wet” Propulsor systems are designed to prevent leakage. Typical subsea thruster systems are prone to water entering or oil leaking through the propeller shaft seals. The “Wet” Propulsor design eliminates this problem by the introduction of an internal sealed diaphragm located between the rotor and stator, creating two separate isolated and sealed compartments. Water cannot reach the stator and electronics through the shaft seal. By incorporating kort type nozzles – a 30% increase in bollard thrust is achieved.
## High Power SubSea Podded Propulsors with Kort Nozzles

<table>
<thead>
<tr>
<th>Model</th>
<th>Power</th>
<th>Thrust</th>
<th>Prop Dia</th>
<th>Input Volts to the Controller</th>
<th>Current @ 440vac</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hp</td>
<td>Kw</td>
<td>Lbs</td>
<td>Kgf</td>
<td>Inch</td>
</tr>
<tr>
<td>P20E</td>
<td>20</td>
<td>15</td>
<td>720</td>
<td>325</td>
<td>15.0</td>
</tr>
<tr>
<td>P30E</td>
<td>30</td>
<td>22</td>
<td>1080</td>
<td>490</td>
<td>18.0</td>
</tr>
<tr>
<td>P50E</td>
<td>50</td>
<td>37</td>
<td>1800</td>
<td>800</td>
<td>24.0</td>
</tr>
<tr>
<td>P75E</td>
<td>75</td>
<td>56</td>
<td>2700</td>
<td>1225</td>
<td>28.0</td>
</tr>
<tr>
<td>P100E</td>
<td>100</td>
<td>75</td>
<td>3600</td>
<td>1635</td>
<td>30.0</td>
</tr>
<tr>
<td>P150E</td>
<td>150</td>
<td>112</td>
<td>5400</td>
<td>2450</td>
<td>32.0</td>
</tr>
</tbody>
</table>

Options: Steerable / Full Azimuthing configurations available

### Motor Controller:

The Drive System is a fully proportional drive with Serial Link capabilities if required.

The drive uses EUPEC IGBT modules, which have continuous ratings from 50 amps to 350 amps. The middle boards are a gate drive from CONCEPT and the control board sits on top. Situated behind the IGBT module is a capacitor or power board. Input power, either AC or DC input power comes in from this side.

The capacitor board comes in different designs depending on the input power requirements, whether the power needs to be rectified, the magnitude of the voltages, the types of control power available, required inrush suppression and the amount of transient and ripple suppression required on the DC bus. The Motor Controller is designed to be heat sink mounted in a dry compartment.

SubSea Propulsion Systems use RS for our serial interface and can work with a wide range of different Input and Output requirements.
About the Company

We are pleased to introduce Engtek Manoeuvra Systems Pte Ltd, a manufacturer of Marine Propulsion and Maneuvering Systems. The company is strategically based in Singapore and is well-positioned for continued growth in the offshore oil/gas and subsea marine industry.

Engtek Manoeuvra Systems is part of the Engtek Group of companies with Engtek Pte Ltd main business being the supply of marine equipment and services to the marine and offshore sector.

Founded in 1974 by its Executive Chairman, Mr. Hon Chee Wah, the company started with only two staff. Today, it has staff strength of 110 with offices and subsidiaries all over the region.

Engtek has a large and regular base of customers stretching from Singapore to China, Malaysia and Vietnam. An ASMI Associate Member since its incorporation, the company has built up a network in Asia with its headquarters in Singapore. It currently has offices in Kuala Lumpur, Ho Chih Minh, Hai Phong, Shanghai, Nantong, Dalian and Guangzhou. Engtek also has businesses in Indonesia, Japan, Thailand and South Korea.

Today, Engtek has grown from strength to strength to become a manufacture and OEM company, manufacturing products under license as well as having the capability to design and manufacture its own products. It represents a range of reputable brands in complement with its own proprietary products. It develops and manufactures its own proprietary equipment, steel work fabrication and engineered systems for package deliveries. Its philosophy is to represent and offer only good quality and reliable products and services to customers.

Company Profile

Who - Engtek Manoeuvra Systems Pte Ltd serves the Marine Thruster and Propulsion markets with a distinctive approach to thruster design, technology and management.

What – Engtek Manoeuvra Systems staff is at your service from the initial design phase to onboard installation, ensuring flexible and professional support throughout your project. Our commercial grade products are known for rock solid reliability and meet all class requirements. All standard and customized products are designed and manufactured in both Singapore and China.

How – In collaboration with naval architects, customers, shipyards and suppliers we are continuously expanding our product range.
Our Approach

Thrusters have become an essential addition for maneuvering today's maritime vessels. To provide thrust in all directions we build and supply Engtek-branded thrusters suitable for Yachts and Commercial Vessels in three different configurations:

Design Philosophy

- All models are engineered by a proven design philosophy that is based on: Certification under the rules of leading Classification Society’s (ABS, BV, DNV, GL, LRS, and RINA).

- High efficiency with the smallest possible tunnel diameter;

- Heavy duty bearings. The bearings are designed to meet class requirements and exceed a lifetime of 30,000 hours;

- Low propeller tip speed. Propellers are designed at a tip speed of 30 m/s to minimize noise and maximize the comfort level on board;

- Easy maintenance due to the modular design;

System Integrator

As a system integrator, the Engtek Manoeuvra Systems Pte Ltd is able to aggregate a complete thruster drive train, including: generator sets, diesel engines, power packs, frequency converters and Dynamic Positioning Systems.

With our international network of maritime professionals we are your one-stop-shop for easy maneuvering.

Where

Our Main Sales and Engineering Offices plus production facilities are located in Singapore.

The Company has an experienced staff of technical personnel who are familiar with the demanding requirements of the ocean environment. We are small enough to give you personal attention, yet big enough to give you excellent service.
Stay ON COURSE with – Engtek SubSea Thruster Systems …

We offer tailored designed systems to suit any application. This, in combination with evolutionary designs, will fulfill your every need for propulsion and effective power. We have over 40 years experience in the maritime propulsion world.

Engtek SubSea Systems Pte Ltd

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